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ALTERATION EFFECTS IN THE UPPER OCEANIC CRUST - DATA AND COMMENTS

(Technical Note)

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APPENDIX A

Petrographic Descriptions

This appendix contains petrographic descriptions of igneous rocks and XRD and electron diffraction data of secondary minerals.

Costa Rica Rift (Legs 69, 70, 83, 111,137, 140, and 148)

Hole 504B

Sample 69-504B-2R-1, 108–110 cm (Piece 233), Unit 1 [Z-883]

Olivine-clinopyroxene-plagioclase-microphyric basalt, massive, with hyalopilitic groundmass texture. Microphenocrysts of plagioclase are represented by elongated laths 0.2–1 mm (10%). Large grains of labradorite (An_{62}). Small laths are andesine ($An_{43–45}$). Sparsely idiomorphic microphenocrysts of clinopyroxene (1%–3%) are colorless diopside (salite?). Groundmass: light brown weakly anisotropic interstitial glass at the first stage of crystallization. Panicle like plagioclase and clinopyroxene crystallites (in glass) form pseudovariolitic texture. Single rounded vesicles (<0.2 mm) infilled with brown anisotropic glass.

Alteration: rock is fresh; single idiomorphic crystals (0.2–0.4 mm) of olivine(?) completely replaced by isotropic brown matter and partly by green anisotropic chlorite.

Sample 69-504B-4R-1, 62–64 cm (Piece 274), Unit 2A [Z-884]

Olivine-plagioclase-phyric basalt, massive, with vitrophyric groundmass texture. Rock volume contains phenocrysts (20%) and volcanic glass. Phenocrysts: fresh olivine (5%) and glomerophyric segregates of plagioclase prismatic crystals (15%, labradorite [An_{52}]). Groundmass contains isotropic green-cream glass.

Alteration: rock is fresh.

XRD: smectites; smectite and chlorite veinlet.

Sample 69-504B-4R-3, 108–111 cm (Piece 322), Unit 2A [Z-885]

Olivine-plagioclase-phyric basalt, crystallized, massive, with intersertal-crystallitic groundmass texture. Phenocrysts of plagioclase are represented by elongated-prismatic laths (0.5–1.7 mm, 20%). More small grains form glomerophyric segregates (labradorite [An_{55}]). There are two grains of idiomorphic dark mineral (olivine?). Groundmass; needle-shaped laths, microlites of plagioclase (andesine [$An_{42–45}$]), and crystallized interstitial glass with plagioclase, opaque dust, and segregates of clinopyroxene. Crystallites form panicle like segregates.

Alteration: olivine(?) completely replaced by high double-refracted green or green-brown iddingsite-bowlingite; single small parts (up to 0.4 mm), maybe it is clinopyroxene, replaced by clay mineral.

XRD: smectites.

Sample 69-504B-4R-4, 42–45 cm (Piece 330), Unit 2A [Z-886]

Aphyric basalt (microdolerite), crystallized, massive, with intersertal-microdoleritic groundmass texture. Rocks contain plagioclase laths (40% labradorite [An_{55}], 40% clinopyroxene grains, 5% opaque mineral, and 15% glass).

Alteration: slight (15%); interstitial glass completely replaced by clay mineral.

XRD: veinlet; smectite, hematite, and phillipsite.

Sample 69-504B-5R-2, 142–146 cm (Piece 387), Unit 2A [Z-887]

Olivine-plagioclase-phyric basalt, irregularity crystallized, massive, with pilotaxitic groundmass texture. Phenocrysts: plagioclase tabular grains (as much as 2 mm, 15%, labradorite [$An_{56–58}$]), sometimes plagioclases are zonal with inclusions of glass. Olivine or clinopyroxene (5%–10%) forms idiomorphic grains with sizes up to 2 mm completely replaced by aggregate of iddingsite. Groundmass; needle-shaped microlites of plagioclase. Plagioclase is located in black weakly crystallized glass. Occasionally more crystallized parts demonstrate crystallites and microlites of clinopyroxene and opaque dust. These parts have transitional texture from pilotaxitic to intersertal-crystallitic.

Alteration: slight (10%); dark-brown mineral and small parts (0.5 mm–2 mm) replaced by green clay mineral.

XRD: smectites; veinlet of smectite and undetermined mineral (3.20 Å).

Sample 69-504B-6R-1, 65–69 cm (Piece 404), Unit 2A [Z-888]

Olivine-clinopyroxene-plagioclase-phyric basalt, weakly crystallized, massive, with pilotaxitic groundmass texture. Phenocrysts are plagioclase and dark-color mineral. Plagioclase (labradorite [An_{58}]) forms elongated-prismatic grains and their glomerophyric segregates; sizes from 0.5 to 2 mm (15%) are tabular grains (labradorite [An_{56-58}]). There are two types of dark-color minerals: single diamond-tabular grains (as much as 1 mm) completely replaced by iddingsite (olivine?) and small grains (0.2–0.3 mm). The latter (1%) forms segregates of completely chloritized clinopyroxene(?). Groundmass; unoriented laths and microlites of plagioclase (andesine [An_{40}]). Glass is brown-black and almost isotropic. In other parts of thin section, glass is crystallized with crystallites and microlites of clinopyroxene. There are single thin veinlets with clay mineral.

Alteration: slight (5%).

XRD: smectites; smectite veinlets.

Sample 69-504B-7R-2, 64–68 cm (Piece 459), Unit 2C [Z-889]

Plagioclase-phyric basalt, weakly crystallized, vesicular, with vitrophyric-hyalopilitic groundmass texture. Phenocrysts of plagioclase (labradorite [An_{55-58}]) are represented by plate and prismatic crystals (0.5–2 mm, 30%) and dark mineral. Single grains of plagioclase are zonal. Groundmass; unoriented laths and microlites of plagioclase (andesine [An_{42-45}]) and crystallized glass with opaque dust. Small rounded-isometric vesicles (0.05–0.1 mm) are present. There are empty vesicles (5%).

Alteration: vesicles infilled with brown-green clay mineral.

XRD: smectites; smectite, chlorite, and phillipsite veinlets.

Sample 69-504B-7R-3, 61–65 cm (Piece 481), Unit 2C [Z-890]

Olivine(?)-plagioclase-phyric basalt, weakly crystallized, massive, with vitrophyric-microlitic groundmass texture. Phenocrysts are elongated-prismatic and plate crystals of plagioclase (0.5–2 mm, 20%, labradorite [An_{65}]). Single grains of olivine are present. Groundmass; laths of plagioclase and glass (from completely isotropic brown-black glass to weakly anisotropic light brown glass). There are rounded microvesicles (0.01–0.05 mm, <1%).

Alteration: olivine replaced by iddingsite-bowlingite; vesicles infilled with clay mineral.

XRD: smectites, chlorite, hematite, and phillipsite veinlets.

Sample 69-504B-8R-3, 61–66 cm (Piece 538), Unit 2D [Z-891]

Dolerite, massive; groundmass is poikilitic-ophitic texture. Phenocrysts: plagioclase (50%, 0.2–2 mm, labradorite [An_{65}]) and clinopyroxene (salite; 40%, as much as 2 mm) grains. Spots of small (0.1 mm) grains of opaque mineral. Chlorite and pyroxene are present.

Alteration: slight.

XRD: smectites; smectite veinlets.

Sample 69-504B-9R-1, 142–147 cm (Piece 583), Unit 3A [Z-892]

Plagioclase-microphyric basalt, weakly crystallized, massive, groundmass is vitrophyric texture. Phenocrysts of plagioclase (labradorite [An_{55}]) are represented by sparse short-prismatic grains (10%) as much as 0.5 mm in size. Plagioclase grains contain glass. Groundmass glass is fresh and weakly anisotropic.

Alteration: glass from plagioclase completely replaced by clay mineral.

XRD: smectites; smectite and phillipsite veinlets.

Sample 69-504B-10R-3, 17–20 cm (Piece 643), Unit 3A [Z-893]

Plagioclase-clinopyroxene-phyric basalt, crystallized, massive, with microlitic, partly pilotaxitic groundmass texture. Plagioclase; single small (<0.5 mm) elongated-prismatic zonal grains. There is one large (2.5 mm) rounded-isometric (xenocryst) grain of salite with inclusions of short-prismatic, small (0.2 mm) grains of plagioclase (labradorite [An_{56}]). Microlites demonstrate andesine (An_{38-40}). Groundmass contains unoriented laths and microlites of plagioclase. Interstices contain microlites of clinopyroxene with opaque micrograin mass or weakly crystallized glass with opaque dust.

Alteration: slight (3%–5%); sparse spots (as much as 2 mm) with high chloritization; near these spots there are minor microvesicles (0.05 mm) infilled with clay mineral.

XRD: smectites; smectite and undetermined mineral (3.20 Å) veinlets.

Sample 69-504B-11R-1, 61–64 cm (Piece 667), Unit 3A [Z-894]

Plagioclase basalt, weakly crystallized, massive; groundmass is microlitic-pilotaxitic texture. Rock is the same as Sample 69-504B-10R-3, 17–20 cm (Z-893), but without grains of clinopyroxene. Glomerophyric segregate (0.4 mm) of clinopyroxene and plagioclase with poikilitic texture is present.

Alteration: slight (3%–5%).

XRD: smectite veinlets.

Sample 69-504B-12R-1, 39–43 cm (Piece 714), Unit 3A [Z-895]

Plagioclase-sparsely microphyric basalt, crystallized, massive, with microlitic, partly microdoleritic groundmass texture. Plagioclase; small (as much as 0.4 mm) laths and glomerophyric segregates (2%–3%, labradorite [An_{53}]). Groundmass contains laths and microlites of plagioclase. Interstices contain segregates of small grains of plagioclase (microdoleritic texture). Occasionally microlites of plagioclase are oriented (trachytoid texture). Opaque mineral (very small grains, often idiomorphic) is in paragenesis with clinopyroxene.

Alteration: slight (1%–2%); rare spots (1 mm) with chloritization of rock.

XRD: smectites; smectites, chlorite, and phillipsite veins.

Sample 69-504B-13R-4, 40–44 cm (Piece 806), Unit 3A [Z-896]

Plagioclase-sparsely microphyric basalt, crystallized, massive, groundmass is microlitic texture. Phenocrysts of plagioclase (labradorite [An_{62}]) are represented by sparsely glomerophyric segregates (2%) of short-prismatic grains. Groundmass contains laths (andesine [An_{47}]) and microlites of plagioclase. Interstices contain small rounded grains or their segregates (salite). Clinopyroxene occurs together with small isometric and partly idiomorphic grains of opaque mineral (as much as 15%).

Alteration: slight; very sparsely rounded spots (as much as 0.2 mm) with chloritization of rock (possibly olivine replaced by chlorite).

XRD: smectites; smectites and hematite veinlets.

Sample 69-504B-15R-1, 24–26 cm (Piece 872), Unit 3C [Z-901]

Plagioclase-sparsely microphyric basalt, uncrystallized, massive, with vitrophyric groundmass texture. Single small (as much as 0.4 mm) table-like grains of plagioclase (labradorite [An_{64}]) are located in weakly anisotropic brown glass with pseudovariolitic texture. Small segregates of plagioclase and pyroxene, ophitic texture (inclusion of microdolerite?).

Alteration: rock is fresh.

XRD: smectites; smectites, chlorite(?), and phillipsite(?) veinlets.

Sample 69-504B-16R-1, 45–49 cm (Piece 961), Unit 3C [Z-897]

Olivine-plagioclase-sparsely phyric basalt, uncrystallized, massive, with vitrophyric groundmass texture. Elongated-prismatic and tabular grains (0.6–0.8 mm) of plagioclase form glomerophyric segregates up to 15 grains (5%–7%, labradorite [$An_{55–57}$]). There are segregates of laths of plagioclase and small isometric grains of clinopyroxene. Olivine; idiomorphic small (0.2–0.3 mm) grains. Groundmass contains rare microlites of plagioclase and weakly anisotropic glass with panicle-like crystallites of clinopyroxene and plagioclase and grains of opaque mineral.

Alteration: slight; olivine completely replaced by clay mineral (center) and hematite (margin parts).

XRD: smectites; smectites and hematite veinlets.

Sample 69-504B-16R-4, 22–26 cm (Piece 1005), Unit 4 [Z-898]

Plagioclase-phyric basalt, uncrystallized, massive, groundmass is hyalopilitic texture. Short-prismatic grains (0.4–0.6 mm) of plagioclase (labradorite [An_{60}]) form glomerophyric segregates (20%). Groundmass contains needle-shaped, case-like microlites of plagioclase. Grains of plagioclase are located in weakly anisotropic brown glass.

Alteration: slight.

XRD: smectites; smectite veinlets.

Sample 69-504B-17R-1, 30–34 cm (Piece 1036), Unit 4 [Z-899]

Plagioclase-phyric basalt, uncrystallized, massive, groundmass is hyalopilitic texture. Rock is the same as Sample 69-504B-16R-4, 22–26 cm (Z-898).

Alteration: slight.

XRD: smectites; smectites and magnesite veinlets.

Sample 69-504B-18R-1, 45–49 cm (Piece 1087), Unit 5 [Z-900]

Plagioclase-phyric basalt, crystallized, massive, groundmass is microlitic (microdoleritic) texture. Plagioclase forms glomerophyric segregates of various sizes. Idiomorphic or rounded-prismatic grains (0.2–2 mm, 20%). Composition of plagioclases are labradorite ($An_{58–60}$). In a single case, there is weakly anisotropic completely oxidized brown mineral (olivine?). Groundmass contains unoriented laths and microlites of plagioclase.

Interstices contain accreted microlites of clinopyroxene and segregates of very small grains of this mineral. Pyroxene is diopside with hedenbergite in trace amounts. Very small grains of opaque mineral in paragenesis with clinopyroxene are present.

Alteration: rock is fresh.

XRD: smectites; smectites, chlorite(?), hematite, phillipsite, and undetermined mineral (3.20 Å) in veinlets.

Sample 69-504B-19R-1, 84–87 cm (Piece 1124), Unit 5 [Z-902]

Plagioclase-phyric basalt, uncrystallized, weakly vesicular, groundmass is hyalopilitic texture. Plagioclase (0.2–0.4 mm) forms glomerophyric segregates (15%, labradorite - [An_{58}]). There is a single diamond-shaped grain completely replaced by chlorite (clinopyroxene?). Groundmass contains needle-shaped microlites of plagioclase. Grains of plagioclase are located in brown-black weakly crystallized glass with opaque dust. There are small isometric vesicles (as much as 0.1 mm, 5%).

Alteration: rock is fresh; vesicles infilled with green clay mineral.

XRD: smectites; smectites and chlorite(?) in veinlets.

Sample 69-504B-20R-1, 110–113 cm (Piece 1173), Unit 9 [Z-903]

Plagioclase-phyric dolerite, crystallized, massive, small grains, groundmass is doleritic texture. Sparse elongated-prismatic laths of plagioclase as much as 2 mm (5%) are represented by labradorite (An_{62}). Groundmass has unoriented variously sized (0.2–2 mm) elongated laths of plagioclase (40%, labradorite [An_{53-55}]). Clinopyroxene (salite) forms small tabular grains (0.2–0.3 mm, often clinopyroxene forms panicle like segregates. Total of clinopyroxene in rock is 40%). Interstices contain parts of iddingsite in paragenesis with very small grains of sphene and brown matter in paragenesis with opaque mineral. Thin veins (0.2–0.4 mm) are present.

Alteration: rock is fresh.

XRD: smectites; smectites, hematite, and aragonite in veinlets.

Sample 69-504B-21R-2, 126–130 cm (Piece 1215), Unit 10 [Z-904]

Plagioclase-phyric basalt, weakly crystallized, massive, groundmass is pilotaxitic texture. Elongated-table grains of plagioclase (0.2–0.4 mm) forms glomerophyric segregates (labradorite [An_{55}]). Groundmass contains unoriented laths and microlites (andesine [An_{43}]). Glass is weakly anisotropic. Opaque dust is present.

Alteration: rock is fresh.

XRD: smectites; smectites and phillipsite in veinlets.

Sample 69-504B-21R-4, 116–120 cm (Piece 1253), Unit 14 [Z-905]

Plagioclase-phyric basalt, uncrystallized, massive, groundmass is hyalopilitic texture. Plagioclase (0.8–1 mm) forms short-prismatic idiomorphic grains (10%, labradorite [An_{55}]). Groundmass has needle-shaped and skeletal microlites of plagioclase in weakly anisotropic brown glass.

Alteration: rock is fresh.

XRD: smectites and hematite in veinlets.

Sample 69-504B-21R-5, 63–66 cm (Piece 1267), Unit 16 [Z-906]

Clinopyroxene-plagioclase-phyric basalt, uncrystallized, massive, groundmass is hyalopilitic texture. Elongated-prismatic and table-like grains of plagioclase (0.2–0.8 mm) forms glomerophyric segregates (10%, labradorite [An_{62}]). There is a single grain (0.5 mm) of clinopyroxene (diopside) in accretion with plagioclase grains. Groundmass contains unoriented needle-shaped microlites of plagioclase in black or brown glass.

Alteration: slight.

XRD: smectites; smectites in veinlets.

Sample 69-504B-22R-1, 108–109 cm (Piece 1280), Unit 16 [Z-907]

Olivine-plagioclase-microphyric basalt, uncrystallized, massive, groundmass is vitrophyric texture. Rock contains laths (20%) and groundmass (80%). Olivine (5%) occurs in small grains (0.2–0.3 mm) completely replaced by iddingsite. Plagioclase (0.2–0.8 mm, 15%) forms laths and prismatic grains (0.2–0.7 mm, labradorite [An_{55}] and andesine [An_{45}]. There is weakly anisotropic brown glass with rare crystallites of plagioclase. A single grain (0.5 mm) of clinopyroxene (diopside) is in accretion with plagioclase grains.

Alteration: slight (5%).

XRD: smectites; smectites in veinlets.

Sample 69-504B-23R-1, 32–35 cm (Piece 1314), Unit 16 [Z-908]

Clinopyroxene-plagioclase-phyric basalt, crystallized, massive, groundmass is microlitic and partly intersertal texture. Phenocrysts of plagioclase with various sizes (0.3–0.8 mm). There is a single elongated-prismatic crystal (3 mm). Grains often form glomerophyric segregates. Total plagioclase is 25% (labradorite [An_{60}]). Idiomorphic grains (0.5–0.7 mm, 5%) of clinopyroxene (diopside-salite) are present. Other areas of groundmass contain unoriented laths and microlites of plagioclase (andesine [An_{42}]). Interstices infilled with segregate of small, occasionally panicle-like microlites and grains of clinopyroxene and opaque mineral. Glass is brown-black and almost isotropic. In other parts of the thin section, glass is crystallized with crystallites and microlites of clinopyroxene. There are single thin veins contain chlorite.

Alteration: slight; small areas with green clay mineral.

XRD: smectites in veinlets.

Sample 69-504B-24R-1, 125–128 cm (Piece 1349), Unit 16 [Z-909]

Olivine(?)-clinopyroxene-plagioclase-phyric basalt, uncrystallized, massive; groundmass is vitrophyric texture. Phenocrysts of plagioclase (0.2–2 mm, 25%) with elongated-prismatic and table-like habite forms crystals and glomerophyric segregates. There is a single elongated-prismatic crystal (3 mm). Grains often form glomerophyric segregates. Composition of plagioclase is labradorite (An_{65}). There are single idiomorphic grains (as much as 0.5 mm). Many idiomorphic grains (0.2–0.4 mm) are completely altered. These grains are possibly olivine (2%–3%). Groundmass contains very black, dark-brown glass.

Alteration: some parts of glass replaced by chlorophaeite; olivine(?) replaced by iddingsite; very thin cracks infilled with chlorophaeite.

XRD: Ca-Mg and Na-K smectites (or mixed-layer illite-smectite mineral) contain mica layers (~10%); quartz in trace amounts; contact of basalt and black glass consists of smectites with 10% swelling interlayers; quartz in trace amounts.

Sample 69-504B-24R-3, 125–129 cm (Piece 1393), Unit 17 [Z-910]

Clinopyroxene-plagioclase-microphyric basalt, uncrystallized, massive, groundmass is vitrophyric-variolitic texture. Phenocrysts contain rare glomerophyric radial-radiant segregates of plagioclase and clinopyroxene with poikilitic like texture of dolerites. There are single elongated-prismatic laths of plagioclase. Total plagioclase is 20% of the rock volume. Laths in segregates and single crystals are 0.2–0.3 mm (andesine [An_{48}]). Groundmass contains black or weakly anisotropic glass with rounded, radial-radiant paths and varioles (variolitic texture).

Alteration: rock is fresh.

XRD: smectites and hematite in veinlets.

Sample 69-504B-25R-2, 62–66 cm (Piece 1429), Unit 17 [Z-911]

Rock is similar to Sample 69-504B-24R-3, 125–129 cm (Z-910).

Alteration: rock is fresh.

XRD: smectites, chlorite(?), and phillipsite in veinlets.

Sample 69-504B-26R-1, 15–18 cm (Piece 1449), Unit 17 [Z-912]

Olivine-microphyric basalt, weakly crystallized, massive, groundmass is hyalopilitic texture. Phenocrysts contain rare small (0.2 mm, <1%) idiomorphic minerals (olivine) completely replaced by chlorite and black opaque mineral (opacite?). Groundmass contains needle-shaped microlites and laths of plagioclase in weakly anisotropic glass.

Alteration: rock is fresh.

XRD: smectites; smectites and hematite in veinlets.

Sample 69-504B-27R-2, 55–58 cm (Piece 1484), Unit 17 [Z-913]

Clinopyroxene-plagioclase-microphyric basalt, partly crystallized, massive, groundmass is intersertal-pilotaxitic texture. Phenocrysts contain short-prismatic grains (0.5–0.8 mm, size single grain as much as 2 mm) of plagioclase (10%, labradorite [An_{52}]. A single grain of clinopyroxene (0.5 mm) is possibly diopside. Groundmass contains unoriented needle-shaped microlites of plagioclase. These laths are in various crystallized glass. Rock contains rounded microvesicles (0.05 mm, <1%).

Alteration: slight; vesicles infilled with chlorite.

XRD: smectite with ~10% mica layers with interlayer Ca-Mg cations; chlorite in trace amounts; smectites in veinlets.

Sample 69-504B-28R-3, 69–73 cm (Piece 1530), Unit 19 [Z-914]

Clinopyroxene-plagioclase-phyric basalt, uncrystallized, massive, groundmass is vitrophyric texture, brecciated. Phenocrysts of plagioclase form elongated-prismatic (as much as 2 mm) and tabular (0.5 mm) grains (15%–20%, labradorite [An_{67-68}]) and often form glomerophyric segregates. Clinopyroxene demonstrates small (0.2–0.3 mm) idiomorphic grains (1%–2%), sometimes in paragenesis with plagioclase. Groundmass contains black-brown, partly anisotropic glass. Rock (possibly glassy crust) is broken by microcracks (as much as 0.7 mm thick).

Alteration: slight (5%–7%); glass is fresh; microcracks infilled with chlorophaeite-palagonite.

XRD: smectite with ~10% mica layers with interlayer Ca-Mg cations; chlorite and quartz in trace amounts; smectites in veinlets.

Sample 69-504B-29R-1, 31–34 cm (Piece 1562), Unit 20 [Z-915]

Plagioclase-phyric basalt, uncrystallized, massive, groundmass is hyalopilitic-vitrophyric texture. Sparse (5%) phenocrysts of plagioclase (labradorite [An_{55}]) form table-like or prismatic grains (0.3–0.5 mm). Groundmass contains weakly anisotropic brown glass. Glass contains rare laths and microlites of plagioclase (labradorite [An_{52}]). Small segregates of clinopyroxene grains in paragenesis with laths of plagioclase (spotty crystallization of glass).

Alteration: rock is fresh.

XRD: smectites in veinlets.

Sample 70-504B-32R-2, 137–140 cm (Piece 177), Unit 22 [Z-919]

Clinopyroxene-olivine-plagioclase-phyric basalt, uncrystallized, massive, groundmass is vitrophyric texture. Elongated and short-prismatic grains (0.2–2 mm, 15%) of plagioclase form glomerophyric segregates. Composition of plagioclase phenocrysts varies from small grains (0.2–0.4 mm, labradorite [An_{55}]) to single large crystals that demonstrate labradorite-bitovnite (An_{70}). Olivine (elongated-prismatic skeletal grains; 2 mm, 5%) is present. Clinopyroxene (diopside-augite) demonstrates single idiomorphic grains as much as 2 mm in size and glomerophyric segregates of plagioclase small grains (5%). Total of phenocrysts is 25%. Groundmass contains weakly anisotropic brown glass in pseudovariolitic texture (glassy crust).

Alteration: slight; olivine completely replaced by iddingsite.

XRD: smectites with various swelling layers and with interlayer Ca-Mg cations; quartz in trace amounts; smectites and phillipsite in veinlets.

Sample 70-504B-33R-1, 70–72 cm (Piece 191), Unit 22 [Z-916]

Aphyric basalt with pilotaxitic groundmass texture. Rock contains needle-shaped microlites and laths (as much as 2.5 mm) of plagioclase (50%, labradorite [An_{55}] and andesine [An_{40}]). Olivine (small grains; 0.1–0.2 mm, 5%) is present. Glass (45%) is crystallized from black and almost isotropic to segregates of panicle like crystals. Microlites of clinopyroxene are present.

Alteration: slight (5%); olivine completely replaced by iddingsite.

Sample 70-504B-33R-1, 86–88 cm (Piece 193), Unit 22 [Z-917]

Olivine-plagioclase-phyric basalt, partly crystallized, massive, with intersertal groundmass texture. Elongated-prismatic and short-table grains (0.3–2 mm, 15%) of plagioclase form segregates. Composition is labradorite (An_{60-62}). Olivine (idiomorphic large grains as much as 0.8 mm) is present. There is olivine as segregate of small (0.2 mm) rounded grains in paragenesis with plagioclase. Total of olivine is 5%–10%. Other areas of groundmass demonstrate microlites and laths of plagioclase (andesine [An_{32}]). Interstices contain segregate of small isometric grains of clinopyroxene and opaque mineral. In weakly crystallized parts of the rock, pyroxene forms panicle like segregates of microlites. Opaque dust is present.

Alteration: slight; olivine completely replaced by iddingsite; microcracks in olivine infilled with Fe hydroxides.

XRD: smectites; smectites and hematite in veinlets.

Sample 70-504B-33R-2, 14–16 cm (Piece 202), Unit 22 [Z-918]

Olivine-plagioclase-phyric basalt similar to Sample 70-504B-33R-1, 86–88 cm (Z-917).

Alteration: rock is fresh.

XRD: smectites with ~10% mica layers with interlayer Ca-Mg cations; mixed-layer smectite-swelling chlorite mineral, chlorite, and quartz in trace amounts; Ca-Mg and Na-K smectites (Ca-Mg > Na-K) in veinlets.

Sample 70-504B-34R-1, 19–24 cm (Piece 220), Unit 22 [Z-550]

Olivine-plagioclase-phyric basalt, weakly crystallized, massive, groundmass is microlitic texture. Phenocrysts of plagioclase form rare short-prismatic idiomorphic grains (0.5–0.8 mm, 5%, labradorite [An_{52}]). Olivine (rounded

grains 0.5–0.8 mm, 5%) is present. Groundmass demonstrates unoriented microlites of plagioclase and segregate of very small grains of clinopyroxene and opaque mineral. Interstices contain chlorite (<1%). Rock on the whole contains many opaque mineral.

Alteration: slight; olivine completely replaced by iddingsite, margin parts of grains replaced by Fe hydroxides.

Sample 70-504B-34R-1, 140–142 cm (Piece 235), Unit 23B [Z-920]

Plagioclase-phyric basalt, uncrystallized, massive, groundmass is hyalopilitic texture. Phenocrysts of plagioclase form rare prismatic grains (0.3–0.5 mm, 10%). Composition of large laths is andesine (An_{46}). Groundmass demonstrates unoriented needle-shaped, skeletal microlites and microlaths of plagioclase. Plagioclase grains are located in dark-brown almost isotropic glass. Occasionally glass contains radial-radiant segregates of crystallites of plagioclase and clinopyroxene.

Alteration: rock is fresh.

XRD: smectites; smectites and hematite in veinlets.

Sample 70-504B-34R-2, 18–21 cm (Piece 240), Unit 23B [Z-921]

Olivine-plagioclase-phyric basalt, uncrystallized, massive, groundmass is vitrophyric texture. Phenocrysts of plagioclase (15%) form single short-prismatic grains (as much as 2 mm) and segregates (as much as 3 mm) of labradorite [An_{68}]. Other small grains (as much as 0.5 mm) are also labradorite [An_{55}]. Olivine (sparsely idiomorphic grains as much as 2 mm, often size is 0.4–0.5 mm, 5%–10%) is present. Groundmass contains weakly anisotropic dark brown glass with rare needle-shaped microlites of plagioclase. In some parts of the rock, isotropic glass is nonoxidized and is light green. It is glassy crust.

Alteration: slight; olivine completely replaced by iddingsite and very small calcite crystals; thin cracks in glass infilled with micrograin aggregate of clay mineral and zeolite(?); clay mineral salbands of cracks.

XRD: smectites with interlayer Ca-Mg cations; chlorite in trace amounts; smectites with interlayer Ca-Mg and Na-K cations (Ca-Mg > Na-K) in veinlets, mixed-layer chlorite-smectite mineral, chlorite, analcime, natrolite, and anhydrite.

Sample 70-504B-35R-1, 110–112 cm (Piece 274), Unit 24 [Z-922]

Olivine-clinopyroxene-plagioclase-sparsely phyric basalt, uncrystallized, massive, with vitrophyric groundmass texture. Phenocrysts of plagioclase form single large (3 mm) glomerophyric segregates of short-prismatic grains (0.3–1 mm, xenocrysts) and glomerophyric segregates of small elongated-prismatic lath-like grains (0.2–0.4 mm). Large grains are An_{58} labradorite, small grains are An_{55} labradorite. Olivine; rare (1%–2%) small (0.2–0.3 mm) idiomorphic fresh grains, occasionally in accretion with plagioclase laths. Clinopyroxene-xenomorphic grains (<1%). Glass of groundmass oxidized to varying degrees. Glass is from almost colorless isotropic to brown. Glass contains rare microlites of plagioclase.

Alteration: rock is fresh.

XRD: smectites with interlayer Ca-Mg and Na-K cations; chlorite and quartz in trace amounts; smectites with interlayer Ca-Mg and Na-K cations (Ca-Mg > Na-K), mixed-layer illite-smectite mineral with as much as 15% illite layers, and analcime in veinlets; chlorite in trace amounts.

Sample 70-504B-35R-2, 14–16 cm (Piece 283), Unit 24 [Z-923]

Olivine, sparsely phyric basalt, weakly crystallized, massive, with pilotaxitic groundmass texture. Phenocrysts are single idiomorphic crystals of olivine (1 mm). Groundmass demonstrates unoriented laths (sparse) and microlites of plagioclase, radial-radiant panicle like segregates of clinopyroxene and brown-black glass with opaque dust. Rock on the whole contains many opaque mineral.

Alteration: slight to moderate (15%–20%); olivine completely replaced by iddingsite; thin cracks (2–3 mm thick) infilled with rounded segregates of calcite with brown-green isotropic mineral and Fe hydroxides (Salinas); central parts veins contain chalcedony.

XRD: smectites with interlayer Ca-Mg and Na-K cations (Na-K > Ca-Mg); chlorite and quartz in trace amounts; mixed-layer smectite-swelling chlorite mineral, illite(?), calcite, analcime, natrolite, okenite, talc, and calcite in veinlets.

Sample 70-504B-36R-1, 91–110 cm (Piece 301A), Unit 24 [Z-551]

Clinopyroxene-plagioclase-phyric dolerite, crystallized, small grains, massive, groundmass is doleritic texture. Sparse (5%–7%) phenocrysts of plagioclase form table-shaped grains (0.5–0.6 mm), occasionally form glomerophyric segregates, composition is labradorite (An_{60}). Single phenocrysts are represented by clinopyroxene (0.8 mm), diopside. Groundmass demonstrates unoriented laths of plagioclase (andesine [An_{48}]).

Interstices contain small isometric grains (0.1–0.2 mm) of augite, very small xenomorphic segregates of opaque mineral, and single small aggregates of chlorophaeite (<1%).

Alteration: rock is fresh.

Sample 70-504B-36R-2, 25–27 cm (Piece 305), Unit 24 [Z-924]

Olivine-plagioclase-phyric dolerite, crystallized, small grains, massive, groundmass is doleritic texture. Phenocrysts of plagioclase (0.5 mm, single grains as much as 2 mm) form glomerophyric segregates. Large grains are labradorite (An_{68}), small grains are andesine (An_{47}). Single idiomorphic grain of olivine (2.3 mm) completely replaced by iddingsite. Groundmass demonstrates unoriented laths (0.2–0.5 mm) of plagioclase (andesine [An_{45-47}]). Interstices contain segregate of small grains of augite and opaque mineral. About 10% of rock demonstrates rounded-isometric parts mixed with small of grains augite and chlorite (chlorophaeite), dendritic opaque mineral and cubic segregates, and xenomorphic grains of opaque mineral.

Alteration: slight (5%).

XRD: smectites and hematite or smectites and pyrite in veinlets.

Sample 70-504B-37R-1, 15–20 cm (Piece 344), Unit 25 [Z-925]

Plagioclase-sparsely phyric basalt, weakly crystallized, massive, groundmass is hyalopilitic texture. Phenocrysts of plagioclase (<5%) are represented by rare elongated-prismatic (as much as 0.8 mm) and tabular phenocrysts of plagioclase. Large grains are labradorite (An_{64}), small grains are andesine (An_{58}). Groundmass demonstrates unoriented needle-shaped laths and microlites of plagioclase. Grains of plagioclase are located in weakly anisotropic glass. Glass demonstrates panicle like segregates of pyroxene and opaque dust. There are parts with higher levels of crystallized of rock and demonstrate segregates of diopside, laths of plagioclase with chlorite (trace), and opaque mineral.

Alteration: slight.

XRD: smectites; smectites in veinlets.

Sample 70-504B-37R-1, 55–60 cm (Piece 349), Unit 25 [Z-926]

Clinopyroxene-plagioclase-phyric basalt, uncrystallized, massive, groundmass is vitrophyric-variolitic texture. Phenocrysts of plagioclase are represented by laths and short-tabular grains (0.2–0.8 mm, 20%, labradorite [An_{56}]). Grains of plagioclase form glomerophyric segregates. Single xenomorphic grain of clinopyroxene (0.3 mm, diopside) is in accretion with laths of plagioclase. Groundmass demonstrates rare needle-shaped laths and microlites of plagioclase. Plagioclase grains are located in weakly anisotropic dark brown glass. Glass demonstrates rounded variolitic parts with radial-radiant segregation of clinopyroxene.

Alteration: rock is fresh.

XRD: smectites, hematite, and analcime in veinlets.

Sample 70-504B-37R-2, 75–78 cm (Piece 373), Unit 25 [Z-927]

Plagioclase-phyric basalt, uncrystallized, massive, groundmass is hyalopilitic texture. Phenocrysts of plagioclase (0.3–0.8 mm, 7%–10%) form glomerophyric segregates (tabular and laths). Grains of plagioclase are often with inclusions of glass. Groundmass demonstrates needle-shaped laths and microlites of plagioclase. They are located in dark brown weakly anisotropic glass. Glass contains panicle like segregates of crystallites of pyroxene with opaque dust. There are rare small parts (0.5 mm) of more crystallized rock demonstrating segregates of laths of plagioclase and xenomorphic grains (0.2–0.3 mm) of clinopyroxene. Level of the crystallization is very slight (1%–3%).

Alteration: rock is fresh.

XRD: smectites with ~20% mica layers and interlayer Ca-Mg cations; quartz in trace amounts; smectites with ~20%–30% mica layers and interlayer Ca-Mg cations in veinlets; trace chlorite, analcime, and gyrolite.

Sample 70-504B-37R-3, 14–17 cm (Piece 391), Unit 25 [Z-928]

Breccia of pyroxene-plagioclase-phyric basalt, weakly crystallized, massive, groundmass is hyalopilitic texture. Isometric basalt fragments (0.5–1.5 cm) are cemented by clay minerals. Basalt demonstrates elongated-prismatic grains and segregates of plagioclase. Groundmass glass is brown-black, some parts of glass are crystallized with segregates of plagioclase and pyroxene.

Alteration: fragments of basalt are slightly altered (10%–15%); plagioclase almost completely replaced by clay minerals; cement contains clay mineral, prehnite, and rounded segregates of isotropic colorless mineral (zeolite?).

XRD: smectites, hematite, and analcime in veinlets.

Sample 70-504B-38R-1, 7–15 cm (Piece 411), Unit 25 [Z-929]

Plagioclase-phyric basalt, uncrystallized, massive, groundmass is vitrophyric-variolitic texture. Phenocrysts of plagioclase (0.2–0.6 mm, 10%, labradorite [An_{68}]) form glomerophyric segregates (tabular and elongated-prismatic grains). There are small (0.1 mm) idiomorphic grains of olivine (<1%). Groundmass demonstrates sparse laths and microlites of plagioclase. Grains of plagioclase are located in dark-brown weakly anisotropic glass.

Alteration: slight; olivine completely replaced by iddingsite and Fe hydroxides.

XRD: smectites with interlayer Ca-Mg cations; quartz in trace amounts; veinlets with smectites (~20% mica layers and interlayer Ca-Mg and Na-K cations), mixed-layer chlorite-smectite mineral (30% swelling interlayers), hematite, calcite, quartz, analcime, gyrolite, and 12.9 Å-undetermined mineral.

Sample 70-504B-39R-2, 97–102 cm (Piece 492), Unit 27 [Z-930]

Plagioclase-phyric dolerite, crystallized, small grains, massive, groundmass is doleritic texture. Phenocrysts of plagioclase (0.4–2 mm, 20%) form glomerophyric segregates (elongated and short-prismatic grains). Composition of plagioclase is labradorite (An_{68-69}), smaller grains are An_{58}. A single idiomorphic grain of olivine (0.5 mm) is present. Groundmass demonstrates unoriented laths of plagioclase, composition varies from andesine (An_{45}) to labradorite (An_{52}). Interstices contain small (as much as 0.1 mm), xenomorphic, often rounded grains of diopside-augite and opaque mineral and chlorite (<1%).

Alteration: slight; olivine completely replaced by iddingsite; chlorite replaces glass.

XRD: smectites; smectites and pyrite in veinlets.

Sample 70-504B-40R-1, 55–60 cm (Piece 510), Unit 27 [Z-552]

Olivine-pyroxene-plagioclase-phyric dolerite, crystallized, medium grained, massive, groundmass is doleritic texture. Olivine; single, small (0.3 mm) altered grains and large (as much as 1.5 mm) fresh grains of augite (single grains) with laths of plagioclase. Phenocrysts of plagioclase (0.4–1.2 mm, labradorite [An_{58}]) form glomerophyric segregates (short-prismatic grains). Groundmass demonstrates unoriented laths and grains of plagioclase (0.2–0.5 mm), composition varies from andesine (An_{45}) to labradorite (An_{55}). Interstices contain rounded isometric grains (0.2–0.4 mm) of clinopyroxene-augite and segregates of clinopyroxene and laths of plagioclase. There are skeletal and idiomorphic cubic grains of opaque mineral and occasionally clay mineral (<1%).

Alteration: slight; olivine replaced by iddingsite; clay mineral replaces glass.

XRD: smectites with interlayer Ca-Mg cations; mixed-layer chlorite-smectite mineral and quartz in trace amounts; oxidized crust is maghemite, lepidolite, and goethite; black clay crust contains trace smectites with ~20% mica layers and with interlayer Ca-Mg cations, chlorite.

Sample 70-504B-40R-2, 84—86 cm (Piece 532), Unit 27 [Z-553]

Olivine-plagioclase-phyric dolerite, crystallized, moderate-grains, massive, groundmass is doleritic texture. Olivine (5%) forms idiomorphic (1.2 mm) or partly unoriented xenomorphic (0.5 mm) grains. Phenocrysts of plagioclase (labradorite [An_{60}]) form glomerophyric segregates (3 mm in diameter) of elongated-prismatic and tabular (zonal) grains, 0.5–2 mm in size. Groundmass demonstrates elongated-prismatic grains and laths of plagioclase (0.2–0.3 mm), composition varies from andesine (An_{45}) to andesine (An_{47}). Interstices contain xenomorphic grains of augite (0.1–0.3 mm) and small (0.05–0.1 mm) grains of opaque mineral (3%–4%).

Alteration: slight; olivine partly replaced by iddingsite; trace clay mineral.

Sample 70-504B-41R-3, 146–148 cm (Piece 628), Unit 27 [Z-554]

Plagioclase-phyric basalt, weakly crystallized, massive, groundmass is microlitic texture. Phenocrysts of plagioclase (0.3–0.8 mm, 15%, labradorite [An_{55}]) form glomerophyric segregates of elongated and short-prismatic grains. Groundmass demonstrates unoriented microlites of plagioclase and segregate of small grains of clinopyroxene and opaque mineral. There are isometric vesicles (2%–3%, 0.05 mm).

Alteration: rock is fresh; vesicles infilled with clay mineral.

XRD: smectites with ~35% mica layers and interlayer Ca-Mg cations; quartz in trace amounts; smectites with ~20% mica layers and with interlayer Ca-Mg and Na-K cations (Ca-Mg > Na-K) in veinlets; chlorite and talc in trace amounts.

Sample 70-504B-43R-1, 80–82 cm (Piece 680), Unit 28 [Z-555]

Clinopyroxene-plagioclase-sparsely phyric dolerite, crystallized, moderate-grains, massive, groundmass is doleritic texture. Single grains (0.4 mm) of plagioclase form glomerophyric segregates with clinopyroxene. Composition of plagioclase is labradorite-bitovnite (An_{70}). Groundmass demonstrates unoriented elongated-prismatic laths of

plagioclase, composition varies from andesine (An_{47}) to labradorite (An_{52}). Interstices contain xenomorphic grains (0.1–0.2 mm) of augite and small xenomorphic, occasionally skeletal, grains of opaque mineral.

Alteration: rock is fresh.

Sample 70-504B-44R-1, 125–130 cm (Piece 716), Unit 29B [Z-931]

Olivine-plagioclase-phyric basalt, uncrystallized, massive, groundmass is hyalopilitic texture. Phenocrysts of plagioclase (0.5–0.8 mm, 10%, labradorite [An_{55}]) form elongated-prismatic grains. Olivine is completely replaced by iddingsite. Groundmass demonstrates needle-shaped microlites and laths of plagioclase. Glass is weakly anisotropic. Opaque dust is present.

Alteration: rock is fresh.

XRD: smectites and pyrite in veinlets.

Sample 70-504B-47R-1, 46–48 cm (Piece 808), Unit 30A [Z-556]

Olivine-pyroxene-plagioclase-phyric basalt, crystallized, massive, groundmass is microdoleritic texture. Microphenocrysts of idiomorphic olivine (0.1–0.3 mm, 1%–2%) are present. Clinopyroxene (diopside) forms single large (as much as 4 mm) elongated-prismatic crystals or tabular grains (5%, as much as 1 mm). Plagioclase forms glomerophyric segregates of elongated-prismatic crystals (0.5–0.8 mm, 5%–7%, labradorite [An_{68}]). Groundmass demonstrates unoriented microlites and laths of plagioclase. Interstices contain small grains of augite, often paniclelike segregates of clinopyroxene microlites. Opaque mineral is present (5%). Occasionally opaque mineral forms spots with skeletal grains.

Alteration: slight; olivine completely replaced by iddingsite.

Sample 70-504B-47R-2, 130–140 cm (Piece 835), Unit 30C [Z-932]

Olivine-plagioclase-phyric dolerite, crystallized, moderate-grains, massive, groundmass is doleritic texture. Small (0.2–0.4 mm) idiomorphic or partly xenomorphic grains of olivine (2%–3%) are present. Plagioclase forms sparse glomerophyric segregates and grains of short-prismatic habit. Composition of plagioclase is labradorite (An_{55}). Occasionally grains are zonal. Groundmass demonstrates unoriented laths of plagioclase (andesine [An_{43}]). Interstices contain segregates of small isometric grains of augite, small grains (0.05 mm) of opaque mineral, and chlorite (<1%). Occasionally augite forms panicle like segregates.

Alteration: slight; olivine completely replaced by iddingsite; clay mineral replaces glass.

XRD: smectites with ~20% mica layers and with interlayer Ca-Mg cations; trace quartz; smectites with Ca-Mg cations and pyrite in veinlets; trace quartz.

Sample 70-504B-48R-1, 113–115 cm (Piece 871), Unit 31 [Z-933]

Pyroxene-plagioclase-phyric basalt, brecciated, groundmass is hyaline texture. Rock demonstrates brecciated and partly palagonitized volcanic glass with rare small (0.2 mm) glomerophyric segregates of plagioclase (5%) and clinopyroxene (3%). Light cream glass is isotropic.

Alteration: glass fragments are cemented by clay minerals; volcanic glass partly palagonitized.

XRD: smectites and pyrite in veinlets.

Sample 70-504B-49R-1, 122–126 cm (Piece 932), Unit 33B [Z-934]

Clinopyroxene-plagioclase-phyric basalt, uncrystallized, massive, groundmass is vitrophyric texture. Single phenocrysts of plagioclase form short-prismatic grains (0.3–0.8 mm, 5%–8%, labradorite [An_{55}]). Groundmass demonstrates weakly anisotropic black-brown glass with variolitic texture (glassy crust).

Alteration: thin cracks infilled with clay mineral.

XRD: smectites; smectites and pyrite in veinlets.

Sample 70-504B-49R-1, 140–147 cm (Piece 933), Unit 33B [Z-559]

Olivine-phyric dolerite, crystallized, moderate-grains, vesicles (7%–8%), groundmass is doleritic texture. Phenocrysts: idiomorphic fresh grains of olivine (0.3–0.5 mm, 10%). Groundmass demonstrates unoriented laths of plagioclase (from labradorite [An_{52}] to andesine [An_{47}]). Rounded vesicles (0.2–0.4 mm) infilled with black-brown oxidized glass.

Alteration: rock is fresh; green glass from central part of vesicles is weakly anisotropic; some vesicles are lined with brown or green glass, central parts of vesicles infilled with carbonate.

Sample 70-504B-49R-2, 7–10 cm (Piece 936), Unit 33B [Z-560]

Pyroxene-plagioclase-phyric basalt, uncrystallized, massive, groundmass is vitrophyric texture. Phenocrysts of pyroxene-diopside forms segregates (0.5 mm) of small (0.1 mm) xenomorphic grains with laths of plagioclase

(1%). Plagioclase forms elongated-prismatic grains (2 mm, 5%, labradorite [An_{56}]). Groundmass demonstrates dark-brown weakly anisotropic glass with variolitic texture. Rock is weakly brecciated.

Alteration: rock is fresh; microcracks infilled with clay matter.

XRD: smectites with ~20% mica layers and interlayer Na-K cations; trace quartz.

Sample 70-504B-54R-1, 35–38 cm (Piece 1062), Unit 35 [Z-935]

Aphyric basalt, weakly crystallized, vesicles (15%–20%), groundmass is pilotaxitic texture. Groundmass has unoriented laths and microlites of plagioclase. Interstices are weakly crystallized glass. Glass demonstrates segregate of very small grains or paniclelike segregates of microlites and crystallites of pyroxene and opaque dust. Green glass replaced by chlorophaeite (2%–3%). Vesicles (2%–3%) are isometric (0.5–0.8 mm) and rounded (0.1–0.2 mm).

Alteration: slight (15%); small vesicles completely infilled with chlorophaeite.

XRD: smectites and pyrite in veinlets.

Sample 70-504B-56R-2, 92–95 cm (Piece 1121), Unit 36 [Z-936]

Aphyric basalt, uncrystallized, vesicles, groundmass is hyalopilitic texture. Rock is similar to Sample 70-504B-54R-1, 35–38 cm (Z-935) but contains more dark brown to black uncrystallized glass.

Alteration: slight; vesicles infilled with chlorophaeite.

XRD: smectites and pyrite in veinlets.

Sample 70-504B-61R-1, 55–60 cm (Piece 1287), Unit 40 [Z-937]

Olivine-pyroxene-plagioclase-sparsely microphyric basalt, uncrystallized, massive, groundmass is vitrophyric texture. Phenocryst are small (0.2 mm) segregates of xenomorphic grains of pyroxene, single (0.2 mm) idiomorphic grains of olivine and laths of plagioclase are present. Occasionally plagioclase forms elongated-prismatic grains up to 0.5 mm in size. Groundmass demonstrates dark brown to black oxidized glass. Glass contains sparse needle-shaped microlites of plagioclase. Occasionally glass is weakly crystallized and variolitic texture.

Alteration: slight; olivine completely replaced by iddingsite.

XRD: smectites with ~20% mica layers and interlayer Ca-Mg and Na-K cations (Ca-Mg > Na-K); trace quartz; smectites with interlayer Ca-Mg cations and anhydrite in veinlets; trace apophyllite, gypsum, and pyrite.

Sample 70-504B-61R-2, 145–149 cm (Piece 1313), Unit 40 [Z-561]

Olivine-plagioclase-phyric basalt, uncrystallized, massive, vesicles, groundmass is hyalopilitic texture. Olivine (1%–2%) forms small rounded–idiomorphic grains in segregates with plagioclase. Rock contains single vesicle (0.3 mm).

Alteration: slight; olivine completely replaced by iddingsite; vesicle infilled with brown-green chlorophaeite.

XRD: smectites with ~10% mica layers and interlayer Ca-Mg cations; trace quartz; smectites and pyrite in veinlets.

Sample 70-504B-61R-2, 145–149 cm (Piece 1314), Unit 40 [Z-938]

Plagioclase-sparsely phyric basalt, uncrystallized, massive, vesicles, groundmass is hyalopilitic (partly pilotaxitic) texture, brecciated. Single short-prismatic (0.8 mm) idiomorphic grains of plagioclase (2%–3%, labradorite [An_{60}]) and glomerophyric segregates of smaller grains (0.1–0.2 mm) of plagioclase. Groundmass has dark-brown weakly anisotropic glass. Glass contains paniclelike segregates of needle-shaped microlites of plagioclase. Fragments of basalt are cemented by green chlofaeite and small fragments of black isotropic glass.

Alteration: rock is fresh; altered cement (25%–30%).

XRD: Smectites or mixed-layer illite-smectite mineral with 10% mica layers.

Sample 70-504B-64R-1, 65–68 cm (Piece 1287), Unit 42 [Z-939]

Olivine-pyroxene-plagioclase-sparsely phyric basalt, massive, groundmass is hyalopilitic-vitrophyric texture. Olivine forms idiomorphic grains (0.1–0.5 mm, 2%–3%). There are sparse idiomorphic grains of pyroxene-diopside (0.4–0.8 mm). Often xenomorphic small (0.2 mm) grains of pyroxene are located in segregates with laths of plagioclase. Plagioclase forms single elongated-tabular grains (0.3–0.5 mm). Groundmass demonstrates black glass. Glass contains sparse microlites of plagioclase. Rock is partly brecciated.

Alteration: slight; olivine completely replaced by iddingsite; cement contains aggregate of quartz and chlorophaeite; occasionally birefringent hydromica is present; crack infilled with chalcedony.

XRD: smectites, anhydrite, quartz, and pyrite in veinlets.

Sample 70-504B-64R-2, 32–35 cm (Piece 1424), Unit 43 [Z-562]

Aphyric dolerite, crystallized, small grains, massive, groundmass is doleritic texture. Rock contains unoriented laths (0.1–0.5 mm) of plagioclase (40%, labradorite [An_{52}]). Interstices contain segregate of xenomorphic grains (0.1–0.2 mm) of augite (55%) and opaque mineral (5%).

Alteration: rock is fresh.

XRD: smectites with ~10% mica layers and interlayer Ca-Mg cations; trace quartz; black clay crust contains smectites with ~20% mica layers and interlayer Ca-Mg cations; trace quartz.

Sample 70-504B-66R-2, 0–5 cm (Piece 1506), Unit 45 [Z-940]

Olivine-pyroxene-plagioclase-phyric basalt, uncrystallized, massive, groundmass is vitrophyric texture. Phenocrysts demonstrate sparse idiomorphic grains of pyroxene-diopside (2 mm). Often xenomorphic (0.2–0.3 mm, 5%–7%) grains pyroxene are in segregates with laths of plagioclase, labradorite, (An_{67}). Groundmass demonstrates weakly anisotropic oxidized glass. Glass is paniclelike and variolitic texture.

Alteration: slight; olivine completely replaced by iddingsite.

XRD: smectites with ~20% mica layers and interlayer Ca-Mg cations; trace quartz; veinlets contain smectites with interlayer Ca-Mg and Na-K cations, anhydrite, and quartz; chlorite, anhydrite, and quartz.

Sample 70-504B-67R-1, 45–49 cm (Piece 1527), Unit 47 [Z-941]

Clinopyroxene-phyric basalt, crystallized, massive, groundmass is from microlitic to microdoleritic texture. There is a single glomerophyric segregate of rounded-isometric small (0.2 mm) grains of clinopyroxene (salite). Groundmass demonstrates elongated-prismatic grains of plagioclase (0.5 mm); plagioclases contain inclusions of altered glass; segregate of small grains of clinopyroxene; opaque mineral. On the whole rock is similar to Sample 70-504B-68R-1, 81–83 cm (Z-942).

Alteration: slight; interstitial clay mineral is 2%–3%, clay mineral replaces glass from plagioclase.

XRD: smectites.

Sample 70-504B-68R-1, 81–83 cm (Piece 1537), Unit 47 [Z-942]

Plagioclase-phyric basalt, crystallized, massive, groundmass is microdoleritic texture. There is a single glomerophyric segregate of elongated-prismatic grains of plagioclase (0.2–0.5 mm, labradorite [An_{55}]). Plagioclase contains altered glass. Groundmass demonstrates thin elongated (0.5 mm) laths of plagioclase. Interstices contain a segregate of clinopyroxene small grains, opaque mineral, and glass (5%).

Alteration: slight; glass from plagioclase replaced by green clay mineral; interstitial glass replaced by clay mineral.

XRD: smectites and anhydrite in veinlets.

Sample 70-504B-68R-1, 107–111 cm (Piece 1538), Unit 47 [Z-563]

Plagioclase-sparsely phyric basalt, massive, groundmass is microdoleritic texture. Single segregate of elongated-tabular grains of plagioclase (0.2–0.3 mm, labradorite [An_{55}]). Groundmass is melanocratic with laths and microlites of plagioclase (andesine [An_{38}?]; 30%), segregate of small isometric grains of augite or elongated segregates of microlites of this mineral (65%,) and opaque mineral (very small xenomorphic or skeletal grains; 5%). Opaque mineral occurs together with brown-green chlorophaeite (2%–3%).

Alteration: slight.

XRD: smectites with ~10% mica layers and interlayer Ca-Mg cations; trace quartz; veinlet contain smectites with ~10% mica layers and interlayer Ca-Mg cations; trace mixed-layer chlorite-smectite mineral (~20% swelling interlayers).

Sample 70-504B-69R-1, 14–17 cm (Piece 1540), Unit 47 [Z-564]

Plagioclase-phyric dolerite, massive, groundmass is doleritic texture. Plagioclase forms glomerophyric segregates of short and elongated-prismatic grains (0.2–1.0 mm, labradorite [An_{55}]). Groundmass demonstrates unoriented laths of plagioclase (0.1–0.2 mm). Interstices with accretions of plagioclase and small (0.1 mm) isometric grains of augite, xenomorphic grains of opaque mineral, and sparse glass.

Alteration: slight; interstitial glass replaced by green chlorophaeite.

XRD: smectites with ~20% mica layers; trace quartz.

Sample 70-504B-69R-1, 74–77 cm (Piece 1545), Unit 47 [Z-565]

Plagioclase-pyroxene-sparsely phyric dolerite, massive, fine grained, groundmass is doleritic texture. There are single phenocryst of pyroxene-diopside tabular grains (0.8 mm) and a glomerophyric segregate of elongated-prismatic grains of plagioclase. Groundmass demonstrates unoriented laths of plagioclase (0.2–0.4 mm, 40%) and

rounded-isometric grains (0.1–0.2 mm) of salite. There are spotty areas (0.5–1.0 mm) that contain small grains of pyroxene and green chlorophaeite with very small skeletal grains of opaque mineral.

Alteration: slight; chlorophaeite is 5%–7%.

XRD: smectites with ~15% mica layers and interlayer Ca-Mg cations; trace quartz; black clay crust contains smectites with ~10% mica layers and interlayer Ca-Mg cations; trace quartz.

Sample 70-504B-69R-1, 77–81 cm (Piece 1545), Unit 47 [Z-943]

Plagioclase-sparsely phyric basalt, massive, groundmass is microlitic (microdoleritic) texture. Phenocrysts with plagioclase (5%, labradorite [An_{60}]). Groundmass with microlites and microlaths (0.1–0.6 mm) of plagioclase (labradorite [An_{55}] and andesine [An_{40-44}]). Small grains of olivine (2%–3%) and opaque mineral (2%–3%) are present.

Alteration: slight (2%–3%); olivine replaced by iddingsite.

XRD: smectites and pyrite in veinlets.

Sample 70-504B-70R-1, 17–20 cm (Piece 1550), Unit 48 [Z-944]

Volcanic breccia with lithocrystaloclastic cement (50%). Fragments (2–5 mm) are aphyric dolerite and aphyric basalt. Cement contains small (0.1 mm) fragments of plagioclase crystals and pyroxene (70% of cement volume) and brown matter (30%).

Alteration: slight.

XRD: smectites; smectites and pyrite in veinlets.

Sample 70-504B-70R-1, 79–82 cm (Piece 1556), Unit 48 [Z-567]

Aphyric dolerite, massive, partly brecciated and cemented by lithocrystaloclastic cement. Possibly more large (10 mm) fragments of volcanic breccia than described in Sample 70-504B-70R-1, 17–20 cm (Z-944).

Alteration: slight.

Sample 70-504B-70R-1, 127–130 cm (Piece 1561), Unit 49 [Z-568]

Aphyric dolerite, massive, moderate-grains, groundmass is doleritic and poikilophitic texture. Rock contains olivine, clinopyroxene, plagioclase, and opaque mineral. Olivine forms idiomorphic grains and segregates (5%, 0.4–0.8 mm). Rock consist of mainly xenomorphic, large, elongated-prismatic laths (0.8–1.8 mm) of plagioclase (labradorite [An_{60}]).

Alteration: slight; olivine completely replaced by brown-green iddingsite.

XRD: smectite mineral with 20% mica interlayers and interlayer Ca-Mg cations; chlorite, quartz, and talc(?) in trace amounts; smectite mineral with interlayer Ca-Mg cations in veinlets; trace swelling chlorite.

Sample 70-504B-70R-2, 20–23 cm (Piece 1564), Unit 49 [Z-569]

Aphyric dolerite, massive, moderate grains, groundmass is doleritic and poikilophitic texture. Rock is the similar to Sample 70-504B-70R-1, 127–130 cm (Z-568).

Alteration: rock is fresh.

XRD: smectite mineral with 20% mica interlayers and interlayer Ca-Mg cations; chlorite and quartz in trace amounts; black veinlet contains smectite mineral with interlayer Ca-Mg cations; minor chlorite.

Sample 83-504B-72R-2, 60–64 cm (Piece 5), Unit 49 [Z-570]

Plagioclase-phyric basalt, crystallized, massive, groundmass is hyalopilitic texture. Phenocrysts of plagioclase (20%) are represented by prismatic crystals (0.3–1.2 mm, labradorite [An_{68}]). Groundmass; needle-shaped microlites and laths of plagioclase (andesine [An_{45}]; 60%) and brown anisotropic glass. Glass; segregate of plagioclase and clinopyroxene and oxidized brown-red opaque mineral (1%–2%).

Alteration: rock is fresh.

XRD: smectites with ~20% mica layers and interlayer Ca-Mg cations; chlorite and quartz in trace amounts.

Sample 83-504B-73R-2, 56–59 cm (Piece 4), Unit 50 [Z-571]

Olivine-plagioclase-phyric microdolerite, massive, groundmass is microdoleritic texture. Olivine forms single idiomorphic grains (0.8 mm). Phenocrysts of plagioclase (20%) form elongated-tabular grains (0.5–1.5 mm, labradorite [An_{56}]), occasionally plagioclase grains form glomerophyric segregates. Groundmass; unoriented laths (0.1–0.5 mm) of plagioclase (labradorite [An_{54}], 40%). Interstices contain segregates of small isometric or slightly stretched accreted grains of clinopyroxene (50%). Opaque mineral (5%–6%).

Alteration: slight; olivine completely replaced by iddingsite.

XRD: smectites with mica layers and interlayer Ca-Mg cations; quartz and talc(?) in trace amounts.

Sample 83-504B-77R-1, 78–81 cm (Piece 4), Unit 54 [Z-572]

Aphyric dolerite, fine grained, groundmass is intersertal-doleritic texture. Rock; laths (0.3–1.2 mm) of plagioclase (labradorite [An_{56}] and andesine [An_{43}]; 45%), clinopyroxene (40%), opaque mineral (5%), and glass (10%).

Alteration: slight (10%); glass completely replaced by clay mineral.

XRD: corrensite and chlorite with 10% swelling interlayers; amphibole(?) and quartz in trace amounts.

Sample 83-504B-78R-1, 60–64 cm (Piece 3D), Unit 56 [Z-573]

Plagioclase-microphyric dolerite, fine grained, massive, crystallized, groundmass is ophitic texture. Phenocrysts of plagioclase (5%) form tabular grains (0.5–0.8 mm, labradorite [An_{68}]). Groundmass; unoriented laths of plagioclase (40%, andesine [An_{48}] to labradorite [An_{54}]). Clinopyroxene; augite. Plagioclase/clinopyroxene ratio is 1:1. Opaque mineral (as much as 0.1 mm, 5%–7%) occurs together with pyroxene. Green chlorite (1%–2%) occurs in opaque mineral with pyroxene association.

Alteration: slight.

XRD: Fe chlorite with single swelling interlayers; thin clay crust contains Fe chlorite with single swelling interlayers and epistilbite(?) or clinoptilolite/heulandite(?).

Sample 83-504B-79R-3, 50–54 cm (Piece 4A), Unit 58 [Z-574]

Plagioclase-sparsely phyric basalt, massive, crystallized, groundmass is microdoleritic-intersertal texture. Phenocryst; single tabular xenocrystal (0.8 mm) of plagioclase. Groundmass; elongated-laths (0.3–0.8 mm) of plagioclase (labradorite [An_{62}]). Interstices are segregates of paniclelike grains and microlites of clinopyroxene. Opaque mineral (0.1 mm, 7%–8%) is present.

Alteration: slight; glass replaced by chlorite (15%).

XRD: corrensite and mixed-layer chlorite-smectite mineral (chlorite/smectite ratio = 90:10); quartz and amphibole in trace amounts; black clay from vein is Fe and Mg chlorite (Fe > Mg) with 10% swelling interlayers; amphibole and quartz in trace amounts.

Sample 83-504B-80R-1, 5–10 cm (Piece 1), Unit 60 [Z-1301]

Olivine-plagioclase-phyric basalt, weakly crystallized, groundmass is hyalopilitic texture. Phenocrysts (30%) are represented by sparse (5%) idiomorphic grains (0.5–1.5 mm) of olivine; plagioclase (25%) forms glomerophyric segregates of prismatic crystals (0.5–1.7 mm, labradorite [An_{60}]). Groundmass; needle-shaped grains of plagioclase (labradorite [An_{52}]) and black, weakly anisotropic glass. Idiomorphic grains of opaque mineral (0.4–0.8 mm, 5%) are present.

Alteration: moderate (30%); olivine completely replaced by chlorite; plagioclase replaced by albite (90% of plagioclase); microcrack (0.1 mm) infilled with carbonate.

XRD: mixed-layer chlorite-smectite mineral (5%–10% swelling interlayers); amphibole and quartz in trace amounts; dark-green matter from veins is Fe chlorite with single swelling interlayers; quartz, calcite, and zeolite (epistilbite?) in trace amounts.

Sample 83-504B-80R-2, 143–146 cm (Piece 12), Unit 60 [Z-1302]

Volcanic breccia of olivine-plagioclase-phyric basalt, groundmass is hyalopilitic texture, with chlorite cement (30%). Fragments of basalt (70%) are from 0.5 to 8 mm. Basalt is similar to Sample 83-504B-80R-1, 5–10 cm (Z-1301). Cement contains chlorite aggregate with Fe-Mn hydroxides.

Alteration: moderate (30%).

XRD: Fe chlorite with single swelling interlayers; quartz and (heulandite?) in trace amounts; white matter from veins is calcite, epistilbite(?), and lomontite; dark green clay from veins is Fe chlorite with single swelling interlayers; trace quartz.

Sample 83-504B-80R-4, 3–8 cm (Piece 1A), Unit 60 [Z-1303]

Olivine-plagioclase-phyric basalt, uncrystallized, groundmass is hyalopilitic texture, brecciated. Phenocrysts (10%) are represented by sparse (2%–3%) grains of olivine and prismatic grains of plagioclase (0.5–0.8 mm, labradorite [An_{60}]). Groundmass; needle-shaped laths and microlites of plagioclase (andesine–labradorite [An_{50}]) and brown isotropic glass. Idiomorphic cubic grains (0.1–0.3 mm, 5%) of opaque mineral are located in central parts of large (0.8 mm) prismatic grains of albitized plagioclase.

Alteration: slight to moderate (20%); plagioclase replaced by albite (90% of plagioclase); groundmass is chloritized; glassy crust is broken by thin (0.2–0.8 mm) cracks infilled with chlorite-pennine (10%); microcrack (0.1 mm) infilled with carbonate.

XRD: Fe and Mg chlorite with single swelling interlayers; quartz and stilbite(?) in trace amounts; dark green clay from veins is Fe and Mg chlorite (Fe and Mg in approximately equal amounts) with 10% swelling interlayers; quartz and heulandite in trace amounts.

Sample 83-504B-81R-1, 83–86 cm (Piece 10), Unit 60 [Z-1304]

Olivine-plagioclase-phyric basalt, uncrystallized, groundmass is vitrophyric texture, brecciated. Phenocrysts (30%)are represented by grains of olivine and plagioclase. Plagioclase (10%) forms grains 0.3–0.6 mm in size (labradorite [An_{60}]). Olivine (20%) forms large (0.5–0.7 mm) idiomorphic altered grains; small (0.3–0.5 mm) grains of olivine are fresh. Groundmass; black glass (70%).

Alteration: slight to moderate (20%); rock is chloritized; olivine completely replaced by chlorite; microcrack (0.8–1.7 mm) infilled with aggregate of small (0.1 mm) rounded grains of albite-oligoclase and quartz (salbands); center of vein; chlorite.

XRD: dark green clay from veins is Fe chlorite with single swelling interlayers; minor quartz.

Sample 83-504B-82R-2, 92–96 cm (Piece 6F), Unit 60 [Z-1305]

Olivine-plagioclase-phyric basalt, crystallized, groundmass is microlitic texture. Phenocrysts (15%) are represented by grains of olivine (5%) and plagioclase (10%). Olivine forms (0.5–0.8 mm) idiomorphic grains. Plagioclase (10%) forms tabular and prismatic crystals 0.4–1.7 mm in size (bitovnite [An_{72-74}]. Groundmass; needle-shaped laths (15%) of plagioclase (labradorite [An_{55}]), paniclelike segregates of microlites of pyroxene (50%), and plagioclase (5%).

Alteration: slight (15%); olivine completely replaced by chlorite; plagioclase replaced by albite (10%).

XRD: Fe chlorite; quartz and amphibole in trace amounts.

Sample 83-504B-84R-2, 48–50 cm (Piece 7), Unit 60 [Z-1306]

Olivine-plagioclase-phyric basalt, uncrystallized, groundmass is hyalopilitic texture. Phenocrysts (40%) represented by idiomorphic grains (0.5–0.9 mm) of olivine (15%) and tabular and prismatic grains (0.3-1.7 mm) of plagioclase. Groundmass represented by needle-shaped laths (5%) of altered plagioclase and brown-black isotropic glass (50%). Single xenomorphic grains of opaque mineral (0.1–0.3 mm) are present.

Alteration: moderate (30%–35%); olivine completely replaced by chlorite; plagioclase replaced by albite; sosuritized interstitial plagioclase.

XRD: Fe chlorite (~5% swelling interlayers); quartz and heulandite(?) in trace amounts; black clay from vein is Fe chlorite with 5% swelling interlayers and quartz; amphibole and zeolite in trace amounts.

Sample 83-504B-85R-1, 58–62 cm (Piece 6B), Unit 60 [Z-1307]

Volcanic breccia. Rock: one fragment of plagioclase-phyric basalt with vitrophyric groundmass texture and hyalo-breccia (fragments from 0.1 to 0.9 mm in size; from colorless to brown-black).

Alteration: rock is fresh; veinlet (0.4 mm thick) with granoblastic aggregate of quartz.

XRD: Fe chlorite; trace quartz and amphibole; dark green matrix from breccia is Fe chlorite.

Sample 83-504B-86R-1, 15–20 cm (Piece 2), Unit 62 [Z-1308]

Clinopyroxene-olivine-plagioclase-phyric basalt, slight crystallized, groundmass is hyalopilitic texture. Phenocrysts (20%) represented by grains (<1%, 0.6–1.2 mm) of clinopyroxene, sparse large (0.8–1 mm) idiomorphic grains of olivine (5%), and glomerophyric segregates of prismatic grains (0.2–0.7 mm) of plagioclase (labradorite [An_{65}]). Groundmass represented by needle-shaped microlites and microlaths (0.2–0.6 mm) of plagioclase (10%, labradorite [An_{52}]) and volcanic glass (70%).

Alteration: slight to moderate (20%); olivine completely replaced by chlorite; plagioclase replaced by albite (70%–80%); veinlet (0.1–0.2 mm thick) is chlorite and small grains of quartz.

XRD: Fe chlorite with single swelling interlayers (as much as 5%); trace quartz and amphibole.

Sample 83-504B-88R-1, 68–71 cm (Piece 4A), Unit 70 [Z-575]

Olivine-plagioclase-phyric basalt, crystallized, groundmass is microlitic texture. Phenocrysts (25%) represented by single (2%–3%) grains (0.3–0.6 mm) of olivine and glomerophyric segregates of prismatic and tabular grains (0.5–1.2 mm) of plagioclase (labradorite [An_{59}]). Groundmass represented by laths of plagioclase (30%), grains of clinopyroxene (35%), and olivine (10%). Opaque mineral (1%–2%) is present.

Alteration: slight (12%–15%); olivine completely replaced by iddingsite.

XRD: Fe chlorite; trace quartz and amphibole.

Sample 83-504B-89R-2, 74–78 cm (Piece 9), Unit 71 [Z-1309]

Aphyric basalt, crystallized, groundmass is microlitic texture. Rock contains microlites (0.1–0.5 mm) of plagioclase (45%, labradorite [An_{60}]). Pyroxene forms segregates of very small grains and accretions of microlites (55%) in interstices. Opaque mineral and chlorite (5%) are present.

Alteration: slight; veinlets (0.1–0.2 mm, 5%) are albite, quartz, and chlorite.

XRD: Fe chlorite; trace amphibole and quartz.

Sample 83-504B-90R-4, 112–114 cm (Piece 10A), Unit 72 [Z-1310]

Aphyric dolerite, fine grained, groundmass is intersertal-ophitic texture. Rock contains prismatic grains (40%) of altered plagioclase (labradorite [An_{60}]). Interstices contain xenomorphic grains (0.2–0.5 mm) of pyroxene (40%). Opaque mineral (5%) is present. Rock contains brown-black isotropic glass (15%).

Alteration: slight to moderate (15%–20%); albitized plagioclase; veinlets (0.1 mm) represented by microgranoblastic aggregate of albite; trace chlorite.

XRD: Fe chlorite; quartz, amphibole, and zeolite(?) in trace amounts; white matter and clay from vein is quartz and Fe chlorite with single swelling interlayers; trace amphibole and epistilbite.

Sample 83-504B-91R-1, 115–118 cm (Piece 15), Unit 75 [Z-576]

Clinopyroxene-plagioclase-sparsely phyric basalt, microvesicular, crystallized, groundmass is microlitic texture. Groundmass; microlites and microlaths of plagioclase. Clinopyroxene forms segregate of small grains with opaque dust. Vesicles (0.1–0.3 mm, 15%–20%) are isometric-rounded or isometric in shape.

Alteration: central parts of plagioclase replaced by sosurite and albite, occasionally by carbonate; interstitial plagioclase completely replaced by sosurite and albite; vesicles infilled with green chlorite.

XRD: Fe chlorite with 5%–10% smectite interlayers; trace quartz; black clay from vein is Fe chlorite with single swelling interlayers; trace epistilbite.

Sample 83-504B-92R-3, 38–42 cm (Piece 4), Unit 79 [Z-577]

Clinopyroxene-phyric basalt, partly crystallized, groundmass is poikilophitic-intersertal texture. Phenocrysts (60%) represented by rounded segregates (3 mm) of clinopyroxene-augite. Segregates of clinopyroxene and plagioclase are located in mesostasis of unoriented laths of plagioclase and weakly crystallized brown glass.

Alteration: chlorite is present (10%).

XRD: clay and white matter from veins is Fe chlorite with single swelling interlayers; amphibole and epistilbite(?) in trace amounts.

Sample 83-504B-94R-3, 91–94 cm (Piece 10), Unit 86 [Z-578]

Olivine-clinopyroxene-plagioclase-phyric dolerite, fine grained, massive, groundmass is doleritic texture. Phenocrysts (15%–20%) represented by single idiomorphic crystals of olivine (2.0 mm) and segregates of grains (0.5 mm); clinopyroxene-augite (0.5–2.0 mm, 2%–3%) and elongated-short-prismatic crystals of plagioclase (0.5–2.0 mm, labradorite-bitovnite [An_{58}]). Groundmass; short-prismatic laths of plagioclase (labradorite [An_{52}]). Interstices contain individual and segregates of small (0.1–0.2 mm) xenomorphic grains of augite. Opaque mineral (3%–5%) is present.

Alteration: slight; olivine completely replaced by iddingsite.

XRD: corrensite, Fe chlorite, and swelling chlorite; trace amphibole.

Sample 83-504B-97R-1, 88–90 cm (Piece 7), Unit 91 [Z-1311]

Plagioclase-phyric dolerite, fine grained, massive, groundmass is intersertal-doleritic texture. Phenocrysts (5%) represented by prismatic (4 mm) and tabular (0.8 mm) crystals of plagioclase. Groundmass represented by prismatic grains and laths (0.3–1.2 mm) of partly altered plagioclase (40%, labradorite [An_{55}]). Interstices contain xenomorphic grains of pyroxene, often their segregates, small (0.2 mm) grains of olivine (5%), and volcanic glass. Large (0.2–0.6 mm) grains of opaque mineral (10%) are present.

Alteration: slight (10%–15%); partly sosuritized plagioclase; olivine replaced by chlorite; chlorite replaces volcanic glass.

XRD: Fe chlorite with single swelling interlayers; amphibole and epistilbite in trace amounts; white matter (friable) is lomontite; white matter (hard) is scolecite.

Sample 83-504B-97R-2, 108–111 cm (Piece 10), Unit 91 [Z-579]

Plagioclase-sparsely phyric basalt, crystallized, massive, groundmass is microlitic texture. Phenocrysts are represented by single elongated-tabular grains of plagioclase (2%–3%, 0.2–0.3 mm, labradorite [An_{56}]).

Groundmass; microlites of plagioclase (andesine [An_{48}]; 40%) and segregates of small isometric grains of augite (60%). Opaque mineral (5%) is present.

Alteration: rock is fresh.

XRD: Fe chlorite, swelling chlorite, and corrensite-like mineral; trace quartz.

Sample 83-504B-98R-1, 80–85 cm (Piece 11), Unit 94 [Z-1312]

Aphyric dolerite, moderate grained, groundmass is intersertal-ophitic texture. Rock contains elongated laths (0.6–1.7 mm) of plagioclase (40%, labradorite [An_{55-60}]. Interstices contain xenomorphic grains (0.2–0.7 mm) of clinopyroxene (40%), small (0.3 mm) grains of olivine (5%), and brown-green glass (10%). Opaque mineral (2%–3%) is present.

Alteration: slight to moderate (10%–15%); plagioclase is albitized (5%–10%); olivine and glass replaced by chlorite.

XRD: Fe chlorite with single swelling interlayers; trace amphibole.

Sample 83-504B-99R-2, 93–96 cm (Piece 11), Unit 96 [Z-580]

Plagioclase-phyric basalt, crystallized, groundmass is massive, microlitic texture. Phenocrysts represented by glomerophyric segregates of short-prismatic and tabular grains of plagioclase (5%–7%, 0.5–1.7 mm, labradorite [An_{55}]). Groundmass; unoriented short-prismatic microlites and microlaths of plagioclase (andesine [An_{48}]). Interstices contain xenomorphic grains of augite (0.05–0.1 mm) or segregates. Skeletal grains of opaque mineral (5%–7%) are present.

Alteration: rock is fresh; microcracks (as much as 0.4 mm thick) infilled with chlorite-pennine (salbands), center parts of veins contain colorless mineral.

XRD: Fe chlorite; amphibole in trace amounts.

Sample 83-504B-100R-1, 19–20 cm (Piece 2A), Unit 96 [Z-581]

Aphyric dolerite, fine grained, groundmass is intersertal-ophitic texture. Rock contains unoriented microlaths (0.2–0.3 mm) of plagioclase (40%, labradorite [An_{55}]). Interstices contain xenomorphic grains of clinopyroxene-salite, small grains of opaque mineral (5%), and chlorite (5%). Microcracks (0.1–0.2 mm thick) infilled with chlorite-pennine.

Alteration: slight; chlorite is present.

XRD: Fe chlorite and quartz; trace amphibole.

Sample 83-504B-100R-1, 83–87 cm (Piece 10), Unit 96 [Z-1313]

Aphyric basalt, crystallized, groundmass is microlitic (microdoleritic) texture. Rock contains unoriented microlaths (0.1–0.5 mm) of plagioclase (30%). Interstices contain segregates of very small (0.1 mm) grains of clinopyroxene (25%) and opaque mineral (5%).

Alteration: strong (70%–75%); rock replaced by chlorite (25%) and tremolite (15%); plagioclase almost completely replaced by albite and sosurite; small (0.3 mm) grains of olivine (5%) replaced by chlorite and brown-green glass (10%) replaced by chlorite.

XRD: Fe chlorite with single swelling interlayers and amphibole; trace epistilbite(?); black and light gray matter from matrix is Fe chlorite; amphibole and epistilbite in trace amounts.

Sample 83-504B-104R-3, 30–33 cm (Piece 5A), Unit 106 [Z-582]

Olivine-plagioclase-sparsely phyric dolerite, medium grained, massive, groundmass is ophitic-poikilophitic texture. Phenocrysts (5%) represented by sparse (2%–3%) idiomorphic grains of olivine (0.3–0.5 mm) and single tabular crystals (0.7–0.8 mm) of zonal plagioclase. Groundmass represented by elongated-prismatic, often xenomorphic, grains of clinopyroxene (salite) with inclusions of short-prismatic laths of plagioclase. Clinopyroxene is present in interstices as small (0.1–0.2 mm) xenomorphic grains.

Alteration: olivine completely replaced by green chlorite.

XRD: Fe chlorite; quartz and amphibole in trace amounts.

Sample 83-504B-109R-1, 50–54 cm (Piece 7), Unit 112 [Z-583]

Plagioclase-phyric dolerite, fine grained, massive, groundmass is intersertal-poikilophitic texture. Phenocrysts: glomerophyric segregates of short-prismatic and tabular grains of plagioclase (10%, 0.4-1 mm), labradorite-bitovnite, An_{70}. Groundmass: microlaths of plagioclase, labradorite [An_{55}] and segregates of augite grains. Interstices: segregate of augite grains (up to 0.1 mm) with opaque dust.

Alteration: slight; plagioclase replaced by sosurite in microcracks; chlorite replaces glass.

XRD: swelling chlorite and Fe chlorite; corrensite-like mineral, quartz, and amphibole in trace amounts.

Sample 83-504B-111R-1, 86–89 cm (Piece 9), Unit 113 [Z-1314]

Plagioclase-olivine-phyric basalt, massive, groundmass is pilotaxitic texture. Phenocrysts (20%) are represented by olivine (10%) and plagioclase (10%). Olivine forms idiomorphic grains (0.6–1.7 mm). Plagioclase forms prismatic grains (0.4–0.9 mm, labradorite [An_{60}]) and glomerophyric segregates. Groundmass; needle-shaped microlites of plagioclase (40%) and weakly anisotropic brown-black glass (40%).

Alteration: slight to moderate (15%–20%); olivine completely replaced by chlorite; large grains of plagioclase replaced by albite and sosurite.

XRD: swelling chlorite and Fe chlorite with 10% swelling interlayers; trace amphibole; black clay from vein is chlorite and corrensite-like mineral.

Sample 83-504B-113R-1, 7–10 cm (Piece 1), Unit 115 [Z-584]

Olivine-plagioclase-phyric dolerite, medium grained, massive, groundmass is ophitic and poikilophitic texture. Phenocrysts of olivine (0.7–1.0 mm, 2%–3%) are present. Plagioclase (15%); short and elongated-tabular grains and their glomerophyric segregates (0.5–4.0 mm). Groundmass; elongated-prismatic grains and laths of plagioclase (40%–45%, labradorite [An_{55}]). Interstices contain isometric grains of clinopyroxene (diopside-salite; 0.5–0.8 mm) and segregates of smaller grains of pyroxene with laths of plagioclase. Opaque mineral (5%) forms segregates of skeletal isometric grains. Glass is present (5%).

Alteration: slight; olivine completely replaced by iddingsite and brown Fe hydroxides; chlorite replaces glass.

XRD: swelling chlorite, Fe chlorite, and corrensite-like mineral; quartz, amphibole, and talc(?) in trace amounts.

Sample 83-504B-116R-1, 56–60 cm (Piece 9), Unit 117 [Z-1315]

Clinopyroxene-plagioclase-phyric basalt (microdolerite), groundmass is microlitic (microdoleritic) texture. Phenocrysts (10%) represented by prismatic grains of clinopyroxene (5%) and plagioclase (5%). Clinopyroxene forms grains (1.7–2.5 mm), occasionally clinopyroxene includes laths of plagioclase. Plagioclase forms glomerophyric segregates of prismatic grains (0.5–0.8 mm). Groundmass; unoriented laths (0.1–0.7 mm) of plagioclase (45%, andesine [An_{48}]). Interstices contain small xenomorphic grains of clinopyroxene (40%) and opaque mineral (5%).

Alteration: slight (5%–10%); plagioclase replaced by albite-oligoclase (70%–80% of plagioclase volume); microvein (0.2 mm thick) contains chlorite and trace albite and epidote.

XRD: Fe chlorite; swelling chlorite, quartz, and amphibole in trace amounts.

Sample 83-504B-117R-1, 109—113 cm (Piece 15), Unit 118 [Z-1316]

Plagioclase-phyric dolerite, groundmass is ophitic-poikilophitic texture. Phenocrysts are represented by tabular grains of plagioclase (1%–2%, labradorite [An_{62}]). Groundmass; laths (0.5–0.8 mm) of plagioclase (45%, andesine [An_{45}]). Interstices contain xenomorphic grains (0.2–0.5 mm) of clinopyroxene (45%). Opaque mineral (5%) is present.

Alteration: rock is fresh.

XRD: Fe chlorite; quartz, talc, lomontite, and amphibole in trace amounts; white and black matter from vein is Fe chlorite and lomontite; trace amphibole.

Sample 83-504B-118R-1, 62–66 cm (Piece 5), Unit 118 [Z-585]

Olivine-plagioclase-phyric dolerite, medium grained, massive, groundmass is doleritic and poikilophitic texture. Phenocrysts of olivine (1.5 mm) are present. Plagioclase (10%–15%); short-prismatic grains and their glomerophyric segregates (0.5–2.0 mm). Composition of central parts of plagioclase is labradorite (An_{68}), rims are An_{65}. Groundmass; unoriented laths and short-prismatic grains of plagioclase (40%–45%) from 0.2 to 1.5 mm in size (labradorite [An_{55}]; small laths are andesine [An_{43}]). Interstices contain isometric grains and segregates of grains (0.1–0.3 mm) of clinopyroxene (augite). Occasionally pyroxene forms xenomorphic grains 0.5–0.8 mm in size with inclusions of laths of plagioclase. Opaque mineral (2%–3%) is distributed uniformly.

Alteration: slight; olivine completely replaced by iddingsite and opaque dust; iddingsite-chlorite mineral (2%–3%) is present.

XRD: Fe chlorite; quartz, amphibole, and talc(?) in trace amounts.

Sample 83-504B-121R-1, 32–38 cm (Piece 5), Unit 120 [Z-586]

Olivine-plagioclase-phyric dolerite, fine grained, massive, groundmass is doleritic and ophitic texture. Rock is similar to Sample 83-504B-118R-1, 62–66 cm (Z-585), but the size of mineral grains is smaller than in Sample Z-585.

Alteration: rock is fresh.

XRD: swelling chlorite, Fe chlorite, and corrensite-like mineral; trace quartz and amphibole.

Sample 83-504B-127R-1, 97–101 cm (Piece 12), Unit 131 [Z-587]

Olivine-plagioclase-phyric dolerite, medium grained, massive, groundmass is poikilophitic texture. Phenocrysts of olivine (0.3–0.9 mm, 5%) completely replaced by iddingsite-chlorite and opaque dust. Plagioclase (20%); elongated-tabular grains (1.0–2.5 mm, labradorite [An_{68}]) and their segregates. Groundmass; elongated-prismatic laths (0.1–1.0 mm) of plagioclase (45%–50%, from An_{55} to An_{60}. Clinopyroxene-augite forms isometric grains as much as 2 mm in size with inclusions of laths of plagioclase. Interstices contain small (0.2 mm) grains and segregates of grains. Small xenomorphic grains of opaque mineral (2%–3%, 0.1 mm) are distributed uniformly.

Alteration: slight; iddingsite-chlorite mineral is present (2%).

XRD: swelling chlorite and Fe chlorite; talc, amphibole, and quartz in trace amounts.

Sample 83-504B-130R-1, 88–91 cm (Piece 8), Unit 135 [Z-588]

Clinopyroxene-olivine-plagioclase-phyric dolerite, medium grained, massive, groundmass is doleritic texture. Isometric grains of olivine (0.5–0.9 mm, 5%–7%) are present. Clinopyroxene-augite; single isometric grain (2.5 mm) with inclusions of plagioclase laths. Plagioclase; short-prismatic grains (1.0–2.5 mm, labradorite [An_{68}]). Groundmass represented by laths and short-prismatic grains (0.3–0.5 mm) of plagioclase (50%). Interstices contain small (0.1–0.3 mm) isometric grains of augite and segregates of grains. Small xenomorphic grains of opaque mineral (2%–3%) is distributed uniformly.

Alteration: slight; olivine completely replaced by iddingsite and opaque dust; chlorite is present.

XRD: Fe chlorite and swelling chlorite; talc, quartz, and amphibole in trace amounts.

Sample 83-504B-130R-3, 78–81 cm (Piece 9A), Unit 135 [Z-1317]

Olivine-plagioclase-phyric dolerite, medium grained, massive, groundmass is ophitic-poikilophitic texture. Idiomorphic grains of olivine (0.7–2.5 mm, 5%) are present. Plagioclase (5%); prismatic and tabular grains (1.5–1.7 mm, labradorite [$An_{60–62}$]). Groundmass; prismatic grains (0.2–0.8 mm) of plagioclase (35%). Clinopyroxene (40%) forms xenomorphic grains (0.2–0.5 mm). Olivine (0.2–0.3 mm, 5%), opaque mineral (5%), and chloritized glass are present.

Alteration: slight (10%–12%); olivine completely replaced by green iddingsite.

XRD: swelling chlorite and Fe chlorite; talc and amphibole in trace amounts; black matter from vesicles is stivensite (mixed-layer smectite-talc; Mg-trioctahedral mineral) and talc, chlorite with 10% swelling interlayers; serpentine(?) in trace amounts.

Sample 83-504B-132R-1, 76–80 cm (Piece 10), Unit 137 [Z-589]

Olivine-clinopyroxene-plagioclase-phyric dolerite, fine grained, massive, groundmass is doleritic texture. Idiomorphic grains of olivine (0.5–0.9 mm, 5%) are present. Clinopyroxene-augite (5%); tabular and elongated-prismatic grains (1–2 mm). Plagioclase (15%); elongated-tabular (1–2 mm) and elongated-prismatic (often glomerophyric segregates) grains (0.8–1 mm, labradorite [$An_{65–68}$]). Groundmass represented by unoriented laths, elongated-prismatic, and tabular grains (0.1–0.9 mm) of plagioclase (labradorite [An_{55}] and andesine [An_{47}]). Interstices contain segregates of augite in small, often paniclelike, grains. Opaque mineral (5%–6%) forms segregates small grains.

Alteration: slight; olivine completely replaced by iddingsite; chlorite (3%–4%) is present.

XRD: Fe chlorite with 5% swelling interlayers, swelling chlorite, and mixed-layer chlorite-smectite mineral (20% swelling interlayers); amphibole, quartz, and talc(?) in trace amounts.

Sample 83-504B-133R-1, 46–50 cm (Piece 7), Unit 138 [Z-590]

Clinopyroxene-phyric basalt, massive, groundmass is microlitic to microdoleritic texture. Single large (3 mm) idiomorphic phenocryst of clinopyroxene-salite is present. Groundmass; microlaths of plagioclase (50%, 0.1–0.2 mm, labradorite [An_{52}]). Interstices contain small (0.05–0.1 mm) grains of clinopyroxene, often with opaque dust.

Alteration: rock is fresh; microcracks (5%, 0.1–3.0 mm thick) infilled with chlorite and chalcedony.

XRD: Fe chlorite; quartz and amphibole in trace amounts.

Sample 83-504B-134R-1, 147–150 cm (Piece 19), Unit 140 [Z-1318]

Clinopyroxene-plagioclase-phyric basalt, crystallized, massive, groundmass is microlitic (microdoleritic) texture. Phenocrysts (10%) are represented by isomorphic grains of clinopyroxene (5%, 1.0–1.2 mm) and prismatic crystals of plagioclase (5%, labradorite [An_{60}]). Groundmass (90%); unoriented laths (0.3–0.7 mm) of

plagioclase (40%, andesine [An_{42}]). Interstices contain xenomorphic grains of pyroxene (40%). Opaque mineral (5%) and glass (5%) are present.

Alteration: slight (5%–10%); plagioclase partly replaced by albite and sosurite; chlorite replaces glass.

XRD: Fe chlorite; amphibole and talc in trace amounts.

Sample 111-504B-142R-1, 129–132 cm (Piece 17B), Unit 153 [Z-597]

Clinopyroxene-plagioclase-phyric basalt, incompletely crystallized, massive, groundmass is microlitic texture. Single elongated-prismatic crystal of clinopyroxene-salite (2 mm) is present. Phenocrysts of plagioclase (15%) form elongated-prismatic and tabular grains (0.5–1.5 mm) and glomerophyric segregates. Groundmass; weakly crystallized mesostasis: unoriented altered microlites of plagioclase and brown microlites of clinopyroxene with opaque dust.

Alteration: slight (10%); plagioclase partly replaced by albite-oligoclase and chlorite; chlorite (5%–7%) is present; microcrack (0.2 mm thick) infilled with hydrobiotite.

XRD: Fe chlorite; amphibole and talc(?) in trace amounts.

Sample 111-504B-142R-2, 40–44 cm (Piece 6), Unit 153 [Z-114]

Sparsely plagioclase-phyric basalt, fine grained, inequigranular, incompletely crystallized, massive. Phenocrysts of plagioclase (3%–5%) form glomerophyric segregates. Groundmass is intersertal, occasionally micropoikilophitic, texture; laths of plagioclase, clinopyroxene, opaque mineral, single crystal of olivine, and interstitial glass (<1%). Single vesicles are present.

Alteration: slight (<10%); clay minerals replace olivine and interstitial glass; vesicles are filled with clay mineral.

XRD: Fe and Mg chlorite (Fe and Mg approximately equal) and swelling chlorite; amphibole and talc(?) in trace amounts.

Sample 111-504B-143R-1, 124–127 cm (Piece 19), Unit 155 [Z-598]

Olivine-plagioclase-phyric dolerite, medium grained, massive, groundmass is doleritic texture. Idiomorphic grains of olivine (0.5–0.9 mm, 5%) are present. Plagioclase (5%); elongated-tabular grains (1–2 mm, labradorite [An_{68}]). Groundmass; elongated-prismatic lathlike grains (0.2–0.5 mm) of plagioclase (labradorite [An_{56}]). Interstices contain xenomorphic grains of clinopyroxene (salite to augite) or their segregates. Small xenomorphic grains of opaque mineral (5%) and glass (<1%) are present.

Alteration: slight; olivine completely replaced by iddingsite and chlorite; chlorite replaces glass.

XRD: Fe chlorite and swelling chlorite; corrensite-like mineral, amphibole, quartz, and talc(?) in trace amounts.

Sample 111-504B-145R-1, 103–105 cm (Piece 13A), Unit 160 [Z-115]

Sparsely plagioclase-clinopyroxene-phyric basalt, inequigranular, incompletely crystallized, massive. Phenocrysts of plagioclase (5%) form glomerophyric segregates, occasionally with clinopyroxene (<1%). Single phenocrysts of olivine are present. Groundmass: intersertal, partly poikilophitic, texture; laths of plagioclase, clinopyroxene, opaque minerals, and interstitial glass (<1%). Single vesicles are present.

Alteration: slight (<10%); clay minerals replace olivine and interstitial glass.

XRD: Fe chlorite and swelling chlorite; corrensite-like mineral, amphibole, quartz, and talc(?) in trace amounts.

Electron micrograph: b = 9.27 Å (trioctahedral chlorite).

Sample 111-504B-145R-2, 74–76 cm (Piece 7F), Unit 160 [Z-116]

Sparsely plagioclase-phyric basalt, inequigranular, incompletely crystallized, massive. Phenocrysts: plagioclase (1%) forms glomerophyric segregates. Single phenocrysts of olivine are present. Groundmass: intersertal or micropoikilophitic texture; laths of plagioclase, clinopyroxene, opaque minerals, single crystals of olivine, and interstitial glass (<1%–3%).

Alteration: slight (<10%); clay minerals replace olivine and interstitial glass.

XRD: Fe and Mg chlorite (Mg > Fe), swelling chlorite, and corrensite-like mineral; trace amphibole.

Electron micrograph: b = 9.28 Å (trioctahedral chlorite).

Sample 111-504B-145R-3, 66–68 cm (Piece 6A), Unit 160 [Z-117]

Plagioclase-clinopyroxene-phyric basalt, inequigranular, incompletely crystallized, massive. Phenocrysts: plagioclase (<1%), clinopyroxene (3%–5%), and single phenocrysts of olivine. Groundmass: intersertal and micropoikilophitic texture; laths of plagioclase, clinopyroxene, opaque minerals, and interstitial glass (<1%).

Alteration: slight (~5%); clay minerals replace olivine and interstitial glass.

XRD: Fe and Mg chlorite (Mg > Fe) and swelling chlorite; corrensite-like mineral, amphibole, and talc(?) in trace amounts.

Electron micrograph: b = 9.30 Å (trioctahedral chlorite).

Sample 111-504B-147R-1, 11–13 cm (Piece 3), Unit 163 [Z-118]

Very sparsely plagioclase-phyric basalt, inequigranular, incompletely crystallized, massive. Phenocrysts: plagioclase (<1%). Groundmass: intergranular to intersertal texture; laths of plagioclase, clinopyroxene, opaque minerals, and interstitial glass.

Alteration: slight (<5%).

XRD: Fe and Mg chlorite (Mg > Fe), talc, and swelling chlorite; trace quartz and amphibole.

Sample 111-504B-147R-2, 15–20 cm (Piece 1C), Unit 163 [Z-599]

Sparsely olivine-plagioclase-phyric basalt, massive. Single phenocryst (1 mm) of olivine is present. Phenocrysts: single glomerophyric segregate of grains of plagioclase (0.7–1.2 mm, labradorite [An_{56}]). Groundmass: laths of plagioclase (labradorite [An_{65-50}]. Interstices: xenomorphic grains (0.2–0.8 mm) of salite-augite. Small grains of opaque minerals (5%–7%, as much as 0.1 mm) are uniformly distributed.

Alteration: slight; olivine completely replaced by iddingsite; opaque minerals are located in microcracks in olivine; chlorite mineral is present.

XRD: Fe chlorite with 5% swelling interlayers and swelling chlorite; trace corrensite-like mineral (40% swelling interlayers), quartz, talc, and amphibole.

Sample 111-504B-147R-2, 26–28 cm (Pies 1D), Unit 163 [Z-119]

Aphyric basalt, almost completely crystallized, massive. Groundmass: intergranular texture; represented by laths of plagioclase, clinopyroxene, opaque minerals, single crystals of olivine, and small amounts of interstitial glass.

Alteration: slight (~1%–5%); clay minerals and carbonate replace olivine.

XRD: swelling chlorite; trace quartz, amphibole, and talc(?).

Sample 111-504B-148R-1, 53–55 cm (Piece 8), Unit 164 [Z-120]

Sparsely olivine-microphyric hyalobasalt, poorly crystallized, highly vesicular (0.05–0.1 mm, 40%–50%). Microphenocrysts of olivine (1%–3%) are present. Groundmass: vitrophyric texture; black volcanic glass with opaque dust and needle-shaped chaotically distributed microlaths of plagioclase.

Alteration: strong (50%–60%); clay minerals replace olivine; vesicles are filled with clay minerals.

XRD: Fe chlorite, swelling chlorite, and corrensite-like mineral; quartz, amphibole, and talc(?) in trace amounts.

Electron micrograph: b = 9.30 Å (trioctahedral chlorite).

Sample 111-504B-149R-1, 122–124 cm (Piece 16%), Unit 164 [Z-121]

Aphyric basalt, inequigranular, almost completely crystallized, massive. Groundmass: intergranular texture; laths of plagioclase, clinopyroxene, opaque minerals, and interstitial glass (<1%).

Alteration: slight (<5%).

XRD: Fe and Mg chlorite (Fe and Mg are approximately equal), swelling chlorite, and corrensite-like mineral; amphibole, quartz, and talc(?) in trace amounts.

Electron micrograph: b = 9.30 Å (trioctahedral chlorite).

Sample 111-504B-152R-1, 11–13 cm (Piece 2C), Unit 169 [Z-600]

Hydrothermally altered volcanic breccia. Rock: replaced by fine-grained aggregates of quartz, orthoclase, chlorite, and aggregate hydromica (muscovite?) and small grains of epidote. Thin veins contain chlorite and hydromica.

Alteration: very strong.

XRD: Fe chlorite; trace amphibole; white crystals are lomontite.

Sample 111-504B-154R-1, 30–32 cm (Piece 2C), Unit 176 [Z-122]

Very sparsely plagioclase-clinopyroxene-phyric basalt, inequigranular, almost completely crystallized, massive. Rare phenocrysts are represented by plagioclase and clinopyroxene. Single crystals of olivine are present. Groundmass: intergranular to intersertal texture; laths of plagioclase, clinopyroxene, opaque minerals, and interstitial glass (<1%).

Alteration: slight (5%–7%); clay minerals replace olivine and interstitial glass.

XRD: chlorite and swelling chlorite; amphibole and talc(?) in trace amounts.

Electron micrograph: b = 9.26 Å (trioctahedral chlorite).

Sample 111-504B-156-1, 64–67 cm (Piece 13), Unit 178 [Z-601]

Aphyric basalt, incompletely crystallized, massive, microlitic-intersertal in groundmass texture. Rock: unoriented microlites and microlaths of plagioclase (labradorite [An_{58}]). Interstices: various levels of crystallized glass, from small segregates of grains of augite to dark brown oxidized glass.

Alteration: rock is fresh.

XRD: Fe chlorite and amphibole; trace quartz.

Sample 111-504B-158-1, 16–19 cm (Piece 3A), Unit 182 [Z-602]

Aphyric basalt, uncrystallized, hyalopilitic in groundmass texture. Rock: unoriented needle-shaped microlites of plagioclase (20%), very small grains of opaque minerals (5%), and brown weakly anisotropic glass.

Alteration: rock is fresh; crack (0.3 mm thick) infilled with chlorite.

XRD: amphibole and Fe chlorite; trace quartz.

Sample 111-504B-162M-1, 45–47 cm (Piece 5), Unit 187 [Z-123]

Plagioclase-phyric basalt, inequigranular, incompletely crystallized, massive. Phenocrysts: plagioclase (0.8-2 mm, 7%–10%); single phenocrysts of olivine are present. Groundmass: intersertal to subvariolitic texture; laths of plagioclase, clinopyroxene, opaque minerals, and interstitial glass (<1%).

Alteration: slight (10%–15%); clay minerals replace olivine.

XRD: mixed-layer illite-smectite minerals with ~20% mica layers; trace defective chlorite.

Electron micrograph: b = 9.30 Å (trioctahedral chlorite).

Sample 111-504B-163-1, 36–41 cm (Piece 8), Unit 187 [Z-603]

Dolerite, massive. Groundmass: ophitic texture. Plagioclase: short-tabular (up to 0.5 mm) and needle-shaped (up to 3 mm) grains, labradorite [An_{55}] to andesine [An_{43}]. Interstices: xenomorphic grains of clinopyroxene from brown to almost colorless (diopside-augite). Opaque minerals (5%) form isometric, occasionally skeletal small (up to 0.1 mm), grains.

Alteration: slight; chlorite (3%–5%) is present; occasionally chlorite replaces plagioclase and pyroxene.

XRD: Fe chlorite; quartz and amphibole in trace amounts.

Sample 111-504B-163-1, 120–123 cm (Piece 4), Unit 187 [Z-1319]

Plagioclase-phyric basalt, crystallized, fine grained. Phenocrysts (10%): plagioclase (0.9–2 mm), labradorite [An_{60}]. Groundmass: microdoleritic texture; prismatic grains and laths of plagioclase (40%, 0.2–0.7 mm, andesine [An_{42}]). Interstices: xenomorphic grains of clinopyroxene (0.2–0.4 mm). Opaque minerals (5%) are present.

Alteration: slight (10%–17%); plagioclase replaced by albite (5%–7% of grain volume); rock partly (10%) is chloritized.

XRD: Fe chlorite; amphibole and quartz in trace amounts.

Sample 111-504B-169R-1, 66–69 cm (Piece 14), Unit 191 [Z-604]

Olivine-clinopyroxene-plagioclase-phyric dolerite, fine grained, massive. Single idiomorphic phenocrysts of olivine (0.7 mm) are present. Clinopyroxene (diopside-salite) forms idiomorphic grains (5%) 0.5–2 mm in size. Plagioclase (10%): glomerophyric segregates of tabular or prismatic grains, labradorite (An_{60}). Groundmass: doleritic texture; unoriented laths (0.2–0.3 mm) of plagioclase, andesine (An_{48}). Interstices contain segregates of small (0.1 mm) isometric grains of salite. Opaque minerals (7%–8%) form xenomorphic grains.

Alteration: slight; olivine completely replaced by chlorite; chlorite (<1%) is present.

XRD: Fe chlorite and amphibole; trace quartz.

Sample 137-504B-177R-1, 48–49 cm (Piece 13), Unit 206 [Z-812]

Olivine-clinopyroxene-plagioclase-sparsely phyric dolerite, medium grained, massive. Phenocrysts (5%): segregates of two small (0.2–0.3 mm) idiomorphic grains of olivine, single xenomorphic grains (up to 2 mm) of colorless diopside, and single tabular crystals (1–1.2 mm) of plagioclase, labradorite, (An_{68}). Groundmass: doleritic-ophitic texture; elongated-prismatic laths (0.1–0.8 mm) of plagioclase, labradorite (An_{55}). Interstices contain xenomorphic small (0.2 mm) grains of salite. Opaque minerals (5%–7%) form small xenomorphic grains (up to 0.1 mm).

Alteration: slight; olivine completely replaced by iddingsite (opaque minerals, 30%, is present in altered olivine); chlorite (<1%) is present.

XRD: Fe chlorite; quartz, corrensite-like mineral, and amphibole in trace amounts.

Sample 137-504B-181M-1, 6–8 cm (Piece 1), Unit 206 [Z-813]

Clinopyroxene-plagioclase-phyric dolerite, fine grained, massive. Phenocrysts (5%): isometric grains (0.5–1 mm) of clinopyroxene. Clinopyroxene includes laths of plagioclase (poikilophitic texture). Plagioclase forms rare tabular or short-prismatic grains. Groundmass: doleritic texture; prismatic and elongated-prismatic laths (0.1–0.5 mm) of plagioclase, labradorite (An_{56}). Interstices: segregates of small isometric grains of augite. Opaque minerals (5%) and chlorite (<1%) are present.

Alteration: slight.

XRD: Fe chlorite and quartz; swelling chlorite, corrensite-like mineral, and amphibole in trace amounts.

Sample 140-504B-186-2, 30–31 cm (Piece 8), Unit 213 [Z-838]

Aphyric dolerite, medium grained. Groundmass: poikilophitic texture. Rock: xenomorphic and elongated grains of clinopyroxene-salite (0.5–2 mm), clinopyroxene includes elongated (up to 2 mm) laths of plagioclase, labradorite (An_{55}), small grains (0.3 mm) of plagioclase-andesine-labradorite (An_{50}). Chlorite-pennine (30%) is present.

Alteration: moderate-strong; rock is chloritized.

XRD: Fe chlorite and amphibole; trace quartz.

Sample 140-504B-187R-1, 59–60 cm (Piece 14), Unit 216 [Z-839]

Olivine-clinopyroxene-phyric dolerite, fine grained, massive. Phenocrysts (5%): single idiomorphic grains (0.5–0.8 mm) of olivine and tabular and elongated-prismatic grains (1–1.5 mm) of clinopyroxene-salite. Groundmass: microdoleritic texture; short and elongated-prismatic laths (0.2–0.4 mm) of plagioclase, labradorite [An_{52}]. Interstices: xenomorphic small grains of salite, occasionally with opaque dust. Opaque minerals (10%) are located uniformly in rock.

Alteration: slight; olivine completely replaced by green iddingsite; chlorite (<1%) is present in interstices.

XRD: Amphibole; trace Fe chlorite.

Sample 140-504B-189-1, 85–86 cm (Piece 19), Unit 218 [Z-840]

Aphyric dolerite, fine grained, massive; Groundmass: doleritic texture. Rock: elongated-prismatic and rounded-isometric laths and grains of plagioclase, labradorite (An_{52-55}). Interstices: xenomorphic or rounded grains of salite and chlorite (1%). Opaque minerals (7%–8%) are present.

Alteration: slight.

XRD: Fe chlorite and swelling chlorite; quartz, amphibole, and talc in trace amounts.

Sample 140-504B-189R-2, 15–17 cm (Piece 3), Unit 218 [Z-841]

Olivine-phyric gabbro-dolerite, medium grained, massive. Phenocrysts (5%): olivine (0.3–1 mm). Groundmass: gabbro-doleritic texture; prismatic and rounded-prismatic grains (0.2–0.6 mm) of plagioclase, labradorite (An_{58}), and andesine (An_{45}). Interstices contain xenomorphic grains (0.1–0.4 mm) of clinopyroxene (from salite to augite). Opaque minerals (5%) and chlorite are present.

Alteration: slight; olivine completely replaced by chlorite, altered olivine contains opaque minerals; chlorite replaces glass.

XRD: Fe chlorite, corrensite-like mineral, and amphibole; quartz and talc(?) in trace amounts.

Sample 140-504B-190-1, 10–14 cm (Piece 2), Unit 218 [Z-842]

Aphyric basalt, massive. Groundmass: intersertal texture. Rock: unoriented prismatic laths of plagioclase (0.2–0.7 mm). Mesostasis demonstrates dark-brown matter with brown grains of clinopyroxene.

Alteration: moderate (30%–35%); rock is hydrothermally altered; plagioclase almost completely replaced by sosurite and albite; aggregate of chlorite contains very small grains of sphene.

XRD: Fe chlorite, lomontite, and amphibole; trace corrensite-like mineral(?) and quartz.

Sample 140-504B-191-1, 26–28 cm (Piece 9), Unit 218 [Z-843]@@

Plagioclase-phyric dolerite, fine grained. Groundmass: ophitic texture. Phenocrysts (20%): plagioclase tabular and prismatic crystals (1–5 mm), labradorite (An_{69}). Plagioclase crystals contain inclusions of glass. Interstices: xenomorphic grains of clinopyroxene-salite (0.2–0.3 up to 0.8–1 mm). Opaque minerals (2%–3%) and chlorite (1%) are present.

Alteration: slight.

XRD: Fe chlorite, corrensite-like mineral (40% swelling interlayers), and amphibole; swelling chlorite and quartz in trace amounts.

Sample 140-504B-193-1, 49–51 cm (Piece 13A), Unit 220 [Z-844]

Breccia of amphibolitized dolerite, cement is clay matter. Rock: fragments (5–7 mm diameter) of plagioclase-amphibole hydrothermally altered dolerite. Rock: unoriented prismatic laths of plagioclase (0.3–0.4 mm) almost completely replaced by albite and sosurite. Interstices contain xenomorphic grains (0.1–0.3 mm) of brown-green amphibole (from uralite to tremolite-actinolite). Occasionally actinolitic hornblende replaced by chlorite. Small isometric grains of sphene are located on contact plagioclase and amphibole.

Alteration: very strong.

XRD: white matter and clay from vein is amphibole and lomontite; trace Fe chlorite.

Sample 140-504B-194R-1, 42–44 cm (Piece 8), Unit 220 [Z-845]

Olivine-plagioclase-phyric dolerite, medium grained, massive. Phenocryst: single large (3 mm) idiomorphic; olivine. Plagioclase forms large (5 mm) prismatic grain. Groundmass: doleritic-ophitic texture; short and elongated-prismatic laths (0.2–1 mm) of plagioclase, labradorite (An_{56}). Interstices: isomorphic grains (0.2–0.8 mm) of clinopyroxene-salite.

Alteration: moderate (30%–35%); rock is partly amphibolitized; olivine grain completely replaced by chlorite and in central part of grains by iddingsite; plagioclase laths are albitized; occasionally pyroxene partly or completely replaced by amphibole; crystals of tremolite (up to 2.5 mm) replace of rock-forming minerals; small isometric grains of sphene are located in central parts of tremolite; rock contain chlorite.

XRD: amphibole and Fe chlorite; trace corrensite-like mineral(?).

Sample 140-504B-197R-1, 31–33 cm (Piece 7), Unit 222 [Z-846]

Olivine-clinopyroxene-plagioclase-phyric dolerite, fine grained, massive. Phenocrysts (10%): single grains (up to 2 mm) of olivine, clinopyroxene-salite (up to 2.5 mm), and grains (1.2–1.5 mm) of plagioclase. Groundmass: ophitic texture; laths (0.2–1 mm) of plagioclase, labradorite (An_{56}). Interstices contain xenomorphic small grains of salite and opaque minerals (5%).

Alteration: strong; rock replaced by amphibole and chlorite on 70%, olivine completely replaced by chlorite (pennine); occasionally crystals of plagioclase replaced by albite, chlorite, and sosurite; pyroxene replaced by amphibole.

XRD: amphibole and Fe chlorite; trace corrensite-like mineral, swelling chlorite, and quartz.

Sample 140-504B-198R-1, 52–54 cm (Piece 14), Unit 223 [Z-847]

Olivine-clinopyroxene-plagioclase-phyric dolerite, fine grained, massive. Phenocrysts (15%): olivine forms rare xenomorphic rounded grains (0.5–1 mm); clinopyroxene-salite forms large (up to 4 mm) prismatic doubled grains; laths of plagioclase. Plagioclase forms glomerophyric segregates of prismatic grains (1–1.2 mm), labradorite (An_{56}). Groundmass: doleritic texture; laths (0.2–0.8 mm) of plagioclase, labradorite (An_{55}). Interstices contain xenomorphic small grains of clinopyroxene (salite). They accrete with plagioclase. Opaque minerals (5%) and chlorite are present.

Alteration: slight; olivine completely replaced by chlorite, iddingsite, and opaque dust; chlorite replaces glass.

XRD: talc and Fe chlorite; swelling chlorite and amphibole in trace amounts.

Sample 140-504B-199R-1, 54–57 cm (Piece 13), Unit 226 [Z-848]

Olivine-clinopyroxene-plagioclase-phyric dolerite, medium grained, massive. groundmass is doleritic, occasionally poikilophitic, texture. Phenocrysts (20%): olivine (5%) forms idiomorphic grains (1–1.2 mm); clinopyroxene-salite forms large (up to 4 mm) elongated-prismatic crystals with laths of plagioclase. Plagioclase forms glomerophyric segregates of tabular and prismatic grains (1–1.5 mm), labradorite (An_{67}). Groundmass: doleritic, occasionally poikilophitic, texture; unoriented laths (0.2–1.5 mm) of plagioclase (labradorite [An_{57}]), small grains of plagioclase (andesine [An_{45}]). Interstices contain xenomorphic grains of clinopyroxene-salite (0.8–1 mm). They accrete with laths of plagioclase. Opaque minerals (5%) and chlorite (7%–8%) are present.

Alteration: slight; olivine completely replaced by iddingsite and opaque dust; chlorite replaces glass.

XRD: amphibole, talc, and Fe chlorite.

Sample 140-504B-200R-1, 50–52 cm (Piece 7B), Unit 227 [Z-849]

Olivine-plagioclase-phyric dolerite, medium grained, massive. groundmass is doleritic-poikilophitic texture. Phenocrysts (20%): olivine forms rare idiomorphic grains (up to 1 mm); plagioclase forms prismatic grains (0.6–1.5 mm) and glomerophyric segregates; labradorite (An_{60}). Groundmass: doleritic–poikilophitic texture;

elongated prismatic laths (0.2–0.8 mm) of plagioclase (labradorite [An_{55}]). Interstices contain xenomorphic grains of clinopyroxene-salite. They accrete with laths (up to 0.7 mm) of plagioclase. Opaque minerals (3%–4%) and green chlorophaeite (4%–5%) are present.

Alteration: slight; olivine completely replaced by iddingsite; chlorite replaces glass.

XRD: Fe chlorite, talc, and amphibole; s trace welling chlorite.

Sample 140-504B-202R-1, 23–25 cm (Piece 7), Unit 229 [Z-850]

Olivine-plagioclase-phyric dolerite, medium grained, massive. Phenocrysts (5%): olivine (1%) forms idiomorphic grains (0.5–0.6 mm); plagioclase (labradorite, [An_{67}]) forms tabular and short-prismatic grains (0.5–0.8 mm) with inclusions of glass. Groundmass is the same as Sample 140-504B-200R-1, 50–52 cm (Z-849).

Alteration: slight; olivine partly replaced by iddingsite.

XRD: Fe chlorite, talc, and amphibole; swelling chlorite and quartz in trace amounts.

Sample 140-504B-204-1, 15–19 cm (Piece 4), Unit 232 [Z-851]

Aphyric dolerite, massive, medium grained. Groundmass: doleritic-poikilophitic texture. Rock: unoriented laths of plagioclase (0.2–2 mm, labradorite [An_{56}]) and clinopyroxene. Opaque minerals (2%–3%) are present.

Alteration: strong (50%); rock replaced by amphibole; clinopyroxene replaced by needle-shaped segregate of amphibole.

XRD: Fe chlorite and amphibole; trace quartz.

Sample 140-504B-208-3, 3–5 cm (Piece 1), Unit 239 [Z-852]

Plagioclase-sparsely phyric dolerite, medium grained. Single prismatic grains (2–2.5 mm) of plagioclase (5%) broken by microcracks. Groundmass: doleritic-ophitic texture; laths of plagioclase (labradorite [An_{52}]). Interstices contain grains of clinopyroxene-augite and chlorite (10%). Pyroxene replaced by uralite (70% pyroxene).

Alteration: moderate to strong (40%); rock replaced by amphibole; microcracks in plagioclase infilled with clay minerals; chlorite replaces glass.

XRD: Fe chlorite and amphibole; trace quartz.

Sample 140-504B-209-1, 102–103 cm (Piece 14), Unit 240 [Z-853]

Plagioclase-phyric dolerite, massive. Phenocrysts (5%): plagioclase of (1%–2%) xenomorphic or prismatic grains (1.5–2 mm) and segregates of prismatic grains (1–1.2 mm, labradorite [An_{68}]). Groundmass: poikilophitic texture; small (0.1–0.3 mm) laths of plagioclase (labradorite [An_{56}]). Clinopyroxene (salite-augite) forms isomorphic, large (up to 3 mm) grains. Clinopyroxene grains contain laths of plagioclase.

Alteration: moderate (30%); rock replaced by chlorite; occasionally pyroxene almost completely replaced by segregate of chlorophaeite.

XRD: Fe chlorite and amphibole.

Sample 140-504B-209-2, 66–68 cm (Piece 10), Unit 240 [Z-854]

Plagioclase-phyric dolerite, medium grained, massive. Phenocrysts (30%): plagioclase represented by large (2.5 mm) and prismatic (0.5–1.2 mm) grains or segregates. Large grains are labradorite-bitovnite (An_{70}); small grains are labradorite (An_{62}). Groundmass: poikilophitic texture; unoriented laths and prismatic grains (0.3–0.8 mm, labradorite [An_{55}]). Interstices: xenomorphic grains (0.3–0.5 mm) of clinopyroxene-augite. Chlorite (5%) and opaque minerals (3%–4%) are present.

Alteration: slight.

XRD: Fe chlorite and swelling chlorite; trace corrensite-like mineral, talc, amphibole, and quartz.

Sample 140-504B-211-1, 70–72 cm (Piece 16), Unit 241 [Z-855]

Aphyric dolerite, massive, moderate grains. groundmass is ophitic-poikilophitic texture. Rock: unoriented laths of plagioclase (0.2–1 mm, labradorite [An_{56-57}]) Interstices contain xenomorphic grains of clinopyroxene-salite. Clinopyroxene forms xenomorphic grains (1–4 mm) with inclusions of laths of plagioclase.

Alteration: slight; chlorophaeite (3%–5%) and opaque minerals (2%–3%) are present.

XRD: Fe chlorite; amphibole, talc, quartz, and swelling chlorite in trace amounts.

Sample 140-504B-213-1, 66–68 cm (Piece 19), Unit 243 [Z-856]

Plagioclase-sparsely phyric dolerite, medium grained, massive. Single xenomorphic phenocryst of plagioclase (2.3 mm) broken by microcracks. Groundmass: poikilophitic texture; short and elongated-prismatic laths of

plagioclase (0.2–2 and 0.1 mm, labradorite [An_{60} and An_{50}]) Clinopyroxene (augite) forms large (0.5–2 mm) isometric grains containing plagioclase lath inclusions.

Alteration: strong; rock replaced by chlorite (7%–8%) and amphibole (~30%); microcracks in plagioclase infilled with chlorite.

XRD: Fe chlorite; amphibole, corrensite-like mineral, and quartz in trace amounts.

Sample 140-504B-214-1, 30–32 cm (Piece 5A), Unit 244 [Z-857]

Plagioclase-sparsely phyric dolerite, medium grained, massive. Groundmass: poikilophitic texture. Rock: same as Sample 140-504B-213-1, 66–68 cm (Z-856).

Alteration: strong; rock replaced by chlorite (7%–8%) and amphibole (~30%).

XRD: amphibole and Fe chlorite.

Sample 140-504B-214-1, 76–77 cm (Piece 8), Unit 244 [Z-858]

Aphyric dolerite, medium grained, massive. groundmass is poikilophitic texture. Rock: elongated and prismatic plagioclase laths (0.2–5 mm).

Alteration: very strong (90%); rock almost completely altered (amphibolitized and albitized); plagioclase almost completely replaced by sosurite and albite; clinopyroxene almost completely replaced by uralitic amphibole (0.3–5 mm); large grains of uralite contain altered plagioclase laths.

XRD: amphibole and lomontite; trace Fe chlorite.

Sample 140-504B-222-1, 73–74 cm (Piece 12A), Unit 254 [Z-859]

Aphyric dolerite, medium grained, massive. Groundmass: ophitic-intersertal-poikilophitic texture. Rock: unoriented elongated-prismatic, prismatic, and tabular laths (0.3–2.5 mm) of plagioclase (labradorite [An_{50-54}]). Small grains of clinopyroxene are located in interstices. Large grains form poikilophitic segregates with plagioclase.

Alteration: moderate to strong (40%); rock is altered (amphibole and chlorite); occasionally interstices infilled with chlorite (7%–8%) and opaque minerals; occasionally clinopyroxene replaced by isotropic earthy matter and needle-shaped amphibole.

XRD: Fe chlorite; amphibole and quartz in trace amounts.

Sample 140-504B-225-2, 30–32 cm (Piece 5), Unit 260 [Z-860]

Plagioclase-sparsely phyric dolerite, medium grained, massive. Phenocryst: single, xenomorphic, weakly zonal plagioclase (up to 2 mm) with inclusions of glass. Groundmass: doleritic-poikilophitic texture; laths of plagioclase (0.2–1.8 mm), prismatic grains (labradorite [An_{68}]) and elongated laths (labradorite [An_{60}]). Clinopyroxene (salite-augite) forms small and large grains (0.2–0.3 and 0.5–1.2 mm, respectively) containing inclusions of plagioclase laths.

Alteration: slight; interstices contain chlorite (2%–3%) and opaque minerals (2%–3%).

XRD: amphibole, Fe chlorite, and talc(?) or lomontite(?); quartz and corrensite-like mineral(?) in trace amounts.

Sample 140-504B-230-1, 11–14 cm (Piece 3), Unit 265 [Z-861]

Clinopyroxene-plagioclase-phyric dolerite, fine grained, massive. Phenocrysts (5%): plagioclase; glomerophyric segregates (1–1.5 mm across); grains (0.2–0.7 mm) are fresh (labradorite [An_{60}]). Groundmass: doleritic texture; plagioclase laths (0.2–0.5 mm, labradorite [An_{52}]). Interstices: small grains of clinopyroxene. Opaque minerals (5%) are present.

Alteration: strong (50%); clinopyroxene replaced by amphibole (uralite) on 90%, microcrack (0.2 mm in thickness) infilled by chlorite.

XRD: amphibole; trace Fe chlorite.

Sample 140-504B-238-1, 4–7 cm (Piece 2), Unit 269 [Z-862]

Plagioclase-phyric dolerite, medium grained, massive. Phenocrysts (5%): plagioclase; large (up to 2 mm) prismatic grains (labradorite [An_{58}]). Groundmass: ophitic texture; plagioclase laths (0.3–2.5 mm, labradorite [An_{53}]). Interstices: xenomorphic grains (up to 0.5 mm) of clinopyroxene-augite.

Alteration: moderate (25%); rock is chloritized and amphibolitized; clinopyroxene partly or completely replaced by uralite (15%); chlorite (10%) replaces groundmass minerals and margin parts of plagioclase phenocrysts.

XRD: Fe chlorite and amphibole; trace quartz.

Sample 148-504B-239-1, 46–50 cm (Piece 14), Unit 271 [Z-1586]

Plagioclase-phyric basalt (microdolerite). Phenocrysts (10%): plagioclase; glomerophyric segregates of prismatic grains (0.7–1.5 mm, labradorite [An_{60}]). Groundmass: microophitic texture; laths of plagioclase (0.4–0.7 mm, andesine [An_{47}]). Interstices: xenomorphic grains (0.1–0.5 mm) of clinopyroxene (15%). Opaque minerals (5%) are present.

Alteration: moderate (30%); rock is amphibolitized and chloritized; clinopyroxene replaced by uralitic amphibole (25%); occasionally there are chlorite spots in groundmass.

XRD: amphibole; trace Fe chlorite.

Sample 148-504B-240-1, 82–88 cm (Piece 2I), Unit 274 [Z-1587]

Plagioclase-phyric dolerite, coarse grained. Phenocrysts (50%): prismatic plagioclase grains (0.5–2 mm, labradorite [An_{55}] and laths (andesine [An_{44}]). Interstices: xenomorphic grains (20%) of clinopyroxene.

Alteration: moderate (30%); rock is amphibolitized; clinopyroxene replaced by uralite and uralitic hornblende (tremolite; 30%).

XRD: amphibole; trace Fe chlorite.

Sample 148-504B-246-1, 87–90 cm (Piece 25), Unit 284 [Z-1588]

Plagioclase-phyric dolerite, fine grained. Phenocrysts (5%): plagioclase; prismatic grains (1.5–1.7 mm). Groundmass: ophitic texture; prismatic grains and laths (0.2–0.7 mm) of plagioclase (40%, labradorite [An_{55}] and andesine [An_{40}]). Interstices: xenomorphic grains of clinopyroxene (40%). Opaque minerals (2%–3%) are present.

Alteration: slight (15%); rock is amphibolitized; clinopyroxene replaced partly by uralite.

XRD: amphibole, Fe chlorite, and talc(?); trace quartz.

Sample 148-504B-249-1, 85–89 cm (Piece 27), Unit 290 [Z-1589]

Plagioclase-phyric dolerite, medium grained. Phenocrysts (10%): plagioclase; zonal short-prismatic grains (up to 2.5 mm, labradorite [An_{68}]). Groundmass: ophitic texture; prismatic grains and laths (0.2–1 mm) of plagioclase (40%, labradorite [An_{51-53}] and andesine [An_{48}]). Interstices: xenomorphic grains (0.3–0.8 mm) of clinopyroxene (10%). Opaque minerals (1%–2%) are present.

Alteration: moderate to strong (40%); rock is amphibolitized; clinopyroxene replaced by uralite and uralitic hornblende (40%).

XRD: chlorite and amphibole; quartz and talc(?) in trace amounts.

Sample 148-504B-251-1, 35–40 cm (Piece 6A), Unit 293 [Z-1590]

Aphyric dolerite, medium grained. groundmass is intersertal-ophitic texture. Rock: plagioclase grains (0.5–2.5 mm, 35%, labradorite [An_{55-57}]). Interstices: xenomorphic grains of clinopyroxene and black-brown glass (15%). Opaque minerals (2%–3%) are present.

Alteration: slight (8%); glass partly replaced by chlorite (8%).

XRD: Fe chlorite; amphibole and quartz in trace amounts.

Middle Valley, Juan de Fuca Ridge, and Escanaba Trough, Gorda Ridge (Legs 139 and 169)

Hole 855A

Sample 139-855A-8R-1, 36–39 cm (Piece 5), Unit 1 [Z-814]

Plagioclase phyric basalt, massive. Phenocrysts (20%): plagioclase; prismatic and elongated-prismatic laths (0.5–1.5 mm); several of grains are zonal and have undulatory extinction (labradorite ([An_{62}]). Groundmass: pilotaxic texture; black isotropic glass containing microlites of plagioclase and panicle-like crystallites of pyroxene in accretion with opaque dust. Microvesicles (<1%) are infilled with chlorite.

Alteration: rock is fresh.

XRD: smectites with ~20% mica layers; trace chlorite, amphibole, and talc(?).

Sample 139-855A-9R-1, 10–14 cm (Piece 2), Unit 2 [Z-815]

Aphyric basalt (microdolerite), massive, crystallized. Groundmass: microdoleritic-intersertal texture. Rock: small rounded grains of fresh olivine (0.1–0.5 mm) and unoriented plagioclase laths (0.1–0.5 mm, labradorite [An_{58-}

$_{60}$]). Interstices: segregates of small grains of clinopyroxene and plagioclase; black glass (~5%). Opaque minerals in paragenesis with pyroxene (7%–8%). Microvesicles (~1%, 0.1–0.2 mm) are present.

Alteration: rock is fresh; vesicles infilled with smectites.

XRD: smectites with ~20% mica layers; chlorite, amphibole, and talc in trace amounts.

Hole 855D

Sample 139-855D-6R-1, 55–58 cm (Piece 8), Unit 2 [Z-816]

Pyroxene-plagioclase phyric basalt, massive, crystallized. Phenocrysts: plagioclase; segregates (up to 3 mm in size) of prismatic and elongated-prismatic grains (0.2–0.8 mm); labradorite (An_{58}). Groundmass: microlitic texture; segregate of plagioclase and clinopyroxene microlaths; single needle-shaped laths of plagioclase (andesine-labradorite [An_{50}]). Opaque minerals (7%–8%) are distributed evenly in rock.

Alteration: rock is fresh.

XRD: slightly reflexes of smectite, chlorite, and quartz.

Hole 856A

Sample 139-856A-13X-CC, 22–24 cm (Piece 2A), Unit 1 [Z-817]

Olivine microphyric basalt, massive, weakly crystallized. Phenocrysts: olivine (5%); rounded small (0.1–0.3 mm) grains. Groundmass: microlitic texture; plagioclase microlaths (labradorite [An_{52}]); segregates of very small grains; crystallites of clinopyroxene; opaque dust.

Alteration: rock is fresh.

XRD: smectites with ~20% mica layers; trace chlorite, talc, quartz, and amphibole.

Sample 139-856A-14X-1, 34–38 cm (Piece 3), Unit 1 [Z-945]

Olivine phyric basalt, massive, crystallized. Olivine (10%) and groundmass (90%). Groundmass: microlitic (microdoleritic) texture; microlites and laths of plagioclase (55%, labradorite [An_{52}] and andesine [An_{40}]); sparse crystals of plagioclase-andesine ($An_{35–37}$); small grains of olivine (0.1–0.2 mm, 3%–5%) and panicle-like segregates of plagioclase and pyroxene microlites (30%).

Alteration: rock is fresh.

XRD: smectites with ~20% mica layers; minor chlorite and talc; trace quartz, illite, and amphibole.

Sample 139-856A-14X-1, 61–64 cm (Piece 4), Unit 1 [Z-818]

Olivine phyric basalt, massive, crystallized. Phenocrysts: fresh olivine (0.2–0.5 mm, 15%). Groundmass: microlitic texture; plagioclase microlites and laths (0.2–0.3 mm, labradorite [An_{52}]).

Alteration: rock is fresh.

XRD: smectites with ~30% mica layers; minor chlorite and talc, trace quartz and amphibole.

Sample 139-856A-14X-CC, 14–18 cm (Piece 2B), Unit 1 [Z-819]

Identical to Sample 139-856A-14X-CC, 14–18 cm.

Alteration: slight; single grain of olivine partly replaced by secondary mineral.

XRD: smectites with ~30% mica layers; minor chlorite and talc; trace quartz.

Hole 856B

Sample 139-856B-8H-CC, 0–5 cm (Piece 1), Unit 1 [Z-820]

Olivine phyric basalt, massive, weakly crystallized. Phenocrysts: olivine (0.3–0.7 mm, 15%). Groundmass: pilotaxitic texture; unoriented microlites and laths of plagioclase (up to 0.3 mm, labradorite [An_{58}]). Interstitial glass is black isotropic, occasionally with anisotropic spots and single grains of pyroxene.

Alteration: slight; olivine replaced by secondary mineral in microcracks.

XRD: chlorite, smectites, mixed-layer smectite-chlorite mineral, and talc; trace quartz.

Hole 856H

Sample 169-856H-55R-1, 28–33 cm (Piece 5A), Unit VII [Z-1591]

Olivine sparsely phyric basalt. Single glomerophyric segregate (<1%); grains (0.2–0.3 mm) of olivine. Groundmass: hyalopilitic texture; plagioclase laths (0.3–0.8 mm, 15%–20%); glass (0.01–0.05 mm, brown-black microlites (0.01–0.05 mm, 30%) of clinopyroxene(?); opaque minerals (5%) and clay mineral (30%).

Alteration: very strong (70%–80%); olivine completely replaced by chlorite; plagioclase completely replaced by albite, zeolite, and clay minerals; glass completely replaced by albite and chlorite; possibly there is epidote (very small grains make identification difficult).

XRD: Fe chlorite; trace quartz.

Sample 169-856H-56R-1, 10–14 cm (Piece 3), Unit III [Z-1592]

Aphyric basalt, uncrystallized. Groundmass: hyalopilitic texture. Rock: needle-shaped laths (0.2–0.7 mm) of plagioclase (20%); glass (75%); opaque minerals (5%); small grains (0.05 mm) of titanite (<1%). Occasionally opaque minerals are partly oxidized with spots (0.5–1 mm) of Fe hydroxides (<1%).

Alteration: very strong (90%); plagioclase completely replaced by albite, zeolite, and clay minerals; glass completely replaced by microblastic aggregate of albite and chlorite.

XRD: Fe chlorite; trace quartz and cristobalite; veinlet: Fe chlorite and quartz.

Sample 169-856H-56R-1, 28–32 cm (Piece 5), Unit VII [Z-1593]

Plagioclase(?) sparsely phyric basalt. Single prismatic phenocryst (1.2–3 mm) of plagioclase(?). Groundmass: pilotaxitic texture; needle-shaped laths of plagioclase (20%) and glass. Occasionally rims of opaque minerals and groundmass in contact with opaque minerals are oxidized with formation of Fe hydroxides (2%–3%).

Alteration: very strong (90%); plagioclase phenocrysts completely replaced by chlorite and albite; groundmass plagioclase completely replaced by albite, zeolite, and clay minerals; glass completely replaced by granoblastic aggregate of albite, chlorite, and small (0.1–0.2 mm) xenomorphic grains of opaque minerals; veinlets (0.8–1.2 mm) contain chlorite (70%–80%), opaque minerals (20%), quartz (10%), and single grains of titanite.

XRD: Fe chlorite; trace quartz.

Sample 169-856H-59R-1, 90–93 cm (Piece 13), Unit VII [Z-1594]

Olivine-plagioclase phyric basalt. Phenocrysts (15%): idiomorphic grains of olivine (10%, 0.5–0.8 mm) and their glomerophyric segregate. Prismatic phenocrysts (0.6–1.9 mm) of plagioclase (5%) contain abundant inclusions of glass. Rock: grains and segregates of titanite (2%–3%, 0.1–0.5 mm). Groundmass: vitrophyric texture; light brown isotropic glass.

Alteration: slight (15%); olivine completely replaced by chlorite; plagioclase replaced by albite and chlorite.

XRD: Fe chlorite; trace quartz.

Sample 169-856H-60R-1, 65–70 cm (Piece 11), Unit VII [Z-1595]

Plagioclase phyric dolerite, fine grained. Phenocrysts (5%): stretch-prismatic grains of plagioclase (2.5–4 mm). Groundmass: intersertal-doleritic texture; laths of plagioclase (40%, 0.2–1 mm, labradorite [An_{55}]). Interstices: small grains of pyroxene (30%), opaque minerals (10%), and glass (15%).

Alteration: slight (15%); chloritized glass.

XRD: Fe chlorite; trace quartz and amphibole.

Sample 169-856H-60R-2, 15–20 cm (Piece 3), Unit VII [Z-1596]

Dolerite, medium grained. Groundmass: intersertal-ophitic texture. Rock: unoriented prismatic grains of plagioclase (35%, 0.5–1.5 mm, labradorite [An_{55}], andesine [An_{43}], and andesine [An_{39}]) Interstices: xenomorphic grains of pyroxene (20%); partly idiomorphic grains of olivine (0.3–0.7 mm). Glass (25%) with micrograins of brown segregate of pyroxene (0.01 mm), plagioclase, and green chlorite (5%–10%).

Alteration: moderate (20%–25%); olivine completely replaced by chlorite and magnetite; glass replaced by chlorite.

XRD: Fe chlorite; quartz and amphibole in trace amounts.

Sample 169-856H-61R-1, 52–57 cm (Piece 5E), Unit VII [Z-1597]

Olivine-plagioclase phyric dolerite, fine grained. Phenocrysts (~10%): prismatic grains of plagioclase (2–2.5 mm) and rounded-isometric grains (1.2–1.4 mm) of olivine(?). Groundmass: doleritic(?) texture; laths (0.3–0.5 mm) and prismatic grains of plagioclase and glass.

Alteration: very strong (100%); plagioclase phenocrysts completely replaced by chlorite and albite; olivine completely replaced by chlorite; groundmass plagioclase completely replaced by albite and chlorite; clinopyroxene replaced by uralite and chlorite; glass is replaced with granoblastic aggregate of small (0.1 mm) isometric grains of albite, chlorite, and abundant (10%) micrograins of opaque minerals (xenomorphic grains and opaque dust), occasionally chlorite contains small grains of titanite.

XRD: Fe chlorite; quartz and amphibole in trace amounts.

Sample 169-856H-62R-1, 89–90 cm (Piece 15A), Unit VIII [Z-1598]

Plagioclase sparsely phyric basalt. Phenocrysts (2%–3%): plagioclase (0.8–1.2 mm) completely replaced by chlorite. Several phenocrysts of opaque minerals (0.4–0.7 mm, 1%–2%), occasionally oxidized with formation of leucoxene and Fe hydroxides (<1%). Groundmass: vitrophyric texture; needle-shaped and skeletal microlites and laths of plagioclase (2%–3%). Plagioclase contains inclusions of glass, microlites of opaque minerals that replaced by leucoxene and titanite. gray-cream glass (95%) is weakly crystallized with formation of micrograins (0.01 mm) of pyroxene and albite.

Alteration: very strong (100%).

XRD: Fe chlorite; trace quartz.

Sample 169-856H-63R-1, 30–35 cm (Piece 6A), Unit VIII [Z-1599]

Plagioclase-olivine phyric basalt. Groundmass: vitrophyric texture. Rock: identical with Sample 169-856H-62R-1, 89–90 cm (Z-1598).

Alteration: slight (2%–3%).

XRD: Fe chlorite; trace quartz.

Sample 169-856H-64R-1, 10–14 cm (Piece 3), Unit VIII [Z-1600]

Olivine-plagioclase phyric basalt, weakly crystallized. Phenocrysts (5%): prismatic grains of plagioclase (0.5–1.5 mm, 3%, labradorite [An_{60}]) and idiomorphic grains (0.6 mm) of olivine (2%); olivine completely replaced by chlorite. Groundmass: pilotaxitic texture; needle-shaped laths (0.1–0.8 mm) of plagioclase (30%–35%, andesine-labradorite [An_{50}] and andesine [An_{38}]). Almost isotropic dark-brown glass contains opaque dust and crystals of pyroxene. Chloritized glass is ~1%.

Alteration: slight (2%–3%).

XRD: Fe chlorite; quartz and amphibole in trace amounts.

Sample 169-856H-64R-1, 75–80 cm (Piece 13), Unit VIII [Z-1601]

Olivine-plagioclase phyric basalt. Phenocrysts (5%): prismatic grains of plagioclase (0.4–0.7 mm, 3%, labradorite [An_{63}] and idiomorphic grains (0.3–0.7 mm) of olivine (2%); olivine completely replaced by chlorite. Groundmass: vitrophyric texture; needle-shaped laths of plagioclase (2%–3%) and grayish cream isotropic glass.

Alteration: slight (2%).

XRD: Fe chlorite; quartz, amphibole, and talc in trace amounts.

Sample 169-856H-64R-2, 132–136 cm (Piece 20), Unit VIII [Z-1602]

Olivine-plagioclase phyric dolerite fine grained. Phenocrysts: single (2%–3%) tabular grains of plagioclase (1.5–2 mm) completely replaced by chlorite and albite. Single idiomorphic grains (up to 2 mm) of olivine completely replaced by chlorite. Groundmass: ophitic texture, sparsely vesicular; laths (0.7–1.2 mm) of plagioclase completely replaced by albite and chlorite. Clinopyroxene (2%) replaced by chlorite. Glass(?) replaced by granoblastic aggregate of albite, chlorite, and opaque minerals (5%). On the whole rock is chloritized. Rounded vesicles (0.6–0.7 mm, 1%) completely are filled with chlorite (pennine).

Alteration: very strong (98%).

XRD: Fe chlorite; quartz and amphibole in trace amounts.

Sample 169-856H-65R-1, 0–5 cm (Piece 1A), Unit VIII [Z-1603]

Olivine-plagioclase phyric basalt, crystallized. Phenocrysts (3%–5%): tabular grains (1–1.2 mm) of plagioclase (labradorite [An_{60}]) and idiomorphic grains (1.2 mm) of olivine completely replaced by chlorite. Groundmass: intersertal texture; laths (0.4–2 mm in size) and prismatic grains (0.2–0.6 mm) of plagioclase (30%, labradorite [An_{55}] and labradorite [An_{51}]). Interstices: pyroxene partly replaced by uralite, isometric grains (0.05 mm) of albite, and opaque minerals. Clinopyroxene and glass completely replaced by granoblastic aggregate of albite and chlorite. Small isometric grains of opaque minerals and leucoxene are present. Veinlets (0.1–0.2 mm) contain granoblastic aggregate of albite and chlorite.

Alteration: moderate (40%).

XRD: Fe chlorite; trace quartz and amphibole; vein contains Fe chlorite, quartz, amphibole, and talc.

Sample 169-856H-65R-2, 54–59 cm (Piece 7), Unit VIII [Z-1604]

Plagioclase phyric basalt, crystallized. Microphenocrysts (5%): prismatic grains (0.4–0.8 mm) of plagioclase (labradorite [An_{51-52}]). Groundmass: microlitic texture; needle-shaped laths (up to 2 mm) of plagioclase. Case-like grains of plagioclase, center parts of crystals contain glass. Glass (75%): segregates of pyroxene and plagioclase microlites and opaque dust (5%).

Alteration: fresh rock.

XRD: Fe chlorite; trace quartz, amphibole, and talc; veinlet contains Fe chlorite, quartz, amphibole, and talc.

Hole 857C

Sample 139-857C-59R-1, 20–22 cm (Piece 1), Unit 1 [Z-946]

Olivine sparsely phyric basalt, crystallized, massive. Single grains of olivine completely replaced by secondary minerals. Groundmass: microlitic (microdoleritic) texture; needle-shaped laths and prismatic crystals of plagioclase (0.2–1.5 mm, 35%). Laths of plagioclase with 0.8–1.2 mm size are labradorite (An_{58}), <0.8 mm laths are andesine (An_{46} and An_{38}). Isometric or radial-radiant crystals of pyroxene (50%) are located in interstices. Opaque minerals (up to 15%): aggregates of very small grains (<0.01 mm) distributed in all rock and forms sparse skeletal stretching grains. Vein (~5 mm) contains chalcedony, chlorite, and opaque minerals. Host rock in contact with vein is altered; plagioclase replaced by secondary mineral, clinopyroxene partly replaced by chlorite.

Alteration: slight.

XRD: Mg-Fe chlorite (Fe > Mg); trace quartz.

Sample 139-857C-59R-1, 84–87 cm (Piece 7), Unit 1 [Z-821]

Aphyric microdolerite, massive. Groundmass: microophitic texture. Rock: unoriented laths of plagioclase (0.1–0.5 mm, labradorite [An_{56}]), small (0.1 mm) xenomorphic grains of augite, opaque minerals (5%–6%), and sparse chlorite (1%–2%).

Alteration: rock is fresh.

XRD: Mg-Fe chlorite (Fe > Mg) with ~5% swelling layers; smectite, quartz, and amphibole in trace amounts.

Sample 139-857C-59R-2, 57–59 cm (Piece 5), Unit 1 [Z-947]

Aphyric dolerite medium grained. Groundmass: ophitic texture. Rock: laths and prismatic crystals of plagioclase (0.2–1 mm, 35%, labradorite [An_{55}] and andesine [An_{40}]). Isometric grains of clinopyroxene-augite (up to 0.5 mm, 40%) and chlorite (15%) are located in interstices. Opaque minerals (7%–8%) are irregularly distributed.

Alteration: slight (~10%–15%).

XRD: Mg-Fe chlorite (Fe > Mg) with single swelling interlayers; trace quartz.

Sample 139-857C-59R-3, 80–83 cm (Piece 4), Unit 1 [Z-822]

Aphyric dolerite fine grained, massive. Groundmass: ophitic texture. Rock: unoriented laths of plagioclase (0.1–0.5 mm, labradorite [An_{51}]) partly replaced by chlorite. Dark cream augite (Ti-augite?; 0.1–0.2 mm) with pleochroism and chlorite (3%–4%) are located in interstices. Opaque minerals (5%–6%) are located in areas with chlorite.

Alteration: rock is fresh.

XRD: Mg-Fe chlorite (Fe > Mg); quartz and amphibole in trace amounts.

Sample 139-857C-59R-4, 88–90 cm (Piece 7), Unit 1 [Z-823]

Aphyric dolerite fine grained, massive. Groundmass: ophitic texture. Rock: identical to Sample 139-857C-59R-3, 80–83 cm (Z-822).

Alteration: slight (8%–10%).

XRD: Fe chlorite with single swelling interlayers; trace quartz.

Sample 139-857C-60R-1, 53–56 cm (Piece 3), Unit 2 [Z-824]

Aphyric basalt (microdolerite), massive. Groundmass: microdoleritic texture. Rock: unoriented laths of plagioclase (0.3–0.8 mm, labradorite [An_{58-60}]). Panicle-like segregates of microlites of plagioclase, clinopyroxene, opaque minerals (4%–5%), and chlorite (1%) are in interstices.

Alteration: rock is fresh.

XRD: Mg-Fe chlorite (Fe > Mg) with single swelling interlayers; trace quartz and amphibole.

Sample 139-857C-60R-1, 130–132 cm (Piece 8), Unit 2 [Z-948]

Dolerite blastophyric, fine grained. Groundmass: ophitic texture. Euhedral skeletal sulfide crystals (up to 3 mm, ~5%) are present. Rock: laths and prismatic crystals of plagioclase (35%, labradorite [An_{55}]). Interstices: isometric grains of augite (0.1–0.7 mm, 45%), chlorite (10%), and segregates and grains (0.01–0.05 mm) of opaque minerals. Opaque minerals replaced by leucoxene and titanite (5%–7%).

Alteration: slight to moderate (10%–20%).

XRD: Mg-Fe chlorite (Fe > Mg) with single swelling interlayers; corrensite-like mineral (minor); quartz and amphibole in trace amounts.

Sample 139-857C-60R-2, 14–16 cm (Piece 1), Unit 2 [Z-949]

Dolerite blastophyric, fine grained. Rock: blastophyric (0.6–3.5 mm) idiomorphic (cubic pyrite?) segregates of opaque minerals (15%) with rare small inclusions of plagioclase and pyroxene. Groundmass: intersertal-ophitic texture; laths and prismatic crystals of plagioclase (30%, labradorite [An_{54}] and andesine [An_{40}]). Interstices: xenomorphic grains of pyroxene-augite (40%) and small chloritized areas (10%). Small (<0.05 mm) grains of opaque minerals, leucoxene, and titanite (~5%–7%). Titanite replaces Ti-magnetite.

Alteration: moderate (25%).

XRD: Mg-Fe chlorite (Fe > Mg) with ~5% swelling interlayers; corrensite-like mineral (minor); trace quartz.

Sample 139-857C-61R-1, 81–83 cm (Piece 6), Unit 4 [Z-950]

Basalt sparsely blastophyric, crystallized. Single (<1%) small (0.9 mm) blastophyric sulfide crystal is present. Groundmass: microlitic texture; microlites and laths of plagioclase (35%, labradorite [An_{52-55}] and andesine [An_{44}]). Segregate of small (0.1–0.3 mm) grains of clinopyroxene (40%) and chlorite (15%). Interstices: small (<0.1 mm) grains of opaque minerals, leucoxene, and titanite (~10%).

Alteration: slight (15%).

XRD: Mg-Fe chlorite (Fe > Mg) with ~5% swelling interlayers; trace quartz.

Sample 139-857C-61R-2, 8–10 cm (Piece 1), Unit 5 [Z-951]

Aphyric basalt, crystallized. Groundmass: microlitic texture. Rock: unoriented microlites and needle-shaped laths (0.1–0.9 mm) of plagioclase (45%, labradorite [An_{55}]); very small grains of leucoxene and titanite (5%). Interstices: panicle-like segregates of microlites of clinopyroxene and chlorite (1%).

Alteration: slight (10%–15%).

XRD: Fe-Mg chlorite (Mg > Fe) with single swelling interlayers; trace quartz and amphibole.

Sample 139-857C-62R-1, 70–72 cm (Piece 5), Unit 6 [Z-952]

Aphyric congo-dolerite medium grained. Groundmass: intersertal-ophitic texture. Rock: laths and prismatic crystals (0.6–1.5 mm) of plagioclase (30%, labradorite [An_{55}]); isometric grains of augite (0.2–1.7 mm, 25%); segregate of small grains of quartz (0.1–0.4 mm, 5%) and chlorite (10%). Opaque minerals (~10%): small (0.2–0.3 mm) cubic and pseudocubic grains, pyrite? Titanite (<0.1 mm) occurs with chlorite. Veinlet (up to 4 mm) contains chalcedony, chlorite, and epidote. Rock in contact with vein is chloritized and silicified, opaque minerals replaced by leucoxene and titanite (titanite replaces Ti-magnetite). Clinopyroxene is chloritized and partly replaced by uralite (several grains). Often opaque minerals are replaced by leucoxene and titanite (5%–7%). Interstices: panicle-like segregates of microlites of clinopyroxene and chlorite (1%). Rock: very small grains of leucoxene and titanite (5%).

Alteration: moderate (30%), rock is chloritized.

XRD: Fe-Mg-chlorite (Fe > Mg) with single swelling interlayers; mixed-layer chlorite-swelling chlorite (minor); quartz and amphibole in trace amounts.

Sample 139-857C-62R-2, 40–42 cm (Piece 6), Unit 6 [Z-953]

Congo-dolerite, medium grained, blastophyric. Groundmass: intersertal-poikilophitic texture; single (1%) blastophyric sulfide crystal (up to 2.5 mm). Rock: prismatic crystals (0.5–1.7 mm) of plagioclase (20%, labradorite [An_{58}] and andesine [An_{39}]). Clinopyroxene grains (20%, 0.5–2 mm) often contain inclusions of plagioclase laths. Interstices: aggregate of chlorite (40%), uralite (7%–8%), and quartz (0.1 mm, 2%–3%). Plagioclase is partly replaced by albite. Opaque minerals (7%–8%) replaced by leucoxene. Leucoxene replaces Ti-magnetite. Microcracks are filled with chlorite.

Alteration: strong (50%–55%).

XRD: Fe-Mg chlorite (Mg > Fe); minor mixed-layer chlorite-swelling chlorite; trace amphibole.

Sample 139-857C-63R-1, 50–52 cm (Piece 4), Unit 7 [Z-954]

Congo-dolerite, aphyric, medium grained. Groundmass: intersertal-poikilophitic texture. Rock: laths and prismatic crystals (0.5–1.5 mm) of plagioclase (35%, labradorite [An_{55-57}] and andesine [An_{39}]). Clinopyroxene xenomorphic grains (0.3–1.7 mm) often contain inclusions of plagioclase laths. Interstices: clinopyroxene (30%), chlorite (15%), and small grains of quartz (1%–2%). Chlorite and epidote replace clinopyroxene. Opaque minerals (7%–8%) partly replaced by leucoxene and titanite. Veinlet (0.3 mm) contains chlorite and epidote. Host rock in contact with veinlet is strongly chloritized.

Alteration: moderate (25%), rock is chloritized.

XRD: Fe chlorite; quartz and amphibole in trace amounts.

Sample 139-857C-64R-1, 18–20 cm (Piece 2), Unit 8 [Z-955]

Dolerite, aphyric, medium grained. Groundmass: intersertal-ophitic-poikilophitic texture. Rock: laths and prismatic crystals (0.4–1.5 mm) of plagioclase (35%, labradorite [An_{55}] and andesine [An_{44}]). Clinopyroxene isometric grains (0.3–1.7 mm) often contain inclusions of plagioclase laths. Interstices: clinopyroxene (35%), chlorite (15%), and uralite. Chlorite and epidote replace clinopyroxene. Opaque minerals (7%–8%) partly replaced by leucoxene and titanite. Veinlet (0.3 mm) contains chlorite and epidote. Host rock in contact with veinlet is strongly chloritized.

Alteration: slight to moderate (20%), rock is chloritized.

XRD: Fe-Mg-chlorite (Fe > Mg); quartz and amphibole in trace amounts.

Sample 139-857C-64R-1, 41–44 cm (Piece 3), Unit 8 [Z-825]

Dolerite, aphyric, medium grained, massive. Groundmass: ophitic-poikilophitic-intersertal texture. Rock: stretch-prismatic and prismatic laths (0.3–0.8 mm) of plagioclase (labradorite [An_{55}]). Clinopyroxene forms small (0.2 mm) xenomorphic grains and stretch grains (up to 5 mm) with inclusions of microlaths of plagioclase (andesine [An_{43}]). Interstices (30%): chlorite (pennine) and very small opaque minerals grains (9%–10%). Occasionally opaque minerals form xenomorphic grains (up to 0.5 mm).

Alteration: moderate (30%), rock is chloritized.

XRD: Fe-Mg-chlorite (Fe > Mg); trace amphibole.

Sample 139-857C-64R-2, 46–49 cm (Piece 5), Unit 8 [Z-826]

Dolerite, aphyric, medium grained, massive. Groundmass: ophitic-poikilophitic-intersertal texture. Rock: identical to Sample 139-857C-64R-1, 41–44 cm (Z-825). Interstices: very small grains of titanite with chlorite and opaque minerals. Ti-magnetite replaced by ore mineral.

Alteration: moderate (30%), rock is chloritized.

XRD: Fe chlorite; quartz and amphibole in trace amounts.

Sample 139-857C-68R-1, 97–100 cm (Piece 16), Unit 12 [Z-827]

Dolerite, aphyric, medium grained, massive. Groundmass: ophitic-poikilophitic-intersertal texture. Rock: identical to Samples 139-857C-64R-1, 41–44 cm (Z-825) and 139-857C-64R-2, 46–49 cm (Z-826). Large (0.5–2 mm) skeletal-isometric grains of opaque minerals with inclusions of plagioclase and pyroxene. Interstices: very small grains of titanite with chlorite and opaque minerals.

Alteration: moderate (30%), rock is chloritized.

XRD: Fe chlorite; quartz and amphibole in trace amounts.

Sample 139-857C-68R-2, 69–71 cm (Piece 7), Unit 12 [Z-957]

Dolerite, aphyric, medium grained. Groundmass: intersertal-poikilophitic texture. Rock: laths and prismatic crystals (0.6–1.6 mm, single crystals up to 2.5 mm) of plagioclase (40%, labradorite [An_{55}] and andesine [An_{40}]). Clinopyroxene idiomorphic isometric grains (0.5–4.5 mm) are present. Large grains contain plagioclase laths. Interstices: chlorite, opaque minerals (5%), and sparse small (0.1 mm) grains of quartz. Opaque minerals partly replaced by leucoxene.

Alteration: slight to moderate (20%), rock is chloritized.

XRD: Fe-Mg-chlorite (Fe > Mg); quartz and amphibole in trace amounts.

Sample 139-857C-68R-3, 20–23 cm (Piece 2), Unit 12 [Z-828]

Dolerite, aphyric, medium grained. Groundmass: ophitic-intersertal texture. Rock: replaced by laths (0.3–0.8 mm) of plagioclase (labradorite [An_{53}]) with undulatory extinction. Interstices: xenomorphic grain of augite (25%, 0.3–0.5 mm) in association with opaque minerals (5%) and very small grains of titanite.

Alteration: moderate (25%), rock is chloritized.

XRD: Fe-chlorite; quartz and amphibole in trace amounts.

Hole 857D

Sample 139-857D-1R-1, 34–36 cm (Piece 5), Unit 13 [Z-958]

Plagioclase phyric basalt. Groundmass: hyalopilitic texture. Rock: phenocrysts (10%) and groundmass (90%). Phenocrysts: prismatic laths (0.8–1.7 mm) of plagioclase (labradorite [$An_{>50}$]). Groundmass: microlites and laths of plagioclase (20%, labradorite [An_{55}] and andesine [An_{42}]). Cracks in plagioclase filled with albite and chlorite. Glass (50%) completely replaced by chlorite, very small grains (<0.1 mm, 20%) of leucoxene, and titanite.

Alteration: very strong (70%–75%), rock is altered.

XRD: Fe-Mg-chlorite (Fe > Mg) with single swelling interlayers; trace quartz.

Sample 139-857D-1R-1, 35–39 cm (Piece 5A), Unit 13 [Z-829]

Plagioclase, sparsely phyric basalt, massive, weakly crystallized. Phenocrysts: tabular and prismatic grains (0.7–1.2 mm) of plagioclase (glomerophyric aggregates; labradorite [An_{56}]). Groundmass: pilotaxitic texture; laths of plagioclase (labradorite [An_{52}]). Cracks in plagioclase are filled with albite and chlorite. Glass is anisotropic (black glass with abundant, very small grains of opaque minerals and titanite); part of mesostasis consists of clinopyroxene and plagioclase microlites. Chloritization is ~5%–7%. Opaque minerals (10%–12%): occasionally skeletal grains from 0.3 to 1 mm.

Alteration: slight (10%–15%).

Sample 139-857D-2R-1, 10–13 cm (Piece 3), Unit 14A [Z-831]

Plagioclase, sparsely phyric dolerite, massive. Single (2%–3%) glomerophyric segregates of short-prismatic grains of plagioclase (0.5–0.8 mm, labradorite [An_{69}]). Zonal plagioclase has undulatory extinction. Groundmass: doleritic texture; laths of plagioclase (0.2–0.7 mm, labradorite [An_{52}]), ~10% filled with chlorite. Interstices: segregate of small isometric or panicled stretch-grains (up to 0.7 mm) of augite. Very small grains of opaque minerals are present (5%–6%).

Alteration: rock is fresh.

XRD: Fe chlorite; quartz and amphibole in trace amounts.

Sample 139-857D-3R-1, 43–46 cm (Piece 4), Unit 14B [Z-832]

Plagioclase, phyric dolerite, medium grained, massive. Phenocrysts (50%): plagioclase; large tabular grains (2–2.5 mm) and segregates of small crystals (1.2 mm, labradorite [An_{60}]). Groundmass: doleritic texture; laths of plagioclase (labradorite [An_{55}]) and segregate of panicle-like grains of clinopyroxene and plagioclase ("pegmatoidic" texture). Interstitial glass replaced by chlorite and very small grains of opaque minerals. Chlorite replaces plagioclase and partly pyroxene.

Alteration: slight (10%), rock is chloritized.

XRD: Fe chlorite; quartz and amphibole in trace amounts.

Sample 139-857D-3R-2, 86–88 cm (Piece 10B), Unit 14B [Z-959]

Plagioclase phyric dolerite, medium grained, massive. Phenocrysts: plagioclase (30%) and groundmass (70%); plagioclase is large tabular grains (2–5 mm, labradorite [An_{55-60}]), some sharply zoned (bitovnite in center and labradorite [An_{65}] in periphery). Groundmass: poikilophitic texture; various (0.2–1.2 mm) laths and tabular grains of plagioclase (30%, labradorite [An_{55}] and andesine [An_{48}]). Clinopyroxene (25%) forms xenomorphic grains (0.2–1.7 mm), occasionally panicle grains in interstices with plagioclase. Pyroxene and plagioclase are replaced by chlorite and leucoxene. Epidote and albite also occur. Interstices: chlorite (5%), opaque minerals (~7%–8%), Ti-magnetite, titanite.

Alteration: slight (5%).

XRD: Fe-Mg-chlorite (Fe > Mg); trace quartz.

Sample 139-857D-4R-2, 53–56 cm (Piece 11), Unit 15 [Z-960]

Plagioclase phyric basalt, crystallized. Rock: phenocrysts (15%) and groundmass (85%). Phenocrysts: plagioclase; prismatic and tabular grains (0.7–2.1 mm, labradorite [An_{58-60}]). Groundmass: microlitic texture; laths (up to 0.8 mm) and microlites (0.1–0.4 mm) of plagioclase (35%, labradorite [An_{55}] and andesine [An_{44}]). Interstices: microlite of clinopyroxene (from <0.1 to 0.2–0.3 mm, 30%) and chloritized glass (10%). Host rock in contact with veinlet is highly chloritized. Single microvesicle (0.3 mm × 0.6 mm) is filled with fine grained aggregate of quartz and chlorite. Zone (~10%) with small (0.2 mm) idiomorphic pseudocubic grains of pyrite(?).

Alteration: slight (10%).

XRD: Fe chlorite; quartz and amphibole in trace amounts.

Sample 139-857D-8R-1, 5–7 cm (Piece 1), Unit 16B [Z-962]

Plagioclase phyric basalt, sparsely vesicular. Phenocrysts (30%): plagioclase; short and stretch prismatic and tabular grains (0.8–3 mm, labradorite [An_{54}]) with inclusions of glass. Groundmass (45%): hyalopilitic texture; needle-shaped microlites and microlaths of plagioclase (10%, andesine [An_{45}]) and isotropic glass (35%) containing very small crystals of clinopyroxene and disseminated opaque minerals. Vein (3 mm) contains grains (0.3–0.9 mm) of orthoclase (sanidine?) and quartz. Large grain of sulfide (1.7 mm) is located in center of veinlets. Small skeletal grains (up to 0.9 mm) of sulfide (2%–3%) were identified in groundmass.

Alteration: slight.

XRD: Fe-Mg-chlorite (Fe > Mg) with single swelling interlayers.

Sample 139-857D-9R-1, 23–25 cm (Piece 4), Unit 16C [Z-833]

Aphyric dolerite, medium grained, massive. Groundmass: ophitic texture, highly altered. Rock: laths of plagioclase (0.3–0.8 mm) almost completely replaced by albite and chlorite. Interstices: clinopyroxene completely or partly replaced by chlorite and uralite. Opaque minerals (~10%) partly replaced by titanite in areas with chlorite and uralite.

Alteration: very strong (80%).

XRD: Fe chlorite with single swelling interlayers; quartz and amphibole in trace amounts.

Sample 139-857D-12R-1, 25–27 cm (Piece 5), Unit 17A [Z-834]

Plagioclase phyric basalt. Phenocrysts: large (1–3 mm) prismatic and stretch-prismatic plagioclase crystals (15%–20%, labradorite-bitovnite [An_{70}]); central parts of plagioclase contain abundant inclusions of glass. Groundmass: hyalopilitic texture; microlites and microlaths of plagioclase (labradorite [An_{55}]) and glass; completely replaced by chlorite and uralite. Rock is impregnated by opaque minerals (~20%) partly replaced by titanite.

Alteration: strong (60%).

XRD: Fe chlorite; quartz in trace amounts.

Sample 139-857D-12R-1, 106–108 cm (Piece 14), Unit 17A [Z-963]

Aphyric dolerite (basalt?), fine grained. Phenocrysts: prismatic grains of plagioclase (10%, labradorite [An_{60}]). Groundmass: vitrophyric texture; weakly crystallized, almost isotropic, glass with crystallites of plagioclase, clinopyroxene, and opaque minerals (3%–4%).

Alteration: moderate (20%–25%).

XRD: Fe chlorite; trace quartz.

Sample 139-857D-12R-2, 17–19 cm (Piece 3), Unit 17A [Z-964]

Aphyric dolerite, fine grained. Groundmass: intersertal-ophitic texture. Rock: laths of plagioclase (0.1–0.8 mm, 45%, labradorite [An_{60}] and andesine [An_{46}]). Interstices: xenomorphic (0.1–0.4 mm) grains of augite (40%), chlorite (10%–12%), and small (up to 0.3 mm) xenomorphic grains of opaque minerals (5%–7%). In chloritized areas opaque minerals replaced by leucoxene and titanite.

Alteration: slight (10%–15%).

XRD: Fe-Mg chlorite (Fe > Mg) with single swelling interlayers; trace quartz and amphibole.

Sample 139-857D-17R-3, 72–74 cm (Piece 11), Unit 19 [Z-967]

Aphyric basalt (microdolerite), crystallized. Groundmass (55%): microlitic (microdoleritic) texture, vesicular; microlites and laths (0.1–0.8 mm) of plagioclase (20%, labradorite [An_{55-60}]). Interstices: clinopyroxene (15%), plagioclase, and opaque minerals (10%); clinopyroxene partly replaced by uralite and chlorite, Ti-magnetite partly replaced by titanite. Rounded vesicles (1.2–4.5 mm, 45%) are filled completely or partially with chlorite. Several vesicles (in center, up to 0.8 mm) are filled by epidote and pyrite(?).

Alteration: moderate (30%).

XRD: Fe chlorite with single swelling interlayers; quartz and amphibole in trace amounts.

Sample 139-857D-18R-2, 84–85 cm (Piece 9), Unit 19 [Z-968]

Aphyric gabbro-dolerite, coarse grained, poikilophitic. Rock; prismatic and tabular grains (0.8–2.5 mm) of plagioclase (45%, labradorite [An_{60}] and andesine [An_{48}]). Clinopyroxene (35%) forms xenomorphic grains (0.5–2.5 mm) with inclusions of plagioclase laths. Chlorite and uralite replace pyroxene. Interstices (10%): chlorite,

orthoclase, needle-shaped apatite, epidote, uralite, opaque minerals, and sparse, small (<0.1 mm) grains of titanite and leucoxene. Opaque minerals (10%) are small (0.5 mm) skeletal grains. A single, large (up to 2.5 mm) blastophyric grain of sulfide is present.

Alteration: slight (10%).

XRD: Fe-Mg chlorite (Fe > Mg); quartz and amphibole in trace amounts.

Sample 139-857D-20R-1, 64–66 cm (Piece 8), Unit 19 [Z-969]

Olivine-orthopyroxene blastophyric gabbro-dolerite. Groundmass: intersertal-ophitic texture. Rock: prismatic and tabular grains (0.9–2.5 mm) of plagioclase (35%, labradorite [An_{54}] and andesine [An_{34-40}]). Clinopyroxene (35%) forms isometric grains (0.5–2.5 mm). Single grains replaced by uralite. About 25% of rock is chloritized. Single chloritized grains (2.5 mm) have relicts of olivine structure. Orthopyroxene is replaced by chlorite and uralite. Opaque minerals (5%) are sulfide.

Alteration: moderate (25%).

XRD: Fe-Mg chlorite (Mg > Fe) with ~10% swelling interlayers; mixed-layer chlorite-swelling chlorite mineral (minor); quartz and amphibole in trace amounts.

Sample 139-857D-21R-1, 59–61 cm (Piece 6), Unit 20A [Z-835]

Aphyric dolerite, medium grained. Groundmass: ophitic texture. Rock: stretch-prismatic laths of plagioclase (45%, 0.2–1.5 mm, labradorite [An_{60}, large laths] and labradorite [An_{55}, small laths]). Interstices: isometric (0.2–0.5 mm) grains of clinopyroxene (salite), augite (40%), chlorite (10%–12%), and small (up to 0.3 mm) xenomorphic grains of opaque minerals (5%–7%). In chloritized areas, opaque minerals are replaced by leucoxene and titanite.

Alteration: slight to moderate (15%–20%).

XRD: Fe chlorite; quartz and amphibole in trace amounts.

Sample 139-857D-23R-1, 57–59 cm (Piece 10), Unit 20D [Z-970]

Blastophyric dolerite, medium grained. Groundmass: intersertal-ophitic texture. Rock: tabular and prismatic grains (0.4–2.5 mm) of plagioclase (40%, labradorite [An_{55-60}] and andesine [An_{45}]). Interstices: xenomorphic grains (0.3–0.7 mm) of clinopyroxene (40%), augite or Ti-augite and segregate of chlorite and small grains (<0.1 mm) of titanite. Opaque minerals (5%): sparse idiomorphic small grains (0.2–0.4 mm) of Ti-magnetite and two large (2.5 mm) skeletal grains of sulfide.

Alteration: slight (15%).

XRD: Fe chlorite; quartz and amphibole in trace amounts.

Sample 139-857D-24R-2, 4–7 cm (Piece 1), Unit 21 [Z-836]

Aphyric dolerite, fine grained. Groundmass: doleritic texture, vesicular. Rock: unoriented laths of plagioclase (labradorite [An_{68}]) with undulatory extinction. Plagioclase partly replaced by chlorite (in cracks). Interstices: segregate of small xenomorphic grains (0.1–0.5 mm) of augite or chlorite (15%) with association with opaque minerals (7%–8%). Rounded, small (0.3 mm) vesicles (5%) completely filled with chlorite.

Alteration: moderate (20%).

XRD: Fe chlorite; quartz and amphibole in trace amounts.

Sample 139-857D-25R-1, 73–75 cm (Piece 10), Unit 21 [Z-971]

Plagioclase, sparsely phyric dolerite, fine grained. Two prismatic grains (2 and 2.5 mm) of plagioclase (labradorite [An_{68}]). Groundmass: intersertal-ophitic texture; prismatic grains (0.3–1.2 mm) of plagioclase (40%, labradorite [An_{55}] and andesine [An_{47}]). Interstices: xenomorphic grains of clinopyroxene (40%) and chlorite (10%). Clinopyroxene is replaced by chlorite. Plagioclase is replaced by chlorite, epidote, and albite. Opaque minerals (5%–7%): small (0.2 mm), evenly distributed skeletal grains. Sphene and Ti-magnetite are replaced with leucoxene.

Alteration: slight (10%).

XRD: Fe chlorite with single swelling interlayers; quartz and amphibole in trace amounts.

Sample 139-857D-26R-1, 58–60 cm (Piece 6), Unit 21 [Z-972]

Plagioclase, sparsely phyric dolerite, fine grained. Phenocrysts (2%): prismatic grains (1.2 and 2.5 mm) of plagioclase. Groundmass: intersertal-ophitic texture, sparsely vesicular, identical to Sample 139-857D-25R-1, 73–75 cm (Z-971). Rounded, small (0.5–0.7 mm) vesicles (1%) completely filled with light green isotropic glass.

Alteration: slight (10%).

XRD: Fe chlorite; trace quartz.

Sample 139-857D-29R-2, 36–39 cm (Piece 4), Unit 23A [Z-973]

Aphyric dolerite, fine grained. Groundmass: intersertal-ophitic texture; prismatic and tabular grains (0.3 and 0.9 mm) of plagioclase (40%, labradorite [An_{60}] and andesine [An_{42}]). Interstices: xenomorphic grains of clinopyroxene (40%), green chloritized glass with rare grains (10%) of titanite. Opaque minerals (10%) form xenomorphic grains (0.2–0.4 mm). Several skeletal grains (up to 0.8 mm) of sulfides are present.

Alteration: slight (10%).

XRD: Fe chlorite; trace quartz.

Sample 139-857D-33R-1, 81–83 cm (Piece 13), Unit 24 [Z-974]

Aphyric dolerite, fine grained. Groundmass: intersertal-ophitic texture, sparsely vesicular; prismatic and tabular grains (0.3 and 1.5 mm) of plagioclase (35%, labradorite [An_{55}] and andesine [An_{39-40}]). Clinopyroxene (30%) forms isometric grains (0.3 and 1.2 mm) containing inclusions of plagioclase laths. Interstices: chlorite (5%–7%), occasionally chlorite forms large (up to 3.5 mm) zones of chloritization with sparse, small grains of titanite; large areas (up to 4 mm) are replaced by fine grained segregate (0.1 mm) of clinopyroxene (second generation), chlorite, small grains of quartz and orthoclase (<1%), and small xenomorphic grains of opaque minerals. Opaque minerals (10%) are partly replaced by leucoxene. Rounded vesicle (1 mm) is filled with chlorite.

Alteration: slight (10%).

XRD: Fe chlorite; quartz and amphibole in trace amounts.

Sample 139-857D-35R-1, 29–31 cm (Piece 5), Unit 25B [Z-975]

Blastophyric basalt, crystallized. Blastophyric grains (0.3–1 mm) of sulfide (10%–12%) are present. Groundmass: microlitic texture; needle-shaped, panicle-like microlites and laths (0.1–0.9 mm) of case-like plagioclase (40%, labradorite [An_{60}] and andesine [An_{45}]). Interstices: plagioclase, panicle-like segregate of microlites of clinopyroxene (45%) and chlorite (5%).

Alteration: slight (10%).

XRD: Fe chlorite with single swelling interlayers; quartz and amphibole in trace amounts.

Sample 139-857D-35R-1, 103–106 cm (Piece 14A), Unit 25B [Z-837]

Aphyric dolerite, fine grained. Groundmass: doleritic texture, sparsely vesicular (2%). Rock: identical to Sample 139-857D-24R-2, 4–7 cm (Z-836).

Alteration: slight to moderate (20%).

XRD: Fe chlorite; quartz and amphibole in trace amounts.

Sample 139-857D-36R-1, 3–5 cm (Piece 1), Unit 25B [Z-976]

Olivine phyric (?) basalt (microdolerite), crystallized. Phenocrysts: sparse (2%–3%), small (0.7 mm) idiomorphic phenocrysts of olivine completely replaced by chlorite. Groundmass: microdoleritic texture; microlites and laths (0.1–0.9 mm) of plagioclase (40%, labradorite [An_{55}] and andesine [An_{38}]). Interstices: small (0.1–0.7 mm) xenomorphic grains of augite (45%), chlorite (5%), and opaque minerals (10%). Opaque minerals partly replaced by leucoxene and titanite. Occasionally there are skeletal grains (0.5 mm) of sulfide (2% of volume of opaque minerals). Plagioclase and pyroxene are chloritized. Plagioclase is replaced with albite.

Alteration: slight (10%–15%).

XRD: Fe chlorite; trace quartz.

Hole 858F

Sample 139-858F-26R-1, 93–95 cm (Piece 11), Unit 1B [Z-977]

Olivine-plagioclase, phyric basalt. Rock; phenocrysts, groundmass, and vesicles. Phenocrysts (10%): small (0.4–0.8 mm) idiomorphic grains of olivine and plagioclase; olivine completely replaced by chlorite (4%). Single, large (up to 5 mm) phenocryst of plagioclase is present. Microphenocrysts of plagioclase (0.6–1.7 mm, 6%, labradorite [An_{56}]) are present. Groundmass (85%): hyalopilitic texture, vesicular; sparse, needle-shaped microlites of plagioclase (5%, andesine [An_{40}]) and slightly anisotropic glass with crystals of clinopyroxene (80%). Plagioclase is partly replaced by chlorite. Rounded vesicles (5%, 0.9–1.5 mm) are completely filled with aggregate of light green chlorite.

Alteration: slight.

XRD: Mg-Fe chlorite (Mg > Fe); mixed-layer chlorite-swelling chlorite mineral (minor); trace quartz.

Sample 139-858F-27R-1, 25–27 cm (Piece 6), Unit 1C [Z-978]

Olivine-plagioclase, sparsely phyric basalt, crystallized. Rock: microphenocrysts (5%), groundmass (95%), and single vesicles. Phenocrysts: glomerophyric segregates of small (0.4–0.5 mm) idiomorphic grains of olivine (completely replaced by chlorite) and laths (0.5–0.9 mm) of plagioclase (3%, labradorite [An_{55}]). Groundmass: microlitic texture, sparsely vesicular; needle-shaped microlites and microlaths of plagioclase (30%–35%). Plagioclase often forms segregates with panicle-like microlites of clinopyroxene (~60%). Groundmass contains spots of brown glass. Rounded sparse vesicles (0.6 mm in across) completely are filled with chlorite.

Alteration: slight (~2%).

XRD: Mg-Fe chlorite (Mg > Fe) with ~10% swelling interlayers and mixed-layer chlorite-swelling chlorite mineral; quartz and amphibole in trace amounts.

Sample 139-858F-28R-1, 43–45 cm (Piece 8), Unit 1C [Z-979]

Olivine-plagioclase, phyric basalt. Phenocrysts (15%): olivine (2%) and plagioclase (13%). Olivine replaced by chlorite. Plagioclase forms prismatic crystals (0.3–0.9 mm, labradorite [An_{57}]). Groundmass (85%): hyalopilitic texture, sparsely vesicular; needle-shaped, case-like microlites and laths of plagioclase (10%) and weakly anisotropic brown glass. Glass contains segregates of plagioclase and clinopyroxene. Single blastophyric skeletal grain (0.7 mm) of sulfide is present. Rounded vesicles (0.2 mm) are filled with chlorite.

Alteration: slight (~3%).

XRD: Mg-Fe chlorite (Mg > Fe) with ~10% swelling interlayers; mixed-layer chlorite-swelling chlorite mineral and corrensite-like mineral (minor); trace quartz.

Sample 139-858F-29R-1, 39–41 cm (Piece 8), Unit 1C [Z-980]

Olivine-plagioclase sparsely phyric basalt. Phenocrysts (<1%): olivine and several prismatic grains of plagioclase (0.3–0.9 mm, labradorite [An_{51}]). Groundmass: vitrophyric texture, vesicular; brown isotropic glass. Rounded vesicles (0.2–1 mm, 10%) completely filled with chlorite.

Alteration: rock is fresh.

XRD: Mg-Fe chlorite (Fe ≈ Mg) with ~15% swelling interlayers; mixed-layer chlorite-swelling chlorite mineral (minor); trace quartz.

Hole 858G

Sample 139-858G-1R-1, 14–16 cm (Piece 2), Unit 1C [Z-981]

Olivine-plagioclase sparsely phyric basalt, crystallized. Phenocrysts (<5%): glomerophyric accretions of completely chloritized olivine and stretch-prismatic laths of plagioclase partly replaced by albite. Groundmass: microlitic texture; needle-shaped microlites and laths (0.1–2 mm) of plagioclase (50%, andesine [An_{37}]). Interstices: segregates of clinopyroxene microlites (35%) and light green partly chloritized glass (10%). Chlorite partly replaces plagioclase and pyroxene.

Alteration: slight (~5%).

XRD: Mg-Fe chlorite (Mg > Fe) with ~15% swelling interlayers; mixed-layer chlorite-swelling chlorite mineral (minor); trace quartz.

Sample 139-858G-4R-1, 35–37 cm (Piece 9), Unit 2A [Z-982]

Olivine-plagioclase phyric basalt. Phenocrysts (15%): glomerophyric accretions of completely chloritized olivine and laths of plagioclase (0.6–2 mm, andesine [An_{42}] and andesine-labradorite [An_{50}]). Two grains of sulfide (0.8–0.9 mm) are present. Groundmass (85%): hyalopilitic texture, single vesicle; needle-shaped microlites and laths of plagioclase (0.1–1.2 mm, 10%, andesine [An_{38}] and andesine [An_{42}]). Dark-brown glass partly crystallized to accretions of plagioclase and clinopyroxene (75%). Interstitial glass is chloritized. Single rounded vesicle (0.5 mm) is filled with chlorite.

Alteration: slight (7%–8%).

XRD: Mg-Fe chlorite (Mg > Fe) with ~10% swelling interlayers; mixed-layer chlorite-swelling chlorite mineral and corrensite-like mineral (minor); trace quartz.

Sample 139-858G-7R-1, 32–34 cm (Piece 6), Unit 2B [Z-983]

Olivine-plagioclase phyric basalt. Microphenocrysts (<5%): single grains of chloritized olivine and prismatic grains (0.8–2 mm) of plagioclase (andesine [An_{38}]). Groundmass: hyalopilitic (or vitrophyric) texture; needle shaped, case-like microlites of plagioclase (5%, andesine [An_{32}]) and almost isotropic glass (90%).

Alteration: slight (1%).

XRD: Mg-Fe chlorite (Fe ≈ Mg) with ~15% swelling interlayers; mixed-layer chlorite-swelling chlorite mineral and corrensite-like mineral (minor); trace quartz.

Sample 139-858G-14R-1, 10–12 cm (Piece 6), Unit 6 [Z-984]

Olivine-plagioclase phyric basalt, crystallized. Phenocrysts (12%): completely chloritized olivine (7%) and prismatic and tabular grains (0.8–1.7 mm) of plagioclase (5%, andesine [An_{38}]). Plagioclase partly replaced by albite, one grain replaced by albite and chalcedony. Groundmass: microlitic texture, sparsely vesicular; replaced by needle-shaped laths of plagioclase (30%, from andesine [An_{44}] to andesine-labradorite [An_{50}]). Glass is crystallized with a segregate of clinopyroxene microlites (40%) and light green isotropic glass (~10%). Opaque dust (5%–7%) is present. Vesicles are filled with chlorite.

Alteration: slight (7%–10%).

XRD: Mg-Fe chlorite (Fe > Mg) with single swelling interlayers; trace quartz and amphibole.

Sample 139-858G-16R-1, 75–77 cm (Piece 9), Unit 6 [Z-985]

Aphyric dolerite, fine grained. Groundmass: ophitic texture, vesicular; laths and prismatic grains (0.3–1.7 mm) of plagioclase (25%, labradorite {An_{50-51}]) replaced by albite, epidote, and clay minerals. Interstices: grains of clinopyroxene (20%) and segregate of small (0.1 mm) grains of clinopyroxene, green chloritized glass, and small (<0.01 mm) grains of leucoxene and titanite (15%). Glass contains epidote. About 5% of interstices are filled with chloritized glass. Chlorite and leucoxene replace pyroxene. Vesicles (30%, 1.5–4 mm in across) are rounded in shape and filled by chlorite. Occasionally, center of vesicles infilled with epidote. One vesicle is filled with quartz.

Alteration: moderate (30%).

XRD: Fe chlorite; quartz and amphibole in trace amounts.

Hole 1037B

Sample 169-1037B-57R-1, 32–37 cm (Piece 8A) [Z-1605]

Olivine-plagioclase phyric basalt, crystallized. Phenocrysts (25%): glomerophyric segregates of olivine (5%–8%) and plagioclase (17%–20%). Olivine forms idiomorphic fresh grains (0.3–0.6 mm). Tabular and prismatic phenocrysts (0.3–0.8 mm and up to 2 mm, respectively) of plagioclase (labradorite [An_{56}]). Groundmass: microlitic texture; needle-shaped microlites of plagioclase (30%, andesine [An_{44}]), microlites of clinopyroxene (40%), opaque minerals (1%–2%), and glass (1%–2%).

Alteration: fresh rock.

XRD: smectites with ~30% mica layers and with interlayer Na-K and Ca-Mg cations (Na-K > Ca-Mg); chlorite; quartz, amphibole, and talc in trace amounts.

Sample 169-1037B-58R-1, 100–104 cm (Piece 7C) [Z-1606]

Plagioclase sparsely phyric dolerite, medium grained. Phenocrysts: one (<1%) tabular phenocryst of plagioclase (2.5 mm). Groundmass: intersertal-doleritic texture; prismatic grains (0.2–1.2 mm) of plagioclase (40%, labradorite [An_{59}] and andesine [An_{38}]). Interstices: partly idiomorphic rounded grains of olivine (20%), occasionally olivine grains (one-quarter of all grains) partly or completely replaced by green biotite-like mica. Clinopyroxene (25%) almost completely replaced by aggregate of uralite. Glass (15%) replaced by uralite; crystallized part of glass contains crystallites of pyroxene and needles of opaque minerals (5%).

Alteration: strong (45%–50%).

XRD: smectites with ~30% mica layers and with interlayer Na-K and Ca-Mg cations (Ca-Mg > Na-K); illite, chlorite, quartz, amphibole, and talc in trace amounts. Brown vein: smectites with ~20% mica layers and with interlayer Na-K and Ca-Mg cations (Ca-Mg > Na-K); illite, chlorite, quartz and amphibole in trace amounts.

Sample 169-1037B-58R-2, 0–5 cm (Piece 1) [Z-1607]

Olivine-plagioclase phyric basalt. Phenocrysts (20%): glomerophyric segregates of olivine (5%) and plagioclase (15%). Rounded grains (0.2–0.5 mm) of olivine completely replaced by secondary minerals and biotite. Stretch-prismatic laths (0.5–1.7 mm) of plagioclase (labradorite [An_{55-58}]) are present. Groundmass: hyalopilitic texture, sparsely vesicular; case-like needles of microlites and microlaths (10%) of plagioclase and earthy-brown weakly anisotropic glass (70%). One rounded vesicle (0.6 mm) is filled with needles of uralite. Veinlet (0.4 mm) contains uralite.

Alteration: slight (5%–8%).

XRD: smectites with interlayer Na-K and Ca-Mg cations (Ca-Mg > Na-K); illite, chlorite, quartz, and amphibole in trace amounts.

Sample 169-1037B-59R-1, 65–68 cm (Piece 10) [Z-1608]

Olivine-plagioclase phyric basalt, crystallized. Phenocrysts (15%): glomerophyric segregates of olivine (7%) and plagioclase (8%). Grains (0.2–0.4 mm) of olivine are fresh. Tabular and prismatic laths (0.5–1.5 mm) of plagioclase (labradorite [An_{60}]). Groundmass: microlitic texture; microlites and microlaths of plagioclase (30%, andesine [An_{44}]), small (0.05–0.1 mm) rounded grains of pyroxene (50%), and opaque minerals (5%).

Alteration: rock is fresh.

XRD: smectites with interlayer Na-K and Ca-Mg cations (Ca-Mg > Na-K); illite, chlorite, quartz, and amphibole in trace amounts. Black vein: smectites with ~20% mica layers and with interlayer Ca-Mg cations; smectites with interlayer Na-K cations; illite, chlorite, quartz, amphibole, and talc in trace amounts.

Sample 169-1037B-60R-1, 90–95 cm (Piece 11A) [Z-1609]

Aphyric dolerite, fine grained, groundmass is ophitic texture. Rock: tabular and prismatic laths (0.5–1 mm) of plagioclase (45%, labradorite [An_{55}] and andesine [An_{46}]). Interstices: grains of olivine (0.3–0.5 mm, 10%) partly (10%) replaced by biotite, xenomorphic grains (0.5–1 mm) of clinopyroxene (40%), and opaque minerals (2%–3%).

Alteration: slight (~2%–3%).

XRD: smectites with ~20% mica layers and interlayer Mg cations; smectite with interlayer Na cations; illite, chlorite, quartz, amphibole, and talc in trace amounts.

Sample 169-1037B-60R-1, 120–124 cm (Piece 11C) [Z-1610]

Aphyric dolerite, fine grained. Groundmass: ophitic texture. Rock: identical to Sample 169-1037B-60R-1, 90–95 cm (Z-1609).

Alteration: slight (~2%–3%).

Sample 169-1037B-61R-1, 7–10 cm (Piece 1A) [Z-1611]

Aphyric dolerite, medium grained. Groundmass: ophitic-poikilophitic texture. Rock: tabular and prismatic laths (0.5–2.5 mm) of plagioclase (45%, labradorite [An_{60}] and andesine [An_{44}]). Interstices: grains of iddingsitized olivine (0.3–0.4 mm, 2%–3%) and glass (7%) replaced by biotite-like mica. Glass contains opaque minerals (5%). Main volume of rock consists of xenomorphic grains (0.5–2.5 mm) of clinopyroxene. Occasionally clinopyroxene contains abundant inclusions of plagioclase (poikilophitic texture; ~40% of rock).

Alteration: slight (10%).

XRD: smectites with ~10% mica layers and interlayer Ca-Mg cations; smectites with interlayer Na cations, chlorite, quartz, and talc in trace amounts.

Sample 169-1037B-62R-1, 13–17 cm (Piece 2) [Z-1612]

Aphyric dolerite, medium grained. Groundmass: intersertal-ophitic texture. Rock: identical to Sample 169-1037B-61R-1, 7–10 cm (Z-1611).

Alteration: slight (13%).

XRD: smectites with ~10% mica layers and interlayer Ca-Mg cations; trace illite, chlorite, quartz, smectites with interlayer Na cation, and talc.

Sample 169-1037B-62R-3, 52–56 cm (Piece 4) [Z-1613]

Aphyric dolerite, medium grained. Groundmass: ophitic texture. Rock: identical to Samples 169-1037B-61R-1, 7–10 cm (Z-1611) and 169-1037B-62R-1, 13–17 cm (Z-1612).

Alteration: slight (~2%).

XRD: smectites with ~10% mica layers and interlayer Ca-Mg cations; illite, chlorite, quartz, smectites with interlayer Na cation, and talc in trace amounts.

Hole 1038I

Sample 169-1038I-43R-3, 3–7 cm (Piece 2) [Z-1614]

Olivine-plagioclase sparsely phyric basalt. Phenocrysts (5%): glomerophyric segregates of olivine (2%) and plagioclase (3%). Olivine forms small (0.3–0.4 mm) idiomorphic fresh grains. Tabular and prismatic grains (0.2–0.6 mm) of plagioclase (labradorite [An_{56}]). Groundmass: hyalopilitic texture; needle-shaped microlaths of plagioclase (10%–15%, andesine [An_{42}]) and isotropic brown glass (80%–85%).

Alteration: fresh rock.

XRD: smectites with 20%–45% mica layers; chlorite and quartz in trace amounts. Black vein: smectites, chlorite, and quartz.

Gulf of California and off Baja California (Legs 63–65)

Guaymas Basin, Gulf of California (Hole 477)

Sample 64-477-9R-1, 57–59 cm (Piece 10), Unit 1b [Z-1254]

Aphyric dolerite, medium grained, massive. Rock: ophitic texture; various short- and elongated-prismatic laths of plagioclase (0.3–1.5 mm, 50%, labradorite [An_{60}] and andesine [An_{48}]); xenomorphic and partly idiomorphic grains of clinopyroxene (0.2–2 mm, 40%), opaque minerals (8%), and interstitial black glass (1%–2%).

Alteration: fresh; rock is nonoxidized.

XRD: smectite with ~15% mica layers and various interlayer cations of Na-K and Mg-Ca; minor chlorite; trace quartz and amphibole.

Sample 64-477-11R-2, 61–63 cm (Piece 5), Unit 1a [Z-1255]

Sparsely plagioclase-phyric dolerite, coarse grained, massive. Phenocrysts (10%): prismatic crystals of sparsely zonal plagioclase (2.5–5 mm, labradorite [An_{58}]). Small (0.2–0.3 mm), rounded grains of olivine are present. Groundmass: poikilophitic texture; various tabular and prismatic grains of plagioclase (60%, 0.3–1.7 mm, labradorite [An_{58}] and andesine [An_{40}]), xenomorphic grains of clinopyroxene (0.8–2 mm and up to 0.4 mm), rounded grains of olivine (10%, 0.1–0.4 mm), opaque minerals (1%–2%), and interstitial black glass (~5%).

Alteration: slight; rock is nonoxidized; clay mineral replaces glass.

XRD: smectite with ~10% mica layers and various interlayer cations of Na-K and Mg-Ca; minor chlorite with ~5% swelling interlayers, talc, and amphibole; trace quartz.

Sample 64-477-12R-1, 49–52 cm (Piece 4), Unit 1a [Z-1256]

Sparsely plagioclase-phyric dolerite, coarse grained, massive. Groundmass: poikilophitic texture. Rock: identical to Sample 64-477-11R-2, 61–63 cm (Z-1255).

XRD: smectite with ~20% mica layers; minor chlorite with ~5% swelling interlayers, amphibole, and talc; trace quartz.

Sample 64-477-12R-2, 70–73 cm (Piece 3C), Unit 1a [Z-1257]

Sparsely plagioclase-phyric dolerite, coarse grained, massive. Groundmass: poikilophitic texture. Rock: identical to Samples 64-477-12R-1, 49–52 cm (Z-1256), and 64-477-11R-2, 61–63 cm (Z-1255).

XRD: smectite with ~20% mica layers; minor chlorite, defective chlorite, amphibole, and talc; trace quartz.

Sample 64-477-12R-3, 39–42 cm (Piece 3C), Unit 1a [Z-1258]

Sparsely plagioclase-phyric dolerite, coarse grained, massive. Groundmass: poikilophitic texture. Rock: identical to Sample 64-477-12R-2, 70–73 cm (Z-1257).

XRD: smectite with ~10% mica layers and various interlayer cations of Na-K and Mg-Ca; minor chlorite, talc, and amphibole; trace mixed-layer chlorite-smectite mineral with ~15% swelling interlayers, quartz.

Sample 64-477-12R-4, 6–9 cm (Piece 1A), Unit 1a [Z-1259]

Plagioclase-phyric dolerite, coarse grained, massive. Phenocrysts (40%): prismatic large (2–2.7 mm) crystals of plagioclase (labradorite [$An_{62–63}$]). Rims of zonal plagioclase are andesine (An_{42}). Groundmass: poikilophitic texture; various (0.2–1.2 mm) tabular and prismatic grains of plagioclase (50%, andesine [$An_{42–44}$]), xenomorphic grains of clinopyroxene (20%, up to 1.5 mm) and their segregates (0.6–0.8 mm), rounded xenomorphic grains of olivine (10%, 0.3–0.7 mm), opaque minerals (1%–2%), and interstitial altered glass (~2%–3%).

Alteration: slight; rock is nonoxidized; clay mineral replaces glass.

XRD: smectite with ~10% mica layers; minor chlorite with ~5% swelling interlayers and talc; trace amphibole and quartz.

Sample 64-477-12R-4, 76–80 cm (Piece 1E), Unit 1a [Z-1260]

Plagioclase-phyric dolerite, massive. Phenocrysts (30%–35%): prismatic large (2–2.5 mm) tabular and prismatic grains of plagioclase (labradorite [$An_{60–62}$]). Groundmass: poikilophitic texture; prismatic grains and plagioclase laths (25%), xenomorphic grains of clinopyroxene (20%, 1.2–2 mm), almost idiomorphic grains (up to 0.3 mm) of olivine (10%), opaque minerals (1%–2%), and interstitial altered glass (10%) with orthoclase and needle-shaped grains of opaque minerals.

Alteration: slight; rock is nonoxidized; clay mineral replaces glass.

XRD: smectite with ~20% mica layers; minor chlorite and talc; trace amphibole and quartz.

Sample 64-477-12R-5, 46–50 cm (Piece 1H), Unit 1a [Z-1261]

Plagioclase-phyric dolerite, massive. Phenocrysts (40%): prismatic large (1.5–2.5 mm) grains of plagioclase (labradorite [An_{65-68}]). One grain of plagioclase is 4.8 mm. Groundmass: ophitic texture; laths of plagioclase (20%, 0.1–0.8 mm, andesine [An_{42}]), xenomorphic grains of clinopyroxene (30%), rounded small (up to 0.3 mm) grains of olivine (5%), opaque minerals (1%), and interstitial altered glass (5%).

Alteration: slight; rock is nonoxidized; clay mineral replaces glass.

XRD: smectite with ~10% mica layers; trace chlorite, talc, and quartz.

Sample 64-477-13R-1, 53–62 cm (Piece 3H), Unit 1a [Z-1262]

Plagioclase-phyric dolerite, fine grained, massive. Phenocrysts (40%): tabular, prismatic, and elongated-prismatic large (2.5–4 mm) grains of plagioclase (labradorite [An_{68}]). Groundmass: doleritic texture; laths of plagioclase (20%, 0.1–0.8 mm, andesine [An_{42-46}]), segregate of xenomorphic grains of clinopyroxene (30%), grains of olivine (5%, 0.1–0.3 mm), opaque minerals (2%–3%), and interstitial altered glass (1%–2%).

Alteration: fresh; rock is nonoxidized.

XRD: smectite with ~20% mica layers; trace chlorite and quartz.

Sample 64-477-13R-2, 13–17 cm (Piece 3), Unit 1a [Z-1263]

Plagioclase-phyric dolerite, fine grained, massive. Groundmass: doleritic texture. Rock: identical to Sample 64-477-13R-1, 53–62 cm (Z-1262). One phenocryst of plagioclase is 6 mm.

XRD: smectite with ~20% mica layers; trace chlorite, talc, and quartz; brown veinlet -smectite with ~20% mica layers.

Sample 64-477-13R-2, 146–150 cm (Piece 8), Unit 1a [Z-1264]

Plagioclase-phyric basalt (microdolerite), massive. Phenocrysts (40%): tabular, prismatic, and elongated-prismatic large (1.5–5 mm) grains of plagioclase (labradorite [An_{68}]) and sparse glomerophyric segregates of xenomorphic grains (0.3–0.5 mm) of plagioclase and olivine. Microphenocrysts of idiomorphic olivine grains (2%–3%, 0.5–0.7 mm) are present. Groundmass: microlitic (microdoleritic) texture; microlites (0.1–0.2 mm) and microlaths (0.2–0.5 mm) of plagioclase (20%, andesine [An_{40-42}]), segregate of xenomorphic grains (0.1–0.4 mm) of clinopyroxene (30%) and single xenomorphic (0.6–0.7 mm) grains of clinopyroxene, grains of olivine (2%–3%, 0.2–0.3 mm), opaque minerals (5%), and interstitial altered glass (<1%).

Alteration: fresh; rock is nonoxidized; clay mineral replaces glass.

XRD: smectite with ~20% mica layers; trace chlorite, talc, and quartz.

Gulf of California (Hole 483B)

Sample 65-483B-32R-1, 1–6 cm (Piece 1), Unit 10 [Z-1275]

Olivine(?)-plagioclase-phyric basalt, sparsely vesicular. Phenocrysts (20%): tabular zonal (0.7–0.8 mm) and elongated-prismatic laths (0.3–0.7 mm) of plagioclase (15%, andesine [An_{44}]) and their glomerophyric segregates. Microphenocrysts (0.2–0.3 mm) of altered olivine are present (5%). Groundmass: vitrophyric texture; black glass with sparse case-like microlites of plagioclase. Vesicles (3%, 0.1–0.4 mm) are rounded.

Alteration: slight; rock is nonoxidized; clay mineral replaces olivine and completely fills vesicles.

XRD: smectite with ~20% mica layers; trace chlorite and quartz; black veinlet - smectite with ~20% mica layers.

Sample 65-483B-32R-1, 27–31 cm (Piece 2B), Unit 10 [Z-1276]

Plagioclase-phyric basalt, fine grained, spotty structure, sparsely vesicular. Phenocrysts (20%): tabular, prismatic, and elongated-prismatic grains (0.8–2.5 mm) of plagioclase (labradorite [An_{60}]). Groundmass (80%): microlitic texture; glass with segregates of clinopyroxene and plagioclase. Vesicles (2%–3%, 0.2–0.6 mm) are rounded.

Alteration: slight (5%–7%); rock is nonoxidized; vesicles (or grains of olivine?) mainly completely infilled with clay mineral.

XRD: smectite with ~20% mica layers; trace chlorite and quartz.

Sample 65-483B-32R-1, 44–50 cm (Piece 2D), Unit 10 [Z-1277]

Olivine-plagioclase-phyric basalt, fine grained, spotty structure, sparsely vesicular. Phenocrysts (30%): prismatic grains (0.6–1.4 mm) of plagioclase (20%, labradorite [An_{58-60}]) and occasionally their glomerophyric segregates.

Altered olivine (0.3–0.8 mm) is present (10%). Groundmass (70%): hyalopilitic-microlitic texture; glass with segregates of clinopyroxene and plagioclase. Single vesicles (<1%, 0.1–0.4 mm) are rounded.

Alteration: slight (10%–12%); rock is nonoxidized; olivine replaced by clay mineral and carbonate; vesicles completely infilled with clay mineral.

XRD: smectite with ~20% mica layers; trace chlorite and quartz.

Sample 65-483B-32R-1, 70–74 cm (Piece 2F), Unit 10 [Z-1278]

Olivine-plagioclase-phyric basalt, sparsely vesicular. Phenocrysts (35%): prismatic grains of plagioclase (25%, labradorite [An_{60}]) and their glomerophyric segregates (0.6–2.5 mm). Altered olivine (15%) forms segregates of idiomorphic grains (0.5–0.7 mm). Groundmass (75%): hyalopilitic-microlitic texture; brownish black glass with crystals of plagioclase, clinopyroxene, and opaque dust. One vesicle (<1%) is present.

Alteration: slight (15%); rock is nonoxidized; olivine replaced by iddingsite, carbonate, and Fe hydroxides; vesicles completely infilled with clay mineral.

XRD: smectite with ~30% mica layers; trace chlorite and quartz. Black veinlet: smectite with ~15% mica layers.

Sample 65-483B-32R-1, 90–94 cm (Piece 3), Unit 10 [Z-1279]

Olivine-plagioclase-phyric basalt, sparsely vesicular. Phenocrysts (40%): tabular (0.6–0.7 mm) and elongated-prismatic (up to 1.2 mm) grains of plagioclase (20%, andesine [An_{42}]). Altered olivine (20%) forms idiomorphic grains (0.3–0.8 mm). Groundmass (60%): hyalopilitic-microlitic texture; black glass and sparse skeletal microlites of plagioclase. Vesicles (1%, 0.05–0.3 mm) are rounded.

Alteration: slight to moderate (20%); rock is nonoxidized; olivine completely replaced by iddingsite; vesicles infilled with clay mineral.

XRD: smectite with ~10% mica layers; trace chlorite; black veinlet - smectite with ~10% mica layers.

Sample 65-483B-32R-2, 95–100 cm (Piece 4A), Unit 10 [Z-1280]

Olivine-plagioclase-phyric basalt, sparsely vesicular. Groundmass: vitrophyric texture. Rock: identical to Sample 65-483B-32R-1, 90–94 cm (Z-1279).

Alteration: slight to moderate (20%); rock is nonoxidized; olivine completely replaced by iddingsite; part of vesicles with 0.3–0.6 mm infilled with clay mineral and opaque minerals.

XRD: smectite; trace chlorite and quartz; black veinlet - smectite with ~10% mica layers.

Sample 65-483B-32R-2, 116–123 cm (Piece 4C), Unit 10 [Z-1281]

Olivine-plagioclase-phyric basalt, spotty structure. Phenocrysts (10%): prismatic grains (0.3–0.9 mm) of plagioclase (5%, labradorite [An_{55}] and andesine [An_{42}]) and their segregates. Altered olivine (5%) forms idiomorphic grains (0.3–0.5 mm). Groundmass (90%): vitrophyric to microdoleritic texture; incompletely crystallized glass. Isometric grains of opaque minerals (5%) are present.

Alteration: slight (5%); olivine completely replaced by green iddingsite.

XRD: smectite with ~15% mica layers; trace quartz; black veinlet - smectite with ~10% mica layers.

Sample 65-483B-32R-2, 135–141 cm (Piece 6A), Unit 10 [Z-1282]

Olivine-plagioclase-phyric basalt. Phenocrysts (30%): prismatic (0.7–2 mm) and elongated-prismatic (0.9–1.8 mm) crystals of plagioclase (15%, labradorite [An_{61-62}] and andesine [An_{42}]). Occasionally, plagioclase crystals consist of inclusions of glass. Altered olivine (10%) forms idiomorphic grains (0.5–1.7 mm). Groundmass (70%): pilotaxitic texture; laths and microlites of plagioclase (90%, andesine [An_{40}]), microlites of clinopyroxene, and opaque minerals (5%).

Alteration: slight (15%); olivine completely replaced by greenish brown iddingsite and carbonate.

XRD: smectite with ~20% mica layers; trace chlorite and quartz.

Hole 485A

Sample 65-485A-11R-3, 56–58 cm (Piece 1A), Unit 1 [Z-1283]

Sparsely olivine-plagioclase-phyric basalt. Phenocrysts (~1%): one prismatic microphenocryst (0.5 mm) of plagioclase and one microphenocryst of olivine, which is a segregate of three idiomorphic grains (0.3–0.5 mm). Groundmass: microlitic texture; unoriented microlites (andesine [An_{34}]) and microlaths (labradorite [An_{55}]) of plagioclase (80%) and interstitial glass (20%) with crystallites of clinopyroxene and opaque dust.

Alteration: slight; rock is nonoxidized; clay mineral replaces olivine and completely fills vesicles.

Sample 65-485A-11R-3, 82–84 cm (Piece 1B), Unit 1 [Z-1284]

Olivine-plagioclase-phyric basalt. Phenocrysts (10%): idiomorphic grains (0.5–0.7 mm) of olivine and plagioclase. Groundmass: microlitic texture; microlites and laths (0.1–0.6 mm) of plagioclase (40%, labradorite [An_{55}] and andesine [An_{42}]). Interstices: segregate of small grains of clinopyroxene (45%) and very small grains of opaque minerals (5%).

Alteration: rock is fresh and nonoxidized.

Sample 65-485A-12R-1, 62–64 cm (Piece 4A), Unit 1 [Z-1285]

Olivine-clinopyroxene-plagioclase-phyric basalt. Phenocrysts (10%): glomerophyric segregates of idiomorphic grains (0.3–0.4 mm) of olivine (2%), partly idiomorphic grains (0.2–0.5 mm) of clinopyroxene (3%), and prismatic and elongated-prismatic grains (0.2–0.8 mm) of plagioclase (5%, labradorite [An_{60}] and mainly andesine [An_{42}]). Groundmass: vitrophyric texture; glass with needle-shaped microlites (1%–2%) of plagioclase and segregates of crystallites of clinopyroxene and plagioclase. Small (<0.1 mm) grains of opaque minerals are present (8%–10%).

Alteration: rock is fresh and nonoxidized.

Sample 65-485A-14R-1, 56–60 cm (Piece 1F), Unit 1 [Z-1286]

Plagioclase-phyric dolerite, fine grained. Phenocrysts (15%): prismatic grains (0.6–0.9 mm) of plagioclase (labradorite [An_{56}]) and their segregates. Groundmass: doleritic texture; microlaths (0.2–0.3 mm) and laths (0.3–0.5 mm) of plagioclase (andesine [$An_{40–42}$]). Interstices: segregate of small (0.1–0.3 mm) rounded grains of clinopyroxene (45%). Olivine (5%) and opaque minerals (5%) are present.

Alteration: slight (1%–2%); rock is nonoxidized; olivine partly replaced by iddingsite.

Sample 65-485A-17R-1, 80–83 cm (Piece 5), Unit 2 [Z-1287]

Aphyric dolerite, medium grained. Groundmass: doleritic texture; prismatic and elongated-prismatic grains (0.4–1 mm) of plagioclase (40%, labradorite [An_{54}] and mainly andesine [$An_{38–42}$]). Interstices: xenomorphic grains and segregates of small (0.1–0.3 mm) xenomorphic grains of clinopyroxene (45%), small rounded grains of olivine (3%), and small (0.1 mm) xenomorphic skeletal grains of opaque minerals (10%–12%).

Alteration: slight (3%); rock is nonoxidized; olivine completely replaced by iddingsite.

Sample 65-485A-17R-1, 114–115 cm (Piece 6C), Unit 2 [Z-1288]

Aphyric dolerite, medium grained. Rock: identical to Sample 65-485A-17R-1, 80–83 cm (Z-1287).

Alteration: slight (3%–5%); rock is nonoxidized; olivine completely replaced by iddingsite.

Sample 65-485A-23R-1, 55–56 cm (Piece 4A), Unit 4 [Z-1289]

Olivine-plagioclase-phyric basalt, fine grained. Phenocrysts (10%): idiomorphic grains (0.3–0.4 mm) of olivine (10%). Plagioclase (9%, labradorite [An_{55}]) forms large (up to 2 mm) prismatic crystals of plagioclase or glomerophyric segregates of small (0.5–0.8 mm) tabular crystals. Groundmass: doleritic texture; laths (0.2–0.7 mm) of plagioclase (40%, labradorite [An_{55}] and andesine [An_{42}]). Interstices: segregate of small (0.1 mm) rounded grains of clinopyroxene (45%) and very small (<0.1 mm) grains of opaque minerals (5%).

Alteration: rock is fresh and nonoxidized.

Sample 65-485A-24R-1, 71–73 cm (Piece 1D), Unit 4 [Z-1290]

Aphyric dolerite, coarse grained. Rock: intersertal-poikilophitic texture; prismatic and tabular grains (0.6–2.5 mm) of plagioclase (30%, labradorite [An_{60}] and andesine [An_{45}]). Interstices: xenomorphic grains (0.3–3 mm) of clinopyroxene (30%), small (0.3 mm) rounded grains of olivine (10%), opaque minerals (5%–7%), and altered glass (25%) with skeletal grains of opaque minerals and very small (<0.1 mm) microlites of albite.

Alteration: moderate (30%–35%); rock is nonoxidized; olivine completely replaced by iddingsite; clay mineral replaces interstitial glass.

Sample 65-485A-24R-1, 86–88 cm (Piece 1E), Unit 4 [Z-1291]

Aphyric dolerite, coarse grained. Groundmass: intersertal-poikilophitic texture. Rock: identical to Sample 65-485A-24R-1, 71–73 cm (Z-1290).

Sample 65-485A-26R-1, 16–18 cm (Piece 1B), Unit 4 [Z-1292]

Olivine-plagioclase-phyric, crystallized, basalt. Phenocrysts (10%): single idiomorphic grain of olivine and prismatic crystals (0.8–2.5 mm) of plagioclase (labradorite [An_{60}]). Groundmass: microlitic texture; needle-shaped and skeletal microlites and laths (0.1–0.6 mm) of plagioclase (30%), segregate of small (<0.1 mm) rounded grains of clinopyroxene (55%), and opaque minerals (5%).

Alteration: rock is fresh and nonoxidized; single grain of olivine replaced by iddingsite.

Sample 65-485A-29R-2, 120–122 cm (Piece 3G), Unit 5 [Z-1293]

Aphyric dolerite, medium grained. Rock: doleritic texture; prismatic grains (0.2–1.2 mm) of plagioclase (50%: labradorite [An_{58-60}] and andesine [An_{42-43}]). Interstices: isometric grains and segregates of clinopyroxene (40%, 0.2–0.6 mm), opaque minerals (5–8%), and altered glass (2%).

Alteration: slight (2%); rock is nonoxidized; interstitial glass completely replaced by clay mineral.

Sample 65-485A-30R-3, 139–140 cm (Piece 1P), Unit 5 [Z-1294]

Gabbro-dolerite, coarse grained. Rock: ophitic texture; prismatic, tabular, and rounded-isometric grains (1.2–5 mm) of plagioclase (60%, labradorite [An_{58}] and andesine [An_{42}]), xenomorphic grains (0.6–5 mm) of clinopyroxene (38%), idiomorphic skeletal grains (up to 0.7 mm) of opaque minerals (10%), and altered interstitial glass (1%–2%) with skeletal grains of opaque minerals.

Alteration: slight (1%–2%); rock is nonoxidized; clay mineral replaces interstitial glass.

Sample 65-485A-31R-2, 36–37 cm (Piece 1P), Unit 5 [Z-1295]

Dolerite, coarse grained. Rock: poikilophitic texture; prismatic and elongated-prismatic grains (0.3–3 mm) of plagioclase (50%, labradorite [An_{60-62}] and andesine [An_{40}]), isometric grains (0.5–4 mm) of clinopyroxene (30%) with prismatic crystals of plagioclase, partly idiomorphic grains (0.3–0.6 mm) of olivine (10%), xenomorphic skeletal grains (up to 1 mm) of opaque minerals (8%), and altered interstitial glass (2%).

Alteration: slight; olivine completely replaced by limonite; clay mineral replaces interstitial glass; microcrack (0.2 mm) is filled with clay mineral.

Sample 65-485A-31R-2, 85–88 cm (Piece 1G), Unit 5 [Z-1296]

Dolerite, coarse grained. Groundmass: poikilophitic texture. Rock: identical to Sample 65-485A-31R-2, 36–37 cm (Z-1295).

Alteration: slight; olivine completely replaced by Fe hydroxides; clay mineral replaces interstitial glass.

Sample 65-485A-33R-1, 135–136 cm (Piece 1K), Unit 5 [Z-1297]

Olivine-phyric basalt, medium grained. Phenocrysts (5%): idiomorphic grains (0.5–1.7 mm) of olivine. Groundmass: ophitic texture; prismatic and elongated-prismatic laths (0.3–1 mm) of plagioclase (40%, labradorite [An_{63}] and andesine [An_{42}]). Interstices: xenomorphic grains (0.1–0.7 mm) of clinopyroxene (40%), small (0.1–0.2 mm) grains of olivine (5%), and opaque minerals (10%).

Alteration: slight; olivine completely replaced by iddingsite and Fe hydroxides.

Sample 65-485A-33R-2, 85–87 cm (Piece 1I), Unit 5 [Z-1298]

Olivine-plagioclase-phyric, microdolerite. Phenocrysts (15%): idiomorphic grains (0.8–1.2 mm) of olivine (5%) and prismatic and tabular grains (0.9–1.7 mm) of plagioclase (10%, labradorite [An_{60}]). Groundmass: microdoleritic texture; laths (0.2–0.8 mm) of plagioclase (40%, labradorite [An_{55}] and andesine [An_{42}]), segregate of xenomorphic grains of clinopyroxene (40%), opaque minerals (7%–8%), and grains (0.2 mm) of olivine (1%–2%).

Alteration: slight; rock is nonoxidized; olivine replaced by iddingsite and carbonate.

Sample 65-485A-38R-2, 36–37 cm (Piece 6A), Unit 8 [Z-1299]

Olivine-plagioclase-phyric basalt. Phenocrysts (20%): idiomorphic grains (0.3–0.7 mm) of olivine (5%) and prismatic and elongated-prismatic laths (0.5–1.7 mm) of plagioclase (15%, labradorite [An_{55}]) and their glomerophyric segregates. Occasionally, plagioclase grains consist of inclusions of glass. Groundmass: hyalopilitic texture; needle-shaped microlites (0.1–0.2 mm) and microlaths (0.3–0.6 mm) of plagioclase (30%, andesine [An_{42-44}]) and black glass (50%) with crystallites of clinopyroxene.

Alteration: slight; rock is nonoxidized; olivine completely replaced by greenish brown iddingsite.

Sample 65-485A-39R-5, 2–6 cm (Piece 1), Unit 8 [Z-1300]

Aphyric dolerite, medium grained. Rock: intersertal-poikilophitic texture; large (1.5–2.5 mm) isometric grains of augite with abundant inclusions of plagioclase prismatic crystals; small (0.5–0.6 mm) rounded grains of clinopyroxene (50%); prismatic crystals and laths (0.5–1.2 mm) of plagioclase (30%, labradorite [An_{55}] and andesine [An_{42}]); rounded or partly idiomorphic grains altered olivine (10%); opaque minerals (5%–7%); and dark-brown interstitial glass with very small microlites of albite-oligoclase and opaque minerals.

Alteration: slight; olivine completely replaced by greenish brown iddingsite.

Off Southern California (Hole 473)

Sample 63-473-29R-1, 85–90 cm (Piece 6D), Unit 1 [Z-1245]

Plagioclase-phyric dolerite, fine grained. Phenocrysts (10%): elongated-prismatic and zonal tabular grains (0.8–1.5 mm) of plagioclase (labradorite [An_{55}]) and their segregates. Groundmass (90%): intersertal-doleritic texture; unoriented laths (0.1–0.4 mm) of plagioclase (50%, labradorite [An_{55}]). Interstices: segregate of small (0.1–0.2 mm) grains of clinopyroxene (35%), opaque minerals (5%), and greenish brown altered glass (some areas of glass are black).

Alteration: slight (5%–7%); rock is nonoxidized; interstitial glass replaced by clay mineral.

XRD: smectite with ~20% mica layers; trace quartz; dark-brown crust - smectite with ~10% mica layers and aragonite.

Sample 63-473-30R-2, 126–134 cm (Piece 3A), Unit 1 [Z-1246]

Aphyric dolerite, medium grained. Rock: intersertal-doleritic texture; prismatic grains (0.2–1.2 mm) of plagioclase (40%, labradorite [An_{55-58}]). Interstices: segregate of small (0.1–0.3 mm) xenomorphic grains of clinopyroxene (40%), opaque minerals (5%), and dark-brown glass (15%–20%).

Alteration: rock is fresh and nonoxidized.

Sample 63-473-32R-2, 133–140 cm (Piece 5L), Unit 1 [Z-1247]

Aphyric dolerite, fine grained, vesicular. Rock: intersertal-doleritic texture; unoriented laths (0.3–0.6 mm) of plagioclase (35%, labradorite [An_{65}] and labradorite [An_{54}]). Interstices: segregate of small (0.1–0.3 mm) xenomorphic grains of clinopyroxene (30%), opaque minerals (8%–10%), and glass (5%). Vesicles (20%, 0.5–1.2 mm) are rounded in shape.

Alteration: moderate (20%–25%); rock is nonoxidized; clay mineral replaces interstitial glass; vesicles are filled with celadonite(?).

XRD: smectite with ~20% mica layers; trace quartz. Dark veinlet: smectite with ~15% mica layers and trace defective chlorite. Vesicles infilled by smectite.

Sample 63-473-32R-3, 51–57 cm (Piece 1F), Unit 1 [Z-1248]

Aphyric dolerite, fine grained, vesicular. Groundmass: intersertal-doleritic texture. Rock: identical to Sample 63-473-32R-2, 133–140 cm (Z-1240).

Baja California (Hole 469)

Sample 63-469-40R-1, 30–32 cm (Piece 1A) [Z-1229]

Aphyric andesite-basalt, crystallized, fine grained. Rock: intersertal texture; unoriented microlites and microlaths (0.1–0.4 mm) of plagioclase (60%, andesine [An_{48}]). Interstices: segregate of very small grains of clinopyroxene (5%–10%), opaque minerals (5%), altered glass (25%), and carbonate (5%).

Alteration: moderate (20%–25%); rock is nonoxidized; clay mineral replaces interstitial glass.

XRD: smectite with ~20% mica layers; trace chlorite and quartz.

Sample 63-469-42R-1, 117–120 cm (Piece 1D) [Z-1230]

Aphyric andesite-basalt with intersertal groundmass texture, crystallized, fine grained. Rock: identical to Sample 63-469-40R-1, 30–32 cm (Z-1229).

Alteration: rock is fresh and nonoxidized.

XRD: smectite with ~20% mica layers; trace amphibole and quartz.

Sample 63-469-42R-5, 112–115cm (Piece 1C) [Z-1231]

Aphyric andesite-basalt with intersertal groundmass texture, crystallized, fine grained. Rock: identical to Sample 63-469-42R-1, 117–120 cm (Z-1230).

Alteration: rock is fresh and nonoxidized.

XRD: smectite with ~15%–20% mica layers.

Sample 63-469-44R-1, 3–8cm (Piece 1B) [Z-1232]

Aphyric basalt, sparsely vesicular. Rock: pilotaxitic texture; microlites of plagioclase (35%, andesine [An_{48}] and labradorite [An_{50}]). Interstices: very small microlites of clinopyroxene (50%), opaque dust (5%), and altered glass (5%). Vesicles (5%, 0.2–0.3 mm) are rounded. Several vesicles are filled with black glass.

Alteration: slight (5%–10%); rock is nonoxidized; interstitial glass partly replaced by clay mineral; vesicles mainly are filled with clay mineral.

XRD: smectite with ~10% mica layers; black veinlet: smectite with ~10% mica layers; white veinlet: calcite and smectite with interlayer Na cation.

Sample 63-469-46R-1, 134–138cm (Piece 11) [Z-1233]

Sparsely clinopyroxene-plagioclase-phyric basalt, sparsely vesicular. Phenocrysts: two glomerophyric segregates are represented by prismatic grains (0.2–0.3 mm) of plagioclase (labradorite [An_{52}]) and single grains (0.2–0.3 mm) of clinopyroxene. Groundmass: pilotaxitic texture; unoriented microlites (0.1–0.3 mm) of plagioclase (40%, andesine [An_{46}]) and interstitial glass (40%) with crystals of clinopyroxene and oval grains of opaque dust (10%). Vesicles (5%, 0.1 mm) are rounded.

Alteration: slight; rock is nonoxidized; vesicles mainly are filled with clay mineral.

XRD: smectite with ~15%–20% mica layers.

Sample 63-469-48R-1, 22–28cm (Piece 1D) [Z-1234]

Glassy crust of basalt.

Alteration: very strong (60%–70%); glass almost completely replaced by green clay mineral (80%–85%) and Fe hydroxides (15%–20%).

XRD: smectite with ~10% mica layers.

Sample 63-469-48R-1, 49–53cm (Piece 5A) [Z-1235]

Glassy crust of basalt.

Alteration: rock is fresh and nonoxidized.

XRD: smectite with ~10% mica layers and with different interlayer Na-K and Mg-Ca cations; trace quartz.

Sample 63-469-49R-1, 84–88cm (Piece 8A) [Z-1236]

Sparsely plagioclase-phyric basalt. Phenocrysts: single glomerophyric segregate; prismatic grains (0.3–1.5 mm) of plagioclase. Groundmass: vitrophyric texture; brown and light brown glass. light brown glass consists of crystallites of clinopyroxene, plagioclase, and opaque dust.

Alteration: rock is fresh and nonoxidized.

Sample 63-469-50R-2, 27–32cm (Piece 3A) [Z-1237]

Aphyric basalt, sparsely vesicular. Rock with vitrophyric texture; brownish green glass with crystallites of plagioclase and opaque dust. Several vesicles (<0.1 mm) are filled with glass.

Alteration: rock is fresh and nonoxidized.

XRD: smectite with ~10% mica layers; white inclusions from glass - calcite.

Sample 63-469-51R-1, 34–40cm (Piece 3) [Z-1238]

Aphyric basalt, sparsely vesicular. Rock: vitrophyric texture; black glass with crystals of plagioclase and clinopyroxene. Vesicles (2%–3%, 0.05–0.2mm) are filled by brownish green glass. One vesicle (0.6 mm) is empty, wall of vesicle is lined with clay mineral.

Alteration: rock is fresh and nonoxidized.

XRD: smectite with ~10% mica layers; trace quartz.

Hole 471

Sample 63-471-80R-1, 135–140 cm (Piece 9A), Unit 2 [Z-1239]

Dolerite and tuff (breccia) contact.

Aphyric dolerite, medium grained. Rock: ophitic-intersertal texture; elongated-prismatic grains (0.7–2.5 mm) of zonal plagioclase with undulatory extinction (50%, from andesine [An_{42}] to labradorite [An_{55}]). Central part of plagioclase consists of inclusions of glass. Interstices: isometric grains of Ti-augite (20%), volcanic glass (25%), and small (0.2 mm) isometric and needle-shaped grains (up to 1 mm) of opaque minerals (5%).

Tuff (breccia): fragments (10%, 0.3–2 mm) of clayey chert and angular small (0.1–0.3 mm) fragments (70%) of plagioclase grains, altered green volcanic glass, and opaque minerals. Cement: clayey chert matter.

Alteration: rock is nonoxidized; dolerite is moderately to highly altered (40%–50%). Glass from plagioclase grains and interstitial glass completely replaced by chlorite; augite partly replaced by chlorite; breccia of tuff: volcanic glass replaced by chlorite; clayey chert cement partly is chloritized.

XRD: correnslte; minor quartz; trace mixed-layer chlorite-smectite mineral and calcite.

Sample 63-471-82R-1, 127–132 cm (Piece 9), Unit 3 [Z-1240]

Aphyric dolerite, medium grained. Rock: intersertal-doleritic texture; elongated-prismatic laths (0.5–0.7 mm) of zonal plagioclase (40%). Interstices: segregate of small grains of clinopyroxene (20%), opaque minerals (10%, 0.01–0.1 mm), and altered glass (30%).

Alteration: moderate (40%–45%); rock is nonoxidized; plagioclase partly (30%–40%) replaced by albite, sosurite, and chlorite; interstitial glass completely replaced by chlorite.

XRD: correnslte; minor mixed-layer chlorite-smectite mineral; black vein - correnslte; trace calcite and chlorite.

Sample 63-471-82R-2, 15–18 cm (Piece 1B), Unit 3 [Z-1241]

Aphyric dolerite, medium grained. Rock: identical to Sample 63-471-82R-1, 127–132 cm (Z-1240).

Alteration: moderate (40%–45%); rock is nonoxidized; plagioclase partly (30%–40%) replaced by albite and chlorite; interstitial glass completely replaced by chlorite.

XRD: correnslte and mixed-layer chlorite-smectite mineral; trace quartz.

Sample 63-471-84R-1, 9–16 cm (Piece 2A), Unit 3 [Z-1242]

Aphyric dolerite, medium grained. Rock: ophitic-intersertal texture; elongated-prismatic grains (0.7–2.5 mm) of zonal plagioclase (50%, labradorite [An_{50}] and labradorite [An_{55}]) with undulatory extinction. Central parts of plagioclase grains consist of inclusions of altered glass. Interstices: xenomorphic grains of clinopyroxene (10%), idiomorphic large (0.7–0.8 mm), occasionally skeletal, grains of opaque minerals (7%–8%), and altered glass (30%–35%).

Alteration: strong (50%); rock is nonoxidized; glass from plagioclase and interstitial glass completely replaced by clay mineral.

XRD: smectite with ~15% mica layers; trace chlorite and quartz.

Sample 63-471-84R-1, 107–114 cm (Piece 6G), Unit 3 [Z-1243]

Aphyric dolerite, coarse grained. Rock: intersertal-poikilophitic texture; tabular (0.5–0.7 mm) and elongated-prismatic (up to 5 mm) grains of zonal plagioclase (40%, labradorite [An_{58-62}]) with undulatory extinction. Central parts of plagioclase grains consist of inclusions of altered glass. Interstices: xenomorphic grains of clinopyroxene and small segregates of clinopyroxene and plagioclase, opaque minerals (10%), and altered glass (10%).

Alteration: slight; rock is nonoxidized; glass from plagioclase and interstitial glass completely replaced by clay mineral; some areas of interstices consist of small idiomorphic grains of albite, orthoclase, chlorite, and abundant needles of apatite.

XRD: smectite with ~10% mica layers; trace chlorite, defective chlorite, and quartz.

Sample 63-471-87R-2, 19–26 cm (Piece 1B), Unit 3 [Z-1244]

Aphyric dolerite, coarse grained. Rock: intersertal-ophitic texture; tabular (0.7–0.9 mm) and elongated-prismatic (up to 4.5 mm) grains of plagioclase (50%, labradorite [An_{60}]). Interstices: xenomorphic grains (0.5–0.8 mm, up to 1.2 mm) of clinopyroxene, opaque minerals (5%), and altered glass (10%). Occasionally, several interstices consist of small idiomorphic grains of albite, orthoclase, chlorite, and abundant needles of apatite.

Alteration: slight; rock is nonoxidized; interstitial glass completely replaced by clay mineral; some areas of interstices consist of albite, clay mineral, and needles of apatite.

XRD: smectite with ~10% mica layers; trace chlorite and quartz; brown veinlet - smectite with ~5% mica layers; trace chlorite and quartz.

Mid Atlantic Ridge (Leg 37)

Hole 332B

Sample 37-332B-1R-5, 121–124 cm (Piece 11), Unit 1-1 [Z-280]

Plagioclase-phyric (phenocrysts 0.8–3 mm, 25%) basalt, incompletely crystallized, vesicular. Groundmass: subvariolitic texture; volcanic glass, microlites of clinopyroxene, laths of plagioclase, and opaque minerals. Vesicles (0.2–0.5 mm, 5%–10%) are rounded in shape.

Alteration: slight (~5%–10%); rock is poorly oxidized; vesicles partly infilled by smectites, occasionally by calcite.

XRD: smectites with interlayer Na-K and Mg-Ca cations; trace hydromica with swelling layers (~5%).

Sample 37-332B-2R-2, 100–103 cm (Piece 11), Unit 1-1 [Z-501]

Plagioclase-phyric basalt, vesicular. Phenocrysts: large idiomorphic prismatic grains of plagioclase (2–4 mm, 50%, labradorite [An_{56}]); second generation of phenocrysts include more small (0.5–0.8 mm) tabular grains of plagioclase (labradorite [An_{52}]). Groundmass: hyalopilitic texture; needle-shaped microlites of plagioclase and clinopyroxene, and black volcanic glass. Vesicles (0.3–0.5 mm, 3%–5%) are rounded.

Alteration: rock is fresh.

Sample 37-332B-2R-3, 91–94 cm (Piece 8), Unit 1-1 [Z-502]

Plagioclase-phyric basalt, vesicular (5%), groundmass is hyalopilitic texture. Rock is identical to Sample 37-332B-2R-2, 100–103 cm (Z-501). There are very large glomerophyric segregates of plagioclase (13 mm), several grains to 5 mm. One grain of olivine (0.2 mm) is present.

Alteration: rock is fresh.

Sample 37-332B-6R-1, 94–96 cm (Piece 10), Unit 2-3 [Z-281]

Aphyric basalt, massive, incompletely crystallized, sparsely vesicular. Groundmass demonstrates poorly expressed subvariolitic texture; volcanic glass, sparse microlites of clinopyroxene, laths of plagioclase, and opaque minerals. Vesicles (0.2–0.3 mm, ~3%) are often empty.

Alteration: slight (<5%); rock is slightly oxidized; single vesicles are filled with smectites.

XRD: smectite.

Electron micrograph: b = 9.21Å (trioctahedral smectite).

Sample 37-332B-11R-1, 58–60 cm (Piece 3D), Unit 3A-7 [Z-282]

Plagioclase-phyric (phenocrysts to 2 mm, 5%) basalt with doleritic texture. Groundmass: laths of plagioclase, microlites of clinopyroxene, single grains of olivine, and sparse (~3%) opaque minerals.

Alteration: slight (~5%); olivine and clinopyroxene are replaced with smectite.

XRD: smectites, mixed-layer smectite-illite mineral with ~40% mica layers; trace hydromica with swelling interlayers (~20%).

Electron micrograph: b = 9.18 Å (trioctahedral smectite).

Sample 37-332B-14R-2, 23-26 cm (Piece 2), Unit 3B-8 [Z-503]

Plagioclase-phyric basalt with microlitic texture, vesicular. Phenocrysts: small prismatic grains of plagioclase (15%, 0.5–1.5 mm, labradorite [An_{62}]) and segregates of plagioclase. Groundmass: needle-shaped microlaths and microlites of plagioclase (labradorite [An_{56}]) and microlites of clinopyroxene (panicle segregates). Vesicles are rounded (0.5–1 mm, 20%) and infilled partially and completely with glass, some vesicles are empty.

Alteration: rock is fresh.

Sample 37-332B-16R-2, 37–40 cm (Piece 5), Unit 4-12 [Z-283]

Sparsely clinopyroxene-phyric basalt, phenocrysts ~1 mm and glomerocrysts to 4 mm (15%–20%). Groundmass: subvariolitic texture; volcanic glass, microlites of clinopyroxene, laths of plagioclase, and admixture of opaque minerals. Vesicles (0.2–0.5 mm, ~5%) are present.

Alteration: slight (~10%); rock is slightly oxidized; vesicles are rimed with smectites.

XRD: smectite.

Electron micrograph: b = 9.19 Å (trioctahedral smectite).

Sample 37-332B-17R-1, 97–103 cm (Piece 13), Unit 4-12 [Z-284]

Micro-clinopyroxene-phyric (microphenocrysts 0.3–0.4 mm, ~5%) basalt, poorly crystallized, vesicular (0.2–0.5 mm, ~5%–10%). Groundmass: variolitic texture; volcanic glass, xenomorphic microlites of clinopyroxene, laths of plagioclase, and opaque minerals.

Alteration: slight (~5%); rock is slightly oxidized; vesicles are filled with smectites.

XRD: smectite.

Sample 37-332B-21R-1, 12-15 cm (Piece 1à), Unit 4-13 [Z-285]

Olivine-clinopyroxene-phyric (phenocrysts of clinopyroxene 1–2.5 mm, 15%; phenocrysts of olivine 1–2.5 mm, 5%) basalt, poorly crystallized, vesicular (0.2–0.4 mm, ~5%). Groundmass: subvariolitic texture; volcanic glass, xenomorphic microlites of clinopyroxene, laths of plagioclase, and opaque minerals. Single crystals of picotite are present.

Alteration: slight; vesicles are rimed with smectites.

XRD: smectite; chlorite in trace amounts.

Electron micrograph: b = 9.24 Å (trioctahedral smectite).

Sample 37-332B-22R-1, 105–108 cm (Piece 9), Unit 5-14 [Z-286]

Clinopyroxene-plagioclase-phyric basalt, poorly crystallized, vesicular (0.1–0.5 mm, ~5%), phenocrysts of plagioclase (~70%) and clinopyroxene (~30%) to 0.2 mm form glomerocrysts. Groundmass: subvariolitic texture; volcanic glass, xenomorphic microlites of clinopyroxene, laths of plagioclase, and opaque minerals. Some vesicles are filled with volcanic glass which contains thin opaque dust.

Alteration: slight (~5%); vesicles are rimed with smectites.

XRD: smectite.

Electron micrograph: b = 9.19 Å (trioctahedral smectite).

Sample 37-332B-22R-2, 106–108 cm (Piece 12), Unit 5-14 [Z-504]

Sparsely plagioclase-phyric basalt, vesicular. Phenocrysts: glomerophyric segregates of prismatic plagioclase grains (5%, 0.5–0.8 mm, labradorite [An_{56}]). Groundmass: pilotaxitic texture; needle-shaped microlaths and microlites of plagioclase (labradorite [An_{52}]) and black volcanic glass. Vesicles are rounded (0.4–0.6 mm, 10%).

Alteration: rock is fresh; some vesicles are empty to partially filled with zeolite or carbonate; veinlet (0.2 mm) consists of zeolite and carbonate.

Sample 37-332B-24R-2, 21–25 cm (Piece 2), Unit 5-14 [Z-505]

Olivine-plagioclase-phyric basalt, vesicular. Phenocrysts: glomerophyric segregates of prismatic plagioclase grains (7%–8%, up to 0.3–1.5 mm, labradorite [An_{55-57}]). Glomerophyric segregates consist of small (0.3–0.4 mm) grains of olivine (1%). Groundmass: pilotaxitic texture; needle-shaped microlaths and microlites of plagioclase (labradorite [An_{52}]) and black volcanic glass. Vesicles are rounded (0.2-0.4 mm, 8%–10%) and filled with glass.

Alteration: rock is fresh; olivine replaced by iddingsite.

Sample 37-332B-24R-1, 71–75 cm (Piece 8), Unit 5-15 [Z-287]

Clinopyroxene-plagioclase-phyric basalt, poorly crystallized, vesicular (0.2–0.5 mm, ~5%) Phenocrysts of plagioclase (~70%) and clinopyroxene (~30%) form glomerocrysts. Groundmass: subvariolitic texture; volcanic glass, xenomorphic microlites of clinopyroxene, laths of plagioclase, and opaque minerals. Some vesicles are filled with volcanic glass which contains thin opaque dust.

Alteration: slight (~5%); interstitial glass and clinopyroxene are replaced with smectite; vesicles are rimed with smectites.

XRD: smectite.

Electron micrograph: b = 9.30 Å (smectite with high content of Fe^{++}).

Sample 37-332B-29R-1, 94–98 cm (Piece 5D), Unit 6-19 [Z-288]

Olivine-clinopyroxene-plagioclase-phyric basalt, crystallized, vesicular (0.1–1.5 mm, ~10%). Phenocrysts of clinopyroxene (5%) are 1.1–1.2 mm. Small phenocrysts of olivine (0.1–0.7 mm) and plagioclase laths (to 0.8 mm) are present also. Groundmass texture is subvariolitic. Some vesicles are filled with volcanic glass.

Alteration: slight (~10%); rock is slightly oxidized; vesicles are filled with smectites, occasionally with calcite.

XRD: smectite.

Sample 37-332B-33R-1, 96–99 cm (Piece 10E), Unit 6-20 [Z-506]

Aphyric basalt (microdolerite), vesicular. Groundmass: intersertal-microdoleritic texture; laths of plagioclase (0.2–0.5 mm, labradorite [An_{55}]). Interstices: panicle like segregates of clinopyroxene. Volcanic glass with opaque dust is present also. Vesicles (0.2–0.6 mm, 15%) are rounded.

Alteration: rock is fresh; glass partly replaced by chlorite and palagonite; vesicles are filled with carbonate and palagonite.

Sample 37-332B-33R-2, 30–33 cm (Piece 2), Unit 6-21 [Z-289]

Olivine-clinopyroxene-phyric (phenocrysts to 2.5 mm, 10%) basalt, poorly crystallized, massive. Groundmass: subvariolitic texture; volcanic glass impregnated with opaque dust; laths of plagioclase often form quench-crystals.

Alteration: slight (5%–7%); olivine is replaced with smectite and carbonate; smectites replace interstitial volcanic glass and clinopyroxene.

XRD: smectite; trace talc(?).

Sample 37-332B-35R-1, 131–134 cm (Piece 6J), Unit 7-23 [Z-507]

Olivine-phyric dolerite, sparsely vesicular. Phenocrysts: large idiomorphic crystals (25%, 1.2–6 mm). Occasionally plagioclase crystals include grains of opaque minerals (0.4 mm). Groundmass: doleritic texture; laths of plagioclase (labradorite [An_{56-58}]). Interstices consist of small xenomorphic grains of olivine and panicle-like segregates of clinopyroxene. Glass is present (3%–5%). Vesicles (0.3–0.5 mm, 7%–8%) are rounded.

Alteration: rock is fresh; glass replaced by chlorite; vesicles infilled with carbonate and palagonite.

Sample 37-332B-37R-1, 100–104 cm (Piece 13), Unit 8-25 [Z-508]

Olivine-plagioclase-phyric basalt, vesicular. Phenocrysts: prismatic grains of plagioclase (15%, 0.5–0.8 mm, labradorite [An_{62}]). Olivine: small (0.1 mm) idiomorphic grains. Groundmass: hyalopilitic texture; needle-shaped microlaths and microlites of plagioclase and black glass. Vesicles (0.05–0.3–0.6 mm) are present.

Alteration: slight; olivine completely replaced by chlorite(?); vesicles infilled with clay mineral.

Sample 37-332B-37R-3, 17–20 cm (Piece 2), Unit 9-26 [Z-290]

Olivine-clinopyroxene-microphyric (phenocrysts to 1.2 mm, 5%) basalt, poorly crystallized, vesicular (0.5–0.8 mm, 20%). Groundmass: subvariolitic texture; volcanic glass, microlites of clinopyroxene, laths of plagioclase, and admixture of opaque minerals. Single crystals of picotite (0.8 mm) are present.

Alteration: slight to moderate (~20%); rock is oxidized through bands along zones of concentration of vesicles; some vesicles are filled palagonitized volcanic glass; some vesicles are filled with calcite; most filled vesicles demonstrate zonality in distribution of intercalating palagonite, smectite, and opaque minerals; some vesicles show rim of oxidized opaque minerals.

XRD: smectite.

Electron micrograph: $b = 9.30$ Å (smectite with high content of Fe^{++}).

Sample 37-332B-41R-1, 65–69 cm (Piece 6a), Unit 9-32 [Z-291]

Olivine-clinopyroxene-phyric basalt, almost completely crystallized, vesicular (0.5–0.8 mm, 15%). Groundmass: poorly expressed subvariolitic texture; microlites of clinopyroxene, small laths of plagioclase, and opaque minerals. Vesicles are rounded.

Alteration: slight (~15%); vesicles are filled with smectite; smectites replace interstitial volcanic glass, groundmass clinopyroxene, and fill cracks.

XRD: smectite.

Electron micrograph: $b = 9.22$ Å (trioctahedral smectite).

Sample 37-332B-42R-1, 63–66 cm (Piece 3D), Unit 9-36 [Z-509]

Aphyric basalt (dolerite), massive. Groundmass: intersertal-microdoleritic texture; laths of plagioclase (0.1–0.7 mm, labradorite [An_{56}]). Interstices: brownish-green glass with opaque dust and segregate of small pyroxene grains.

Alteration: slight; clay mineral replaces interstitial volcanic glass and clinopyroxene.

Sample 37-332B-42R-2, 22–25 cm (Piece 1C), Unit 9-38 [Z-292]

Aphyric basalt, sparsely vesicular. Groundmass: poorly expressed intersertal texture; volcanic glass with opaque dust, laths of plagioclase, microlites of clinopyroxene, and sparse olivine. Vesicles (0.2–0.3 mm, 3%) are rounded.

Alteration: slight; rock is slightly oxidized; vesicles are filled with smectite.

XRD: smectite.

Sample 37-332B-43R-1, 132–136 cm (Piece 8C), Unit 10-41 [Z-293]

Plagioclase-phyric (phenocrysts to 5 mm) basalt, glomerophyric, sparsely vesicular. Groundmass: subvariolitic texture; volcanic glass with opaque dust, microlites of clinopyroxene, and laths of plagioclase. Vesicles (up to 0.5 mm, 15%) are rounded.

Alteration: slight (~5%); smectites replace interstitial volcanic glass.

XRD: smectite.

Electron micrograph: $b = 9.29$ Å (trioctahedral smectite).

Sample 37-332B-43R-2, 28–31 cm (Piece 1C), Unit 10-41 [Z-294]

Plagioclase-phyric (phenocrysts to 4 mm) basalt, glomerophyric, and vesicular. Groundmass: hyalopilitic texture; volcanic glass with opaque dust, microlites of clinopyroxene, and laths of plagioclase. Vesicles (0.2–0.5 mm, 7%) are empty. Single vesicles are filled with volcanic glass which contains opaque dust.

Alteration: slight; smectites replace interstitial volcanic glass and groundmass clinopyroxene.

XRD: smectite containing ~10% of mica layers.

Electron micrograph: b = 9.18 Å (trioctahedral smectite).

Sample 37-332B-43R-3, 47–50 cm (Piece 2D), Unit 10-41 [Z-510]

Aphyric basalt, partly brecciated, highly vesicular. Groundmass: vitrophyric texture; needle-shaped microlites of plagioclase (up to 40%–50%) and black glass. Vesicles (~30%, 0.5 mm) are isometric.

Alteration: very strong (70%); vesicles are lined with chlorite; fragments (~0.1 cm) of basalt are cemented by clay mineral.

XRD: smectite; minor mixed-layer chlorite-smectite mineral.

Sample 37-332B-46R-2, 60–63 cm (Piece 3B), Unit 10-44 [Z-295]

Aphyric basalt, vesicular (0.1–0.8 mm, 20%). Groundmass: volcanic glass, laths of plagioclase, xenomorphic microlites of clinopyroxene.

Alteration: slight to moderate (~20%); vesicles are filled with smectite; smectites replace volcanic glass and clinopyroxene.

XRD: smectite containing ~10% of mica layers; trace hydromica.

Electron micrograph: b = 9.23 Å (trioctahedral smectite).

Sample 37-332B-48R-1, 73–76 cm (Piece 6), Unit 11-45 [Z-296]

Hyaloclastic breccia. Fragments (up to 2–4 mm) of chilled glass in groundmass of palagonized volcanic glass. Chilled glass contains small crystals of olivine and opaque minerals. Palagonized volcanic glass contains areas enriched in thinly dispersed opaque minerals.

Alteration: slight (~15%); rock is strongly oxidized; siliceous vein are present.

Serocki Volcano, Mid Atlantic Ridge Rift Valley (Leg 106)

Hole 648B

Sample 106-648B-1R-1, 69–70 cm (Piece 12), Unit 3 [Z-106]

Sparsely plagioclase-phyric hyalobasalt, poorly crystallized, massive. Phenocrysts: plagioclase (1–3 mm, 5%–7%). Groundmass: microsubvariolitic texture; black devitrified glass with rare radial laths of plagioclase (mostly quench crystals) and opaque dust. Olivine occurs in small amounts (<1%).

Alteration: rock is fresh.

XRD: trace smectite.

Sample 106-648B-1R-2, 85–88 cm (Piece 15), Unit 9 [Z-107]

Sparsely olivine-plagioclase-phyric hyalobasalt, poorly crystallized, massive. Phenocrysts: plagioclase (3%–5%). Groundmass: microsubvariolitic texture; black devitrified glass with rare radial laths of quench of plagioclase and opaque dust. Olivine is registered in small (1%) amounts.

Alteration: rock is fresh.

XRD: smectite and quartz in trace amounts.

Sample 106-648B-1R-3, 60–65 cm (Piece 12), Unit 14 [Z-108]

Sparsely micro-plagioclase-phyric hyalobasalt, poorly crystallized, massive. Microphenocrysts of plagioclase (<1%). Groundmass: hyalovariolitic texture; black volcanic glass with rare radial laths of plagioclase (mostly quench crystals) and opaque dust.

Alteration: rock is fresh.

XRD: smectite and quartz in trace amounts.

Sample 106-648B-3R-1, 85–87 cm (Piece 14), Unit 20 [Z-109]

Sparsely micro-plagioclase-phyric hyalobasalt, massive. Microphenocrysts of plagioclase (<1%) occasionally as quench crystals. Groundmass: hyaline to subvariolitic texture; black volcanic glass.

Alteration: rock is fresh; single vesicles are filled by opaque minerals.

XRD: trace quartz.

Sample 106-648B-4R-1, 15–18 cm (Piece 4), Unit 21 [Z-110]

Sparsely olivine-plagioclase-phyric hyalobasalt, poorly crystallized, massive. Phenocrysts of plagioclase (3%–5%) and single crystals of olivine. Groundmass: subvariolitic texture; black volcanic glass with subradial laths of quench crystals of plagioclase and opaque dust. Olivine is present in small (1%) amounts.

Alteration: rock is fresh.

XRD: trace quartz.

Sample 106-648B-4R-1, 61–64 cm (Piece 12), Unit 23 [Z-111]

Sparsely plagioclase-phyric hyalobasalt, poorly crystallized, sparsely vesicular. Phenocrysts: plagioclase (3%–5%). Groundmass: hyalotaxitic texture; black volcanic glass with quench laths of plagioclase and opaque dust. Vesicles (0.1–0.7 mm) are empty.

Alteration: rock is fresh; glass is palagonized through patches.

XRD: trace quartz.

Sample 106-648B-5R-1, 15–22 cm (Piece 4), Unit 24 [Z-112]

Sparsely micro-plagioclase-phyric hyalobasalt, poorly crystallized, massive. Groundmass: black volcanic glass with quench laths of plagioclase and opaque dust. Texture of rock is subvariolitic, pilotaxitic. Single vesicles (<0.5 mm).

Alteration: rock is fresh, nonoxidized.

XRD: smectite and quartz in trace amounts.

Sample 106-648B-6R-1, 1–3 cm (Piece 1), Unit 25 [Z-113]

Sparsely plagioclase-microphyric hyalobasalt, poorly crystallized, massive, with single microphenocrysts of olivine. Groundmass: subvariolitic texture; black devitrified glass with laths of plagioclase and opaque dust. Single vesicles (0.03 mm) are empty.

Alteration: rock is fresh, nonoxidized.

XRD: feldspars and amorphous matter.

Nauru Basin (Leg 61)

Hole 462

Sample 61-462-60R-2, 135–138 cm (Piece 9), Unit 1 [Z-1198]

Olivine-clinopyroxene-plagioclase-phyric basalt. Phenocrysts (20%): glomerophyric segregates of idiomorphic grains (0.3–0.4 mm) of olivine (2%), xenomorphic grains (0.1–0.3 mm) of clinopyroxene (3%), and laths (0.2–0.7 mm) of plagioclase (15%, andesine [An_{46}]). Groundmass (80%): vitrophyric texture; glass with crystallites of clinopyroxene, plagioclase, and opaque dust.

Alteration: slight; rock is nonoxidized; olivine completely replaced by green iddingsite.

Sample 61-462-61R-1, 48–50 cm (Piece 3B), Unit 6 [Z-1199]

Olivine-plagioclase-phyric basalt, crystallized. Phenocrysts (15%): glomerophyric segregates of idiomorphic grains (0.2–0.5 mm) of olivine (8%) and plagioclase. Plagioclase (10%, labradorite [An_{55}]) forms prismatic grains and laths (0.4–0.6 mm). Groundmass: microlitic texture; plagioclase (25%, andesine [An_{42}]), segregate of small (0.1–0.3 mm) rounded or isometric grains of clinopyroxene (50%), and opaque minerals (10%).

Alteration: slight; olivine completely replaced by brown iddingsite.

Sample 61-462-62R-2, 135–137 cm (Piece 9), Unit 8 [Z-1200]

Plagioclase-olivine-clinopyroxene-phyric basalt. Phenocrysts (20%): glomerophyric segregates of isometric grains (0.3–0.4 mm) of clinopyroxene (10%); olivine (7%, 0.1–0.3 mm); laths (0.2–0.4 mm) of plagioclase (3%). Groundmass (80%): microlitic texture; microlites of plagioclase (25%), clinopyroxene (50%), and opaque minerals (5%).

Alteration: slight; olivine completely replaced by brown iddingsite.

Sample 61-462-63R-2, 18–22 cm (Piece 1), Unit 10 [Z-1201]

Aphyric dolerite, fine grained. Rock with intersertal-ophitic texture; laths (0.1–0.6 mm) of plagioclase (40%, labradorite [An_{60}] and andesine [$An_{46–48}$]). Interstices: segregates of idiomorphic grains (0.1–0.5 mm) of clinopyroxene (35%), opaque minerals (5%), and altered brown and greenish brown glass (15%).

Alteration: slight; rock is nonoxidized; interstitial glass replaced by clay mineral.

Sample 61-462-64R-1, 12–14 cm (Piece 2), Unit 10 [Z-1202]

Aphyric dolerite with intersertal-ophitic texture, fine grained. Rock: identical to Sample 61-462-63R-2, 18–22 cm (Z-1201).

Sample 61-462A-17R-2, 84–86 cm (Piece 4B), Unit 2 [Z-1203]

Sparsely olivine-plagioclase-phyric basalt (microdolerite), crystallized. Phenocrysts (5%): glomerophyric segregates of small rounded and idiomorphic grains (0.2–0.6 mm) of olivine (2%). Central parts of olivine grains consist of opaque dust. Plagioclase (3%) forms prismatic grains (labradorite [An_{68}]). Groundmass with doleritic texture; laths (0.1–0.4 mm) of plagioclase (40%, andesine [An_{49}] and labradorite [An_{52}]). Interstices: segregate of small (0.1–0.3 mm) grains of clinopyroxene (40%); brown glass (5%); opaque minerals (5%).

Alteration: slight; olivine completely replaced by brown iddingsite.

Sample 61-462A-24R-1, 12–14 cm (Piece 2B), Unit 12 [Z-1204]

Aphyric dolerite, fine grained. Rock with intersertal-doleritic texture; unoriented prismatic crystals (0.1–0.7 mm) of plagioclase (40%, andesine [An_{44}] and labradorite [An_{55}]). Interstices are filled with aggregate of small (0.1–0.2 mm) rounded grains of clinopyroxene (40%), small (0.2 mm) rounded grains of altered and oxidized olivine (2%), black glass (15%), and opaque minerals (3%).

Alteration: slight; olivine completely replaced by brown iddingsite.

Sample 61-462A-27R-2, 71–76 cm (Piece 6), Unit 12 [Z-1205]

Aphyric dolerite, fine grained. Rock with doleritic texture; prismatic crystals and laths (0.1–0.6 mm) of plagioclase (40%, andesine [An_{42}] and labradorite [An_{55}]). Interstices are filled with isometric grains (0.1–0.5 mm) of clinopyroxene (45%), small (0.2 mm) rounded grains of altered olivine (2%), opaque minerals (8%), and greenish brown glass (5%).

Alteration: slight; olivine completely replaced by iddingsite.

Sample 61-462A-28R-1, 92–94 cm (Piece 4), Unit 12 [Z-1206]

Aphyric dolerite with doleritic texture, fine grained. Rock: identical to Sample 61-462A-27R-2, 71–76 cm (Z-1205).

Alteration: slight; olivine completely replaced by iddingsite.

Sample 61-462A-29R-2, 105–108 cm (Piece 1G), Unit 12 [Z-1207]

Aphyric dolerite, medium grained. Rock with doleritic-ophitic texture; prismatic crystals and laths (0.2–0.8 mm) of plagioclase (40%, andesine [An_{42}] and labradorite [An_{52-54}]). Interstices are filled with isometric grains (0.4–0.5 mm) and segregates of clinopyroxene (45%), opaque minerals (10%), and black or brownish black glass (5%).

Alteration: slight; rock is nonoxidized.

Sample 61-462A-30R-3, 14–17 cm (Piece 1G), Unit 12 [Z-1208]

Sparsely plagioclase-phyric dolerite, fine grained. Phenocrysts (<1%): single prismatic grain (1.8 mm) of plagioclase (labradorite [An_{62}]). Groundmass (80%) with microlitic texture; prismatic crystals (0.1–0.5 mm) of plagioclase (40%, labradorite [An_{55}] and andesine [An_{47}]), segregates of small (0.1–0.3 mm) xenomorphic grains of clinopyroxene (50%), and xenomorphic grains (0.3–0.8 mm) of opaque minerals (10%). Occasionally, clinopyroxene forms large (up to 0.5 mm) xenomorphic or prismatic grains (0.7–0.8 mm).

Alteration: rock is fresh and nonoxidized.

Sample 61-462A-32R-3, 10–14 cm (Piece 2A), Unit 12 [Z-1209]

Aphyric basalt, fine grained, crystallized. Rock with microlitic texture; microlites and microlaths of plagioclase (50%). Interstices are filled with small (0.1–0.3 mm) grains and microlites (0.4–0.5 mm) of clinopyroxene (45%), opaque minerals (3%), and green altered glass (2%).

Alteration: slight; rock is nonoxidized; interstitial glass completely replaced by clay mineral; microcrack (0.4 mm in thickness) is filled with prismatic crystals of clinopyroxene (clinopyroxene almost completely replaced by aggregate of green uralite).

Sample 61-462A-44R-2, 12–14 cm (Piece 2), Unit 22 [Z-1210]

Sparsely plagioclase-phyric basalt. Phenocrysts (10%): glomerophyric segregates of prismatic crystals and laths (0.1–0.6 mm) of plagioclase (labradorite [An_{55}]). Groundmass with vitrophyric texture; glass with radial-radiant segregates of clinopyroxene and plagioclase crystallites.

Alteration: rock is fresh and nonoxidized.

Sample 61-462A-47R-1, 95–98 cm (Piece 9), Unit 23 [Z-1211]

Olivine-plagioclase-phyric basalt (glassy crust of basalt). Phenocrysts (10%): small (0.1–0.3 mm) idiomorphic grains of olivine (5%) and prismatic crystals and laths (0.1–0.4 mm) of plagioclase (10%, labradorite [An_{60}]). Groundmass with vitrophyric texture; light cream glass (areas of brownish black glass with crystallites of plagioclase are present).

Alteration: slight; olivine completely replaced by green iddingsite.

Sample 61-462A-50R-3, 130–134 cm (Piece 1E), Unit 24 [Z-1212]

Aphyric dolerite, medium grained. Rock with doleritic-poikilophitic texture; unoriented elongated-prismatic laths (0.5–1.7 mm) of plagioclase (40%). Interstices are filled with large isometric grains (1–2.5 mm) and small (0.3–0.5 mm) grains of clinopyroxene (50%), opaque minerals (5%), and altered glass (5%).

Alteration: slight; rock is nonoxidized; interstitial glass replaced by clay mineral.

Sample 61-462A-51R-4, 27–30 cm (Piece 1F), Unit 24 [Z-1213]

Olivine-plagioclase-phyric basalt. Phenocrysts (5%): small (0.1–0.3 mm) idiomorphic grains of olivine (2%) and small laths (0.1–0.7 mm) of plagioclase (3%, labradorite [An_{58}]). Groundmass with vitrophyric texture; light cream glass.

Alteration: slight; olivine completely replaced by green iddingsite.

Sample 61-462A-52R-4, 33–36 cm (Piece 1), Unit 25 [Z-1214]

Plagioclase-phyric basalt. Phenocrysts (5%): glomerophyric segregates and individual laths (0.4–0.8 mm) of plagioclase (3%, labradorite [An_{58}]). Groundmass with hyalopilitic texture; needle-shaped plagioclase (10%, andesine [An_{40}]) and brownish gray glass with segregates of clinopyroxene crystals, plagioclase, and opaque dust.

Alteration: rock is fresh and nonoxidized.

Sample 61-462A-53R-1, 143–146 cm (Piece 7B), Unit 26 [Z-1215]

Plagioclase-olivine-phyric basalt. Phenocrysts (15%): glomerophyric segregates of small (0.2–0.4 mm) idiomorphic grains of olivine (10%). Small laths (0.4–0.6 mm) of zonal plagioclase (5%, labradorite [An_{55}]) with inclusions of glass are present. Groundmass with pilotaxitic-microlitic texture; needle-shaped microlites and microlaths (up to 0.5–0.6 mm) of plagioclase (10%, andesine $An_{39–41}$), crystallized glass with segregates of clinopyroxene microlites, and individual grains of clinopyroxene.

Alteration: slight; olivine completely replaced by greenish brown iddingsite.

Sample 61-462A-55R-2, 50–52 cm (Piece 4), Unit 26 [Z-1216]

Plagioclase-olivine-phyric basalt with pilotaxitic-microlitic groundmass texture. Rock: identical to Sample 61-462A-53R-1, 143–146 cm (Z-1215).

Sample 61-462A-57R-1, 145–147 cm (Piece 13), Unit 26 [Z-1217]

Aphyric basalt, fine grained. Rock with hyalopilitic texture; needle-shaped microlites and microlaths of plagioclase (10%) and glass with segregates of microlites and crystallites of clinopyroxene and plagioclase. Rock: identical to Sample 61-462A-53R-1, 143–146 cm (Z-1215).

Alteration: slight; rock is nonoxidized.

Sample 61-462A-62R-2, 148–150 cm (Piece 2F), Unit 30 [Z-1218]

Plagioclase-olivine-phyric basalt, spotty in structure. Phenocrysts (10%): glomerophyric segregates of plagioclase (3%) and olivine (7%). Plagioclase forms small (0.2–0.4 mm) prismatic crystals (labradorite [An_{55}]). Olivine forms segregates of small (0.1–0.3 mm) idiomorphic grains. Groundmass with hyalopilitic-microlitic texture; needle-shaped microlites and microlaths of plagioclase (andesine [$An_{45–46}$]), glass with crystallites of clinopyroxene microlites, and individual grains of clinopyroxene.

Alteration: slight; olivine completely replaced by green iddingsite.

Sample 61-462A-65R-1, 59–61 cm (Piece 3), Unit 32 [Z-1219]

Aphyric dolerite, fine grained. Rock with doleritic texture; unoriented prismatic crystals and laths (0.1–0.8 mm) of plagioclase (40%, labradorite [An_{65}] and andesine [An_{44}]). Interstices are filled with small (0.1–0.3 mm) xenomorphic grains of clinopyroxene (45%), olivine (5%), opaque minerals (5%), and greenish brown glass (5%).

Alteration: slight.

Sample 61-462A-74R-4, 25–31 cm (Piece 1A), Unit 35 [Z-1220]

Aphyric dolerite, medium grained. Rock with ophitic texture; prismatic crystals and laths (0.5–1.7 mm) of zonal plagioclase (50%). Plagioclase consist of inclusions of glass. Interstices are filled with segregate of xenomorphic grains (0.1–0.7 mm) of clinopyroxene (45%), opaque minerals, and glass (5%).

Alteration: slight (5%); interstitial glass completely replaced by clay mineral.

Sample 61-462A-79R-5, 140–146 cm (Piece 1J), Unit 38 [Z-1221]

Aphyric basalt, crystallized. Rock with microlitic texture; microlites (0.1–0.2 mm) of plagioclase (35%, labradorite [An_{53}] and andesine [An_{43}]). Interstices are filled with small (0.01–0.1 mm) rounded grains of clinopyroxene (45%), altered olivine (5%), opaque minerals (5%), and brownish oxidized glass (10%).

Alteration: slight; interstitial glass is oxidized; olivine completely replaced by clay minerals.

Sample 61-462A-80R-2, 122–124 cm (Piece 3), Unit 40 [Z-1222]

Aphyric basalt with microlitic texture, crystallized. Rock: identical to Sample 61-462A-79R-5, 140–146 cm (Z-1221).

Alteration: slight; interstitial glass is oxidized; olivine completely replaced by clay minerals.

Sample 61-462A-88R-3, 9–11 cm (Piece 1A), Unit 43 [Z-1223]

Breccia of aphyric basalt, fine grained. Rock: fragments (1.2–10 mm) of basalt and smectite cement. Basalt: identical to Sample 61-462A-80R-2, 122–124 cm (Z-1222).

Alteration: slight; cement is smectite.

Sample 61-462A-89R-2, 15–16 cm (Piece 1), Unit 43 [Z-1224]

Plagioclase-clinopyroxene-olivine-phyric basalt. Phenocrysts (10%): single (1%) prismatic crystals of plagioclase (labradorite [An_{55}]), segregates of xenomorphic grains (0.2–0.3 mm) of clinopyroxene, and idiomorphic grains (0.1–0.4 mm) of olivine (6%). Groundmass with hyalopilitic-microlitic texture; microlites and microlaths of plagioclase (40%, andesine [An_{42}]), small (0.05–0.2 mm) rounded grains of clinopyroxene, opaque minerals (5%), and greenish brown glass.

Alteration: slight; olivine is oxidized and completely replaced by greenish brown iddingsite.

Sample 61-462A-90R-3, 88–90 cm (Piece 1H), Unit 44 [Z-1225]

Plagioclase-clinopyroxene-olivine-phyric basalt. Rock: identical to Sample 61-462A-89R-2, 15–16 cm (Z-1224).

Alteration: slight; olivine completely replaced by clay minerals.

South Pacific (Leg 91)

Hole 595B

Sample 91-595B-2R-1, 30–35 cm (Piece 3A), Unit 2 [Z-429]

Aphyric basalt, fine grained, inequigranular, incompletely crystallized, sparsely vesicular. Rock is subvariolitic, occasionally variolitic, texture; laths of plagioclase, clinopyroxene, and devitrified volcanic glass with opaque dust. Single vesicles are 0.2–0.4 mm.

Alteration: slight (~10%); interstitial glass is replaced with smectite.

XRD: smectite.

Sample 91-595B-3R-1, 119–124 cm (Piece 5B), Unit 2 [Z-430]

Aphyric basalt, fine grained, incompletely crystallized, massive. Rock is subvariolitic texture; laths of plagioclase, clinopyroxene, devitrified volcanic glass with opaque dust, and isometric and elongated grains of opaque minerals.

Alteration: slight (~5%); interstitial glass is replaced with smectite.

XRD: smectite.

Sample 91-595B-3R-2, 68–72 cm (Piece 3B), Unit 2 [Z-431]

Aphyric basalt, fine grained, incompletely crystallized, massive. Rock is subvariolitic, occasionally variolitic, texture; laths of plagioclase, clinopyroxene, devitrified volcanic glass with opaque dust, and grains of opaque minerals.

Alteration: slight (~3%); interstitial glass partly replaced by smectite.

XRD: smectite.

Sample 91-595B-4R-1, 17–22 cm (Piece 1B), Unit 2 [Z-432]

Aphyric basalt, fine grained, incompletely crystallized, sparsely vesicular. Rock is intergranular texture; laths of plagioclase, clinopyroxene, olivine, devitrified volcanic glass with opaque dust, and isometric and elongated grains of opaque minerals. Rare vesicles are empty.

Alteration: slight (~5%); interstitial glass and olivine are replaced with smectites.

XRD: smectite.

Sample 91-595B-4R-2, 8–13 cm (Piece 1A), Unit 2 [Z-433]

Aphyric basalt, fine grained, crystallized, massive. Rock is subvariolitic texture; laths of plagioclase, clinopyroxene, devitrified volcanic glass with opaque dust, and isometric and elongated grains of opaque minerals. Single vesicles are present.

Alteration: slight (~3%); interstitial glass is replaced with smectite; vesicles are filled with smectite.

XRD: smectite.

Sample 91-595B-4R-3, 145–147 cm (Piece 4C), Unit 2 [Z-434]

Aphyric basalt, fine grained, incompletely crystallized, massive. Rock is intergranular, partly subvariolitic, texture; laths of plagioclase, clinopyroxene, devitrified volcanic glass, and opaque minerals.

Alteration: slight (~3%); interstitial glass is replaced with smectite.

XRD: smectite.

Sample 91-595B-5R-1, 90–95 cm (Piece 6), Unit 2 [Z-435]

Aphyric basalt, fine grained, incompletely crystallized, massive. Rock is intergranular texture; laths of plagioclase, clinopyroxene, olivine, devitrified volcanic glass, and opaque minerals. Single phenocrysts plagioclase, clinopyroxene, and olivine are registered.

Alteration: slight (~5%); interstitial glass and olivine are replaced with smectite.

XRD: smectite.

Sample 91-595B-5R-2, 87–91 cm (Piece 7A), Unit 2 [Z-436]

Aphyric basalt, fine grained, almost completely crystallized, massive. Rock is intergranular texture; laths of plagioclase, clinopyroxene, devitrified volcanic glass, and opaque minerals. Single vesicles (0.2 mm) are present.

Alteration: slight (~3%); interstitial glass is replaced with smectite; vesicles are filled with smectite.

XRD: smectite.

Sample 91-595B-6R-1, 136–142 cm (Piece 14), Unit 2 [Z-437]

Aphyric basalt, fine grained, incompletely crystallized, massive. Rock is intersertal texture; laths of plagioclase, clinopyroxene, devitrified volcanic glass, and opaque minerals. Single vesicles (0.2 mm) are present.

Alteration: slight (~3%); interstitial glass is replaced with smectite; vesicles are filled with smectite.

XRD: smectite contains ~10% of mica layers.

Sample 91-595B-6R-2, 129–131 cm (Piece 15), Unit 2 [Z-438]

Plagioclase-phyric basalt (dolerite?), completely crystallized, vesicular. Phenocrysts of plagioclase (0.5–6 mm, 60%), clinopyroxene (0.4–0.8 mm up to 1 mm, 20%), and olivine (0.2–0.4 mm, 5%). Groundmass is doleritic texture; laths of plagioclase, clinopyroxene, olivine, devitrified volcanic glass, and opaque minerals. Single vesicles (0.2 mm) are present.

Alteration: slight (~10%); interstitial glass and olivine are replaced with smectite; vesicles are filled with smectite.

XRD: smectite contains ~20% of mica layers.

Sample 91-595B-7R-3, 18–22 cm (Piece 4), Unit 3 [Z-439]

Aphyric basalt, fine grained, almost completely crystallized, vesicular (0.3–0.8 mm, ~8%). Rock is subvariolitic texture; laths of plagioclase, clinopyroxene, devitrified volcanic glass, and opaque minerals.

Alteration: slight (10%); interstitial glass and olivine are replaced with smectite; vesicles are filled with smectite.

XRD: smectite contains single mica layers.

Argo Abyssal Plain (Leg 123)

Hole 765D

Sample 123-765D-1R-2, 8–10 cm (Piece 1A), Unit 1 [Z-86]

Aphyric basalt, medium grained, almost completely crystallized, vesicular (0.3–0.5 to 1 mm, 10%). Single microphenocrysts of plagioclase and clinopyroxene. Groundmass is intergranular (occasionally subvariolitic) texture; laths of plagioclase, clinopyroxene, olivine, devitrified volcanic glass, and opaque dust.

Alteration: slight (10%); olivine and interstitial glass are replaced with smectite and carbonate; vesicles are filled with smectite or/and carbonate.

XRD: smectites with various content of interlayer cations: Na-K and Mg-Ca; smectites contain ~10% mica layers.

Sample 123-765D-5R-1, 130–132 cm (Piece 8E), Unit 3 [Z-87]

Aphyric basalt, fine grained, almost completely crystallized, vesicular (0.1–0.3 mm, 10%). Single microphenocrysts of plagioclase. Groundmass is subvariolitic texture; laths of plagioclase, clinopyroxene, olivine, devitrified volcanic glass, and opaque dust.

Alteration: slight (10%); olivine and interstitial glass are replaced with smectite; vesicles are filled with smectite.

XRD: smectite.

Sample 123-765D-5R-5, 143–145 cm (Piece 3B), Unit 3 [Z-89]

Aphyric basalt, fine grained, almost completely crystallized, vesicular (0.2–0.4 mm, 5%). Groundmass is subvariolitic (occasionally intergranular) texture; laths of plagioclase, clinopyroxene, olivine, devitrified volcanic glass, and opaque minerals.

Alteration: slight (~5%); rock is nonoxidized; olivine and interstitial glass are replaced with smectites; vesicles are filled with smectites.

XRD: smectites with various content of interlayer cations: Na-K and Mg-Ca.

Sample 123-765D-7R-2, 135–137 cm (Piece 6B), Unit 6 [Z-80]

Aphyric basalt (dolerite?), coarse grained, completely crystallized, vesicular (0.2–0.5 mm, 5%). Rock is poikilophitic texture; laths of plagioclase, clinopyroxene, olivine, devitrified volcanic glass, and opaque minerals.

Alteration: slight (~5%); olivine and interstitial glass are replaced with smectites; vesicles and cracks are filled with smectites.

XRD: smectites with various content of interlayer cations: Na-K and Mg-Ca; trace hydromica.

Sample 123-765D-9R-1, 17–21 cm (Piece 1A), Unit 7 [Z-81]

Aphyric basalt (dolerite?), coarse grained, completely crystallized, massive. Rock is poikilophitic texture; laths of plagioclase, clinopyroxene, olivine, devitrified volcanic glass, and opaque minerals.

Alteration: scarce (~1%); olivine and interstitial glass are replaced with smectites.

XRD: smectites with various content of interlayer cations: Na-K and Mg-Ca.

Sample 123-765D-17R-2, 49–52 cm (Piece 6), Unit 13 [Z-83]

Aphyric basalt, fine grained, almost completely crystallized, vesicular (0.2–0.3 mm, 3%). Groundmass is subvariolitic texture; laths of plagioclase, clinopyroxene, olivine, devitrified volcanic glass, and opaque minerals.

Alteration: slight (~5%); olivine and interstitial glass are replaced with smectites; vesicles are filled with smectites.

XRD: smectites with various content of interlayer cations: Na-K and Mg-Ca; trace hydromica.

Sample 123-765D-18R-1, 82–84 cm (Piece 1E), Unit 14 [Z-90]

Aphyric basalt, fine grained, almost completely crystallized, vesicular (0.2–0.3 mm, 3%). Groundmass is intergranular (occasionally) subvariolitic texture; laths of plagioclase, clinopyroxene, olivine, devitrified volcanic glass, and opaque minerals.

Alteration: slight (~3%–5%); olivine and interstitial glass are replaced with smectites; vesicles are filled with smectites.

XRD: smectites with various content of interlayer cations: Na-K and Mg-Ca; hydromica in trace amounts.

Sample 123-765D-19R-1, 78–84 cm (Piece 4B), Unit 15 [Z-1358]

Sparsely plagioclase-phyric basalt, crystallized, vesicular. Phenocrysts (1%): prismatic grains (0.6–0.8 mm) of plagioclase. Groundmass with microlitic (microdoleritic) texture; microlites and microlaths (0.1–0.2 mm) of

plagioclase (30%, andesine [An_{44-46}]). Interstices consist of panicle like segregate of clinopyroxene microlites (45%); volcanic glass (5%) and opaque minerals (10%). Vesicles (10%, 0.2–0.4 mm) are rounded in shape. They are empty and lined by brown glass.

Alteration: rock is fresh and nonoxidized.

XRD: smectite.

Sample 123-765D-22R-1, 2–4 cm (Piece 1A), Unit 16 [Z-88]

Aphyric basalt, fine grained, almost completely crystallized, vesicular (0.2 mm, 1%). Groundmass is intergranular (occasionally subvariolitic) texture; laths of plagioclase, clinopyroxene, olivine, devitrified volcanic glass, and opaque minerals.

Alteration: slight (~3%); rock is nonoxidized; olivine and interstitial glass are replaced with smectites; vesicles are filled with carbonate.

XRD: smectite.

Sample 123-765D-24R-1, 7–9 cm (Piece 1A), Unit 17 [Z-82]

Aphyric basalt (dolerite?), coarse grained, almost completely crystallized, massive. Rock is poikilophitic texture; laths of plagioclase, clinopyroxene, olivine, devitrified volcanic glass, and opaque minerals.

Alteration: slight (8%); rock is nonoxidized; olivine and interstitial glass are replaced with smectite.

XRD: smectite.

Sample 123-765D-27R-2, 31–33 cm (Piece 1C), Unit 22 [Z-85]

Aphyric basalt, medium grained, almost completely crystallized, vesicular (0.3–0.4 mm, 5%). Groundmass is intergranular (occasionally subvariolitic) texture; laths of plagioclase, clinopyroxene, olivine, devitrified volcanic glass, and opaque minerals.

Alteration: slight (~10%); olivine and interstitial glass are replaced with smectite; vesicles are filled with smectite or carbonate.

XRD: hydromica and smectite.

Sample 123-765D-27R-3, 4–6 cm (Piece 1), Unit 22 [Z-84]

Aphyric basalt, medium grained, almost completely crystallized, vesicular (0.3–1 mm, 8%). Single phenocrysts of plagioclase (0.5 mm). Groundmass is intergranular texture; laths of plagioclase, clinopyroxene, olivine, devitrified volcanic glass, and opaque minerals.

Alteration: slight (~10%); rock is nonoxidized; olivine and interstitial glass are replaced with smectite and carbonate; vesicles are filled with carbonate.

XRD: smectite and hydromica.

Pigafetta Basin (Leg 129)

Hole 801B

Sample 129-801B-40R-1, 26–28 cm (Piece 5), Unit B4 [Z-776]

Aphyric basalt, crystallized, massive. Rock with microintersertal texture; unoriented laths (0.5–2 mm) of plagioclase. Interstices are filled with glass and opaque dust, xenomorphic and needle-shaped grains of opaque minerals (20%).

Alteration: slight to moderate (20%); plagioclase grains and interstitial glass replaced by smectite.

XRD: smectite; trace hydromica and swelling chlorite.

Sample 129-801B-41R-1, 20–22 cm (Piece 3), Unit B5 [Z-777]

Aphyric dolerite, crystallized, massive. Rock: identical to Sample 129-801B-40R-1, 26–28 cm (Z-776).

Alteration: slight to moderate (20%).

XRD: smectite with ~20% mica layers; trace mixed-layer chlorite-smectite mineral with ~10% swelling interlayers, mica(?), and amphibole(?).

Sample 129-801B-41R-1, 141–143 cm (Piece 3), Unit B5 [Z-778]

Aphyric dolerite, coarse grained, massive. Rock with ophitic texture; elongated-prismatic crystals (1–3 mm) of zonal plagioclase (50%) with undulatory extinction. Interstices are filled with xenomorphic and elongated-prismatic grains (1–2.5 mm) of clinopyroxene-augite-Ti augite (40%).

Alteration: slight to moderate (20%); clinopyroxene partly replaced by clay mineral; some areas of interstices consist of albite, opaque minerals, smectites, chlorite, and carbonate.

Sample 129-801B-42R-1, 91–93 cm (Piece 5B), Unit B6 [Z-779]

Aphyric dolerite with ophitic texture, coarse grained, massive. Rock: identical to Sample 129-801B-41R-1, 141–143 cm (Z-778).

Alteration: moderate (25%–30%); clinopyroxene partly replaced by chlorite; biotite and apatite are present.

XRD: smectite with different interlayer cations: Na-K and Ca-Mg; trace chlorite and mica.

Sample 129-801B-43R-2, 8–10 cm (Piece 1B), Unit B7 [Z-780]

Aphyric dolerite with ophitic texture, coarse grained, massive. Rock: identical to Sample 129-801B-41R-1, 141–143 cm (Z-778) and Sample 129-801B-42R-1, 91–93 cm (Z-779).

Alteration: strong (50%); clinopyroxene partly (60%) replaced by clay mineral; chlorite replaces plagioclase.

XRD: smectite with different interlayer cations: Na-K and Ca-Mg; trace chlorite and mica.

Sample 129-801B-43R-3, 128–129 cm (Piece 17), Unit B9 [Z-781]

Plagioclase-phyric dolerite, medium grained, massive. Phenocrysts (10%): large (up to 3 mm) xenocrysts of plagioclase with inclusions of glass. Groundmass with ophitic texture; prismatic grains and laths (0.2–1 mm) of plagioclase (50%, labradorite [An_{60}] and andesine [An_{48}]). Interstices are filled with small (0.2–0.4 mm) rounded grains of altered olivine (10%), xenomorphic grains of clinopyroxene, and opaque minerals (5%–6%).

Alteration: slight (10%); olivine completely replaced by iddingsite.

Sample 129-801B-43R-4, 40–41 cm (Piece 4A), Unit B11 [Z-782]

Aphyric dolerite, fine grained, massive. Rock with doleritic texture; prismatic grains and laths (0.2–0.8 mm) of plagioclase (labradorite [An_{60}]) with undulatory extinction. Interstices are filled with grains (0.1–0.2 mm and up to 0.8 mm) of clinopyroxene and opaque minerals (4%–5%).

Alteration: slight; clay mineral is in interstices.

XRD: smectite with ~20% mica layers; trace mixed-layer chlorite-smectite mineral with ~10% swelling interlayers, mica(?), and calcite.

Sample 129-801B-44R-1, 105–107 cm (Piece 2E), Unit B12 [Z-783]

Aphyric basalt, massive. Rock with pilotaxitic texture; microlites of plagioclase (labradorite [An_{58}]), clinopyroxene, altered glass, and opaque minerals (10%).

Alteration: strong (60%); interstitial glass completely replaced by clay mineral.

XRD: smectite; minor hydromica and mixed-layer chlorite-smectite mineral; trace chlorite.

Sample 129-801B-44R-2, 32–33 cm (Piece 4A), Unit B13 [Z-784]

Aphyric basalt, crystallized, massive. Rock with intersertal texture; segregates of elongated laths (up to 2 mm) of plagioclase. Interstices are filled with altered glass and unoriented needle-shaped grains (0.1–0.2 mm) of opaque minerals (35%–40%).

Alteration: very strong (80%); plagioclase almost completely replaced by clay minerals; interstitial glass completely replaced by clay mineral.

XRD: smectite with ~10% mica layers; trace mica.

Sample 129-801B-44R-3, 27–28 cm (Piece 2), Unit B14 [Z-785]

Plagioclase-phyric basalt with xenolites(?) of dolerite.

Alteration: olivine completely replaced by carbonate; augite replaced by clay mineral; plagioclase partly replaced by clay mineral; abundant needle-shaped large (0.6–0.7 mm) grains of opaque minerals; microcracks (0.1–0.2 mm) are filled with carbonate.

Hole 801C

Sample 129-801C-1R-1, 107–109 cm (Piece 2G), Unit C1 [Z-786]

Aphyric dolerite, medium grained, massive. Rock with ophitic texture; prismatic and elongated-prismatic grains (1–2 mm) of zonal plagioclase (labradorite [An_{62-64}]) with undulatory extinction and grains (0.5–1 mm and up to 4 mm) of augite-Ti augite. Interstices are filled with panicle like microlites of clinopyroxene and plagioclase. Opaque minerals (7%–8%) forms needle-shaped grains (0.3–0.6 mm) and xenomorphic grains.

Alteration: moderate (30%–40%); plagioclase partly (30%) replaced by smectites and albite; clinopyroxene partly (15%–20%) replaced by chlorite; hydromica, biotite, and apatite replace microlites of clinopyroxene and plagioclase.

Sample 129-801C-1R-2, 10–11 cm (Piece 1A), Unit C1 [Z-787]

Aphyric dolerite with ophitic texture, medium grained, massive. Rock: identical to Sample 129-801C-1R-1, 107–109 cm (Z-786).

XRD: smectite with ~20% mica layers and mica; trace mixed-layer chlorite-smectite mineral with ~10% swelling interlayers.

Sample 129-801C-2R-1, 6–7 cm (Piece 1A), Unit C3 [Z-788]

Sparsely olivine(?)-plagioclase-phyric basalt, coarse grained. Phenocrysts: single tabular microphenocryst (0.5 mm) of plagioclase; idiomorphic and skeletal grains (0.3 mm) of altered dark-colored mineral (olivine?). Groundmass with vitrophyric texture; volcanic glass with panicle like segregates of olivine(?) crystallites; plagioclase and opaque dust.

Alteration: moderate (20%–30%); olivine completely replaced by carbonate; plagioclase almost completely replaced by smectites; microcrack (0.2 mm) is filled with carbonate.

Sample 129-801C-2R-5, 106–107 cm (Piece 2), Unit C6 [Z-789]

Aphyric dolerite with doleritic texture, fine grained, massive. Rock: identical to Sample 129-801C-1R-1, 107–109 cm (Z-786) and Sample 129-801C-1R-2, 10–11 cm (Z-787).

Alteration: moderate (30%); plagioclase partly replaced by smectites; clinopyroxene partly replaced by chlorite; interstitial minerals replaced by smectites, biotite, and apatite.

Sample 129-801C-3R-1, 44–46 cm (Piece 2C), Unit C7 [Z-790]

Aphyric dolerite, fine grained, massive. Rock is represented mainly by prismatic grains of plagioclase (90%). Relicts of dark-colored minerals are absent (plagioclasite?). Opaque minerals (10%) form small (0.1 mm) xenomorphic or needle-shaped grains and abundance opaque dust.

Alteration: very strong (80%–90%); plagioclase completely replaced by smectites.

XRD: smectite with ~10% mica layers; minor mixed-layer chlorite-smectite mineral with ~45% swelling interlayers; trace chlorite and mica.

Sample 129-801C-4R-1, 18–21 cm (Piece 4), Unit C8 [Z-791]

Fe hydroxides (hydrothermal deposit).

XRD: quartz.

Sample 129-801C-4R-2, 111–114 cm (Piece 13), Unit C8 [Z-792]

Rock: identical to Sample 129-801C-4R-1, 18–21 cm (Z-791).

XRD: quartz; trace goethite.

Sample 129-801C-5R-1, 44–45 cm (Piece 2C), Unit C9 [Z-793]

Plagioclase-phyric basalt, massive. Phenocrysts (8%–10%): prismatic and elongated-prismatic grains (1.2–2.5 mm) of zonal plagioclase. Groundmass with microintersertal texture; unoriented laths (0.2–0.5 mm) of plagioclase (labradorite [An_{55}]). Opaque minerals is present (8–10%).

Alteration: strong (60%); plagioclase almost completely (90%) replaced by carbonate; interstices are filled with smectites.

Sample 129-801C-5R-2, 17–18 cm (Piece 1A), Unit C9 [Z-794]

Sparsely plagioclase-phyric basalt, massive. Phenocrysts: one prismatic grain (1.3 mm) of zonal plagioclase (labradorite [An_{55}]). Groundmass with hyalopilitic texture; needle-shaped microlites of plagioclase and altered glass with opaque dust. Rock is brecciated (partly).

Alteration: very strong (90%); plagioclase phenocryst partly replaced by carbonate; interstitial glass completely replaced by clay mineral; microcracks (0.5–1 mm) are filled with clay mineral and carbonate.

XRD: smectite; trace mica with ~20% swelling interlayers and calcite.

Sample 129-801C-5R-3, 98–100 cm (Piece 4B), Unit C10 [Z-795]

Plagioclase-phyric basalt, massive. Phenocrysts (40%): prismatic grains (1–5 mm) of plagioclase (labradorite-bitovnite [An_{70}]) and their glomerophyric segregates. Groundmass with pilotaxitic texture; needle-shaped microlites and black glass.

Alteration: fresh; microcracks (5%–7%, 0.1–0.3 mm, up to 0.8 mm in thickness) are filled with carbonate.

XRD: smectite with ~30% mica layers.

Sample 129-801C-5R-5, 55–58 cm (Piece 3C), Unit C13 [Z-796]

Aphyric dolerite, fine grained, massive. Rock with doleritic-intersertal texture; laths (0.1–0.9 mm) of plagioclase (labradorite [An_{64-68}]). Interstices are filled with segregate of small (<0.1 mm) rounded grains of olivine (25%) and xenomorphic grains of clinopyroxene (diopside-pigeonite) with opaque minerals.

Alteration: fresh.

Sample 129-801C-7R-1, 51–53 cm (Piece 4C), Unit C21 [Z-797]

Aphyric dolerite, massive. Rock with intersertal-doleritic texture; laths (0.1–0.8 mm) of plagioclase (labradorite [An_{55-57}]). Interstices are filled with segregate of small (0.1–0.2 mm) isometric grains of clinopyroxene (pigeonite); altered glass (25%) with opaque minerals.

Alteration: interstitial glass replaced by clay mineral.

Sample 129-801C-7R-3, 38–41 cm (Piece 1E), Unit C23 [Z-798]

Aphyric dolerite, sparsely vesicular. Rock with intersertal-doleritic texture. Rock: identical to Sample 129-801C-7R-1, 51–53 cm (Z-797). Sparse vesicles (3%–4%, 0.2–0.3 mm) are present.

Alteration: vesicles are filled with carbonate.

Sample 129-801C-8R-1, 9–12 cm (Piece 2C), Unit C23 [Z-799]

Aphyric basalt, crystallized, sparsely vesicular. Rock with microlitic texture; microlites and laths (0.05–0.8 mm) of plagioclase (laths: labradorite [An_{68}]; microlites: labradorite [An_{55}] and andesine [An_{48}]), rounded-isometric grains of clinopyroxene (pigeonite), and glass with panicle like microlites of clinopyroxene and opaque minerals.

Alteration: microcracks (0.2 mm) are filled with carbonate and clay mineral.

XRD: smectite with ~5% mica layers.

Sample 129-801C-10R-1, 60–62 cm (Piece 1G), Unit C25 [Z-800]

Aphyric dolerite with intersertal-doleritic texture, fine grained, massive. Rock: identical to Sample 129-801C-7R-1, 51–53 cm (797).

Emperor Seamount Chain (Leg 55)

Ojin Seamount (Hole 430A)

Sample 55-430A-5R-4, 105–108 cm (Piece 12), Unit 2 [Z-1110]

Aphyric trachyandesite, vesicular. Rock with pilotaxitic (occasionally, with trachydoid) texture; microlaths (0.1–0.5 mm) of plagioclase (60%, from andesine [An_{48}] to andesine [An_{42}]), black glass (15%), and opaque minerals (10%). Vesicles (15%, 1.2–4 mm) are oval in shape.

Alteration: slight (5%–10%); rock is slightly oxidized (5%); vesicles are filled with carbonate.

Sample 55-430A-5R-5, 33–37 cm (Piece 5), Unit 2 [Z-1111]

Aphyric trachyandesite, vesicular. Rock with pilotaxitic (occasionally, with trachytoid) texture; microlaths (0.1–0.5 mm) of plagioclase (40%, from andesine [An_{46}] to andesine [An_{35}]), black to dark green altered glass (20%), and grains (0.01–0.3 mm) of opaque minerals (15%). Vesicles (25%, 2.5–5 mm) are oval in shape. Walls of vesicles are lined dark green altered glass.

Alteration: slight to moderate (15%–20%); interstitial glass replaced by clay mineral; clay mineral replaces glass from vesicles.

XRD: smectite with ~10% mica layers; trace mixed-layer smectite-swelling chlorite(?).

Sample 55-430A-5R-5, 96–101 cm (Piece 10), Unit 2 [Z-1619]

Aphyric trachybasalt, fine grained, sparsely vesicular. Rock with trachytoid texture; subparallel oriented microlaths (0.1–0.6 mm) of plagioclase (75%, andesine [An_{39-40}]). Interstices are filled with small (<0.1 mm) grains of clinopyroxene (5%), opaque minerals (5%), and altered glass (15%) with biotite (<1%) and chlorite. Single vesicle (2 mm) are oval in shape, empty.

Alteration: slight (15%); rock is nonoxidized; interstitial glass partly replaced by clay mineral.

Sample 55-430A-6R-1, 6–11 cm (Piece 1), Unit 2 [Z-1620]

Clinopyroxene-phyric basalt, crystallized, fine grained. Phenocrysts (35): isometric grains (0.8–1.7 mm) of clinopyroxene with abundant inclusions of plagioclase microlaths. Groundmass with microlitic texture; microlites and microlaths (0.1–0.4 mm) of plagioclase (30%, from andesine [An_{45}] to andesine [An_{37}]). Interstices are filled with isometric grains of orthoclase (5%), small grains of clinopyroxene (5%), altered dark green glass (15%), and abundant idiomorphic pseudocubic grains (0.1–0.2 mm) of opaque minerals.

Alteration: slight (15%–17%); rock is nonoxidized; interstitial glass partly replaced by clay mineral; orthoclase is pelletized.

Sample 55-430A-6R-1, 98–103 cm (Piece 7B), Unit 2 [Z-1622]

Aphyric basalt, crystallized, medium grained. Rock with intersertal-doleritic texture; laths (0.2–0.8 mm) of plagioclase (40%, andesine [$An_{42–45}$]). Interstices are filled with xenomorphic grains (0.1–0.3 mm) of clinopyroxene (35%), altered glass (20%), and opaque minerals (5%).

Alteration: slight to moderate (20%); rock is nonoxidized; interstitial glass partly by clay mineral, sparse biotite is present.

Sample 55-430A-6R-2, 24–30 cm (Piece 4), Unit 3 [Z-1112]

Aphyric hawaiite (trachyandesite), fine grained, vesicular. Rock with trachytic texture; laths and microlites (0.1–0.4 mm) of plagioclase (50%, andesine [An_{38}]). Interstices are filled with altered clinopyroxene (10%), altered glass (20%), and needles of opaque minerals (10%). Single idiomorphic grains (up to 0.4 mm) of opaque minerals are present. Vesicles (25%, 2 mm) are rounded in shape.

Alteration: moderate (30%); rock is nonoxidized; interstitial glass and clinopyroxene replaced by clay mineral; walls of vesicles are lined celadonite(?).

Sample 55-430A-6R-3, 19–24 cm (Piece 2), Unit 3 [Z-1623]

Aphyric trachybasalt, crystallized, fine grained. Rock with trachytoid texture; subparallel microlites and microlaths (0.1–0.6 mm) of plagioclase (65%, andesine [$An_{40–45}$]). Interstices are filled with small (<0.1 mm) grains of clinopyroxene (15%), laths of plagioclase, opaque minerals (5%–7%), and altered glass (15%).

Alteration: moderate (30%); rock is nonoxidized; interstitial glass and clinopyroxene completely replaced by clay mineral (sparse biotite is present in altered glass); plagioclase partly (40%–50%) replaced by smectites.

Nintoku Seamount (Hole 432A)

Sample 55-432A-2R-1, 99–104 cm (Piece 8E), Unit 1 [Z-1624]

Plagioclase-phyric basalt, crystallized, medium grained, massive. Phenocrysts (35%): two prismatic crystals (2.5 mm and 7 mm) of plagioclase. Groundmass with microdoleritic texture; laths (0.2–0.6 mm) of plagioclase (25%; andesine [An_{45}], andesine-labradorite [An_{50}], and andesine [An_{32}]). Interstices: isometric grains (0.1–0.3 mm) of clinopyroxene (20%), opaque minerals (10%), and altered glass (5%).

Alteration: slight (5%); rock is non oxidized; clay mineral replaces interstitial glass.

XRD: smectite and mixed-layer smectite-chlorite mineral; trace chlorite with swelling interlayers.

Sample 55-432A-2R-2, 102–107 cm (Piece 11C), Unit 2 [Z-1627]

Plagioclase-phyric basalt with microdoleritic groundmass texture, crystallized, medium grained, sparsely microvesicular. Rock is the same as Sample 55-432A-2R-1, 99–104 cm (Z-1624). Interstitial isometric "vesicles" (5%, 0.2–0.6 mm) are lined with celadonite(?).

Alteration: slight (1%–2%); rock is slightly oxidized (10%).

Sample 55-432A-2R-3, 43–48 cm (Piece 1E), Unit 2 [Z-1629]

Plagioclase-phyric basalt, crystallized, medium grained, sparsely vesicular. Phenocrysts (40%): large prismatic crystals (6–11) of plagioclase (labradorite [$An_{54–56}$]). Groundmass with microdoleritic-intersertal texture; microlites and laths (0.2–1 mm) of plagioclase (30%, andesine [An_{46}] and andesine [An_{40}]). Interstices consist of xenomorphic grains of clinopyroxene (10%), oxidized olivine (5%), opaque minerals (5%), and interstitial "microvesicles" (2%–3%, 0.2–0.7 mm). Two large (1.7 mm) vesicles are oval in shape.

Alteration: slight (5%–7%); clay mineral replaces interstitial glass; walls of vesicles are lined with clay mineral.

Sample 55-432A-3R-1, 9–12 cm (Piece 1), Unit 3 [Z-1113]

Olivine-phyric basalt, fine grained. Phenocrysts (10%): idiomorphic grains (0.2–3 mm) of oxidized olivine. Groundmass with hyalopilitic; glass which contains segregate of microlites (up to 0.1 mm) of plagioclase (50%), very small (up to 0.05 mm) grains of opaque minerals.

Alteration: rock is fresh.

XRD: smectite with ~10% mica layers.

Sample 55-432A-3R-2, 15–20 cm (Piece 2), Unit 3 [Z-1631]

Olivine-phyric basalt, crystallized, fine grained. Phenocrysts (10%): idiomorphic grains (0.2–1 mm) of olivine. Groundmass with microlitic texture; microlites (0.1–0.2 mm) of plagioclase (50%, andesine [An_{42}] and andesine [An_{33}]). Interstices consist of segregate of small (<0.05 mm) black grains of clinopyroxene (25%); small (<0.1 mm) grains of olivine (5%) and opaque minerals (10%).

Alteration: slight (12%); partly oxidized olivine is replaced with iddingsite.

Sample 55-432A-3R-3, 70–75 cm (Piece 7), Unit 3 [Z-1632]

Aphyric basalt, crystallized, fine grained, sparsely vesicular. Rock with microlitic texture; microlites and microlaths (0.1–0.3 mm) of plagioclase (50%, labradorite [An_{66}] and andesine [An_{46}]). Interstices consist of grains (0.01–0.4 mm) of clinopyroxene (25%), small (up to 0.3 mm) grains of olivine (5%), opaque minerals (10%). and altered glass (5%). Two vesicles (0.7 mm and 1.2 mm) are rounded in shape.

Alteration: slight (10%); olivine replaced by iddingsite; clay mineral replaces glass; vesicles are filled with smectites or carbonate.

Sample 55-432A-4R-3, 140–145 cm (Piece 14), Unit 3 [Z-1633]

Aphyric basalt, crystallized, medium grained, sparsely vesicular. Rock with microlitic texture (some areas demonstrate poikilophitic texture); idiomorphic grains (0.1–0.5 mm) of oxidized olivine (20%), xenomorphic grains (0.1–0.3 mm) of clinopyroxene (20%), microlites and microlaths (0.1–0.3 mm) of plagioclase (40%, andesine [An_{45}] and andesine [An_{40}]). Interstices consist of glass (10%) and opaque minerals (10%).

Alteration: slight (10%); plagioclase partly (10%) is pelletized and replaced by smectites; clay mineral replaces glass.

Sample 55-432A-4R-4, 80–83 cm (Piece 6B), Unit 3 [Z-1114]

Clinopyroxene-olivine-phyric alkali basalt, medium grained, massive. Microphenocrysts (20%): idiomorphic grains (up to 0.6 mm) of oxidized olivine (5%) and xenomorphic grains (0.5–0.7 mm) of clinopyroxene (15%) which contains inclusions of plagioclase microlites. Groundmass with microlitic texture; microlites (0.1–0.3 mm) of plagioclase (30%, andesine [$An_{36–37}$]), small (0.1–0.2 mm) idiomorphic grains of oxidized olivine (20%), altered grains of clinopyroxene (10%), idiomorphic (0.1 mm) grains of opaque minerals (10%), xenomorphic grains (up to 0.1 mm) of orthoclase(?) with small (0.05 mm) needles of apatite, and volcanic glass (<5%).

Alteration: slight to moderate (20%); olivine is oxidized; clinopyroxene and interstitial glass completely replaced by clay mineral.

XRD: smectite with ~20% mica layers; trace mixed-layer chlorite-smectite mineral with ~10% swelling interlayers and hydromica.

Sample 55-432A-4R-5, 56–61 cm (Piece 4), Unit 3 [Z-1634]

Olivine-plagioclase-phyric basalt, crystallized, medium grained, massive. Phenocrysts (30%): large (2.5–6 mm) rounded-tabular (xenocrysts) grains of plagioclase (20%, labradorite [An_{60}]) and idiomorphic grains (0.4–0.8 mm) of olivine (10%). Groundmass with microlitic texture; laths (0.2–0.6 mm) of plagioclase (35%, andesine [An_{46}] and andesine [An_{38}]). Interstices are filled with small (0.2 mm) grains of olivine (5%), segregate of small (0.05–0.2 mm) xenomorphic grains of clinopyroxene (20%), volcanic glass (5%) and opaque minerals (5%).

Alteration: slight to moderate (20%); oxidized olivine is replaced with iddingsite; interstitial glass completely replaced by clay mineral.

Sample 55-432A-5R-1, 100–105 cm (Piece 2B), Unit 3 [Z-1635]

Aphyric basalt, crystallized, fine grained. Rock with microlitic texture; microlites and microlaths (0.1–0.6 mm) of plagioclase (40%, oligoclase-andesine [An_{30}]). Interstices consist of small (0.1 mm) isometric grains of orthoclase and sanidine (10%), small (0.1–0.2 mm) grains of olivine (15%), clinopyroxene (25%), opaque minerals (5%), and glass (5%).

Alteration: slight (5%–10%); olivine is oxidized; clay mineral replaces glass.

Suiko Seamount (Hole 433C)

Sample 55-433C-10R-2, 127–133 cm (Piece 19), Unit 4a [Z-1640]

Olivine-phyric basalt, fine grained, vesicular. Phenocrysts (10%): idiomorphic grains (0.5–1.6 mm) of olivine. Groundmass with pilotaxitic texture; microlites and laths (0.1–0.7 mm) of plagioclase (15%, andesine [An_{45}]),

idiomorphic grains (0.2–0.4 mm) of clinopyroxene (5%), grains (0.1–0.3 mm) of olivine (5%), opaque minerals (5%), and glass (30%). Vesicles (30%, 0.2–1.7 mm) are isometric in shape.

Alteration: moderate (40%); olivine completely replaced by iddingsite; vesicles are filled with clay mineral.

Sample 55-433C-10R-4, 121–123 cm (Piece 8B), Unit 4h [Z-1115]

Olivine-phyric picrite, coarse grained. Rock with doleritic-vitrophyric texture; idiomorphic grains (0.5–2 mm) of olivine (65%). Interstices are filled with segregate of laths of plagioclase (10%, andesine [An_{38}] and andesine [An_{32}]), altered glass (20%) and xenomorphic grains (0.1–0.4 mm) of clinopyroxene (5%).

Alteration: very strong (85%); olivine completely replaced by iddingsite; smectites and carbonate (<1%) replace interstitial glass.

XRD: smectite with ~10% mica layers; trace mixed-layer chlorite-smectite mineral and serpentine; light green spot (altered olivine?): serpentine; trace smectite and calcite.

Sample 55-433C-12R-1, 75–80 cm (Piece 8A), Unit 9 [Z-1116]

Clinopyroxene-plagioclase-phyric basalt with hyalopilitic texture (glass: 70%–80%) of groundmass, poorly crystallized, highly vesicular (40%).

Alteration: moderate (25%–30%); plagioclase partly replaced by albite and pelite; vesicles are lined with clay mineral.

XRD: smectite with ~20% mica layers; trace hydromica.

Sample 55-433C-12R-2, 32–37 cm (Piece2E), Unit 9 [Z-1644]

Olivine-phyric basalt, crystallized, fine grained, highly vesicular. Phenocrysts (15%): idiomorphic grains (0.7–2 mm) of olivine. Groundmass with pilotaxitic texture; small grains (0.1–0.3 mm) of olivine (5%), microlaths (0.1–0.3 mm) of plagioclase (20%, andesine [An_{45}]), opaque minerals (5%), and brownish black glass (20%). Vesicles (40%, 0.6–5 mm) are oval and isometric in shape.

Alteration: moderate (30%–35%); olivine and plagioclase completely replaced by smectites; vesicles are lined with smectites.

Sample 55-433C-12R-2, 136–141 cm (Piece 3C), Unit 9 [Z-1645]

Clinopyroxene-plagioclase-phyric basalt, crystallized, medium grained. Phenocrysts (25%): glomerophyric segregates of clinopyroxene (0.4–0.6 mm, 10%) and tabular and prismatic grains (0.6–0.8 mm) of plagioclase (15%, labradorite [An_{62}]). Groundmass with pilotaxitic texture; laths (0.2–0.5 mm) of plagioclase (30%, andesine [An_{45}] and andesine [An_{39}]). Interstices are filled with segregate of xenomorphic grains (0.2–0.3 mm) of clinopyroxene (25%), glass (20%) and opaque minerals (5%–7%).

Alteration: slight to moderate (20%); clay mineral replaces interstitial glass, sparse biotite is presented.

Sample 55-433C-12R-3, 54–57 cm (Piece 1D), Unit 9 [Z-1117]

Olivine-plagioclase-phyric basalt, crystallized, fine grained, vesicular. Phenocrysts (10%): idiomorphic grains (0.8–1 mm) of olivine (5%) and short prismatic grains (0.8 mm) of plagioclase (5%, labradorite [An_{60}]). Groundmass with microlitic texture; microlites and laths (0.1–0.5 mm) of plagioclase (30%, andesine [An_{48}]), small (0.1–0.2 mm) grains of olivine (5%), and segregate of small (<0.1 mm) grains of clinopyroxene (30%). Vesicles (20%) are isometric in shape.

Alteration: moderate (25%); olivine completely replaced by smectites and carbonate; vesicles are filled with clay mineral.

XRD: smectite with ~10% mica layers.

Sample 55-433C-13R-2, 69–72 cm (Piece 1J), Unit 10 [Z-518]

Plagioclase-clinopyroxene-phyric dolerite, crystallized, massive. Phenocrysts (5%): sparse partly idiomorphic grains (0.5–0.8 mm) of clinopyroxene and prismatic grains (0.7–1 mm) of plagioclase. Groundmass with doleritic texture; prismatic and elongated-prismatic grains (0.1–0.5 mm) of plagioclase (50%, labradorite [An_{56-58}]). Interstices are filled with isometric grains (0.1–0.3 mm) of clinopyroxene (30%), xenomorphic grains (0.1–0.3 mm) of olivine (10%), opaque minerals (5%), and volcanic glass (5%).

Alteration: slight (10%–15%); olivine and interstitial glass completely replaced by clay mineral.

XRD: smectite with ~20% mica layers; trace mixed-layer smectite-chlorite with ~20% swelling interlayers.

Sample 55-433C-14R-1, 2–7 cm (Piece 1A), Unit 11a [Z-1658]

Plagioclase-phyric basalt, highly vesicular. Phenocrysts (15%): prismatic crystals (0.3–0.6 mm) of plagioclase (labradorite [An_{56}]) and their segregates. Groundmass with vitrophyric texture; black glass with microlites of plagioclase (5%, andesine [An_{43}]). Vesicles (50%, 1–7 mm) are isometric in shape.

Alteration: moderate (20%–25%); plagioclase replaced by smectite-celadonite(?) aggregate; walls of vesicles are lined with clay mineral, central parts of vesicles are filled with brownish glass, zeolite, and clay minerals.

Sample 55-433C-14R-1, 33–38 cm (Piece 1G), Unit 11a [Z-1656]

Plagioclase-phyric basalt, crystallized, medium grained, vesicular. Phenocrysts (15%): tabular and prismatic crystals (0.6–0.8 mm) of plagioclase (labradorite [An_{55}]). Groundmass with microlitic texture; laths (0.2–0.6 mm) of plagioclase (20%, andesine [An_{49}] and andesine [An_{42}]), sparse grains (0.1–0.2 mm) of olivine (3%–4%), opaque minerals (5%), and glass (1%–2%). Interstices are filled with segregate of small isometric grains of clinopyroxene (15%). Vesicles (30%, 2.5–5 mm and 0.5–0.6 mm) are oval in shape.

Alteration: slight to moderate (15%–20%); olivine is oxidized; clay mineral replaces glass; plagioclase partly replaced by clay mineral; walls of large vesicles are lined with clay mineral, small vesicles almost completely are filled with clay mineral.

Sample 55-433C-14R-2, 115–120 cm (Piece 3C), Unit 11a [Z-1657]

Sparsely clinopyroxene-plagioclase-phyric basalt, crystallized, medium grained, sparsely vesicular. Phenocrysts (5%): grains (0.5 mm) of clinopyroxene (1%) and prismatic crystals (0.6–1 mm) of plagioclase (4%, labradorite [An_{57}]). Groundmass with microlitic texture; laths (0.2–0.5 mm) of plagioclase (50%, andesine [An_{43}]), isometric grains of clinopyroxene (20%), small (up to 0.1 mm) grains of olivine (5%), opaque minerals (5%), and interstitial glass (10%). Two vesicles (up to 5 mm) are oval in shape.

Alteration: slight (15%); plagioclase partly (30%–40%) replaced by clay mineral (inclusions of glass in plagioclase crystals); olivine is oxidized; clay mineral replaces interstitial glass; walls of vesicles are lined with clay mineral.

Sample 55-433C-14R-4, 26–31 cm (Piece 2A), Unit 11c [Z-1648]

Clinopyroxene-plagioclase-phyric basalt, crystallized, medium grained. Rock is the same as Sample 55-433C-12R-2, 136–141 cm (Z-1645).

Alteration: slight to moderate (20%).

Sample 55-433C-14R-4, 47–52 cm (Piece 2B), Unit 11c [Z-1649]

Olivine-clinopyroxene-plagioclase-phyric basalt, crystallized, fine grained, sparsely vesicular. Phenocrysts (20%): sparse grains (0.4–0.6 mm) of olivine (3%–4%), partly idiomorphic grains of clinopyroxene (6%–7%), and tabular and prismatic crystals (0.7–1.5 mm) of plagioclase (10%, labradorite [An_{67}]). Groundmass with intersertal-microlitic texture; microlites and laths (0.1–0.5 mm) of plagioclase (25%, andesine [An_{47}] and andesine [An_{42}]). Interstices are filled with segregate of small (0.05–0.2 mm) grains of clinopyroxene (30%); opaque minerals (5%) and altered glass (20%). Two vesicles (up to 5 mm) are oval in shape.

Alteration: moderate (20%–25%); clay mineral replaces interstitial glass.

Sample 55-433C-15R-1, 0–4 cm (Piece 1), Unit 11c [Z-1650]

Clinopyroxene-plagioclase-phyric basalt, crystallized, fine grained, vesicular. Phenocrysts (15%): sparse idiomorphic grains (0.4–1.7 mm) of clinopyroxene (5%) and prismatic crystals (0.6–0.9 mm) of plagioclase (10%, labradorite [An_{60}]). Groundmass with microlitic texture; microlites and laths (0.1–0.6 mm) of plagioclase (20%, andesine [An_{47}] and andesine [An_{38}]). Interstices are filled with small (0.1–0.2 mm) grains of olivine (5%), small (0.01–0.2 mm) grains of clinopyroxene (20%), opaque minerals (5%), and altered glass (10%). Vesicles (35%, 1.2–4 mm) are oval in shape.

Alteration: slight (15%); plagioclase partly replaced by clay mineral (central parts of plagioclase grains); olivine is oxidized; walls of vesicles are lined with clay mineral.

Sample 55-433C-15R-5, 82–87 cm (Piece 4B), Unit 13 [Z-1118]

Plagioclase-phyric basalt, crystallized, fine grained, vesicular. Phenocrysts (10%): glomerophyric segregates of tabular grains (0.4–0.7 mm) of plagioclase (labradorite [An_{56}]). Groundmass with microlitic texture; microlites and laths (0.1–0.3 mm) of plagioclase (30%, andesine [An_{48}]), segregate of small (up to 0.1 mm) grains of clinopyroxene (30%); grains (0.1 mm) of opaque minerals (15%). Vesicles (15%, 0.2–0.6 mm) are oval and isometric in shape.

Alteration: slight to moderate (15%–20%); plagioclase almost completely (80%) replaced by clay mineral; olivine is oxidized; walls of vesicles are lined with clay mineral.

Sample 55-433C-15R-5, 88–92 cm (Piece 4B), Unit 13 [Z-519]

Olivine-plagioclase-phyric basalt, crystallized, massive. Phenocrysts (25%): idiomorphic grains (0.6–0.7 mm) of olivine and glomerophyric segregates of partly xenomorphic grains (0.3–0.5 mm) of olivine with plagioclase. Plagioclase forms tabular grains (up to 2.5 mm) with abundant inclusions of glass. Phenocrysts of plagioclase are mainly represented by glomerophyric segregates (0.5–1.2 mm) of small (0.1–0.3 mm) prismatic grains. Groundmass with microlitic (microdoleritic) texture; microlites and laths (0.05–0.3 mm) of plagioclase (50%, andesine [An_{48}]). Interstices are filled with segregate of small (<0.1 mm) grains of clinopyroxene (30%), altered green glass (10%), and opaque minerals (5%–8%).

Alteration: slight to moderate (20%); olivine completely replaced by iddingsite; plagioclase partly replaced by sosurite; clay mineral replaces interstitial glass.

XRD: smectite with ~10% mica layers.

Sample 55-433C-15R-6, 31–32 cm (Piece 1C), Unit 13 [Z-1119]

Clinopyroxene-plagioclase-phyric basalt, crystallized, medium grained, sparsely vesicular. Phenocrysts (15%): glomerophyric segregates of clinopyroxene and plagioclase (labradorite [An_{56}]). Groundmass with microdoleritic (microlitic) texture; microlites and laths (0.1–0.6 mm) of plagioclase (35%, andesine [An_{48}]). Interstices are filled with segregate of small (0.05–0.2 mm) grains of clinopyroxene (35%); opaque minerals (15%). Single vesicles (~1%, up to 0.4 mm) are isometric in shape.

Alteration: slight; rock is nonoxidized; vesicles are filled with celadonite(?).

XRD: smectite with ~10% mica layers.

Sample 55-433C-17R-1, 64–69 cm (Piece 5A), Unit 13 [Z-1120]

Clinopyroxene-plagioclase-phyric basalt with microdoleritic (microlitic) groundmass texture, crystallized, medium grained. Rock: identical to Sample 55-433C-15R-6, 31–32 cm [Z-1119].

Alteration: slight.

Sample 55-433C-19R-1, 48–50 cm (Piece 4C), Unit 13 [Z-1655]

Aphyric basalt, fine grained, vesicular. Rock with pilotaxitic texture; microlites (0.01–0.1 mm) and microlaths (0.1–0.5 mm) of plagioclase (25%, labradorite [An_{53}], andesine [An_{44}] and andesine [An_{32}]), sparse (~1%) small (up to 0.2 mm) oxidized grains of olivine and clinopyroxene (10%), brownish black glass (30%), and opaque minerals (5%). Vesicles (30%, 0.2–1.8 mm) are oval and isometric in shape.

Alteration: moderate (20%); vesicles are filled with clay mineral.

Sample 55-433C-21R-3, 20–23 cm (Piece 2), Unit 17 [Z-520]

Sparsely plagioclase-phyric basalt, crystallized, massive. Phenocrysts (2%–3%): elongated-prismatic grains (1.2–1.5 mm) of plagioclase (labradorite [An_{52-54}]) and glomerophyric segregates (up to 1.2 mm) of small (0.2–0.4 mm) grains of plagioclase. Groundmass with microlitic texture; microlites and laths (up to 0.5 mm) of plagioclase (50%, andesine-labradorite [An_{50}] and andesine [An_{44}]). Interstices are filled by segregate of small grains of clinopyroxene (30%); opaque minerals (10%), and green volcanic glass (10%). Small (0.1 mm) rounded grains of olivine (5%–7%) are present.

Alteration: slight (15%); clay mineral completely replaces glass and olivine.

XRD: smectite with ~10% mica layers; trace mixed-layer smectite-chlorite with ~15% swelling interlayers.

Sample 55-433C-22R-5, 48–52 cm (Piece 3), Unit 18 [Z-521]

Plagioclase-phyric basalt, massive. Phenocrysts (20%): prismatic grains (0.5–1.5 mm) of plagioclase (labradorite [An_{64}]) and their glomerophyric segregates. Groundmass with vitrophyric texture; greenish brown volcanic glass.

Alteration: rock is fresh.

XRD: smectite with ~10% mica layers; trace mixed-layer smectite-chlorite.

Sample 55-433C-23R-1, 100–104 cm (Piece 5D), Unit 19a [Z-1121]

Olivine-phyric basalt, fine grained, highly vesicular. Phenocrysts (10%): idiomorphic grains (0.3–1.6 mm) of olivine. Groundmass with micropilotaxitic texture; small grains (0.01–0.05 mm) of plagioclase and glass with rudimental grains (<0.01 mm) of clinopyroxene and opaque minerals. Vesicles (40%, 0.2–2 mm) are isometric in shape.

Alteration: moderate (35%–40%); olivine completely replaced by clay mineral; vesicles are filled with clay mineral, walls of vesicles are lined with cream glass.

XRD: smectite with ~20% mica layers.

Sample 55-433C-23R-2, 12–17 cm (Piece 1C), Unit 19b [Z-1661]

Olivine-phyric basalt (picrite-basalt), crystallized, fine grained, highly vesicular. Phenocrysts (25%): idiomorphic grains (0.2–1.8 mm) of olivine. Groundmass with microlitic texture; microlites and microlaths (0.05–0.3 mm) of plagioclase. Interstices are filled with segregate of small grains of clinopyroxene (10%), opaque minerals (2%–3%), and glass (2%–3%). Vesicles (40%, 2–3.5 mm) are oval and isometric in shape.

Alteration: very strong (80%); olivine, plagioclase, and glass completely replaced by smectites; vesicles are filled with smectites.

Sample 55-433C-24R-1, 12–15 cm (Piece 2), Unit 19b [Z-1122]

Olivine-phyric picrite-basalt, crystallized, coarse grained, vesicular. Phenocrysts (40%): idiomorphic grains (0.3–2 mm) of olivine. Groundmass with doleritic texture; laths (0.2–0.6 mm) of plagioclase (25%, labradorite [An_{58}] and andesine [An_{44}]). Interstices are filled with segregate or individual xenomorphic grains (0.1–0.3 mm) of clinopyroxene (20%), grains (0.1–0.3 mm) of olivine (1%–2%), and opaque minerals (5%–7%). Vesicles (10%, up to 0.7 mm) are isometric in shape.

Alteration: moderate (40%); olivine almost completely (80%) replaced by iddingsite; vesicles are filled with smectites.

XRD: smectite and mixed-layer smectite-chlorite with ~20% swelling interlayers; trace serpentine(?).

Sample 55-433C-24R-7, 104–108 cm (Piece 3B), Unit 19b [Z-522]

Olivine-phyric picrite-basalt, crystallized, massive. Phenocrysts (80%): idiomorphic grains (0.5–4.5 mm) of fresh olivine. Groundmass with microlitic texture; small (up to 0.1 mm) isometric and prismatic grains of clinopyroxene (90%) and glass (10%) which contains sparse rudiment laths or radiant grains of plagioclase.

Alteration: slight; oxidized rims of olivine grains.

XRD: smectite with ~20% mica layers and chlorite.

Sample 55-433C-24R-7, 108–114 cm (Piece 3C), Unit 19b [Z-1662]

Olivine-phyric picrite-basalt, crystallized, medium grained, vesicular. Phenocrysts (40%): idiomorphic grains (0.6–2 mm) of fresh olivine. Groundmass with microlitic texture; laths (0.1–0.3 mm) of plagioclase (10%, labradorite [An_{57}]). Interstices are filled with isometric grains of clinopyroxene (15%), opaque minerals (1%–2%), and altered brownish cream glass (10%). Vesicles (15%, up to 2.5 mm) are oval in shape.

Alteration: slight (15%); oxidized olivine rims; plagioclase partly replaced by albite; smectites replace glass.

Sample 55-433C-24R-7, 133–139 cm (Piece 3F), Unit 19b [Z-1123]

Olivine-phyric picrite-basalt with doleritic groundmass texture, crystallized, coarse grained, vesicular (25%). Rock: identical to Sample 55-433C-24R-1, 12–15 cm (Z-1122).

Alteration: moderate to strong (45%–50%); olivine partly (30%) replaced by iddingsite; plagioclase partly (30%–50%) replaced by pelite and clay mineral; vesicles are filled with clay mineral and chalcedony(?).

XRD: smectite with ~20% mica layers and mixed-layer chlorite-swelling chlorite with ~10% swelling interlayers.

Sample 55-433C-24R-7, 141–144 cm (Piece 3G), Unit 19b [Z-1124]

Olivine-phyric picrite-basalt with doleritic groundmass texture, crystallized, coarse grained, massive. Rock is identical to Samples 55-433C-24R-1, 12–15 cm (Z-1122) and 24R-7, 133–139 cm (Z-1123).

Alteration: slight (10%–15%); olivine partly (<5%) replaced by iddingsite; plagioclase partly (30%–40%) replaced by pelite and clay mineral.

XRD: smectite with ~30% mica layers and chlorite with ~10% swelling interlayers; trace phillipsite.

Sample 55-433C-26R-1, 87–92 cm (Piece 2F), Unit 21 [Z-1663]

Sparsely olivine-phyric basalt, fine grained, sparsely vesicular. Phenocrysts (1%): single idiomorphic grains (0.4–0.8 mm) of olivine. Groundmass with microlitic texture; laths (0.1–0.6 mm) of plagioclase (40%, labradorite [An_{55}], andesine [An_{48}] and andesine [An_{38}]). Interstices are filled with segregate of small grains of clinopyroxene (30%). Opaque minerals (5%) and chlorite (15%) are present. Vesicles (4%, 0.5–0.8 mm) are rounded in shape.

Alteration: slight to moderate (20%); olivine completely replaced by clay mineral; vesicles are filled with clay mineral.

Sample 55-433C-26R-2, 65–68 cm (Piece 1G), Unit 21 [Z-523]

Aphyric basalt (hawaiite-mugearite?), crystallized, sparsely vesicular. Rock with microlitic texture; unoriented laths (0.1–0.3 mm) of plagioclase (70%, andesine [An_{46}]). Interstices are filled with small (up to 0.1 mm) xenomorphic

grains of clinopyroxene (25%) and pseudocubic grains (<0.1 mm) of opaque minerals (5%). Single vesicles are registered.

Alteration: slight; plagioclase partly replaced by sosurite.

XRD: smectite with ~10% mica layers; trace mixed-layer smectite-chlorite with ~20% swelling interlayers.

Sample 55-433C-27R-2, 131–134 cm (Piece 6B), Unit 24a [Z-1125]

Olivine-phyric picrite-basalt with doleritic in groundmass texture, crystallized, coarse grained, vesicular (15%). Rock: identical to Sample 55-433C-24R-1, 12–15 cm (Z-1122).

Alteration: moderate (30%–35%); olivine partly (30%) replaced by iddingsite; vesicles are filled with smectites.

Sample 55-433C-27R-6, 38–43 cm (Piece 1H), Unit 25 [Z-1126]

Sparsely olivine-plagioclase-phyric basalt, fine grained, highly vesicular. Phenocrysts (3%–4%): single brownish red oxidized olivine and prismatic grain (2 mm) of plagioclase. Groundmass with hyalopilitic texture; microlites and laths (up to 0.7 mm) of plagioclase (20%), small (up to 0.2 mm) oxidized grains of olivine (5%), and black glass (30%). Vesicles (40%, 0.5–2 mm) are isometric, oval and rounded in shape.

Alteration: moderate (30%); plagioclase almost completely replaced by smectites; walls of vesicles are lined with clay mineral.

Sample 55-433C-27R-6, 134–140 cm (Piece 5), Unit 25 [Z-1667]

Sparsely olivine-plagioclase-phyric basalt, crystallized, fine grained, vesicular. Phenocrysts (1%–2%): single idiomorphic grains (0.9 mm) of olivine and their glomerophyric segregates; tabular grains (0.4–0.6 mm) of plagioclase (labradorite [An_{56}]). Groundmass with microlitic texture; microlites and microlaths (0.05–0.4 mm) of plagioclase (35%, labradorite [An_{51}], andesine [An_{43}] and andesine [An_{32}]). Interstices: segregate of small grains of clinopyroxene (30%); small (0.1–0.3 mm) idiomorphic grains of oxidized olivine (5%); abundant pseudocubic grains (0.05 mm) of opaque minerals (10%). Vesicles (20%, 0.3–0.8 mm) are isometric in shape.

Alteration: slight to moderate (15%–20%); olivine completely replaced by clay mineral; plagioclase almost completely replaced by clay mineral; vesicles are filled with clay mineral.

Sample 55-433C-28R-1, 42–47 cm (Piece 2E), Unit 25 [Z-1668]

Clinopyroxene-plagioclase-phyric basalt, crystallized, fine grained, vesicular. Phenocrysts (10%): sparse grains (0.6 mm) of clinopyroxene, prismatic crystals (0.9 mm) of plagioclase (andesine [An_{48}]), and glomerophyric segregates of clinopyroxene (3%) and plagioclase (7%). Groundmass with microlitic texture; microlites (<0.1 mm) and microlaths (0.1–0.2 mm) of plagioclase (30%, andesine [An_{38}]). Interstices: segregate of small grains of clinopyroxene (30%); idiomorphic grains (0.05 mm) of opaque minerals (10%). Vesicles (20%, 0.3–1.5 mm) are oval and isometric in shape.

Alteration: moderate (20%–25%); glass from plagioclase replaced by clay mineral; vesicles are filled with clay mineral.

XRD: smectite with ~10% mica layers.

Sample 55-433C-28R-2, 19–21 cm (Piece 1D), Unit 25 [Z-1127]

Clinopyroxene-plagioclase-phyric basalt with microlitic groundmass texture, crystallized, fine grained, sparsely vesicular (5%, 0.2–0.4 mm). Rock: identical to Sample 55-433C-28R-1, 42–47 cm (Z-1668).

Alteration: slight (5%); vesicles are filled with clay mineral.

XRD: smectite with ~20% mica layers; trace chlorite.

Sample 55-433C-28R-2, 66–73 cm (Piece 4B), Unit 25 [Z-1128]

Clinopyroxene-plagioclase-phyric basalt with microlitic groundmass texture, crystallized, medium grained, vesicular (10%, 0.3–2.5 mm). Rock: identical to Sample 55-433C-28R-2, 19–21 cm (Z-1127) and Sample 55-433C-28R-1, 42–47 cm (Z-1668).

Alteration: slight (10%); vesicles are filled with clay mineral.

XRD: smectite.

Sample 55-433C-28R-4, 30–37 cm (Piece 2C), Unit 25 [Z-1129]

Clinopyroxene-plagioclase-phyric basalt with microlitic groundmass texture, crystallized, fine grained, vesicular (30%, 0.3–2.5 mm). Rock: identical to Sample 55-433C-28R-2, 66–73 cm (Z-1128), Sample 55-433C-28R-2, 19–21 cm Z-1127, and 55-433C-28R-1, 42–47 cm (Z-1668).

Alteration: moderate (30%–35%); vesicles are filled with clay mineral.

Sample 55-433C-28R-4, 57–65 cm (Piece 5A), Unit 25 [Z-1672]

Sparsely plagioclase-phyric basalt, crystallized, fine grained, vesicular. Phenocrysts (5%): prismatic crystals (0.6–0.8 mm) of plagioclase (labradorite [An_{59}]). Groundmass with microlitic texture; microlites and laths (up to 0.4 mm) of plagioclase (35%, andesine [An_{48}] and andesine [An_{42}]). Interstices: segregate of small grains of clinopyroxene (35%); small idiomorphic grains of oxidized olivine (5%): opaque minerals (5%). Vesicles (15%, 0.3–0.8 mm) are oval in shape, empty.

Alteration: slight (5%); microcracks (5%, 0.1 mm) are filled with fragments of minerals and clay mineral.

XRD: smectite with ~10% mica layers; trace chlorite.

Sample 55-433C-28R-5, 77–81 cm (Piece 7B), Unit 26a [Z-524]

Clinopyroxene-plagioclase-phyric basalt (hawaiite-mugearite?), crystallized, massive. Phenocrysts (10%): elongated-prismatic grains (0.8–2 mm) of plagioclase (labradorite [An_{56}]) with small inclusions of glass and glomerophyric segregates of their grains (0.2–0.5 mm). Clinopyroxene forms partly idiomorphic grains and their segregates (0.5–1 mm). Groundmass with microlitic (microdoleritic) texture; laths (0.1–0.5 mm) of plagioclase (35%, andesine [$An_{44–46}$]), idiomorphic grains (0.1–0.3 mm) of clinopyroxene (50%), sparse small (0.1 mm) grains of olivine (1%), opaque minerals (5%), and brownish green glass (10%).

Alteration: slight; olivine replaced by clay mineral and iddingsite.

Sample 55-433C-28R-5, 107–109 cm (Piece 6E), Unit 26a [Z-1130]

Clinopyroxene-plagioclase-phyric basalt, crystallized, medium grained, massive. Phenocrysts (20%): small (0.4–0.7 mm) partly idiomorphic grains of clinopyroxene (5%) and prismatic grains (0.5–0.9 mm) of plagioclase (labradorite [An_{60}]), often plagioclase forms glomerophyric segregates. Clinopyroxene forms partly idiomorphic grains and their segregates (0.5–1 mm). Groundmass with microlitic texture; microlites and microlaths (0.1–0.4 mm) of plagioclase (30%, andesine [An_{44}] and [An_{38}]). Interstices: segregate small (0.05–0.2 mm) grains of clinopyroxene (25%); opaque minerals (5%); glass (20%).

Alteration: slight to moderate (20%); interstitial glass completely replaced by clay mineral.

XRD: smectite.

Sample 55-433C-31R-1, 86–90 cm (Piece 1L), Unit 27 [Z-525]

Olivine-plagioclase-phyric basalt (hawaiite-mugearite?), crystallized, sparsely vesicular. Phenocrysts (20%): glomerophyric segregates of partly idiomorphic rounded grains (0.1–0.6 mm) of olivine. Plagioclase (0.1–0.6 mm, labradorite [$An_{60–63}$]) forms glomerophyric segregates. Groundmass with microdoleritic texture; microlaths of plagioclase (40%, andesine [$An_{44–46}$]), segregate of small (<0.1 mm) grains of clinopyroxene (40%), volcanic glass (10%), and opaque minerals (8%–10%). Sparse vesicles (2%–3%, 0.6–1 mm) are oval in shape.

Alteration: slight (10%–12%); olivine partly replaced by iddingsite; clay mineral replaces glass; vesicles are filled with clay mineral.

Sample 55-433C-32R-1, 82–88 cm (Piece 3C), Unit 28c [Z-1674]

Olivine-phyric picrite, crystallized, coarse grained, vesicular. Phenocrysts (60%): idiomorphic grains (0.4–7.5 mm) of olivine. Groundmass with microdoleritic (microlitic) texture; small (0.01–0.3 mm) grains of olivine (5%) and laths (0.1–0.4 mm) of plagioclase (10%, andesine [An_{45}]). Interstices are filled with xenomorphic grains of clinopyroxene (12%) and opaque minerals (2%–3%). Vesicles (10%, 0.2–0.8 mm) are isometric in shape.

Alteration: moderate (20%–25%); olivine partly replaced by iddingsite; vesicles completely infilled by clay mineral.

Sample 55-433C-34R-2, 41–46 cm (Piece 1K), Unit 33 [Z-1131]

Plagioclase-olivine-phyric basalt, crystallized, medium grained, sparsely vesicular (2%–3%). Phenocrysts (20%): idiomorphic grains (0.3–1 mm) of olivine (15). Plagioclase (5%, labradorite [An_{60}]) forms sparse elongated-prismatic grains (up to 1.6 mm). Groundmass with microlitic texture; microlites and laths (0.1–0.4 mm) of plagioclase (25%), small (0.1–0.2 mm) grains of olivine (20%), small (0.1–0.2 mm) grains of clinopyroxene (15%), opaque minerals (5%), and black volcanic glass (10%).

Alteration: slight (10%–15%); olivine replaced by iddingsite.

Sample 55-433C-34R-3, 60–64 cm (Piece 1F), Unit 33 [Z-526]

Plagioclase-olivine-phyric picrite-basalt, crystallized, fine grained, massive. Phenocrysts (30%–35%): single elongated-prismatic grain (2.5 mm) of plagioclase with abundant inclusions of glass; idiomorphic grains (0.3–2 mm) of olivine. Groundmass with micropoikilophitic texture; xenomorphic grains (0.5–1.2 mm) of clinopyroxene (60%) with inclusions of laths of plagioclase (20%, andesine [$An_{43–48}$]); opaque minerals (5%) and glass (15%). Vesicles (40%, 2–3.5 mm) are oval and isometric in shape.

Alteration: moderate (40%); olivine almost completely replaced by iddingsite and Fe hydroxides; clay mineral replaces glass.

XRD: smectite with ~20% mica layers and chlorite with ~10% swelling interlayers.

Sample 55-433C-34R-7, 103–109 cm (Piece 3L), Unit 35 [Z-1681]

Plagioclase-olivine-phyric basalt, crystallized, fine grained, sparsely vesicular. Phenocrysts (15%): single prismatic crystals (0.7 mm) of plagioclase (<1%, labradorite [An_{63}]) and idiomorphic grains (0.3–1.7 mm) of olivine. Groundmass with microlitic texture; microlites and microlaths (0.05–0.6 mm) of plagioclase (30%, labradorite [An_{55}], andesine [An_{40}] and andesine [An_{32}]). Interstices: segregate of small grains (0.01 mm) of clinopyroxene (40%); opaque minerals (7%–8%); olivine (1%); glass (1%–2%). Vesicles (5%, 0.3–0.6 mm) are isometric in shape.

Alteration: slight to moderate (20%); olivine almost completely replaced by iddingsite and carbonate; clay mineral replaces glass.

Sample 55-433C-35R-6, 59–64 cm (Piece 1E), Unit 35 [Z-1682]

Clinopyroxene-plagioclase-olivine-phyric basalt, crystallized, sparsely vesicular. Phenocrysts (20%): single idiomorphic grains (0.9–1.2 mm) of clinopyroxene (2%), prismatic crystals (0.5–0.9 mm) of plagioclase (3%, labradorite [An_{53}]), and idiomorphic grains (0.8–3 mm) of olivine (15%). Groundmass with microlitic texture; microlites and laths (0.05–0.6 mm) of plagioclase (25%, labradorite [An_{55}], andesine [An_{38}]). Interstices: segregate of small grains (<0.1 mm) of clinopyroxene (30%); opaque minerals (10%); small grains (0.05–0.15 mm) of olivine (5%); glass (10%). Vesicles (1%, 0.5–1.7 mm) are oval in shape.

Alteration: moderate (25%); olivine almost completely replaced by iddingsite; clay mineral replaces glass; vesicles completely are filled with clay mineral.

Sample 55-433C-36R-3, 90–95 cm (Piece 1K), Unit 38 [Z-1683]

Olivine-phyric dolerite, crystallized, medium grained, vesicular. Phenocrysts (15%): idiomorphic grains (0.5–1.8 mm) of olivine. Groundmass with doleritic texture; small (0.1–0.2 mm) idiomorphic grains of olivine (5%) and laths (0.2–0.9 mm) of plagioclase (32%, labradorite [An_{57}], andesine [An_{42}], and andesine [An_{38}]). Interstices are filled with grains (0.1–0.3 mm) of clinopyroxene (30%), opaque minerals (2%–3%), and black glass (5%). Vesicles (10%, 0.3–0.8 mm) are isometric in shape.

Alteration: moderate (25%); olivine almost completely replaced by iddingsite; vesicles completely are filled with clay mineral.

Sample 55-433C-38R-5, 90–94 cm (Piece 1M), Unit 47a [Z-527]

Aphyric basalt, crystallized, massive. Rock with intersertal texture; laths (0.1–0.6 mm) of plagioclase (40%, andesine [$An_{44–46}$]). Interstices are filled with small (0.1–0.4 mm) xenomorphic grains of clinopyroxene (35%), opaque minerals (5%), and glass (20%).

Alteration: slight to moderate (20%); glass completely replaced by chlorite.

XRD: smectite with ~20% mica layers and mixed-layer smectite-chlorite with ~10% swelling interlayers; trace serpentine(?).

Sample 55-433C-39R-1, 119–122 cm (Piece 39), Unit 48 [Z-1132]

Sparsely olivine-phyric basalt, fine grained, highly vesicular. Phenocrysts (5%): idiomorphic grains (0.4–1.5 mm) of olivine. Groundmass with pilotaxitic texture; microsegregate of grains (0.05–0.1 mm) of olivine (10%); microlites (<0.1 mm) of plagioclase (20%); opaque minerals (5%); brown glass (5%). Vesicles (55%, 0.5–4 mm) are isometric in shape.

Alteration: very strong (70%); olivine completely replaced by iddingsite; plagioclase almost completely (90%) replaced by smectites; glass partly (50%) replaced by smectites; small vesicles completely infilled by clay mineral (zeolite is registered); walls of large vesicles are lined with clay mineral.

Sample 55-433C-39R-2, 35–40 cm (Piece 1H), Unit 48 [Z-1133]

Olivine-phyric basalt, fine grained with pilotaxitic groundmass texture, vesicular (10%, 0.4–0.8 mm). Rock: identical to Sample 55-433C-39R-1, 119–122 cm (Z-1132).

Alteration: very strong (70%).

Sample 55-433C-39R-3, 88–93 cm (Piece 1F), Unit 48 [Z-1134]

Olivine-phyric basalt, crystallized, fine grained, vesicular. Phenocrysts (10%): idiomorphic grains (1.5–2 mm) of olivine. Groundmass with microlitic texture; microlites (0.1–0.2 mm) of plagioclase (35%, andesine [An_{40}]).

Interstices: small (<0.1 mm) grains of clinopyroxene (25%), opaque minerals (1%–2%), and green glass (10%). Vesicles (20%, up to 3 mm) are oval in shape.

Alteration: moderate (20%–25%); olivine completely replaced by iddingsite; glass replaced by clay mineral; walls of vesicles are lined with clay mineral.

Sample 55-433C-39R-5, 2–8 cm (Piece 1A), Unit 48 [Z-1135]

Olivine-phyric basalt, crystallized with microlitic groundmass texture, moderate grained, sparsely vesicular (1%–2%, 1.5 mm). Rock: identical to Sample 55-433C-39R-3, 88–93 cm (Z-1134).

Alteration: moderate (35%); olivine completely replaced by iddingsite; glass replaced by clay mineral; vesicles are filled with clay mineral.

XRD: mixed-layer smectite-chlorite with ~10%–20% swelling interlayers; trace smectite.

Sample 55-433C-39R-5, 87–94 cm (Piece 1D), Unit 48 [Z-1136]

Olivine-phyric basalt, crystallized, medium grained, massive. Phenocrysts (25%): idiomorphic grains (0.3–1.7 mm) of olivine. Groundmass with microlitic texture; small (<0.3 mm) idiomorphic grains of olivine (5%), microlaths (0.1–0.3 mm) of plagioclase (30%, andesine [An_{39-40}]). Interstices: small (0.1 mm) grains of clinopyroxene (25%), opaque minerals (5%), and glass (10%).

Alteration: moderate (20%–25%); olivine completely or partly replaced by iddingsite; glass replaced by clay mineral.

XRD: mixed-layer smectite-chlorite with ~20% swelling interlayers; trace smectite.

Sample 55-433C-39R-6, 38–43 cm (Piece 1B), Unit 48 [Z-1137]

Olivine-phyric basalt, crystallized, medium grained, vesicular. Phenocrysts (10%): idiomorphic grains (1.2–3.5 mm) of olivine and their glomerophyric segregates. Groundmass with microlitic texture; small (up to 0.4 mm) idiomorphic grains of olivine (10%) and laths (0.1–0.3 mm) of plagioclase (30%, andesine [An_{40}]). Interstices: small (0.1 mm) grains of clinopyroxene (25%), opaque minerals (5%), and glass (10%). Vesicles (15%, 0.3–0.7 mm) are ideal rounded in shape.

Alteration: moderate (35%); olivine completely replaced by iddingsite; glass replaced by clay mineral; vesicles are filled with clay mineral.

Sample 55-433C-39R-6, 114–118 cm (Piece 1H), Unit 48 [Z-1692]

Olivine-phyric basalt, crystallized, fine grained, vesicular. Phenocrysts (15%): idiomorphic grains (up to 2.5 mm and 0.2–0.4 mm) of olivine. Groundmass with pilotaxitic texture; microlites (0.05–0.1 mm) of plagioclase (20%, andesine [An_{38}]), small (up to 0.1 mm) grains of olivine (2%–3%), clinopyroxene, and glass (25%) with crystallites of clinopyroxene and opaque minerals. Vesicles (30%, 0.5–1 mm) are rounded in shape.

Alteration: moderate (25%); olivine completely replaced by smectites; glass replaced by clay mineral; walls of vesicles are lined with clay mineral.

Sample 55-433C-41R-1, 20–23 cm (Piece 1C), Unit 51 [Z-528]

Aphyric basalt, crystallized, fine grained, vesicular. Rock with microlitic (microdoleritic) texture; laths (0.1–0.7 mm) of plagioclase (35%, andesine [An_{43-46}]). Interstices: segregates of plagioclase and grains (0.1–0.5 mm) of clinopyroxene (40%); opaque minerals (5%). Vesicles (20%, 0.2–0.6 mm) are rounded and oval-isometric in shape. Walls of vesicles are lined with volcanic glass.

Alteration: slight.

XRD: smectite.

Sample 55-433C-42R-1, 2–6 cm (Piece 1G), Unit 52 [Z-1138]

Plagioclase-phyric basalt, crystallized, medium grained, vesicular. Phenocrysts (20%): prismatic grains (0.8–1.5 mm) of plagioclase and glomerophyric segregates of elongated-prismatic grains of plagioclase (labradorite [An_{58-59}]). Groundmass with microdoleritic texture; laths (0.2–0.7 mm) of plagioclase (30%, andesine [An_{49}]). Interstices: segregate of grains (0.1–0.3 mm) of clinopyroxene (25%); glass (20%); opaque minerals (5%–7%). Vesicles (20%, 0.2–0.6 mm) are rounded and oval-isometric in shape. Walls of vesicles are lined with volcanic glass.

Alteration: moderate (20%–25%); glass replaced by clay mineral (occasionally, with biotite).

XRD: smectite with ~20% mica layers.

Sample 55-433C-42R-3, 83–88 cm (Piece 6B), Unit 54 [Z-1695]

Olivine-plagioclase-phyric basalt, crystallized, fine grained, highly vesicular. Phenocrysts (20%): single idiomorphic grains (0.3–0.7 mm) of olivine (5%) and prismatic grains (0.5–0.9 mm) of plagioclase (15%, labradorite [An_{52}] and andesine [An_{42}]). Groundmass with microlitic texture; microlites and microlaths (0.05–0.3 mm) of plagioclase (15%, andesine [An_{32}]). Interstices: small (<0.1 mm) grains of clinopyroxene (10%) and glass (5%). Vesicles (50%, 1.2–8 mm) are rounded and oval-isometric in shape.

Alteration: moderate (40%); olivine partly replaced by iddingsite; plagioclase partly (60%) replaced by clay mineral; glass replaced by clay mineral. Vesicles are lined or completely filled with clay mineral.

XRD: smectite; trace chlorite.

Sample 55-433C-43R-1, 118–123 cm (Piece 4B), Unit 54 [Z-1698]

Plagioclase-phyric basalt, crystallized, fine grained, vesicular. Phenocrysts (15%): tabular and prismatic grains (0.5–1 mm) of plagioclase (labradorite [An_{51}]) and their glomerophyric segregates. Groundmass with microlitic texture; microlites and laths (0.1–0.3 mm) of plagioclase (25%, andesine [An_{45}] and andesine [An_{41}]). Interstices: grains (0.1–0.3 mm) of olivine (5%), segregate of small (0.01 mm) grains of clinopyroxene (30%); glass (5%); opaque minerals (2%–3%). Vesicles (15%, 0.5–1.6 mm) are oval and isometric in shape.

Alteration: moderate (30%); glass completely replaced by clay mineral; plagioclase partly replaced by clay mineral; vesicles are filled with clay mineral.

Sample 55-433C-45R-3, 61–65 cm (Piece 3B), Unit 60 [Z-1139]

Sparsely plagioclase-phyric basalt, crystallized, medium grained, highly vesicular. Phenocrysts (1%): single prismatic grain (2.5 mm) of plagioclase. Groundmass with intersertal-microlitic texture; small (0.2–0.6 mm) grains of oxidized olivine (5%–7%), microlites and laths (0.1–0.7 mm) of plagioclase (20%, andesine [An_{47}]). Interstices: segregate of isometric grains (<0.1 mm, up to 0.3 mm) of clinopyroxene (15%); small grains of olivine (5%); green glass. Vesicles (40%, 0.6–2.5 mm) are rounded and isometric in shape.

Alteration: slight (15%); glass completely replaced by smectites; central parts of plagioclase replaced by smectites; vesicles are filled with clay mineral.

Sample 55-433C-45R-3, 119–124 cm (Piece 4D), Unit 60 [Z-1140]

Aphyric basalt, crystallized, medium grained, vesicular. Rock with microlitic texture; microlites and laths (0.1–0.8 mm) of plagioclase (30%, labradorite [An_{55}] and andesine [An_{40-45}]). Interstices: xenomorphic grains of oxidized olivine (10%), clinopyroxene (20%), opaque minerals (5%), and glass. Vesicles (25%, 1.2–5 mm) are oval in shape.

Alteration: moderate (30%–35%); central parts of plagioclase grains replaced by smectites; vesicles are filled with clay mineral.

Sample 55-433C-45R-4, 109–114 cm (Piece 4J), Unit 60 [Z-1704]

Plagioclase-phyric dolerite, crystallized, medium grained, vesicular. Phenocrysts (25%): prismatic crystals (0.8–1.6 mm) of plagioclase (labradorite [An_{55-59}] and andesine [An_{48}]). Groundmass with doleritic texture; laths and prismatic grains (0.1–0.6 mm) of plagioclase (30%, andesine [An_{42-47}]). Interstices: grains (0.2 mm) of oxidized olivine (2%–3%); segregate of isometric grains (0.1–0.4 mm) of clinopyroxene (25%); glass (2%–3%); opaque minerals (5%). Vesicles (10%, 0.1–0.9 mm) are isometric in shape.

Alteration: slight (10%); glass completely replaced by clay mineral; vesicles are filled with clay mineral.

Sample 55-433C-45R-5, 39–44 cm (Piece 1C), Unit 60 [Z-1141]

Clinopyroxene-olivine-plagioclase-phyric basalt, crystallized, medium grained, sparsely vesicular. Phenocrysts (20%): single idiomorphic grains (0.5–0.8 mm) of clinopyroxene (2%), glomerophyric segregates of prismatic crystals (0.4–0.8 mm) of plagioclase (12%–13%, labradorite [An_{62}] and labradorite [An_{54}]); olivine(?) 5%. Groundmass with microdoleritic texture; laths (0.2–0.8 mm) of plagioclase (35%, andesine [An_{48}]). Interstices: isometric grains (0.1–0.3 mm) of clinopyroxene and their segregates (20%); opaque minerals (2%–3%); glass (15%); biotite (2%). Vesicles (5%, 0.3–0.7 mm, single vesicle - 3 mm) are rounded in shape.

Alteration: moderate (25%); vesicles completely are filled with clay mineral.

Sample 55-433C-45R-5, 119–122 cm (Piece 3D), Unit 60 [Z-529]

Plagioclase-phyric dolerite, crystallized, massive. Phenocrysts (5%): glomerophyric segregates (up to 1.5–2 mm) of plagioclase (andesine [An_{48}]) grains (0.1–0.5 mm). Groundmass with doleritic texture; laths (0.2 –0.8 mm) of plagioclase (45%, andesine [An_{42-45}]). Interstices: segregate of xenomorphic grains (0.1–0.2 mm) of clinopyroxene (45%); glass (<5%); opaque minerals (5%).

Alteration: slight.

XRD: smectite.

Sample 55-433C-45R-6, 24–31 cm (Piece 1A), Unit 60 [Z-1142]

Sparsely clinopyroxene-plagioclase-phyric basalt, fine grained, highly vesicular. Phenocrysts (5%): single idiomorphic grains (0.9 mm) of clinopyroxene (2%) and prismatic crystals (0.8–1.2 mm) of plagioclase (38%, andesine [An_{40}]). Single microphenocryst of oxidized olivine is registered. Groundmass with hyalopilitic texture; microlites and laths (0.1–0.5 mm) of plagioclase (10%), rudiment grains of clinopyroxene (5%), and black glass (30%). Vesicles (50%, up to 5 mm) are isometric and oval in shape.

Alteration: strong (50%); vesicles completely are filled with carbonate, two vesicles are filled with clay mineral.

XRD: smectite with ~20% mica layers.

Sample 55-433C-45R-6, 97–102 cm (Piece 1G), Unit 60 [Z-1707]

Olivine-clinopyroxene-plagioclase-phyric dolerite, crystallized, medium grained, vesicular. Phenocrysts (15%): tabular and prismatic crystals (0.6–1.7 mm) of plagioclase (10%) and glomerophyric segregates of prismatic crystals (up to 0.6 mm) of plagioclase (labradorite [An_{53}]). Clinopyroxene (2%) forms grains and glomerophyric segregates of partly idiomorphic grains (0.6–0.8 mm). Olivine(5%) microphenocrysts (0.3–0.8 mm). Groundmass with doleritic texture; laths (0.1–0.7 mm) of plagioclase (30%, andesine-labradorite [An_{50}], andesine [An_{45}], and andesine [An_{35}]). Interstices: small grains of oxidized olivine (5%–7%); segregate of grains of clinopyroxene (20%); opaque minerals (7%–8%); glass (5%). Vesicles (15%, 0.8–1.7 mm and 0.3–0.7 mm) are rounded and isometric in shape.

Alteration: slight to moderate (20%); clay mineral replaces glass; vesicles are filled with clay mineral.

Sample 55-433C-45R-6, 129–132 cm (Piece 1N), Unit 60 [Z-1143]

Aphyric trachybasalt, crystallized, fine grained, sparsely vesicular. Rock with trachydoid texture; subparallel oriented microlites and laths (0.1–0.3 mm) of plagioclase (40%, andesine [An_{38-42}]), small grains (0.1 mm) of clinopyroxene (10%), opaque minerals (7%–8%), and dark green glass (30%). Vesicles (5%–7%, up to 2 mm) are rounded in shape.

Alteration: moderate (35%–40%); clay mineral replaces glass; vesicles are filled with clay mineral.

Sample 55-433C-46R-3, 78–83 cm (Piece 2D), Unit 62a [Z-1709]

Clinopyroxene-plagioclase-phyric basalt, crystallized, fine grained. Phenocrysts (15%): grains of clinopyroxene and their glomerophyric segregates (5%, 0.3–0.7 mm); prismatic crystals (0.7–1.2 mm) of plagioclase; glomerophyric segregates of smaller (0.3–0.5 mm) prismatic crystals of plagioclase (10%, labradorite [An_{65}]). Groundmass with intersertal-doleritic texture; laths (0.1–0.6 mm) of plagioclase (30%, andesine [An_{44}] and andesine [An_{41}]). Interstices: small (0.1–0.3 mm) grains of oxidized olivine (5%); segregate of small (0.05–0.2 mm) grains of clinopyroxene (20%); opaque minerals (5%); glass (20%).

Alteration: moderate (20%–25%); olivine partly replaced by clay mineral; glass completely replaced by clay mineral.

Sample 55-433C-47R-1, 8–13 cm (Piece 2A), Unit 63a [Z-1710]

Clinopyroxene-plagioclase-phyric basalt with intersertal-doleritic groundmass texture, crystallized, moderate grained. Rock: identical to Sample 55-433C-46R-3, 78–83 cm (Z-1709).

Alteration: slight (15%); glass completely replaced by clay mineral (biotite is registered).

XRD: smectite with ~10% mica layers.

Sample 55-433C-49R-2, 62–68 cm (Piece 1J), Unit 66 [Z-1712]

Aphyric dolerite, crystallized, medium grained. Rock with intersertal-doleritic texture; laths (0.2–1 mm) of plagioclase (45%, labradorite [An_{51}], andesine [An_{45}], and andesine [An_{39}]). Interstices: sparse (1%–2%) small (0.1 mm) grains of oxidized olivine (10%); segregate of xenomorphic grains (0.05–0.3 mm) of clinopyroxene (25%); opaque minerals (7%–8%); glass (20%).

Alteration: slight to moderate (20%); glass completely replaced by clay mineral (biotite is registered ~1%, 0.05 mm).

West Pacific Guyots (Legs 143 and 144)

Allison Guyot (Hole 865A)

Sample 143-865A-90R-5, 52–58 cm (Piece 5B), Unit 1 [Z-1492]

Aphyric basalt, vesicular. Rock with hyalopilitic texture; microlites and laths of plagioclase (25%) and black glass (55%). Vesicles (20%) are present.

Alteration: moderate (30%); plagioclase completely replaced by smectites and carbonate; central parts of vesicles are filled with carbonate.

XRD: smectite; trace hydromica (~10% swelling interlayers) and calcite; oxidized limestone intruded by sill: calcite, smectite, and siderite.

Sample 143-865A-90R-6, 45–50 cm (Piece 2), Unit 1 [Z-1493]

Aphyric basalt, vesicular. Rock with pilotaxitic texture; laths (0.2–1.2 mm) of plagioclase (45%, labradorite [An_{56}]). Interstices: small (<0.1 mm) grains of clinopyroxene (15%), subparallel oriented needles of opaque minerals (10%), and glass (20%). Vesicles (10%, 1.5–2.5 mm) are rounded in shape. Walls of vesicles are lined green glass.

Alteration: moderate (35%–45%); plagioclase completely replaced by smectites; glass completely replaced by smectite; central parts of vesicles are filled with smectites.

XRD: smectite with ~10% mica layers; trace mixed-layer swelling chlorite-smectite mineral, chlorite, and hydromica; gray-green clay from vesicles: smectite; trace calcite and chlorite(?); white matter from vesicles: calcite; white veinlet: calcite.

Sample 143-865A-91R-1, 112–118 cm (Piece 13B), Unit 1 [Z-1494]

Olivine-phyric basalt, sparsely vesicular. Phenocrysts (20%): idiomorphic grains (0.3–1.5 mm) of olivine (5%). Groundmass with hyalopilitic texture; laths and prismatic crystals of plagioclase (35%) and black glass (40%) with abundant crystals of opaque minerals. Single vesicles (5%, 0.9–1.8 mm) are rounded in shape.

Alteration: moderate (20%–25%); olivine partly replaced by iddingsite; vesicles are completely filled with smectites.

XRD: smectite; trace mixed-layer swelling chlorite-smectite mineral(?), chlorite, hydromica, and calcite; gray-green clay from vesicles: smectite; trace calcite.

Sample 143-865A-91R-2, 20–25 cm (Piece 2), Unit 1 [Z-1495]

Olivine-phyric basalt, sparsely vesicular. Phenocrysts (15%): idiomorphic grains of olivine (5%). Groundmass with hyalopilitic texture; microlites and laths of plagioclase (30%, labradorite [$An_{55–56}$]) and black glass (50%). Single large vesicle (4.5 mm) is oval in shape.

Alteration: slight (15%–20%); olivine completely replaced by iddingsite; vesicles are filled with brown partly chloritized glass and carbonate (in central parts).

XRD: smectite with ~10% mica layers; minor swelling chlorite; trace chlorite; black vein: smectite; trace chlorite, and calcite.

Sample 143-865A-91R-3, 22–28 cm (Piece 2), Unit 1 [Z-1496]

Olivine-plagioclase-phyric basalt, vesicular. Phenocrysts (10%): idiomorphic grains (0.5–0.6 mm) of olivine (3%) and prismatic crystals (up to 3 mm) of plagioclase (7%). Groundmass with hyalopilitic texture; microlites and laths of plagioclase (35%, labradorite [An_{55}]), small grains of olivine (5%), and black glass. Vesicles (10%, 0.7–1.5 mm) are rounded in shape. Walls of vesicles are lined with light green and brown glass.

Alteration: slight (15%–20%); olivine completely replaced by iddingsite; plagioclase replaced by clay mineral; vesicle is filled with carbonate (in central part).

XRD: smectite with ~20% mica layers; trace swelling chlorite, chlorite, and hydromica; black vein: smectite; trace chlorite and calcite; gray clay from vesicles: smectite.

Sample 143-865A-92R-3, 80–86 cm (Piece 1), Unit 3 [Z-1497]

Aphyric basalt with pilotaxitic texture.

Alteration: rock completely replaced by Fe-Mn hydroxides; plagioclase completely replaced by smectites.

XRD: smectite; trace, hydromica, and kaolinite(?); pink matter: apatite.

Sample 143-865A-92R-4, 45–47 cm, Unit 3 [Z-1498]

Sparsely olivine-phyric basalt, with intergranular-microdoleritic texture; euhedral olivine microphenocrysts (as large as 0.5 mm) compose ~1% of rock. Groundmass: unoriented plagioclase laths, small grains of pyroxene and opaque minerals.

Alteration: very strong; olivine replaced by iddingsite and smectite; plagioclase and pyroxene replaced by smectite; opaque dust partly oxidized; thin fissures infilled with smectite.

XRD: smectite with interlayer Na-K cations and with ~20% mica layers; minor kaolinite; trace hydromica, hematite, gypsum, and K-feldspar.

Sample 143-865A-93R-1, 30–36 cm, (Piece 4), Unit 3 [Z-1499]

Olivine-plagioclase-phyric basalt. Phenocrysts (15%): phenocrysts of altered olivine and plagioclase. Groundmass with pilotaxitic texture; altered plagioclase (60%), black oxidized glass (5%–10%), and needles of opaque minerals.

Alteration: very strong (100%) and oxidized (40%); all phenocrysts completely replaced by Fe hydroxides; groundmass plagioclase completely replaced by zeolite and smectites; interstitial glass is oxidized.

XRD: smectite with interlayer Na-K cations and with ~30% mica layers; minor kaolinite, calcite, and hematite; trace of hydromica, chlorite, gypsum, and K-feldspar; 2.70 Å (undetermined mineral).

Sample 143-865A-93R-2, 0–8 cm, (Piece 1), Unit 3 [Z-1500]

Olivine-plagioclase-phyric basalt, crystallized. Phenocrysts (20%): altered phenocrysts of olivine and plagioclase. Groundmass with intersertal (microdoleritic) texture; laths of altered plagioclase (30%), altered glass (25%), oxidized grains of olivine (5%), altered clinopyroxene (5%), and needles of opaque minerals (15%).

Alteration: very strong (100%) and oxidized (40%); all phenocrysts completely replaced by Fe hydroxides and smectites; groundmass plagioclase completely replaced by smectites; interstitial glass completely replaced by chlorite; olivine is oxidized; secondary opaque minerals was met.

XRD: swelling chlorite; trace serpentine(?) and hydromica(?); green-gray clay from vein: smectite; trace calcite; pink matter from vein: apatite(?).

Sample 143-865A-93R-3, 47–49 cm, (Piece 2B), Unit 3 [Z-1716]

Olivine-phyric basalt, crystallized, medium grained. Phenocrysts (25%): idiomorphic grains (0.3–1.7 mm) of altered olivine. Groundmass with microlitic texture; small (0.1–0.3 mm) grains of oxidized olivine (5%), laths of altered plagioclase (30%, andesine [An_{45}]), grains of altered clinopyroxene (20%), opaque minerals (5%), and altered glass (15%).

Alteration: very strong (60%–65%); olivine almost completely replaced by smectites; plagioclase almost completely (80%) is pelletized; clay mineral replaces glass.

Sample 143-865A-94R-1, 97–102 cm, (Piece 17D), Unit 3 [Z-1501]

Olivine-phyric basalt. Phenocrysts (15%): idiomorphic grains of altered olivine. Groundmass with microlitic texture; microlites and laths of fresh plagioclase (30%, labradorite [An_{55-56}]). Interstices: small grains of altered olivine (5%), segregate of very small (0.01 mm) grains of clinopyroxene (20%); opaque minerals (10%); altered glass (20%).

Alteration: moderate (40%); olivine completely replaced by iddingsite; clay mineral replaces glass.

XRD: smectite, mixed-layer swelling chlorite-smectite, and hematite; trace chlorite and hydromica.

Sample 143-865A-94R-2, 102–105 cm, (Piece 16), Unit 3 [Z-1502]

Olivine-phyric basalt, highly vesicular. Phenocrysts (20%): altered olivine. Groundmass with hyalopilitic texture; microlites and laths of altered plagioclase (10%–15%), small grains of altered olivine (2%–3%), and black glass (25%). Vesicles (40%, 1.2–10 mm) are oval in shape. Walls of vesicles (20%) are lined with glass.

Alteration: moderate (30%–35%); olivine completely replaced by iddingsite; plagioclase almost completely (50%–90%) replaced by smectites; 80% of vesicles completely are filled with carbonate, glass from vesicles is palagonitized.

Sample 143-865A-94R-4, 133–143 cm, (Piece 9), Unit 4 [Z-1503]

Sparsely olivine-phyric basalt, crystallized, sparsely vesicular. Phenocrysts (5%): altered olivine. Groundmass with microlitic texture; microlites and laths of plagioclase (30%, labradorite [An_{55}]). Interstices: segregate of small grains of clinopyroxene (35%); small grains of altered olivine (5%); opaque minerals (10%); altered glass (5%). Single vesicle (1%–2%, 1.7 mm) is rounded in shape.

Alteration: strong; olivine completely replaced by iddingsite; clay mineral replaces glass; vesicle completely are filled with clay mineral.

XRD: smectite and mixed-layer swelling chlorite-smectite; trace chlorite and hydromica.

Resolution Guyot (Hole 866A)

Sample 143-866A-171R-2, 109–111 cm (Piece 3), Unit 1 [Z-1504]

Olivine-phyric basalt, primary groundmass texture unidentifiable. Phenocrysts: olivine (0.1–1 mm) ~15% of rock. Groundmass: unoriented plagioclase laths, microlites of olivine (0.03–0.1 mm), and opaque minerals; rare unhedral K-feldspar.

Alteration: moderate (30%); olivine and groundmass completely replaced by smectites.

XRD: kaolinite and heterogeneous smectites; smectites contain ~30%–40% mica layers; minor hematite; trace K-feldspar.

Sample 143-866A-171R-4, 131–134 cm, Unit 2 [Z-1505]

Olivine-phyric basalt, pilotaxitic texture. Rock completely replaced by Fe hydroxides (80%) and smectites (20%).

Alteration: very strong (100%); rock is oxidized (80%).

XRD: smectite with ~30% mica layers; trace kaolinite; veinlet: smectite with ~20%–40% mica layers.

Sample 143-866A-178W-1, 37–38 cm, Unit 4 [Z-1506]

Plagioclase-olivine-phyric basalt, weakly crystallized, hyalopilitic texture, tectonized. Phenocrysts are represented mainly by euhedral olivine crystals (0.3–1 mm) and rare plagioclase phenocrysts; phenocrysts total ~10% of rock. Groundmass: represented by plagioclase microlites, volcanic glass, and opaque dust.

Alteration: very strong; smectitized and carbonatized olivine and plagioclase phenocrysts; groundmass, including glass, replaced by smectite, carbonate, and hematite; thin fissures infilled with smectite and carbonate.

XRD: smectite with interlayer Na-K cations; minor kaolinite and hematite; trace hydromica.

Sample 143-866A-178W-1, 79–81 cm, Unit 4 [Z-1507]

Aphyric apobasalt completely replaced by smectite and oxidized opaque matter.

Alteration: very strong.

XRD: smectite with interlayer Na-K cations and with ~10% mica layers; minor kaolinite; trace quartz and 3.51C-undetermined mineral.

Sample 143-866A-179R-5, 40–45 cm, Unit 6 [Z-1508]

Olivine-plagioclase-phyric basalt, crystallized, sparsely vesicular. Phenocrysts (30%): idiomorphic grains (0.4–0.9 mm) of olivine (5%) and prismatic and tabular crystals (1.5–5 mm, up to 6 mm) of plagioclase (25%, labradorite [An_{55}] and labradorite [An_{62}]). Groundmass with microlitic texture; microlites and laths (0.1–0.7 mm) of plagioclase (30%, andesine [An_{32-45}]); small (0.1–0.3 mm) grains of oxidized olivine (5%); segregate of clinopyroxene (25%) grains (<0.1 mm); green altered glass (4%), and grains (<0.1 mm) of opaque minerals (5%–7%). Two vesicles (1%–2%, 0.6 mm and 1.7 mm) are oval in shape.

Alteration: slight (10%) and weakly oxidized (5%–10%); olivine completely replaced by iddingsite; clay mineral replaces glass; vesicles infilled with clay minerals and carbonate.

XRD: smectite; trace mixed-layer smectite-chlorite and swelling chlorite.

Sample 143-866A-180R-1, 27–32 cm, (Piece 3A), Unit 6 [Z-1509]

Olivine-plagioclase-phyric basalt, crystallized. Phenocrysts (25%): phenocrysts (0.5–1.7 mm) of altered olivine (5%–7%) and grains (0.9–6 mm) of plagioclase (18%–20%, labradorite [An_{62}]). Groundmass with microlitic texture; microlites and laths of plagioclase (30%, labradorite [An_{54}], andesine [An_{40-43}], and andesine [An_{38}]). Interstices: clinopyroxene (25%), altered glass (5%), grains of altered olivine (5%), and opaque minerals (10%).

Alteration: slight to moderate (15%–20%) and nonoxidized; olivine completely replaced by iddingsite; clay mineral replaces glass.

XRD: smectite with ~20% mica layers and mixed-layer smectite-chlorite mineral; trace hydromica; gray-green clay from vesicles: smectite.

Sample 143-866A-180R-3, 67–72 cm, (Piece 1D), Unit 6 [Z-1510]

Olivine-plagioclase-phyric basalt, crystallized. Phenocrysts (35%): phenocrysts (1–4 mm) of olivine (10%) and grains (1–7 mm) of plagioclase (25%, labradorite [An_{55-60}], and andesine [An_{43}]). Groundmass with microlitic

texture; microlites and laths of plagioclase (25%, andesine [An_{42-43}] and andesine [An_{38}]), small grains (<0.1 mm) of clinopyroxene (25%), altered glass (5%), and opaque minerals (10%).

Alteration: moderate (20%–25%) and nonoxidized; olivine partly (30%–35%) replaced by iddingsite; clay mineral replaces glass.

XRD: smectite with ~10% mica layers and mixed-layer smectite-chlorite mineral with ~10% swelling interlayers; trace hydromica; vesicle filling: mixed-layer swelling chlorite-smectite mineral and swelling chlorite.

Sample 143-866A-180R-4, 12–17 cm, (Piece 1B), Unit 6 [Z-1511]

Olivine-plagioclase-phyric basalt, crystallized. Rock is identical with Sample 143-866A-180R-3, 67–72 cm (Z-1510).

Alteration: moderate (20%–25%) and nonoxidized; olivine partly (30%–35%) replaced by iddingsite; clay mineral replaces glass.

XRD: smectite and swelling chlorite; trace hydromica.

Sample 143-866A-182R-1, 3–8 cm, (Piece 2), Unit 8 [Z-1512]

Olivine-plagioclase-phyric basalt, crystallized. Phenocrysts (10%): phenocrysts of olivine (5%) and grains of plagioclase (5%). Groundmass with microlitic texture; microlites (0.1–0.3 mm) of plagioclase (30%, andesine [An_{38}] and rare laths (andesine [An_{42}]). Interstices: altered glass (10%), small grains (0.1–0.2 mm) of olivine (5%), and opaque minerals (10%).

Alteration: slight to moderate (15%–20%); rock is nonoxidized; groundmass olivine replaced by iddingsite; clay mineral replaces glass.

XRD: smectite, mixed-layer smectite-chlorite mineral, chlorite, and swelling chlorite.

Sample 143-866A-182R-2, 58–63 cm, (Piece 3C), Unit 8 [Z-1513]

Plagioclase-olivine-phyric basalt, crystallized. Phenocrysts (30%): grains (0.8–2.5 mm) of olivine (20%) and grains (2–2.5 mm) of plagioclase (10%, andesine [An_{42}]). Groundmass with microlitic texture; microlites (0.1–0.3 mm) of plagioclase (30%, andesine [An_{40}]), small grains of clinopyroxene (15%), altered glass (5%), and abundant small (0.1–0.3 mm) isometric grains of opaque minerals (20%).

Alteration: moderate (25%); olivine replaced by Fe hydroxides; clay mineral replaces glass.

XRD: smectite; trace mixed-layer smectite-chlorite mineral and hydromica(?).

Sample 143-866A-182R-4, 26–30 cm, (Piece 4B), Unit 8 [Z-1514]

Aphyric basalt, weakly crystallized, vesicular. Rock with hyalopilitic texture; microlites and microlaths of plagioclase (30%), black to brown glass (35%) with abundant brown grains of Fe hydroxides, and opaque minerals (10%). Vesicles (25%) are rounded in shape.

Alteration: strong (45%–50%); rock is oxidized (35%–40%); plagioclase completely replaced by pelite, albite, and Fe hydroxides.

XRD: smectite.

Sample 143-866A-182R-4, 72–74 cm, (Piece 8), Unit 8 [Z-1515]

Olivine-phyric basalt, crystallized, vesicular, brecciated. Phenocrysts: idiomorphic olivine (up to 0.5 mm) composes ~5% of rock. Groundmass with microlitic texture; unoriented plagioclase laths, pyroxene microlites, opaque dust, and interstitial glass.

Alteration: moderate; olivine and pyroxene replaced by smectite and iddingsite; plagioclase replaced by smectite and opaque dust; glass replaced by smectite; vesicles infilled and encrusted with smectite, some vesicles with oxidized Fe; glassy crust of basalt completely impregnated by Fe-Mn oxides.

XRD: smectite with interlayer Na-K cations and with ~10% mica layers; trace hematite and 4.87 Å (undetermined mineral).

Sample 143-866A-183R-1, 125–131 cm, (Piece 18B), Unit 9 [Z-1516]

Olivine-phyric basalt, crystallized, vesicular. Phenocrysts (15%): microphenocrysts (0.3–0.6 mm) of oxidized olivine. Groundmass with pilotaxitic texture; plagioclase (35%, andesine [An_{42-46}]) microlites and microlaths (0.1–0.4 mm) and interstitial green altered glass (25%). Vesicles (25%, 0.3–1.1 mm) are isometric and rounded in shape.

Alteration: moderate (40%); rock is oxidized (30%); olivine replaced by iddingsite; plagioclase replaced by clay minerals; glass replaced by clay minerals and black Fe hydroxides; vesicles infilled with clay minerals.

XRD: smectite; trace chlorite; gray-green and cream matter from vein: smectite.

Sample 143-866A-184R-1, 23–28 cm, (Piece 4), Unit 9 [Z-1517]

Clinopyroxene-biotite-olivine trachybasalt, microdoleritic, with trachytic texture. Microphenocrysts are represented by euhedral olivine crystals, biotite, and pyroxene; phenocrysts total ~15% of rock; biotite and olivine dominant. Groundmass: represented by subparallel oriented plagioclase (andesine [An_{40}]) laths, augite microlites, opaque minerals, and very small amount of interstitial glass; rare vesicles are present.

Alteration: slight (5%); olivine replaced by iddingsite; pyroxene replaced by smectite; sericitized plagioclase; smectitized groundmass glass; thin fissures and vesicles infilled with smectite.

XRD: smectite with interlayer Na-K cations and ~10% mica layers; trace kaolinite and quartz; thin fissure infilled by smectite with interlayer Na-K cations.

Sample 143-866A-184R-1, 137–139 cm, (Piece 7), Unit 9 [Z-1518]

Tuff (breccia). Rock; fragments (2–10 mm) of altered olivine basalt. Large fragments cemented by aggregate of angular small (0.4–0.6 mm) fragments (10%) of light green glass.

Alteration: very strong; basalt and cement replaced by clay minerals and Fe hydroxides.

XRD: smectite with different interlayer cations: Na-K and Ca-Mg; trace hematite and quartz; matrix from breccia: smectite.

Sample 143-866A-184R-2, 23–26 cm, (Piece 3), Unit 9 [Z-1519]

Olivine-pyroxene-phyric basalt, crystallized, vesicular. Phenocrysts (15%): single idiomorphic grain (1.5 mm) of oxidized olivine (8%) and tabular grains (1–1.2 mm) of orthoclase (12%). Groundmass with pilotaxitic texture; microlites (0.1–0.2 mm) of plagioclase (20%, andesine [An_{38}]), grains (0.1 mm) of oxidized olivine (10%), opaque minerals (5%), and black glass (20%). Vesicles (30%, 0.1–0.5 mm and 2.5–10 mm) are isometric in shape.

Alteration: slight (10%–15%); vesicles infilled and encrusted with clay mineral.

XRD: smectite with interlayer Na-K cations; minor hematite.

Sample 143-866A-185R-3, 41–46 cm, (Piece 1D), Unit 10 [Z-1520]

Clinopyroxene-olivine-plagioclase-phyric basalt, crystallized, sparsely vesicular. Phenocrysts (20%): single grain (3 mm) of clinopyroxene (2%), idiomorphic grains (0.8–1.2 mm) of altered olivine (8%), and prismatic crystals (1.2–2.5 mm) of plagioclase (15%, labradorite [An_{55}]). Groundmass with microlitic texture; microlites and microlaths (0.1–0.3 mm) of plagioclase (35%, andesine [An_{38}]). Interstices: small (<0.1 mm) grains of clinopyroxene (20%), green altered glass, and opaque minerals (5%). Vesicles (1%, 0.7 mm) are rounded in shape.

Alteration: slight (15%); groundmass olivine replaced by iddingsite and partly oxidized; clay mineral replaces glass; vesicles are encrusted with clay mineral and infilled with carbonate.

XRD: smectite; gray-green matter from vesicles: smectite; trace calcite.

Sample 143-866A-185R-4, 26–32 cm, (Piece 6B), Unit 11 [Z-1521]

Olivine-phyric basalt, crystallized, vesicular. Phenocrysts: idiomorphic olivine (up to 0.5 mm) composes ~20% of rock. Groundmass with microlitic texture; plagioclase laths (30%), interstitial glass (10%), and olivine grains. Vesicles (35%, 0.9–2 mm) are isometric in shape.

Alteration: moderate (40%); olivine oxidized; plagioclase and glass replaced by clay mineral and Fe hydroxides; vesicles infilled with clay mineral.

XRD: smectite; gray-green matter from vesicles: smectite; trace calcite.

Sample 143-866A-186R-1, 39–41 cm, (Piece 6), Unit 11 [Z-1522]

Olivine-phyric basalt, highly vesicular. Phenocrysts: single olivine grain. Groundmass with vitrophyric texture; black glass (35%), plagioclase needle-shaped microlites (5%–7%), and olivine grains (5%, 0.1 mm). Vesicles (60%–65%, 0.9–5 mm) are rounded in shape.

Alteration: strong; olivine replaced by smectite; small crystals replaced by iddingsite; plagioclase replaced by smectite; smectitized and oxidized glass; vesicles infilled with smectite.

XRD: smectite with interlayer Ca-Mg cations; trace hematite and gypsum; gray-blue matter from vesicles: smectite with interlayer Ca-Mg cations.

Sample 143-866A-186R-2, 20–24 cm, (Piece 5), Unit 11 [Z-1523]

Olivine-phyric basalt, vesicular. Phenocrysts (2%–3%): single olivine idiomorphic grains (0.8–1 mm). Groundmass with hyalopilitic texture; plagioclase needle-shaped microlites (10%, <0.1 mm), olivine small grains (5%–7%,

0.2 mm), and colorless glass (60%) with abundant crystals of clinopyroxene and opaque minerals (<0.01 mm). Vesicles (5%, 0.9–5 mm) are isometric in shape.

Alteration: slight (15%); olivine replaced by iddingsite, rims of olivine grains are oxidized; vesicles and fissures infilled with clay mineral.

XRD: smectite.

Sample 143-866A-187R-1, 99–104 cm, (Piece 17), Unit 11 [Z-1524]

Olivine-phyric basalt, crystallized. Phenocrysts: olivine (0.2–0.6 mm) composes ~15% of rock. Groundmass with microlitic texture; plagioclase microlaths (55%, 0.1–0.3 mm, andesine [An_{38}]), olivine small (0.1 mm) grains (15%), interstitial green glass (5%), and opaque minerals (10%).

Alteration: slight (5%); oxidized olivine; glass replaced by clay mineral.

XRD: smectite; gray-green vein: smectite.

Sample 143-866A-188R-1, 82–89 cm, (Piece 16A), Unit 11 [Z-1525]

Sparsely olivine-phyric basalt, crystallized. Phenocrysts: olivine composes ~5% of rock. Groundmass with pilotaxitic texture; plagioclase microlites (30%, 0.1–0.2 mm), black glass (45%), and opaque minerals (10%, 0.1–0.3 mm).

Alteration: moderate (45%); olivine oxidized and replaced by iddingsite; plagioclase almost completely replaced by clay mineral and Fe hydroxides; glass replaced by clay minerals.

XRD: smectite; trace mixed-layer swelling chlorite-smectite mineral; green veinlet: smectite; trace chlorite.

Sample 143-866A-189R-1, 65–69 cm, (Piece 5C), Unit 12 [Z-1526]

Clinopyroxene-plagioclase-olivine-phyric basalt, crystallized. Phenocrysts (30%): clinopyroxene idiomorphic grains (5%, 1.2–3 mm), plagioclase grains (10%, 1.2–4 mm, andesine [An_{31}]), and olivine idiomorphic grains (15%, 0.9–4 mm). Groundmass with microlitic texture; plagioclase microlites (30%, 0.1–0.3 mm, andesine [An_{36-42}]). Interstices: clinopyroxene small (<0.1 mm) grains (20%), olivine grains (5%, 0.1–0.2 mm), green altered glass, and opaque minerals (5%). Skeletal opaque minerals (10 mm) is present.

Alteration: slight (18%); groundmass olivine replaced by iddingsite (10%–100%); clay mineral replaces glass.

XRD: mixed-layer smectite-chlorite mineral; minor smectite; trace mixed-layer swelling chlorite: smectite mineral and hydromica(?).

Sample 143-866A-189R-2, 115–120 cm, (Piece 7C), Unit 12 [Z-1527]

Tuff (volcanic breccia). Rock; fragments (up to 7 mm) olivine-plagioclase-phyric basalt with large (up to 5 mm) vesicles (35%).

Alteration: strong (50%–60%); partly oxidized olivine replaced by clay mineral; plagioclase grains partly or completely pelletized and smectitized; glass replaced by clay mineral; vesicles infilled with clay mineral and carbonate; fissures infilled with clay mineral.

XRD: smectite; minor mixed-layer swelling chlorite: smectite mineral; gray-green matter: smectite.

Limalok Guyot (Hole 871C)

Sample 144-871C-35R-3, 70–76 cm (Piece 3C), Unit 6 [Z-1528]

Breccia. Oxidized crust from breccia (Fe-Mn hydroxides and carbonate).

Sample 144-871C-35R-3, 143–145 cm (Piece 5B), Unit 7B [Z-863]

Olivine-phyric basalt, highly vesicular. Phenocrysts (10%): olivine grains (0.1–0.5 mm). Groundmass with microlitic or intersertal texture; clinopyroxene rounded grains (80%, <0.1 mm) and green glass (20%). Vesicles (40%, 0.2–2 mm) are isometric in shape.

Alteration: moderate (30%); olivine replaced by carbonate and clay mineral, rims of olivine grains are oxidized; clay mineral replaces glass; vesicles infilled with carbonate.

Sample 144-871C-35R-4, 96–98 cm (Piece 12), Unit 7B [Z-1529]

Plagioclase-olivine-phyric basalt. Phenocrysts (20%): plagioclase and olivine strong altered microphenocrysts (0.1–1 mm). Groundmass with vitrophyric texture; brownish black to black glass with abundant very small grains of opaque minerals.

Alteration: plagioclase and olivine completely replaced by carbonate and chalcedony(?); cracks infilled with carbonate and chalcedony(?).

XRD: smectite; minor mixed-layer smectite-chlorite mineral; trace hydromica and calcite.

Sample 144-871C-36R-1, 79–86 cm (Piece 7B), Unit 8 [Z-1530]

Olivine-phyric basalt. Phenocrysts (5%): strong altered olivine phenocrysts (0.1–0.5 mm). Groundmass with vitrophyric texture; black glass with rare relicts of brown glass.

Alteration: olivine completely replaced by smectite.

XRD: smectite; minor mixed-layer smectite-chlorite mineral; trace serpentine and quartz; clay matter from vein: smectite and mixed-layer swelling chlorite-smectite mineral; trace hydromica.

Sample 144-871C-36R-2, 107–109 cm (Piece 11), Unit 13 [Z-864]

Olivine-phyric basalt, vesicular. Phenocrysts: olivine (0.3–1.4 mm) composes ~20% of rock. Groundmass with microlitic texture; clinopyroxene grains (85%, up to 0.1 mm), opaque minerals (10%), and interstitial glass (5%). There are vesicles (10%, 0.8–2 mm).

Alteration: moderate (25%); olivine completely replaced by clay mineral, rims of olivine are oxidized; clay mineral replaces glass; vesicles infilled with clay mineral and carbonate.

Sample 144-871C-36R-3, 32–35 cm (Piece 3), Unit 13 [Z-865]

Olivine-phyric basalt, vesicular. Rock: identical to Sample 144-871C-36R-2, 107–109 cm (Z-864).

Sample 144-871C-38R-1, 117–120 cm (Piece 10), Unit 17 [Z-866]

Clinopyroxene-olivine-phyric basalt, sparsely vesicular. Phenocrysts (30%): olivine grains (90%, 0.3–1.8 mm), single idiomorphic grains (0.8 mm) of clinopyroxene (10%), and plagioclase grains (10%, 1.2–4 mm, andesine [An_{31}]),. Groundmass with microlitic texture; clinopyroxene small grains (85%, <0.1 mm), opaque minerals (10%), and glass (5%). Single vesicles are rounded in shape.

Alteration: slight; olivine partly (20%) replaced by clay mineral; clay mineral replaces glass; vesicles are filled with zeolite(?).

Sample 144-871C-38R-3, 83–87 cm (Piece 4), Unit 17 [Z-867]

Rock: identical to Sample 144-871C-38R-1, 117–120 cm (Z-866).

XRD: smectite; minor mixed-layer smectite-chlorite mineral; trace chlorite, hydromica, and analcime.

Sample 144-871C-38R-7, 0–5 cm (Piece 1A), Unit 20 [Z-1531]

Olivine-phyric basalt, crystallized. Phenocrysts: olivine (0.3–2 mm) composes 30% of rock. Groundmass with microlitic texture; clinopyroxene grains (60%, <0.1 mm) segregate; interstitial colorless glass (7%–8%); and opaque minerals (5%).

Alteration: moderate (25%); olivine completely replaced by iddingsite, several olivine grains completely oxidized.

XRD: smectite; minor mixed-layer smectite-chlorite mineral; trace chlorite and serpentine(?); green-gray matter from veinlet: smectite; trace chlorite and calcite.

Sample 144-871C-39R-1, 6–9 cm (Piece 2), Unit 21A [Z-868]

Olivine-phyric basalt, sparsely vesicular. Phenocrysts: olivine composes 20% of rock. Groundmass with microlitic texture; clinopyroxene grains (85%), opaque minerals (10%), and interstitial glass (5%). Single vesicle (0.6 mm) is rounded in shape.

Alteration: moderate (25%); olivine completely replaced by clay mineral; clay mineral replaces glass; wall of vesicle is lined with clay mineral, central part of vesicle infilled with carbonate.

Sample 144-871C-39R-4, 0–5 cm (Piece 1), Unit 21E [Z-1532]

Plagioclase-olivine-phyric basalt. Phenocrysts (20%): olivine (15%) and plagioclase (5%). Groundmass with vitrophyric texture; black glass.

Alteration: slight to moderate (20%); plagioclase and olivine completely replaced by iddingsite and smectite.

XRD: smectite; trace mixed-layer smectite-chlorite mineral, chlorite and hematite.

Sample 144-871C-39R-5, 120–124 cm (Piece 10C), Unit 21G [Z-1533]

Olivine-phyric basalt, crystallized, vesicular. Phenocrysts: olivine idiomorphic grains (0.3–2 mm) compose 30% of rock. Groundmass with microlitic texture; olivine grains (10%, 0.1–0.2 mm); segregate of clinopyroxene grains (45%); interstitial colorless glass (5%). There are vesicles (10%, up to 3 mm).

Alteration: moderate (30%); olivine completely replaced by iddingsite; vesicles infilled with smectite and carbonate.

XRD: smectite with ~10% mica layers; minor mixed-layer smectite-chlorite mineral; trace serpentine(?).

Sample 144-871C-40R-1, 126–130 cm (Piece 10A), Unit 22A [Z-1534]

Olivine-orthopyroxene-phyric basalt, crystallized, vesicular. Phenocrysts (45%): olivine idiomorphic grains (15%, 0.3–1 mm) and orthopyroxene idiomorphic grains (30%, up to 2 mm). Groundmass with microlitic texture; olivine grains (2–3%, <0.12 mm); segregate of clinopyroxene grains (30%–35%); interstitial colorless glass (10%); opaque minerals (2%–3%). Vesicles (10%) are present.

Alteration: slight to moderate (20%); olivine completely replaced by iddingsite; pyroxene partly (10%–20%) replaced by iddingsite.

XRD: swelling chlorite and hydromica; trace analcime; altered olivine grain: smectite, mixed-layer smectite-chlorite mineral, mixed-layer swelling chlorite-chlorite mineral, and chlorite.

Sample 144-871C-40R-2, 70–75 cm (Piece 3), Unit 22D [Z-1535]

Olivine-phyric basalt. Phenocrysts (30%): strong altered olivine phenocrysts. Groundmass with vitrophyric texture; brownish black to black glass.

Alteration: moderate (30%); olivine completely replaced by iddingsite, carbonate, and Fe hydroxides.

XRD: smectite, mixed-layer swelling chlorite-smectite mineral, and swelling chlorite; trace hematite(?) and calcite; gray-green matter from vein: smectite; trace swelling chlorite and calcite.

Sample 144-871C-40R-4, 98–101 cm (Piece 3D), Unit 22G [Z-869]

Olivine-phyric basalt, vesicular. Phenocrysts (30%): strong altered olivine grains (0.2–1.2 mm). Groundmass with vitrophyric texture; glass. Vesicles (10%, 0.5–0.9 mm) are isometric in shape.

Alteration: moderate (30%); olivine completely replaced by iddingsite; vesicles infilled with carbonate or empty.

Lo-En Guyot (Hole 872B)

Sample 144-872B-5R-1, 56–58 cm (Piece 6), Unit 6 [Z-870]

Aphyric basalt, massive. Phenocrysts (10%): olivine grains (0.1–0.5 mm). Groundmass with hyalopilitic texture; needle-shaped microlites and microlaths of plagioclase (30%–35%, up to 0.5 mm, labradorite [An_{56}]), weakly crystallized glass, and opaque minerals.

Alteration: slight (10%); clay mineral replaces glass.

XRD: smectite and swelling chlorite; trace mixed-layer chlorite-smectite mineral and hydromica; white vein: calcite.

Sample 144-872B-5R-3, 104–108 cm (Piece 10), Unit 9 [Z-1536]

Sparsely olivine-plagioclase-phyric basalt, vesicular. Phenocrysts (3%–5%): single strong altered olivine grain (2 mm) and single plagioclase prismatic crystal (6 mm). Groundmass with microlitic (microdoleritic) texture; microlites and microlaths of plagioclase (35%, 0.1–0.8 mm, andesine [An_{45}]). Interstices: clinopyroxene grains (30%, 0.1–0.3 mm), opaque minerals (5%), and glass. Vesicles (10%, 0.8–1 mm) are rounded in shape.

Alteration: slight to moderate (15%–20%); olivine completely replaced by iddingsite, clay mineral, and carbonate; glass replaced by clay mineral (celadonite?); vesicles infilled with carbonate or clay mineral.

XRD: smectite and mixed-layer chlorite-smectite mineral; trace serpentine and hydromica; green-blue matter from vein: smectite and hydromica (~5% swelling interlayer).

Sample 144-872B-5R-4, 65–68 cm (Piece 10), Unit 10B [Z-1537]

Sparsely olivine-plagioclase-phyric basalt, crystallized, vesicular, brecciated. Phenocrysts (5%): strong altered olivine grains (2%, 0.4–0.6 mm) and plagioclase prismatic crystals (3%). Groundmass with microlitic texture; microlites and microlaths of plagioclase (35%, 0.1–0.3 mm). Interstices: clinopyroxene grains (30%, <0.1 mm), oxidized olivine (5%), opaque minerals (5%). Vesicles (10%, 0.9–1.5 mm) are isometric in shape. Thin fissures are present (10%).

Alteration: moderate (35%); olivine completely replaced by iddingsite; plagioclase replaced by smectite and albite; vesicles and thin fissures infilled with chalcedony and quartz.

Sample 144-872B-7R-1, 8–12 cm (Piece 1), Unit 13 [Z-1538]

Plagioclase-olivine-clinopyroxene-phyric basalt, weakly crystallized, vesicular, brecciated. Phenocrysts (10%): strong altered olivine idiomorphic grains (4%, 0.3–0.8 mm), clinopyroxene idiomorphic grains (5%, 0.4–1.5 mm), and plagioclase prismatic crystals (1%, 0.8–0.9 mm). Groundmass with vitrophyric texture; microlites of plagioclase (20%, 0.1–0.2 mm). Interstices: oxidized olivine grains (10%, <0.1 mm), clinopyroxene crystallites (25%), and opaque minerals (5%). Vesicles (30%, 0.3–1.5 mm) are isometric in shape. Thin fissures (0.1 mm) are present.

Alteration: moderate (35%); olivine completely replaced by iddingsite; plagioclase replaced by chalcedony or smectite; vesicles infilled with clay mineral, carbonate, and chalcedony; thin fissures infilled with carbonate, chalcedony, and quartz.

XRD: crystals from vein: calcite.

Sample 144-872B-7R-3, 32–37 cm (Piece 1), Unit 14 [Z-1539]

Lava breccia. Rock consists of rounded basalt fragments (70%, 1–7 mm) and cement (small fragments of basalt). Large fragments of basalt are represented by phenocrysts of oxidized olivine, plagioclase, and single clinopyroxene grains. Cement: fragments of basalt with microphenocrysts of oxidized olivine (1%–2%, 0.3–0.4 mm), single plagioclase prismatic crystals (1%), and groundmass. Groundmass; plagioclase microlites (40%, 0.1–0.3 mm), clinopyroxene crystals (30%), oxidized olivine grains (5%, <0.1 mm), and opaque minerals (5%).

Alteration: very strong (80%); olivine completely oxidized; plagioclase completely replaced by smectite.

XRD: smectite and mixed-layer smectite-chlorite mineral; trace calcite, analcime, and talc(?).

Sample 144-872B-7R-4, 102–107 cm (Piece 3), Unit 14 [Z-1540]

Clinopyroxene-olivine-plagioclase-phyric trachybasalt, crystallized, sparsely vesicular. Phenocrysts (7%–10%): clinopyroxene idiomorphic grains (1%, 0.5 mm), olivine grains (3%–4%, 0.3–0.5 mm), and plagioclase prismatic crystals (5%, 0.3–0.8 mm, andesine-labradorite [An_{50}]). Groundmass with microlitic (trachytoid) texture; parallel oriented microlites of plagioclase (35%, 0.1–0.3 mm, andesine [An_{43}] and andesine [An_{34}]). Interstices: clinopyroxene grains (30%, <0.1 mm), oxidized olivine grains (5%, 0.1 mm), light greenish yellow glass (5%), and opaque minerals (10%). Single vesicle (1.5 X 0.2 mm) is elongated-oval in shape. Thin fissure is present.

Alteration: moderate (35%); olivine replaced by iddingsite; plagioclase replaced by carbonate; vesicle infilled with chalcedony; thin fissures infilled with carbonate.

XRD: smectite with ~20% mica layers; trace defective chlorite; matter from vein: smectite and calcite.

Sample 144-872B-7R-6, 10–15 cm (Piece 3), Unit 14 [Z-1541]

Olivine-clinopyroxene-plagioclase-phyric basalt, crystallized, sparsely vesicular. Phenocrysts (15%): olivine grains (1%), clinopyroxene grains (7%, up to 1.5 mm), and plagioclase prismatic crystals (7%, 0.3–0.78 mm, labradorite [An_{55}]). Groundmass with microlitic texture; unoriented microlites and laths of plagioclase (30%, 0.1–0.4 mm, andesine [An_{43}] and andesine [An_{34}]). Interstices: clinopyroxene grains (35%), dark green glass (10%), and opaque minerals (5%–7%). Vesicles (10%) are elongated-oval in shape.

Alteration: slight (10%–12%); olivine replaced by iddingsite; clay mineral replaces glass.

XRD: smectite; trace defective chlorite and talc(?); matter from veinlet: calcite; trace smectite.

Sample 144-872B-8R-1, 50–54 cm (Piece 7), Unit 16A [Z-1542]

Lava breccia. Rock consists of angular or weakly rounded fragments (0.3–1.5 mm) of aphyric vesicular basalt with hyalopilitic texture.

Alteration: rock completely replaced by smectite, carbonate, and zeolite(?).

XRD: smectite with ~20% mica layers; trace hematite and talc(?).

Sample 144-872B-8R-1, 63–68 cm (Piece 7), Unit 16A [Z-1543]

Tuff (breccia). Rock consists of basalt fragments (0.1–3 mm). Aphyric basalt with hyalopilitic texture, vesicular (up to 50%). Thin fissures (20%) are present.

Alteration: very strong (50%–60%); glass partly (10%) replaced by clay mineral; vesicles infilled with carbonate and zeolite; thin fissures infilled with carbonate.

XRD: smectite; trace hematite, calcite, analcime, and talc(?).

Sample 144-872B-8R-2, 9–12 cm (Piece 1), Unit 16A [Z-1720]

Aphyric basalt, highly vesicular. Rock with vitrophyric and pilotaxitic texture; black glass with needle-shaped microlites (0.1–0.15 mm) of plagioclase; clinopyroxene grains (<0.05 mm) segregate; opaque minerals; and smectite. Vesicles (50%, 0.1–0.3 mm and up to 5 mm) are rounded, oval, and isometric-elongated in shape. Thin fissure (0.05 mm) was met.

Alteration: slight (5%–10%); plagioclase completely replaced by smectite, smectite partly replaces glass; vesicles infilled with quartz and chalcedony; thin fissure infilled with carbonate.

XRD: smectite with interlayer Ca-Mg cations and ~20% mica layer, calcite, and chabazite.

Sample 144-872B-8R-2, 91–94 cm (Piece 3), Unit 16B [Z-1717]

Aphyric basalt, crystallized, fine grained, vesicular. Rock with microlitic texture; plagioclase microlites and microlaths (0.05–0.2 mm, andesine [An_{46}] and andesine [An_{40}]). Interstices: clinopyroxene grains (25%, 0.01 mm) segregate; opaque minerals (10%); phlogopite (5%). Vesicles (25%, 0.4–0.9 mm) are isometric in shape. Thin fissure (0.05 mm) is present.

Alteration: moderate (25%); vesicles infilled with smectite and carbonate.

XRD: smectite with interlayer Ca-Mg cations and calcite.

Sample 144-872B-8R-4, 24–29 cm (Piece 2), Unit 16B [Z-871]

Sparsely olivine-plagioclase-phyric basalt, crystallized, sparsely vesicular. Phenocrysts (5%): single strong altered olivine grain (0.3 mm) and plagioclase prismatic crystals (0.5–2 mm, labradorite [An_{62}]). Groundmass with intersertal texture; laths of plagioclase (50%, 0.1–0.3 mm, labradorite [An_{52}]). Interstices: clinopyroxene grains (35%, <0.1 mm) segregate; needle-shaped grains of opaque minerals (5%); glass (10%). Vesicles (2%–3%, 0.1–0.3 mm) are rounded in shape.

Alteration: slight (15%); olivine completely replaced by clay mineral; clay mineral replaces glass; vesicles infilled with clay mineral.

Sample 144-872B-9R-2, 19–21 cm (Piece 1), Unit 17A [Z-872]

Aphyric basalt, weakly crystallized, vesicular. Rock with hyalopilitic texture; plagioclase microlites, altered olivine grains (up to 0.1 mm), and volcanic glass with opaque dust. Vesicles (15%–20%, 0.1–0.3 mm) are isometric in shape.

Alteration: very strong (80%); plagioclase almost completely replaced by clay mineral and sosurite; olivine completely replaced by Fe hydroxides; clay mineral replaces glass; vesicles infilled with clay mineral and carbonate.

Sample 144-872B-9R-3, 28–33 cm (Piece 3), Unit 17B [Z-1544]

Aphyric basalt, crystallized, sparsely vesicular. Rock with microlitic texture; plagioclase microlites and microlaths (50%, 0.1–0.4 mm, labradorite [An_{60}], andesine [An_{47}] and andesine [An_{38}]). Interstices: olivine idiomorphic grains (15%, 0.1 mm); clinopyroxene grains (20%, <0.1 mm) segregate; opaque minerals (5%); glass (5%). Vesicles (3%, up to 2.5 mm) are elongated-isometric in shape. Thin fissure (0.05 mm) was met.

Alteration: moderate (20%–25%); olivine completely replaced by iddingsite; glass completely replaced by clay mineral; vesicles infilled with clay mineral; thin fissure infilled with carbonate.

XRD: smectite with ~10% mica layers; trace hydromica(?); veinlet: calcite.

Sample 144-872B-9R-4, 73–78 cm (Piece 1C), Unit 18B [Z-1545]

Lava breccia. Rock consists of angular fragments (0.2–2 mm) of basalt. Olivine-phyric basalt, uncrystallized, with vitrophyric texture, sparsely vesicular. Rock consists of olivine large idiomorphic grains (15%, up to 2.5 mm) and black glass (75%) with rare microlites of clinopyroxene and plagioclase (~5%). Vesicles (10%) demonstrate irregular sizes (0.5–1 mm).

Alteration: slight (15%); vesicles infilled with smectite.

XRD: smectite; trace calcite and analcime; matter from veinlet: smectite and dolomite; trace calcite and analcime.

Sample 144-872B-9R-5, 38–40 cm (Piece 1A), Unit 18B [Z-1546]

Lava breccia. Clinopyroxene-olivine-phyric basalt (ankaramite), with vitrophyric texture, vesicular. Phenocrysts (50%): olivine large idiomorphic crystals (48%, 1.2–3 mm) and single microphenocryst (0.6 mm) of clinopyroxene (2%). Groundmass consists of dark gray glass (75%) with rare microlites of clinopyroxene, plagioclase, and olivine (<5%). Vesicles (10%, 0.1–0.4 mm) are isometric in shape. Thin fissures are present.

Alteration: strong (5%); olivine completely replaced by iddingsite, rims of olivine grains are oxidized; vesicles infilled with smectite and chalcedony; thin fissures infilled with carbonate.

XRD: smectite with ~10% mica layers; trace analcime.

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Sample 144-874B-22R-4, 48–53 cm (Piece 1), Unit 1 [Z-1547]

Clinopyroxene-olivine-phyric basalt (ankaramite), vesicular, brecciated. Phenocrysts (50%): olivine idiomorphic zonal large grains (0.5–2.5 mm). Clinopyroxene forms large phenocryst (5–7 mm, 5%–7%). Groundmass with vitrophyric texture; glass with abundant microlites of oxidized olivine, opaque minerals, and crystallites of

plagioclase and clinopyroxene. Vesicles (15%, 0.1–2 mm) are oval-isometric in shape. Thin fissures (5%, 0.01–0.05 mm) are present.

Alteration: strong (55%); rock is oxidized (20%); olivine replaced by iddingsite and Fe hydroxides; microcracks in clinopyroxene phenocryst infilled with carbonate; vesicles infilled with light yellowish green matter (chalcedony and smectite?); thin fissures are filled with carbonate.

XRD: mixed-layer swelling chlorite-smectite mineral; minor smectite with ~10% mica layers; trace hydromica, calcite, and analcime; altered olivine grain: smectite with ~10% mica layers; trace mixed-layer swelling chlorite-smectite mineral and calcite; white matter: smectite with ~10% mica layers and mixed-layer swelling chlorite-smectite mineral; trace mixed-layer smectite-chlorite mineral and calcite.

Sample 144-874B-23R-1, 100–105 cm (Piece 13), Unit 1 [Z-1548]

Clinopyroxene-olivine-phyric basalt (ankaramite), sparsely vesicular. Phenocrysts (60%): olivine idiomorphic large grains (55%, 1–4.5 mm). Clinopyroxene forms partly idiomorphic phenocryst (1–2.5 mm, 5%). Groundmass with vitrophyric texture; colorless glass with rare microlites of clinopyroxene. Vesicles (5%, 0.3–1.7 mm) are isometric in shape.

Alteration: strong; 60% of rock is oxidized: completely oxidized olivine; vesicles infilled by light brown matter.

XRD: mixed-layer swelling chlorite-smectite mineral; trace smectite, serpentine, and hematite; altered olivine grain: swelling chlorite; trace serpentine and quartz.

Sample 144-874B-23R-2, 112–117 cm (Piece 23), Unit 1 [Z-1549]

Clinopyroxene-olivine-phyric basalt (ankaramite), sparsely vesicular. Rock: identical to Sample 144-874B-23R-1, 100–105 cm (1548). Vesicles (20%, 0.3–1.7 mm) are isometric in shape.

Alteration: strong (55%); olivine completely replaced by iddingsite and smectite, central parts of olivine grains are oxidized; glass replaced by smectite; vesicles infilled with light cream matter.

XRD: mixed-layer swelling chlorite-smectite mineral; trace serpentine, hematite, and calcite; altered olivine grain: swelling chlorite; trace serpentine.

Sample 144-874B-24R-1, 30–35 cm (Piece 2), Unit 1 [Z-1550]

Clinopyroxene-olivine-phyric basalt (ankaramite), crystallized, sparsely vesicular. Phenocrysts (60%): fresh olivine idiomorphic large grains (50%, 0.4–3.5 mm). Clinopyroxene (augite) forms partly idiomorphic large phenocrysts (up to 3 mm, 10%). Groundmass with microlitic texture; (2%–3%) microlites (<0.1 mm) of plagioclase, oxidized olivine (2%–4%), green glass (5%), clinopyroxene microlites (15%), and opaque minerals (10%). Vesicles (1–3 mm) are isometric and rounded in shape.

Alteration: slight (5%); cracks in olivine phenocrysts infilled with Fe hydroxides; chlorite replaces glass; vesicles infilled with quartz or cristobalite(?).

XRD: chlorite with ~10% swelling interlayers; trace smectite, mixed-layer smectite-chlorite mineral, calcite, and quartz; altered olivine grain: smectite with ~20% mica layers; trace mixed-layer smectite-chlorite mineral and calcite.

Sample 144-874B-24R-1, 100–105 cm (Piece 7), Unit 1 [Z-1551]

Clinopyroxene-olivine-phyric basalt (ankaramite), crystallized, vesicular. Rock: identical to Sample 144-874B-24R-1, 30–35 cm (Z-1550). Vesicles (10%, up to 5 mm) are isometric and rounded in shape.

Alteration: strong (50%); olivine phenocrysts completely replaced by iddingsite and carbonate, several grains are completely oxidized; cracks in clinopyroxene phenocrysts infilled with carbonate; clay mineral replaces glass; vesicles infilled with chalcedony, quartz, and clay mineral.

Sample 144-874B-24R-1, 120–127 cm (Piece 8), Unit 1 [Z-1552]

Clinopyroxene-olivine-phyric basalt (ankaramite), crystallized. Phenocrysts (70%): olivine grains (50%, 0.5–4.5 mm) and clinopyroxene large isomorphic grain (up to 5 mm, 20%) with inclusions of glass. Groundmass with microlitic texture; clinopyroxene microlites (15%), glass (10%), and opaque minerals (5%).

Alteration: strong (50%–55%); olivine phenocrysts completely replaced by iddingsite, several grains almost completely replaced by Fe hydroxides, one grain is fresh; clay mineral replaces glass.

Sample 144-874B-24R-2, 70–76 cm (Piece 9), Unit 1 [Z-1553]

Clinopyroxene-olivine-phyric basalt (ankaramite), crystallized, brecciated. Phenocrysts (60%): olivine grains (50%, 1.3–2.5 mm) and clinopyroxene xenomorphic grains (1.5–2 mm, 10%). Groundmass with vitrophyric texture; colorless glass with crystallites of clinopyroxene and opaque minerals. Thin fissures are present (10%, 0.1 mm, up to 0.5 mm).

Alteration: strong (60%); olivine phenocrysts completely replaced by iddingsite and Fe hydroxides, several grains are fresh with microcracks (microcracks infilled with hydrobiotite?); thin fissures infilled with carbonate and biotite like mineral.

XRD: trace smectite, mixed-layer smectite-chlorite mineral, calcite, serpentine, and quartz.

Sample 144-874B-24R-2, 120–124 cm (Piece 18), Unit 1 [Z-1554]

Clinopyroxene-olivine-phyric basalt (ankaramite), highly vesicular. Phenocrysts (5%): two small (0.5–0.7 mm) phenocrysts of clinopyroxene and olivine grains (3%–4%). Groundmass with vitrophyric texture; black glass with microlites of plagioclase (<1%). Vesicles (49%, 0.1–0.5 mm) are rounded and isometric in shape.

Alteration: olivine phenocrysts completely replaced by Fe hydroxides; vesicles infilled with chalcedony and Fe hydroxides.

XRD: swelling chlorite; trace chlorite and calcite; altered olivine grain: swelling chlorite; trace smectite; altered olivine crystals: swelling chlorite and mixed-layer swelling chlorite-smectite mineral.

Sample 144-874B-24R-3, 125–130 cm (Piece 18), Unit 1 [Z-1555]

Clinopyroxene-olivine-phyric basalt (ankaramite), crystallized. Phenocrysts (70%): olivine idiomorphic grains (30%, 1–3 mm), clinopyroxene large (1%–5%) tabular crystals (20%) with inclusions of glass, and plagioclase prismatic crystals (20%, 0.5–2 mm, labradorite [An_{59-60}]) and their glomerophyric segregates. Groundmass with microlitic texture; plagioclase microlites and microlaths (10%) segregate; oxidized olivine grains (<0.1 mm, 5%); clinopyroxene (12%); and opaque minerals (2%–3%).

Alteration: moderate (30%); olivine phenocrysts completely replaced by iddingsite and Fe hydroxides.

Sample 144-874B-24R-4, 54–72 cm (Piece 3), Unit 1 [Z-1718]

Plagioclase-clinopyroxene-olivine-phyric basalt, crystallized, fine grained, sparsely vesicular. Phenocrysts (50%): glomerophyric segregates of plagioclase prismatic crystals (5%, 0.3–1.2 mm, labradorite [An_{68}]); clinopyroxene large (2.5–5 mm) idiomorphic crystals (25%); olivine idiomorphic grains (25%, 0.4–2.5 mm). Groundmass with microlitic texture; plagioclase microlites and microlaths (10%, 0.05–0.15 mm, andesine [An_{38}]); clinopyroxene grains (25%, <0.1 mm) segregate; opaque minerals (10%); glass (5%).

Alteration: moderate (20%–25%); oxidized olivine phenocrysts are replaced with iddingsite and carbonate; clay mineral replaces glass.

XRD: smectite; trace mixed-layer smectite-chlorite mineral, chlorite, and hydromica; vesicle: calcite; microfissures: smectite with ~20% interlayers of mica type.

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Sample 144-878A-78R-2, 64–70 cm (Piece 3B), Unit 1 [Z-1556]

Olivine-phyric andesite-basalt (hawaiite), crystallized, vesicular. Phenocrysts (10%): oxidized olivine idiomorphic small grains. Groundmass with microlitic texture; plagioclase microlites and laths (up to 1 mm, 40%, andesine [An_{41-42}] and andesine [An_{32}]), clinopyroxene small grains (<0.1 mm), 30%), black oxidized grains (up to 0.2 mm) of olivine (10%), and opaque minerals (10%).

Alteration: oxidized olivine.

Sample 144-878A-79R-2, 9–12 cm (Piece 1), Unit 2 [Z-873]

Olivine-plagioclase-phyric basalt, weakly crystallized, sparsely vesicular. Phenocrysts (20%): idiomorphic small grains (0.1–0.4 mm, 10%) of oxidized olivine and laths and elongated-prismatic crystals (up to 0.7 mm) of plagioclase. Groundmass with hyalopilitic texture; plagioclase grains, small grains (<0.1 mm) of oxidized olivine, opaque dust, and glass. Vesicles (~5%, 0.2–0.3 mm) are empty.

Alteration: very strong (80%); plagioclase replaced by sosurite; clay mineral replaces glass.

Sample 144-878A-79R-4, 24–27 cm (Piece 1), Unit 2 [Z-874]

Olivine-plagioclase-phyric trachybasalt (trachyandesite), crystallized, massive. Phenocrysts (20%): olivine grains (0.1–0.3 mm, 10%) and plagioclase elongated-prismatic grains (0.5–1 mm). Plagioclase grains are parallel oriented. Groundmass with trachytic texture; parallel oriented albite microlites (40%), very small black grains and dust of opaque minerals, and clinopyroxene. Microcracks (0.1 mm) are present.

Alteration: slight to moderate (20%); olivine completely replaced by clay mineral; plagioclase replaced by pelite; microcracks infilled with opaque minerals.

Sample 144-878A-80R-5, 20–24 cm (Piece 1G), Unit 8 [Z-1557]

Olivine-phyric basanite, crystallized, fine grained, sparsely vesicular. Phenocrysts (30%): olivine idiomorphic grains (0.6–2.5 mm). Groundmass with microlitic texture; clinopyroxene microlites (30%, up to 0.1 mm), oxidized olivine grains (10%, 0.1–0.3 mm), plagioclase microlites (20%, andesine [An_{42-44}]), opaque minerals (7%–8%), and interstitial secondary carbonate (<1%). Vesicles (1%–2%, 1–4.5 mm) are rounded and oval in shape.

Alteration: moderate (30%–35%); oxidized olivine is replaced with iddingsite; interstitial carbonate (glass replaced by carbonate?), vesicles infilled with carbonate.

Sample 144-878A-80R-5, 106–109 cm (Piece 4B), Unit 8 [Z-876]

Olivine-phyric basanite, sparsely vesicular. Phenocrysts (15%): olivine idiomorphic grains (0.3–1.7 mm). Groundmass with microlitic texture; plagioclase microlites and microlaths (20%, andesine [An_{46-48}]); clinopyroxene grains (60%, 0.1–0.2 mm) segregate; oxidized olivine grains (10%, 0.1–0.2 mm); opaque minerals. Single vesicles (0.5 mm) are rounded in shape.

Alteration: slight (15%); oxidized olivine is replaced with iddingsite and clay mineral; vesicles infilled with clay mineral.

Sample 144-878A-81R-2, 10–15 cm (Piece 1), Unit 10 [Z-1558]

Olivine-phyric basanite, crystallized. Phenocrysts (35%): olivine idiomorphic grains (0.5–2 mm). Groundmass with microlitic texture; clinopyroxene grains (35%, up to 0.2 mm) segregate, oxidized olivine grains (10%, up to 0.4 mm), plagioclase microlites (10%, andesine [An_{42}]), and opaque minerals (10%). Thin fissure (0.5–0.9 mm) was met.

Alteration: moderate (25%); oxidized olivine is replaced with iddingsite; thin fissure infilled with chalcedony(?) and carbonate.

Sample 144-878A-81R-4, 120–124 cm (Piece 12), Unit 11 [Z-1559]

Olivine-phyric basanite, crystallized, vesicular. Phenocrysts (25%): olivine grains (0.5–0.9 mm). Groundmass with microlitic texture; clinopyroxene microlites (25%), plagioclase microlites (20%, andesine [An_{38}] and oligoclase-andesine [An_{30}]), oxidized olivine grains (10%, up to 0.2 mm), and opaque minerals (10%). Vesicles (10%, 0.6–1.5 mm) are present.

Alteration: oxidized olivine is replaced with iddingsite; vesicles infilled with carbonate and zeolite.

Sample 144-878A-81R-5, 42–45 cm (Piece 3A), Unit 11 [Z-1560]

Olivine-phyric basanite, crystallized, sparsely vesicular. Phenocrysts (25%): olivine grains (0.4–0.9 mm). Groundmass with microlitic texture; clinopyroxene microlites (25%), plagioclase microlites (25%, andesine [An_{32}]), oxidized olivine grains (10%), and opaque minerals (10%). Single large vesicle (3%–4%, 2 X 3.5 mm) is oval in shape.

Alteration: slight (5%); oxidized olivine is replaced with iddingsite; vesicles infilled with carbonate.

Sample 144-878A-83R-3, 84–87 cm (Piece 4), Unit 13 [Z-877]

Olivine-phyric basalt, sparsely vesicular. Phenocrysts (20%): oxidized olivine iiomorphic grains (0.1–0.7 mm). Groundmass with vitrophyric texture; glass with rare plagioclase and clinopyroxene crystallites and opaque minerals. Vesicle (5%, 0.1–0.3 mm) is rounded in shape, often empty.

Alteration: slight; oxidized olivine is replaced with iddingsite; walls of several vesicles are lined with clay mineral.

Sample 144-878A-84R-2, 119–123 cm (Piece 6C), Unit 15 [Z-878]

Olivine-phyric basalt (basanite?), vesicular. Phenocrysts (20%): olivine idiomorphic grains (0.1–0.7 mm). Groundmass with microlitic texture; plagioclase microlites (20%, 0.1–0.3 mm, andesine [An_{42-44}]), clinopyroxene idiomorphic grains (70%, up to 0.1 mm) segregate, opaque minerals (5%–7%), and glass (5%). Vesicles (10%, 0.5–3 mm) are oval-isometric in shape.

Alteration: moderate (20%–30%); oxidized olivine is partly replaced with clay mineral; clay mineral replaces glass; vesicles infilled with zeolite, clay mineral, and carbonate.

Sample 144-878A-84R-3, 18–22 cm (Piece 2A), Unit 15 [Z-1561]

Olivine-phyric basanite, crystallized, vesicular. Phenocrysts (30%): olivine grains (0.5–1.8 mm). Groundmass with microlitic texture; clinopyroxene (25%) and plagioclase (20%, andesine [An_{44}] and andesine [An_{36}]) microlites, opaque minerals (7%–8%), and oxidized olivine grains (5%). Vesicles (10%, 0.7–2.4 mm) are rounded in shape.

Alteration: slight (5%); oxidized olivine is partly replaced with iddingsite; vesicles infilled with smectite and carbonate.

Sample 144-878A-84R-3, 116–120 cm (Piece 8C), Unit 15 [Z-1562]

Olivine-phyric basanite, crystallized, vesicular. Rock: identical to Sample 144-878A-84R-3, 18–22 cm (Z-1561).

Alteration: moderate (30%); oxidized olivine is replaced with iddingsite; clay mineral replaces glass; vesicles infilled with clay mineral.

Sample 144-878A-84R-5, 114–118 cm (Piece 9B), Unit 15 [Z-879]

Olivine-phyric basanite, sparsely crystallized, vesicular. Rock: identical to Sample 144-878A-84R-3, 18–22 cm (Z-1561) and Sample 144-878A-84R-3, 116–120 cm (Z-1562).

Alteration: slight (10%); olivine partly replaced by iddingsite, clay mineral, and Fe hydroxides.

Sample 144-878A-85R-2, 110–114 cm (Piece 8), Unit 16 [Z-1563]

Olivine-phyric basanite, crystallized, sparsely vesicular. Phenocrysts (25%): olivine grains (0.3–0.8 mm). Groundmass with microlitic texture; clinopyroxene microlites (35%), opaque minerals (15%), plagioclase microlites (10%, andesine [An_{40}] and andesine [An_{32}]), oxidized olivine grains (5%, 0.1 mm), and altered green glass (5%). Vesicles (5%, 0.4–0.7 mm) are rounded in shape and infilled with oxidized light green and black glass.

Alteration: moderate (25%); oxidized olivine is replaced with iddingsite; clay mineral replaces glass.

Sample 144-878A-88R-3, 88–92 cm (Piece 7), Unit 20 [Z-1564]

Olivine-phyric basanite, crystallized, vesicular. Phenocrysts (25%): oxidized olivine grains (0.2–0.9 mm). Groundmass with microlitic texture; plagioclase microlites (30%, andesine [An_{42}] and andesine [An_{31}]), clinopyroxene grains (20%, 0.01 mm) segregate, oxidized olivine grains (5%, <0.1 mm), and opaque minerals (5%). Vesicles (10%, 0.7–1.5 mm) are isometric in shape. Walls of vesicles are lined yellowish glass.

Alteration: oxidized olivine.

Sample 144-878A-89R-2, 0–5 cm (Piece 1A), Unit 21 [Z-1565]

Clinopyroxene-plagioclase-olivine-phyric basanite, crystallized. Phenocrysts (40%): oxidized olivine grains (20%, 0.4–1.2 mm), clinopyroxene large (up to 3 mm) isometric and very idiomorphic crystals (10%), and plagioclase tabular and prismatic crystals (10%, 0.4–1.7 mm, andesine [An_{49}] and andesine [An_{31-38}]). Groundmass with microlitic texture; clinopyroxene grains (20%, <0.1 mm), plagioclase microlites and laths (15%, andesine [An_{35}]), oxidized olivine grains (15%, 0.1–0.3 mm), opaque minerals (5%), and glass (5%).

Alteration: slight; oxidized olivine is partly (5%) replaced with iddingsite; glass replaced by smectite and chalcedony.

Sample 144-878A-89R-4, 31–35 cm (Piece 3), Unit 21 [Z-1566]

Plagioclase-clinopyroxene-olivine-phyric basanite, crystallized. Phenocrysts (15%): oxidized olivine grains (10%, 0.9–2 mm), clinopyroxene idiomorphic grains (4%, 0.5–1.5mm), and plagioclase prismatic crystals (1%, 0.4–0.6 mm, labradorite [An_{55}]). Groundmass with microlitic texture; plagioclase microlites and laths (30%, 0.1–0.9 mm, andesine [An_{32-38}]), clinopyroxene grains (30%, <0.1 mm), oxidized olivine grains (5%, 0.1–0.2 mm), opaque minerals (5%), and light green glass (5%).

Alteration: slight; groundmass olivine completely replaced by Fe hydroxides.

Sample 144-878A-90R-1, 90–95 cm (Piece 6C), Unit 21 [Z-1567]

Clinopyroxene-plagioclase-olivine-phyric basanite, crystallized, sparsely vesicular. Phenocrysts (15%): single clinopyroxene grains (1%), plagioclase prismatic crystals (4%, 1.2–2 mm) with abundant inclusions of glass, and oxidized olivine grains (10%, 0.2–0.7 mm). Groundmass with microlitic texture; plagioclase microlites and laths (30%, andesine [An_{32-39}]), clinopyroxene grains (35%, <0.1 mm), oxidized olivine grains (5%), opaque minerals (5%), and glass (5%). Vesicles (5%) are present.

Alteration: slight; olivine phenocrysts partly (10%) replaced by iddingsite; groundmass olivine completely replaced by Fe hydroxides.

Sample 144-878A-90R-2, 32–36 cm (Piece 1B), Unit 21 [Z-1568]

Lava breccia. Rock consists of fragments of basanite. Phenocrysts (5%): oxidized olivine grains (3%, up to 2.5 mm) and clinopyroxene grains (2%, 0.5–1.5 mm). Groundmass of fragments is hyalopilitic to microlitic texture.

Alteration: moderate (30%–40%); plagioclase replaced by smectite.

Sample 144-878A-90R-4, 115–120 cm (Piece 8), Unit 22 [Z-1569]

Plagioclase-olivine-phyric alkali(?) basalt, crystallized. Phenocrysts (15%): plagioclase tabular and prismatic crystals (5%, 0.4–1.2 mm, andesine [An_{40}]) and oxidized olivine grains (10%, 0.5–2.5 mm). Groundmass with

microlitic texture; zonal plagioclase microlites (40%, oligoclase [An_{28}]) with inclusions of glass; clinopyroxene grains (20%, <0.1 mm); oxidized olivine grains (15%, 0.1–0.2 mm); opaque minerals (5%).

Alteration: moderate (30%); groundmass plagioclase completely replaced by pelite.

Sample 144-878A-90R-6, 0–5 cm (Piece 1), Unit 23 [Z-1570]

Clinopyroxene-olivine-plagioclase-phyric alkali basalt, crystallized. Phenocrysts (15%): oxidized olivine grains (5%, 0.5–1.7 mm), single clinopyroxene grains (1%): augite, and plagioclase tabular and prismatic crystals (9%, 0.5–1.2 mm, labradorite [An_{53}]) with inclusions of glass. Groundmass with microlitic texture; plagioclase laths and microlites (10%, andesine [An_{40}] and andesine [An_{31}]), clinopyroxene grains (35%, <0.1 mm), oxidized olivine grains (20%), opaque minerals (10%), and glass (5%). Biotite and carbonate (<1%) were met.

Alteration: slight; olivine phenocrysts partly (2%) replaced by iddingsite; groundmass olivine completely replaced by Fe hydroxides.

Sample 144-878A-91R-2, 80–84 cm (Piece 4B), Unit 23 [Z-1571]

Clinopyroxene-plagioclase-olivine-phyric alkali basalt, crystallized. Phenocrysts (20%): single augite grains (2%, 0.5–1.2 mm), oxidized olivine grains (10%, 0.4–1.5 mm), and plagioclase tabular and prismatic crystals (8%, up to 2.5 mm). Groundmass with microlitic texture; plagioclase laths and microlites (10%, oligoclase-andesine [An_{30}]), orthoclase isometric grains (20%, <0.1 mm), clinopyroxene grains (25%), oxidized olivine grains (15%), opaque minerals (10%), and biotite (<1%).

Alteration: slight.

Sample 144-878A-91R-4, 120–125 cm (Piece 13A), Unit 23 [Z-1572]

Olivine-clinopyroxene-plagioclase-phyric alkali basalt, crystallized. Phenocrysts (25%): olivine grains (2%, 0.6–0.8 mm), clinopyroxene xenomorphic grains (18%, 0.6–1.2 mm) and their segregates, plagioclase tabular and prismatic crystals (12%, 0.5–2.5 mm, andesine [An_{45}] and andesine [An_{38}], labradorite [An_{52}]), and idiomorphic grains of opaque minerals (0.4–0.7 mm). Groundmass with microlitic texture; plagioclase microlites and microlaths (30%, andesine [An_{48}] and andesine [An_{32}], oligoclase [An_{28}]), orthoclase isometric grains (10%, <0.1 mm), clinopyroxene (20%), olivine (5%), opaque minerals (5%), and glass (5%). Biotite (<1%) was met.

Alteration: slight; oxidized (5%) olivine, several olivine grains replaced by iddingsite.

Sample 144-878A-92R-4, 50–54 cm (Piece 13C), Unit 26 [Z-1573]

Clinopyroxene-olivine-phyric alkali basalt, crystallized, sparsely vesicular. Phenocrysts (20%): oxidized olivine grains (15%, 1–3 mm) and clinopyroxene isometric rounded grains (5%, 1.2–2 mm). Groundmass with microlitic texture; plagioclase microlites (40%, andesine [An_{36-40}]), orthoclase grains (5%), clinopyroxene (10%), oxidized olivine (20%, up to 0.2 mm), and opaque minerals (5%). Vesicle (<1%, 0.8 mm) infilled with green glass.

Alteration: slight; oxidized olivine, microcracks infilled with Fe hydroxides; central part of vesicle infilled with carbonate.

Sample 144-878A-93R-1, 7–11 cm (Piece 3A), Unit 28 [Z-1574]

Olivine-phyric basalt, crystallized, vesicular. Phenocrysts (10%): oxidized olivine. Groundmass with microlitic texture; clinopyroxene microlites (30%, <0.1 mm, albite-oligoclase), clinopyroxene (20%), opaque minerals (5%), and oxidized olivine (10%, up to 0.2 mm). Vesicles (25%, up to 2 mm) are elongated-isometric in shape. Walls of vesicles are lined light yellowish glass.

Alteration: slight; glass in vesicles partly replaced by clay mineral.

Sample 144-878A-93R-2, 118–122 cm (Piece 22), Unit 30 [Z-1575]

Olivine-clinopyroxene-plagioclase-phyric alkali basalt, crystallized, sparsely vesicular. Phenocrysts (35%): oxidized olivine (10%, 0.4–0.7 mm), large (up to 2.5 mm) prismatic and isometric grains of clinopyroxene (10%), and plagioclase (15%) tabular (2.5–2.7 mm, labradorite [An_{58}]) and prismatic (0.8–2.5 mm, andesine-labradorite [An_{50}]) crystals. Groundmass with microlitic texture; plagioclase microlites and laths (0.8 mm, andesine [An_{43-45}]), oxidized olivine grains (10%, 0.1–0.2 mm), clinopyroxene grains (10%, <0.1 mm) segregate, and opaque minerals (10%). Vesicles (5%, 0.7 mm) are rounded in shape. Walls of vesicles are lined glass.

Alteration: slight; central parts of vesicles infilled with carbonate.

Sample 144-878A-93R-3, 120–124 cm (Piece 14), Unit 30 [Z-1576]

Plagioclase-clinopyroxene-olivine-phyric basanite, crystallized, vesicular. Phenocrysts (30%): oxidized olivine (15%, 0.2–0.7 mm), clinopyroxene (10%, 0.6–1.5 mm), and plagioclase prismatic crystals (5%, andesine [An_{44}]). Groundmass with microlitic texture; plagioclase microlites and laths (25%, up to 0.6 mm, andesine [An_{42}]), oxidized olivine (15%, up to 0.2 mm), clinopyroxene grains (15%, <0.1 mm) segregate, and opaque minerals (5%). Vesicles (10%, 0.7–2.2 mm) are isometric-elongated in shape. They infilled with light cream glass.

Alteration: slight; oxidized olivine.

Sample 144-878A-94R-1, 0–4 cm (Piece 1A), Unit 30 [Z-880]

Olivine-clinopyroxene-phyric basalt, weakly crystallized, vesicular. Phenocrysts (20%): clinopyroxene grains (1.2–2 mm and 0.1–0.3 mm) and oxidized olivine (0.1–0.3 mm). Groundmass with pilotaxitic texture; plagioclase microlaths (andesine [An_{42}]), glass, clinopyroxene, and opaque dust. Vesicles (30%, 0.1–2 mm) are oval-isometric in shape, empty.

Alteration: moderate (30%); plagioclase almost completely replaced by sosurite, albite, and zeolite; clay mineral replaces glass; several small (0.3 mm) vesicles infilled with zeolite and carbonate.

Sample 144-878A-94R-2, 0–5 cm (Piece 1A), Unit 31A [Z-1577]

Aphyric basalt, highly vesicular. Rock with vitrophyric texture; volcanic glass (40%) and microvesicles (60%, 0.01–0.3 mm). Vesicles are rounded in shape and infilled with glass.

Alteration: rock is fresh.

Sample 144-878A-94R-2, 0–5 cm (Piece 1A), Unit 31A [Z-1578]

Hyalobasalt, microvesicular.

Alteration: rock almost completely (90%) replaced by Fe-Mn hydroxides.

Sample 144-878A-94R-5, 102–107 cm (Piece 1), Unit 31A [Z-1579]

Lava breccia of olivine-phyric basalt with vitrophyric texture, microvesicular. Rock consists of phenocrysts of oxidized olivine (3%–4%), colorless to black volcanic glass (40%), and microvesicles (56%–57%, 0.01–0.3 mm). Vesicles infilled with light cream glass.

Alteration: rock is fresh.

Sample 144-878A-94R-7, 70–74 cm (Piece 1), Unit 31B [Z-1580]

Lava breccia. Rock: identical to Sample 144-878A-94R-5, 102–107 cm (Z-1579).

Sample 144-878A-95R-2, 0–5 cm (Piece 1), Unit 31B [Z-1581]

Lava breccia of olivine-phyric basalt with vitrophyric texture, microvesicular (70%). Rock: identical to Sample 144-878A-94R-5, 102–107 cm (Z-1579).

Alteration: slight; oxidized olivine and glass; ~10% of vesicles infilled with carbonate.

Sample 144-878A-95R-3, 125–128 cm (Piece 9), Unit 31B [Z-1582]

Lava breccia of olivine-phyric basalt with vitrophyric texture, microvesicular (40%). Rock: identical to Sample 144-878A-94R-5, 102–107 cm. Vesicles infilled with colorless glass.

Alteration: rock is fresh.

Sample 144-878A-95R-5, 0–5 cm (Piece 1), Unit 31B [Z-1583]

Lava breccia of olivine-phyric basalt with vitrophyric texture, microvesicular (40%). Rock: identical to Sample 144-878A-94R-5, 102–107 cm (Z-1579).

Alteration: fresh; several vesicles infilled with carbonate.

Sample 144-878A-97R-1, 20–24 cm (Piece 7B), Unit 34 [Z-1584]

Sparsely olivine-clinopyroxene-plagioclase-phyric alkali basalt. Phenocrysts (5%): olivine (3%, 0.3–0.7 mm), single grains of clinopyroxene (1%), and plagioclase (1%, 1,7 mm, andesine [An_{32}]). Groundmass with hyalopilitic to microlitic texture; plagioclase laths (25%, 0.2–0.6 mm, andesine [An_{40}] and occasionally: labradorite [An_{54}]), clinopyroxene microlites (40%), opaque minerals (10%), olivine (10%), and biotite (3%–4%).

Alteration: slight (3%–5%); olivine replaced by iddingsite.

Sample 144-878A-97R-2, 28–31 cm (Piece 3D), Unit 34 [Z-881]

Sparsely olivine-phyric basalt, massive. Phenocrysts (5%): olivine idiomorphic grains (5%, 0.2–0.5 mm). Groundmass with hyalopilitic texture; laths and microlites of plagioclase(30%, andesine [An_{40-42}]), olivine (5%, 0.1 mm), and glass with abundant opaque dust.

Alteration: slight; olivine replaced by clay mineral.

Sample 144-878A-98R-2, 93–96 cm (Piece 5D), Unit 35 [Z-882]

Sparsely olivine-phyric basalt, massive. Phenocrysts (5%–7%): fresh olivine (0.3–1.2 mm). Groundmass with microlitic texture; plagioclase microlites (andesine [An_{42}]), olivine (5%, <0.1 mm), pyroxene, opaque minerals, and glass (5%).

Alteration: rock is fresh.

Sample 144-878A-98R-3, 8–12 cm (Piece 1B), Unit 35 [Z-1585]

Clinopyroxene-olivine-phyric alkali basalt, sparsely vesicular. Phenocrysts (10%): single clinopyroxene grains (1%, 0.4 mm) and olivine idiomorphic grains (9%, 0.3–0.7 mm). Groundmass with microlitic texture; plagioclase microlites (35%, 0.1–0.2 mm, andesine [An_{45}] and andesine [An_{38}]), clinopyroxene grains (25%, up to 0.1 mm) segregate, olivine (10%, up to 0.2 mm), opaque minerals (10%), light green glass (9%), and carbonate (1%). Vesicles (<1%) were met.

Alteration: slight (10%–15%); several olivine phenocrysts replaced by iddingsite; groundmass olivine completely replaced by iddingsite.

Hess Rise (Leg 62)

Hole 465A

Sample 62-465A-40R-3, 17–25 cm (Piece 1B), Unit 1 [Z-1226]

Lava (tuff?) breccia of aphyric trachyandesite. Rock demonstrates spotty-trachytic texture. Angular fragments (1–5 mm) of volcanic rock are represented by trachyandesite. Rock consists of laths (<5%) of altered plagioclase (andesine [An_{38}]) and cream glass. Often rock fragments are rimed by small (<0.1 mm) grains of opaque minerals (~5%).

Alteration: slight (~5%–10%); plagioclase mainly replaced by albite and orthoclase; matrix of breccia; carbonate.

XRD: smectite; matrix of breccia: calcite, siderite.

Sample 62-465A-40R-3, 27–35 cm (Piece 1C), Unit 1 [Z-1227]

Tuff (breccia of trachyandesite). Rock consists of isometric fragments of trachyandesite (60%, 1–5 mm) and matrix (40%). Matrix; angular-isometric fragments of volcanic glass (0.05–0.2 mm) and carbonate. Rock (in composition and texture): identical to Sample 62-465A-40R-3, 17–25 cm (Z-1226).

Alteration: slight (~5%–10%); rock is slightly oxidized (5%–7%); plagioclase mainly replaced by albite and orthoclase; matrix of breccia is represent by carbonate.

XRD: smectite and calcite, trace quartz and chlorite.

Sample 62-465A-41R-1, 113–120 cm (Piece 9), Unit 1 [Z-1228]

Aphyric trachyandesite, vesicular. Rock with trachytic texture; laths (0.1–0.4 mm) of altered plagioclase (10%, andesine [An_{38}]), needle-shaped grains of dark-colored mineral, glass (20%), opaque dust, and isometric grains of opaque minerals (3%). Vesicles (15%–20%, 0.1–0.5 mm) are empty. Vesicles with sizes 0.1–0.2 mm completely infilled with light cream glass.

Alteration: moderate (20%–25%); rock is nonoxidized; plagioclase mainly replaced by albite and orthoclase.

XRD: smectite with ~20% mica layers; matter from vein: calcite, siderite, and smectite with ~20% mica layers; trace quartz.

Sample 62-465A-41R-2, 90–93 cm (Piece 11A), Unit 1 [Z-383]

Aphyric trachyandesite, fine grained, glassy, poorly crystallized, vesicular (0.2–0.6 mm, 10%). Rock demonstrates hyalotaxitic texture and fluidal structure; light devitrified glass with crystals of feldspar; opaque dust; small and xenomorphic grains of opaque minerals; small amounts of various elongated plates of sanidine(?). Single phenocrysts of K-feldspar are present.

Alteration: slight (~15%); rock is slightly oxidized; vesicles are filled partly with green smectites.

XRD: smectite with ~15%–20% mica layer.

Sample 62-465A-42R-1, 128–132 cm (Piece 8A), Unit 2 [Z-384]

Aphyric trachyandesite, glassy, poorly crystallized, vesicular (0.2–0.3 mm, 7%–10%). Rock demonstrates hyalotaxitic texture and fluidal structure; light devitrified glass with crystals of feldspar; opaque dust; small and xenomorphic grains of opaque minerals; small amounts of various elongated plates of sanidine(?).

Alteration: slight (~10%); rock is slightly oxidized; vesicles are filled partly with green smectites.

XRD: smectite.

Sample 62-465A-42R-3, 98–103 cm (Piece 9), Unit 2 [Z-385]

Aphyric trachyandesite, glassy, poorly crystallized, vesicular. Rock demonstrates hyalotaxitic texture and fluidal structure; light devitrified glass with crystals of feldspar, opaque dust, small and xenomorphic grains of opaque

minerals, and small amounts of various elongated plates of sanidine(?). Vesicles (0.2–0.4 mm, 15%–20%) are rounded to elongated in shape.

Alteration: slight to moderate (15%–20%); vesicles are filled partly with green smectites.

Sample 62-465A-43R-2, 130–135 cm (Piece 14A), Unit 2 [Z-386]

Aphyric trachyandesite, glassy, poorly crystallized, vesicular (0.1–0.2 up to 1.5 mm, 10%). Rock demonstrates hyalotaxitic texture and fluidal structure; light devitrified glass with crystals of feldspar, opaque dust, small and xenomorphic grains of opaque minerals, and small amounts of various elongated plates of sanidine(?).

Alteration: slight (~10%–15%); small vesicles are filled with smectites, largess are filled with smectite and zeolites.

XRD: smectite.

Sample 62-465A-44R-1, 112–116 cm (Piece 13B), Unit 3 [Z-387]

Aphyric trachyandesite, glassy, poorly crystallized, vesicular. Rock is pilotaxitic texture; light glass with crystals of feldspar, clinopyroxene(?), opaque dust, small and xenomorphic grains of opaque minerals, and small amounts (5%–7%) of various elongated plates of sanidine(?), and single microphenocrysts of plagioclase. Various vesicles (10%–15%) are irregular in shape; as a rule they are empty.

Alteration: slight (~10%); rock is slightly oxidized.

XRD: smectite.

Sample 62-465A-44R-3, 118–123 cm (Piece 7A), Unit 3 [Z-388]

Aphyric trachyandesite, glassy, poorly crystallized, vesicular. Rock is hyalotaxitic texture; glass with crystals of feldspar, opaque dust, small and xenomorphic grains of opaque minerals, and small amounts (5%–10%) of elongated plates of sanidine(?). Various vesicles (up to 2.5 mm, ~10%) are irregular in shape.

Alteration: slight (10%–15%); rock is moderately oxidized; small vesicles are filled partly with smectites, large ones are filled with calcite.

XRD: smectite.

Sample 62-465A-45R-1, 81–85 cm (Piece 5D), Unit 3 [Z-389]

Aphyric trachyandesite, glassy, poorly crystallized, vesicular. Rock demonstrates hyalotaxitic or trachytic texture structure; light devitrified glass with crystals of feldspar, opaque dust, idiomorphic grains of opaque minerals, and small amounts of elongated plates of sanidine(?). Single table crystals of brownish hornblende are present. Various vesicles (0.1–0.8 mm, ~10%), are irregular in shape. Some vesicles filled with glass.

Alteration: slight (10%–15%); rock is slightly oxidized; small vesicles are empty or filled partly with smectites, large vesicles contain carbonate.

XRD: smectite.

Sample 62-465A-46R-1, 82–86 cm (Piece 6G), Unit 5 [Z-390]

Aphyric trachyandesite, glassy, poorly crystallized, vesicular. Rock is hyalotaxitic or trachytic texture; light devitrified glass with crystals of feldspar, opaque dust, small and xenomorphic grains of opaque minerals, and small amounts (5%–7%) of elongated plates of sanidine(?). Vesicles are various (1.5–2 mm, 5%–7%) and irregular in shape.

Alteration: slight (10%); rock is slightly oxidized; vesicles are filled partly with smectites and zeolites, some vesicles are filled with chalcedony.

XRD: smectite and hydromica.

Sample 62-465A-46R-3, 57–61 cm (Piece 8), Unit 5 [Z-391]

Aphyric trachyandesite, glassy, poorly crystallized, vesicular. Rock is hyalotaxitic texture; light devitrified glass with crystals of feldspar, pyroxene, opaque dust, small and xenomorphic grains of opaque minerals, and small amounts (5%–7%) of elongated plates of sanidine(?). Various (2–3 mm, 5%–7%) vesicles are irregular in shape.

Alteration: slight (10%); rock is moderately oxidized; vesicles are filled partly with carbonate; a narrow zone of smectites is located beneath carbonates on the walls of vesicles.

XRD: smectite; trace calcite.

Voring Plateau (Leg 104)

Hole 642E

Sample 104-642E-9R-1, 59–62 cm (Piece 4E), Unit D1 [Z-153]

Sparsely plagioclase-phyric basalt, fine grained, crystallized, vesicular (0.3–1 mm, 10%). Phenocrysts of plagioclase (0.5–1 mm, 3%). Single crystals of olivine are present. Groundmass is intergranular texture; laths of plagioclase, clinopyroxene, devitrified volcanic glass, and aggregated opaque dust.

Alteration: slight (~15%); rock is nonoxidized; smectites fill vesicles and replace both olivine and interstitial glass.

XRD: smectite; trace chlorite.

Sample 104-642E-10R-1, 133–136 cm (Piece 20), Unit D2 [Z-592]

Sparsely olivine-plagioclase-phyric basalt, fine grained, massive. Phenocrysts: two small (0.2–0.4 mm) idiomorphic grains of reddish brown oxidized olivine and prismatic grains (0.4–0.6 mm) and segregates of plagioclase (3%–4%, labradorite [An_{55}]). Groundmass with microdoleritic texture; unoriented microlaths of plagioclase (labradorite [An_{54}]), segregate of small (<0.1 mm) isomorphic grains of pyroxene, volcanic glass (7%–8%), and opaque minerals (3%–5%).

Alteration: slight; clay minerals replace glass.

Sample 104-642E-10R-2, 87–90 cm (Piece 12), Unit D3 [Z-154]

Olivine-plagioclase-phyric basalt, crystallized, vesicular (1%–2%). Phenocrysts of plagioclase (0.8–1 mm). Groundmass is intergranular texture; laths of plagioclase, clinopyroxene, olivine, devitrified volcanic glass, and aggregated opaque dust.

Alteration: moderate (~25%); rock is nonoxidized; smectites fill vesicles and replace both olivine and interstitial glass, as well as form rims around plagioclases.

XRD: smectite.

Sample 104-642E-15R-1, 120–123 cm (Piece 22), Unit F11 [Z-155]

Aphyric basalt, incompletely crystallized. Groundmass is intersertal, partly subvariolitic, texture; laths of plagioclase, clinopyroxene, olivine, brown interstitial glass, and opaque dust. Vesicles have sizes of 0.3–3.5 mm (30%). Large vesicles join each other.

Alteration: moderate (~35%); rock is slightly oxidized; smectites and carbonate fill vesicles; smectites replace olivine.

XRD: smectite.

Sample 104-642E-15R-3, 77–80 cm (Piece 4), Unit F11 [Z-156]

Olivine basalt, incompletely crystallized, massive. Plagioclase (0.5–0.8 mm, 50%) forms glomerophyric aggregates, olivine (0.3–0.5 mm, 20%), and clinopyroxene (0.2–0.4 mm, 15%). Texture of rock is intersertal, partly subophitic.

Alteration: moderate (~30%); rock is nonoxidized; smectites replace olivine and interstitial glass.

XRD: smectite.

Sample 104-642E-18R-4, 13–16 cm (Piece 1), Unit F17 [Z-157]

Aphyric basalt, almost completely crystallized, massive. Microphenocrysts of plagioclase (up to 0.3 mm, <1%) and olivine (0.1–0.3 mm, <1%). Groundmass is intergranular texture; laths of plagioclase, clinopyroxene, and devitrified volcanic glass with opaque dust.

Alteration: slight (~5%); rock is nonoxidized; smectites replace olivine and interstitial glass.

XRD: smectite.

Sample 104-642E-22R-3, 93–96 cm (Piece 4), Unit F23 [Z-158]

Sparsely plagioclase-phyric basalt, highly vesicular (0.5–2 mm, 10%). Phenocrysts of plagioclase (0.5–2 mm, 10%) form glomerophyric segregates. Single crystals of olivine are registered. Groundmass is intersertal texture; laths of plagioclase, clinopyroxene, olivine, and devitrified volcanic glass with opaque dust. Often large vesicles join each other.

Alteration: strong (50%); rock is nonoxidized; smectites replace olivine, interstitial glass, and plagioclase; vesicles are filled with smectites.

XRD: smectites with various composition of interlayer cations.

Sample 104-642E-22R-5, 32–35 cm (Piece 2), Unit F23 [Z-159]

Olivine-plagioclase-phyric basalt, massive. Phenocrysts of plagioclase (0.8–1.5 mm, 30%) form glomerophyric segregates and olivine (0,3–1 mm, 10%). Groundmass is intergranular texture; laths of plagioclase, clinopyroxene, interstitial glass, and opaque minerals.

Alteration: moderate (~20%); rock is nonoxidized; smectites replace olivine and interstitial glass.

XRD: smectites with various composition of interlayer cations.

Sample 104-642E-30R-2, 76–79 cm (Piece 2A), Unit F36 [Z-160]

Olivine basalt, massive. Groundmass is intersertal texture; laths of plagioclase, clinopyroxene, olivine, interstitial glass, and opaque minerals.

Alteration: slight (~15%); rock is nonoxidized; smectites replace olivine and interstitial glass.

XRD: smectites with various composition of interlayer cations.

Sample 104-642E-34R-1, 4–7 cm (Piece 1), Unit S18 [Z-594]

Plagioclase-phyric microdolerite, massive. Phenocrysts of plagioclase (8%–10%) form tabular and prismatic grains (0.5–0.6 mm) and segregates. Groundmass with doleritic texture; laths (0.1–0.3 mm) of plagioclase (labradorite [An_{55}]), segregate of small (0.1 mm) xenomorphic grains of clinopyroxene (grains with size up to 0.5 mm are present), interstitial greenish brown altered glass (10%), and opaque minerals (5%–7%).

Alteration: clay mineral replaces of glass.

Sample 104-642E-40R-1, 33–36 cm (Piece 2D), Unit F48 [Z-161]

Olivine basalt, fine grained, massive. Groundmass is intersertal texture; laths of plagioclase, clinopyroxene, olivine, interstitial glass, and opaque minerals.

Alteration: slight (~15%); rock is nonoxidized; smectites replace olivine and interstitial glass.

XRD: smectites with various composition of interlayer cations; trace chlorite.

Sample 104-642E-46R-3, 40–43 cm (Piece 1C), Unit F53 [Z-162]

Olivine basalt, fine grained, sparsely vesicular. Groundmass is intersertal texture; laths of plagioclase, clinopyroxene, olivine, interstitial glass, and opaque minerals. Single vesicles have size up to 1.25 mm.

Alteration: slight (~10%); rock is nonoxidized; smectites replace olivine and interstitial glass.

XRD: smectites with various composition of interlayer cations.

Sample 104-642E-60R-1, 68–71 cm (Piece 14), Unit F63A [Z-163]

Olivine basalt, fine grained, highly vesicular (0.2–2.5 mm, 30%). Groundmass is hyalopilitic texture; laths of plagioclase, clinopyroxene, olivine, interstitial glass, and opaque minerals.

Alteration: moderate 40%; rock is nonoxidized; smectites replace olivine and interstitial glass; vesicles are filled by smectites.

XRD: smectite.

Sample 104-642E-60R-2, 25–27 cm (Piece 1%), Unit F63A [Z-164]

Olivine basalt, fine grained, vesicular (0.8–1.2 mm, 5%). Groundmass is intersertal texture; laths of plagioclase, clinopyroxene, olivine, interstitial glass, and opaque minerals.

Alteration: moderate (~20%); rock is nonoxidized; smectites replace olivine and interstitial glass; vesicles are filled with smectites.

XRD: smectite.

Sample 104-642E-69R-2, 59–61 cm (Piece 1D), Unit F78 [Z-165]

Olivine-plagioclase-phyric basalt, medium grained, vesicular (0.1–0.4 mm, <5%). Phenocrysts of plagioclase (0.3–1 mm, 20%) form glomerophyric segregates. Microphenocrysts of olivine (0.1–0.5 mm, 15%). Groundmass is intersertal texture; laths of plagioclase, clinopyroxene, olivine, and interstitial glass.

Alteration: moderate (~20%); rock is nonoxidized; smectites replace olivine and interstitial glass; vesicles are filled with smectites.

XRD: smectite.

Sample 104-642E-78R-2, 46–48 cm (Piece 5A), Unit F90 [Z-166]

Sparsely plagioclase-phyric basalt, fine grained, vesicular (0.1–0.4 mm, <5%). Microphenocrysts of plagioclase (0.2–0.4 mm) form glomerophyric segregates. Groundmass is intergranular texture; laths of plagioclase, clinopyroxene, and interstitial glass.

Alteration: moderate (~20%); rock is nonoxidized; smectites replace olivine and intersertal glass.

XRD: smectites with various composition of interlayer cations.

Sample 104-642E-88R-2, 70–72 cm (Piece 7B), Unit F102 [Z-167]

Basalt, fine grained, vesicular (0.1–5 mm, 25%). Groundmass is hyalopilitic texture; laths of plagioclase, clinopyroxene, olivine, interstitial glass, and opaque minerals.

Alteration: rock is nonoxidized; smectites replace olivine and interstitial glass; vesicles are filled with smectites.

XRD: smectites with various composition of interlayer cations and contain ~20% of mica layers; trace hydromica.

Sample 104-642E-91R-1, 18–20 cm (Piece 3), Unit F104A [Z-168]

Basalt, fine grained, highly vesicular. Groundmass is hyalopilitic, partly subvariolitic, texture; laths of plagioclase, clinopyroxene, olivine, interstitial glass, and opaque minerals. Vesicles (0.2–5 mm, 50%) penetrate rock.

Alteration: strong (~50%); rock is nonoxidized; smectites replace olivine, interstitial glass, and plagioclase; vesicles are filled with smectites.

XRD: smectite contains single mica layers; trace hydromica (~15% swelling layers).

Sample 104-642E-94R-1, 32–34 cm (Piece 1B), Unit F105 [Z-169]

Sparsely plagioclase-phyric basalt, almost completely crystallized, massive. Phenocrysts of plagioclase (up to 1.5 mm, 5%) form glomerophyric segregates. Microphenocrysts of clinopyroxene (0.3–0.4 mm) are registered. Groundmass: laths of plagioclase, clinopyroxene, opaque minerals, and interstitial glass. Single vesicles (0.2 mm) are registered.

Alteration: slight (~3%); rock is nonoxidized; smectites replace olivine and intersertal glass.

XRD: smectite; trace chlorite.

Sample 104-642E-94R-4, 67–72 cm (Piece 2B), Unit S43 [Z-596]

Breccia. Fragments of rock are represented by isometric fragments of plagioclase (0.2–0.3 mm), brown oxidized glass, and opaque dust. Matrix of breccia consists of Fe hydroxides.

Alteration: strong; rock is oxidized; Fe hydrooxides in matrix of breccia.

XRD: smectite and kaolinite; trace goethite.

Sample 104-642E-102R-2, 45–47 cm (Piece 6), Unit F115 [Z-170]

Hyalobasalt, vesicular (1–2.5 mm, 3%). Phenocrysts of plagioclase (1.5–2.5 mm, 3%) within volcanic glass. Texture of rock is perlitic. Vesicles are empty.

Alteration: scarce (<1%); rock is nonoxidized.

XRD: smectite.

Sample 104-642E-105R-1, 64–66 cm (Piece 7A), UnitD5 [Z-171]

Basalt, large-crystalline, almost completely crystallized, massive. Rock is poikilophitic, partly doleritic, texture; plagioclase, clinopyroxene, olivine, volcanic glass, and opaque minerals.

Alteration: slight (~10%); rock is nonoxidized; smectites replace olivine and interstitial glass; present of carbonate.

XRD: smectite; trace mixed-layer smectite-chlorite mineral(?).

Sample 104-642E-110R-1, 39–41 cm (Piece 5B), Unit D7 [Z-172]

Olivine basalt, fine grained, incompletely crystallized, sparsely vesicular (0.2–0.3 mm). Microphenocrysts of plagioclase (0.2–0.4 mm, <1%). Groundmass is intersertal texture; laths of plagioclase, clinopyroxene, olivine, interstitial glass, and opaque minerals.

Alteration: slight to moderate (15%–20%); rock is nonoxidized; smectites replace olivine and intersertal glass; cracks are filled with carbonate.

XRD: smectite.

Bermuda Rise (Legs 51, 52, and 53)

Hole 417A

Sample 51-417A-29R-5, 58–61 cm (Piece 5), Unit 8 [Z-511]

Olivine-plagioclase-phyric basalt, sparsely vesicular. Phenocrysts: sparsely idiomorphic grains of olivine (0.3–0.5 mm, 2%–3%); plagioclase (20%, 0.3–2 mm, labradorite [An_{55}]) forms prismatic grains. Groundmass with hyalopilitic texture; needle-shaped microlites of plagioclase and black glass. Sparsely vesicles (0.3–0.8 mm) are rounded in shape.

Alteration: slight (10%–15%); olivine completely replaced by carbonate; albite replaces partly large grains of plagioclase, small crystals almost completely replaced by albite and chlorite; vesicles are rimed with black glass, central parts of vesicles infilled with palagonite and carbonate.

XRD: smectite and mixed-layer smectite-chlorite mineral.

Sample 51-417A-32R-2, 5–8 cm (Piece 1), Unit 12 [Z-512]

Olivine-plagioclase-phyric basalt, sparsely vesicular. Phenocrysts: idiomorphic grains of olivine (0.4–0.5 mm, 3%–5%); plagioclase (25%, 0.3–2 mm, labradorite [An_{55}]) form prismatic grains and segregates (up to 0.5–1 mm). Groundmass with pilotaxitic texture; needle-shaped microlites of plagioclase, small grains of pyroxene, and black glass. Sparsely rounded vesicles (0.3–0.5 mm) infilled with glass.

Alteration: moderate (25%); olivine replaced by carbonate and hydroxides of Fe; smectites almost completely replace plagioclase.

XRD: mixed-layer chlorite-smectite mineral with 80% smectite layers.

Sample 51-417A-44R-3, 31–34 cm (Piece 1A), Unit 18B [Z-513]

Plagioclase-phyric dolerite, medium grained, massive. Phenocrysts: prismatic grains of plagioclase (0.7–0.8 mm, 10%, labradorite [An_{68}]). Groundmass with ophitic-poikilophitic texture; laths of plagioclase (0.1–0.4 mm, labradorite [An_{56}] and andesine [An_{48}]); clinopyroxene forms isometric large grains (0.5–0.7 mm) with inclusions of laths of plagioclase and small isometric grains. Interstices consist of greenish brown glass (7%–8%) and opaque minerals (7%–8%).

Alteration: rock is fresh.

XRD: smectite with ~20% mica layers; trace chlorite, hydromica, quartz, and talc(?).

Hole 418A

Sample 52-418A-15R-1, 98–101 cm (Piece 1I), Unit 1 [Z-297]

Plagioclase-phyric (phenocrysts 0.2–0.8 mm, 20%) basalt, poorly crystallized, sparsely vesicular. Groundmass with subvariolitic texture; volcanic glass with opaque dust, microlites of clinopyroxene, and laths of plagioclase. Vesicles (0.2 mm, 5%) are empty. Single vesicles are filled with volcanic glass which contains opaque dust.

Alteration: slight (5%–10%); rock is nonoxidized; secondary minerals are represented by smectites and calcite; vesicles are filled with palagonitized volcanic glass, smectites, and calcite; carbonization effects some areas.

XRD: smectite (~10% of mica layers); calcite(?) in trace amounts.

Sample 52-418A-15R-3, 129–132 cm (Piece 4D), Unit 1 [Z-298]

Plagioclase-phyric (phenocrysts of plagioclase 0.8–3 mm, 15%) hyalobasalt, poorly crystallized, massive. Single microphenocrysts of clinopyroxene and olivine are present. Groundmass with subvariolitic texture; volcanic glass with opaque dust, microlites of clinopyroxene, and laths of plagioclase. Vesicles (0.2 mm, 5%) are empty. Single vesicles are filled with volcanic glass which contains opaque dust.

Alteration: slight (5%–7%); smectites and calcite replace olivine; single vesicles are filled with smectites.

XRD: smectite; calcite(?) in trace amounts.

Sample 52-418A-18R-1, 81–84 cm (Piece 2F), Unit 2C [Z-299]

Plagioclase-phyric (phenocrysts 0.2–0.8 mm, 20%) basalt, poorly crystallized; vesicular (0.5–1.5 mm, 3%). Single microphenocrysts of clinopyroxene (0.3 mm) are present. Groundmass with poorly subvariolitic texture; volcanic glass with opaque dust, microlites of clinopyroxene, and laths of plagioclase.

Alteration: slight (~15%); rock is slightly oxidized; vesicles are mostly filled by carbonate, or sparsely, palagonitized and smectitized volcanic glass; smectites replace clinopyroxene and interstitial glass.

XRD: smectite (~10% of mica layers); trace calcite(?).

Sample 52-418A-19R-4, 86–89 cm (Piece 1I), Unit 2C [Z-300]

Plagioclase-phyric basalt, poorly crystallized; massive. Plagioclase phenocrysts (0.8–2.5 mm, 15%–20% abundance) form glomerophyric segregates. Microphenocrysts of olivine (0.2–0.5 mm, 2%) are present. Groundmass is hyalopilitic texture; volcanic glass, microlites of clinopyroxene, and large laths of plagioclase (often quench crystals).

Alteration: slight (3%); rock is nonoxidized; smectites replace olivine and clinopyroxene.

XRD: smectite.

Sample 52-418A-19R-7, 6–9 cm (Piece 1A), Unit 2C [Z-301]

Olivine-plagioclase-phyric basalt, massive. Phenocrysts of plagioclase (0.8–2.4 mm, 25%) form glomerophyric segregates. Phenocrysts of olivine (0.3–0.5 mm, 1%) occur. Groundmass with intergranular texture; microlites of clinopyroxene, large laths of plagioclase (0.5 mm), and opaque minerals.

Alteration: slight (15%); rock is nonoxidized; smectites replace olivine and clinopyroxene.

XRD: smectite.

Sample 52-418A-20R-5, 10–13 cm (Piece 1B), Unit 2C [Z-302]

Olivine-plagioclase-phyric basalt, massive. Phenocrysts of plagioclase (up to 2.5 mm, 20%) form glomerophyric segregates. Phenocrysts of olivine (0.2–1.5 mm, 5%) occur. Groundmass with intergranular texture; laths of plagioclase, microlites of clinopyroxene, olivine, and opaque minerals.

Alteration: slight (15%); rock is nonoxidized; smectites replace of olivine, clinopyroxene, and interstitial glass.

XRD: smectite (~25%–30% of mica layers).

Sample 52-418A-27R-1, 33–35 cm (Piece 1D), Unit 5 [Z-303]

Plagioclase-phyric basalt, poorly crystallized, scarcely vesicular. Phenocrysts of plagioclase (0.5–1 mm, 10%). Phenocrysts of olivine (0.1–0.3 mm, <1%). Groundmass is hyalopilitic texture; volcanic glass, laths of plagioclase, of clinopyroxene and opaque minerals.

Alteration: slight (~10%); rock is slightly oxidized; smectites replace olivine and clinopyroxene, as well as fill vesicles.

XRD: smectite; trace calcite(?).

Sample 52-418A-27R-2, 91–93 cm (Piece 5B), Unit5 [Z-304]

Plagioclase-phyric hyalobasalt, poorly crystallized, sparsely vesicular (0.1–0.3 mm, <1%). Phenocrysts of plagioclase (0.8–2.5 mm, 15%) form glomerophyric segregates. Single grains of olivine are present. Groundmass with hyalopilitic texture; volcanic glass, laths of plagioclase, clinopyroxene, and opaque minerals.

Alteration: slight (~10%); rock is nonoxidized; smectites replace olivine and clinopyroxene; smectites and carbonate fill vesicles (carbonate is located in central part, smectite covers inner walls of vesicles).

XRD: smectite.

Sample 52-418A-31R-2, 47–51 cm (Piece 3A), Unit 5 [Z-514]

Plagioclase-phyric basalt, massive. Phenocrysts of plagioclase (0.8–2.7 mm, 30%). Phenocrysts: plagioclase forms prismatic grains (0.7–0.8 mm, labradorite [An_{56}]) and small prisms (0.1–0.2 mm). Groundmass with vitrophyric texture is represented mainly by volcanic glass.

Alteration: volcanic glass replaced with carbonate and palagonite.

XRD: smectite with ~10% mica layers; trace calcite, chlorite, and amphibole.

Sample 52-418A-31R-2, 134–139 cm (Piece 12), Unit 5 [Z-515]

Plagioclase-phyric basalt, massive. Phenocrysts of plagioclase (0.3–0.9 mm, 30%, labradorite [An_{67}]). Groundmass with vitrophyric texture; volcanic glass (70%).

Alteration: microcracks in glass unfilled with clay mineral and palagonite; volcanic glass is palagonitized (30%).

XRD: smectite; minor mixed-layer chlorite-smectite mineral with ~10%–15% smectite layers; trace calcite.

Sample 52-418A-38R-1, 41–44 cm (Piece 2C), Unit 5 [Z-305]

Plagioclase-phyric basalt, poorly crystallized and sparsely vesicular (0.2 mm). Phenocrysts of plagioclase (0.8–2.7 mm, 30%). Some phenocrysts form glomerophyric segregates. Groundmass with hyalopilitic texture; volcanic glass with opaque dust, clinopyroxene, laths of plagioclase. Laths of plagioclase are partly represented by quench crystals.

Alteration: moderate (~15%–20%); rock is nonoxidized; smectites replace clinopyroxene and plagioclase; carbonate and smectites fill vesicles (carbonate and smectites are located in central part, volcanic glass with opaque dust cover inner walls of vesicles).

XRD: smectite.

Sample 52-418A-38R-3, 10–13 cm (Piece 1A), Unit 5 [Z-306]

Plagioclase-phyric basalt, poorly crystallized, and sparsely vesicular (0.2–0.3 mm). Phenocrysts of plagioclase (0.5–2.5 mm, 30%) form glomerophyric segregates. Single xenomorphic crystals of olivine and clinopyroxene (0.1–0.2 mm) are present. Groundmass is trachytic to subvariolitic texture; volcanic glass, clinopyroxene, laths of plagioclase, and opaque dust.

Alteration: slight (~10%); rock is nonoxidized; smectites replace olivine, clinopyroxene and plagioclase; carbonate and smectites fill sparsely vesicles.

XRD: smectite; hydromica and talc(?) in trace amounts.

Sample 52-418A-42R-3, 2–6 cm (Piece 1A), Unit 6B [Z-516]

Olivine-plagioclase-phyric basalt, sparsely vesicular, tectonized. Phenocrysts: olivine (3%–4%) forms small (0.2–0.3 mm) idiomorphic fresh grains; plagioclase (15%–20%) forms large (1–3 mm) tabular or elongated prismatic grains (labradorite [An_{56}]) with microcracks. Groundmass with microlitic texture; needle-shaped microlites and segregate very small grains of pyroxene. Rounded vesicles (5%, 0.3–0.5 mm) are rimed with green and greenish brown glass (palagonite?).

Alteration: slight (~5%–10%); central parts of vesicles infilled with zeolite; microcracks in rock infilled with zeolite.

XRD: smectite with ~10% mica layers; trace quartz.

Sample 53-418A-52R-1, 61–64 cm (Piece 6B), Unit 6B [Z-307]

Plagioclase-phyric basalt, poorly crystallized, sparsely vesicular (1%–3%). Phenocrysts of plagioclase (0.3–2.5 mm, 30%) form glomerophyric segregates. Single crystals of plagioclase contain inclusions of volcanic glass filled with opaque dust. Single phenocrysts of olivine (0.2–1 mm, <1% abundance). Groundmass with hyalopilitic and, occasionally, subvariolitic texture; volcanic glass with opaque dust, clinopyroxene, laths of plagioclase.

Alteration: slight (~5%); rock is nonoxidized; smectites replace olivine, clinopyroxene, and interstitial glass; smectites and palagonitized volcanic glass fill vesicles.

XRD: smectite.

Sample 53-418A-52R-4, 29–32 cm (Piece 2), Unit 6B [Z-308]

Olivine-plagioclase-phyric basalt, sparsely vesicular (0.1–0.2 mm). Phenocrysts of plagioclase (0.5–2 mm, 20%) form glomerophyric segregates. Often, phenocrysts of olivine (0.3–1.5 mm, 15%) associate with glomerophyric segregates of plagioclase. Groundmass is hyalopilitic texture; volcanic glass with occasional accumulations of opaque minerals, clinopyroxene, and small laths of plagioclase (0.1–0.2 mm).

Alteration: moderate (~20%); rock is nonoxidized; smectites replace of olivine, clinopyroxene, and interstitial glass; smectites and volcanic glass with opaque minerals fill vesicles.

XRD: smectite.

Sample 53-418A-70R-1, 64–67 cm (Piece 2A), Unit 13 [Z-309]

Clinopyroxene-plagioclase-phyric hyalobasalt, sparsely vesicular (0.2–0.3 mm, 1%). Phenocrysts of plagioclase (0.8–2.5 mm, 20%) are relatively abundant. Often, phenocrysts of clinopyroxene (0.3–1 mm, 5%) tend to occur in association with glomerophyric segregates of plagioclase. Single xenomorphic crystals of olivine are present. Groundmass with hyalopilitic texture; volcanic glass with opaque dust, clinopyroxene, laths of plagioclase.

Alteration: slight (~15%); rock is nonoxidized; smectites replace of olivine, clinopyroxene and interstitial glass; smectites fill vesicles.

XRD: smectites with composition of Na-K and Mg-Ca interlayer cations.

Sample 53-418A-70R-1, 67–68 cm (Piece 2A), Unit 13 [Z-517]

Plagioclase-phyric hyalobasalt, sparsely vesicular. Phenocrysts: plagioclase (30%–35%) forms large prismatic grains (2.5–3 mm) and segregates of smaller (1–1.5 mm) grains, labradorite [An_{60}]; second generation; small (0.3–0.5 mm) prismatic grains of plagioclase, labradorite [An_{54}]. Groundmass with hyalopilitic texture; sparsely needle-shaped microlites and microlaths of plagioclase and volcanic glass. Vesicles (1%) are rounded, empty, single vesicles infilled with green chlorite.

Alteration: rock is fresh.

XRD: smectite with ~10% mica layers; trace quartz.

Sample 53-418A-77R-2, 57–60 cm (Piece 4A), Unit 14B [Z-310]

Sparsely clinopyroxene-plagioclase-phyric basalt, vesicular (0.4–0.8 mm). Phenocrysts of plagioclase (0.3–1 mm, 15%), large crystal form glomerophyric segregates. Phenocrysts of clinopyroxene (0.2–0.8 mm, 5%) are present. Single crystals of olivine occur also. Groundmass with intergranular-subophitic texture; clinopyroxene, laths of plagioclase, and opaque minerals. The latter local clusters which tend to occur with glass and, probably, olivine.

Alteration: slight (~10%); rock is nonoxidized; smectites and carbonate replace olivine and interstitial glass, as well as fill vesicles.

XRD: smectite; trace talc(?).

Sample 53-418A-77R-3, 33–36 cm (Piece 2B), Unit 14B [Z-311]

Plagioclase-phyric basalt, vesicular (0.4–1 mm). Phenocrysts of plagioclase (0.4–2.5 mm, 20%). Phenocrysts of clinopyroxene (0.2–0.5 mm, 5%). Single crystals of olivine. Groundmass with hyalopilitic texture; volcanic glass with opaque dust, clinopyroxene, laths of plagioclase.

Alteration: slight (~10%); rock is nonoxidized; smectites and carbonate replace olivine and fill vesicles.

XRD: smectite (~20% of mica layers).

Sample 53-418A-84R-2, 51–54 cm (Piece 1D), Unit 14C [Z-312]

Dolerite, massive, completely crystallized. Crystals of plagioclase (0.8–2.3 mm, 45%–50%), clinopyroxene (0.5–2.5 mm) and smaller xenomorphic crystals of the latter are ~50% abundance. Olivine is 5% abundance. Texture of rock is poikilophitic.

Alteration: slight (~10%); rock is nonoxidized; smectites-chlorite aggregate fills cracks in plagioclase and replaces of olivine.

XRD: smectite (~10% of mica layers); chlorite and talc in trace amounts.

Sample 53-418A-85R-2, 48–51 cm (Piece 3), Unit 14C [Z-313]

Olivine dolerite, massive, almost completely crystallized, medium grained. Rock; aggregate of xenomorphic and hypidiomorphic clinopyroxene (45%), plates and large laths of plagioclase (45%), and opaque minerals (1%). Poorly crystallized interstitial glass (5%) is present also. The texture of rock is hypidiomorphic-granular, poikilophitic.

Alteration: slight (~10%); rock is nonoxidized; smectites-chlorite aggregate replaces olivine and interstitial glass.

XRD: smectite; chlorite and talc in trace amounts.

Manihiki Plateau (Leg 33)

Hole 317A

Sample 33-317A-31R-2, 37–39 cm (Piece 5), Unit 2 [Z-1104]

Clinopyroxene-phyric (microphenocrysts 0.3–0.4 mm, 5%) basalt, fine grained, vesicular, groundmass is microlitic texture. Phenocrysts are represented by prismatic grains of clinopyroxene (0.2–0.8 mm, 10%). Groundmass; microlaths and microlites of plagioclase (0.1–0.4 mm, labradorite [An_{62}] and andesine [An_{47}]), microlites of clinopyroxene, volcanic glass, and opaque minerals (5%–7%). Vesicles demonstrate irregular in shape (0.3–2.5 mm, 30%).

Alteration: moderate to strong (~40%–45%); rock is nonoxidized; central parts of microlaths almost completely replaced with smectites; glass is replaced with smectites; vesicles are filled with clay mineral.

Sample 33-317A-31R-2, 87–89 cm (Piece 10), Unit 2 [Z-266]

Sparsely clinopyroxene-phyric (microphenocrysts 0.3–0.6 mm, 5%) basalt, medium grained, incompletely crystallized, vesicular. Single grains (0.3 mm) of olivine are present. Groundmass (70%) is intersertal texture; laths of plagioclase (up to 0.3 mm, andesine [An_{44}] 30%), microlites of clinopyroxene (<0.1 mm, 30%), volcanic glass (5%), and opaque minerals (5%). Vesicles (25%) demonstrate irregular in shape (0.2–0.4 and 1.7–2.8 mm, 20%).

Alteration: moderate (~30%–35%); rock is nonoxidized; vesicles are filled with smectites.

XRD: smectite with interlayer cations of Na-K; trace hydromica.

Sample 33-317A-31R-3, 20–23 cm (Piece7), Unit 3 [Z-267]

Sparsely clinopyroxene-phyric (microphenocrysts 0.3–0.5 mm, 3%) basalt, medium grained, almost completely crystallized, vesicular. Single microphenocrysts of olivine are present. Groundmass; laths of plagioclase, microlites of clinopyroxene, volcanic glass, and opaque dust. Vesicles are rounded and isometric in shape (0.2–3 mm, 30%).

Alteration: strong (~50%); rock is nonoxidized; vesicles partly filled with smectites, interstitial glass is replaced with smectites.

XRD: smectites with Na-K and Mg-Ca interlayer cations.

Sample 33-317A-31R-4, 76–82 cm (Piece 11), Unit 5A [Z-1105]

Clinopyroxene-phyric (phenocrysts 0.5–0.8 mm, 3%) dolerite, medium grained, vesicular. Groundmass (75%) with ophitic-intersertal texture; laths of plagioclase (0.3–0.7 mm, andesine [An_{48}] and labradorite [An_{54}]). Interstices infilled with xenomorphic grains of clinopyroxene and brownish black volcanic glass. Vesicles (0.5 up to 5 mm, 20%).

Alteration: rock is fresh and nonoxidized; several vesicles partly filled with clay mineral.

Sample 33-317A-31R-4, 91–94 cm (Piece 11), Unit 5A [Z-268]

Sparsely plagioclase-clinopyroxene-phyric (microphenocrysts of clinopyroxene 0.2–0.5 mm, 10%) basalt, medium grained, almost completely crystallized, vesicular. Single phenocrysts of olivine. Groundmass is intergranular texture; laths of plagioclase, microlites of clinopyroxene, volcanic glass, and opaque dust. Vesicles are rounded and isometric in shape (0.3–2.5 mm, 7%).

Alteration: slight (~10%); rock is nonoxidized; vesicles filled with smectites, interstitial glass and olivine are replaced with smectites.

XRD: smectites with Na-K and Mg-Ca interlayer cations.

Sample 33-317A-32R-1, 93–95 cm (Piece 5), Unit 5B [Z-269]

Aphyric basalt, medium grained, completely crystallized. Occasional microphenocrysts of clinopyroxene (0.2–0.4 mm, <3%). Clinopyroxene forms glomerophyric segregates. Groundmass is intergranular texture; laths of plagioclase, olivine(?), and dust of opaque minerals.

Alteration: slight (~3%); smectites replace of interstitial glass and olivine.

XRD: smectites with Na-K and Mg-Ca interlayer cations.

Sample 33-317A-32R-2, 120–124 cm (Piece 13), Unit 5B [Z-270]

Aphyric basalt, medium grained, almost completely crystallized, vesicular (0.5–5 mm, 20%). Single microphenocrysts of clinopyroxene (0.2–0.4 mm). Groundmass demonstrate intergranular texture; laths of plagioclase, microphenocrysts of clinopyroxene and volcanic glass with opaque dust.

Alteration: moderate (~20%); rock is nonoxidized; smectites fill vesicles.

XRD: smectites with Na-K and Mg-Ca interlayer cations.

Sample 33-317A-32R-3, 60–65 cm (Piece 7), Unit 5B [Z-271]

Clinopyroxene-phyric basalt, medium grained, completely crystallized, vesicular (5 mm, 20%). Microphenocrysts of clinopyroxene (0.2–0.5 mm, 5%). Groundmass; laths of plagioclase, clinopyroxene, and small amounts of volcanic glass.

Alteration: moderate (~20%); rock is nonoxidized.

XRD: smectites with Na-K and Mg-Ca interlayer cations.

Sample 33-317A-32R-4, 112–117 cm (Piece 7), Unit 6A [Z-272]

Aphyric basalt, medium grained, incompletely crystallized, vesicular (0.3–0.5 mm, 5%). Groundmass is intersertal, occasionally intergranular texture; laths of plagioclase (which often forms quench crystals), clinopyroxene, olivine, volcanic glass, and opaque minerals.

Alteration: moderate (~5%); rock is nonoxidized; smectites fill vesicles.

XRD: smectites with Na-K and Mg-Ca interlayer cations, may present smectite only which contains 10% of mica layers.

Sample 33-317A-32R-5, 58–63 cm (Piece 1), Unit 6A [Z-273]

Clinopyroxene-phyric basalt, medium grained, incompletely crystallized, some areas are almost completely crystallized, vesicular (0.2–2.5 mm, 20%). Phenocrysts of clinopyroxene (0.5–0.8 mm, 50%) and

microphenocrysts of olivine (0.2–0.3 mm, 5%). Groundmass is intersertal texture; some areas are intergranular texture; laths of plagioclase, microlites of clinopyroxene, volcanic glass, and opaque minerals.

Alteration: moderate (~20%); rock is nonoxidized; smectites fill vesicles and replace olivine and interstitial glass.

XRD: smectites with Na-K and Mg-Ca interlayer cations.

Sample 33-317A-32R-5, 89–93 cm (Piece 2), Unit 6A [Z-1106]

Plagioclase-clinopyroxene-phyric dolerite, medium grained, vesicular, ophitic-intersertal texture. Phenocrysts are represented by single glomerophyric segregates of prismatic grains of plagioclase (0.5–1 mm, labradorite [An_{68}]). Phenocrysts are represented mainly by xenomorphic grains of clinopyroxene (40%, 0.5–0.9 mm). Groundmass (50%); laths of plagioclase (labradorite [An_{55}]). Interstices infilled with small isometric grains of clinopyroxene and greenish black volcanic glass. Vesicles (1.2–2.5 mm, 10%) filled with brownish green glass.

Alteration: slight to moderate (15%–20%); rock is nonoxidized; large vesicles filled with clay mineral which replaces glass.

Sample 33-317A-32R-6, 64–66 cm (Pies 6), Unit 6A [Z-274]

Clinopyroxene-phyric basalt, coarse grained, completely crystallized, vesicular (0.5–2 mm, 15%). Phenocrysts of clinopyroxene (0.2–2 mm, 60%). Groundmass; laths of plagioclase, microlites of clinopyroxene, volcanic glass, olivine, and opaque minerals; some areas demonstrate doleritic texture.

Alteration: slight (~15%); rock is nonoxidized; smectites fill vesicles and replace olivine and interstitial glass; some vesicles are empty.

XRD: smectites with Na-K and Mg-Ca interlayer cations and contain ~10% of mica layers.

Sample 33-317A-32R-6, 104–107 cm (Piece 8), Unit 6A [Z-1107]

Plagioclase-clinopyroxene-phyric dolerite, medium grained, vesicular. Rock: phenocrysts (20%), groundmass (55%), and vesicles (25%). Groundmass is ophitic-intersertal texture. Rock: identical to Sample 33-317A-32R-5, 89–93 cm (Z-1106).

Alteration: vesicles filled with clay mineral which replaces glass.

Sample 33-317A-33R-2, 20–25 cm (Piece 2), Unit 6B [Z-275]

Plagioclase-clinopyroxene-phyric basalt, coarse grained (in some areas is fine grained), almost completely crystallized, vesicular (0.2–1.2 mm, less then 10%). Phenocrysts of clinopyroxene (0.4–0.8 mm and more, 10%). Groundmass is doleritic texture; laths of plagioclase, clinopyroxene, volcanic glass, olivine, and opaque minerals; some areas demonstrate poikilophitic texture.

Alteration: slight (~10%); rock is nonoxidized; smectites fill vesicles and replace olivine and interstitial glass; some vesicles are empty.

XRD: smectites with Na-K and Mg-Ca interlayer cations.

Sample 33-317A-33R-3, 46–51 cm (Piece 1), Unit 6B [Z-276]

Plagioclase-clinopyroxene-phyric basalt, medium grained, almost completely crystallized, vesicular. Phenocrysts of clinopyroxene (0.4–0.6 mm, 20%) and plagioclase (0.5–0.8 mm, 50%). Groundmass is ophitic texture; laths of plagioclase, clinopyroxene, volcanic glass, olivine, and opaque minerals. Vesicles are rounded, elongated, or isometric in shape (0.3–2 mm, 20%).

Alteration: moderate (~25%); rock is nonoxidized; smectites fill vesicles and replace olivine, interstitial glass, and partly plagioclase.

XRD: smectites with interlayer cations of Na-K and Mg-Ca.

Sample 33-317A-33R-3, 92–96 cm (Piece 3), Unit 6B [Z-1108]

Clinopyroxene-phyric dolerite, fine grained, vesicular. Rock: identical to Sample 33-317A-32R-5, 89–93 cm (Z-1106) and Sample 33-317A-32R-6, 104–107 cm (Z-1107). Phenocrysts (20%) are represented by grains of clinopyroxene (0.5–0.7 mm). Groundmass (70%) with ophitic-intersertal texture includes laths of plagioclase (0.1–0.3 mm, labradorite [An_{55-58}]), interstices filled with small grains of clinopyroxene, greenish black glass, and opaque minerals (5%).

Alteration: slight to moderate (15%–20%); glass and opaque minerals are slightly oxidized (<1%); vesicles (10%, 0.5–1.2 mm) completely filled with clay mineral which replaces glass.

Sample 33-317A-34R-1, 32–34 cm (Piece 1), Unit 7B [Z-277]

Sparsely plagioclase-phyric basalt, medium grained, incompletely crystallized, vesicular. Microphenocrysts of plagioclase (0.5–0.8 mm, 8%) and clinopyroxene (0.3–0.5 mm, 5%). Groundmass is intergranular texture; laths

of plagioclase, clinopyroxene, volcanic glass with opaque dust, and olivine. Vesicles are rounded and isometric in shape (0.5–2.5 mm, 30%).

Alteration: slight to moderate (~20%); rock is nonoxidized; smectites fill vesicles and replace olivine, interstitial glass, and partly plagioclase. Some vesicles are empty.

XRD: smectites with interlayer cations of Na-K and Mg-Ca.

Sample 33-317A-34R-2, 136–141 cm (Piece 28), Unit 9 [Z-278]

Aphyric basalt, medium grained, incompletely crystallized, vesicular. Microphenocrysts of plagioclase and clinopyroxene (up to 3 mm). Groundmass is intergranular texture; some areas demonstrate intersertal texture; laths of plagioclase, clinopyroxene, olivine, and volcanic glass with opaque dust. Occasionally vesicles organized chains (0.3–0.8 mm, 15%).

Alteration: slight to moderate (~15%); rock is nonoxidized; smectites fill vesicles and replace olivine and interstitial glass.

XRD: smectites with interlayer cations of Na-K and Mg-Ca; trace hydromica with swelling layers (~5%).

Sample 33-317A-34R-4, 18–21 cm (Piece 1), Unit 10 [Z-1109]

Clinopyroxene-plagioclase-phyric microdolerite, fine grained, vesicular, groundmass is microdoleritic texture. Phenocrysts (10%) are represented by isometric grains of clinopyroxene (0.5–0.6 mm) and short-prismatic and tabular grains of plagioclase (0.5–0.9 mm). Groundmass (70%) includes laths and microlites of plagioclase (30%, labradorite [An_{55-58}]), opaque minerals (15%), and glass (5%). Clinopyroxene (50%) forms segregate of very small (up to 0.1 mm) grains.

Alteration: slight (10%–15%); rock is nonoxidized; vesicles (20%, 0.3–2 mm): small vesicles infilled with green glass; large vesicles are encrusted with clay mineral.

Sample 33-317A-34R-4, 136–140 cm (Piece 21), Unit 10 [Z-279]

Sparsely plagioclase-phyric basalt, fine grained, almost completely crystallized, vesicular. Microphenocrysts of plagioclase (0.3–0.5 mm, 10%) form glomerophyric segregates. Clinopyroxene (up to 1 mm, 3%) is present. Groundmass; laths of plagioclase, microlites of clinopyroxene, olivine, volcanic glass, and opaque dust. Vesicles are rounded and isometric in shape (0.3–2.8 mm, 20%).

Alteration: rock is nonoxidized; smectites fill vesicles and replace of olivine and interstitial glass; mica partly replaces plagioclase.

XRD: smectites with interlayer cations of Na-K and Mg-Ca.

Ninetyeast Ridge (Legs 26 and 121)

Hole 254

Sample 26-254-35R-1, 123–125 cm (Piece 11), Unit 5 [Z-100]

Sparsely olivine-microphyric basalt, fine grained, incompletely crystallized, massive, spotty in structure. Some areas (3–7 mm or ~50%–70% of the thin section) demonstrate microdoleritic (poikilophitic) texture. These areas are separated by poorly crystallized glassy mass with laths of plagioclase. Texture is hyalocrystalline. Microphenocrysts of olivine (0.5–1.3 mm) are ~1%–2% abundance. Crystals are rhomboidal or tabular in shape. Tabular crystals demonstrate clear cleavage, distinct pleochroism from orange to reddish orange color, and parallel extinction. Pleochroism is weak or absent in rhomboidal crystals. Groundmass is combined by clinopyroxene, laths of plagioclase, and opaque minerals. Opaque minerals are located in glassy areas or in marginal parts between crystallized and poorly crystallized areas. Components: plagioclase (~30%), clinopyroxene (~30%), volcanic glass (~25%), opaque minerals (~5%), and olivine (<1%).

Alteration: moderate (~30%); olivine is completely replaced with reddish orange iddingsite; interstitial volcanic glass is replaced with grassy-green smectite; laths of plagioclase which are submerged in the glass are smectitized while those in crystallized areas of rock are almost fresh.

XRD: smectite; chlorite as trace.

Sample 26-254-35R-2, 105–107 cm (Piece 14), Unit 5 [Z-101]

Sparsely olivine-microphyric basalt, fine grained, incompletely crystallized, massive, spotty in structure. About 50% of the thin section is built of poorly crystallized glassy mass, which contains laths of plagioclase and demonstrates hyalocrystalline texture. About 50% of rock are crystallized (clinopyroxene and laths of plagioclase) and demonstrate poikilophitic texture. Hypidiomorphic microphenocrysts of olivine (0.3–1 mm) are restricted to crystallized areas, while opaque minerals tend to be located in poorly crystallized areas.

Components: plagioclase (~30%), clinopyroxene (~30%), volcanic glass (~30%), opaque minerals (~10%), and olivine (<0.5%).

Alteration: moderate to strong (40%–50%); olivine is completely replaced with reddish orange iddingsite; tabular crystals of olivine demonstrate cleavage are distinct pleochroism; within poorly crystallized areas interstitial volcanic glass is replaced with grassy-green smectite; laths of plagioclase in such areas are partly replaced with smectite.

XRD: smectite; chlorite as trace.

Sample 26-254-35R-3, 72–75 cm (Piece 9), Unit 5 [Z-102]

Sparsely olivine-microphyric basalt, fine grained, incompletely crystallized, sparsely vesicular. Microphenocrysts of olivine (0.3–1 mm) are ~1% abundance. Crystals are isometrically rhombic or occasionally tabular in shape. As a rule, tabular ones demonstrate both cleavage parallel to elongation of crystals and parallel extinction. Rock has spotty structure. Groundmass (~60%–70%); clinopyroxene-plagioclase aggregate which contains small amounts of opaque minerals and microphenocrysts of olivine. Texture is poikilophitic. Such areas are separated by glassy groundmass with laths of plagioclase, opaque minerals, and occasionally with olivine. Components: plagioclase (~35%), clinopyroxene (~30%), volcanic glass (~30%), opaque minerals (5%–7%), and olivine (~1%).

Alteration: moderate (25%–30%); olivine is replaced with pleochroic in orange to orange-red iddingsite; as a rule, iddingsitized olivine is replaced with green smectite both in marginal and in central parts of crystals; occasionally, pseudomorphs of olivine are surrounded by thin opacite rim, which is built of opaque minerals; interstitial glass is replaced with grassy-green smectite; laths of plagioclase are partly replaced with similar smectite.

XRD: smectite; swelling chlorite as trace.

Sample 26-254-36R-1, 140–143 cm (Piece 20), Unit 5 [Z-103]

Aphyric olivine basalt, fine grained, incompletely crystallized, sparsely vesicular, with single idiomorphic microphenocrysts of olivine (0.6 mm). Groundmass is intersertal texture; chaotically located laths of plagioclase, xenomorphic aggregates of clinopyroxene, small xenomorphic opaque minerals, and interstitial devitrified volcanic glass filled with opaque dust and idiomorphic crystals of olivine. Components: plagioclase (~50%), clinopyroxene (~40%), opaque minerals (from 5%–7%), and volcanic glass (~1%).

Alteration: slight (10%–15%); microphenocrysts of olivine are completely replaced with orange-red and reddish brown iddingsite; prismatic olivine demonstrates orange-red pleochroism; zonal replacement is obvious: central parts are built of iddingsite while margins are represented by dark green smectite; rounded vesicles (0.3–0.6 mm) are filled with green volcanic glass; occasionally, this glass is replaced with smectite and, sparsely, by an aggregate of smectite and carbonate; interstitial glass is replaced with smectite.

XRD: smectite.

Sample 26-254-36R-2, 2–4 cm (Piece 1), Unit 5 [Z-104]

Aphyric olivine basalt, fine grained, poorly crystallized, vesicular. Texture is intersertal up to hyalocrystalline. Groundmass; chaotically located laths of plagioclase, hypidiomorphic grains of olivine, and interstitial devitrified glass. The glass is filled with aggregates of clinopyroxene crystals, plagioclases, and opaque dust. Vesicles (~5%–10%) have irregular in shape. Components: plagioclase (from 50%–60%), clinopyroxene (~20%), volcanic glass (~20%), olivine (from 5% to7%), and opaque minerals (from 5%–7%).

Alteration: moderate (20%–35%); olivine is replaced with the pleochroic iddingsite and with brownish green smectite; laths of plagioclase are replaced with grayish green smectite. Interstitial glass is replaced with smectite; vesicles are filled with smectite; the latter contains some admixture of carbonate.

XRD: smectite.

Sample 26-254-36R-2, 114–118 cm (Piece 20), Unit 5 [Z-105]

Aphyric olivine basalt, fine grained, near to aphanitic, poorly crystallized, vesicular. Texture is hyalocrystalline. Groundmass; devitrified volcanic glass with chaotically located laths of plagioclase, hypidiomorphic grains of olivine, abundant opaque dust, and crystals of clinopyroxene. Vesicles (0.2–1.2 mm) have irregular in shape. Interstitial glass is opaque; it is overfilled with opaque dust. Components: plagioclase (~60%), volcanic glass (from 30%–35%), and olivine (~5%).

Alteration: moderate (30%–40%); olivine is replaced with iddingsite and brownish green smectite; from 50%–60% of plagioclase laths are replaced with green smectite; vesicles are partly filled with green smectite.

XRD: smectite; chlorite in trace amounts; smectite in vesicles.

Sample 121-756D-6R-1, 23–25 cm (Piece 4), Unit 5 [Z-639]

Sparsely plagioclase-phyric basalt, fine grained, crystallized, sparsely vesicular. Sparsely (2%–3%) prismatic phenocrysts of plagioclase (0.7–1.2 mm, labradorite [An_{68}]). Groundmass with microlitic texture; microlites and microlaths (0.1–0.4 mm) of plagioclase (labradorite [An_{51}]). Interstices consist of very small grains of clinopyroxene segregate, opaque minerals (7%–8%), and dark green partly altered glass (1%–2%). Inclusions of glass in laths and phenocrysts of plagioclase are present. Sparse vesicles (<5%, 0.5–2 mm) demonstrate oval in shape.

Alteration: interstitial glass partly replaced by clay mineral, vesicles are encrusted by chloritized(?) glass or completely infilled with clay mineral.

Sample 121-756D-6R-2, 32–35 cm (Piece 1B), Unit 5 [Z-640]

Sparsely plagioclase-phyric basalt, sparsely vesicular. Single large (3 mm) idiomorphic prismatic phenocryst of plagioclase (0.7–1.2 mm, labradorite [An_{68}]) is present. Groundmass with microlitic texture; microlites, laths, and prismatic grains (20%, 0.1–0.4 mm) of plagioclase (labradorite [$An_{55–57}$]). Interstices consist of very small grains (70%, <0.1 mm) of clinopyroxene (segregate), opaque minerals (5%), and dark green glass (5%). Inclusions of glass in laths and phenocrysts of plagioclase are present. Single vesicles (up to 0.70 mm) are present.

Alteration: rock is fresh; vesicles infilled with green-brown clay mineral.

Sample 121-756D-6R-2, 91–95 cm (Piece 1C), Unit 5 [Z-29]

Sparsely plagioclase-phyric basalt, fine grained, crystallized, sparsely vesicular. Sparsely (<1%) phenocrysts of plagioclase (2–3 mm) are tabular in shape, corroded, and fractured. Phenocrysts contain small inclusions of opaque minerals. Small grains of olivine are present. Single vesicles are from 0.5–2 mm in diameter. Groundmass; aggregate of plagioclase laths, xenomorphic grains of clinopyroxene with admixture of opaque minerals, and microphenocrysts of olivine. Groundmass demonstrates intergranular texture. Components: plagioclase (~40%), clinopyroxene (~45%), opaque minerals (~10%), and olivine (~1%).

Alteration: moderate (30%); brownish red iddingsite or occasionally brownish green smectite replace olivine; cracks in plagioclases, as well as microcracks cutting vesicles, are filled with smectite with Fe hydroxide; vesicles are filled with radial to spherical aggregate of smectite and with fine dispersed oxidized opaque dust.

XRD: smectite and mixed-layer smectite-chlorite mineral; trace hydromica.

Sample 121-756D-7R-1, 136–138 cm (Piece 12C), Unit 6 [Z-22]

Aphyric basalt, fine grained, near to aphanitic, crystallized, massive. Texture is intergranular. Single microphenocrysts of plagioclase (up to 0.3–0.5 mm), Slightly corroded, with small inclusions of idiomorphic opaque minerals. Single phenocrysts of olivine (up to 0.2–0.3 mm). Sparsely areas with interstitial volcanic glass. Components: plagioclase (~45%), clinopyroxene (~45%), opaque minerals (7%–10%), olivine (in single grains).

Alteration: slight (5%); olivine and volcanic glass in interstices are replaced with grassy-green smectite.

XRD: smectite; hydromica trace.

Sample 121-756D-7R-2, 26–28 cm (Piece 1C), Unit 6 [Z-25]

Aphyric basalt, fine grained (near to aphanitic), fractured, with single microphenocrysts (0.2–0.3 mm) of plagioclase, clinopyroxene, and olivine. Isometric opaque minerals are from 10% to 12% abundance. Groundmass; laths of plagioclase and small grains of clinopyroxene. Sparsely small areas are built interstitial volcanic glass. Single vesicles vary from 0.1 to 0.2 mm. Composition: plagioclase (~45%), clinopyroxene (~45%), opaque minerals (up to 10%), olivine (single grains).

Alteration: slight (10%); plagioclase is partly replaced with grassy-green smectite; olivine is completely replaced with smectite; interstitial volcanic glass is replaced with smectite; vesicles are filled with grassy-green smectite; cracks are filled with brownish red iddingsite; opaque minerals are partly oxidized along salbands.

XRD: smectite; trace chlorite.

Sample 121-756D-7R-3, 59–63 cm (Piece 2C), Unit 6 [Z-641]

Aphyric basalt, sparsely vesicular. Rock with microlitic texture; microlaths (0.1–0.5 mm) of plagioclase (50%, labradorite [An_{52}]). Interstices consist of small grains (<0.1 mm) of clinopyroxene (35%) segregates, opaque minerals (5%), and altered glass (10%). Sparse vesicles (2%–3%, 0.2–0.6 mm) demonstrate rounded-isometric in shape.

Alteration: slight; interstitial glass partly replaced by clay mineral, vesicles infilled with clay mineral.

Sample 121-756D-8R-1, 16–19 cm (Piece 2), Unit 7 [Z-1337]

Aphyric basalt, crystallized, vesicular. Rock with microlitic texture; microlites (0.05–0.1 mm) of plagioclase (20%, andesine [An_{38-42}]). Interstices consist of isometric partly oxidized grains (up to 0.1 mm) of clinopyroxene (70%), opaque minerals (5%–7%), and glass. Vesicles (5%, up to 2 mm) are rounded in shape.

Alteration: slight (5%–10%); 20%–25% of rock is oxidized; vesicles and microcracks completely infilled with clay mineral and Fe hydroxides.

Sample 121-756D-8R-1, 72–75 cm (Piece 14), Unit 8 [Z-642]

Plagioclase-phyric basalt, sparsely vesicular. Phenocrysts (5%): glomerophyric segregate of prismatic grains (0.3–0.5 mm) of plagioclase (labradorite [An_{60}]). Single small oxidized grains (0.1–0.2 mm) of olivine are present. Groundmass with microlitic texture; segregate of very small grains (<0.1 mm) of clinopyroxene (60%); microlites (0.1–0.4 mm) of plagioclase (30%, labradorite [An_{52-53}]); skeletal grains of opaque minerals (10%). Single large vesicles (up to 2 mm in diameter) are oval-elongate in shape.

Alteration: slight to moderate (15%–20%); microcracks in plagioclase grains infilled with albite and clay mineral; olivine is oxidized; clinopyroxene partly (30%) replaced by clay mineral and Fe hydroxides; vesicles infilled with clay mineral.

Sample 121-756D-9R-1, 36–38 cm (Piece 5), Unit 9 [Z-5]

Aphyric olivine basalt, fine grained, crystallized, massive, with single microphenocrysts (0.2–0.5 mm) of olivine. Groundmass; laths and hypidiomorphic crystals of plagioclase, grains of clinopyroxene, xenonomorphic and elongated to tabular opaque minerals, as well as by hypidiomorphic grains of olivine (5%–7% abundance). Single small areas are built of interstitial glass. Groundmass demonstrates intersertal texture and partly variolitic texture. Composition: plagioclase (~40%), clinopyroxene (~40%), opaques (~10%), and olivine (~10%).

Alteration: slight (10%–15%); inner parts of olivine crystals are replaced with brown iddingsite while marginal parts are replaced with grassy-green smectite; areas of interstitial volcanic glass are completely replaced with smectite; single relatively large laths of plagioclase are partly replaced with green smectite.

XRD: smectite.

Sample 121-756D-9R-3, 119–121 cm (Piece 4E), Unit 9 [Z-36]

Aphyric olivine basalt, fine grained, crystallized, massive, with single microphenocrysts of olivine. Groundmass demonstrates intergranular, partly microdoleritic, or taxitic (due to subparallel oriented laths of plagioclase) texture. Groundmass; laths of plagioclase, clinopyroxene, olivine grains, xenomorphic and elongated to tabular crystals of opaque minerals (magnetite) as well as by idiomorphic and xenomorphic grains of olivine. Sparsely single microphenocrysts of olivine are present. Composition: plagioclase (~45%), clinopyroxene (~35%), opaque minerals (~10%), and olivine (up to 10%).

Alteration: slight (10%–15%); microphenocrysts of olivine are replaced with red iddingsite in their central parts; along margins microphenocrysts are replaced with green smectite; relatively large laths of plagioclase are replaced with green smectite in their central parts; clinopyroxene is partly replaced with smectite.

XRD: smectite; trace mixed-layer smectite-chlorite mineral.

Sample 121-756D-11R-1, 115–118 cm (Piece 17), Unit 13 [Z-643]

Plagioclase-phyric basalt, massive. Phenocrysts (5%): tabular and prismatic grains (0.4–0.8 mm) of plagioclase (labradorite [An_{58}]). Groundmass with microlitic texture; very small grains of clinopyroxene (50%) segregate; microlites and microlaths of plagioclase (30%); and opaque minerals (5%). Altered olivine(?) is present (15%).

Alteration: slight (10%–15%); microcracks in plagioclase grains infilled with clay mineral, olivine(?) is oxidized and replaced by iddingsite; microcracks in rock are filled with clay mineral.

Sample 121-756D-11R-2, 95–99 cm (Piece 11D), Unit 14 [Z-4]

Aphyric basalt, crystallized, vesicular, fine grained, near to aphanitic with single microphenocrysts of plagioclase. Plagioclase often forms glomeroporphyric aggregates. Microphenocrysts are from 0.2 to 0.4 mm. Plagioclase is fractured. Vesicles (0.2–0.6 mm in diameter and 1%–3% abundance) are mostly empty and demonstrate irregular in shape. Groundmass demonstrates intergranular texture. Groundmass; laths of plagioclase, grains of clinopyroxene, idiomorphic grains of opaque minerals, and single grains of olivine. Composition: clinopyroxene (~50%), plagioclase (~40%), opaque minerals (up to 10%), and olivine (single grains).

Alteration: slight (10%); olivine is replaced with grassy-green smectite; walls of vesicles are covered with radial zonal aggregate of grassy-green smectite, impregnated with Fe hydroxides; small vesicles are completely filled with smectite; cracks in plagioclases are filled with light green smectite; carbonates are recognized in central parts of microcracks.

XRD: smectite and mixed-layer smectite-chlorite mineral; trace hydromica.

Sample 121-756D-12R-2, 69–72 cm (Piece 1C), Unit 14 [Z-16]

Aphyric olivine basalt, fine grained, crystallized, vesicular. Vesicles (0.2–1 mm) are <1% abundance. Groundmass is intergranular texture; plagioclase laths, small grains of clinopyroxene, xenomorphic opaque minerals, and hypidiomorphic olivine. Cracks are filled with opaque minerals. Composition: clinopyroxene (~45%), plagioclase (~40%), opaque minerals (~10%), and olivine (~5%).

Alteration: slight (5%–10%); olivine is replaced with grassy-green smectite; clinopyroxene is partly replaced with smectite; vesicles are filled with radial aggregates of grassy-green smectite; opaque minerals are partly oxidized.

XRD: smectite.

Hole 757C

Sample 121-757C-8R-1, 127–129 cm (Piece 5A), Unit 2 [Z-9]

Plagioclase-phyric basalt, fine grained, highly vesicular, fractured. Corroded phenocrysts of plagioclase (3–4 mm) are 5%–7% abundance. Vesicles (2–5 mm in diameter and ~25% abundance) are rounded and demonstrate irregular in shape. Groundmass; an aggregate of laths of plagioclase, xenomorphic clinopyroxene, and opaque minerals (7%–10%). Groundmass demonstrates intergranular texture.

Alteration: strong (>50%); phenocrysts of plagioclase are significantly replaced with chlorite and occasionally carbonatized; sparsely pseudomorphs of iddingsite and smectite upon olivine are present; groundmass is orange to brown in color due to oxidation of opaque minerals; outer parts of the inner surfaces in vesicles are asymmetrically covered by volcanic glass, mostly replaced with smectite-chlorite aggregate, while the inner parts are built of the fine grained aggregate of Fe and Mn(?) oxides; intermediate parts of some vesicles are filled by carbonate or occasionally zeolite; small vesicles are completely filled with smectite-chlorite aggregate and with Fe and Mn(?) hydroxides; microcracks which connect vesicles, are filled with smectite-chlorite aggregate and Fe hydroxides.

XRD: smectite and swelling chlorite; trace chlorite.

Sample 121-757C-8R-2, 119–121 cm (Piece 3I), Unit 2 [Z-6]

Plagioclase-phyric basalt, sparsely vesicular. Phenocrysts of plagioclase and their glomerophyric segregates (up to 6 mm) are ~50% abundance. Phenocrysts of plagioclase are corroded and demonstrate resorption borders. Single grains of olivine. Groundmass; fine grained aggregate of laths of plagioclase, grains of clinopyroxene, and xenomorphic grains of opaque minerals. Groundmass demonstrates intersertal texture. Occasionally, phenocrysts of plagioclase are surrounded by irregularly curved concentrations of volcanic glass. As a rule, phenocrysts of plagioclase contain microcracks and often contain inclusions of volcanic glass. Composition: plagioclase (~70%), clinopyroxene (~25%), opaque minerals (~3%), and olivine (single grains).

Alteration: strong (>50%); olivine is completely replaced with smectite and by an aggregate of smectite and chlorite; occasionally, grains of altered olivine are surrounded by opaque rims; volcanic glass around phenocrysts of plagioclase (or in plagioclases as inclusions) is completely replaced with green and brown smectite; plagioclases are replaced with brown smectite and occasionally by zeolite along margins and microcracks; opaque minerals are partly oxidized; inner surfaces of vesicles are lined by thin (0.01 mm) layer of radial aggregate of smectite and chlorite; intermediate part; calcite; microcracks in plagioclase are filled with brown smectite and occasionally by zeolite(?).

XRD: smectite and chlorite with hydrated interlayers.

Sample 121-757C-9R-1, 59–61 cm (Piece 3), Unit 2 [Z-1]

Plagioclase-phyric basalt, with fine grained incompletely crystallized groundmass, massive. Phenocrysts of plagioclase are tabular, corroded along margins, and fractured. Grains of plagioclase contain small inclusions of devitrified volcanic glass filled with opaque dust. Occasionally, phenocrysts of plagioclase are surrounded by narrow rim of the second generation plagioclase. Single idiomorphic phenocrysts (up to 2 mm) of olivine are present. Groundmass; chaotically located laths of plagioclase and xenomorphic crystals of clinopyroxene; single small grains of olivine are present also. Some areas demonstrate irregularly curved spots of interstitial volcanic glass. Small xenomorphic opaque minerals are ~3%–5% abundance. Groundmass demonstrates intergranular texture. Composition: plagioclase (50%–60%), clinopyroxene (~30%), opaque minerals (3%–5%), volcanic glass (1%–3%), and olivine (single grains).

Alteration: moderate (25%–35%); phenocrysts of olivine are completely replaced with green smectite and partly, in central parts, by carbonate; kelyphytic rims (0.1 mm) of opaque minerals (magnetite) are evident around altered grains of olivine; interstitial volcanic glass is completely replaced with smectite; veins of smectite are present;

opaque minerals are oxidized. Fe hydroxides partly impregnate groundmass, smectitized volcanic glass, and veins of smectite; cracks in plagioclases are filled with green smectite; occasionally, smectite is brown in color due to Fe hydroxide and contains fine grained aggregate of an oxidized brownish black opaque minerals. Zeolite (?) is restricted to boundaries between plagioclases of different generations.

XRD: mixed-layer chlorite-smectite mineral and smectite.

Sample 121-757C-9R-2, 24–26 cm (Piece 1A), Unit 2 [Z-17]

Plagioclase-phyric basalt, with fine grained groundmass, sparsely vesicular, almost completely crystallized. Rounded vesicles (0.1–0.2 mm) are <1% abundance. Phenocrysts of plagioclase and their glomeroporphyric segregates (5–8 mm) represent ~50%–55% of the thin section. Occasionally, phenocrysts are surrounded by the rim built of more acid material. Phenocrysts are corroded along margins. Also, phenocrysts contain small inclusions of devitrified volcanic glass filled with opaque dust. Occasionally, phenocrysts contain tabular inclusions of opaque minerals (magnetite?). As a rule, interstitial glass (~1% abundance) is localized around phenocrysts of plagioclase. Occasionally, large inclusions of glass are known within phenocrysts of plagioclase. Groundmass; nonoriented laths of plagioclase, xenomorphic grains of clinopyroxene, xenomorphic or sparsely tabular opaque minerals, and single subidiomorphic crystals of olivine. Groundmass demonstrates intergranular texture. Composition: plagioclase (60%–70%), clinopyroxene (~25%), opaque minerals (3%–5%), volcanic glass (<1%), and olivine (single grains).

Alteration: slight to moderate (20%); olivine is completely replaced with smectite; olive-green smectite completely replaced volcanic glass from both inclusions in plagioclases and interstices; vesicles are filled with olive-green smectite.

XRD: smectite.

Sample 121-757C-9R-3, 35–37 cm (Piece 1A), Unit 2 [Z-18]

Plagioclase-phyric basalt, fine grained, almost completely crystallized, sparsely vesicular. Phenocrysts of plagioclase and their segregates (both 3–8 mm) represent 60%–65% of the thin section. Faces of plagioclase are intensely corroded. Plagioclases are fractured and contain inclusions of volcanic glass with opaque dust. Interstitial glass (<1% abundance) demonstrate irregular in shape. Single vesicles are from 0.3 to 0.5 mm in diameter. Groundmass; laths of plagioclase, xenomorphic grains of clinopyroxene, and opaque minerals. Composition: plagioclase (~70%), clinopyroxene (~20%), opaque minerals (5%–7%), volcanic glass (<1%), and olivine (single grains).

Alteration: slight to moderate (15%–20%); olivine and interstitial glass are completely replaced with smectite. Inclusions of glass in plagioclases are partly replaced with smectite; vesicles are filled with smectite; cracks in plagioclases and clinopyroxenes are filled with smectite; marginal parts of clinopyroxenes are replaced with smectite.

XRD: smectite.

Sample 121-757C-9R-4, 38–42 cm (Piece 1A), Unit 3 [Z-1338]

Olivine-plagioclase-phyric basalt, crystallized, vesicular. Phenocrysts (50%): xenomorphic grains (0.8–1.5 mm) of altered olivine (5%) and large prismatic grains (1–10 mm) of plagioclase (45%, labradorite-bitovnite [An_{70}] and andesine [An_{48}]). Groundmass (30%) with microlitic texture; microlites (up to 0.1 mm) of plagioclase (5%, andesine [An_{32}]), small grains (up to 0.1 mm) of clinopyroxene (10%), black glass, and opaque minerals. Vesicles (20%, 0.3 mm and 3 mm in diameter) are isometric in shape.

Alteration: slight (5%); olivine replaced by iddingsite, part (50%) of clinopyroxene is oxidized, small vesicles are filled with clay mineral, part (30%) large vesicles completely infilled with carbonates.

XRD: smectite with ~10% mica layers; trace natrolite.

Sample 121-757C-9R-5, 70–73 cm (Piece 2), Unit 5 [Z-1339]

Plagioclase-phyric basalt, crystallized, vesicular. Phenocrysts (20%): prismatic grains (1.2–2 mm) of plagioclase (labradorite [An_{64}]). Groundmass (50%) with microlitic texture; microlites (up to 0.1 mm) of plagioclase (5%), small grains of clinopyroxene (25%), black glass (10%), and opaque minerals (10%). Vesicles (30%, 1.2–3 mm in diameter) are rounded and isometric in shape.

Alteration: slight (10%–15%); rock is slightly oxidized (10%–15%); plagioclase mainly (70%) replaced by clay minerals and albite, grains of clinopyroxene partly are oxidized, vesicles are filled with clay mineral, chalcedony, tridymite-cristobalite.

XRD: calcite and zeolite (analcime and natrolite-heulandite); trace smectite and chlorite.

Sample 121-757C-9R-7, 71–73 cm (Piece 1B), Unit 5 [Z-30]

Plagioclase-phyric basalt, fine grained, almost completely crystallized, massive. Phenocrysts of plagioclase (from 1 to 5–6 mm) represent ~45%–50% of the thin section. Phenocrysts are resorbed, fractured, and occasionally contain inclusions of volcanic glass both with and without opaque dust. Often, small grains of clinopyroxene are impregnated in glomeroporphyric segregates near margins of grains. Groundmass demonstrates intergranular texture; laths of plagioclase, clinopyroxene, and xenomorphic grains of opaque minerals. Occasionally, interstitial volcanic glass is present. Composition: plagioclase (~60%), clinopyroxene (~30%), opaque minerals (5%–7%), volcanic glass (<1%), olivine (single grains).

Alteration: moderate (30%); volcanic glass from inclusions in plagioclases is replaced with green smectite; interstitial glass is replaced with olive-green smectite; opaque minerals are partly replaced with Fe hydroxide; the latter is partly responsible for the rusty-brown color of clinopyroxenes.

XRD: smectite; trace mixed-layer smectite-chlorite mineral.

Sample 121-757C-9R-8, 57–60 cm (Piece 4A), Unit 5 [Z-644]

Plagioclase-phyric basalt, vesicular. Phenocrysts (60%): glomerophyric segregates of tabular and short prismatic grains (0.5–3 mm up to 7–8 mm) of plagioclase (approximately labradorite [An_{55}]) and individual small prismatic grains (0.8–1.5 mm) of plagioclase. Groundmass with microlitic texture; microlites of plagioclase (labradorite [An_{52}]), rounded isometric grains (0.1 mm) of clinopyroxene segregate, and grains (0.1 mm) of opaque minerals. Vesicles (15%, 0.2–0.5 mm in diameter) are isometric in shape.

Alteration: slight to moderate (15%–20%); inclusions of glass from small grains of plagioclase partly replaced by albite and clay mineral; vesicles completely are filled with clay mineral.

Sample 121-757C-10R-2, 66–70 cm (Piece 5A), Unit 7 [Z-1340]

Plagioclase-phyric basalt, crystallized, vesicular. Phenocrysts (55%): large prismatic crystals (1.5–8 mm of plagioclase (labradorite [An_{68}]). Plagioclase consists of inclusions of glass. Groundmass (25%) with microlitic texture; microlites of plagioclase (5%), grains of clinopyroxene (15%), and glass (5%). Vesicles (20%, 1–10 mm in diameter) are rounded in shape.

Alteration: slight (10%–15%); rock is oxidized (5%–10%); inclusions of glass from grains of plagioclase replaced by smectite and chalcedony; grains of clinopyroxene are oxidized; vesicles completely are filled with carbonate.

Sample 121-757C-10R-3, 79–81 cm (Piece 2C), Unit 9 [Z-1341]

Plagioclase-phyric basalt, crystallized, vesicular. Phenocrysts (40%): large prismatic and tabular crystals (1.5–5 mm) of plagioclase (labradorite [An_{68}]). Groundmass (40%) with microlitic texture; microlites of plagioclase (5%), grains of clinopyroxene (30%), and glass (5%). Vesicles (20%, 2–4 mm in diameter) are oval-isometric in shape.

Alteration: slight (5%); rock is oxidized (10%); cracks in grains of plagioclase are filled with smectite (10% of grain volume); grains of clinopyroxene partly (10%) are oxidized; vesicles (7%) completely are filled with carbonate; vesicles (10%) are empty and encrusted by glass; vesicles (3%) infilled with chalcedony.

XRD: smectite; trace calcite.

Sample 121-757C-11R-1, 54–58 cm (Piece 8B), Unit 10 [Z-645]

Plagioclase-phyric basalt, vesicular. Phenocrysts (30%–35%): large short prismatic and tabular crystals (1.5–5 mm) of plagioclase. Groundmass (35%–40%) with microlitic (occasionally, microintersertal) texture; microlites of plagioclase, small grains of clinopyroxene, greenish glass, and opaque minerals. Vesicles (30%, up to 5 mm and 0.3–0.5 mm in diameter) are rounded-isometric (large vesicles) and isometric (small vesicles) in shape.

Alteration: very strong (80%); plagioclase phenocrysts almost completely replaced by albite, clay mineral, and zeolite (in single grains albite completely replaced by smectite); microlites of groundmass plagioclase almost completely replaced by smectite and zeolite; clinopyroxene partly is oxidized; large vesicles completely are filled with zeolite (occasionally, single grains of carbonate are present among zeolite); small vesicles are lined by clay mineral and infilled in central parts with zeolite; microcracks consist of zeolite and Fe hydroxides.

XRD: smectite with ~20% mica layers; minor swelling chlorite and zeolite (analcime); trace chlorite and hydromica.

Sample 121-757C-11R-1, 98–99 cm (Piece 9C), Unit 10 [Z-646]

Plagioclase-phyric basalt, vesicular. Phenocrysts (30%): prismatic crystals (0.5–2 mm) of plagioclase. Groundmass (50%) with pilotaxitic texture; microlites of plagioclase, brownish black glass, and brown grains of clinopyroxene. Vesicles (20%, 1.5–2 mm in diameter) are rounded in shape.

Alteration: moderate (30%–40%); plagioclase phenocrysts almost completely replaced by albite and clay mineral; microlites of groundmass plagioclase almost completely replaced by albite and zeolite; vesicles are filled with fragments of glass, zeolite, and clay mineral.

XRD: swelling chlorite; minor analcime; trace chlorite and hydromica.

Sample 121-757C-11R-1, 135–137 cm (Piece 9E), Unit 12 [Z-34]

Plagioclase-phyric basalt, incompletely crystallized, cryptocrystalline, vesicular. Phenocrysts of plagioclase (0.8–5 mm) vary from 20%–25% abundance. Plagioclases are tabular, idiomorphic, Slightly corroded, occasionally fractured, and contain inclusions of opaque minerals. Some crystals contain single inclusions of volcanic glass. The latter contains opaque dust. Vesicles (up to 3–7 mm) represent ~20% of the thin section. Two types of vesicles are present. Vesicles of the first type are partly or completely filled with devitrified volcanic glass, while vesicles of the second type are originally empty. Groundmass; crystallized volcanic glass with microlites of plagioclase, clinopyroxene, small laths of plagioclase, single microphenocrysts of clinopyroxene, and olivine. Some spots of noncrystallized volcanic glass are present. Composition: plagioclase (~40%), clinopyroxene (~40%), opaque minerals (5%–7%), volcanic glass (5%–7%), and olivine (~1%).

Alteration: strong (50%–60%); olivine is completely replaced with smectite; some phenocrysts of plagioclase are replaced (up to 20%–80%) by zeolite; inclusions of volcanic glass in plagioclases are replaced along their margins by the grassy-green smectite, while their central parts are replaced with zeolite(?); smectite replaces volcanic glass in vesicles; inner parts of the originally empty vesicles are covered by the thin film of radial grassy-green smectite; this film demonstrates three layers in some vesicles: outer and inner layers are represented by an opaque aggregates, while intermediate layer is built of green smectite; some vesicles demonstrate radial zeolite; interstitial volcanic glass is replaced with smectite; cracks in plagioclases are filled with grassy-green smectite; secondary finely dispersed grassy-green mineral replaces olivine.

XRD: mixed-layer chlorite-smectite mineral and smectite; trace hydromica.

Sample 121-757C-12R-1, 5–9 cm (Piece 1), Unit 18 [Z-1342]

Plagioclase-phyric basalt, crystallized. Phenocrysts (30%): prismatic and tabular crystals (0.8–1.6 mm) of plagioclase (labradorite [An_{68}]). Groundmass (70%) with microlitic texture; short-prismatic laths (0.1–0.3 mm) of plagioclase (35%, andesine [An_{42}]), segregate of small (<0.1 mm) grains of clinopyroxene (25%); green glass (8%), and opaque minerals (2%–3%).

Alteration: slight (8%–10%); rock is non oxidized; clay mineral replaces interstitial glass.

XRD: smectite; trace chlorite and hydromica.

Sample 121-757C-12R-1, 84–86 cm (Piece 2), Unit 18 [Z-21]

Clinopyroxene-plagioclase-phyric basalt, almost completely crystallized, fine grained, massive. Tabular phenocrysts of plagioclase (1–5 mm) represent ~25% of the thin section. Occasionally, they form glomerophyric segregates with clinopyroxene. Clinopyroxene (1.5–3 mm) is <1% abundance. Phenocrysts of plagioclase occasionally contain elongated inclusion of devitrified volcanic glass both with or without opaque dust. Phenocrysts of plagioclase are corroded and fractured. A thin rims of the second generation plagioclase are restricted to corroded zones. Groundmass; an aggregate of laths of plagioclase, grains of clinopyroxene with an admixture (~1%–3%) of idiomorphic opaque minerals. Interstitial volcanic glass is ~1%–3% abundance. Cryptocrystalline aggregates of clinopyroxene are occasionally restricted to phenocrysts of plagioclase. Groundmass demonstrates intergranular texture. Composition: plagioclase (~50%), clinopyroxene (~45%), opaque minerals (1%–3%), volcanic glass (1%–3%), olivine (single grains).

Alteration: slight (~10%); smectite forms pseudomorphs upon olivine; also, it replaces both inclusions of the volcanic glass in plagioclases and interstitial glass; smectite fills microcracks in clinopyroxenes and plagioclases.

XRD: smectite.

Sample 121-757C-12R-2, 8–10 cm (Piece 1), Unit F18 [Z-13]

Plagioclase-phyric basalt, incompletely crystallized, fine grained, massive. Elongated to tabular phenocrysts of plagioclase (0.5–7 mm) vary from 30%–40% abundance. Phenocrysts are corroded and contain inclusions of opaque minerals and volcanic glass. Phenocrysts of clinopyroxene and single grains of olivine are present. Groundmass; an aggregate of laths of plagioclase, clinopyroxene, xenomorphic segregates of opaque minerals (~3%–5%), and spotty interstitial glass (~5%–10%). Groundmass demonstrates intergranular to intersertal texture. Composition: plagioclase (~60%), clinopyroxene (~30%), opaque minerals (~5%), volcanic glass (5%–10%), olivine (single grains).

Alteration: moderate (20%–30%); grassy-green smectite replaces volcanic glass from inclusions in plagioclases and interstitial glass; also, smectite forms pseudomorphs upon olivine; smectite fills microcracks in clinopyroxenes and plagioclases.

XRD: smectite.

Sample 121-757C-12R-2, 75–79 cm (Piece 4), Unit 18 [Z-1343]

Plagioclase-phyric basalt, vesicular. Phenocrysts (20%): prismatic crystals (1.3–2.5 mm) of plagioclase. Groundmass (40%) with vitrophyric texture; brown grain with very small vesicles (0.1 mm, 2%–3%). Vesicles (40%, 2.5–6 mm) are rounded in shape. Vesicles are located in brecciated zone.

Alteration: strong (60%); 40% of rock is oxidized; interstitial glass is oxidized; very small vesicles from interstitial glass infilled with opal; large vesicles and brecciated zone contain carbonate (70%) and zeolite (30%).

XRD: calcite and natrolite; trace smectite and mixed-layer smectite-chlorite mineral; white matter from vesicles: calcite; trace analcime and quartz.

Hole 758A

Sample 121-758A-56R-1, 21–23 cm (Piece 2A), Unit 1 [Z-26]

Sparsely plagioclase-phyric basalt, fine grained, massive. Phenocrysts (0.5–2.5 mm) vary from 1%–3% abundance. Occasionally, phenocrysts form glomerophyric segregates (up to 4 mm) from 3 to 4 grains of plagioclase. Groundmass demonstrates intersertal to intergranular texture. Groundmass; chaotically oriented laths of plagioclase, xenomorphic grains of clinopyroxene, interstitial volcanic glass, and angular grains of opaque minerals (magnetite). Composition: plagioclase (~50%), clinopyroxene (~25%), opaques (3%–5%), interstitial volcanic glass (~25%), and olivine (single grains).

Alteration: moderate (~30%); interstitial volcanic glass is completely replaced with olive-green smectite; clinopyroxene is slightly replaced with smectite along margins of grains; cracks in clinopyroxene are filled by smectite.

XRD: smectite.

Sample 121-758A-57R-2, 110–114 cm (Piece 2), Unit 2 [Z-647]

Clinopyroxene-plagioclase-phyric basalt, massive. Phenocrysts (10%): glomerophyric segregates of small (0.2–0.3 mm) grains of clinopyroxene and laths of plagioclase. Groundmass (90%) with pilotaxitic texture; needle-shaped microlites of plagioclase and glass with opaque minerals.

Alteration: very strong (90%); plagioclase phenocrysts are completely replaced by zeolite; groundmass plagioclase replaced by clay minerals and zeolite; clay mineral replaces interstitial glass.

Sample 121-758A-57R-3, 7–9 cm (Piece 1), Unit 2 [Z-32]

Aphyric basalt, aphanitic, cryptocrystalline, sparsely vesicular (<1% abundance). Sparse microphenocrysts of clinopyroxene and plagioclase (up to 0.2–0.3 mm). Groundmass demonstrates hyalopylitic texture with elements of variolitic organization. Vesicles (0.1–0.2 mm) are rounded in shape. Interstitial glass is ~10%–15% abundance. It contains up to 3% of opaque dust.

Alteration: strong to very strong (50%–70%); laths of plagioclase and its caselike crystals are replaced with smectite in their central parts; clinopyroxene is replaced with smectite up to 50% abundance; vesicles are filled with radial aggregate of smectite. Interstitial glass is completely replaced with smectite.

XRD: smectite.

Sample 121-758A-57R-3, 37–41 cm (Piece 4), Unit 2 [Z-648]

Aphyric basalt, massive. Rocks with intersertal texture; microlites and laths (0.2–0.3 mm) of plagioclase (andesine-labradorite [An_{50}]), rounded-isometric grains of clinopyroxene (20%), and completely smectitized glass with opaque minerals (5%–8%).

Alteration: strong (50%).

Sample 121-758A-58R-1, 41–43 cm (Piece 3), Unit 2 [Z-33]

Aphyric basalt, fine grained, sparsely vesicular. Groundmass demonstrates intersertal to intergranular texture. Vesicles (~0.5–0.7 mm) are <1% abundance. Groundmass; chaotically located laths of plagioclase. Interstices are filled with clinopyroxene and interstitial volcanic glass. Composition: plagioclase (~40%), clinopyroxene (~35%), volcanic glass (~25%). Volcanic glass contains opaque dust (occasionally in dendritic aggregates) and skeletal grains of magnetite (up to 0.01 mm).

Alteration: moderate (25%–30%); clinopyroxene is slightly replaced with smectite along margins of crystals; cracks in clinopyroxene are filled with smectite; volcanic glass is completely replaced with olive-green smectite; vesicles are filled with radial aggregates of olive-green smectite.

XRD: smectite.

Sample 121-758A-58R-5, 55–57 cm (Piece 2A), Unit 2 [Z-8]

Aphyric basalt, fine grained, massive. Groundmass domesticates intergranular to intersertal texture. Groundmass; chaotically oriented laths of plagioclase, clinopyroxene in interstices, and interstitial volcanic glass. Volcanic glass contains skeletal and xenomorphic magnetite and opaque dust. Composition: plagioclase (~45%), clinopyroxene (~35%), volcanic glass (~20%).

Alteration: moderate (~25%); clinopyroxene is slightly smectitized along peripheral parts of the crystals; interstitial volcanic glass is completely replaced with smectite; cracks in clinopyroxene are filled with smectite.

XRD: smectite.

Sample 121-758A-59R-7, 52–56 cm (Piece 1A), Unit 2 [Z-1344]

Aphyric basalt (microdolerite), crystallized, massive. Rocks with intersertal-microdoleritic texture; laths (0.2–0.7 mm) of plagioclase (10%, labradorite [An_{68}] and [An_{58}]), rounded grains (0.1–0.3 mm) of clinopyroxene (45%), greenish black glass (10%), and opaque minerals (5%).

Alteration: rock is fresh.

Sample 121-758A-60R-1, 11–13 cm (Piece 1B), Unit 3 [Z-31]

Aphyric basalt, fine grained, massive. Groundmass domesticates intergranular to intersertal texture. Groundmass; chaotically located laths of plagioclase and hypidiomorphic grains of clinopyroxene. The latter fills up to 75% of interstices between laths of plagioclase. The other space is filled with interstitial volcanic glass. Occasional glomerophyric segregates of clinopyroxene and plagioclase are present. Interstitial volcanic glass contains xenomorphic (sparsely skeletal) opaque minerals (magnetite). Composition: plagioclase (~40%), clinopyroxene (~40%), volcanic glass (15%–20%), opaque minerals (up to 5%).

Alteration: moderate (~20%–25%); secondary minerals are represented by smectite; interstitial volcanic glass and, partly, clinopyroxene are replaced with olive-green smectite along margins and microcracks.

XRD: smectite.

Sample 121-758A-60R-2, 80–82 cm (Piece 2), Unit 3 [Z-3]

Aphyric basalt, fine grained, massive. Groundmass demonstrates intersertal texture. Laths of plagioclase and xenomorphic grains of pyroxene are cemented by interstitial volcanic glass. Xenomorphic grains of magnetite and opaque dust are concentrated within interstitial glass. Composition: plagioclase (~35%), clinopyroxene (~30%), volcanic glass (~30%), magnetite (~5%), and olivine (single grains).

Alteration: moderate (~40%); idiomorphic pseudomorphs of smectite upon olivine are evident; interstitial volcanic glass is completely replaced with olive-gray smectite; clinopyroxene is partly replaced with smectite along peripheral parts of crystals; microcracks in clinopyroxene are filled with smectite.

XRD: smectite.

Sample 121-758A-60R-6, 82–84 cm (Piece 1C), Unit 3 [Z-27]

Sparsely plagioclase-phyric basalt, fine to medium grained, sparsely vesicular. Single phenocrysts of plagioclase and their glomerophyric segregates (~2–3 mm in diameter). Occasionally, small (0.1–0.3 mm) grains of olivine (3–4 grains) are grouped around such segregates. Single vesicles are 1–1.5 mm. Groundmass; plagioclase, xenomorphic grains of clinopyroxene, and irregularly distributed intersertal glass with inclusions of magnetite. Groundmass demonstrates intergranular texture; intersertal texture is present in isolated spotty areas. Composition: plagioclase (~50%), clinopyroxene (~25%), volcanic glass (~25%), magnetite (1%–3%), and olivine.

Alteration: slight to moderate (~20%); pseudomorphs of smectite upon olivine; interstitial volcanic glass is replaced with olive-green smectite; vesicles are filled with smectite.

XRD: smectite.

Sample 121-758A-61R-2, 62–67 cm (Piece 1A), Unit 3 [Z-1345]

Plagioclase-phyric basalt (microdolerite), crystallized. Phenocrysts (5%): plagioclase (0.9.3–1.2 mm, approximately labradorite [An_{50-52}]). Groundmass (95%) with intersertal-microdoleritic texture; laths (0.3–0.8 mm) of plagioclase (30%, labradorite [An_{55-57}] and andesine [An_{40}]), segregate of small grains (0.1–0.4 mm) of clinopyroxene (35%), glass (25%), and opaque minerals (2%–3%).

Alteration: slight (15%); brownish dark green glass replaced by clay mineral.

XRD: smectite; trace chlorite(?).

Sample 121-758A-61R-4, 60–64 cm (Piece 1B), Unit 3 [Z-1346]

Aphyric basalt (microdolerite), crystallized, vesicular. Rocks with intersertal-microdoleritic texture; laths (0.2–0.8 mm) of plagioclase (40%, labradorite [An_{55}] and andesine [An_{34}]), segregate of small xenomorphic grains of clinopyroxene (40%), greenish black glass (10%), and opaque minerals (5%). Sparse vesicles (5%, 0.6–0.9 mm) are oval in shape.

Alteration: slight (5%); rock is non oxidized; vesicles infilled with clay mineral.

XRD: smectite with ~10% mica layers.

Sample 121-758A-61R-7, 0–5 cm (Piece 1A), Unit 3 [Z-1347]

Aphyric basalt (microdolerite), crystallized, vesicular. Rock: identical to Sample 121-758A-61R-4, 60–64 cm (Z-1346).

Alteration: slight (5%–7%); rock is nonoxidized; vesicles infilled with clay mineral.

XRD: smectite.

Sample 121-758A-62R-1, 57–59 cm (Piece 4A), Unit 4 [Z-23]

Plagioclase-phyric basalt, fine grained, vesicular. Phenocrysts (up to 5 mm) of plagioclase are ~10% abundance. Occasionally, phenocrysts form glomerophyric segregates built of 3 or 4 crystals. Vesicles (1–1.5 mm) are ~10% abundance. Groundmass; chaotically oriented laths of plagioclase, small xenomorphic grains of clinopyroxene, and interstitial volcanic glass with opaque dust. Groundmass demonstrates hyalopylitic texture. Composition: plagioclase (~60%), clinopyroxene (~20%), volcanic glass (~20%). Magnetite is present in trace amounts.

Alteration: strong (50%–60%); volcanic glass is completely replaced with green smectite; clinopyroxene is significantly replaced with smectite; phenocrysts of plagioclase are partly replaced with smectite and slightly carbonatized; vesicles are filled with radial aggregate of green smectite; microcracks located near some vesicles are filled with smectite.

XRD: smectite; trace calcite.

Sample 121-758A-62R-3, 27–29 cm (Piece 2), Unit 4 [Z-24]

Plagioclase-phyric basalt, fine grained, sparsely vesicular, fractured. Phenocrysts (up to 4 mm) are ~15% abundance. Occasionally, phenocrysts form glomerophyric segregates represented by 2 to 4 grains. Vesicles (0.5–0.7 mm) are <1% abundance. Groundmass; laths of plagioclase, small xenomorphic grains of clinopyroxene, and a small amount of interstitial glass. Small xenomorphic grains of magnetite and opaque dust are present also. Groundmass demonstrates hyalopylitic texture. Composition: plagioclase (~50%), clinopyroxene (~30%), volcanic glass (~15%), and magnetite (up to 5%).

Alteration: moderate (~25%–30%); olive-green smectite replaces interstitial glass, volcanic glass from small inclusions in phenocrysts of plagioclases, and peripheral parts of crystals of clinopyroxene; microcracks in phenocrysts of plagioclase are filled by smectite and by small amount of carbonate; opaque minerals are oxidized.

XRD: smectite; trace calcite.

Sample 121-758A-62R-3, 88–92 cm (Piece 8A), Unit 5 [Z-649]

Plagioclase-phyric basalt, pseudo-variolitic structure. Phenocrysts (10%): tabular grains (1–1.5 mm) of plagioclase. Groundmass (90%) with pilotaxitic texture; laths and needle-shaped microlites of plagioclase (labradorite [An_{50}]) and glass with opaque dust. Vesicles (30%, 0.1–0.5 mm) are rounded-isometric in shape.

Alteration: strong (50%); interstitial glass replaced by chlorite; vesicles completely infilled with chlorite.

Sample 121-758A-63R-1, 3–5 cm (Piece 1), Unit 7 [Z-19]

Aphyric basalt, fine grained, vesicular. Vesicles (0.3–1.5 mm) are rounded and irregularly rounded. Both are ~15%–20% abundance. Groundmass; chaotically located laths of plagioclase, small xenomorphic grains of clinopyroxene, small amount of interstitial volcanic glass, and small xenomorphic surrogates of magnetite. Groundmass demonstrates intersertal texture. Composition: plagioclase (~40%), clinopyroxene (~30%), volcanic glass (~10%), and magnetite (up to 5%).

Alteration: strong (~50%); clinopyroxene is almost completely replaced with olive-green smectite; volcanic glass is completely replaced with smectite; vesicles and cracks in plagioclases are filled with smectite.

XRD: smectite.

Sample 121-758A-63R-2, 46–50 cm (Piece 1B), Unit 7 [Z-1349]

Aphyric basalt (microdolerite), crystallized, vesicular. Rock: identical to Sample 121-758A-61R-4, 60–64 cm (Z-1346).

Alteration: slight (5%); rock is non oxidized; vesicles infilled with celadonite(?), single vesicle consists of carbonate (besides celadonite?).

XRD: smectite.

Sample 121-758A-63R-5, 48–50 cm (Piece 1A), Unit 7 [Z-7]

Aphyric basalt, fine grained, vesicular, intergranular texture. Some areas demonstrate intersertal texture. Vesicles (0.5–1.5 mm) are ~5% through 7% abundance. Groundmass; chaotically located laths of plagioclase and xenomorphic grains of clinopyroxene. Opaque minerals are known as spots within interstitial glass and as xenomorphic and skeletal crystals in interstices between plagioclase and clinopyroxene. Interstitial volcanic glass is distributed as spots. Composition: plagioclase (~40%), clinopyroxene (~35%), volcanic glass (~15%–20%), opaque minerals (up to 5%), olivine (single grains).

Alteration: slight to moderate (~20%); pseudomorphs of smectite upon olivine; clinopyroxene is partly replaced with smectite along crystal margins; interstitial volcanic glass is replaced with smectite; cracks in clinopyroxene are filled with smectite; occasionally, smectite is present in fractures within twins of plagioclases.

XRD: smectite.

Sample 121-758A-64R-1, 76–80 cm (Piece 1A), Unit 7 [Z-650]

Aphyric microdolerite, massive. Rock with intersertal texture; laths of plagioclase (40%, labradorite [An_{60}]), isometric grains (0.1–0.3 mm) of clinopyroxene (30%), brownish green glass (30%), and opaque minerals (2%–3%).

Alteration: moderate (30%); interstitial glass replaced by clay mineral.

Sample 121-758A-64R-2, 130–135 cm (Piece 1B), Unit 7 [Z-1350]

Plagioclase-phyric basalt, crystallized. Single (3%) large (3 mm) glomerophyric segregate of xenomorphic grains of plagioclase (labradorite [An_{60}]). Groundmass with microlitic texture; microlites and microlaths of plagioclase (40%, labradorite [An_{55}] and andesine [An_{41}]), segregate of small grains (0.1–0.3 mm) of clinopyroxene (45%), greenish black glass (10%), and opaque minerals (2%).

Alteration: slight (7%–8%); rock is non oxidized; interstitial glass replaced by clay mineral.

XRD: smectite.

Sample 121-758A-65R-2, 10–15 cm (Piece 1A), Unit 10 [Z-1351]

Aphyric basalt, crystallized, vesicular. Rocks with pilotaxitic texture; microlites and laths of plagioclase (40%, labradorite [An_{54}] and andesine [An_{43}]), small xenomorphic grains of clinopyroxene (15%), glass (30%), and opaque minerals (5%). Sparse vesicles (5%) are oval in shape.

Alteration: moderate (35%); rock is non oxidized; glass completely replaced by clay mineral, vesicles completely infilled with clay mineral.

XRD: smectite; white matter from veinlet: calcite.

Sample 121-758A-65R-4, 58–62 cm (Piece 1B), Unit 10 [Z-1352]

Aphyric basalt (microdolerite), crystallized, sparsely vesicular. Rocks with intersertal-microdoleritic texture; laths of plagioclase (40%–45%, labradorite [An_{60}] and andesine [An_{48}]), small xenomorphic grains of clinopyroxene (40%), glass (30%), greenish black glass (15%), and opaque minerals (2%–3%). Sparse vesicles (5%) are present.

Alteration: slight (10%); rock is non oxidized; glass partly (5%) replaced by clay mineral, vesicles infilled with clay mineral and carbonate.

XRD: smectite; black veinlet: smectite.

Sample 121-758A-65R-5, 1–6 cm (Piece 1A), Unit 10 [Z-651]

Aphyric microdolerite, crystallized, massive. Rock: identical to Sample 121-758A-64R-1, 76–80 cm (Z-650).

Sample 121-758A-65R-6, 25–27 cm (Piece 1A), Unit 10 [Z-28]

Aphyric basalt, fine grained, vesicular, intergranular texture. Some areas demonstrate intersertal texture. Vesicles (0.5–1.2 mm) are ~5% abundance. Groundmass; chaotically located laths of plagioclase and xenomorphic grains of clinopyroxene. Also, groundmass contains some admixture (not <5%) of xenomorphic opaque minerals. The latter is distributed within interstitial glass, which contains opaque dust and dendritic segregates of opaques. Composition: plagioclase (~40%), clinopyroxene (~35%), volcanic glass (15%–20%), and opaque minerals (up to 5%).

Alteration: slight to moderate (~20%); interstitial volcanic glass is completely replaced with green smectite; occasionally, smectite is located in large laths of plagioclase along boundaries of twins; vesicles are completely filled with smectite; inner parts are represented by radial aggregates, while peripheral rims are built of brownish green aggregate which is oriented perpendicularly to the walls of vesicles.

XRD: smectite.

Sample 121-758A-66R-1, 31–35 cm (Piece 5A), Unit 11 [Z-1353]

Aphyric basalt (microdolerite), crystallized, sparsely vesicular. Rocks with intersertal-microdoleritic texture; laths of plagioclase (35%, labradorite [An_{55}] and andesine [An_{44}]), small xenomorphic grains of clinopyroxene (30%), greenish brown glass (12%), and opaque minerals (3%). Vesicles (20%, 0.4–0.7 mm) are oval in shape.

Alteration: moderate (30%–35%); rock is nonoxidized; glass replaced by clay mineral, vesicles completely infilled with clay mineral.

XRD: smectite.

Sample 121-758A-66R-3, 44–46 cm (Piece 1B), Unit 11 [Z-14]

Aphyric basalt, fine grained, sparsely vesicular, intergranular texture. Some areas demonstrate intersertal texture. Vesicles (0.3–1.2 mm) with irregularly rounded in shape are ~5% abundance. Groundmass; chaotically oriented laths of plagioclase and xenomorphic clinopyroxene. The latter fills interstices between plagioclases. Interstitial volcanic glass contains xenomorphic opaque minerals and opaque dust. Composition: plagioclase (~45%), clinopyroxene (~40%), volcanic glass (10%–15%), and opaque minerals (<5%).

Alteration: moderate (~20%–25%); interstitial glass is completely replaced with olive-green smectite; pyroxenes and, lesser, plagioclases are replaced with smectite along margins and cracks; vesicles are filled with smectite.

XRD: smectite.

Sample 121-758A-66R-5, 2–7 cm (Piece 1A), Unit 11 [Z-652]

Aphyric basalt, massive. Rocks with pilotaxitic texture; unoriented laths (0.1–0.3 mm) of plagioclase (50%, andesine-labradorite [An_{55}]), isometric small grains of clinopyroxene (10%), green glass (30%–35%) with opaque dust (5%–8%), completely chloritized glass, and opaque minerals (5%–8%).

Alteration: moderate to strong (40%–50%); glass replaced by chlorite, several laths of plagioclase in their central parts replaced by chlorite, microcrack (2 mm in thickness) consists of carbonate and clay mineral.

Sample 121-758A-66R-5, 50–55 cm (Piece 1E), Unit 11 [Z-1354]

Aphyric basalt, vesicular. Rocks with vitrophyric texture; glass (90%), sparse (5%) microlites of plagioclase, and microlites of clinopyroxene (10%). Single vesicle (2 mm) is isometric in shape.

Alteration: very strong (95%); rock is nonoxidized; glass and plagioclase almost completely replaced by smectites, vesicle completely infilled with smectites and carbonate.

XRD: smectite.

Sample 121-758A-67R-4, 79–83 cm (Piece 3), Unit 14 [Z-653]

Aphyric basalt, massive. Rocks with intersertal texture; elongated laths (0.3–0.8 mm) of plagioclase. Interstices consist of altered glass and small needle-shaped, skeletal or pseudo-cubic grains (0.1–0.2 mm) of opaque minerals (20%). Biotite is present.

Alteration: very strong (90%); plagioclase and glass almost completely replaced by clay mineral.

Sample 121-758A-67R-4, 78–80 cm (Piece 3), Unit 14 [Z-12]

Aphyric basalt, fine grained (near to aphanitic), sparsely vesicular, hyalopylitic texture. Groundmass; laths of plagioclase and devitrified interstitial glass. The latter contains grains of clinopyroxene and opaque dust. Vesicles (0.01–0.05 mm) are rounded and irregularly rounded in shape. Vesicles are up to 10% abundance. Composition: plagioclase (~35%), clinopyroxene (~30%), volcanic glass (~25%), and opaque minerals (~10%).

Alteration: moderate to strong (~50%); interstitial volcanic glass is replaced with smectite; clinopyroxenes are partly replaced with smectite; vesicles are completely filled with radial aggregates of smectite.

XRD: smectite.

Sample 121-758A-67R-6, 28–30 cm (Piece 1), Unit 14 [Z-35]

Sparsely plagioclase-phyric basalt, fine grained, sparsely vesicular, with single microphenocrysts of olivine. Groundmass demonstrates intergranular to intersertal texture. Phenocrysts of plagioclase (up to 2 mm) are <5% abundance. Single glomerophyric segregates of plagioclase, as well as aggregates of plagioclase and olivine(?) or with clinopyroxene are present. Interstitial glass contains opaque minerals and opaque dust. Single rounded

vesicles (0.2 mm) are present. Composition: plagioclase (~40%), clinopyroxene (~30%), volcanic glass (~20%), opaque minerals (1%–3%), and olivine (single grains).

Alteration: moderate (~30%–40%); pseudomorphs of olive-green smectite upon olivine; clinopyroxenes are partly replaced with smectite along marginal parts of crystals; interstitial volcanic glass is replaced with smectite; smectite is present along fractures and cleavage in plagioclases; vesicles are filled with smectite.

XRD: smectite.

Sample 121-758A-68R-3, 106–108 cm (Piece 8), Unit 17 [Z-20]

Sparsely plagioclase-phyric basalt, fine grained, sparsely vesicular. Some vesicles are <0.5 mm in diameter. Groundmass demonstrates intersertal texture; chaotically oriented laths of plagioclase, xenomorphic grains of clinopyroxene, and interstitial glass. Idiomorphic segregates of magnetite are restricted to volcanic glass. Composition: plagioclase (~45%), clinopyroxene (~20%), volcanic glass (~30%), opaque minerals (<5%), and olivine (single grains).

Alteration: strong (~50%–60%); interstitial glass is completely replaced with olive-green smectite; the latter also replaces some clinopyroxene; vesicles are filled with smectite; microphenocrysts of olivine are fresh.

XRD: smectite.

Sample 121-758A-69R-2, 45–47 cm (Piece 1), Unit 17 [Z-10]

Plagioclase-phyric basalt, fine grained, massive. Phenocrysts of plagioclase and their glomerophyric segregates (2–5 mm) are ~10% abundance. Groundmass; aggregate of laths of plagioclase, hypidiomorphic grains of clinopyroxene, interstitial volcanic glass, single grains of olivine, and xenomorphic segregates of opaque minerals (magnetite). Magnetite is restricted to interstitial glass. Groundmass demonstrates intergranular texture. Composition: plagioclase (~45%), clinopyroxene (~40%), volcanic glass (10%–15%), opaque minerals (<2%–5%), and olivine (single grains).

Alteration: slight (~10%–15%); occasionally clinopyroxene is replaced with smectite along peripheral parts of crystals; interstitial glass is completely replaced with olive-green smectite.

XRD: smectite.

Sample 121-758A-69R-5, 18–21 cm (Piece 1A), Unit 17 [Z-654]

Plagioclase-clinopyroxene-phyric microdolerite, vesicular. Phenocrysts (50%): prismatic grains (up to 2 mm) and glomerophyric segregates of small (up to 1 mm) grains of plagioclase (labradorite [An_{55}]); segregates of clinopyroxene (0.5–0.8 mm). Groundmass with intersertal-doleritic texture; unoriented laths (0.3–0.8 mm) of plagioclase (labradorite [An_{51}]). Interstices: segregate of small grains (0.1–0.2 mm) of clinopyroxene (50%); green altered glass (15%–20%); opaque minerals (5%). Microvesicles (10%–15%) are isometric in shape.

Alteration: slight to moderate (~20%); clay mineral replaces interstitial glass, vesicles infilled with clay mineral.

Sample 121-758A-69R-5, 120–123 cm (Piece 1C), Unit 17 [Z-1355]

Clinopyroxene-plagioclase-phyric basalt, vesicular. Phenocrysts (7%–8%): glomerophyric segregates and prismatic grains of plagioclase (approximately labradorite [An_{55}]); small (up to 0.7 mm) xenomorphic grains of clinopyroxene (2%–3%). Groundmass with hyalopilitic texture; microlites and crystals (<0.05 mm) of plagioclase, brown (<0.01 mm) grains of clinopyroxene, and altered glass. Vesicles (10%, 0.3–0.7 mm) is isometric in shape.

Alteration: strong to very strong (60%–70%); rock is nonoxidized; glass completely replaced by smectites; vesicles completely infilled with smectites and carbonate.

XRD: smectite.

Sample 121-758A-70R-2, 47–50 cm (Piece 4), Unit 19 [Z-655]

Aphyric basalt, vesicular. Rock with vitrophyric texture; dark brown glass and radial-radiant segregates of crystals of plagioclase and pyroxene. Vesicles (30%, 0.1–2 mm) are rounded and isometric in shape.

Alteration: vesicles infilled with clay mineral.

Sample 121-758A-71R-2, 104–107 cm (Piece 8B), Unit 21 [Z-656]

Aphyric basalt with vitrophyric texture, vesicular. Rock: identical to Sample 121-758A-70R-2, 47–50 cm (Z-655).

Alteration: vesicles infilled with clay mineral.

Sample 121-758A-71R-3, 87–89 cm (Piece 3B), Unit 22 [Z-2]

Aphyric basalt, fine grained, vesicular, hyalopilitic or, occasionally, subvariolitic texture. Vesicles (0.2–0.5 mm) are up to 10% abundance. Small (0.2 mm) and isometric vesicles are dominant. Groundmass; laths of plagioclase,

xenomorphic grains of clinopyroxene, devitrified interstitial glass, fine xenomorphic segregation of opaque minerals (near to opaque dust). Occasionally, laths of plagioclase demonstrate radial pattern. Composition: plagioclase (~55%), clinopyroxene (~35%), volcanic glass (~10%), and opaque minerals (<5%).

Alteration: slight to moderate (~15%–20%); interstitial glass is completely replaced with smectite; vesicles are filled with green smectite.

XRD: smectite.

Sample 121-758A-72R-3, 0–5 cm (Piece 1A), Unit 25 [Z-657]

Aphyric basalt, sparsely vesicular. Rock with vitrophyric texture; dark brown glass with sparse needle-shaped microlites of plagioclase. Microvesicles (20%) are isometric and rounded in shape.

Alteration: vesicles infilled with clay mineral, occasionally, they are lined by clay mineral.

Sample 121-758A-72R-4, 90–95 cm (Piece 3), Unit 25 [Z-658]

Aphyric basalt, sparsely vesicular. Rock with intersertal-microdoleritic texture; needle-shaped laths (up to 0.5 mm) of plagioclase (50%, andesine-labradorite [An_{50}]). Interstices consist of small grains of clinopyroxene, opaque minerals (5%–8%), and green altered glass. Vesicles (15%, 0.5–2 mm) are rounded, oval, and isometric in shape.

Alteration: moderate (30%); chlorite replaces glass, vesicles infilled with clay mineral and carbonate (occasionally, they are empty).

Sample 121-758A-73R-2, 71–74 cm (Piece 1C), Unit 27 [Z-659]

Sparsely plagioclase-phyric basalt, sparsely vesicular. Single phenocryst; glomerophyric segregate (2.5 mm) of prismatic grains (0.5–1 mm) of plagioclase (labradorite [An_{56}]). Groundmass with pilotaxitic texture; microlites of plagioclase (20%, andesine-labradorite [An_{50}]). Interstices consist of segregate of small grains of clinopyroxene (40%), green altered glass (30%), and opaque minerals (10%). Sparse vesicles (0.3–0.5 mm) are rounded in shape.

Alteration: moderate (30%); interstitial glass completely replaced by clay mineral.

Sample 121-758A-73R-3, 85–87 cm (Piece 4F), Unit 29 [Z-15]

Aphyric basalt, fine grained, vesicular, hyalopilitic texture. Isometric vesicles (0.3–0.7 mm) vary from 15%–20% abundance. Groundmass; chaotically located laths of plagioclase, small xenomorphic grains of clinopyroxene, devitrified interstitial glass, and opaque dust within glass. Composition: plagioclase (~50%), clinopyroxene (~25%), volcanic glass (~20%), opaque minerals (~5%).

Alteration: strong (~50%); interstitial glass is completely replaced with smectite; vesicles are filled with green smectite.

XRD: smectite.

Sample 121-758A-73R-3, 136–140 cm (Piece 5), Unit 29 [Z-1356]

Aphyric basalt, vesicular. Rock with pilotaxitic texture; microlites and laths of plagioclase (30%, labradorite [An_{50}] and andesine [An_{44}]). Interstices consist of small grains of clinopyroxene (15%) and altered glass (15%). Vesicles (40%, 0.8–5 mm) are rounded in shape.

Alteration: strong (55%); rock is nonoxidized; clay mineral replaces glass; vesicles completely infilled with clay mineral.

XRD: smectite.

Sample 121-758A-73R-4, 105–110 cm (Piece 8), Unit 29 [Z-1357]

Sparsely plagioclase-phyric basalt, crystallized, vesicular. Phenocrysts (3%); tabular grains (0.7–0.9 mm) of plagioclase (labradorite [An_{65}]). Groundmass (95%) with microlitic texture; laths of plagioclase (45%, andesine [An_{42-48}]). Interstices consist of segregate of xenomorphic grains of clinopyroxene (40%), brownish green altered glass (8%–10%), and opaque minerals (2%–3%). Sparse vesicles (2%) are present.

Alteration: slight (10%–12%); rock is nonoxidized; interstitial glass completely replaced by clay mineral, vesicles are filled with clay mineral.

XRD: smectite.

Kerguelen Plateau (Legs 120 and 183)

Hole 747C

Sample 120-747C-12R-1, 53–56 cm (Piece 7A), Unit 8 [Z-91]

Olivine microphyric basalt, fine grained (near to aphanitic), Slightly crystallized, massive. Groundmass; devitrified microcrystalline glass with hyalopilitic texture. Hypidiomorphic microphenocrysts (0.05–0.1 mm) of olivine vary from 5%–7% abundance. Components: plagioclase, clinopyroxene, and opaque minerals. Single spots of noncrystallized glass (0.3–0.5 mm) are present also.

Alteration: slight (~10%–15%); olivine is replaced by orange-red iddingsite; some microphenocrysts are replaced with grassy-green smectite along margins; glass is replaced with the grassy-green smectite.

XRD: smectite; trace hydromica.

Sample 120-747C-12R-1, 125–127 cm (Piece 18), Unit 10 [Z-629]

Aphyric basalt, fine grained, vesicular. Rock with intersertal texture is represent by laths (<0.1 mm) of plagioclase (40%), clinopyroxene, glass, and opaque minerals. Several isometric and rounded crystals of olivine are present. Large vesicles (up to 1–1.2 mm) demonstrate rounded in shape. Microcracks are present.

Alteration: slight (~10%); clay minerals and zeolite replace olivine and glass and infilled vesicles and microcracks.

XRD: smectite; trace hydromica.

Sample 120-747C-12R-2, 6–9 cm (Piece 1), Unit 10 [Z-630]

Olivine-clinopyroxene-plagioclase-phyric basalt, massive. Phenocrysts (8%–10%): elongated crystals of plagioclase (8%, up to 0.7 mm), single isometric grains of clinopyroxene (0.4 mm) and olivine. Groundmass with intersertal texture is represent by laths of plagioclase (20%), clinopyroxene (20%, up to 0.1 mm), and interstitial fresh glass (10%).

Alteration: slight (~10%); clay minerals replace olivine; phenocrysts of plagioclase replaced by clay minerals.

XRD: smectite.

Sample 120-747C-12R-2, 85–87 cm (Piece 10), Unit 10 [Z-92]

Basalt, fine grained (near to aphanitic), vesicular. Groundmass demonstrates intergranular texture. Groundmass; laths of plagioclase, xenomorphic clinopyroxene, opaque minerals, and small (<1%) amounts of microphenocrysts (up to 0.2 mm) of olivine. Vesicles (0.03–0.05 mm) demonstrate irregularly rounded in shape and vary from 5%–7% abundance. Components: pyroxene (50%–60%), laths of plagioclase (~30%), opaque minerals (5%–7%), and olivine (single grains).

Alteration: slight to moderate (~15%–20%); olivine is replaced with orange-brown iddingsite; occasionally grains of olivine are replaced along their peripheral parts with grassy-green smectite; glass in small vesicles is completely replaced with grassy-green smectite; in large vesicles smectite is only present in peripheral parts.

XRD: smectite; trace chlorite.

Sample 120-747C-12R-3, 18–22 cm (Piece 3A), Unit 10 [Z-631]

Clinopyroxene-plagioclase-olivine-phyric basalt, sparsely vesicular. Phenocrysts (15%–20%): isometric grains of olivine (10%, 0.5–1 mm), elongated crystals of plagioclase (10%, up to 1.2 mm), and grains of clinopyroxene. Groundmass with intergranular (partly intersertal) texture is represent by olivine (20%, up to 0.7–0.08 mm) segregates, clinopyroxene, plagioclase, interstitial altered glass (10%), and partly oxidized opaque minerals (~2%). Vesicles (5%, 0.1–0.5 mm) are mainly empty.

Alteration: slight (~10%–15%); clay mineral replaces olivine and glass; single large (> 0.5 mm) vesicles infilled with clay mineral; feldspar(?) rimes large grains of olivine.

XRD: smectite.

Sample 120-747C-12R-3, 146–148 cm (Piece 12), Unit 10 [Z-93]

Aphyric basalt, fine grained, massive. Groundmass demonstrates intergranular textures. Some areas represent intersertal texture. Single isomorphic and hypidiomorphic grains of olivine are present. Groundmass; chaotically located laths of plagioclase, xenomorphic grains of clinopyroxene, and hypidiomorphic grains of opaque minerals. Single tabular microphenocrysts of plagioclase and clinopyroxene are present. Components: clinopyroxene (~60%), plagioclase (30%–40%), opaque minerals (5%–7%), and olivine (<1%).

Alteration: slight to moderate (~15%–20%); both olivine and interstitial glass are completely replaced with grassy-green smectite.

XRD: smectite.

Sample 120-747C-13R-1, 6–10 cm (Piece 1A), Unit 10 [Z-632]

Clinopyroxene-olivine-plagioclase-phyric basalt, massive. Phenocrysts (15%): isometric tabular grains of olivine (5%, 0.5–0.5 mm), glomerophyric segregates of plagioclase tabular crystals (10%, up to 0.8 mm), and grains of clinopyroxene (1%, 0.1–0.2 mm). Large plagioclase phenocrysts have undulatory extinction. Groundmass with intersertal texture is represent by small grains (0.07 mm) of clinopyroxene, plagioclase, olivine, glass, and cubic crystals of opaque minerals.

Alteration: slight (~10%); clay mineral replaces olivine, glass, clinopyroxene, and plagioclase; feldspar(?) partly replaces plagioclase.

XRD: smectite.

Sample 120-747C-13R-1, 98–102 cm (Piece 2D), Unit 10 [Z-633]

Olivine-clinopyroxene-plagioclase-phyric basalt, vesicular. Phenocrysts (10%): single isometric grains of clinopyroxene (1.5 mm), altered olivine (0.8 mm), elongated-tabular crystals of plagioclase (0.5–0.7 mm). Groundmass (90%) with intergranular (partly intersertal) texture is represent by microlites of plagioclase, clinopyroxene, olivine, and glass with opaque dust. Vesicles (10%) demonstrate rounded in shape.

Alteration: slight to moderate (20%); clay mineral replaces olivine and glass, vesicles partly infilled with clay mineral (partly they are empty).

XRD: smectite.

Sample 120-747C-13R-3, 97–99 cm (Piece 10B), Unit 18 [Z-94]

Aphyric basalt, fine grained, crystallized, massive, trachytic or intergranular texture. Groundmass; subparallel oriented laths of plagioclase, xenomorphic pyroxene, and hypidiomorphic opaque minerals. Single hypidiomorphic microphenocrysts of olivine are present. Components: plagioclase (~50%), clinopyroxene (~45%), opaque minerals (5%–7%), olivine (up to 1%), and volcanic glass (<1%).

Alteration: slight (~10%); olivine is replaced with brown iddingsite or bluish green smectite with opacite-iddingsite rim.

XRD: smectite.

Sample 120-747C-14R-1, 49–51 cm (Piece 3C), Unit 19 [Z-95]

Aphyric basalt, fine grained, crystallized, massive (with single vesicles), and with single microphenocrysts of olivine. Groundmass demonstrates intergranular texture. Single rounded vesicles are ~0.2 mm in diameter. Microphenocrysts of olivine vary from 0.05–0.1 mm. Groundmass; chaotically located laths of plagioclase, xenomorphic clinopyroxene, and opaque minerals. Composition: plagioclase (~45%), clinopyroxene (~45%), opaque minerals (7%–10%), and olivine (1%–3%).

Alteration: slight (~7%–10%); vesicles are filled with grassy-green smectite; microphenocrysts of olivine are replaced with orange-red iddingsite; fine isometric grains of olivine within the groundmass are replaced with green smectite; some microphenocrysts of olivine demonstrate clathrate pattern of replacement: lattices of both brownish red iddingsite with an admixture of opaque minerals and green smectite are present; secondary opacite accumulations of opaque minerals are characteristic.

XRD: smectite; chlorite in trace amounts.

Sample 120-747C-15R-1, 22–24 cm (Piece 3A), Unit 23 [Z-96]

Aphyric olivine basalt, fine grained, incompletely crystallized, vesicular, with single microphenocrysts of plagioclase. Groundmass demonstrates intersertal texture. Some areas demonstrate poikilophitic texture. Microphenocrysts (up to 0.5 mm) of plagioclase are tabular in shape. Microphenocrysts (0.2–0.3 mm) of olivine are isometric. Vesicles (0.3–0.6 mm) have irregular in shape and vary from 20%–25% abundance. Groundmass; chaotically located laths of plagioclase, grains of clinopyroxene, and interstitial devitrified glass which is filled with opaque dust. Composition: plagioclase (~45%), clinopyroxene (~40%), volcanic glass (~10%), olivine (~5%), and opaque minerals (~1%).

Alteration: moderate (~25%–30%); tabular plagioclases in their central parts are replaced with pale green to almost colorless smectite; microphenocrysts of olivine are replaced along margins with orange-red iddingsite, while their central parts are replaced with pale green smectite; vesicles are filled with light green zonal smectite, central parts of vesicles are filled with pale green smectite.

XRD: smectite; minor chlorite.

Sample 120-747C-15R-2, 97–99 cm (Piece 13), Unit 25 [Z-97]

Sparsely olivine microphyric basalt, medium grained, incompletely crystallized, vesicular. Isometric microphenocrysts (0.2–0.7 mm) of olivine vary from 2%–5% abundance. Microphenocrysts of olivine unevenly

distributed in the groundmass; occasionally they form glomero-microphyric segregates. Single microphenocrysts of plagioclase vary from 0.2 to 0.5 mm. Groundmass; an aggregate of chaotically located laths of plagioclase, grains of clinopyroxene, fine isometric grains of olivine, and devitrified glass filled with opaque dust. Vesicles (0.1–0.8 mm) demonstrate irregular in shape and vary from 20%–25% abundance. Composition: plagioclase (~45%), clinopyroxene (~40%), volcanic glass and opaque minerals (~10%), olivine (5%–7%).

Alteration: moderate (~25%–30%); olivine is completely replaced with light green smectite; occasionally, it is replaced along peripheral parts of grains with orange-red iddingsite; some microphenocrysts are surrounded with opacite rim built of opaque minerals; isometric grains of olivine are replaced with light green smectite and with intersertal smectite; some relatively large laths of plagioclase are replaced in their central parts with light green smectite; vesicles are filled with light green smectite along peripheral parts; central parts of vesicles are filled with light green or almost colorless smectite.

XRD: smectite; minor chlorite.

Sample 120-747C-16R-2, 11–14 cm (Piece 1B), Unit 29 [Z-634]

Olivine-clinopyroxene-plagioclase-phyric basalt, massive. Phenocrysts (20%): clinopyroxene (12%, 0.8 mm), altered olivine (5%, 0.1–0.5 mm), and elongated crystals of plagioclase (3%, up to 0.7 mm). Groundmass (80%) with intersertal texture is represent by clinopyroxene and altered glass, plagioclase forms segregates.

Alteration: slight (15%); clay mineral replaces olivine and partly clinopyroxene, interstitial glass replaced by clay minerals.

XRD: smectite; trace calcite.

Sample 120-747C-16R-2, 51–53 cm (Piece 1D), Unit 29 [Z-98]

Aphyric olivine basalt, medium grained, incompletely crystallized, vesicular. Groundmass demonstrates intergranular to intersertal texture. Some areas demonstrate poikilophitic texture. Groundmass; laths of plagioclase, clinopyroxene, fine hypidiomorphic grains of olivine, interstitial glass, and opaque minerals. Large laths and sparsely microphenocrysts of plagioclase are ~0.5 mm. Devitrified interstitial glass is filled with opaque dust. Occasional grains of irregularly lamella opaque minerals are present within interstitial glass. Vesicles (0.2–1.2 mm) demonstrate irregular in shape. Composition: plagioclase (~40%), clinopyroxene (~40%), olivine (~10%), volcanic glass (~5%), and opaque minerals (~5%).

Alteration: moderate (~25%); fine olivine grains are completely replaced with orange-brown smectite, while coarser (0.2–0.3 mm) ones are replaced with light green smectite in central parts and with iddingsite along margins and fractures; occasionally, iddingsite is present in both central and peripheral parts; intermediate parts are replaced with green smectite; vesicles are filled with light green zonal smectite; intensity of light green color significantly varies.

XRD: smectite; minor swelling chlorite; trace heulandite.

Sample 120-747C-16R-2, 101–105 cm (Piece 1G), Unit 29 [Z-635]

Olivine-clinopyroxene-plagioclase-phyric basalt, vesicular. Phenocrysts (40%): altered olivine (1%, 0.5 mm), clinopyroxene (10%, up to 0.8 mm), and plagioclase (10%, from 0.1–0.2 to 0.8–0.9 mm). Partly plagioclase forms glomerophyric segregates. Groundmass (90%) with intersertal texture is represent by microlites of plagioclase, clinopyroxene, olivine, and altered glass. Vesicles (10%, 0.1–0.5 mm) demonstrate rounded and isometric in shape.

Alteration: slight (10%–15%); clay minerals completely replace olivine and glass, they partly replace plagioclase; vesicles partly infilled with clay minerals (partly they are empty).

XRD: smectite.

Sample 120-747C-16R-2, 145–148 cm (Piece 1A), Unit 29 [Z-636]

Clinopyroxene-olivine-plagioclase-phyric basalt, vesicular. Phenocrysts (60%): tabular grains of plagioclase (50%, from 0.4–2.5 mm), olivine (10%, up to 0.2 mm), and single grains of clinopyroxene (0.1 mm). Phenocrysts of plagioclase form glomerophyric segregates. Groundmass (40%) is intersertal (occasionally doleritic) texture. Vesicles (10%) demonstrate irregular in shape and vary from 0.1 to 4 mm.

Alteration: very strong (70%); clay mineral replaces olivine and clinopyroxene; vesicles infilled with clay minerals and zeolite.

XRD: smectite; trace heulandite.

Sample 120-747C-16R-4, 14–16 cm (Piece 1A), Unit 30 [Z-99]

Aphyric basalt, fine grained, almost all crystallized, sparsely vesicular. Groundmass demonstrates intergranular texture. Some areas (spots) demonstrate poikilophitic texture. Groundmass; chaotically located laths of

plagioclase, clinopyroxene, fine hypidiomorphic and coarser idiomorphic grains of olivine, some small amount of opaque minerals and volcanic glass. Grains of opaque minerals are finely lamella or xenomorphic. Interstitial volcanic glass contains opaque minerals as elongated lamellae or as opaque dust. Vesicles (0.1–0.5 mm) have irregular in shape. Composition: plagioclase, clinopyroxene, olivine and opaque minerals, and volcanic glass.

Alteration: moderate (~20%–25%); large laths of plagioclase are replaced in central parts with light green smectite; interstitial volcanic glass is partly replaced with green smectite; vesicles are filled with zonal light green smectite; zonality in smectite is underlined by changes from dark green to light green colors and by the presence of oxidized rusty-brown opaque minerals.

XRD: smectite; minor swelling chlorite and chlorite.

Sample 120-747C-16R-5, 0–3 cm (Piece 1A), Unit 30 [Z-637]

Olivine-clinopyroxene-plagioclase-phyric basalt, vesicular. Phenocrysts (50%): clinopyroxene (0.1–0.2 mm), unoriented elongated-tabular crystals of plagioclase (0.8–1 mm), and altered olivine (0.1 mm). Groundmass (50%) is intersertal (occasionally doleritic) texture. Vesicles (10%) demonstrate irregular in shape.

Alteration: slight (10%); clay mineral replaces glass, olivine, and partly clinopyroxene; vesicles completely infilled with clay mineral.

XRD: smectite.

Sample 120-747C-16R-5, 105–108 cm (Piece 3C), Unit 31 [Z-638]

Olivine-clinopyroxene-plagioclase-phyric basalt, highly vesicular. Phenocrysts (60%): plagioclase (50%, 0.6–0.8 mm), large crystals of plagioclase form glomerophyric segregates; clinopyroxene (4%, 0.1–0.2 mm); altered olivine (6%, 0.1–0.4 mm). Groundmass with intersertal (occasionally doleritic) texture is represent by unoriented laths of plagioclase, tabular and isometric grains (0.1–0.2 mm) of clinopyroxene, and glass with opaque dust. Vesicles (25%) demonstrate irregular in shape.

Alteration: slight (10%–15%); clay mineral replaces plagioclase, interstitial glass, olivine, and partly clinopyroxene; vesicles infilled with clay mineral (occasionally vesicles are empty in their central parts).

XRD: smectite.

Holes 1136A, 1137A, 1138A, and 1140A

Note: Petrographic description of analyzed basalts and XRD data of secondary minerals from Holes 1136A, 1137A, 1138A, and 1140A were published in Kurnosov et al. (2003).

Western Indian Ocean, Chagos Bank, and Maldives Ridge (Leg 115)

Hole 706C

Sample 115-706C-3R-2, 21–23 cm (Piece 3), Unit 12 [Z-60]

Aphyric basalt, inequigranular, incompletely crystallized, vesicular. Rock is intersertal-glassy texture; black devitrified glass, various laths of plagioclase, hypidiomorphic crystals of clinopyroxene, and opaque dust. Vesicles (0.3–0.6 mm, 5%–7%) are irregular in shape. As a rule vesicles are empty; some vesicles are partly or completely filled with clay minerals.

Alteration: slight (up to 15%); rock is nonoxidized; vesicles are filled with smectites.

XRD: smectite contains ~10% of mica layers; trace hydromica (~10% swelling interlayers).

Sample 115-706C-4R-2, 111–113 cm (Piece 15), Unit 12 [Z-64]

Aphyric basalt, inequigranular, incompletely crystallized, vesicular. Rock is intersertal texture; black devitrified glass, needle-shaped crystals of plagioclase, small grains of clinopyroxene, and opaque dust, with. Glass contains tabular microphenocrysts of plagioclase. Vesicles (0.1–0.7 mm, ~5%) are rounded in shape.

Alteration: slight to moderate (15%–20%); vesicles are filled with smectites.

XRD: smectite.

Sample 115-706C-4R-3, 10–13 cm (Piece 1), Unit 13 [Z-1320]

Aphyric dolerite, vesicular. Rock with intersertal-doleritic (occasionally ophitic) texture; prismatic crystals of plagioclase (30%, 0.2–0.7 mm, labradorite [An_{58}]), xenomorphic grains (0.1–0.4 mm) of clinopyroxene (30%), greenish brown volcanic glass, and opaque minerals (10%, 0.1–0.2 mm). Vesicles (15%, 0.3–1.5 mm) are rounded in shape; they are lined with palagonitized brown and dark green glass. Central parts of vesicles are empty.

Alteration: slight; palagonite replaces glass from interstices and vesicles.

Sample 115-706C-5R-1, 38–40 cm (Piece 2%), Unit 13 [Z-38]

Aphyric basalt, inequigranular, almost completely crystallized, highly vesicular. Rock is intergranular (occasionally micropoikiliophitic) texture; black devitrified glass, needle-shaped crystals of plagioclase, small grains of clinopyroxene, and opaque dust. Glass contains prismatic-tabular microphenocrysts of plagioclase. Vesicles (0.1–0.8 mm, ~10%–15%) are oval or irregular in shape.

Alteration: moderate (20%–25%); vesicles are filled with green smectites.

XRD: smectite contains ~20% of mica layers.

Sample 115-706C-5R-1, 113–115 cm (Piece 10), Unit 14 [Z-59]

Aphyric basalt, inequigranular, incompletely crystallized. Rock is intersertal texture; laths of plagioclase, clinopyroxene, opaque minerals, and devitrified glass. Vesicles (0.2–0.5 mm, ~1%–3%) are oval or irregular in shape.

Alteration: slight (1%–3%); vesicles are filled with smectites.

XRD: smectite.

Sample 115-706C-5R-3, 69–71 cm (Piece 9), Unit 19 [Z-50]

Aphyric hyalobasalt, poorly crystallized, vesicular (up to 1–1.5 mm, ~5%–10%). Rock is hyaline-vitrophyric texture; black volcanic glass with laths of plagioclase (25%) and xenomorphic crystals of clinopyroxene (5%).

Alteration: slight (5%); vesicles are filled with smectites.

XRD: smectite; trace hydromica (~10% swelling interlayers).

Sample 115-706C-6R-1, 38–40 cm (Piece 2), Unit 20 [Z-54]

Aphyric basalt, inequigranular, poorly crystallized, vesicular. Rock is intersertal texture; black devitrified glass, laths of tabular crystals of plagioclase, xenomorphic grains of clinopyroxene, needle-shaped opaque minerals and small amounts of diamond-shaped olivine. Vesicles (0.1–1 mm, ~7%–10%) are oval or irregular in shape.

Alteration: slight (10%–15%); rock is nonoxidized; vesicles are filled with smectites; smectites replace olivine.

XRD: smectite contains ~40% of mica layers; trace hydromica and amphibole.

Sample 115-706C-6R-1, 45–50 cm (Piece 2), Unit 20 [Z-1321]

Aphyric basalt, brecciated, vesicular. Rock with pilotaxitic texture; laths and microlites of plagioclase (25%, 0.1–0.7 mm, labradorite [An_{65}] and andesine [An_{48}]), black devitrified glass, glomerophyric segregates of small (0.2–0.4 mm) xenomorphic grains of clinopyroxene (20%), and glass (30%) with needle-shaped opaque minerals. Vesicles (25%, 0.1–0.2 mm and 0.5–0.9 mm) are oval or irregular in shape. Small vesicles infilled with brownish green glass, large vesicles are empty in centers and encrusted by palagonitized and chloritized glass. Matrix of breccia consists of green clay mineral, fragments of basalt, and reddish brown hematite(?).

Alteration: slight (10%–15%); secondary minerals: clay mineral, palagonite, and hematite(?).

XRD: smectite with ~30% mica layers; minor hydromica; trace chlorite; blue matter from veinlet: mica (celadonite?).

Sample 115-706C-8R-2, 26–28 cm (Piece 1%), Unit 28 [Z-39]

Aphyric basalt, inequigranular, poorly crystallized, vesicular. Rock is intersertal texture; devitrified glass, laths of tabular crystals of plagioclase, xenomorphic grains of clinopyroxene, needle-shaped opaque minerals and small amounts of hypidiomorphic crystals of olivine. Vesicles (0.08–1.5 mm, ~15%–20%) are oval or irregular in shape.

Alteration: moderate (20%); vesicles are filled with smectites; smectites replace olivine; thin cracks are filled with oxidized opaque minerals, zones of oxidation occur along salbands.

XRD: smectite contains ~40% of mica layers; trace hydromica (single swelling interlayers).

Sample 115-706C-9R-1, 72–74 cm (Piece 8), Unit 31 [Z-47]

Plagioclase-phyric basalt, poorly crystallized, vesicular. Phenocrysts of plagioclase (2–5 mm, 15%–20%). Groundmass is hyaline-vitrophyric texture; devitrified glass, laths and tabular crystals of plagioclase, xenomorphic crystals of clinopyroxene, opaque dust. Vesicles (0.08–1.8 mm, ~10%) are irregular in shape.

Alteration: slight (10%–15%); vesicles are filled with smectites and Fe hydroxides; hair-thin cracks are filled with Fe hydroxides.

XRD: smectite.

Sample 115-706C-9R-2, 0–7 cm (Piece 1), Unit 32 [Z-1322]

Clinopyroxene-plagioclase-phyric basalt, vesicular. Phenocrysts (40%): single large (up to 5 mm) prismatic crystals of plagioclase; glomerophyric segregates (80%) of small grains (0.1–0.3 mm) of clinopyroxene; prismatic grains (up to 0.3 mm) of plagioclase (labradorite [An_{60}]). Groundmass with hyalopilitic texture; glass (35%). Vesicles (25%, 0.1–0.2 up to 0.5 mm) completely infilled with chlorite.

Alteration: moderate (20%–25%); 25% of rock is oxidized; clay mineral replaces glass, vesicles are filled with clay mineral and limonite.

Hole 707C

Sample 115-707C-22R-1, 94–98 cm (Piece 11A), Unit 1 [Z-1323]

Sparsely plagioclase-phyric dolerite, massive, vesicular. Phenocrysts (2%–3%): single elongated-prismatic grains of plagioclase (0.8–1.2 mm). Groundmass with intersertal-doleritic texture; unoriented laths of plagioclase (50%, 0.–0.7 mm, labradorite [$An_{53–55}$]), xenomorphic grains of clinopyroxene (20%, 0.2–0.3 mm) and their segregates, and interstitial altered glass (30%). Rounded and oval isometric vesicles (5%, 1.5–2 mm) are present.

Alteration: moderate (30%–35%); clay mineral replaces glass and completely infills vesicles.

XRD: smectite with ~20% mica layers; red-brown matter from vesicles: smectite; clay matter from vesicles: smectite.

Sample 115-707C-22R-2, 49–51 cm (Piece 3A), Unit 1 [Z-78]

Sparsely plagioclase-phyric dolerite, incompletely crystallized, vesicular. Phenocrysts: single (1%) zonal tabular crystals of plagioclase (0.7 mm) with inclusions of glass. Groundmass (60%) with intersertal-doleritic texture; unoriented laths (0.3–0.5 mm) of plagioclase (50%, labradorite [$An_{58–60}$]), xenomorphic crystals segregate of clinopyroxene (30%), and interstitial altered glass. Vesicles (40%) have various, from 1.5 to 5 mm.

Alteration: strong (50%–60%); clay mineral replaces glass and completely infills vesicles.

XRD: smectites with various content of interlayer cations.

Sample 115-707C-23R-1, 32–36 cm (Piece 1C), Unit 3 [Z-1325]

Plagioclase-phyric dolerite, vesicular. Phenocrysts (25%): glomerophyric segregates (1.5–2 mm) of xenomorphic and prismatic grains (0.3–2 mm) of plagioclase (labradorite [An_{58}]). Single xenocrysts (up to 5 mm) of plagioclase are present. Groundmass (70%) with intersertal-doleritic texture; unoriented tabular and prismatic grains (0.3–0.8 mm) of plagioclase (60%, labradorite [$An_{59–60}$]), xenomorphic crystals and segregate of clinopyroxene (30%), and interstitial altered glass (10%). Xenomorphic and skeletal grains (0.1–0.2 mm) of opaque minerals are present (<1%). Single (<5%) large (up to 2.4 mm) vesicles infilled with clay mineral.

Alteration: slight (10%); clay mineral replaces glass and completely infills vesicles.

XRD: smectite.

Sample 115-707C-23R-1, 98–100 cm (Piece 1N), Unit 3 [Z-69]

Sparsely plagioclase-phyric basalt, almost completely crystallized, massive. Phenocrysts of plagioclase (up to 2–3 mm, 1%). Rock is intergranular to intersertal texture; laths and tabular crystals of plagioclase, xenomorphic crystals of clinopyroxene, opaque minerals, and interstitial glass (3%–5%).

Alteration: slight (10%); smectites replace interstitial glass.

XRD: smectite.

Sample 115-707C-23R-4, 0–3 cm (Piece 1A), Unit 3 [Z-605]

Clinopyroxene-plagioclase-phyric basalt, vesicular. Phenocrysts (20%): tabular grains of plagioclase (1.5–2 mm, labradorite [$An_{58–61}$]). Segregates consist of tabular and partly xenomorphic grains (0.6–1.2 mm, labradorite [$An_{52–55}$]) of plagioclase and rounded and partly idiomorphic small grains (0.2–0.3 mm, occasionally 0.5 mm) of clinopyroxene. Groundmass is microlitic texture; microlites and laths of plagioclase (labradorite [An_{55}]). Interstices consist of opaque minerals (5%) and altered glass (10%); small grains (0.1 mm) of clinopyroxene forms segregates. Rounded and isometric vesicles (1%, 0.7–0.8 mm) infilled with clay mineral.

Alteration: slight (10%); clay mineral replaces interstitial glass and infills vesicles.

Sample 115-707C-24R-1, 138–140 cm (Piece 6), Unit 4 [Z-606]

Clinopyroxene-plagioclase-phyric basalt, vesicular. Phenocrysts (10%): prismatic grains of plagioclase (0.3–0.7 mm, labradorite [$An_{58–60}$]) and their segregates; segregates of plagioclase and clinopyroxene (0.1–0.3 mm). Groundmass with intersertal texture; laths of plagioclase (50%, 0.1–0.3 mm), opaque minerals (5%–8%), and

altered glass (15%–20%); small grains of clinopyroxene (30%) form segregates. Altered (partly) small biotite crystals (0.1–0.2 mm) are present. Large vesicles (10%, up to 4 mm) infilled with clay mineral.

Alteration: moderate (20%–25%); clay mineral replaces interstitial glass and infills vesicles.

XRD: smectite.

Sample 115-707C-25R-1, 108–110 cm (Piece 1H), Unit 4 [Z-70]

Sparsely microplagioclase-phyric basalt, incompletely crystallized, vesicular. Microphenocrysts of plagioclase (up to 1.5–2 mm, <5%) occasionally form glomerophyric segregates. Rock is intergranular to intersertal texture; laths and tabular crystals of plagioclase, xenomorphic crystals of clinopyroxene, small idiomorphic crystals of olivine, opaque minerals, and interstitial glass (5%–7%). Vesicles (0.5–0.8 mm, ~1%–3%) are rounded in shape.

Alteration: slight (7%–10%); smectites replace interstitial glass and olivine; vesicles are filled with smectites.

XRD: smectite.

Sample 115-707C-25R-2, 38–42 cm (Piece 1C), Unit 4 [Z-607]

Plagioclase-phyric basalt, massive. Phenocrysts (20%): elongated-prismatic grains of plagioclase (up to 2 mm); segregates of smaller (0.3–0.7 mm) short-prismatic and xenomorphic grains of plagioclase. Groundmass with intersertal texture; laths of plagioclase (40%, 0.1–0.4 mm, labradorite [An_{60}]), xenomorphic grains (0.1–0.3 mm) of clinopyroxene (45%), opaque minerals (5%), and altered interstitial glass (10%).

Alteration: slight (10%); clay mineral replaces interstitial glass.

Sample 115-707C-25R-3, 108–111 cm (Piece 11M), Unit 4 [Z-608]

Clinopyroxene-plagioclase-phyric basalt, massive. Phenocrysts (20%): prismatic grains (0.1–0.4 mm) of plagioclase (labradorite [An_{55-56}]) and their segregates; glomerophyric segregates of plagioclase and xenomorphic grains (up to 0.5 mm) of clinopyroxene. Groundmass with microlitic-intersertal texture; laths (0.1–0.3 mm) of plagioclase (40%, labradorite [An_{51-52}]), opaque minerals (5%), altered glass (20%), and segregate of small grains of clinopyroxene. Altered (partly) small biotite crystals (0.1–0.2 mm) are present.

Alteration: moderate (20%); clay mineral replaces interstitial glass.

Sample 115-707C-25R-4, 42–45 cm (Piece 1G), Unit 4 [Z-609]

Clinopyroxene-plagioclase-phyric basalt, massive. Rock: identical to Sample 115-707C-25R-3, 108–111 cm (Z-608).

Alteration: moderate (20%); clay mineral replaces interstitial glass.

Sample 115-707C-25R-5, 110–114 cm (Piece 1P), Unit 4 [Z-610]

Clinopyroxene-plagioclase-phyric basalt, massive. Rock is the identical to Samples 115-707C-25R-3, 108–111 cm (Z-608), and 25R-4, 42–45 cm (Z-609).

Alteration: moderate (20%); clay mineral replaces interstitial glass.

Sample 115-707C-26R-1, 81–86 cm (Piece 1N), Unit 4 [Z-611]

Aphyric basalt, vesicular. Rock with microlitic texture; laths (0.1–0.7 mm) of plagioclase (50%, labradorite [An_{52}]), very small grains of clinopyroxene (40%), opaque minerals (5%), and altered interstitial glass (5%). Altered (partly) small biotite crystals (0.1–0.2 mm) are present. Single small (0.2–0.3 mm) rounded vesicles are lined with radial-radii and crystals of zeolite.

Alteration: slight (5%); clay mineral replaces interstitial glass, zeolite from vesicles.

XRD: smectite and smectite with ~30% mica layers.

Sample 115-707C-26R-2, 123–125 cm (Piece 10), Unit 4 [Z-1326]

Plagioclase-phyric basalt, fine grained. Phenocrysts (15%): glomerophyric segregates of tabular and prismatic grains (0.3–0.8 mm) of plagioclase, labradorite [An_{60}]. Single xenocrysts of zonal plagioclase are present. Groundmass (80%) with intersertal-microlitic texture; elongated-prismatic laths (0.1–0.7 mm) of plagioclase (50%, labradorite [An_{52}]), small rounded grains (up to 0.2 mm) of clinopyroxene (40%), xenomorphic small (0.1 mm) opaque minerals (5%), and altered volcanic glass (10%).

Alteration: moderate (20%); clay mineral replaces interstitial glass.

Sample 115-707C-26R-3, 71–73 cm (Piece 1H), Unit 4 [Z-49]

Sparsely plagioclase-phyric basalt, almost completely crystallized, massive. Phenocrysts of plagioclase (up to 1.5–3 mm, 3%–5%) occasionally form glomerophyric segregates. Rock is intergranular texture; laths and tabular crystals of plagioclase, xenomorphic crystals of clinopyroxene, single crystals of olivine, opaque minerals, and interstitial glass (5%–7%).

Alteration: slight (7%–10%); smectites replace interstitial glass and olivine.

XRD: smectite with ~20% mica interlayers.

Sample 115-707C-26R-5, 62–65 cm (Piece 1L), Unit 4 [Z-612]

Clinopyroxene-plagioclase-phyric basalt, massive. Rock is the identical to Samples 115-707C-25R-3, 108–111 cm (Z-608), 25R-4, 42–45 cm (Z-609), and 25R-5, 110–114 cm (Z-610).

Alteration: slight (5%); clay mineral replaces interstitial glass.

Sample 115-707C-26R-7, 46–48 cm (Piece 1E), Unit 4 [Z-61]

Plagioclase-phyric basalt, almost completely crystallized, sparsely vesicular. Phenocrysts of plagioclase (up to 1.5–4 mm, 7%–10%). Rock is intergranular texture; laths and tabular crystals of plagioclase, various xenomorphic crystals of clinopyroxene, small idiomorphic crystals of olivine, opaque minerals, and interstitial glass (5%–7%). Vesicles (up to 2 mm, <1%) are rounded in shape.

Alteration: slight (7%–10%); smectites replace interstitial glass and olivine; vesicles are filled with smectites.

XRD: smectite with ~20% mica interlayers.

Sample 115-707C-27R-1, 32–34 cm (Piece 4A), Unit 4 [Z-1327]

Plagioclase-phyric basalt, fine grained. Rock: identical to Sample 115-707C-26R-2, 123–125 cm (Z-1326).

Alteration: moderate; clay mineral replaces interstitial glass.

Sample 115-707C-27R-4, 46–49 cm (Piece 2B), Unit 4 [Z-613]

Clinopyroxene-plagioclase-phyric basalt, vesicular. Phenocrysts (15%–18%): glomerophyric segregates of grains (0.2–0.7 mm) of plagioclase (labradorite [An_{56}]). Groundmass with microlitic texture; laths of plagioclase (35%, labradorite [An_{52}]), segregate of clinopyroxene grains (55%, 0.1–0.2 mm), opaque minerals (5%), and altered glass (5%). Single vesicles (0.7 mm and 1.5 mm) infilled with clay mineral or carbonate.

Alteration: slight (5%); clay mineral replaces interstitial glass; vesicles infilled with clay mineral or carbonate.

Sample 115-707C-27R-5, 32–36 cm (Piece 5), Unit 4 [Z-614]

Clinopyroxene-plagioclase-phyric basalt, massive. Rock: identical to Sample 115-707C-27R-4, 46–49 cm (Z-613), except vesicularity.

Alteration: slight (<5%); clay mineral replaces interstitial glass.

Sample 115-707C-27R-6, 29–31 cm (Piece 2A), Unit 4 [Z-77]

Plagioclase-phyric basalt, almost completely crystallized, sparsely vesicular (0.05–0.07 up to 2 mm, <1%). Phenocrysts of plagioclase (up to 1–4 mm, 10%–15%). Rock is intergranular texture; laths and tabular crystals of plagioclase, various xenomorphic crystals of clinopyroxene, small idiomorphic crystals of olivine, opaque minerals, and interstitial glass (3%–5%).

Alteration: slight (7%–10%); smectites replace interstitial glass and olivine; small vesicles are filled with smectites, large ones are filled with carbonate.

XRD: smectite with ~30% mica interlayers.

Sample 115-707C-27R-7, 32–34 cm (Piece 5), Unit 4 [Z-68]

Plagioclase-phyric basalt, fine grained, inequigranular, almost completely crystallized, massive. Phenocrysts of plagioclase (up to 0.8–2 mm, 7%–10%). Rock is intergranular texture; laths of plagioclase, various crystals of clinopyroxene, olivine (<1%), opaque minerals, and interstitial glass.

Alteration: slight (5%–7%); smectites replace interstitial glass and olivine; single vesicles are filled with smectites.

XRD: smectite; trace mixed-layer chlorite-swelling chlorite mineral(?).

Sample 115-707C-28R-2, 53–55 cm (Piece 6A), Unit 5 [Z-44]

Plagioclase-phyric basalt, inequigranular, almost completely crystallized, vesicular (up to 2–5 mm, 5%). Phenocrysts of plagioclase (0.8–2.5 mm, 5%–7%). Rock is intergranular texture; laths of plagioclase, various crystals of clinopyroxene, single crystals of olivine, opaque minerals, and interstitial glass.

Alteration: slight (10%); smectites replace interstitial glass and olivine; walls of vesicles are lined with smectites, inner parts of vesicles are filled with carbonate which occasionally contains rounded segregates of smectites.

XRD: smectite.

Sample 115-707C-28R-3, 133–135 cm (Piece 12), Unit 5 [Z-58]

Sparsely plagioclase-phyric basalt, inequigranular, almost completely crystallized, massive. Phenocrysts of plagioclase (1–1.5 mm, 1%–3%). Single microphenocrysts of clinopyroxene and olivine are present. Groundmass is intergranular texture; laths and tabular of plagioclase, crystals of clinopyroxene, opaque minerals, and interstitial glass.

Alteration: slight (5%–7%); smectites replace interstitial glass, olivine, and clinopyroxene.

XRD: smectite.

Chagos Bank (Hole 713A)

Sample 115-713A-13R-1, 97–99 cm (Piece 10C), Unit 1 [Z-53]

Plagioclase-phyric basalt, almost completely crystallized, sparsely vesicular (1.5–3, 7%–10%). Phenocrysts of plagioclase (1.5–3 mm, 5%–7%). Groundmass is intersertal to intergranular texture; laths of plagioclase, various crystals of clinopyroxene, single crystals of olivine, opaque minerals, and scarce interstitial glass.

Alteration: slight (5%–7%); smectites replace interstitial glass and olivine; vesicles are filled with smectites for ~1/4th of their volumes.

XRD: smectite; trace calcite.

Sample 115-713A-13R-3, 16–20 cm (Piece 3), Unit 2 [Z-1328]

Plagioclase-phyric basalt, fine grained, vesicular. Phenocrysts (10%): tabular zonal xenocrysts (0.8–1.8 mm) of plagioclase; glomerophyric segregates of short-prismatic grains (0.3–0.7 mm, labradorite [An_{50}]) of plagioclase (occasionally with xenomorphic grains of clinopyroxene). Groundmass (80%) with intersertal-microlitic texture; laths (0.1 mm) of plagioclase (30%, labradorite [An_{50}]), opaque minerals (5%), altered volcanic glass (15%), and segregate of small grains (<0.1 mm) of clinopyroxene (50%). Vesicles (10%, 0.8–1.2 mm) in central parts are empty and lined with dark green altered glass.

Alteration: slight (10%–15%); clay mineral replaces glass.

Sample 115-713A-14R-3, 99–101 cm (Piece 5), Unit 3 [Z-74]

Sparsely plagioclase-phyric basalt, incompletely crystallized, massive. Phenocrysts of plagioclase (up to 2–3 mm, 10%). Groundmass is poikilophitic texture; laths of plagioclase, various crystals of clinopyroxene, single crystals of olivine, opaque minerals, and interstitial glass.

Alteration: slight (10%–15%); smectites replace interstitial glass and olivine.

XRD: smectite; trace hydromica.

Sample 115-713A-15R-1, 77–79 cm (Piece 4B), Unit 3 [Z-55]

Sparsely clinopyroxene-plagioclase-phyric basalt, incompletely crystallized, massive. Phenocrysts of plagioclase (up to 2–3 mm, <5%) and clinopyroxene (1–2 mm, <1%). Groundmass is poikilophitic texture; laths of plagioclase, various crystals of clinopyroxene, single crystals of olivine, opaque minerals, and interstitial glass (5%–7%).

Alteration: slight (7%–10%); smectites replace interstitial glass and olivine.

XRD: smectite; trace hydromica and defective chlorite(?).

Sample 115-713A-15R-3, 52–57 cm (Piece 2B), Unit 3 [Z-615]

Clinopyroxene-plagioclase-phyric dolerite, massive. Phenocrysts (15%): single idiomorphic grain (2.5 mm) of clinopyroxene; short-prismatic grains (1.5–2 mm) of plagioclase (labradorite [An_{60}]) and their single glomerophyric segregates. Groundmass with doleritic texture; laths of plagioclase (50%, 0.2–0.5 mm). Interstices: grains (0.1–0.3 mm) and segregates of clinopyroxene (30%), opaque minerals (5%), and altered glass (10%–15%). Single vesicles (0.7 mm and 1.5 mm) infilled with clay mineral or carbonate.

Alteration: slight (10%–15%); clay mineral replaces interstitial glass.

Sample 115-713A-15R-4, 64–69 cm (Piece 1), Unit 3 [Z-616]

Plagioclase-phyric basalt (microdolerite), massive. Phenocrysts (2%–3%): tabular grains (0.5–0.8 mm) of plagioclase. Groundmass with intersertal-microdoleritic texture; laths (0.1–0.3 mm) of plagioclase (40%). Interstices: xenomorphic grains (0.1–0.3 mm) of clinopyroxene or their segregates, opaque minerals (5%), and altered glass (15%).

Alteration: slight (15%); clay mineral replaces interstitial glass.

Sample 115-713A-15R-4, 103–105 cm (Piece 4), Unit 4 [Z-1329]

Clinopyroxene-plagioclase-phyric basalt, vesicular. Phenocrysts (20%) are represent by glomerophyric segregates of xenomorphic grains of clinopyroxene and prismatic grains (0.2–0.5 mm) of plagioclase (labradorite [An_{65-68}]). Groundmass with vitrophyric texture; black glass (50%). Vesicles (30%, 0.1–0.3 mm up to 0.8–1.5 mm) completely or partly infilled with brownish green clay mineral. Veinlets (0.1–0.2 mm in thickness) infilled with clay mineral.

Alteration: slight to moderate (15%–20%).

Sample 115-713A-15R-5, 85–87 cm (Piece 5), Unit 5 [Z-52]

Sparsely plagioclase-phyric basalt, incompletely crystallized, sparsely vesicular (up to 0.2–0.3 mm, <1%). Phenocrysts: plagioclase (up to 1–1.5 mm, 10%). Groundmass; laths of plagioclase, various crystals of clinopyroxene, single crystals of olivine, opaque minerals, and interstitial glass (5%–7%).

Alteration: slight (10%); smectites replace interstitial glass and olivine.

XRD: smectite with ~40% mica layers; trace hydromica.

Sample 115-713A-18R-1, 93–95 cm (Piece 9), Unit 6 [Z-48]

Micro-clinopyroxene-plagioclase-phyric basalt, poorly crystallized, massive. Microphenocrysts of plagioclase (5%) and clinopyroxene (5%–7%). Groundmass is hyalopilitic texture; needle-shaped laths of plagioclase, various crystals of clinopyroxene, single crystals of olivine, opaque dust, and devitrified volcanic glass.

Alteration: scarce (<1%); smectites replace interstitial glass and olivine; opaque dust is oxidized through patches.

XRD: smectites with various content of interlayer cations: Na-K and Mg-Ca.

Sample 115-713A-19R-1, 132–134 cm (Piece 13), Unit 10 [Z-56]

Clinopyroxene-plagioclase-phyric hyalobasalt, poorly crystallized, massive. Phenocrysts of plagioclase (1.5–2.5 mm, 15%) and clinopyroxene (0.3–0.7 mm, 3%–5%). Groundmass is hyalopilitic texture; laths of plagioclase, clinopyroxene, single crystals of olivine, opaque dust, and devitrified volcanic glass.

Alteration: slight (1%–3%); smectites replace interstitial glass and olivine; opaque dust is oxidized through patches.

XRD: smectite.

Sample 115-713A-19R-2, 49–53 cm (Piece 3F), Unit 10 [Z-617]

Clinopyroxene-plagioclase-phyric basalt, vesicular. Phenocrysts (25%) are represented by idiomorphic and partly xenomorphic grains (0.3–0.5 mm) of clinopyroxene (10%). Plagioclase forms glomerophyric segregates of prismatic and xenomorphic grains (0.2–0.5 mm). Large grains of plagioclase: labradorite [An_{59-60}], small grains: labradorite [An_{52-54}]. Groundmass with vitrophyric texture; brownish black glass with sparse of needle-shaped microlites of plagioclase. Vesicles (2%–3%, 0.4–0.8 mm) infilled with black and altered green glass.

Alteration: slight; clay mineral replaces glass.

Sample 115-713A-19R-3, 9–12 cm (Piece 2A), Unit 11 [Z-618]

Olivine-plagioclase-clinopyroxene-phyric basalt, vesicular. Phenocrysts (15%–20%): idiomorphic (0.5–0.8 mm) grains of olivine; segregates of elongated-prismatic grains of plagioclase (andesine [An_{48}] and andesine-labradorite [An_{50}]) and clinopyroxene crystals. Groundmass with vitrophyric texture; brownish black glass which contains sparse microlites of plagioclase. Vesicles (2%, 0.2–0.5 mm) are present.

Alteration: slight; vesicles infilled with clay mineral.

Sample 115-713A-20R-1, 70–72 cm (Piece 5A), Unit 12 [Z-40]

Plagioclase-phyric basalt, almost completely crystallized, massive. Phenocrysts: plagioclase grains (1–4 mm, 15%). Groundmass is intersertal texture; laths and small tabular crystals of plagioclase, various crystals of clinopyroxene, single crystals of olivine, opaque minerals, and interstitial devitrified volcanic glass (5%–10%) with opaque dust.

Alteration: slight (10%); smectites replace interstitial glass and olivine.

XRD: smectite.

Sample 115-713A-20R-2, 104–108 cm (Piece 6B), Unit 13 [Z-619]

Clinopyroxene-plagioclase-phyric basalt, vesicular. Phenocrysts (20%–25%): idiomorphic grains (0.2–0.5 mm) and xenomorphic grains of clinopyroxene. Plagioclase forms sparse tabular and prismatic grains (up to 1 mm, labradorite [An_{60}]) which contain small inclusions of glass and laths of plagioclase (labradorite [An_{52}]). Groundmass with vitrophyric texture; black glass with sparse microlites of plagioclase. Vesicles (2%, 0.1–0.2 mm) infilled with clay mineral.

Alteration: slight.

Sample 115-713A 20R-3, 40–42 cm (Piece 2A), Unit 14 [Z-37]

Clinopyroxene-plagioclase-phyric hyalobasalt, poorly crystallized, sparsely vesicular (0.5–1.5 mm, <1%). Phenocrysts of plagioclase (0.8–2.5 mm, 15%–20%) occasionally form glomerophyric segregates. Microphenocrysts of clinopyroxene (0.5–1 mm, 5%) and single microphenocrysts of olivine are present. Groundmass is hyalopilitic texture; black volcanic glass with needle-shaped microlaths of plagioclase, crystals of clinopyroxene, and opaque minerals (opaque dust and small grains).

Alteration: scarce (1%); smectites replace olivine and interstitial glass; vesicles are filled with smectites and carbonate; opaque dust is slightly oxidized.

XRD: smectites with various content of interlayer cations: Na-K and Mg-Ca; smectites with ~10% mica layers.

Sample 115-713A-20R-4, 57–62 cm (Piece 1), Unit 18 [Z-620]

Plagioclase-phyric basalt, vesicular. Phenocrysts (20%): large (up to 5 mm) glomerophyric segregates of prismatic xenomorphic grains (0.3–0.8 mm) of plagioclase. Groundmass with poikilophitic-microlitic texture; poikilophitic segregates of xenomorphic grains (0.2–0.3 mm) of clinopyroxene and plagioclase. Single rounded vesicle (0.3 mm) infilled with carbonate.

Alteration: rock is fresh.

Sample 115-713A-20R-5, 65–67 cm (Piece 5B), Unit 20 [Z-65]

Clinopyroxene-plagioclase-phyric hyalobasalt, poorly crystallized, massive. Phenocrysts of plagioclase (15%), clinopyroxene (5%), and single microphenocrysts of olivine. Groundmass is hyalopilitic texture; devitrified volcanic glass with needle-shaped microlaths of plagioclase, fine grained segregate of clinopyroxene and opaque minerals.

Alteration: scarce (<1%); smectites replace olivine and interstitial glass.

XRD: smectite with ~10% mica layers.

Sample 115-713A-20R-6, 103–108 cm (Piece 1C), Unit 23 [Z-621]

Clinopyroxene-plagioclase-phyric basalt, vesicular. Phenocrysts (20%): glomerophyric segregates of grains (0.3–0.8 mm) of clinopyroxene and laths of plagioclase (labradorite [An_{56}]). Groundmass with pilotaxitic texture; microlites of plagioclase, pyroxene, small grains of opaque minerals, and glass. Sparse vesicles (2%–3%, 0.1–0.3 mm) infilled with chlorite.

Alteration: slight.

Sample 115-713A-21R-1, 73–75 cm (Piece 4B), Unit 27 [Z-71]

Sparsely clinopyroxene-plagioclase-phyric hyalobasalt, poorly crystallized, sparsely vesicular (5%). Phenocrysts of tabular plagioclase (0.5–2.5 mm, 1%–3%) and xenomorphic clinopyroxene (0.3–1 mm, 5%–7%). Groundmass is hyalopilitic texture; black devitrified volcanic glass with needle-shaped microlaths of plagioclase, fine grained segregate of clinopyroxene, and small grains of opaque minerals.

Alteration: scarce (~1%); smectites replace interstitial glass, vesicles infilled with clay mineral or carbonate.

XRD: smectites with various content of interlayer cations: Na-K and Ca-Mg.

Sample 115-713A-21R-2, 61–63 cm (Piece 4B), Unit 31 [Z-75]

Sparsely clinopyroxene-plagioclase-phyric hyalobasalt, poorly crystallized, sparsely vesicular. Phenocrysts of plagioclase (0.5–2.5 mm, 5%–7%) and xenomorphic clinopyroxene (0.2–0.6 mm, 3%). Groundmass is hyalopilitic texture; brown-black devitrified volcanic glass with needle-shaped microlaths of plagioclase, crystals of clinopyroxene, and small grains of opaque minerals.

Alteration: slight (1%–3%); smectites replace interstitial glass.

XRD: smectites with various content of interlayer cations: Na-K and Ca-Mg.

Sample 115-713A-21R-3, 83–85 cm (Piece 4A), Unit 33 [Z-73]

Plagioclase-phyric basalt, almost completely crystallized, massive. Phenocrysts: plagioclase (1.5–5 mm, 15%). Groundmass is intergranular texture; laths of plagioclase, xenomorphic crystals of clinopyroxene, single crystals of olivine (0.7–2 mm, 1%), opaque minerals, and interstitial glass (3%).

Alteration: slight (3%–5%); smectites replace interstitial glass and olivine; single vesicles (0.3 mm) are filled with smectites.

XRD: smectite; trace quartz (?).

Sample 115-713A-22R-1, 34–36 cm (Piece 5), Unit 35 [Z-66]

Sparsely plagioclase-phyric basalt, almost completely crystallized, vesicular (0.5–1.8 mm, 3%–5%). Phenocrysts of plagioclase (0.8–3.5 mm, 15%). Groundmass is intergranular texture; laths of plagioclase, xenomorphic crystals of clinopyroxene, single crystals of olivine (0.7–2 mm, 1%), opaque minerals, and interstitial glass.

Alteration: slight (5%–7%); smectites replace interstitial glass and olivine; vesicles are filled with smectites.

XRD: smectite; trace quartz(?).

Maldives Ridge (Hole 715A)

Sample 115-715A-23R-2, 28–31 cm (Piece 2A), Unit 4 [Z-622]

Sparsely plagioclase-phyric basalt, vesicular. Phenocrysts (5%): prismatic grains (0.5–1.7 mm) of plagioclase (labradorite [An_{56}]). Groundmass with hyalopilitic texture; microlites and laths of plagioclase (andesine-labradorite [An_{50}]) and black glass. Large (2–5 mm) vesicles (50%) are rounded in shape.

Alteration: rock is fresh; vesicles infilled with calcite.

Sample 115-715A-23R-3, 62–64 cm (Piece 11), Unit 7a [Z-79]

Aphyric basalt, fine grained, equigranular, almost completely crystallized, massive. Rock is intergranular texture; laths of plagioclase, small grains of clinopyroxene, opaque minerals, single crystals of olivine, rare xenomorphic accumulations of volcanic glass (~1%–3%). Single microphenocrysts of plagioclase (up to 1.5 mm) are present. Plagioclases content numerous inclusions of volcanic glass. Vesicles (0.1–1 mm, ~7%–10%) are oval and irregular in shape.

Alteration: slight (1%–3%); smectites replace olivine and interstitial glass.

XRD: smectite with various content of interlayer cations: Na-K and Ca-Mg.

Sample 115-715A-23R-3, 91–95 cm (Piece 14A), Unit 7a [Z-1333]

Sparsely plagioclase-phyric basalt (microdolerite). Phenocrysts (<1%): single glomerophyric segregates (0.7 mm) of plagioclase grains. Groundmass (99%) with intersertal-microdoleritic and microlitic texture; laths (0.1–0.4 mm) of plagioclase (65%, labradorite [An_{60}]), small xenomorphic grains (0.1–0.3 mm) of clinopyroxene (25%), opaque minerals (5%), and brown volcanic glass (5%).

Alteration: rock is fresh.

XRD: smectite with ~20% mica layers and mixed-layer chlorite-smectite mineral (~60% chlorite layers); minor hydromica with ~20% swelling interlayers.

Sample 115-715A-24R-1, 76–79 cm (Piece 11), Unit 7b [Z-623]

Aphyric basalt, massive. Rock with microlitic texture; microlaths (0.1–0.3 mm) of plagioclase (40%, labradorite [An_{52}]), segregate of clinopyroxene small grains (0.1–0.2 mm, 25%), altered volcanic glass (1%–2%), and opaque minerals (5%–8%).

Alteration: slight; clay mineral replaces glass.

Sample 115-715A-24R-2, 13–18 cm (Piece 2), Unit 7b [Z-624]

Sparsely plagioclase-phyric andesite-basalt (islandite), massive. Phenocrysts: single elongated-prismatic grain (1.2 mm) of plagioclase (andesine [An_{48}]). Groundmass with microlitic texture; microlaths (0.1–0.3 mm) of plagioclase (50%), segregate of xenomorphic grains of clinopyroxene (40%), abundant (10%–12%) pseudo-cubic and isometric grains (0.1–0.2 mm) of opaque minerals, and altered interstitial glass (1%).

Alteration: scarce (<1%); clay mineral replaces interstitial glass (<1%).

Sample 115-715A-24R-2, 30–38 cm (Piece 3), Unit 7b [Z-1334]

Aphyric basalt (microdolerite), massive. Rock: identical to Sample 115-715A-23R-3, 91–95 cm (Z-1333).

Alteration: slight; palagonite replaces glass.

Sample 115-715A-25R-2, 80–82 cm (Piece 3C), Unit 9 [Z-63]

Sparsely olivine-microphyric basalt, fine grained, equigranular, almost completely crystallized, massive. Microphenocrysts of olivine (0.7–1.5 mm, 3%–5%). Groundmass is intersertal texture; laths of plagioclase, clinopyroxene, opaque minerals, and interstitial glass (3%).

Alteration: slight (5%–7%); smectites replace interstitial glass and olivine.

XRD: smectite.

Sample 115-715A-25R-3, 0–4 cm (Piece 1A), Unit 9 [Z-625]

Aphyric basalt, vesicular. Rock with microlitic (microdoleritic) texture; unoriented laths (0.1–0.4 mm) of plagioclase (55%, labradorite [An_{51}]), xenomorphic grains (0.1–0.2 mm) of clinopyroxene (30%), opaque minerals (5%), and 10% of altered reddish brown olivine(?) with sizes 0.1–0.2 mm. Isometric vesicles (5%, up to 2.5 mm) are empty, occasionally they infilled with clay mineral.

Alteration: slight.

Sample 115-715A-25R-5, 108–112 cm (Piece 15), Unit 10 [Z-626]

Aphyric basalt, vesicular. Rock with microlitic (microdoleritic) texture; laths (0.1–0.3 mm) of plagioclase (andesine-labradorite [An_{50}], microlaths: andesine [An_{45}]). Clinopyroxene (30%) forms xenomorphic and idiomorphic grains (0.1–0.6 mm). Small (0.1–0.2 mm) rounded grains of completely altered olivine (10%) are present. Opaque minerals: 2%–3%. Altered interstitial glass: 2%–3%. Large vesicles (15%–20%, 3–4 mm) partly infilled with clay mineral.

Alteration: slight (10%–12%); clay mineral: iddingsite replace olivine, interstitial glass replaced by clay mineral, clay mineral from vesicles.

XRD: smectite with ~10% mica layers; white matter from veinlet: calcite.

Sample 115-715A-25R-6, 2–4 cm (Piece 1), Unit 10 [Z-1335]

Aphyric dolerite, fine grained. Rock with intersertal-poikilophitic texture; unoriented laths (0.1–0.7 mm) of plagioclase (60%, labradorite [An_{58}]), xenomorphic grains (0.3–0.7 mm) of clinopyroxene (25%) with laths of plagioclase (poikilophitic texture), xenomorphic grains (<0.1 mm) of opaque minerals (5%), and altered volcanic glass (10%).

Alteration: slight (10%).

XRD: smectite; gray-brown inclusion in rock: smectite; minor calcite; trace swelling chlorite(?).

Sample 115-715A-25R-6, 16–18 cm (Piece 1), Unit 10 [Z-57]

Olivine-phyric microdolerite, fine grained, equigranular, almost completely crystallized, massive. Microphenocrysts of olivine (0.7–1.5 mm, 3%–5%). Groundmass is microdoleritic texture; laths of plagioclase, hypidiomorphic crystals of clinopyroxene, opaque minerals, microphenocrysts of olivine (1%), and interstitial glass (3%).

Alteration: slight (1%–3%); smectites replace interstitial glass and olivine.

XRD: smectite with ~20% mica layers; trace mixed-layer chlorite-swelling chlorite mineral and chlorite(?).

Sample 115-715A-26R-2, 14–20 cm (Piece 1A), Unit 10 [Z-627]

Olivine-phyric basalt, vesicular. Phenocrysts (15%): sparse large (2.5–3 mm) idiomorphic crystals and microphenocrysts (0.2–0.4 mm) of altered olivine. Groundmass with microlitic (microdoleritic) texture; laths (0.2–0.5 mm) of plagioclase (40%, labradorite [An_{52}]), elongated-prismatic and xenomorphic grains of clinopyroxene (40%), opaque minerals (5%), and altered interstitial glass (5%). Vesicles (10%, 0.2–0.5 mm) are present.

Alteration: slight (15%); olivine almost completely replaced by clay mineral and iddingsite, clay minerals replace interstitial glass, vesicles infilled with clay minerals.

Sample 115-715A-26R-3, 17–19 cm (Piece 1B), Unit 10 [Z-62]

Olivine-phyric basalt, fine grained, incompletely crystallized, vesicular (0.5–5 mm). Groundmass is intersertal texture; laths and platy-laths crystals of plagioclase, small xenomorphic crystals of clinopyroxene, xenomorphic crystals of olivine (5%–7%), opaque minerals, and interstitial glass (3%).

Alteration: slight to moderate (20%); opaque minerals and rims around olivines are oxidized; smectites replace interstitial glass and olivine; vesicles are filled with smectites and carbonate.

XRD: smectite.

Sample 115-715A-29R-1, 38–42 cm (Piece 2A), Unit 12 [Z1336]

Olivine-phyric dolerite, medium grained, sparsely vesicular. Phenocrysts (5%): idiomorphic crystals (0.5–1.7 mm) of altered olivine, small grains form glomerophyric segregates. Groundmass with intersertal-doleritic texture; prismatic grains and laths (0.1–0.7 mm) of plagioclase (35%, labradorite [An_{60}] and andesine [An_{44}]), xenomorphic grains of clinopyroxene (25%), small rounded grains of olivine (10%), altered interstitial glass (10%), and opaque minerals (2%–3%). Sparse vesicles (0.5–2.4 mm) are present.

Alteration: moderate (35%); olivine completely replaced by iddingsite, clay minerals replace interstitial glass, vesicles infilled with clay minerals.

XRD: smectite.

Sample 115-715A-29R-1, 64–66 cm (Piece 2B), Unit 12 [Z-42]

Olivine-phyric basalt, medium grained, almost completely crystallized, massive. Groundmass is intergranular texture; laths of plagioclase (45%), xenomorphic crystals of clinopyroxene (40%), olivine (7%–10%), opaque minerals (2%–3%), and interstitial glass (5%).

Alteration: slight (15%); smectites replace interstitial glass and olivine.

XRD: smectite contain ~10% of mica layers; trace chlorite.

Sample 115-715A-29R-1, 95–97 cm (Piece 3A), Unit 13 [Z-51]

Olivine-phyric basalt, medium grained, almost completely crystallized, massive. Groundmass is intergranular texture; laths and small plates of plagioclase (50%), xenomorphic crystals of clinopyroxene (35%–40%), olivine (2%–3%), opaque minerals (5%), and interstitial devitrified glass (5%).

Alteration: slight (~10%); smectites replace interstitial glass and olivine.

XRD: smectite.

Sample 115-715A-29R-2, 80–82 cm (Piece 1F), Unit 13 [Z-67]

Olivine-phyric basalt, medium grained, almost completely crystallized, massive. Groundmass is intergranular texture; laths and small plates of plagioclase, xenomorphic crystals of clinopyroxene, olivine (3%–5%), opaque minerals (1%–3%), and interstitial devitrified glass (5%).

Alteration: slight (7%–10%); smectites replace interstitial glass and olivine.

XRD: smectite; trace chlorite.

Sample 115-715A-30R-2, 1–5 cm (Piece 1), Unit 15 [Z-628]

Aphyric dolerite, sparsely vesicular. Rock with doleritic texture; laths (0.2–0.8 mm) of plagioclase (40%, labradorite [An_{51-52}]), xenomorphic grains (0.2–0.7 mm) of clinopyroxene (40%), partly oriented small grains (0.2–0.4 mm) of altered olivine (10%), and opaque minerals (2%–3%). Large vesicles (5%–10%, 2–5 mm) are present.

Alteration: slight to moderate (20%); olivine completely replaced by iddingsite, vesicles completely infilled with clay minerals.

Sample 115-715A-30R-3, 28–30 cm (Piece 1), Unit 16 [Z-41]

Olivine-phyric basalt, medium grained, almost completely crystallized, sparsely vesicular. Groundmass is intergranular texture; laths and rare plates of plagioclase, xenomorphic crystals of clinopyroxene, olivine (5%–7%), opaque minerals, and interstitial devitrified glass. Vesicles (1%–3%) rounded and irregular in shape.

Alteration: slight (10%); smectites replace interstitial glass and olivine.

XRD: smectites with ~10% mica layers; trace mixed-layer chlorite-smectite mineral(?) and chlorite.

Sample 115-715A-30R-5, 30–32 cm (Piece 3), Unit 19 [Z-72]

Aphyric hyalobasalt, poorly crystallized, highly vesicular (0.5–5 mm, 50%). Rock is hyalopilitic texture; black volcanic glass with laths of plagioclase (15%–20%), xenomorphic crystals of clinopyroxene (5%), and opaque dust.

Alteration: strong (50%); vesicles are filled with carbonate; clay minerals replace interstitial glass.

XRD: smectite and chlorite.

Sample 115-715A-30R-5, 39–41 cm (Piece 4), Unit 19 [Z-43]

Sparsely plagioclase-phyric hyalobasalt, poorly crystallized, vesicular (up to 3–5 mm, 30%). Phenocrysts of plagioclase (1–1.5 mm, <1%). Rock is hyalopilitic texture; black volcanic glass with laths and small plates of plagioclase, small xenomorphic crystals of clinopyroxene, and opaque dust.

Alteration: moderate (25%); Fe hydroxides replace opaque minerals; vesicles are filled with carbonate.

XRD: calcite.

Sample 115-715A-30R-5, 98–100 cm (Piece 9), Unit 20 [Z-46]

Olivine-phyric basalt, medium grained, almost completely crystallized, massive. Rock is intergranular texture; laths and plates of plagioclase, xenomorphic crystals of clinopyroxene, hypidiomorphic crystals of olivine (10%), and interstitial glass (3%).

Alteration: slight (15%); smectites replace interstitial glass and olivine.

XRD: smectite; trace chlorite and calcite.

Sample 115-715A-31R-1, 103–105 cm (Piece 8B), Unit 21 [Z-45]

Sparsely olivine-plagioclase-phyric basalt, almost completely crystallized, vesicular (1–6 mm, 10%). Phenocrysts of plagioclase (1–1.5 mm, 1%) and olivine (0.7–1.5 mm, 1%). Groundmass is intergranular texture; laths and tabular crystals of plagioclase, xenomorphic crystals of clinopyroxene, opaque minerals, and interstitial volcanic glass.

Alteration: slight (15%); smectites replace interstitial glass and olivine; vesicles are filled with smectites or carbonate.

XRD: smectite.

Sample 115-715A-31R-2, 98–100 cm (Piece 6A), Unit 21 [Z-76]

Aphyric basalt, medium grained, almost completely crystallized, vesicular (1–2 mm, 3%–5%). Rock is intergranular texture; laths of plagioclase, xenomorphic clinopyroxene, hypidiomorphic olivine, interstitial glass, and opaque minerals.

Alteration: slight (10%–15%); rock is nonoxidized; smectites replace olivine and interstitial glass. Vesicles are filled with smectites.

XRD: smectites with various content of interlayers cations (Na-K and Ca-Mg) and contain ~20% of mica layers; trace chlorite.

Walvis Ridge (Leg 74)

Hole 525A

Sample 74-525A-53R-2, 87–90 cm (Piece 5B), Unit 1 [Z-398]

Aphyric andesite-basalt, medium grained, incompletely crystallized, vesicular. Rock is intersertal texture; chaotically located laths of plagioclase (55%), xenomorphic crystals of clinopyroxene (20%), interstitial volcanic glass (15%), and opaque minerals (magnetite + pyrite) 5%. Single crystals of K-feldspar occur sporadically. Glass contains of leizite(?) and analcime(?). Vesicles (0.3–2 mm, 10%) are rounded in shape.

Alteration: moderate (~30%); interstitial glass and glass from vesicles are replaced with smectites, zeolite occurs sporadically.

XRD: smectite.

Sample 74-525A-53R-3, 36–39 cm (Piece 3), Unit 1 [Z-397]

Aphyric andesite-basalt (basalt?), medium grained, incompletely crystallized, vesicular (0.2–2.5 mm, 2%–3%). Rock is intersertal texture; laths of plagioclase (50%), clinopyroxene (30%), interstitial volcanic glass (10%), and opaque minerals (3%). Single tabular crystals of K-feldspar are present. Glass contains of leizite(?) and analcime(?).

Alteration: moderate (~25%); interstitial glass is replaced with smectites, occasionally with admixture of calcite; vesicles are filled with smectites, calcite occurs occasionally.

XRD: smectite.

Sample 74-525A-55R-1, 107–110 cm (Piece) [Z-399]

Sediment.

XRD: hydromica and opal-CT; the preparation contains mainly amorphic in X-rays matter.

Sample 74-525A-56R-1, 43–46 cm (Piece 1G), Unit 3 [Z-400]

Aphyric basalt, fine grained, incompletely crystallized, highly vesicular (cavernous). Rock is intersertal texture; various laths of plagioclase (50%–55%), small grains of clinopyroxene (25%), interstitial volcanic glass (5%–7%), and opaque minerals (1%–3%). Vesicles have size 0.3–0.5 mm (20%).

Alteration: moderate (~30%); interstitial glass is replaced with smectites; vesicles are filled with calcite and thin pellicle of smectites on the walls of vesicles.

XRD: smectite; trace calcite.

Sample 74-525A-56R-2, 121–124 cm (Piece 1W), Unit 3 [Z-401]

Aphyric basalt, medium grained, inequigranular, almost completely crystallized, vesicular (1.5.–2.5 mm, ~15%). Rock is intergranular to subophitic texture; various laths of plagioclase (45%), clinopyroxene (40%), interstitial volcanic glass (<5%), and opaque minerals (1%–3%).

Alteration: slight to moderate (15%–20%); interstitial glass is replaced with smectites; vesicles are filled with smectites.

XRD: smectite; trace calcite.

Sample 74-525A-56R-3, 108–111 cm (Piece 1R), Unit 3 [Z-402]

Aphyric basalt, medium grained, inequigranular, almost completely crystallized, vesicular (0.3–3 mm, 15%). Rock is intergranular to subophitic texture; various laths of plagioclase (50%), clinopyroxene (25%), interstitial glass (5%), and opaque minerals (5%).

Alteration: moderate (~20%–25%); interstitial glass is replaced with smectites; vesicles are filled with secondary minerals in the folslighting succession: smectites on the walls of vesicles, oxidized opaque minerals and calcite (90% of the volume) in the centers of vesicles.

XRD: smectite; trace hydromica.

Sample 74-525A-56R-6, 81–84 cm (Piece 10), Unit 3 [Z-403]

Aphyric basalt, fine grained, inequigranular, almost completely crystallized, vesicular (0.3.–1.5 mm, 5%–7%). Rock; various laths of plagioclase (45%), clinopyroxene (40%), interstitial glass (1%–3%), and opaque minerals (5%–7%). Single hypidiomorphic tabular crystals of K-feldspar occur sporadically.

Alteration: slight (10%–15%); interstitial glass is replaced with smectites; vesicles are filled with smectites or calcite or both.

XRD: smectite; trace hydromica.

Sample 74-525A-58R-1, 106–109 cm (Piece 4D), Unit 3 [Z-404]

Aphyric basalt, fine grained, poorly crystallized, massive. Rock is hyalopilic texture; black volcanic glass (60%) filled with opaque dust, crystals of clinopyroxene and needle-shaped laths of plagioclase (40%).

Alteration: slight.

XRD: smectite and hydromica.

Sample 74-525A-58R-4, 82–85 cm (Piece 4C), Unit 4 [Z-405]

Aphyric basalt, fine grained, inequigranular, almost completely crystallized, vesicular (0.2–0.4 mm, 10%). Rock is intergranular texture; various (mostly thin) needle-shaped laths of plagioclase (30%), xenomorphic grains of clinopyroxene (50%), interstitial glass (5%), and needle-shaped crystals of opaque minerals (3%–5%).

Alteration: slight to moderate (~15%–20%); interstitial glass is replaced with smectites; vesicles are filled with smectites.

XRD: smectite.

Sample 74-525A-59R-3, 40–42 cm (Piece 1G), Unit 4 [Z-406]

Aphyric basalt, fine grained, inequigranular, incompletely crystallized, vesicular (0.2–0.6 mm, 10%). Rock is intersertal texture; various laths of plagioclase (40%), clinopyroxene (40%), interstitial glass (5%–7%), and opaque minerals (5%–7%).

Alteration: slight to moderate (~20%); interstitial glass is replaced with smectites; vesicles are filled with smectites or calcite.

XRD: smectite.

Sample 74-525A-60R-1, 41–44 cm (Piece 1ä), Unit 4 [Z-407]

Aphyric basalt, fine grained, inequigranular, incompletely crystallized, vesicular (0.2–0.5 mm, 5%–10%). Rock is intersertal texture; various laths of plagioclase (45%), clinopyroxene (35%), interstitial glass (5%–7%), and opaque minerals (3%–5%).

Alteration: slight to moderate (~20%); interstitial glass is replaced with smectites; vesicles are filled with smectites.

XRD: smectite.

Sample 74-525A-60R-3, 40–43 cm (Piece 1H), Unit 4 [Z-408]

Aphyric basalt, fine grained, incompletely crystallized, vesicular (1–4 mm, 10%). Rock is intersertal texture; small laths of plagioclase (40%), clinopyroxene (45%), interstitial glass (5%–7%), and both opaque minerals and dust (5%).

Alteration: slight (~15%); interstitial glass is replaced with smectites; vesicles are filled with calcite, smectites cover walls of vesicles; small laths and microlites of plagioclase (0.1–0.5 mm, 25%, andesine [An_{45}]), clinopyroxene

(up to 0.1 mm, 15%), interstitial glass (40%) with needles of opaque minerals (15%). Vesicles (0.1–0.4 mm, 5%) are filled with brownish green glass.

XRD: smectite and calcite.

Sample 74-525A-60R-4, 32–35 cm (Piece 1D), Unit 4 [Z-409]

Aphyric basalt, fine grained, poorly crystallized, microvesicular. Rock is hyalopilitic texture.

Alteration: rock is fresh.

XRD: smectite; trace hydromica.

Sample 74-525A-61R-2, 2–5 cm (Piece 1A), Unit 5 [Z-410]

Aphyric basalt, fine grained, poorly crystallized, vesicular (0.2–0.4 mm, 25%). Rock is intersertal to hyalopilitic texture; black volcanic glass filled with small laths of plagioclase and opaque dust.

Alteration: moderate (~25%–30%); small vesicles are filled with smectites, large ones: with calcite.

XRD: smectite; trace hydromica.

Sample 74-525A-63R-2, 104–107 cm (Piece 4A), Unit 5 [Z-411]

Aphyric basalt, fine grained, incompletely crystallized, massive. Rock is intersertal texture; laths of plagioclase and devitrified volcanic volcanic glass. The latter contains small xenomorphic crystals and crystallites of clinopyroxene and opaque dust. Needle-shaped crystals of opaque minerals and single vesicles (0.01 mm) are present.

Alteration: moderate (~25%); interstitial glass is replaced with smectites; vesicles are filled with calcite.

XRD: smectite; trace hydromica.

Hole 527

Sample 74-527-39R-2, 131–134 cm (Piece 1G), Unit 1 [Z-412]

Aphyric basalt, fine-medium grained, inequigranular, almost completely crystallized, massive. Rock is intergranular texture; laths of plagioclase (40%), various xenomorphic grains of clinopyroxene (40%), interstitial glass (10%), and opaque minerals (10%). Single microphenocrysts of plagioclase are present.

Alteration: slight (10%–15%).

XRD: smectite; trace hydromica.

Sample 74-527-39R-3, 64–67 cm (Piece 1G), Unit 1 [Z-413]

Plagioclase-phyric basalt, fine grained, inequigranular, incompletely crystallized, massive. Phenocrysts of plagioclase (1.5–8 mm, 25%). Groundmass is intersertal to intergranular texture; aggregate of laths of plagioclase (35%), clinopyroxene (40%), interstitial glass (15%), and opaque minerals (7%–8%).

Alteration: slight (~15%); interstitial glass is replaced with smectites.

XRD: smectite and hydromica; trace amphibole.

Sample 74-527-40R-1, 82–85 cm (Piece 3F), Unit 2 [Z-414]

Sparsely clinopyroxene-plagioclase-phyric basalt, medium grained, almost completely crystallized, massive. Phenocrysts of plagioclase (0.5–2 mm, 1%) and clinopyroxene (<1%). Groundmass is intergranular texture; aggregate of laths of plagioclase (40%), clinopyroxene (40%), interstitial glass (5%), opaque minerals (7%–10%), and single grains of olivine.

Alteration: slight (~5%–7%); interstitial glass and olivine are replaced with smectites.

XRD: smectite; trace hydromica and amphibole.

Sample 74-527-41R-3, 39–42 cm (Piece 1C), Unit 3 [Z-415]

Clinopyroxene-plagioclase-phyric basalt, medium grained, crystallized, massive. Phenocrysts of plagioclase (1–10 mm, 25%–30%) and clinopyroxene (1.5–2 mm, <1%). Groundmass; laths of plagioclase (45%), clinopyroxene (45%), opaque minerals (5%–7%), and olivine (1%–3%).

Alteration: slight (~5%).

XRD: smectite; trace hydromica and amphibole.

Sample 74-527-42R-2, 69–72 cm (Piece) [Z-416]

Sediment.

XRD: salcite and smectite; trace hydromica.

Sample 74-527-42R-4, 45–48 cm (Piece 1C), Unit 5 [Z-417]

Aphyric basalt, fine grained, equigranular, almost completely crystallized, massive. Rock is intergranular texture; laths of plagioclase (55%), clinopyroxene (35%–40%), interstitial glass (5%–7%), and opaque minerals (5%).

Alteration: slight (10%).

XRD: smectite; trace chlorite.

Sample 74-527-44R-3, 10–13 cm (Piece 1A), Unit 5 [Z-418]

Aphyric basalt, medium grained, equigranular, massive. Rock is intergranular texture; large laths of plagioclase (55%), various crystals of clinopyroxene (35%), interstitial glass (5%), olivine (<1%), and opaque minerals (5%–7%).

Alteration: slight (~5%–10%); interstitial glass and olivine are replaced with smectites.

XRD: two smectites with various composition of interlayers cations (Na-K and Ca-Mg); trace hydromica.

Hole 528

Sample 74-528-39R-2, 7–10 cm (Piece 1A), Unit 1 [Z-419]

Sparsely plagioclase-phyric basalt, medium grained, equigranular, almost completely crystallized, massive. Phenocrysts of plagioclase (0.7–2.5 mm, 1%–3%). Groundmass is intergranular to subophitic texture; laths of plagioclase (45%), clinopyroxene (45%), interstitial glass (5%), and opaque minerals (5%).

Alteration: slight (5%–10%).

XRD: smectite; trace hydromica and defective chlorite.

Sample 74-528-40R-2, 24–27 cm (Piece 1B), Unit 1 [Z-420]

Olivine-plagioclase-phyric basalt, medium grained, equigranular, incompletely crystallized, vesicular (1–1.5 mm, 5%). Phenocrysts of plagioclase (1–7 mm, 25%) and olivine (0.8–2 mm, 1%–3%). Groundmass is subophitic texture; laths of plagioclase (40%), clinopyroxene (45%), olivine (<1%), interstitial glass (5%), and opaque minerals (3%).

Alteration: slight (10%); interstitial glass and olivine is replaced with smectites; vesicles are filled with smectites.

XRD: smectite and mixed-layer smectite-chlorite mineral; hydromica, talc, and defective chlorite in trace amounts.

Sample 74-528-40R-5, 76–79 cm (Piece 1C), Unit 1 [Z-421]

Sparsely clinopyroxene-plagioclase-phyric basalt, medium grained, inequigranular, incompletely crystallized, massive. Phenocrysts of plagioclase (0.8–1 mm, 1%–3%) and clinopyroxene (0.8–1.5 mm, <1%). Groundmass is intergranular texture; laths of plagioclase (45%), clinopyroxene (40%), interstitial glass (5%–10%), and opaque minerals (5%–7%).

Alteration: slight (5%–10%).

XRD: two smectites with various cation composition of interlayers (Na-K and Ca-Mg); hydromica and defective chlorite in trace amounts.

Sample 74-528-42R-1, 32–35 cm (Piece 1C), Unit 2 [Z-422]

Aphyric basalt, fine grained, poorly crystallized, vesicular (0.3–0.8 mm, 15%–20%). Rock is hyalopilitic texture; devitrified volcanic glass which contains needle-shaped laths of plagioclase, crystals of clinopyroxene, and needle-shaped crystals of opaque minerals.

Alteration: moderate (30%–40%); walls of vesicles are lined with smectites.

XRD: smectite; trace hydromica.

Sample 74-528-43R-2, 85–88 cm (Piece 1F), Unit 4 [Z-423]

Aphyric basalt, fine grained, inequigranular, incompletely crystallized, vesicular (0.7–1.5 mm, 5%–10%). Rock is intersertal texture; laths of plagioclase (40%), clinopyroxene (40%), interstitial glass (5%–10%), and opaque minerals (3%).

Alteration: moderate (20%); vesicles are filled with calcite, walls of vesicles are lined with smectites; interstitial glass is replaced with smectites.

XRD: smectite; hydromica and chlorite in trace amounts.

Sample 74-528-44R-3, 94–97 cm (Piece 1E), Unit 5 [Z-424]

Plagioclase-phyric basalt, fine grained, incompletely crystallized, massive. Phenocrysts of plagioclase (1–5 mm, 5%–10%) are distributed in rock chaotically. Groundmass is intergranular to intersertal texture; laths of plagioclase (50%), clinopyroxene (40%), interstitial glass (5%–10%), and opaque minerals (5%).

Alteration: slight to moderate (~15%–20%).

XRD: smectite; hydromica and chlorite in trace amounts.

Sample 74-528-46R-1, 130–133 cm (Piece) [Z-425]

Sediment.

XRD: calcite and smectite with admixture of 10% of mica-like interlayers; hydromica and chlorite in trace amounts.

Sample 74-528-46R-3, 68–70 cm (Piece) [Z-426]

Sediment.

XRD: smectite; calcite and heulandite(?) in trace amounts.

Sample 74-528-46R-5, 70–74 cm (Piece) [Z-427]

Sediment.

XRD: calcite; trace quartz, smectite, heulandite/clinoptilolite(?), and hydromica.

Sample 74-528-47R-3, 67–70 cm (Piece 3B), Unit 8 [Z-428]

Sparsely micro-clinopyroxene-plagioclase-phyric basalt, fine grained, equigranular, incompletely crystallized, sparsely vesicular (0.2–0.3 mm, <1%). Microphenocrysts of plagioclase (up to 1 mm, <1%) and clinopyroxene (up to 0.8 mm, <1%). Groundmass is intergranular to intersertal texture; laths of plagioclase (50%), small grains of clinopyroxene (40%), interstitial glass (10%), and opaque minerals (7%–10%).

Alteration: moderate (~20%); interstitial glass is replaced with smectites; vesicles are filled with smectites.

XRD: smectite; trace hydromica.

Rio-Grande Ridge (Leg 72)

Hole 516F

Sample 72-516F-126R-1, 70–73 cm (Piece 2I), Unit 1 [Z-392]

Sparsely plagioclase-phyric basalt, fine grained, incompletely crystallized, vesicular (0.3–0.8 mm up to 2–5 mm, 35%). Phenocrysts of plagioclase (0.6–0.8 mm, 5%), groundmass: 60%, and vesicles: 35%. Groundmass is intersertal texture; various laths of plagioclase (up to 0.3–0.4 mm, 45%, andesine [An_{45}]), clinopyroxene (0.05 mm, 25%), interstitial glass, and opaque minerals.

Alteration: strong (40%–60%); plagioclase is carbonitized; vesicles are zonally filled with secondary minerals: smectites, zeolites, and calcite. The latter fills 80% of the total volume in vesicles.

XRD: smectite; trace hydromica.

Sample 72-516F-126R-2, 53–56 cm (Piece 1E), Unit 1 [Z-393]

Plagioclase-phyric basalt, fine grained, inequigranular, incompletely crystallized, vesicular. Phenocrysts of plagioclase (0.5–2 mm, 5%–7%). Groundmass is intersertal texture; various laths of plagioclase (45%), small and xenomorphic clinopyroxene (35%), interstitial glass (10%–15%), and opaque minerals (5%–7%). Single tabular crystals of K-feldspar. Vesicles have sizes of 0.3–0.8 mm (35%).

Alteration: moderate (~25%–30%); intersertal glass is replaced with smectites and partly carbonate.

XRD: smectite.

Sample 72-516F-127R-1, 55–58 cm (Piece 18), Unit 1 [Z-394]

Aphyric basalt, fine grained, inequigranular, incompletely crystallized, vesicular. Rock is intersertal texture; various laths of plagioclase (40%), xenomorphic clinopyroxene (35%), interstitial glass (10%), and opaque minerals (5%–7%). Elongated vesicles (1–3 mm, 5%–10%) tend to occur on lines.

Alteration: slight to moderate (~20%); vesicles filled with bluish green smectites and zeolites; intersertal glass is replaced with smectites and partly with carbonate.

XRD: smectite; trace hydromica.

Sample 72-516F-127R-3, 64–67 cm (Piece 1G), Unit 1 [Z-395]

Sparsely plagioclase-phyric basalt, fine grained, inequigranular, incompletely crystallized, vesicular. Phenocrysts of plagioclase (0.4–2 mm, 1%–5%). Groundmass is intersertal texture; various laths of plagioclase (45%), clinopyroxene (40%), interstitial glass (5%), and opaque minerals (5%). Single crystals of olivine are present.

Alteration: slight to moderate (~20%); intersertal glass and olivine are replaced with smectites and, partly, with carbonate.

XRD: smectite.

Sample 72-516F-128R-2, 126–129 cm (Piece 4B), Unit 2 [Z-396]

Aphyric basalt, fine grained, inequigranular, incompletely crystallized, sparsely vesicular. Rock is intergranular to intersertal texture; an aggregate of various laths of plagioclase (45%), xenomorphic clinopyroxene (45%), interstitial glass (5%), and opaque minerals (5%). Single phenocrysts of plagioclase and olivine are present. Elongated vesicles (1–3 mm, 5%–10%) tend to occur in lines.

Alteration: slight (10%); intersertal glass and olivine is replaced with smectites and, partly, with carbonate.

XRD: smectite.

Sulu Basin and Celebes Basin (Leg 124)

Sulu Basin (Hole 768C)

Sample 124-768C-74R-1, 100–104 cm (Piece 10B), Unit 1 [Z-660]

Aphyric basalt, vesicular. Rocks with intersertal texture; panicle like segregates of microlites and laths of plagioclase and clinopyroxene. Composition of plagioclase: approximately labradorite [An_{55}]. Interstices infilled by black glass. Vesicles (30%–35%) are rounded-isometric in shape.

Alteration: moderate (35%–40%); laths of plagioclase in central parts replaced by clay mineral and carbonate(?), vesicles completely infilled with clay mineral.

XRD: smectite; dark green matter from veinlet: smectite; trace quartz.

Sample 124-768C-75R-1, 142–146 cm (Piece 6), Unit 1 [Z-661]

Plagioclase-phyric basalt, vesicular. Phenocrysts (10%): prismatic and tabular grains of plagioclase. Groundmass with intersertal texture; panicle like and radial-radiant segregates of microlites and laths of plagioclase and clinopyroxene; idiomorphic grains (0.2–0.4 mm) of clinopyroxene. Composition of plagioclase: approximately labradorite [An_{54}]. Interstices infilled with black glass. Vesicles (50%, 0.1–0.3 mm up to 0.8 mm) are rounded and isometric in shape.

Alteration: strong (60%); laths of plagioclase in central parts of crystals replaced by clay mineral and smectites, phenocrysts of plagioclase replaced by carbonate; microcracks in plagioclase grains infilled with smectites; vesicles infilled with clay minerals.

XRD: smectite.

Sample 124-768C-77R-2, 26–30 cm (Piece 1D), Unit 1 [Z-662]

Olivine(?)-phyric basalt, highly vesicular. Phenocrysts: olivine(?) 5%. Groundmass with hyalopilitic texture; panicle like segregates of microlites of plagioclase; brown oxidized glass. Very small (up to 0.1–0.2 mm) vesicles are present.

Alteration: very strong (90%); olivine completely replaced by clay minerals; glass replaced by clay mineral; vesicles infilled with smectites.

XRD: smectite.

Sample 124-768C-80R-1, 90–92 cm (Piece 1L), Unit 1 [Z-124]

Sparsely olivine-phyric hyalobasalt, fine grained, poorly crystallized, vesicular (0.1–0.3 mm, <1%). Phenocrysts: olivine (0.2–0.8 mm, 5%) crystals are idiomorphic, tabular to diamond-like in shape. Small prismatic quench crystals of olivine are present. Groundmass is hyaline-subvariolitic texture; poorly crystallized volcanic glass with very small needle-shaped laths of plagioclase, hardly visible crystals of clinopyroxene, and opaque dust.

Alteration: strong (50%–60%); volcanic glass is replaced with green smectite and Fe hydroxides (through patches); olivine is replaced with green clay minerals and occasionally with calcite, olivine pseudomorphs are surrounded by a thin rim of opaque minerals, the latter fill veins in olivine.

XRD: smectite and swelling chlorite; trace hydromica.

Electron micrograph: b = 9.22 Å (trioctahedral smectite).

Sample 124-768C-80R-3, 65–71 cm (Piece 3B), Unit 1 [Z-1359]

Plagioclase-phyric basalt, highly vesicular. Phenocrysts (5%): prismatic grains (0.6–1 mm) of plagioclase. Groundmass (30%) with hyalopilitic texture; needle-shaped laths (0.4–1.5 mm) of plagioclase (10%) and interstitial glass (20%). Central parts of plagioclase contain inclusions of glass. Vesicles (65%, 0.1–0.6 mm) are isometric in shape.

Alteration: very strong (70%); plagioclase phenocrysts completely replaced by carbonate (30%) and clay mineral (70%); vesicles infilled with green clay mineral; calcite is present in central parts of several vesicles.

XRD: smectite; trace calcite and mixed-layer chlorite-smectite mineral.

Sample 124-768C-81R-1, 11–16 cm (Piece 2A), Unit X [Z-663]

Aphyric basalt, with intersertal texture, highly vesicular (60%). Rock: identical to Sample 124-768C-74R-1, 100–104 cm (Z-660).

Alteration: laths of plagioclase completely replaced by albite; central parts of case like laths of plagioclase almost completely replaced by smectites; vesicles completely infilled with smectites.

XRD: smectite; minor mixed-layer chlorite-smectite mineral.

Sample 124-768C-82R-1, 64–69 cm (Piece 6), Unit 1 [Z-1360]

Sparsely olivine-phyric basalt, highly vesicular. Phenocrysts (<5%): oxidized olivine (0.2–0.4 mm). Groundmass with hyalopilitic texture; radial-radiant segregates of needle-shaped case-like laths of plagioclase (5%–7%, labradorite [An_{60}]) and glass (30%) with crystals of dark color mineral and opaque dust. Vesicles demonstrate vary from 0.05 to 0.7 mm.

Alteration: strong (50%); olivine is oxidized; part of vesicles infilled with brownish green glass and other part of vesicles infilled with clay mineral; large vesicular or inclusion (8 mm in diameter) completely infilled with carbonate.

XRD: smectite; trace calcite and hydromica; white matter from veinlet: calcite; trace quartz; dark brown matter from veinlet: smectite with interlayer Ca cation; trace quartz.

Sample 124-768C-82R-2, 10–15 cm (Piece 2B), Unit 1 [Z-664]

Sparsely pyroxene(?)-phyric basalt, highly vesicular. Phenocrysts (5%): grains (0.3–1 mm) of completely altered pyroxene. Groundmass with intersertal texture; black glass and panicle like segregates of microlites and laths of case like altered plagioclase (labradorite [An_{50}]). Vesicles (50%) demonstrate vary from <0.1 to 0.7 mm.

Alteration: very strong (70%); pyroxene completely replaced by smectites, carbonate, and Fe hydroxides; plagioclase almost completely replaced by smectites; vesicles infilled with smectites.

XRD: smectite; trace mixed-layer smectite-swelling chlorite mineral(?).

Sample 124-768C-83R-3, 45–50 cm (Piece 4), Unit 1 [Z-1361]

Sparsely plagioclase-phyric basalt, highly vesicular. Phenocrysts (2%–3%): tabular grains (0.3–0.4 mm) of altered plagioclase. Groundmass (35%–40%) with hyalopilitic texture; dark brown glass with sparse crystallites of plagioclase. Vesicles (60%): small vesicles (90%, 0.05–0.4 mm) are isometric in shape and infilled with partly altered brownish green glass; vesicles with 0.4–0.6 mm (10%) are isometric in shape.

Alteration: moderate (~20%–25%); plagioclase phenocrysts completely replaced by greenish clay mineral; glass from vesicles partly (10%) replaced by clay mineral; vesicles with 0.4–0.6 mm completely infilled with clay mineral.

XRD: smectite; trace calcite and defective chlorite(?).

Sample 124-768C-84R-2, 84–87 cm (Piece 2A), Unit 1 [Z-665]

Rock completely replaced by smectites and chlorite.

XRD: smectite; trace mixed-layer smectite-swelling chlorite mineral.

Sample 124-768C-87R-1, 109–112 cm (Piece 5J), Unit 1 [Z-1362]

Aphyric basalt, vesicular. Rocks with pilotaxitic texture; microlites of plagioclase (25%, 0.2–0.4 mm, labradorite [An_{60}]) with glass in central parts. Interstices infilled with small grains (up to 0.1 mm) of clinopyroxene (15%) and brown glass (15%) with crystals of clinopyroxene and opaque minerals. Vesicles (45%) are isometric in shape.

Alteration: moderate (45%); vesicles are encrusted or completely infilled with clay mineral.

XRD: smectite with ~5% mica layers; trace mixed-layer smectite-swelling chlorite mineral.

Sample 124-768C-88R-1, 23–27 cm (Piece 1B), Unit 1 [Z-1363]

Aphyric basalt, vesicular. Rocks with vitrophyric texture; light greenish gray glass (40%) with sparse needle-shaped crystals of plagioclase. Vesicles (60%) are isometric in shape and demonstrate vary from 0.01 to 0.3 mm, vesicles infilled with green glass.

Alteration: slight (5%); glass from vesicles partly (5%) replaced by clay mineral.

XRD: smectite; trace calcite and chlorite.

Sample 124-768C-88R-2, 124–126 cm (Piece 7B), Unit 2 [Z-125]

Olivine-phyric basalt (dolerite?), fine grained, inequigranular, incompletely crystallized. Rock is subvariolitic (occasionally intersertal) texture; an segregate of radially oriented elongated (1:10 or 1:15) crystals of clinopyroxene (~30%) and laths of plagioclase (~45%). Isometric tabular crystals of pyroxene, angular through isometric grains of opaque minerals (8%–10%), and single idiomorphic crystals of olivine (up to 0.5 mm). Interstitial glass (10%–15%). Single vesicles (up to 0.7 mm).

Alteration: moderate (30%); Fe hydroxides partly replace of opaque minerals; volcanic glass, olivine, and partly plagioclase are replaced with green smectite; vesicles are filled by green smectites; xenomorphic grains of quartz and carbonate are present also.

XRD: smectite and swelling chlorite; trace chlorite.

Electron micrograph: b = 9.26 Å (trioctahedral smectite).

Sample 124-768C-89R-1, 69–70 cm (Piece 3B), Unit 2 [Z-1364]

Aphyric dolerite, fine grained. Rocks with intersertal-ophitic texture; tabular and prismatic grains of plagioclase (55%, 0.2–1 mm, labradorite [An_{60}]). Interstices: xenomorphic clinopyroxene grains (25%) and greenish brown glass (15%). Occasionally, glass almost completely crystallized with formation of orthoclase, albite, tridymite, quartz, and single grains of carbonate (total of these minerals is ~1%–2%). Opaque minerals (5%) is present.

Alteration: slight (10%–12%).

XRD: smectite; trace chlorite (~10% swelling interlayers) and hydromica (~10% swelling interlayers); blue and yellow matter from vesicles: smectite, hydromica (~5%–10% swelling interlayers), swelling chlorite, mixed-layer swelling chlorite-smectite mineral, and lomontite.

Sample 124-768C-89R-2, 82–86 cm (Piece 4B), Unit 2 [Z-666]

Clinopyroxene-plagioclase-phyric basalt, massive. Phenocrysts (10%): rounded grains of plagioclase (0.7–0.8 mm) with undulatory extinction and single phenocryst (1 mm) of altered clinopyroxene. Groundmass with doleritic-intersertal texture; rounded and short- and elongated-prismatic grains (0.2–0.7 mm) of plagioclase (labradorite [An_{63}]). Large laths (0.5–0.7 mm) have small inclusions of altered glass. Interstices consist of segregate of clinopyroxene grains (up to 0.2 mm), opaque minerals (7%–8%), and secondary minerals.

Alteration: slight to moderate (~20%); plagioclase phenocryst completely replaced by clay mineral and opacite; inclusions of glass in plagioclase replaced by clay mineral; clay mineral and uralite replace interstitial clinopyroxene.

XRD: smectite, swelling chlorite(?).

Sample 124-768C-89R-3, 74–76 cm (Piece 4), Unit 2 [Z-667]

Aphyric dolerite, medium grained, massive. Rocks with intersertal-doleritic texture; prismatic grains of plagioclase (0.5–0.7 mm, labradorite [An_{55}]). Interstices consist of xenomorphic clinopyroxene grains (0.2–0.6 mm), opaque minerals (2%–3%), and brown glass (20%). Occasionally, glass almost completely crystallized with formation of orthoclase, albite, tridymite, quartz, and single grains of carbonate (total of these minerals is ~1%–2%). Opaque minerals (5%) is present.

Alteration: slight (5%); plagioclase partly replaced by albite and sosurite; interstitial glass partly replaced by clay mineral.

XRD: smectite; trace chlorite and amphibole.

Sample 124-768C-89R-4, 83–87 cm (Piece 3A), Unit 2 [Z-1365]

Aphyric dolerite is intersertal-ophitic texture. Rock: identical to Sample 124-768C-89R-1, 69–70 cm (Z-1364).

Alteration: slight (3%–4%); interstitial glass partly replaced by clay mineral.

XRD: smectite and corrensite-like mineral; trace amphibole(?); gray-yellow spots in rock: smectite with ~10% mica layers and mixed-layer chlorite-smectite mineral (~30%–40% chlorite layers); trace quartz.

Sample 124-768C-90R-1, 16–18 cm (Piece 1A), Unit 2 [Z-126]

Olivine dolerite, medium grained, inequigranular, almost completely crystallized. Rock is intersertal-ophitic texture; laths of plagioclase (50%), clinopyroxene (40%), olivine (up to 2–3 mm, 1%–3%), and opaque minerals (1%). Plagioclase; elongated tabular laths-like idiomorphic crystals as long as 0.8–1.5 mm (elongation is 1:3–1:5). Clinopyroxene; hypidiomorphic tabular and elongated-tabular crystals (0.3–0.7 mm). Interstitial glass (5%) is present.

Alteration: slight (~10%–15%); volcanic glass, olivine, and partly plagioclase are replaced with green smectite; single vesicles are filled with green smectites.

XRD: smectite and swelling chlorite; trace chlorite and corrensite-like mineral or corrensite(?).

Sample 124-768C-90R-6, 58–62 cm (Piece 1B), Unit 2 [Z-668]

Aphyric dolerite, medium grained, massive. Rock with intersertal-doleritic texture; prismatic (0.2–0.5 mm) and laths like grains of zonal plagioclase (0.2–2 mm, labradorite [An_{55}]). Plagioclases content inclusions of glass. Interstices: xenomorphic clinopyroxene grains (0.3–0.5 mm), opaque minerals (5%–6%), and chlorite (10%).

Alteration: slight.

Sample 124-768C-90R-7, 98–103 cm (Piece 5), Unit 2 [Z-1366]

Aphyric dolerite with intersertal-ophitic texture. Rock: identical to Samples 124-768C-89R-1, 69–70 cm (Z-1364), and 89R-4, 83–87 cm (Z-1365).

Alteration: slight (7%–8%); interstitial glass partly replaced by clay mineral.

Sample 124-768C-91R-1, 55–57 cm (Piece 1C), Unit 2 [Z-127]

Olivine dolerite, medium grained, equigranular, almost completely crystallized. Rock is intergranular-ophitic texture; plagioclase (55%), clinopyroxene (35%), olivine (~1%), opaque minerals (0.01–0.4 mm, 5%–7%), and interstitial glass (3%–5%). Plagioclase; tabular lath-like idiomorphic and hypidiomorphic, often zonal, crystals 0.05–1.5 mm in length (elongation 1:1–1:5). Clinopyroxene; hypidiomorphic diamond-like tabular crystals (0.03–1 mm).

Alteration: slight (~10%–15%); volcanic glass, olivine, and partly plagioclase are replaced with smectite and smectite-chlorite aggregate; actinolite is probably present.

XRD: smectite and swelling chlorite; trace chlorite and corrensite-like mineral or corrensite.

Electron micrograph: $b = 9.30$ Å (trioctahedral chlorite?).

Sample 124-768C-92R-1, 54–56 cm (Piece 4A), Unit 3 [Z-128]

Olivine dolerite (microgabbro?), medium grained, inequigranular, almost completely crystallized. Rock is hypidiomorphic-granular texture; plagioclase (0.03–1.5 mm, 45%), clinopyroxene (0.05–0.5 mm, 35%), olivine (0.5–1 mm, 15%), opaque minerals (1%), and interstitial glass (1%–5%). Biotite occurs in trace amounts. Plagioclase; hypidiomorphic elongated-tabular crystals, sparsely by laths. Clinopyroxene; rounded-tabular crystals. Olivine; hypidiomorphic rounded to diamond-shaped and rounded-tabular crystals.

Alteration: moderate (~25%); volcanic glass, olivine, and partly plagioclase are replaced with smectite and smectite-chlorite aggregate; biotite is replaced with chlorite.

XRD: smectite; trace chlorite, talc, and hydromica.

Electron micrograph: $b = 9.23$ Å (trioctahedral smectite).

Sample 124-768C-92R-2, 95–100 cm (Piece 1H), Unit 3 [Z-1367]

Olivine-clinopyroxene-plagioclase gabbro. Rock with gabbroid texture; rounded-partly idiomorphic grains (0.4–0.7 mm) of partly oxidized (3%) and carbonatized (7% of grain volume) olivine (5%–6%), xenomorphic grains (0.4–1.2 mm) of clinopyroxene (45%), short-prismatic and xenomorphic tabular grains of plagioclase (40%), opaque minerals (10%), and spotty areas of clay mineral which replaces interstitial glass.

Alteration: slight (10%–12%).

XRD: smectite and chlorite with ~10% swelling interlayers; trace talc.

Sample 124-768C-92R-3, 108–111 cm (Piece 1E), Unit 3 [Z-1368]

Olivine-pyroxene-plagioclase gabbro-dolerite, tectonized. Rock with gabbroid texture; idiomorphic grains of oxidized olivine (1%–2%), xenomorphic grains of clinopyroxene (30%), prismatic grains of plagioclase (40%), opaque minerals (10%), and clay mineral (10%). Rock consists of three fragments (2–2.5 mm) of partly oxidized and completely chloritized vesicular basalt.

Alteration: slight (10%).

XRD: smectite and chlorite with ~10% swelling interlayers; trace mixed-layer smectite-swelling chlorite(?), talc, and amphibole(?).

Sample 124-768C-92R-3, 111–115 cm (Piece 1E), Unit 3 [Z-669]

Aphyric dolerite, massive. Rock with doleritic-intersertal texture; prismatic (0.2–1 mm) grains of plagioclase (labradorite [An_{55}]) with undulatory extinction. Interstices consist of xenomorphic clinopyroxene grains (0.3–0.5 mm) and opaque minerals (7%–8%).

Alteration: moderate (~40%); rock is chloritized.

XRD: mixed-layer smectite-chlorite mineral (~10% swelling interlayers) and smectite.

Sample 124-768C-92R-4, 0–5 cm (Piece 1), Unit 3 [Z-1369]

Olivine-pyroxene-plagioclase gabbro. Rock with gabbroid texture; olivine (5%), clinopyroxene (35%), plagioclase (40%), opaque minerals (10%), and chlorite (10%). Biotite is present (2%–3%).

Alteration: slight (10%–15%); olivine almost completely is oxidized and partly (3%–5%) replaced by chlorite; chlorite partly replaces all minerals.

XRD: smectite and chlorite with ~10% swelling interlayers; trace talc; white veinlet: calcite.

Sample 124-768C-93R-1, 40–42 cm (Piece 2B), Unit 3 [Z-129]

Olivine twopyroxene microgabbro, medium grained, equigranular, tectonized, hypidiomorphic-granular texture. Rock; plagioclase (45%), clinopyroxene (30%), olivine (10%), orthopyroxene (3%–5%), basaltic (brownish) hornblende (<1%), opaque minerals (5%–7%), and trace biotite. All minerals are highly fissured and partly or completely (e.g. Olivine) are replaced with secondary minerals. Minerals vary from 0.05 through 1 mm.

Alteration: strong (50%); olivine and partly plagioclase and pyroxenes are replaced with clay minerals; hornblende and biotite are replaced with chlorite; opaque minerals are oxidized and replaced with Fe hydroxides.

XRD: swelling chlorite; trace chlorite and talc.

Electron micrograph: b = 9.26 Å (trioctahedral mineral).

Sample 124-768C-93R-2, 10–14 cm (Piece 2C), Unit 3 [Z-670]

Aphyric dolerite, medium grained, with ophitic-intersertal texture, massive. Rock: identical to Sample 124-768C-92R-3, 111–115 cm (Z-669).

Alteration: moderate (~40%).

XRD: smectite and swelling chlorite; trace chlorite and talc.

Sample 124-768C-93R-3, 113–117 cm (Piece 2F), Unit 3 [Z-671]

Aphyric dolerite, with ophitic-intersertal texture, massive. Rock: identical to Samples 124-768C-92R-3, 111–115 cm (Z-669), and 93R-2, 10–14 cm (Z-670).

Alteration: very strong (70%); rock is chloritized.

XRD: smectite and swelling chlorite; trace chlorite, talc, and calcite.

Sample 124-768C-93R-4, 27–29 cm (Piece 3C), Unit 3 [Z-130]

Olivine microgabbro, highly tectonized.

Alteration: very strong (80%–90%).

XRD: smectite; trace chlorite and talc.

Electron micrograph: b = 9.26 Å (trioctahedral smectite and chlorite).

Sample 124-768C-95R-1, 89–91 cm (Piece 8), Unit 4 [Z-131]

Olivine hyalobasalt, fine grained, highly vesicular (0.03–0.7 mm, ~50%). Rock; devitrified volcanic glass with rare microphenocrysts of olivine (0.07–0.2 mm, 1%–5%). Very small laths of plagioclase form poorly expressed subvariolitic texture. Glass contains crystallites of pyroxene and opaque dust.

Alteration: strong (50%); volcanic glass and olivine are replaced with green smectites; vesicles and hair-thin cracks are filled with green smectites.

XRD: smectite.

Electron micrograph: b = 9.27 Å (trioctahedral smectite).

Sample 124-768C-96R-1, 108–111 cm (Piece 9A), Unit 4 [Z-1370]

Olivine-plagioclase-phyric basalt, vesicular. Phenocrysts (25%): idiomorphic grains (0.2–0.6 mm) of fresh olivine (8%); prismatic grains (0.2–2 mm) of plagioclase and their glomerophyric segregates (17%). Composition of

plagioclase-labradorite spar [An_{62-64}]. Groundmass (35%); from light cream to brown glass. Vesicles (40%, 0.1–0.7 mm) are rounded and oval in shape. Small vesicles (10%) completely infilled with green glass, the rest of vesicles (30%) are encrusted by green glass.

Alteration: rock is fresh.

XRD: mixed-layer chlorite-smectite mineral.

Sample 124-768C-96R-2, 0–5 cm (Piece 1A), Unit 4 [Z-1371]

Sparsely olivine-phyric basalt, vesicular. Phenocrysts (3%–4%): idiomorphic grains (0.4–0.5 mm) of olivine. Groundmass (50%) with hyalopilitic texture; almost colorless glass (15%), needle-shaped laths (up to 1.5 mm) of plagioclase (15%, oligoclase [An_{21}]), and microlites of clinopyroxene (20%). Vesicles (45%, 0.1–1.2 mm) are isometric in shape.

Alteration: moderate (35%); olivine is oxidized and replaced by chalcedony; vesicles are empty (20%) or infilled with opal (15%) and tridymite (10%).

XRD: analcime and mixed-layer chlorite-smectite mineral.

Sample 124-768C-97R-2, 9–13 cm (Piece 1B), Unit 4 [Z-672]

Sparsely olivine-phyric basalt, vesicular. Phenocrysts (2%–3%): grains (0.5 mm) of completely altered dark color mineral (olivine). Groundmass with pilotaxitic texture; needle-shaped microlites and microlaths of plagioclase; segregate of small grains clinopyroxene; opaque minerals (~10%); black glass. Vesicles (50%, 0.2–0.5 mm) demonstrate isometric in shape.

Alteration: strong (50%); olivine completely replaced by clay mineral and carbonate; vesicles infilled with clay minerals; central parts in sparse vesicles are filled with carbonate.

XRD: smectite; trace analcime.

Sample 124-768C-97R-3, 9–13 cm (Piece 2), Unit 4 [Z-1372]

Glassy crust of sparsely olivine-phyric basalt. Phenocrysts (2%–3%): by idiomorphic grains (up to 0.5 mm) of olivine. Groundmass with vitrophyric texture; glass (from light brown to black in color).

Alteration: slight; olivine completely replaced by Fe hydroxides and partly replaced by opal; needle-shaped aggregate of secondary minerals is located along thin cracks in glassy crust.

XRD: analcime and amphibole; minor smectite.

Sample 124-768C-97R-3, 89–94 cm (Piece 7A), Unit 4 [Z-673]

Aphyric basalt (dolerite?), vesicular. Rocks with intersertal-doleritic texture; prismatic and laths (0.3–1.2 mm) of plagioclase (labradorite [An_{60}]). Often plagioclase grains content inclusions of glass. Interstices: radial-radiant and panicle like segregates of needle-shaped grains of clinopyroxene; glass. Vesicles (25%–30%, 0.2–0.5 mm) are isometric in shape.

Alteration: plagioclase replaced by sosurite; glass partly replaced by brownish green smectites and chlorite; vesicles completely infilled with smectites.

XRD: smectite; trace analcime(?).

Sample 124-768C-98R-2, 60–65 cm (Piece 2C), Unit 5 [Z-1373]

Aphyric basalt, spotty structure, highly vesicular. Rocks with hyalopilitic texture; needle-shaped microlites of plagioclase (10%, andesine [An_{33}] and oligoclase [An_{18}]), grains of clinopyroxene (20%), and glass (from light green to brown in color). Vesicles (50%, 0.1–0.7 mm) are isometric and oval in shape. Vesicles (10%, 0.1–0.2 mm) are encrusted by light green glass.

Alteration: slight; occasionally vesicles infilled with tridymite and quartz.

XRD: analcime and corrensite-like mineral; trace chlorite and calcite.

Sample 124-768C-98R-3, 77–79 cm (Piece 3B), Unit 5 [Z-132]

Olivine-microphyric basalt, fine grained, highly vesicular (35%), intergranular texture. Microphenocrysts of olivine (0.5 mm, ~1%). Laths of plagioclase (35%) form "honeycomb" texture of rock. Central parts of honeycomb are occupied by vesicles (0.2–0.4 mm), surrounded by segregates of xenomorphic clinopyroxene (25%) with small grains of opaque minerals. Hypidiomorphic crystals of olivine (up to 1–1.3 mm) are present.

Alteration: strong; secondary minerals replace olivine and interstitial glass; vesicles are filled with green clay mineral, occasionally with an admixture of zeolites; central parts of some vesicles are filled with chalcedony.

XRD: analcime and corrensite(?).

Electron micrograph: b = 9.22 Å (trioctahedral mineral).

Sample 124-768C-98R-4, 0–5 cm (Piece 1A), Unit 5 [Z-1374]

Aphyric basalt, highly vesicular. Rock with hyalopilitic texture; glass (5%), needle-shaped microlites of plagioclase (15%, oligoclase [An_{18}]), and grains of clinopyroxene (30%). Vesicles (50%, 0.1–2.5 mm) are isometric in shape. Small vesicles (0.1–0.3 mm, 25%) partly or completely infilled with light green glass. Vesicles with 0.4–0.7 mm are empty (10%) or infilled with zeolite (5%) or quartz (chalcedony?) 5%. Large vesicles (1.2–2.5 mm, 5%) completely infilled with carbonate.

Alteration: slight.

XRD: corrensite-like mineral; minor calcite and analcime.

Sample 124-768C-92R-2, 16–21 cm (Piece 1D), Unit 6 [Z-1375]

Sparsely olivine-phyric basalt, highly vesicular. Phenocrysts (1%–2%): grains of olivine. Groundmass (49%) with hyalopilitic texture; brown glass with needle-shaped microlites of plagioclase (10%, oligoclase [An_{20-24}]) and microlites of clinopyroxene (25%). Vesicles (50%, 0.1–0.4 mm) are isometric in shape and completely infilled with green glass.

Alteration: moderate (30%); 30% of vesicles glass replaced by smectites.

XRD: smectite; trace calcite, mixed-layer smectite-swelling chlorite mineral, and amphibole(?).

Sample 124-768C-99R-3, 106–109 cm (Piece 4C), Unit 6 [Z-1376]

Sparsely olivine-phyric basalt, highly vesicular. Phenocrysts (2%–3%): xenomorphic grains (0.3–0.5 mm) of olivine. Groundmass (49%) with hyalopilitic texture; radial-radiant needle-shaped microlites of plagioclase (5%) and brownish black glass (30%). Vesicles (65%, 0.05–0.8 mm) are isometric in shape. Several vesicles (20%) infilled with smectitized glass.

Alteration: moderate (30%); smectites replace glass from several vesicles.

XRD: smectite; trace calcite.

Sample 124-768C-99R-4, 46–52 cm (Piece 3), Unit 6 [Z-1377]

Sparsely olivine-phyric basalt, highly vesicular. Phenocrysts: single (<1%) grains of olivine. Groundmass with vitrophyric texture; glass (20%) with sparse panicle like crystals of plagioclase and grains of clinopyroxene. Vesicles (80%, 0.01–0.4 mm) infilled with green glass.

Alteration: moderate (30%); olivine is oxidized; vesicles with sizes >0.2 mm (15%) are filled with smectites.

XRD: smectite; trace calcite and hydromica with ~10%–15% swelling interlayers; white veinlet: calcite.

Sample 124-768C-100R-1, 32–36 cm (Piece 3B), Unit 7 [Z-1378]

Aphyric basalt, vesicular. Rock with vitrophyric texture; black glass (70%) with sparse panicle like crystals of plagioclase. Vesicles (30%) demonstrate vary from 0.01 to 1.7 mm.

Alteration: moderate (30%); vesicles are filled with smectites.

XRD: smectite; trace calcite, swelling chlorite, and mixed-layer smectite-swelling chlorite mineral.

Sample 124-768C-100R-2, 13–19 cm (Piece 2), Unit 7 [Z-1379]

Aphyric basalt, vesicular. Rocks with microlitic texture; microlites and microlaths of plagioclase (30%, oligoclase [An_{24}] and albite), small (0.1–0.4 mm) isometric grains of clinopyroxene (30%), black glass, and opaque minerals. Vesicles (30%, 0.1–0.6 mm) are isometric and rounded in shape.

Alteration: moderate (30%); vesicles completely infilled with smectites or encrusted by smectites.

XRD: smectite; trace corrensite-like mineral, swelling chlorite, hydromica, and calcite.

Celebes Basin (Hole 770C)

Sample 124-770C-2R-3, 23–25 cm (Piece 2), Unit 1 [Z-133]

Sparsely micro-plagioclase-phyric olivine hyalobasalt, fine grained, massive. Microphenocrysts of plagioclase (0.3–0.8 mm, <1%) and hypidiomorphic crystals of olivine (up to 0.3 mm) are present. Groundmass: subvariolitic segregate of radially oriented crystals of plagioclase; crystals of pyroxene with admixture of opaque dust.

Alteration: slight (~10%–15%); volcanic glass and olivine is replaced with green smectite; cracks are filled with oxidized opaque minerals.

XRD: smectite.

Electron micrograph: $b = 9.21$ Å (trioctahedral smectite).

Sample 124-770C-3R-3, 36–38 cm (Piece 4B), Unit 1 [Z-134]

Sparsely micro-plagioclase-phyric olivine basalt, fine grained, inequigranular, incompletely crystallized. Microphenocrysts of plagioclase (0.3–1 mm, <5%). Hypidiomorphic crystals of olivine (0.2–0.8 mm, <1%) are presented. Groundmass; laths of plagioclase (50%) and fine grained aggregate of clinopyroxene (40%) with opaque dust. Interstitial glass (5%–7%). Texture of rock is subvariolitic-honeycomb.

Alteration: slight (10%); volcanic glass and olivine is replaced with green smectites.

XRD: smectite with interlayer Na-K and Ca-Mg cations.

Sample 124-770C-3R-4, 55–60 cm (Piece 6), Unit 1 [Z-1380]

Plagioclase-phyric basalt. Phenocrysts (10%): tabular grains (0.7–1.8 mm) of plagioclase (labradorite [An_{58}]). Groundmass (90%) with hyalopilitic to pilotaxitic texture; needle-shaped microlites and laths (up to 2 mm) of plagioclase (40%, andesine [An_{44}] and [An_{32}]), black glass (50%) with sparse segregates of small idiomorphic grains (0.1–0.3 mm) of olivine (2%–3%). Opaque minerals (1%–2%) are present.

Alteration: slight (2%–3%); olivine completely replaced by iddingsite and boulingite.

Sample 124-770C-4R-1, 17–19 cm (Piece 3A), Unit 2 [Z-135]

Plagioclase-phyric olivine hyalobasalt, sparsely vesicular. Phenocrysts of plagioclase (0.5–3 mm, 20%) and olivine (0.2–1 mm, 1%). Groundmass is subvariolitic texture; devitrified brown-black volcanic glass with needle-shaped laths of plagioclase, crystals of pyroxene, and opaque dust.

Alteration: slight (~5%); volcanic glass and olivine is replaced with green smectite; single vesicles are filled with smectites; opaque dust is oxidized.

XRD: smectite; trace chlorite.

Electron micrograph: b = 9.34 Å.

Sample 124-770C-4R-2, 134–140 cm (Piece 12E), Unit 2 [Z-1381-1]

Breccia: single fragment (2 mm) of aphyric basalt with hyalopilitic texture and small (0.7–0.9 mm) angular fragments of green volcanic glass. Matrix consists of carbonate and clay. Breccia is covered with Fe-Mn crust.

Sample 124-770C-4R-2, 134–140 cm (Piece 12E), Unit 2 [Z-1381-2]

Plagioclase-phyric basalt, sparsely vesicular. Phenocrysts (10%): prismatic grains (0.2–1.5 mm) of plagioclase (andesine [An_{46}]). Plagioclase grains content inclusions of glass. Groundmass (90%) with vitrophyric texture; brownish black glass (85%–87%) with sparse needle-shaped crystals of plagioclase. Vesicles (2%–3%, 0.1–0.2 mm) are rounded in shape.

Alteration: slight (10%); glass from plagioclase grains replaced by smectites, vesicles infilled with smectites.

Sample 124-770C-4R-3, 23–27 cm (Piece 3), Unit 2 [Z-674]

Plagioclase-phyric basalt, sparsely vesicular. Phenocrysts (20%–25%): elongated-prismatic grains (0.3–1 mm, labradorite [An_{55}] and 1–2.5 mm, labradorite [An_{68}]) of plagioclase. Phenocrysts with 0.3–1 mm, often they content glass. Groundmass with hyalopilitic texture; needle-shaped microlites and microlaths of plagioclase (labradorite [An_{52}]) and brownish black glass with rudimentary panicle like crystals of clinopyroxene. Vesicles (2%–3%, 0.1 mm) are present.

Alteration: slight; vesicles are filled with clay mineral.

Sample 124-770C-4R-3, 86–88 cm (Piece 9A), Unit 2 [Z-136]

Plagioclase-phyric olivine basalt, sparsely vesicular. Phenocrysts of plagioclase (0.5–1.5 mm, 15%–20%) and olivine (0.5–3 mm, <1%). Groundmass is subvariolitic-intersertal texture; devitrified volcanic glass with laths of plagioclase (40%–50%), crystals of pyroxene, and opaque dust. Rare and small vesicles are filled with black volcanic glass or smectites.

Alteration: slight (~10%–15%); volcanic glass and olivine is replaced with smectites, besides, olivine is replaced with limonite(?); carbonate is present.

XRD: Fe smectite.

Electron micrograph: b = 9.15 Å (dioctahedral smectite).

Sample 124-770C-5R-2, 11–13 cm (Piece 1A), Unit 3 [Z-137]

Plagioclase-phyric olivine basalt, fine-medium grained, sparsely vesicular. Phenocrysts of plagioclase (0.5–0.8 mm, 15%–20%) and olivine (0.3–0.8 up to 1.5 mm, 1%–3%). Groundmass is intergranular texture; laths of plagioclase (50%), crystals of clinopyroxene (40%–50%), small amounts of olivine, and opaque minerals. Vesicles are sparsely (<1%).

Alteration: slight to moderate (15%–20%); olivine is replaced with smectites and Fe hydroxides; vesicles are filled with smectites and Fe hydroxides.

XRD: Fe smectite; trace chlorite and talc(?).

Electron micrograph: b = 9.14 Å (smectite).

Sample 124-770C-5R-3, 89–91 cm (Piece 3B), Unit 3 [Z-138]

Plagioclase-phyric olivine basalt, fine-medium grained, sparsely vesicular (3%–5%). Phenocrysts of plagioclase (1–3 mm, 0.5–0.8 mm, 15%) and olivine (0.3–1 mm, 1%–3%). Groundmass is intergranular texture; laths of plagioclase (50%), crystals of clinopyroxene (45%), small amounts of olivine (<1%), interstitial volcanic glass (<1%), and opaque minerals (1%–3%).

Alteration: slight (~10%); olivine and interstitial glass are replaced with smectites and Fe hydroxides; vesicles are filled with smectites.

XRD: smectite; trace chlorite.

Electron micrograph: b = 9.30 Å (trioctahedral mineral [chlorite?]).

Sample 124-770C-5R-5, 34–38 cm (Piece 2), Unit 3 [Z-675]

Plagioclase-phyric basalt, medium grained, vesicular. Phenocrysts (10%): prismatic grains (1.2–4 mm, labradorite [An_{60}]) of plagioclase. Occasionally, grains of plagioclase consist of glass. Groundmass s doleritic texture; unoriented laths (0.3–1.2 mm) plagioclase (labradorite [An_{58}]), segregate of grains (0.2–0.3 mm up to 0.8 mm) of clinopyroxene (often with laths of plagioclase), and opaque minerals (5%). Vesicles (8%–10%, 1–1.5 mm) are rounded in shape.

Alteration: slight; vesicles are filled with Fe hydroxides and carbonate.

Sample 124-770C-5R-6, 67–72 cm (Piece 4A), Unit 3 [Z-1383]

Aphyric basalt, fine grained, sparsely vesicular, brecciated. Rock with intersertal-doleritic texture; prismatic (up to 2 mm) and tabular (0.2–0.7 mm) grains of plagioclase (35%, labradorite [An_{55}]), segregate of grains of clinopyroxene (45%), segregate of small (0.2–0.4 mm) idiomorphic grains of olivine, and glass (5%) with microlites of opaque minerals. Vesicles (5%, 0.8–1.2 mm) are present.

Alteration: moderate (35%–40%); olivine is oxidized; part of plagioclase grains replaced by aggregate of smectites and quartz, vesicles are filled with carbonate and clay minerals, single vesicle is filled with tridymite and tremolite(?); cracks of brecciated basalt infilled with carbonate.

Sample 124-770C-5R-6, 106–108 cm (Piece 5), Unit 3 [Z-139]

Olivine-plagioclase-phyric basalt, vesicular (<2 mm, ~5%). Phenocrysts of plagioclase (0.8–2.5 mm, 10%–15%) and olivine (0.3–0.7 mm, 3%–5%). Groundmass is intergranular texture; segregate of plagioclase and clinopyroxene and admixture of olivine and opaque minerals.

Alteration: slight (~10%); olivine and interstitial glass are replaced with smectites; Fe hydroxides replace of opaque minerals.

XRD: smectite; trace chlorite.

Electron micrograph: b = 9.17 Å (trioctahedral? smectite).

Sample 124-770C-6R-1, 67–71 cm (Piece 1D), Unit 4 [Z-676]

Plagioclase-phyric basalt, sparsely vesicular. Phenocrysts (15%): glomerophyric segregates of prismatic and tabular grains (0.8–3 mm) of plagioclase (labradorite [An_{62}]). Groundmass with microlitic texture; unoriented laths (0.3–0.8 mm) of plagioclase (labradorite [An_{56}]), segregate of small grains of clinopyroxene, and brown glass. Single vesicles (1%–2%, 0.3–0.6 mm) are rounded in shape and infilled with glass.

Alteration: slight; glass replaced by palagonite; several vesicles are filled with palagonite.

Sample 124-770C-6R-1, 73–77 cm (Piece 1D), Unit 4 [Z-140]

Plagioclase-phyric basalt, vesicular. Phenocrysts of plagioclase (0.3–2 mm, 5%). Groundmass is intersertal-microlitic texture; black devitrified glass with laths of plagioclase and their quench crystals, crystals of clinopyroxene, and opaque dust. Vesicles (0.3–0.7 mm, 10%–15%) are partly or completely filled with devitrified volcanic glass, occasionally with carbonate.

Alteration: slight (~5%).

XRD: smectite.

Electron micrograph: b = 9.21 Å (trioctahedral smectite).

Sample 124-770C-6R-1, 79–85 cm (Piece 2A), Unit 4 [Z-1384]

Olivine-plagioclase-phyric basalt, vesicular. Phenocrysts (30%): large prismatic grains (up to 4 mm, labradorite [An_{60}]) of plagioclase and glomerophyric segregates of smaller prismatic grains (andesine [An_{43}]) and small (up to 0.6 mm) idiomorphic grains of olivine. Groundmass with hyalopilitic texture; needle-shaped microlites and laths of plagioclase (10%) and brown glass (40%–45%) with crystals of clinopyroxene. Vesicles (10%, 0.7–1.2 mm) are rounded in shape. Half of vesicles infilled with black color to brownish red glass.

Alteration: slight (~5%–10%); plagioclase partly (5%–10%) replaced by albite; olivine is oxidized (occasionally, olivine completely replaced by carbonate); half of vesicles infilled with carbonate and Fe hydroxides; crack (0.8 mm in thickness) infilled by Fe hydroxides, smectites, zeolite, and carbonate.

Sample 124-770C-6R-4, 96–98 cm (Piece 6A), Unit 4 [Z-141]

Plagioclase-phyric basalt, vesicular. Phenocrysts of plagioclase (1–2.5 mm, 5%–7%). Groundmass is intersertal-subvariolitic texture; fine grained aggregate of clinopyroxene, laths of plagioclase, opaque dust, and small single grains of olivine. Vesicles (0.2–1 mm, 1%–3%) are empty or filled with calcite and smectites.

Alteration: slight (~5%); olivine is replaced by smectites and carbonate.

XRD: smectite.

Electron micrograph: b = 9.25 Å (trioctahedral smectite).

Sample 124-770C-7R-1, 93–100 cm (Piece 9A), Unit 4 [Z-1385]

Olivine-plagioclase-phyric basalt, crystallized, vesicular. Phenocrysts (20%): prismatic grains (0.5–2.5 mm, labradorite [An_{62}] and andesine [An_{45}]) of plagioclase (18%) with inclusions of glass; glomerophyric segregates of smaller prismatic grains of plagioclase (andesine [An_{43}]) and small (up to 0.5 mm) grains of olivine. Groundmass (70%) with microlitic texture; microlites and laths of plagioclase (35%, andesine [An_{38}]), microlites of clinopyroxene (30%), and opaque minerals (5%). Vesicles (10%, 0.8–1 mm) are rounded in shape. Vesicles are encrusted with green to black glass. Occasionally, vesicles (2%) are empty.

Alteration: olivine is oxidized; there are vesicles (8%) infilled with carbonate.

Sample 124-770C-7R-1, 107–112 cm (Piece 9B), Unit 4 [Z-1386]

Olivine-plagioclase-phyric basalt, crystallized, groundmass with microlitic texture, vesicular. Rock: identical to Sample 124-770C-7R-1, 93–100 cm (Z-1385).

Sample 124-770C-7R-3, 61–63 cm (Piece 2A), Unit 5 [Z-142]

Aphyric basalt, medium grained, almost completely crystallized, vesicular (0.3–0.4 mm, 5%). Groundmass is intergranular (occasionally subvariolitic) texture; laths of plagioclase, clinopyroxene, olivine, devitrified volcanic glass, and opaque minerals.

Alteration: slight (~10%); olivine and interstitial glass are replaced with smectites; vesicles are filled with smectites or carbonate.

XRD: Fe smectite; trace chlorite and hydromica.

Sample 124-770C-9R-2, 53–55 cm (Piece 5B), Unit 6 [Z-143]

Sparsely olivine-plagioclase-phyric basalt, almost completely crystallized, inequigranular, massive. Phenocrysts of plagioclase (1–2 mm, 2%–3%) and olivine (up to 1 mm, <1%). Groundmass is intergranular texture; plagioclase and clinopyroxene, and opaque minerals.

Alteration: slight (~5%).

XRD: smectite; trace goethite(?) and hydromica.

Electron micrograph: b = 9.23 Å (trioctahedral smectite).

Sample 124-770C-10R-2, 110–112 cm (Piece 3D), Unit 7 [Z-144]

Aphyric dolerite, almost completely crystallized, massive.

Alteration: slight ~5%); rock is oxidized in patches.

XRD: Fe smectite with ~10% of mica layer; trace chlorite, hydromica and amphibole(?).

Sample 124-770C-11R-1, 98–100 cm (Piece 7F), Unit 7 [Z-145]

Aphyric basalt, incompletely crystallized, massive. Groundmass; laths of plagioclase, clinopyroxene, small amounts of olivine, interstitial glass (<1%), and opaque minerals.

Alteration: slight (~5%–7%); olivine and interstitial glass are replaced with smectites.

XRD: smectite; trace chlorite, hydromica and amphibole(?).

Electron micrograph: b = 9.20 Å (trioctahedral smectite).

Sample 124-770C-12R-1, 11–13 cm (Piece 1), Unit 8 [Z-146]

Sparsely plagioclase-phyric dolerite, massive. Phenocrysts of plagioclase (up to 1–1.5 mm, 1%–2%). Single phenocrysts of olivine are present. Groundmass is intergranular-subophitic texture; plagioclase, clinopyroxene, opaque minerals, olivine, and small amounts interstitial glass.

Alteration: slight (~3%–5%).

XRD: smectite with ~20% mica layers; trace chlorite, hydromica, and talc(?).

Electron micrograph: b = 9.20 Å (trioctahedral smectite).

Sample 124-770C-12R-2, 79–84 cm (Piece 3C), Unit 8 [Z-1387]

Olivine-plagioclase-phyric dolerite, fine grained. Phenocrysts (30%): grains (up to 1.2 mm) of olivine (5%) and glomerophyric segregates of grains of plagioclase (25%, up to 2.5 mm, labradorite [An_{69}] and [An_{60}] and andesine [An_{48}]). Groundmass (70%) with doleritic texture; laths of plagioclase (35%, andesine [An_{43}]). Interstices consist of glass (3%), opaque minerals (2%), and segregate of small grains of clinopyroxene (25%).

Alteration: olivine completely replaced by carbonate and Fe hydroxides.

Sample 124-770C-12R-3, 140–142 cm (Piece 13), Unit 9 [Z-147]

Plagioclase-phyric basalt, sparsely vesicular. Phenocrysts of plagioclase (0.5–2 mm, 15%–20%) and rare crystals of olivine. Groundmass is intersertal texture; laths of plagioclase, aggregate of clinopyroxene, small amounts of olivine and interstitial glass, and opaque minerals. Vesicles (0.2–0.8 mm, <3%) are empty or filled with smectites.

Alteration: slight (~10%).

XRD: smectite with ~20% mica layers.

Mariana and Izu-Bonin Regions (Leg 125)

Hole 779A

Sample 125-779A-9R-2, 39–41 cm (Piece 4A), Unit 2 [Z-191]

Dunite serpentinized, coarse grained, tectonized. Primary minerals are represented by hypidiomorphic crystals of olivine (2–5 mm, 40%–60%), hypidiomorphic elongated crystals of orthopyroxene (1–3 mm, 1%–3%), and spinel (picotite?) with size 0.05–0.7 mm. Olivine is dissected by cracks in small fragments (0.05–0.4 mm). Cracks in both olivine and orthopyroxene are filled with serpentine.

Alteration: strong (~50%–60%); secondary minerals: serpentine, amphiboles, and Fe hydroxides (hematite?); serpentine replaces most volume of olivine and pyroxene, that is accompanied by transformation of hypidiomorphic texture of dunite to a loop texture; serpentine is presented mostly by chrysotile; sparsely, veins are filled with aggregate of chrysotile and antigorite; amphibole (actinolite) replace serpentinized orthopyroxene; small xenomorphic crystals oxides (hematite?) occur mostly in vein serpentine.

Sample 125-779A-11R-1, 82–86 cm (Piece 11), Unit 2 [Z-677]

Harzburgite serpentinized. Rock; olivine (80%), orthopyroxene (20%), and idiomorphic grains (0.5–1 mm) black spinel (1%).

Alteration: very strong (90%–95%); olivine completely is serpentinized (from lizardite to clinochrysotile), orthopyroxene partly (70%–80%) replaced by bastite (serpentine), spinel is oxidized.

Sample 125-779A-12R-1, 45–49 cm (Piece 7), Unit 2 [Z-678]

Harzburgite serpentinized; rock is completely altered. Orthopyroxene completely replaced by bastite. Cracks infilled with oxidized antigorite. Grains of hydrogarnet (0.05 mm) are present.

Sample 125-779A-14R-1, 20–22 cm (Piece 1B), Unit 2 [Z-192]

Harzburgite serpentinized, coarse grained, tectonized. Primary minerals are represented by hypidiomorphic crystals of olivine (2–4 mm, 60%–80%), hypidiomorphic elongated-tabular crystals of orthopyroxene (1–4 mm, 20%), and spinel (chrome-picotite?, 1%–3%) with size 0.1–1.1 mm. Olivine is dissected by cracks in small fragments (0.05–0.5 mm). Serpentine fill cracks in olivine and orthopyroxene. Orthopyroxene is distributed irregularly; often, it forms segregates. Some crystals of orthopyroxene contain rounded inclusions of olivine. Spinel is distributed irregularly and often is restricted to accumulations of orthopyroxene. Occasionally spinel contains inclusions of olivine and orthopyroxene. Rock is dissected by a series of cracks filled with serpentines. Texture of rock is hypidiomorphic; most intensively serpentinized areas demonstrate loop texture.

Alteration: slight to moderate (15%–20%); secondary minerals: serpentine, amphiboles, chlorite, and Fe hydroxides (hematite?); serpentine (chrysotile) replaces most volume of olivine and pyroxene and form loop texture; amphibole (actinolite) replaces serpentinized orthopyroxene; Fe oxides (hematite?) as small xenomorphic accumulation occur mostly in vein serpentine and partly in spinel.

XRD: serpentine (antigorite?); reflexes: 5.9C, 3.89C, 3.49C - undetermined mineral.

Electron micrograph: b = 9.30 Å (serpentine).

Electron microscopy: chrysotile is fibrous in shape; some fiber are empty along their axis; chrysotile occur sporadically; the next type of chrysotile is near to Povlen-chrysotile, but has high length/diameter ratio; the polytype of chrysotile is $2O_{rc}$; Povlen-chrysotile (D_c) with irregular structure is present; the length-slight fiber chrysotile is represented two polytypes: $2M_{c1}$ and D_c; morphological type is tube-in-tube; lizardite is represented as polycrystals with unclear complicated edges; antigorite forms pseudomorphs and resides in the degradation stage.

Sample 125-779A-16R-2, 109–111 cm (Piece 11), Unit 2 [Z-193]

Harzburgite serpentinized, coarse grained, tectonized. Primary minerals are represented by hypidiomorphic crystals of olivine (1–3 mm, 50%), hypidiomorphic tabular crystals of orthopyroxene (5–8 mm, 30%), and spinel (picotite?, <1% abundance; 0.05–0.3 mm). Olivine is dissected by cracks into fragments (0.01–0.05 mm). Cracks in both olivine and orthopyroxene are filled with serpentine. Some crystals of orthopyroxene contain small inclusions of olivine and spinel. Spinel is distributed irregularly; often, it is restricted to accumulations of orthopyroxene. Occasionally, spinel contains small inclusions of olivine. Rock is dissected by a series of cracks filled with serpentines.

Alteration: moderate (30%); serpentine (chrysotile, 20%–25%) replace most volume of olivine and pyroxene and fill cracks (up to 0.5 mm) in rock, and form loop texture; occasionally, amphibole (actinolite?) occur along cleavage faces, Fe oxides (hematite?, 0.03–0.07 mm) occur in vein serpentine; spinel is replaced along cracks and from the surface with opaque minerals.

XRD: serpentine; amphibole(?) and talc(?) in trace amounts; reflexes 5.9C, 3.89C, 3.49C -undetermined mineral.

Electron micrograph: b = 9.30 Å (serpentine).

Electron microscopy: chrysotile has length-slight fibrous in shape and occurs in small amount as polytype D_c; few particles of Povlen-chrysotile with polytype $2M_{c1}$ are determined; lizardite is the main serpentine mineral and usually demonstrates chaotically structure; antigorite occur in small amounts and demonstrate chaotically structure.

Sample 125-779A-17R-1, 106–110 cm (Piece 14), Unit 2 [Z-679]

Harzburgite serpentinized, medium grained, tectonized. Primary minerals are represented by isometric grains of olivine, crystals of orthopyroxene (10%), and idiomorphic cubic and xenomorphic grains (up to 1.5 mm) spinel.

Alteration: ~40%; olivine is lizardite (10%), orthopyroxene completely replaced by chlorite and very small grains of magnetite (relicts of bastite are located among aggregate of chlorite); spinel completely is oxidized; microcracks (0.1–1.5 mm) are filled with chrysotile, antigorite, and magnetite.

Sample 125-779A-17R-3, 70–72 cm (Piece 8B), Unit 2 [Z-194]

Harzburgite serpentinized, fine to medium grained, tectonized. Primary minerals are represented by xenomorphic crystals of olivine (up to 2–3 mm, 70%), isometrically rounded crystals of orthopyroxene (2–3 mm, 15%), and opaque minerals (chromite?, <1% abundance; 0.03–0.05 mm). Primary minerals are dissected by cracks in small fragments (0.01–0.03 mm). Cracks in both olivine and orthopyroxene are filled with serpentine. Primary texture of rock is hypidiomorphic, highly serpentinized areas demonstrate loop texture.

Alteration: serpentine (20%) fills cracks in olivine and orthopyroxene, and in cracks (up to 1.5–2 mm) in rock; serpentine; antigorite, in veins: by chrysotile; occasionally, amphibole (actinolite) occur along cleavage faces in orthopyroxene; some crystals of olivine are completely replaced with amphibole (actinolite) and contain small inclusions of opaque minerals (hematite?).

XRD: serpentine; talc(?) in trace amounts; reflexes 5.10C, 3.88C, 3.49C - mineral undetermined.

Electron micrograph: b = 9.28 Å (serpentine).

Electron microscopy: chrysotile demonstrate irregular structure and polytype D_c; single particles of disordered Povlen-chrysotile are registered; lizardite is of two morphological types: with curved layers and lath-like pseudomorphs; antigorite is irregular in structure; particles are quadrangle in shape.

Sample 125-779A-22R-3, 17–21 cm (Piece 2), Unit 2 [Z-680]

Apoharzburgite. Rock completely is serpentinized.

Sample 125-779A-22R-3, 17–21 cm (Piece 2), Unit 2 [Z-195]

Apodunitic serpentine, tectonized. Primary minerals almost completely replaced with serpentine. Rare relicts of olivine and orthopyroxene occur. Antigorite replaces olivine; antigorite with some admixture of amphibole (antigorite?)-chlorite aggregate replace orthopyroxene. Cracks are filled by chrysotile. Single xenomorphic crystals of spinel, almost completely replaced with Fe oxides (hematite?). Rock demonstrates loop (occasionally lattice) texture. Rock is presented by isometric grains (0.6–0.8 mm) of olivine, large (up to 6 mm) isometric grains of orthopyroxene (20%–25%), and grains (0.5–1 mm) of spinel (1%–2%).

Alteration: very strong (90%–95%).

XRD: serpentine.

Electron micrograph: b = 9.20 Å.

Electron microscopy: chrysotile is predominant mineral; there are many particles with length-slight fibber in shape; chrysotile has D_c, $2M_{c1}$, and $2O_{rc1}$ polytypes; the central empty of fibber is empty; lizardite is represented as crystals in small amount; antigorite has disordered structure and lath-like particles; the well ordered antigorite is represented as particles having big width and sharp edges.

Sample 125-779A-24R-1, 27–29 cm (Piece 5), Unit 2 [Z-681]

Harzburgite serpentinized, medium grained, tectonized. Rock is presented by isometric grains (0.6–0.8 mm) of olivine, large (up to 6 mm) isometric grains of orthopyroxene (20%–25%), and grains (0.5–1 mm) of spinel (1%–2%).

Alteration: strong (60%); olivine replaced by lizardite; orthopyroxene completely or partly (10%–100%) replaced by bastite and chlorite; spinel completely is oxidized, microcracks are filled with chrysotile and antigorite.

Sample 125-779A-26R-2, 53–55 cm (Piece 2A), Unit 2 [Z-196]

Harzburgite serpentinized, coarse grained, tectonized, hypidiomorphic (occasionally loop) texture. Primary minerals are represented by hypidiomorphic crystals of olivine (3–5 mm, 60%), hypidiomorphic elongated-tabular crystals of orthopyroxene (10%–15%), and picotite (0.08–1 mm, <1%) with size. Olivine is dissected by cracks in small fragments (0.01–0.05 mm). As a rule, orthopyroxene and spinel are fresh.

Alteration: moderate (~30%); serpentine (25%–30%) replace olivine; chrysotile fill interstitial space; cracks are filled with aggregate of chrysotile and antigorite; Fe oxides occur in cracks.

XRD: serpentine.

Sample 125-779A-29R-2, 0–5 cm (Piece 20), Unit 2 [Z-197]

Apodunitic serpentinite, tectonized. Primary minerals almost completely replaced with serpentine. Sparsely relicts of rounded-isometric crystals of olivine (3–5 mm, 3%–5%) and isometric diamond-shaped crystals of chromite (up to 0.8 mm, <1%).

Alteration: very strong (95%–99%); secondary minerals are represented by serpentines (90%–95%), which form chrysotile-antigorite aggregate; brown secondary mineral (iddingsite?) replace olivine; rock is brown color and probably saturated with Fe hydroxides.

XRD: serpentine; bifurcated reflex 3.63C and 3.60C - two varieties of a serpentine mineral are probably present.

Electron micrograph: b = 9.28 Å (serpentine).

Electron microscopy: chrysotile predominates and demonstrate well-ordered structure; there are many particles of chrysotile-asbestos with length/diameter ratio >5; Povlen-chrysotile was found in small amount with polytype $2O_{rc1}$; the small particles form aggregates; there are two polytypes $2M_{c1}$, and D_c; lizardite forms aggregates with chrysotile; antigorite demonstrates well-ordered structure with quadrangle in shape of crystal; this reflects enough space for crystallization during serpentinization; Fe oxide is represented as cubic crystals.

Sample 125-779A-31R-2, 87–89 cm (Piece 11A), Unit 2 [Z-198]

Apomicrogabbro cataclasite. Hardly visible pseudomorphs above plagioclase and possibly clinopyroxene are present. Primary texture of rock unrecognizable. Primary minerals are smashed to pieces, separated, and almost completely replaced with clay minerals. Oxidized opaque minerals occurs in minor (<1%) amounts. Judging from diamond-shaped pseudomorphs of iddingsite(?) rock contained olivine. It is probable that hydrogrossular(?) is present also.

Alteration: very strong (99%).

XRD: chlorite.

Sample 125-779A-31R-3, 30–34 cm (Piece 4), Unit 2 [Z-682]

Volcanic (basalt) breccia completely replaced by smectites.

XRD: chlorite.

Sample 125-779A-31R-CC, 10–12 cm (Piece 2), Unit 2 [Z-199]

Olivine-clinopyroxene-plagioclase-microphyric basalt, fine grained, incompletely crystallized, vesicular (0.5–2 mm, ~1%). Microphenocrysts; glomerophyric segregates diamond-shaped crystals of clinopyroxene with admixture of olivine. Rock contains elongated-tabular crystals of plagioclase. In total microphenocrysts are ~10%–20% abundance. Quantitatively they are about equal in amounts. Groundmass; small laths of plagioclase (40%–50%), crystals of pyroxene, oxidized opaque dust, and small areas (0.1–0.5 mm) interstitial volcanic glass. Hydrogrossular(?) tends to occur within the latter. Texture of rock is pilotaxic.

Alteration: strong (50%–60%); smectites, chlorite, carbonate, hydrogarnet, Fe oxides and Fe hydroxides replace both rock-forming minerals and interstitial glass, as well as occur in vesicles; single cracks are filled with calcite.

XRD: chlorite.

Sample 125-779A-34R-1, 63–65 cm (Piece 5A), Unit 2 [Z-200]

Apoharzburgite serpentinite, tectonized. Primary minerals almost completely replaced with serpentine. Sparsely relicts of orthopyroxene (2.5–4 mm, 1%–5%) and spinel (up to 1.5–2 mm, single grains).

Alteration: very strong (95%); secondary minerals are represented by serpentine (90%–95%), amphibole (actinolite), chlorite, and Fe hydroxides; serpentine forms chrysotile-antigorite aggregate in groundmass; amphibole and chlorite occur along cleavage faces in orthopyroxene; Fe hydroxides impregnate serpentine which replaces olivine.

XRD: serpentine.

Sample 125-779A-35R-1, 118–122 cm (Piece 10), Unit 2 [Z-201]

Apodunitic serpentinite. Primary minerals almost completely replaced with serpentine. Sparsely relicts of crystals of olivine (10%–15%), orthopyroxene (single smashed to pieces crystals up to 1.5–2 mm in length), spinel (up to 1.5 mm, <1%), and chromite (0.01–0.03 mm, single grains). Amphibole, most probably with chlorite, occur along cleavage faces of orthopyroxene.

Alteration: very strong (~90%); secondary minerals are represented by serpentines (80%–90%), amphibole(?) with admixture chlorite (1%–3%), and Fe oxides.

XRD: serpentine; bifurcated reflex 3.64C and 3.62C - two varieties of serpentine mineral are probably present.

Electron micrograph: b = 9.29 Å (serpentine).

Electron microscopy: chrysotile has length-slight fibber in shape and its total amount is ~10%–30%; there are two polytypes $2O_{rc1}$, and D_c; antigorite has well-ordered structure with sharp edges and quandrangle in shape; Fe oxide is represented as cubic crystals; lizardite is <chrysotile and morphologically it close to antigorite.

Hole 780C

Sample 125-780C-18R-1, 31–34 cm (Piece 2A), Unit 2 [Z-1388]

Verlite serpentinized (apoverlite serpentinite), tectonized. Rock; olivine (95%), clinopyroxene (5%), and spinel (<1%).

Alteration: very strong (75%); rock partly is oxidized (10%); olivine partly (70%) is serpentinized; clinopyroxene partly (30%–40%) replaced by calcite and Fe hydroxides; spinel is oxidized; microcracks are filled with small grains of magnetite.

Sample 125-780C-18R-1, 42–45 cm (Piece 2A), Unit 2 [Z-1389]

Lercolite serpentinized, tectonized. Rock; olivine (60%), orthopyroxene (25%), clinopyroxene (10%), and spinel (5%).

Alteration: moderate (40%–45%); rock partly is oxidized (2%–3%); olivine partly (40%) is serpentinized; pyroxenes are fresh (orthopyroxene is serpentinized ~5%), spinel is oxidized; microcracks are filled with serpentine.

Hole 786B

Sample 125-786B-4R-1, 142–144 cm (Piece 30), Unit 1 [Z-202]

Olivine-pyroxene-plagioclase-microphyric andesite-basalt (boninite?), fine grained, scarcely vesicular. Microphenocrysts of plagioclase (0.5–2 mm, 7%–10%), orthopyroxene (0.5–1.5 mm, 5%–7%), olivine (0.05–0.7 mm, 2%–5%), and single crystals of spinel (<1 mm). Groundmass is microlitic texture; poorly crystallized volcanic glass with small amounts of small laths of plagioclase, pyroxene, and opaque dust. Vesicles (~0.5 mm,

<1%) as a rule empty, occasionally filled with either devitrified volcanic glass which is impregnated with opaque dust or smectites. Within some vesicles rounded droplike aggregates of opaque matter (sulfides?).

Alteration: slight (<5%); olivine is replaced by smectites and Fe oxides, occasionally with calcite; orthopyroxene is replaced by smectites along margins and cleavage faces.

XRD: smectite with ~20% mica layers.

Sample 125-786B-5R-1, 25–27 cm (Piece 4A), Unit 1 [Z-203]

Twopyroxene-olivine-plagioclase-microphyric andesite (boninite), fine grained, sparsely vesicular. Microphenocrysts of plagioclase (0.5–2 mm, 5%–7%), orthopyroxene (up to 1.5–2 mm, 5%–7%), clinopyroxene (0.1–0.7 mm, 1%–4%), and olivine (0.3–1.2 mm, <1%). Groundmass is microlitic texture; volcanic glass with small amounts small laths of plagioclase, pyroxene, and opaque dust. Vesicles (0.5–2 mm, <1%) are filled with zeolite, occasionally walls of vesicles are lined with smectites. Thin cracks are filled with zeolite.

Alteration: slight (~10%); olivine is replaced with smectites and Fe oxides, occasionally with calcite; orthopyroxene is replaced with smectites along margins and cleavage faces.

Electron micrograph: b = 9.16 Å (smectite).

Sample 125-786B-6R-1, 100–104 cm (Piece 24), Unit 2 [Z-1390]

Hypersthene-plagioclase-phyric andesite (boninite), sparsely vesicular. Phenocrysts (5%–7%): idiomorphic grains (2%–3%, 0.6–0.8 mm) of hypersthene (orthopyroxene) and altered prismatic grains (0.5–0.7 mm) of plagioclase. Groundmass is pilotaxitic texture; microlites of plagioclase (20%), clino- and orthopyroxene (10%), light greenish cream volcanic glass (55%–60%), and opaque minerals (2%–3%).

Alteration: slight (~3%–4%); plagioclase completely replaced by opal(?), brownish green hydromica, and clay mineral.

Sample 125-786B-6R-2, 38–40 cm (Piece 8), Unit 2 [Z-204]

Olivine-microphyric basalt, fine grained almost aphanitic, sparsely vesicular. Microphenocrysts of olivine (0.2–2 mm, 3%–5%), plagioclase (up to 2 mm, single grains), and clinopyroxene (0.07–0.5 mm, <1%). Groundmass is pilotaxitic texture; small laths of plagioclase, crystals of pyroxene, and small grains of opaque minerals. Vesicles (0.1–0.3 mm, 2%–5%) as a rule empty. Walls of vesicles are lined with green smectites, occasionally they are filled with carbonate.

Alteration: slight (~10%); olivine is replaced with carbonate, Fe oxides, occasionally with admixture of zeolite.

XRD: smectite with ~20% of mica layers.

Electron micrograph: b = 9.26 Å (trioctahedral smectite).

Sample 125-786B-8R-1, 96–99 cm (Piece 17), Unit 3 [Z-1391]

Twopyroxene-plagioclase-phyric andesite. Phenocrysts (20%–25%): grains and glomerophyric segregates of plagioclase, orthopyroxene, and clinopyroxene. Groundmass is vitrophyric texture; prismatic grains (0.4–1.5 mm) of plagioclase (15%, andesine [$An_{47–49}$]), idiomorphic grains (0.5–1.2 mm) of orthopyroxene (2%–3%), idiomorphic grains of clinopyroxene (7%–8%), and brown glass (75%–80%).

Alteration: rock is fresh.

Sample 125-786B-9R-1, 0–7 cm (Piece 1), Unit 3 [Z-1392]

Twopyroxene-plagioclase-phyric andesite, vesicular. Phenocrysts (20%): hypersthene (2%), pigeonite (5%), and plagioclase (13%). Groundmass is vitrophyric texture; prismatic grains (0.3–0.5 mm) of pyroxenes, prismatic and elongated-prismatic grains (0.3–0.7 mm) of plagioclase (labradorite [An_{59}]), and cream glass (80%) with crystals of plagioclase and pyroxene.

Sample 125-786B-15R-1, 46–54 cm (Piece 7), Unit 3 [Z-1393-1]

Twopyroxene-plagioclase-phyric andesite. Phenocrysts (15%): prismatic grains (0.3–0.8 mm) of plagioclase (10%, labradorite [$An_{55–56}$]), orthopyroxene (1%), and clinopyroxene (4%). Groundmass is vitrophyric texture; glass (80%) with crystals of plagioclase and pyroxene, and opaque minerals (2%–3%). Vesicles (5%) are present.

Alteration: rock is fresh.

Sample 125-786B-15R-2, 126–130 cm (Piece 18), Unit 3 [Z-1394]

Lava breccia. Rock; angular fragments (1–5 mm) of andesite, matrix consists of small (up to 1 mm) angular fragments of andesite and angular fragments of light brown glass. Andesite: twopyroxene-plagioclase-phyric, vesicular. Phenocrysts (20%): hypersthene (2%–3%), pigeonite (2%–3%), and plagioclase (15%, labradorite [An_{56}]). Groundmass is vitrophyric texture; light cream glass (75%) with crystals of plagioclase and pyroxene.

Vesicles (2%–3%) are rounded (0.6 mm) and oval (1.5 mm) in shape, vesicles are empty. Microcracks are filled with opaque minerals.

Alteration: rock is fresh.

Sample 125-786B-16R-2, 8–12 cm (Piece 2), Unit 3 [Z-1395]

Twopyroxene-plagioclase-phyric andesite, vesicular. Phenocrysts (5%): hypersthene and pigeonite (1%, 0.2–0.4 mm), and prismatic grains (0.4–0.7 mm) of plagioclase (4%, labradorite [An_{60}]). Groundmass is vitrophyric texture; glass (80%) with crystals of plagioclase and pyroxene. Vesicles (15%, up to 2.5 mm) are rounded in shape, empty.

Alteration: rock is fresh.

Sample 125-786B-18R-1, 8–13 cm (Piece 2), Unit 4 [Z-1396]

Twopyroxene-plagioclase-phyric andesite, vesicular. Phenocrysts (25%): prismatic grains (0.4–0.6 mm) of hypersthene (1%), small grains (0.3–0.5 mm, single idiomorphic grain 1.7 mm) of pigeonite (4%), and prismatic and tabular grains (0.2–0.9 mm) of plagioclase (20%, labradorite [An_{60}]). Groundmass is vitrophyric texture; light cream glass (60%) with crystals of plagioclase and pyroxene. Vesicles (15%, 0.4–3.5 mm) are rounded and oval in shape, empty.

Alteration: rock is fresh.

Sample 125-786B-19R-1, 6–10 cm (Piece 2), Unit -4 [Z-1397]

Twopyroxene-plagioclase-phyric andesite, vesicular. Phenocrysts (15%): hypersthene (<1%), pigeonite (2%), and plagioclase (12%–13%, labradorite [An_{58-60}]). Phenocrysts are small (up to 0.5 mm) idiomorphic grains. Groundmass is vitrophyric texture; light cream glass (75%) with crystals of plagioclase and pyroxene. Vesicles (15%, 0.4–4.5 mm) are rounded and oval in shape, empty.

Alteration: rock is fresh.

Sample 125-786B-20R-1, 85–89 cm (Piece 14), Unit4 [Z-205]

Twopyroxene-olivine-microphyric andesite-basalt (boninite?), fine grained, sparsely vesicular. Microphenocrysts of orthopyroxene (0.3–0.5 mm, 1%–3%), clinopyroxene (0.1–0.5 mm, <1%), and olivine (0.5–1.5 mm, <1%). Groundmass is pilotaxitic texture; small laths of plagioclase, crystals of pyroxene, and small xenomorphic grains of opaque minerals. Occasionally, vesicles (0.5–2 mm, 1%–5%) are filled with zeolite or smectites with small grains of opaque minerals; walls vesicles are lined with smectites.

Alteration: slight (~10%–15%); olivine is replaced by smectite-chlorite aggregate with small grains of opaque minerals, occasionally with admixture of zeolite.

XRD: smectite with ~20% mica layers; trace chlorite(?).

Sample 125-786B-21R-2, 47–49 cm (Piece 3), Unit 7 [Z-206]

Twopyroxene-olivine-microphyric andesite-basalt (boninite?), fine grained, sparsely vesicular. Microphenocrysts of orthopyroxene (0.2–0.5 mm, 1%), clinopyroxene (0.2–0.5 mm, 1%–2%), and olivine (0.5–1 mm, 1%–3%). Groundmass is pilotaxitic texture; small laths of plagioclase, crystals of pyroxene, small xenomorphic grains of opaque minerals, and interstitial glass (10%–15%). Vesicles (0.5–2 mm, 5%–7%) are filled partly with black volcanic glass with opaque dust, center of vesicles present of carbonate. A crack 0.7–1.5 mm thick is filled with carbonate.

Alteration: moderate (~25%–30%); olivine is completely replaced with carbonate; thin opacite rim is built of Fe oxides; orthopyroxene is replaced with smectite–chlorite aggregate and amphibole along margins crystals and on cleavage faces; interstitial glass is replaced with green smectites.

XRD: smectite with ~20% mica layers.

Sample 125-786B-24R-1, 133–135 cm (Piece 12), Unit 9 [Z-207]

Twopyroxene-plagioclase-phyric andesite-dacite, glassy, vesicular. Phenocrysts of orthopyroxene (0.3–0.5 mm, 1%), clinopyroxene (0.2–0.7 mm, <1%), plagioclase (0.3–1.5 mm, 1%–2%), and magnetite (single grains). Groundmass is microlitic or hyalopilitic texture; volcanic glass with small laths of plagioclase. Vesicles (0.2–0.5 mm, 5%–7%) are partly or completely filled with zeolites, occasionally with black volcanic glass containing opaque dust. Hair-thin cracks are filled with smectites and zeolite.

Alteration: slight (~10%).

XRD: smectite with ~15% mica layers; trace chlorite(?).

Sample 125-786B-24R-1, 135–140 cm (Piece 22), Unit 9 [Z-1400]

Plagioclase-phyric andesite, vesicular. Phenocrysts (10%): prismatic grains (0.4–0.7 mm) of plagioclase (labradorite [An_{56}]). Groundmass is hyalopilitic texture; needle-shaped microlites (0.05–0.1 mm) of plagioclase and light cream glass (85%) with crystals of pyroxene. Vesicles (5%–7%, 0.2–0.5 mm) are rounded in shape, vesicles are empty and lined zeolite.

Alteration: rock is fresh.

XRD: phillipsite; trace smectite; white vein: phillipsite; trace smectite.

Sample 125-786B-25R-1, 82–86 cm (Piece 11), Unit 9 [Z-1401]

Clinopyroxene-plagioclase-phyric andesite-basalt, vesicular. Phenocrysts (5%): prismatic grains (0.3–0.6 mm) of plagioclase (4%, labradorite [An_{62}] and andesine [An_{38}]) and clinopyroxene grains (1%), 0.2–0.4 mm. Groundmass is vitrophyric texture; gray glass (75%) with crystals of plagioclase, pyroxene, and opaque dust. Vesicles (20%, 0.2–1.7 mm) are rounded and oval in shape, empty.

Alteration: slight.

Sample 125-786B-26R-1, 50–55 cm (Piece 7), Unit 9 [Z-1402]

Clinopyroxene-plagioclase-phyric andesite-basalt, vesicular. Phenocrysts (5%): prismatic and tabular grains (0.3–0.8 mm) of plagioclase (4%) and clinopyroxene grains (1%). Groundmass is vitrophyric texture; cream-gray glass (65%–70%) with crystals of plagioclase and pyroxene. Vesicles (30%–35%, 0.2–1.8 mm) are isometric in shape, empty.

Alteration: rock is fresh; needless of zeolite are lined of vesicle walls.

Sample 125-786B-27R-1, 58–62 cm (Piece 8), Unit 9 [Z-1403]

Lava breccia. Rock; angular fragments (2.5–10 mm) of andesite. Matrix consists of small (up to 1 mm) angular fragments of colorless glass with sparse grains of hypersthene, pigeonite, and plagioclase (2%–3% in total).

Alteration: rock is fresh.

Sample 125-786B-27R-2, 48–51 cm (Piece 6), Unit 11 [Z-208]

Twopyroxene-plagioclase-phyric andesite (boninite?), glassy, vesicular. Phenocrysts of orthopyroxene (1–2 mm, 5%), clinopyroxene (up to 1.5 mm, 2%), and plagioclase (0.5–2.5 mm, 7%). Groundmass is pilotaxitic texture; volcanic glass with small laths of plagioclase. Vesicles (0.2–0.5 mm, 3%–5%) are empty or occasionally party or completely filled with zeolite.

Alteration: moderate (~20%–30%); interstitial glass is replaced by smectites.

XRD: smectite with ~20% mica layers; trace chlorite(?).

Electron micrograph: $b = 9.26$ (trioctahedral smectite).

Sample 125-786B-30R-3, 31–33 cm (Piece 4), Unit 11 [Z-209]

Twopyroxene-plagioclase-phyric andesite (boninite), fine grained, sparsely vesicular. Phenocrysts of orthopyroxene (0.7–1.5 mm, 7%–10%), clinopyroxene (up to 2–2.5 mm, 3%–5%), plagioclase (up to 2–3 mm, 10%), and olivine (0.5–2 mm, <1%). Groundmass is hyalopilitic or pilotaxitic texture; volcanic glass with small laths of plagioclase, pyroxene, and opaque dust. Single small vesicles and hair-thin cracks are filled with smectites.

Alteration: slight (~10%–15%); orthopyroxene is replaced with smectites and serpentine(?) along cracks and crystal margins; olivine is completely replaced with smectites, carbonate, and opaque minerals; the latter form opacite rims around carbonate fragments in olivine; interstitial glass is replaced with green smectites.

XRD: smectite with ~20% mica layers, cristobalite(?).

Sample 125-786B-31R-2, 30–34 cm (Piece 3), Unit 11 [Z-683]

Olivine(?)-twopyroxene-plagioclase-phyric andesite-basalt (boninite?), massive. Phenocrysts (30%) of orthopyroxene (up to 0.9 mm), clinopyroxene (0.5–0.7 mm), plagioclase (0.3–2 mm, labradorite [An_{60}] and andesine-labradorite [An_{50}]), and completely altered grains (0.1–0.3 mm) of olivine (<1%). Groundmass is hyalopilitic texture; brownish green volcanic glass and microlites of plagioclase and clinopyroxene.

Alteration: olivine is completely replaced with carbonate and Fe hydroxides; cracks in orthopyroxene grains are filled with clay mineral.

Sample 125-786B-32R-1, 39–41 cm (Piece 8), Unit 11 [Z-210]

Twopyroxene-olivine-plagioclase-phyric andesite (boninite?), fine grained, sparsely vesicular. Phenocrysts of orthopyroxene (0.5–1.5 mm, 5%), clinopyroxene (0.3–2 mm, 1%–3%), olivine (0.2–1.5 mm, 1%), and plagioclase (0.1–2 mm, 10%). Groundmass is pilotaxitic texture; volcanic glass, small laths of plagioclase,

crystals of pyroxene, opaque dust, and small grains of opaque minerals. Single small vesicles are filled with green smectites.

Alteration: slight to moderate (~15%–30%); olivine is replaced with smectites, carbonate, and Fe oxides; orthopyroxene is replaced with smectites along margins and transversal cracks; interstitial glass partly is replaced with smectites; patches of Fe oxides are present.

XRD: smectite with ~20% mica layers, cristobalite(?); trace hydromica.

Electron micrograph: b = 9.19 Å (trioctahedral smectite).

Sample 125-786B-34R-2, 41–43 cm (Piece 4), Unit 15 [Z-211]

Twopyroxene-olivine-microphyric basalt, fine grained, vesicular. Microphenocrysts of orthopyroxene (0.7–2 mm, 1%), clinopyroxene (3%–5%), and olivine (0.3–1.5 mm, 3%–5%). Groundmass is intersertal (occasionally pilotaxitic) texture; incompletely crystallized volcanic glass with small laths of plagioclase, xenomorphic small crystals of pyroxene, and patches of opaque minerals. Vesicles (0.1–0.3 mm, 10%–15%) and cracks filled smectites, occasionally with zeolite or calcite.

Alteration: slight to moderate (~15%–30%); olivine is replaced completely with carbonate, often it is surrounded by Fe oxides with opacite rim; orthopyroxene is replaced with smectites along margins and transversal cracks; in central parts it is replaced with carbonate; interstitial glass is replaced with smectites.

XRD: smectite with ~20% mica layers; trace cristobalite(?) and calcite.

Electron micrograph: b = 9.19 Å (trioctahedral smectite).

Sample 125-786B-34R-4, 11–13 cm (Piece 1B), Unit 15 [Z-212]

Twopyroxene-olivine-microphyric basalt, fine grained. Microphenocrysts of orthopyroxene (0.3–1 mm, 5%), clinopyroxene (0.2–0.5 mm, 1%), and olivine (0.3–0.7 mm, 3%–5%). Groundmass is intersertal texture, partly pilotaxitic; laths of plagioclase, xenomorphic small crystals of pyroxene, and interstitial volcanic glass with rare and small crystals of opaque minerals (magnetite?). Cracks (up to 2 mm thick) are filled with carbonate. Chlorite occur along salbands.

Alteration: moderate to strong (~30%–50%); olivine is completely replaced with carbonate and chlorite (in central parts); iddingsite with inclusions of Fe oxides and opacite rim replace olivine along crystal margins; orthopyroxene is replaced with chlorite and amphibole(?) along cracks; interstitial glass is replaced with green smectites.

XRD: smectite with ~20% mica layers; trace cristobalite(?), hydromica, quartz(?), and calcite.

Sample 125-786B-35R-2, 29–31 cm (Piece 4), Unit 15 [Z-213]

Two pyroxene-plagioclase-phyric dacite, fine grained, highly vesicular. Phenocrysts of orthopyroxene (0.5–1.5 mm, 2%), clinopyroxene (0.3–0.7 mm, <1%), plagioclase (0.5–2 mm, 5%), and olivine (0.5–2 mm, <1%). Groundmass is hyalopilitic to variolitic texture; patchy volcanic glass (brownish gray and light green) with small laths of plagioclase, pyroxene, and opaque dust. Vesicles (0.2–2.5 mm, 15%–20%) as a rule are empty, walls are lined with smectites; zeolite and opaque minerals occur sporadically.

Alteration: clinopyroxene is replaced by smectites and zeolite(?); inclusions of glass in plagioclase are replaced with smectites.

XRD: smectite with ~20% mica layers, cristobalite(?); trace hydromica.

Sample 125-786B-37R-2, 97–99 cm (Piece 12A), Unit 15 [Z-214]

Sparsely pyroxene-plagioclase-phyric basalt (andesite-basalt?), glassy, vesicular. Groundmass is hyalopilitic texture; black devitrified volcanic glass with small laths of plagioclase, pyroxene, and opaque dust. Vesicles (0.5–5 mm, 10%–15%) and cracks are filled by carbonate.

Alteration: rock is fresh.

XRD: smectite with ~20% mica layers; trace cristobalite(?) and calcite.

Sample 125-786B-39R-1, 39–42 cm (Piece 10), Unit 15 [Z-1404]

Twopyroxene-plagioclase-phyric andesite, vesicular. Phenocrysts (25%): single idiomorphic grains (0.2–0.4 mm) of hypersthene and pigeonite (2% in total); glomerophyric segregates of prismatic grains (0.1–0.9 mm) of plagioclase (24%, labradorite [An_{58}] and andesine [An_{42}]). Phenocrysts are small (up to 0.5 mm) idiomorphic grains. Groundmass is vitrophyric texture; needle-shaped microlites of plagioclase (10%, andesine [An_{32}]), colorless glass (50%) with crystals of plagioclase and pyroxene, and opaque minerals (5%). Vesicles (25%, 0.1–0.2 mm) are isometric in shape, vesicles are empty.

Alteration: rock is fresh.

Sample 125-786B-39R-2, 13–17 cm (Piece 3), Unit 15 [Z-1405]

Lava (tuff?) breccia. Rock; angular fragments (0.5–4 mm) of pyroxene-plagioclase-phyric andesite. Phenocrysts (25%): single grains of clinopyroxene and glomerophyric segregates of prismatic grains (0.2–0.8 mm) of plagioclase (labradorite [An_{55}]). Groundmass is vitrophyric texture; cream glass (50%) with microlites of plagioclase, crystallites of pyroxene, and opaque dust.

Alteration: strong (50%); glass almost completely (80%) replaced by clay mineral; matrix (15%); zeolite.

Sample 125-786B-39R-2, 32–35 cm (Piece 4A), Unit 16 [Z-1406]

Twopyroxene-plagioclase-phyric andesite, vesicular. Phenocrysts (15%): hypersthene (4%), pigeonite (1%), and plagioclase (10%, labradorite [An_{55}] and andesine [An_{48}]). Groundmass is vitrophyric texture; glass with microlites and crystallites of plagioclase and pyroxene, and opaque minerals (5%). Vesicles (1–5 mm) are elongated oval in shape, empty. Walls of vesicles are lined with glass.

Alteration: rock is fresh.

Sample 125-786B-40R-1, 25–29 cm (Piece 6), Unit 16 [Z-1407]

Vitro-clastic tuff, moderate-fragmented, andesitic composition. Rock; angular fragments (0.1–7 mm) of volcanic glass with grains (1%) of pyroxene and plagioclase. Microvesicles (10%–30%) are empty.

Alteration: moderate to strong; brownish gray to light cream glass almost completely (80%) replaced by clay mineral; fragments of glass are oxidized; matrix; clay.

XRD: cristobalite; trace smectite, quartz, and amphibole.

Sample 125-786B-40R-2, 17–19 cm (Piece 15E), Unit 17 [Z-215]

Olivine-phyric basalt, fine grained, sparsely vesicular. Phenocrysts of olivine (0.3–2 mm, 10%–15%). Groundmass is intersertal texture; small laths of plagioclase, crystals of clinopyroxene, small grains of opaque minerals, and patches of interstitial glass. Sparsely vesicles (1.5–4 mm) are completely filled with calcite.

Alteration: moderate (~30%); olivine is replaced with smectites, carbonate, Fe oxides, and, occasionally, serpentine(?); interstitial glass is replaced with smectites with calcite and/or with calcite.

XRD: smectite with ~20% mica layers; trace cristobalite(?) and calcite.

Electron micrograph: b = 9.23 Å (trioctahedral smectite and mica).

Sample 125-786B-40R-3, 46–50 cm (Piece 1C), Unit 17 [Z-684]

Hypersthene(?)-olivine-phyric basalt, massive. Phenocrysts (1%): completely altered hypersthene (4%), pigeonite (1%), and plagioclase (10%, labradorite [An_{55}] and andesine [An_{48}]). Groundmass is pilotaxitic texture; needle-shaped microlites of plagioclase, panicle like grains of clinopyroxene, and altered glass. Isometric grains (0.1–0.2 mm) of orthoclase(?) are present (15%).

Alteration: phenocrysts completely replaced by clay mineral and carbonate; clay mineral replaces interstitial glass.

Sample 125-786B-42R-3, 116–120 cm (Piece 10C), Unit 19 [Z-685]

Twopyroxene-plagioclase-phyric andesite-basalt (boninite?), massive. Phenocrysts (40%–45%, from 0.1–0.2 mm to 0.3–1 mm): sparse grains of hypersthene (<1%) and clinopyroxene (augite) form idiomorphic grains and their segregates. Plagioclase (labradorite [An_{60}]) forms prismatic and tabular grains (0.5–1.5 mm). Plagioclases contain inclusions of glass. Groundmass is vitrophyric texture; black glass with opaque dust.

Alteration: slight (15%); hypersthene almost completely replaced by chlorite; rims of clinopyroxene grains replaced by clay mineral; interstitial glass partly (10%) is replaced with clay mineral.

Sample 125-786B-43R-2, 81–83 cm (Piece 7), Unit 19 [Z-258]

Pyroxene-plagioclase-phyric andesite (boninite?). Phenocrysts of orthopyroxene (0.05–0.7 mm, 1%–5%), clinopyroxene (0.07–1 mm, 1%), and plagioclase (0.1–1.5 mm, 5%–7%). Groundmass is hyaline texture; gray volcanic glass with crystals of pyroxene and opaque dust, and small isomorphic diamond-shaped crystals of olivine. Vesicles (0.5–2 mm, 5%–7%) are filled partly with black volcanic glass containing opaque dust, nuclear parts of vesicles are built of carbonate. A cracks 0.7–1.5 mm thick is filled with carbonate.

Alteration: slight (~10%–15%); olivine is completely filled with smectites.

XRD: smectite with ~20% mica layers; trace cristobalite(?) and hydromica (~20% swelling interlayers).

Sample 125-786B-44R-1, 21–25 cm (Piece 4), Unit 19 [Z-686]

Pyroxene-plagioclase-phyric basalt, massive. Phenocrysts (15%): idiomorphic prismatic and tabular grains (0.4–1.5 mm) of clinopyroxene and completely altered plagioclase grains. Groundmass is pilotaxitic intersertal texture; microlites of plagioclase and segregate of small grains of clinopyroxene. Intersticies consist of altered glass.

Alteration: moderate (30%–40%); phenocrysts completely replaced by clay mineral; clay mineral replaces glass.

Sample 125-786B-46R-2, 67–72 cm (Piece 8C), Unit 19 [Z-1408]

Crystal-vitric tuff (breccia). Large (up to 15 mm) isometric fragments are represented by twopyroxene-plagioclase-phyric andesite with vitrophyric texture, vesicular (vesicles are empty). Matrix (30%); small (0.1–0.5 mm) angular fragments of glass and crystals of pyroxene and plagioclase, they are cemented by brown clay.

Alteration: rock is fresh.

Sample 125-786B-48R-1, 98–102 cm (Piece 8), Unit 19 [Z-1409]

Breccia. Rock; rounded fragments (90%, 1–15 mm) of twopyroxene-plagioclase-phyric andesite with vary textures and matrix (10%). Matrix consists of small (0.1–0.4 mm) fragments of andesite and clay.

Alteration: fragments of andesite are fresh.

XRD: trace smectite, chlorite, quartz, and hydromica(?).

Sample 125-786B-48R-2, 85–88 cm (Piece 11), Unit 19 [Z-1410]

Lithoclastic breccia. Rock; fragments (90%, up to 20 mm) of twopyroxene-plagioclase-phyric andesite with vitrophyric textures, vesicular (they are empty), and matrix (10%). Groundmass: light cream glass.

Alteration: fragments of andesite are fresh.

Sample 125-786B-49R-2, 90–95 cm (Piece 4C), Unit 19 [Z-1411]

Lithoclastic breccia. Rock; fragments (99%, 4–10 mm) of twopyroxene-plagioclase-phyric andesite with vitrophyric textures, vesicular (they are empty), and matrix (1%). Groundmass: light cream glass (65%).

Alteration: breccia is replaced with clay mineral and oxidized (70%–80%); one fragment of andesite is completely oxidized; interstices glass from fragments of andesite replaced by clay mineral; matrix of breccia; clay mineral and zeolite.

XRD: smectite; trace phillipsite; gray-yellow matrix: phillipsite; trace smectite.

Sample 125-786B-50R-1, 27–30 cm (Piece 4A), Unit 19 [Z-1412]

Lava breccia. Rock; fragments (1–10 mm) of pyroxene-plagioclase-phyric andesite (phenocrysts: 20%, volcanic glass: 80%). Matrix (10%) consists of angular fragments of plagioclase and pyroxene, and cream glass.

Alteration: rock is fresh.

Sample 125-786B-51R-2, 0–5 cm (Piece 1), Unit 19 [Z-1413]

Twopyroxene-plagioclase-phyric andesite (boninite), vesicular. Phenocrysts (20%): idiomorphic grains (15%, 0.2–0.9 mm) of orthopyroxene (hypersthene-bronzite) (<1%), grains of augite (2%), and prismatic grains (0.5–1.5 mm) of plagioclase (labradorite [An_{55}]). Groundmass is vitrophyric texture; light cream glass (70%) with crystals of plagioclase and pyroxene. Vesicles (10%, 0.5–1.5 mm) are elongated-oval in shape. Vesicles are empty and encrusted by glass.

Alteration: one vesicle is filled with zeolite; microcrack (0.4 mm) infilled with zeolite and clay mineral.

Sample 125-786B-52R-1, 10–13 cm (Piece 2), Unit 19 [Z-1414]

Lava breccia. Rock; fragments (80%, 1–15 mm) of olivine-twopyroxene-phyric boninite (phenocrysts: 20%, colorless volcanic glass: 80%). Matrix (20%) consists of angular fragments of groundmass and phenocrysts from boninite. Phenocrysts cemented by cream glass or dark brown clay and carbonate.

Alteration: slight (5%); olivine completely replaced by iddingsite, opal(?), and carbonate.

Sample 125-786B-53R-1, 25–30 cm (Piece 1C), Unit 19 [Z-1415]

Olivine-twopyroxene-plagioclase-phyric andesite (boninite), vesicular. Phenocrysts (35%) are represented by olivine (1%), orthopyroxene (25%), clinopyroxene (4%), and plagioclase (5%). Groundmass is vitrophyric texture; small grains (0.2–0.6 mm) of completely altered olivine, xenomorphic grains (0.5–1.7 mm) of orthopyroxene, xenomorphic small grains (up to 0.9 mm) of augite, prismatic grains (0.4–1.2 mm) of plagioclase (0.3–2 mm, labradorite [An_{60}]), and glass. Vesicles (5%, 0.3–2.5 mm) are elongated-isometric and oval in shape. Vesicles are empty and encrusted by cream glass.

Alteration: olivine is completely replaced with iddingsite and opal(?); several vesicles (<1%) consist of carbonate.

Sample 125-786B-54R-1, 55–60 cm (Piece 6A), Unit 19 [Z-1416]

Lava breccia. Rock; fragments (85%, up to 12 mm) of olivine-twopyroxene-plagioclase-phyric boninite (phenocrysts: 25%, volcanic glass: 70%, and vesicles: 5%). Matrix (15%) consists of angular fragments (0.5–1.5 mm) of boninite. Fragments of boninite cemented by glass or dark brown clay and carbonate.

Alteration: slight (2%); olivine completely replaced by iddingsite; several (<1%) vesicles are filled with carbonate.

Sample 125-786B-54R-3, 67–71 cm (Piece 1J), Unit 19 [Z-1417]

Tuff. Rock; angular fragments (0.1–1.5 mm) of boninite and more small fragments of orthopyroxene and plagioclase crystals. Cement is absent.

Alteration: rock is fresh.

XRD: smectite.

Sample 125-786B-54R-4, 0–5 cm (Piece 1), Unit 19 [Z-1418]

Lava breccia. Rock; large (8–10 mm) fragments (80%) of boninite. Large fragments cemented by small (0.2–0.5 mm) fragments (15%) of boninite and glass (5%). Rock: identical to Sample 125-786B-54R-1, 55–60 cm (Z-1416).

XRD: trace smectite, chlorite, and quartz.

Sample 125-786B-55R-1, 132–138 cm (Piece 13C), Unit 19 [Z-1419]

Olivine-plagioclase-twopyroxene-phyric andesite (boninite), vesicular, brecciated. Phenocrysts (25%) are represented by olivine (2%), orthopyroxene (15%), clinopyroxene (3%), and plagioclase (5%). Groundmass (65%) is vitrophyric texture; idiomorphic grains (0.3–1.4 mm) of altered olivine, prismatic grains of orthopyroxene and clinopyroxene, prismatic grains (0.4–1.2 mm) of plagioclase (labradorite [An_{56}]) and their segregates (0.3–0.6 mm), and gray glass (1%–2%) with sparse microlites of pyroxene. Vesicles (10%, 0.2–2.5 mm) are elongated-isometric and oval in shape. Vesicles are empty and encrusted by glass.

Alteration: slight (2%); small grains of olivine are completely replaced with iddingsite and carbonate; crack (up to 2.5 mm in thickness) infilled with small (up to 0.6 mm) angular fragments of glass, mineral-phenocrysts from andesite (boninite), and carbonate.

Sample 125-786B-55R-3, 0–5 cm (Piece 1), Unit 19 [Z-1420]

Lava breccia. Rock; large (10–12 mm) fragments (80%) of olivine-twopyroxene-plagioclase-phyric boninite (phenocrysts: 25%, volcanic glass: 70%, and vesicles: 5%). Large fragments cemented by small (0.1–1.2 mm) fragments of boninite, glass, and clay.

Alteration: slight.

Sample 125-786B-56R-1, 20–25 cm (Piece 2B), Unit -19 [Z-1421]

Hypersthene-phyric andesite (boninite), vesicular. Phenocrysts (25%): idiomorphic grains (0.2–0.7 mm) of orthopyroxene (hypersthene-bronzite) and their glomerophyric segregates. Groundmass is vitrophyric texture; colorless glass (50%) with rudimentary crystals of pyroxene. Vesicles (25%, 0.2–0.5 mm) are rounded and oval in shape, they mainly (90%) are filled with greenish glass, other vesicles are empty.

Alteration: rock is fresh.

XRD: smectite; trace erionite; dark green clay from veinlet: smectite with ~20%–25% mica layers, erionite.

Sample 125-786B-56R-1, 97–102 cm (Piece 3), Unit 19 [Z-1422]

Lava breccia. Rock; fragments (0.5–5 mm) of andesite (80%) and light cream glass (20%). Rock: twopyroxene-olivine-plagioclase-phyric andesite (phenocrysts: 15%, volcanic glass: 40%, and vesicles: 30%). Cement: greenish brown glass.

Alteration: rock is fresh.

Sample 125-786B-56R-3, 50–55 cm (Piece 1C), Unit 19 [Z-1423]

Lava breccia. Rock; fragments (1–5 mm) of olivine-orthopyroxene boninite (85%) and colorless and light greenish cream glass (15%). Rock; phenocrysts: 25%, volcanic glass: 50%, and vesicles: 25%. Cement: greenish cream glass.

Alteration: slight.

Sample 125-786B-56R-5, 98–102 cm (Piece 1G), Unit 19 [Z-1424]

Lava breccia (fragments of boninite are cemented by glass). Rock: identical to Sample 125-786B-56R-3, 50–55 cm (Z-1423).

Sample 125-786B-57R-1, 41–43 cm (Piece 1B), Unit 20 [Z-257]

Pyroxene-olivine-phyric hyalobasalt, glassy, massive. Phenocrysts of clinopyroxene (0.08–0.9 mm, <1%), orthopyroxene (1%–5%), and olivine (7%–10%). Groundmass is hyaline intersertal texture; green volcanic glass with opaque dust and small crystals of undetermined mineral.

Alteration: moderate to high (30%–40%); olivine and probably orthopyroxene are completely replaced with smectites.

XRD: smectite with ~20% mica layers.

Electron micrograph: b = 9.18 Å (trioctahedral smectite).

Sample 125-786B-61R-4, 108–114 cm (Piece 6B), Unit 22 [Z-1425]

Plagioclase-phyric rhyolite, crystallized, vesicular. Rock; phenocrysts (15%), groundmass (75%), and vesicles (10%). Phenocrysts: prismatic grains of plagioclase and their segregates (0.5–2.5 mm, oligoclase [An_{29}]), small (0.1–0.3 mm) idiomorphic grains of dark-colored mineral (2%–3%), and idiomorphic grains (0.3 mm) of opaque minerals (1%). Groundmass is micropoikilitic texture; small (0.1 mm) rounded-isometric grains of quartz (1%) and grains of orthoclase with inclusions of microlites of albite (70%). Vesicles (0.1–2.5 mm) are filled with smectites or carbonate.

Alteration: very strong (90%); plagioclase partly replaced by sericite; dark-colored mineral completely replaced by green clay mineral; vesicles are filled with green clay mineral, carbonate and zeolite; microcrack (0.1 mm) completely infilled with carbonate.

XRD: quartz; trace chlorite and hydromica.

Sample 125-786B-61R-5, 37–39 cm (Piece 6), Unit 22 [Z-259]

Aphyric dazite (rhyolite?), poorly crystallized, sparsely vesicular. Rock is hyaline texture; devitrified volcanic glass with crystals of plagioclase, opaque dust, single xenomorphic crystals of K-feldspar. Vesicles filled with smectites or carbonate.

Alteration: moderate (~25%).

XRD: quartz; trace cristobalite(?) and chlorite.

Sample 125-786B-62R-1, 16–18 cm (Piece 2A), Unit 24 [Z-260]

Olivine(?)-pyroxene(?)-phyric hyaloandesite (boninite?), massive. Phenocrysts (15%–20%, sizes up to 2–3 mm) of orthopyroxene, clinopyroxene, and olivine. Groundmass is hyaline-hyolopilitic texture; green-gray volcanic glass with laths of plagioclase, crystals of clinopyroxene and opaque dust, and small xenomorphic crystals of olivine. Vesicles (0.5–2 mm, 5%–7%) filled partly with black volcanic glass with opaque dust, nuclear parts of vesicles are built of carbonate. A crack 0.7–1.5 mm thick is filled with carbonate.

Alteration: moderate (~25%); orthopyroxene, clinopyroxene, and olivine are completely replaced with smectites.

XRD: smectite with ~20% mica layers.

Sample 125-786B-63R-1, 118–121 cm (Piece 13), Unit 25 [Z-687]

Tuff, andesite-basaltic composition. Rock; angular fragments (0.1–5.5 mm) of volcanic glass, sparse fragments of grains of plagioclase (andesine [An_{47}]) and pyroxene. Cement; clay mineral.

Alteration: very strong (95%).

Sample 125-786B-64R-2, 88–92 cm (Piece 12), Unit 26 [Z-1426]

Plagioclase-phyric rhyolite, crystallized, vesicular. Rock; phenocrysts (8%–10%), groundmass (75%), and vesicles (15%). Phenocrysts: prismatic grains (0.6–1.5 mm) of plagioclase. Groundmass is micropoikilitic texture; small (<0.1 mm) rounded-isometric grains of quartz (2%–3%) and grains of orthoclase (60%–65%) with inclusions of plagioclase crystals, and opaque dust (<0.01 mm, 10%). Vesicles (0.2–1.5 mm) are rounded in shape. They are empty or lined by quartz.

Alteration: slight (10%–15%); plagioclase replaced by albite and undetermined mineral; orthoclase replaced by pelite; single vesicles infilled with carbonate.

Sample 125-786B-64R-3, 76–78 cm (Piece 8A), Unit 26 [Z-261]

Aphyric andesite-basalt, almost completely crystallized, sparsely vesicular. Microphenocrysts of plagioclase (0.5–2 mm, 7%–10%), orthopyroxene (0.5–1.5 mm, 5%–7%), olivine (0.05–0.7 mm, 2%–5%), and single crystals of spinel (<1 mm). Rock intersertal texture, partly taxitic; laths of plagioclase, pyroxene, opaque minerals, and interstitial glass (5%–7%), occasionally with hypidiomorphic grains of quartz. Vesicles (0.1–0.3 mm, ~5%) partly or completely filled smectites.

Alteration: moderate (25%–30%); interstitial glass and clinopyroxene (partly) is replaced with smectites.

XRD: smectite with ~20% mica layers.

Sample 125-786B-65R-1, 40–44 cm (Piece 3), Unit 26 [Z-688]

Sparsely pyroxene-phyric andesite-basalt (boninite?), massive. Phenocrysts: single glomerophyric segregate of three clinopyroxene grains (0.3 mm). Groundmass is pilotaxitic texture; microlites of plagioclase, very small grains of pyroxene, and interstitial glass with opaque dust.

Alteration: moderate (~30%); two grains of clinopyroxene replaced by clay mineral and carbonate; clay mineral replaces glass; carbonate replaces groundmass.

Sample 125-786B-65R-1, 102–107 cm (Piece 13), Unit 26 [Z-1427]

Plagioclase-phyric rhyolite, crystallized, vesicular. Rock; phenocrysts (10%), groundmass (70%), and vesicles (20%). Phenocrysts: prismatic grains (1.2–2.5 mm) of plagioclase. Groundmass is micropoikilitic texture; small (<0.1 mm) rounded-isometric grains of quartz (7%–8%), small isometric grains (0.1 mm) of orthoclase (60%) with inclusions of plagioclase crystals, and opaque dust. Vesicles (0.2–0.9 mm) are oval and isometric in shape. They are empty (5%) or lined by quartz.

Alteration: moderate (30%–40%); plagioclase replaced by undetermined mineral; occasionally single large (2.5 mm) phenocrysts of plagioclase completely replaced by carbonate (dominant) and clay mineral (trace); orthoclase replaced by pelite.

Sample 125-786B-65R-3, 39–41 cm (Piece 6), Unit 26 [Z-1428]

Plagioclase-phyric rhyolite with micropoikilitic texture, crystallized, vesicular. Rock: identical to Sample 125-786B-65R-1, 102–107 cm (Z-1427).

Sample 125-786B-65R-3, 48–52 cm (Piece 7), Unit 786B-26 [Z-689]

Tuff, andesite-basaltic (boninite?) composition. Rock; completely altered fragments of volcanic glass with microlites (crystallites) of plagioclase (andesine [An_{47}]), pyroxene (orthoclase?), and small (0.1 mm) rounded-isometric grains of quartz.

Alteration: rock is altered (completely).

Sample 125-786B-66R-1, 36–38 cm (Piece 5), Unit 26 [Z-690]

Plagioclase-phyric andesite (boninite?), massive. Phenocrysts (8%–10%): elongated-prismatic grains (0.3–0.8 mm) of plagioclase (5%). Plagioclase grains contain inclusions of glass. Groundmass is poikilititic texture; segregate of needle-shaped microlites (0.05–0.1 mm) of plagioclase, isometric grains (up to 0.1 mm) of feldspar, rounded-isometric grains of quartz, and idiomorphic grains (0.2–0.3 mm) of opaque minerals. Rock impregnated by opaque dust.

Alteration: slight (10%–15%); plagioclase phenocrysts partly replaced by pelite, occasionally they are carbonitized.

Sample 125-786B-66R-2, 0–5 cm (Piece 1A), Unit 26 [Z-1429]

Plagioclase-phyric rhyolite, crystallized. Rock; phenocrysts (10%) and groundmass (90%). Phenocrysts: tabular and prismatic grains (0.5–1 mm) of plagioclase. Groundmass is micropoikilitic texture; small (0.05–0.1 mm) grains of quartz (10%), small isometric grains of orthoclase with microlites of albite and opaque dust, and sparse skeletal grains (0.3 mm) of opaque minerals.

Alteration: very strong (70%–80%); plagioclase phenocrysts completely replaced by albite and microaggregates of sosurite; orthoclase replaced by pelite.

Sample 125-786B-66R-3, 51–56 cm (Piece 7), Unit 26 [Z-1430]

Orthoclase-plagioclase-phyric rhyolite, crystallized. Rock; phenocrysts (25%) and groundmass (75%). Phenocrysts: tabular and prismatic grains (0.5–1.5 mm) of plagioclase (15%) and tabular grains of orthoclase (10%). Groundmass is micropoikilitic texture; small (up to 0.1 mm) isometric grains of quartz (5%–7%%), orthoclase with opaque dust, and opaque minerals (2%–3%).

Alteration: strong to very strong (65%–70%); plagioclase phenocrysts replaced by albite; orthoclase replaced by pelite.

XRD: quartz; trace chlorite.

Sample 125-786B-67R-1, 77–79 cm (Piece 9), Unit 27 [Z-262]

Pyroxene-olivine-phyric basalt, fine grained, massive. Phenocrysts of orthopyroxene (up to 1–1.5 mm, 2%), clinopyroxene (<1%), and olivine (<1%). Groundmass is intersertal texture. It is by laths of plagioclase, clinopyroxene, olivine, and interstitial glass.

Alteration: moderate (~25%); olivine and interstitial glass are replaced with smectites.

XRD: smectites with ~20% mica layers contain various interlayer cations: Na-K and Mg-Ca; trace cristobalite(?) and quartz(?).

Electron micrograph: b = 9.18 Å (trioctahedral smectite).

Sample 125-786B-68R-1, 10–16 cm (Piece 1A), Unit 28 [Z-1431]

Breccia (tuff?), rhyolitic composition. Rock completely replaced by green-brown clay mineral.

Alteration: very strong (95%).

XRD: smectite; trace quartz and talc(?).

Sample 125-786B-69R-2, 79–81 cm (Piece 1F), Unit 28 [Z-263]

Hyaloandesite-dacite (boninite?), glassy, sparsely phyric. Phenocrysts of orthopyroxene(?) and olivine(?) with sizes up to 1–1.5 mm, 1%–3%. Crystals of quartz are present. Groundmass is hyaline texture, occasionally, taxitic; light green volcanic glass with laths-like microlites of plagioclase and opaque dust.

Alteration: moderate to high (~30–40%); olivine and orthopyroxene are completely replaced with smectites; carbonate occurs also.

XRD: smectites with ~20% mica layers; trace quartz(?).

Electron micrograph: b = 9.26 Å (trioctahedral smectite).

Sample 125-786B-69R-4, 107–110 cm (Piece 1D), Unit 28 [Z-1432]

Tuff, riolitic composition. Rock completely replaced by clay minerals.

Alteration: very strong (95%).

Sample 125-786B-70R-2, 46–48 cm (Piece 1F), Unit 28 [Z-264]

Hyaloandesite-basalt (boninite?), glassy, phyric, vesicular. Phenocrysts (up to 20%) of orthopyroxene(?) and olivine(?). Groundmass is taxitic texture; light green volcanic glass with laths of plagioclase and opaque dust. Crystals of quartz occur sporadically. Vesicles (up to 1.5 mm, ~5%) are filled with smectites and carbonate.

Alteration: strong (50%–60%); olivine and orthopyroxene are completely replaced with smectites.

XRD: smectites with ~20% mica layers contain various interlayer cations: Na-K and Mg-Ca.

Electron micrograph: b = 9.25 Å (trioctahedral smectite).

Sample 125-786B-70R-4, 0–5 cm (Piece 1), Unit 28 [Z-1433]

Orthopyroxene-phyric andesite(?), crystallized, fine grained. Rock with andesitic texture; phenocrysts (25%) and groundmass (75%).

Alteration: moderate (30%–35%).

XRD: smectite; trace quartz.

Sample 125-786B-71R-4, 32–36 cm (Piece 3), Unit 30 [Z-691]

Twopyroxene-plagioclase-phyric andesite-basalt (boninite?), massive. Rock: identical to Sample 125-786B-42R-3, 116–120 cm (Z-685).

Alteration: strong to very strong (60%–70%); orthopyroxene replaced by biotite and carbonate; clinopyroxene replaced by with andesitic texture and carbonate; carbonate, pelite and albite replace plagioclase; interstitial glass partly (10%–15%) replaced by clay mineral.

Sample 125-786B-72R-1, 15–17 cm (Piece 3), Unit 30 [Z-265]

Sparsely pyroxene-plagioclase-phyric andesite, poorly crystallized, vesicular. Phenocrysts of pyroxene, plagioclase, and olivine. Groundmass is hyaline texture, occasionally intersertal; green volcanic glass with laths of plagioclase and opaque dust. Crystals of quartz are present. Vesicles partly are filled with smectites.

Alteration: moderate to strong (40%–50%); olivine and orthopyroxene are completely replaced with smectites and carbonate.

XRD: smectite with ~20% mica layers; trace quartz(?).

Electron micrograph: b = 9.27 Å (trioctahedral smectite).

Sample 125-786B-72R-2, 50–55 cm (Piece 5), Unit 30 [Z-1434]

Lithoclastic tuff (breccia). Rock; fragments (80%, 3–12 mm) of andesite (boninite). Large fragments cemented by small (0.1–0.4 mm) fragments of andesite. Fragments of boninite are represented by altered ortho- and clinopyroxene, plagioclase (andesine [An_{37}]), altered glass, and opaque minerals (5%–7%).

Alteration: very strong (90%); pyroxenes completely replaced by clay mineral and partly by biotite; glass partly replaced by clay minerals; plagioclase partly replaced by albite or carbonate.

XRD: corrensite; trace chlorite and quartz.

Sample 126-792E-71R-1, 84–86 cm (Piece 8), Unit 1 [Z-219]

Plagioclase-phyric andesite-basalt, vesicular. Phenocrysts of plagioclase (0.3–3.5 mm, 35%). Groundmass is hyalopilitic texture; volcanic glass with small grains of clinopyroxene, laths of plagioclase, and opaque minerals. Vesicles (0.02–0.5 mm, 5%–7%) were filled with glass which later have been replaced with grassy-green smectites.

Alteration: slight (~5%–7%).

XRD: smectite with ~20% mica layers; trace cristobalite(?) and hydromica(?).

Electron micrograph: b = 9.23 Å (trioctahedral smectite).

Sample 126-792E-72R-1, 18–20 cm (Piece 2), Unit 1 [Z-220]

Plagioclase-phyric andesite-basalt, glassy, massive. Phenocrysts: plagioclase (0.03–2.5 mm, 25%). Single phenocrysts of clinopyroxene and olivine(?) are registered. Groundmass: hyaline texture; volcanic glass with small crystals of pyroxene and opaque minerals.

Alteration: moderate (~25%).

XRD: smectite; trace cristobalite(?).

Electron micrograph: b = 9.20 Å (trioctahedral smectite).

Sample 126-792E-73R-2, 76–78 cm (Piece 6B), Unit 1 [Z-221]

Clinopyroxene-plagioclase-phyric andesite-basalt, poorly crystallized, massive. Phenocrysts: plagioclase (0.3–2.5 mm, 20%), clinopyroxene (1–1.5 mm, <1%), orthopyroxene (?), and olivine(?). Groundmass: hyaline texture; light green volcanic glass with laths of plagioclase, small crystals of pyroxene, and opaque minerals.

Alteration: moderate (~30%).

XRD: smectite and cristobalite.

Electron micrograph: b = 9.20 Å (trioctahedral smectite).

Sample 126-792E-74R-1, 54–58 cm (Piece 5B), Unit 2 [Z-1450]

Plagioclase-phyric andesite, massive. Phenocrysts (35%): prismatic grains (0.3–1.7 mm) of plagioclase (labradorite [An_{55}] and andesine [An_{38}]). Sparse (<0.5%) small grains (up to 0.3 mm) of clinopyroxene are present. Groundmass: vitrophyric texture; volcanic glass and opaque minerals (3%–4%).

Alteration: rock is fresh.

Sample 126-792E-74R-2, 64–66 cm (Piece 6), Unit 3 [Z-222]

Clinopyroxene-plagioclase-phyric hyaloandesite-basalt, massive. Phenocrysts: plagioclase (0.5–2.5 mm, 25%) and clinopyroxene (0.2–0.5 mm, 1%–3%). Groundmass: hyaline texture; light green volcanic glass with tabular crystals of plagioclase, microlites of pyroxene, and opaque minerals.

Alteration: moderate (~30%).

XRD: smectite; trace cristobalite(?) and quartz.

Electron micrograph: b = 9.26 Å (trioctahedral smectite).

Sample 126-792E-75R-2, 62–64 cm (Piece 7), Unit 3 [Z-223]

Pyroxene-plagioclase-phyric hyaloandesite-dacite, massive. Phenocrysts: plagioclase (0.5–2.5 mm, 25%–30%) and clinopyroxene (0.2–1.5 mm, <1%). Highly altered crystals of hornblende(?) or orthopyroxene(?) are present. Groundmass: hyaline texture; by light greenish brown volcanic glass with laths of plagioclase and opaque minerals.

Alteration: moderate (~25%); hornblende(?) or orthopyroxene(?) is replaced by smectites, hydrotalcite(?), and tremolite-actinolite(?).

XRD: cristobalite(?); trace smectite and quartz.

Sample 126-792E-76R-1, 26–32 cm (Piece 3), Unit 4 [Z-1451]

Plagioclase-phyric andesite, massive. Phenocrysts (50%): tabular and prismatic grains (0.3–1.7 mm) of plagioclase (labradorite [An_{62}] and andesine [An_{48}]), occasionally they contain inclusions of glass. Groundmass: vitrophyric texture; represented by gray volcanic glass (50%). Rock: sparse (2%–3%) prismatic grains of dark-colored mineral (pyroxene?).

Alteration: slight (2%–3%); dark-colored mineral completely replaced by clay mineral.

Sample 126-792E-76R-1, 120–122 cm (Piece 11), Unit 5 [Z-224]

Pyroxene-plagioclase-phyric hyaloandesite-dacite, quartz-bearing, massive. Phenocrysts: plagioclase (0.5–2 mm, 25%) and clinopyroxene (0.2–1 mm, <1%). Highly altered crystals hornblende(?) or orthopyroxene(?). Rock: s crystals of quartz (0.1–0.5 mm, 1%–3%). Groundmass: hyaline texture; light green volcanic glass with laths of plagioclase and opaque minerals.

Alteration: moderate (~20%); hornblende(?) or orthopyroxene(?) is replaced by smectites, hydrotalcite(?), tremolite-actinolite(?).

XRD: smectite; trace cristobalite(?) and quartz.

Electron micrograph: $b = 9.10$ Å? (very slight).

Sample 126-792E-78R-1, 118–120 cm (Piece 14), Unit 5 [Z-225]

Plagioclase-phyric hyaloandesite, massive. Phenocrysts: plagioclase (0.2–2 mm, 30%) and single grains of clinopyroxene (0.2–1 mm, <1%). Highly altered crystals (~1%) of hornblende(?) or orthopyroxene(?) are registered. Groundmass: hyaline-hyalopilitic texture; light greenish gray volcanic glass with laths and small plates of plagioclase, opaque minerals, and single small rounded crystals of quartz.

Alteration: moderate (25%–30%); hornblende(?) or orthopyroxene(?) is completely replaced by smectites.

XRD: smectite; trace cristobalite(?).

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Sample 126-793B-1R-2, 82–84 cm (Piece 5A), Unit X [Z-226]

Sparsely clinopyroxene-olivine-phyric, fine grained, almost completely crystallized, massive. Phenocrysts: clinopyroxene (0.5–2 mm, <1%) and olivine (0.3–1.5 mm, 3%–5%). Groundmass: intergranular texture; laths of plagioclase (45%–50%), clinopyroxene (45%), interstitial glass (5%), and opaque minerals (1%–3%).

Alteration: slight (~10%); olivine is completely replaced with smectite-chlorite aggregate, occasionally with admixtures of carbonate; interstitial glass is replaced by smectite-chlorite aggregate.

Sample 126-793B-86R-1, 35–40 cm, Unit 1 [Z-1452]

Bronzite-plagioclase-clinopyroxene-phyric andesite, vesicular. Rock: phenocrysts (20%), glass (60%), and vesicles (20%). Phenocrysts: idiomorphic grains (0.2–1.7 mm) of orthopyroxene (bronzite?) 5%–7%, plagioclase (20%, labradorite [An_{58}] and andesine [An_{40}]), and clinopyroxene (25%–30%). Groundmass: vitrophyric texture; colorless volcanic glass with crystals of plagioclase and pyroxene.

Alteration: rock is fresh.

Sample 126-793B-88R-1, 62–67 cm, Unit 1 [Z-1453]

Twopyroxene-plagioclase-phyric andesite, vesicular. Rock: phenocrysts (20%), glass (60%), and vesicles (20%). Phenocrysts: prismatic grains of bronzite (3%), clinopyroxene (2%), and glomerophyric segregates of prismatic grains of plagioclase (15%, labradorite [An_{60}] and andesine [An_{43}]). Groundmass: hyalopilitic-trachydoid texture; light cream volcanic glass with microlites of plagioclase (andesine [An_{40}]) and needle-shaped crystallites of plagioclase and pyroxene grains. Vesicles (0.7–5 mm): elongated-oval in shape, usually empty. Small (0.3–0.6 mm) vesicles are empty or walls of vesicles are lined with glass.

Alteration: rock is fresh.

Sample 126-793B-92R-1, 0–5 cm, Unit 1 [Z-1454]

Twopyroxene-plagioclase-phyric andesite, sparsely vesicular. Rock consists of phenocrysts (30%), glass (65%–70%), and vesicles (3%–5%). Phenocrysts: idiomorphic grains (0.3–5 mm) of bronzite (20%), small grains (0.3–0.5 mm) of clinopyroxene (2%–3%), and prismatic grains (0.1–0.7 mm) of plagioclase (5%–7%, labradorite [An_{60}]). Groundmass is vitrophyric texture; cream volcanic glass with sparse microlites and crystallites of plagioclase. Vesicles (0.1–0.6 mm) are rounded in shape, usually empty or completely infilled with light green glass.

Alteration: rock is fresh.

Sample 126-793B-95R-2, 28–32 cm (Piece 1), Unit 3 [Z-227]

Hyalobasaltic autobreccia; fragments of clinopyroxene-olivine-phyric glassy vesicular basalt and fragments of altered volcanic glass. Within fragments vesicles (0.05–0.1 mm) are filled by smectites.

Alteration: moderate (35%).

Sample 126-793B-03R-1, 37–42 cm, Unit 9 [Z-1455]

Lithoclastic tuff (breccia). Rock; angular fragments (2–5 mm) of highly vesicular twopyroxene-plagioclase-phyric andesite (90%), vitrophyric texture. Fragments of basalt and andesite-basalt are present. Cement: radial-radiand aggregates of zeolites.

Sample 126-793B-104R-1, 96–98 cm (Piece 6B), Unit 10 [Z-228]

Clinopyroxene-plagioclase-phyric (phenocrysts 0.1–0.5 mm, 1%) basalt, fine grained, poorly crystallized, vesicular. Single tabular crystals of orthopyroxene(?) and olivine(?) are present. Groundmass is hyalopilitic texture; volcanic glass with crystals of pyroxene, plagioclase, olivine, and opaque dust. Vesicles (0.05–0.2 mm, 5%–7%) are filled with smectites.

Alteration: slight (~10%–15%); smectites completely replace orthopyroxene(?) and olivine(?).

XRD: smectites with various composition of interlayer cations: Na-K and Mg-Ca.

Electron micrograph: b = 9.20 Å (trioctahedral smectite).

Sample 126-793B-110R-2, 57–59 cm (Piece 1C), Unit 13 [Z-229]

Olivine-pyroxene-phyric basalt, fine grained, poorly crystallized, vesicular. Phenocrysts of clinopyroxene (up to 3–4 mm, 1%–2%), orthopyroxene (up to 2 mm, <1%), and olivine (less then 1%). Groundmass is hyalopilitic texture; devitrified glass with laths of plagioclase, small grains of clinopyroxene, olivine, and opaque minerals.

Alteration: slight (~10%–15%); olivine is completely replaced with smectites; orthopyroxene is partly replaced with smectites.

XRD: smectite; trace hydromica.

Electron micrograph: b = 9.20 Å (trioctahedral smectite).

Sample 126-793B-110R-4, 38–40 cm (Piece 1C), Unit 13 [Z-230]

Olivine-pyroxene-phyric basalt, fine grained, poorly crystallized, vesicular (<1%). Phenocrysts of clinopyroxene (0.9–3 mm, 3%–5%), orthopyroxene (single grains), olivine (less then 1%), and plagioclase (single grains). Groundmass is hyalopilitic texture; laths of plagioclase, small grains of clinopyroxene, opaque minerals, and interstitial glass (5%–7%).

Alteration: slight (~10%); olivine and interstitial glass are replaced with smectites.

Sample 126-793B-111R-1, 102–104 cm (Piece 9A), Unit 14 [Z-231]

Olivine-pyroxene-phyric basalt, fine grained, poorly crystallized, vesicular. Phenocrysts of clinopyroxene (5%–7%), orthopyroxene (5%), and olivine (less then 1%). Groundmass is hyalopilitic texture; devitrified volcanic glass with laths of plagioclase, small grains of clinopyroxene, and opaque minerals. Small angular to rounded crystals of quartz are known. Vesicles (5%–7%) are partly filled by smectites.

Alteration: slight (~10%); olivine, orthopyroxene, and interstitial glass are replaced with smectites.

Sample 126-793B-112R-1, 100–102 cm (Piece 3C), Unit 14 [Z-232]

Olivine-pyroxene-phyric basalt, fine grained, poorly crystallized, vesicular. Phenocrysts of clinopyroxene (3%), orthopyroxene (5%–7%), and olivine (less then 1%). Groundmass is taxitic texture; laths of plagioclase, small grains of clinopyroxene, interstitial glass, and opaque minerals. Small rounded-xenomorphic crystals of quartz are present. Small rounded vesicles (3%–5%) are filled with smectites.

Alteration: moderate to high (~30%–40%); olivine, orthopyroxene, and interstitial glass are replaced by smectites.

XRD: smectite; trace hydromica.

Electron micrograph: b = 9.26 Å (trioctahedral smectite) and 9.11 Å (mica).

Sample 126-793B-113R-3, 27–31 cm (Piece 1C), Unit 15 [Z-1456]

Olivine-twopyroxene-plagioclase-phyric andesite (boninite), vesicular. Rock: phenocrysts (20%), glass (70%), and vesicles (10%). Phenocrysts: altered olivine, idiomorphic grains (0.3–1 mm) of pyroxenes, glomerophyric segregates of small prismatic grains (0.3–0.7 mm) of plagioclase (labradorite [An_{60-62}]). Groundmass: vitrophyric texture; light cream volcanic glass with crystallites of plagioclase and pyroxene (90%). Vesicles (0.2–0.7 mm): rounded in shape, usually empty (2%–3%) or completely infilled with light green glass (7%–8%).

Sample 126-793B-114R-1, 69–71 cm (Piece 1D), Unit 17 [Z-233]

Olivine-clinopyroxene-plagioclase-phyric basalt, fine grained, poorly crystallized, vesicular. Phenocrysts: plagioclase (0.5–2.5 mm, 15%–20%), clinopyroxene (0.5–0.7 mm, 1%), and orthopyroxene (single grains). Groundmass: hyaline/hyalopilitic texture; black devitrified volcanic glass with laths of plagioclase, small grains of clinopyroxene, and opaque minerals. Vesicles (0.05–0.7 mm, ~7%–10%): filled with smectites.

Alteration: moderate (~20%–25%); olivine, orthopyroxene, and interstitial glass are replaced with smectites.

XRD: smectite; trace hydromica, heulandite(?), and chlorite(?).

Electron micrograph: b = 9.26 Å (trioctahedral smectite).

Hole 791B

Sample 126-791B-57R-1, 0–5 cm (Piece 1B), Unit 4 [Z-1435]

Sparsely plagioclase-phyric basalt, crystallized, vesicular. Phenocrysts (<1%): single prismatic grains of plagioclase (andesine [An_{45}]). Plagioclases contain fine inclusions of glass. Groundmass (75%): intersertal-microdoleritic texture; microlites (0.1–0.4 mm) of plagioclase (labradorite [An_{55}] and andesine [An_{48}]). Interstices: segregates of small (<0.1 mm) grains of clinopyroxene (15%), glass (5%), and opaque minerals (5%). Vesicles (25%, 0.1–0.4 mm and 0.7–1.1 mm): isometric and oval in shape, usually empty; walls of vesicles are lined with smectites.

Alteration: rock is fresh.

Sample 126-791B-57R-1, 52–56 cm (Piece 6), Unit 5 [Z-692]

Sparsely olivine-phyric basalt (microdolerite), vesicular. Phenocrysts: two large (2–2.5 mm) phenocrysts of olivine. Groundmass: intersertal texture; unoriented laths (0.1–0.5 mm) of plagioclase (andesine [An_{42}]). Interstices: segregates of small grains of augite, brownish green glass (5%), with opaque dust. Vesicles (30%–35%, 0.2–2.5 mm): rounded and isometric in shape.

Alteration: phenocrysts of plagioclase are partly replaced by carbonate; vesicles are partly or completely filled with clay minerals and zeolite.

Sample 126-791B-59R-1, 21–25 cm (Piece 1), Unit 6 [Z-1436]

Lava breccia. Rock: oval fragments (80%, 3–5 mm) of pyroxene-phyric basalt and cement (20%). Cement: small (<0.1 mm) fragments of basalt and green glass. Small vesicles in basalt are rounded in shape, usually empty; walls of vesicles are lined with green glass.

Alteration: rock is fresh.

Sample 126-791B-61R-1, 42–50 cm (Piece 9), Unit 8 [Z-143]

Plagioclase-phyric basalt, crystallized. Phenocrysts (15%): prismatic and tabular grains (0.5–1.7 mm) of plagioclase (labradorite [$An_{60–65}$]). Groundmass (85%): microlitic texture; microlites and microlaths (0.1–0.6 mm) of plagioclase (andesine [$An_{38–45}$] and occasionally labradorite [An_{55}]). Interstices: segregate of small (0.1 mm) grains of clinopyroxene (25%), brownish green glass (25%), and opaque minerals (5%–7%).

Alteration: moderate (25%); interstitial glass is replaced by clay minerals.

Sample 126-791B-63R-1, 65–70 cm (Piece 9), Unit 11 [Z-1438]

Aphyric hyalobasalt, glassy, vesicular. Rock: hyalopilitic texture; needle-shaped microlites and laths (up to 2 mm) of plagioclase (andesine [An_{32}]), microlites of clinopyroxene, and black to brownish green volcanic glass with crystals of clinopyroxene. Vesicles (0.01–0.5 mm, ~40%): usually empty; walls of vesicles are lined with green glass, very small vesicles are completely filled with glass. Single large (1.6 mm) vesicle is empty.

Alteration: rock is fresh.

Sample 126-791B-63R-1, 88–93 cm (Piece 12), Unit 11 [Z-1439]

Olivine-plagioclase-phyric basalt, noncrystallized, vesicular. Phenocrysts (20%): idiomorphic grains (0.6–1 mm) of olivine (10%) and glomerophyric segregates (up to 3.5 mm) of prismatic and tabular grains (0.5–2.5 mm) of plagioclase (10%, labradorite [An_{58}]). Groundmass (40%): vitrophyric texture; brownish green and black glass (25%). Vesicles (<0.3–0.6 mm, 40%): rounded and oval in shape; walls (>0.3 mm, 25%) are lined with glass and infilled with chalcedony in central parts. Small vesicles (75%) are completely filled with greenish glass.

Alteration: slight (10%–15%); olivine completely replaced by iddingsite; glass in vesicles is partly replaced by clay minerals; chalcedony in vesicles.

Sample 126-791B-64R-1, 48–52 cm (Piece 6), Unit 11 [Z-216]

Pyroxene-plagioclase-phyric hyalobasalt, glassy, vesicular. Phenocrysts (up to 20%): orthopyroxene(?) and olivine(?). The microphyric scoriaceous rock is hyaline texture, noncrystallized volcanic glass with tabular crystals of plagioclase (0.4–0.6 mm, 5%–7%), rounded crystals of orthopyroxene (0.2–0.3 mm, 1%–3%), and opaque minerals. Vesicles (0.01–0.5 mm, ~50%): usually empty; walls of vesicles are lined with smectites.

Alteration: slight to moderate (~20%).

XRD: smectite with ~20% mica layers.

Sample 126-791B-66R-2, 0–5 cm (Piece 1A), Unit 11 [Z-693]

Olivine-plagioclase-phyric basalt, highly vesicular. Phenocrysts (30%): idiomorphic grains (0.3–0.5 mm) of olivine (10%) and glomerophyric segregates of prismatic grains (0.1–0.8 mm up to 1.2 mm) of plagioclase (20%, andesine-labradorite [An_{50}]). Groundmass (40%): vitrophyric texture; light green glass. Vesicles (0.1–0.5 mm, 50%): oval in shape; walls (0.2–0.5 mm) are lined with glass. Small vesicles are completely filled with glass.

Alteration: slight; plagioclase grains with sizes >0.8 mm (up to 1.2 mm) are replaced by pelite; glass from vesicles is partly replaced by palagonite.

Sample 126-791B-67R-2, 123–125 cm (Piece 16), Unit 11 [Z-217]

Hyalobasaltic autobreccia is composed of various sizes of xenomorphic fragments of two types. The first type (90% of rock volume) is represented by light green devitrified glass with fragments of plagioclase, orthopyroxene, and small amounts of opaque minerals. Groundmass: hyaline texture. Vesicles (0.1–2 mm, 7%–10%): filled with palagonitized glass and smectites. The second type cements the first one. It is composed of black plagioclase-phyric glass with opaque dust and single crystals of orthopyroxene.

Alteration: moderate (~30%).

Electron micrograph: b = 9.20 Å (trioctahedral smectite).

Sample 126-791B-72R-2, 50–55 cm (Piece 6A), Unit 11 [Z-1440]

Plagioclase-phyric basalt, poorly crystallized, vesicular. Phenocrysts (15%): glomerophyric segregates of prismatic grains (0.4–1.5 mm) of plagioclase (labradorite [An_{58}]). Groundmass (45%): vitrophyric texture; light green to brownish black glass. Vesicles (0.1–0.7 mm, 40%): rounded in shape; walls (0.3–0.7 mm, 15%) are lined with glass, in central parts: chalcedony. Small vesicles (25%) usually are lined or completely infilled with glass.

Alteration: slight.

Sample 126-791B-73R-2, 73–75 cm (Piece 4B), Unit 11 [Z-694]

Lithoclastic tuff (breccia). Rock: large angular fragments (5–6 mm) of highly vesicular plagioclase-phyric basalt (glomerophyric segregates of plagioclase, 0.1–0.9 mm, andesine-labradorite [An_{50}], and black glass). Vesicles (60%, 0.3–0.8 mm): rounded in shape; walls are lined with green glass, central parts are infilled with zeolite. Cement: small fragments (0.1–0.3 mm) of hyalobasalt and green glass.

Alteration: rock is fresh.

Sample 126-791B-73R-2, 73–75 cm (Piece 4B), Unit 11 [Z-218]

Hyalobasaltic autobreccia: large (10–25 mm) fragments of plagioclase-phyric vesicular (30%–40%) basalt. Fragments are composed of light green devitrified glass with hyaline texture. These fragments are cemented with black aphyric vesicular hyalobasalt. Within fragments vesicles are filled with palagonitized glass; vesicles within matrix are empty or filled with smectites.

Alteration: slight (~10%).

XRD: smectite with ~20% mica layers; trace chlorite(?).

Electron micrograph: b = 9.20 Å (trioctahedral smectite).

Sample 126-791B-73R-2, 80–84 cm (Piece 4B), Unit 11 [Z-1441]

Orthopyroxene-phyric andesite (boninite), poorly crystallized, vesicular. Phenocrysts (20%): idiomorphic grains (0.2–0.8 mm) of orthopyroxene (bronzite). Groundmass: vitrophyric texture; pyroxene and colorless glass (55%) with very small crystals of plagioclase. Vesicles (25%, 0.1–0.6 mm): rounded in shape; walls are lined with greenish glass, occasionally completely infilled with glass.

Alteration: rock is fresh.

Sample 126-791B-75R-1, 97–105 cm (Piece 14), Unit 14 [Z-1442]

Sparsely plagioclase-phyric andesite, poorly crystallized, highly vesicular. Phenocrysts (5%): two tabular grains (0.4 mm) of andesine. Groundmass: vitrophyric texture; colorless to light brown glass (15%) with sparse microlites of plagioclase. Vesicles (80%, 0.1–0.4 mm): rounded in shape; partly or completely filled with light greenish glass.

Alteration: moderate (40%); plagioclase is replaced by pelite; 40% of vesicles are infilled with clay minerals.

Sample 126-791B-76R-2, 48–52 cm (Piece 6A), Unit 14 [Z-1443]

Lithoclastic tuff (breccia). Rock: angular fragments (1.5–5 mm) of highly vesicular plagioclase-phyric andesite. Andesite is poorly crystallized, plagioclase-phyric. Phenocrysts (25%): prismatic grains (0.5–0.7 mm) of plagioclase (labradorite [An_{68}]). Groundmass (60%): light green glass with microlites of plagioclase (andesine

[An_{42}]). Vesicles (15%, 0.1–0.4 mm): isometric in shape; walls are lined with reddish brown Fe hydroxides, central parts are infilled with green glass. Cement: small angular fragments (0.1–0.7 mm) of andesite.

Alteration: rock is fresh; single vesicles are filled with carbonate; carbonate is present in cement (5%–7% of total volume of breccia).

Sample 126-791B-76R-3, 40–45 cm (Piece 4B), Unit 15 [Z-1444]

Plagioclase-phyric dolerite, fine grained. Phenocrysts (5%): prismatic grains (0.8–1.2 mm) of plagioclase (labradorite [An_{64}]). Groundmass: intersertal-poikilophitic texture; isometric grains (0.3–1.5 mm) of clinopyroxene (30%), laths and prismatic grains of plagioclase (45%, 0.2–0.6 mm, andesine [An_{43}]), greenish brown glass (10%), and grains (0.1–0.3 mm) of opaque minerals (5%–7%).

Alteration: slight (5%–7%); glass is replaced by clay minerals.

Sample 126-791B-77R-2, 0–5 cm (Piece 1A), Unit 18 [Z-1445]

Litho-vitroclastic tuff. Rock: large fragments (up to 5 mm) of andesite and andesite-basalt (10%), small fragments (0.2–0.6 mm) of rocks (10%), altered plagioclase, and fragments of light green glass.

Alteration: very strong (80% or more); plagioclase is almost completely replaced by albite; chalcedony almost completely replaces rock.

Sample 126-791B-77R-2, 132–137 cm (Piece 6A), Unit 20 [Z-1446]

Litho-crystallo-vitroclastic tuff. Rock: angular fragments (0.1–0.6 mm) of different minerals (10%): grains of quartz (2%), plagioclase (6%), and orthoclase (2%). Fragments (up to 2.5 mm) of andesite and basalt (20%); fragments of glass (40%). Cement (30%): clay minerals.

Alteration: moderate (30%–40%); glass replaced by muscovite-phlogopite-like minerals; this mica-mineral (30%) cements fragments of rocks and minerals.

Sample 126-791B-77R-3, 18–23 cm (Piece 1B), Unit 20 [Z-1447]

Litho-crystallo-vitroclastic tuff. Rock is identical to Sample 126-791B-77R-2, 132–137 cm (Z-1446).

Alteration: moderate (30%–40%); mica (30%) replaces cement and fragments of glass.

Sample 126-791B-78R-1, 24–30 cm (Piece 4), Unit 24 [Z-1448]

Lava breccia. Rock: fragments (0.3–1.5 mm) of aphyric andesite and small fragments (0.1–0.3 mm) of plagioclase with inclusions of chloritized glass. Cement: colorless glass and very small fragments of rocks and minerals.

Alteration: slight (10%–15%); glass replaced by clay mineral.

Sample 126-791B-78R-1, 72–77 cm (Piece 8), Unit 24 [Z-1616]

Lava breccia of hyalobasalt with vitrophyric texture.

Alteration: very strong (80%); glass is replaced by clay minerals; albite and clay minerals replace plagioclase.

Sample 126-791B-79R-1, 5–8 cm (Piece 1), Unit 26 [Z-695]

Olivine-clinopyroxene-phyric trachybasalt, massive. Phenocrysts (15%): plagioclase and clinopyroxene (0.1–0.5 mm). Groundmass: intersertal texture; reddish brown laths (0.1–0.3 mm) of orthoclase(?) (80%), grains (up to 0.2 mm) of opaque minerals (15%), and green interstitial glass (5%).

Alteration: strong (50%); orthoclase is completely replaced by pelite; clay minerals replace glass; microcrack (0.3 mm) is infilled with opaque minerals, clay minerals, carbonate, and zoisite(?).

Sample 126-791B-79R-1, 45–50 cm (Piece 5A), Unit 28 [Z-1449]

Litho-vitroclastic tuff. Rock: sparse fragments (0.8 mm) of andesite (1%) and fragments of light green volcanic glass (50%–55%).

Alteration: moderate (35%–40%); rock replaced by orthoclase (adularia?).

West Philippine Basin, Palau-Kyushu Ridge, and Parece Vela Basin (Leg 59)

West Philippine Basin (Hole 447A)

Sample 59-447A-14R-1, 140–144 cm (Piece 4L), Unit 6a [Z-314]

Sparsely plagioclase-phyric basalt. Phenocrysts: plagioclase (0.4–1.6 mm, 5%, andesine [An_{46}]). Groundmass (95%): microlitic texture; laths and microlites (0.1–0.4 mm) of plagioclase (35%, andesine [An_{45}]). Interstices: segregates of clinopyroxene microlites (45%), opaque minerals (5%), small (0.1 mm) oxidized grains of olivine (5%), and volcanic glass. Vesicles are empty.

Alteration: slight (~5%–10%); plagioclase in central parts are occasionally completely replaced by zeolite; glass replaced by clay minerals; veinlets (0.7 mm thick) in rocks contain clay minerals and sparse fragments of altered glass.

XRD: smectite; trace quartz(?) and chlorite(?).

Sample 59-447A-14R-3, 53–58 cm (Piece 3D), Unit 6b [Z-315]

Sparsely plagioclase-phyric basalt, sparsely vesicular (1%–3%). Phenocrysts: plagioclase (1–1.5 mm, 3%). Single phenocrysts of olivine (up to 1 mm) are recognized. Groundmass: intersertal to subvariolitic texture; volcanic glass, small grains of clinopyroxene, and laths of plagioclase.

Alteration: moderate (~20%); smectites-chlorite aggregate replaces olivine and fills vesicles.

XRD: smectite and swelling chlorite(?); trace chlorite(?).

Sample 59-447A-15R-2, 116–121 cm (Piece 5D), Unit 6c [Z-316]

Sparsely plagioclase-phyric basalt, sparsely vesicular (5%). Phenocrysts: plagioclase and glomerophyric segregates (1–2 mm, 5%). Single phenocrysts of olivine (0.5–0.8 mm) are present. Groundmass: subvariolitic texture; volcanic glass, small grains of clinopyroxene, and laths of plagioclase.

Alteration: moderate (~20%–25%); smectites replace olivine and fill vesicles.

XRD: smectite.

Sample 59-447A-16R-2, 19–21 cm (Piece 3A), Unit 7 [Z-317]

Aphyric basalt, fine grained, almost completely crystallized, massive. Rock: intergranular texture (some areas subophitic); xenomorphic clinopyroxene (45%), laths of plagioclase (50%), olivine (1%–3%), and opaque minerals (1%–3%). Single vesicles are registered.

Alteration: moderate (~20%); smectites, chlorite, and carbonate replace olivine; vesicles are filled with carbonate.

XRD: smectite, chlorite(?), and hydromica(?) in trace amounts.

Sample 59-447A-16R-2, 87–89 cm (Piece 10), Unit 7 [Z-1144]

Aphyric dolerite, fine grained, massive. Rock: intersertal-ophitic texture; plagioclase (35%), clinopyroxene (40%), opaque minerals (5%), and glass (20%). Plagioclase forms laths (0.4–1.2 mm) with composition labradorite [An_{56}] and andesine [An_{45}]. Pyroxene forms xenomorphic grains (0.1–0.7 mm). Interstitial glass is black and altered.

Alteration: slight (~15%–18%); glass is almost completely replaced by brown secondary minerals.

Sample 59-447A-17R-3, 49–53 cm (Piece 5A), Unit 8a [Z-1145]

Plagioclase phyric andesite-basalt, fine grained, vesicular. Phenocrysts: plagioclase (0.3–0.6 mm, 5%–7%, andesine [An_{48}]). Groundmass (90%–93%): vitrophyric texture; black glass and needle-shaped microlites of plagioclase (2%–3%, 0.1–0.3 mm, andesine [An_{37}]). Vesicles (1%, 0.1–0.3 mm): rounded, empty.

Alteration: rock is fresh.

Sample 59-447A-19R-3, 115–120 cm (Piece 8G), Unit 8b [Z-318]

Olivine-pyroxene-plagioclase-phyric basalt, poorly crystallized, glassy, massive. Phenocrysts: plagioclase (3%), olivine (<1%), and orthopyroxene (single crystals are present). Groundmass: hyalopilitic texture; black volcanic glass and needle-shaped laths of plagioclase.

Alteration: slight (~10%–15%).

XRD: smectite.

Sample 59-447A-23R-1, 39–42 cm (Piece 2B), Unit 8d [Z-1146]

Pyroxene-plagioclase-phyric basalt, poorly crystallized, massive. Phenocrysts (10%): pyroxene (2%) forms xenomorphic grains (0.8–1 mm); glomerophyric segregates of prismatic grains of plagioclase (8%, 0.5–0.8 mm, labradorite [An_{68}], and several prisms: labradorite [An_{58}]). Groundmass: microlitic (microdoleritic) texture; laths of plagioclase (35%, 0.2–0.6 mm, labradorite [An_{52}] and andesine [An_{45}]). Interstices: segregates of small (0.1–0.3 mm) rounded and isometric grains of clinopyroxene (40%), brownish black glass (10%), and opaque minerals (5%).

Alteration: rock is fresh.

Sample 59-447A-23R-1, 51–58 cm (Piece 5D), Unit 8d [Z-1147]

Plagioclase-phyric basalt, fine grained, massive. Phenocrysts (5%): glomerophyric segregates of prismatic grains of plagioclase (0.7–1 mm). Groundmass: microlitic texture; laths of plagioclase (35%, 0.2–0.9 mm, labradorite

[An_{64}] and [An_{55}], and andesine [An_{40}]). Interstices: xenomorphic grains of clinopyroxene (40%, 0.1–0.6 mm), greenish brown glass (15%), and opaque minerals (5%).

Alteration: slight (10%–15%).

Sample 59-447A-24R-2, 25–39 cm (Piece 1B), Unit 9 [Z-1148]

Aphyric dolerite, fine grained, massive. Rock: doleritic texture; laths of plagioclase (40%, 0.3–1.5 mm, labradorite [An_{65}] and [An_{55}], and andesine [An_{40}]). Interstices: xenomorphic grains of clinopyroxene (45%, 0.2–0.5 mm), brownish green glass (10%), and opaque minerals (5%).

Alteration: slight (~15%); interstitial glass is replaced by hydrobiotite(?).

Sample 59-447A-24R-2, 99–102 cm (Piece 2D), Unit 9 [Z-1149]

Aphyric dolerite, fine grained, massive. Rock: ophitic texture; laths of plagioclase (45%, 0.4–1.5 mm, labradorite [An_{55}] and andesine [An_{40}]). Interstices: xenomorphic grains of clinopyroxene (40%, 0.2–0.6 mm), altered glass (6%–7%), and opaque minerals (3%–4%, 0.1 mm). Olivine forms small (0.2–0.3 mm) idiomorphic grains.

Alteration: slight (~10%); interstitial glass is replaced by clay minerals; chlorite(?) replaces olivine.

Sample 59-447A-25R-1, 40–42 cm (Piece 1C), Unit 9 [Z-319]

Aphyric dolerite, fine grained, inequigranular, massive. Rock: subophitic texture; laths of plagioclase (50%–55%), clinopyroxene (40%–45%), orthopyroxene (1%–5%), and opaque minerals (1%–3%). Interstitial glass is <1% abundance.

Alteration: slight (~10%); smectites and clay minerals replace interstitial glass.

XRD: smectite; chlorite and quartz(?) in trace amounts.

Sample 59-447A-27R-1, 21–25 cm (Piece 2B), Unit 10b [Z-1150]

Sparsely plagioclase-phyric basalt. Phenocrysts: single glomerophyric segregate (1%) of prismatic grains (0.5–0.8 mm) of plagioclase. Groundmass: microlitic texture; microlites of plagioclase (35%, 0.1–0.4 mm, labradorite [An_{68}] and [An_{50}]) and segregates of very small grains (45%, 0.05–0.1 mm) of plagioclase, brownish orange oxidized glass (15%), and opaque minerals (5%).

Alteration: slight (~15%); segregates of plagioclase grains are completely replaced by zeolite; microcracks (3%–4%, 0.1–0.2 thick) in rock are infilled with carbonate and zeolite.

Sample 59-447A-28R-1, 65–70 cm (Piece 4C), Unit 11a [Z-320]

Sparsely plagioclase-phyric basalt, poorly crystallized. Phenocrysts: elongated-platy crystals of plagioclase (5%–7%), partly replaced by K-feldspar. Groundmass: hyalopilitic texture; black volcanic glass containing needle-shaped laths of plagioclase.

Alteration: slight (~15%).

XRD: smectite.

Sample 59-447A-29R-4, 137–142 cm (Piece 3B), Unit 11b [Z-321]

Sparsely plagioclase-phyric basalt, poorly crystallized, sparsely vesicular (<1%). Phenocrysts: platy and elongated-platy crystals of plagioclase (5%). Single microphenocrysts of olivine are registered. Groundmass: hyalopilitic texture.

Alteration: slight to moderate (15%–20%); olivine is replaced by smectites.

XRD: smectite.

Sample 59-447A-30R-3, 89–94 cm (Piece 3C), Unit 11c [Z-322]

Sparsely plagioclase-phyric basalt, poorly crystallized, sparsely vesicular (<1%). Phenocrysts: platy and elongated-platy crystals of plagioclase (1%). Single microphenocrysts of olivine are present. Groundmass: hyalopilitic texture.

Alteration: slight to moderate (15%–20%); olivine is replaced by smectites; vesicles are filled with smectites, occasionally with carbonate.

XRD: smectite; trace quartz(?).

Sample 59-447A-32R-1, 99–105 cm (Piece 3K), Unit 11e [Z-323]

Sparsely plagioclase-phyric basalt, fine grained, crystallized, sparsely vesicular. Phenocrysts (5%): platy and prism crystals of plagioclase (0.4–0.6 mm, labradorite [An_{59}]). Vesicles (2%–3%): small (0.1–0.2 mm) and rounded in shape; infilled with glass or empty. Groundmass: microlitic texture; laths and microlites of plagioclase (30%, andesine [An_{43}] and [An_{48}]), clinopyroxene (50%, glass (5%), and opaque minerals (5%).

Alteration: slight (5%); several grains of plagioclase are replaced by zeolite (2%–3%); olivine is replaced by smectites and carbonate; vesicles are filled with smectites; some crystals of plagioclase are partly replaced by K-feldspar, occasionally with carbonate.

XRD: smectite; trace quartz(?).

Sample 59-447A-35R-3, 45–50 cm (Piece 2C), Unit 11e [Z-324]

Sparsely plagioclase-phyric basalt, poorly crystallized, sparsely vesicular. Phenocrysts: platy and elongated-platy crystals of plagioclase (10%–15%). Vesicles (<1%): small and rounded in shape. Groundmass: hyalopilitic texture; black volcanic glass with opaque dust and laths of plagioclase and single microphenocrysts of olivine.

Alteration: moderate (20%); olivine is replaced by smectites and carbonate; vesicles are filled with smectites; some crystals of plagioclase are partly replaced by K-feldspar, occasionally by carbonate.

XRD: smectite.

Sample 59-447A-36R-4, 31–36 cm (Piece 3A), Unit 11f [Z-325]

Oligoclase-plagioclase-phyric basalt, poorly crystallized, massive. Phenocrysts (10%): platy crystals of oligoclase(?) and elongated-platy crystals of plagioclase. The latter predominate in amounts. Single microphenocrysts of olivine occur also. Groundmass: pilotaxitic or (in some areas) subvariolitic texture; black volcanic glass with opaque dust and laths of plagioclase.

Alteration: moderate (~20%–25%); olivine(?) is replaced by smectites and carbonate.

XRD: smectite.

Palau-Kyushu Ridge (Hole 448)

Sample 59-448-37R-1, 32–37 cm (Piece 3C), Unit 6 [Z-1152]

Plagioclase-phyric basalt, vesicular. Phenocrysts (2%): two prism crystals of plagioclase (0.6 and 1.5 mm). Groundmass: pilotaxitic-microlitic texture; various grains microlites and laths of plagioclase (25%, 0.1–0.6 mm, labradorite [An_{60}] and andesine [An_{42}]), xenomorphic grains and segregates of pyroxene (20%, 0.1 mm), and black glass (5%). Vesicles (50%): large (1–2.5 mm) rounded empty vesicles (20%) and small (0.1–0.5 mm) isometric vesicles (30%). The latter are mainly empty (90%); 10% of small vesicles are encrusted with clay minerals.

Alteration: walls of several small vesicles are lined with smectites; veins and two large vesicles are infilled with carbonate.

Sample 59-448-38R-1, 45–50 cm (Piece 1H), Unit 6 [Z-1153]

Sparsely plagioclase-phyric basalt, incompletely crystallized, vesicular. Phenocrysts (2%): two glomerophyric segregates of plagioclase prismatic grains (0.3–0.5 mm). Vesicles (60%): large (1–2.5 mm) isometric empty vesicles (50%), and small (0.1–0.5 mm) isometric vesicles (30%). Groundmass: vitrophyric texture; black glass (35%), microlites of plagioclase (5%, labradorite [An_{52}]), and microlites of pyroxene (<1%).

Alteration: rock is fresh.

Sample 59-448-38R-1, 123–128 cm (Piece 5B), Unit 6 [Z-1154]

Sparsely plagioclase-phyric basalt, incompletely crystallized, vesicular. Phenocrysts (2%–3%): glomerophyric segregates of plagioclase prismatic grains (0.2–0.5 mm, labradorite [An_{55-56}]). Groundmass: hyalopilitic-vitrophyric texture; black glass, microlites of plagioclase (10%, andesine [An_{42}]), and grains of pyroxene (2%–3%). Vesicles (60%–65%): large (1–3 mm) rounded or isometric (30%–35%); empty, occasionally these large vesicles are completely infilled with carbonate; second type: small (0.1–0.3 mm) isometric (30%); also empty or infilled with carbonate.

Alteration: rock is fresh.

Sample 59-448-39R-1, 117–12 cm (Piece 10B), Unit 6 [Z-1155]

Sparsely plagioclase-pyroxene-phyric basalt, vesicular. Phenocrysts (2%–3%): single glomerophyric segregate of plagioclase prismatic grains (<1%) and several idiomorphic grains (0.3–0.5 mm) of pyroxene. Groundmass: hyalopilitic-vitrophyric texture; microlites of plagioclase (10%, andesine [An_{42-44}]), grains of pyroxene (2%–3%), and black glass (20%–25%). Vesicles (60%–65%): large (1.5–5 mm) isometric (35%) and small (0.05–0.3 mm) isometric (30%); all are empty.

Alteration: rock is fresh.

Sample 59-448-39R-2, 60–63 cm (Piece 2F), Unit 6 [Z-530]

Plagioclase-phyric andesite-basalt, vesicular. Phenocrysts (10%): glomerophyric segregates of plagioclase tabular and prismatic grains (0.5–0.9 mm, labradorite [An_{53}]) and a single grain of olivine (0.5 mm). Groundmass: doleritic-intersertal texture; microlites and laths of plagioclase (50%, labradorite [An_{52}] and andesine [An_{45}]). Interstices: segregates of small grains of clinopyroxene and black glass with opaque minerals. Vesicles (10%, 0.1–0.3 mm): rounded or rounded-isometric in shape; several are lined with palagonitized glass.

Alteration: rock is fresh.

Sample 59-448-43R-2, 45–50 cm (Piece 5), Unit 8 [Z-1156]

Aphyric basalt, crystallized, vesicular. Rock: microlitic texture; microlites of plagioclase (25%, 0.05–0.3 mm, andesine [An_{44}]), segregates of clinopyroxene grains (40%), brownish oxidized glass (10%), and opaque minerals (5%). Vesicles (20%): large, rounded (up to 1.5 mm) and small (18%, 0.1–0.5 mm); almost all (99%) are empty. Several vesicles are lined with crystals of zeolite.

Alteration: rock is fresh.

Sample 59-448-48R-1, 120–125 cm (Piece 11A), Unit 9 [Z-1157]

Aphyric basalt, crystallized, vesicular. Rock: microlitic texture; microlites of plagioclase (25%, andesine [$An_{46–48}$]), microlites of clinopyroxene (25%), and black glass (10%). Vesicles (40%, 0.05–0.9 mm, one vesicle: 1.7 mm) are empty. Several vesicles (1%–2%) are completely or partly infilled with zeolite.

Alteration: rock is fresh.

Sample 59-448-53R-2, 50–53 cm (Piece 1H), Unit 11 [Z-1158]

Aphyric basalt, crystallized, vesicular. Rock: microlitic texture; microlites of plagioclase (25%, 0.05–0.3 mm, andesine-labradorite [An_{50}] and andesine [An_{42}]), segregate of clinopyroxene very small grains (25%), and black glass (10%). Large rounded vesicles (10%, 1.5–5 mm) and small isometric vesicles (30%, 0.05–0.3 mm) are present. Large vesicles are empty or infilled with glass. Occasionally walls of vesicles are lined with chalcedony and zeolite.

Alteration: rock is fresh.

Sample 59-448-59R-2, 50–55 cm (Piece 2G), Unit 13 [Z-1159]

Plagioclase-phyric basalt, crystallized, vesicular. Phenocrysts (15%): glomerophyric segregates of plagioclase prismatic grains (0.5–2 mm, labradorite [$An_{60–62}$]). Groundmass: microlitic texture; microlites of plagioclase (25%, andesine [An_{46}]), microlites of clinopyroxene (20%), brownish glass (10%), and opaque minerals (3%–5%). Vesicles (25%): single rounded (up to 2.5 mm) vesicles and small (0.1–0.3 mm) isometric vesicles; all are empty.

Alteration: rock is fresh.

Sample 59-448-61R-3, 35–38 cm (Piece 1D), Unit 13 [Z-532]

Plagioclase-phyric andesite-basalt, massive. Phenocrysts (15%): tabular grains (0.9–2 mm, labradorite [An_{56}], zonal). Groundmass: pilotaxitic texture; laths of plagioclase (50%, 0.2–0.4 mm, andesine [An_{42}]), small isometric grains of clinopyroxene, green glass, and opaque minerals (10%).

Alteration: rock is fresh.

Hole 448A

Sample 59-448A-10R-4, 61–65 cm (Piece 4A), Unit 5 [Z-533]

Sparsely clinopyroxene-plagioclase-phyric andesite-basalt, vesicular. Phenocrysts: single glomerophyric segregates of plagioclase prismatic grains (2%–3%, 0.3–0.6 mm, labradorite [An_{55}]) and single grain of clinopyroxene (0.7 mm). Groundmass: pilotaxitic texture; laths of plagioclase (andesine [$An_{42–45}$]), small isometric grains of clinopyroxene, and brownish glass (15%). Isometric vesicles (5%, 0.1–0.6 mm) are empty or completely infilled with carbonate.

Alteration: rock is fresh.

Sample 59-448A-12R-4, 27–31 cm (Piece 2C), Unit 5 [Z-534]

Plagioclase-phyric basalt, massive. Phenocrysts (15%): glomerophyric segregates of plagioclase prismatic grains (0.5–1.5 mm, labradorite [An_{55}]). Groundmass (85%): vitrophyric-variolitic texture; brownish variolitic glass. Rock is glassy crust from the top of the flow.

Alteration: rock is fresh.

Sample 59-448A-13R-2, 70–75 cm (Piece 6A), Unit 6 [Z-1160]

Andesite tuff (volcanic ash). Rock: small (0.1 mm) angular or isometric fragments of light green glass.

Alteration: rock is fresh.

Sample 59-448A-14R-2, 58–64 cm (Piece 4B), Unit 11 [Z-1161]

Volcanic breccia with tuff. Rock: fragments (90%–95%) of basalt, andesite, andesite-dacite(?) (1–6 mm). Matrix (5%–10%): zeolite with small (0.1–0.5 mm) fragments of light green glass and black glass.

Alteration: matrix is zeolitized.

XRD: trace smectite with ~30%–40% mica layers; yellow fragments of rock: smectite and phillipsite.

Sample 59-448A-14R-2, 114–118 cm (Piece 4G), Unit 11 [Z-535]

Sparsely plagioclase-phyric andesite-basalt, vesicular. Phenocrysts: single prismatic phenocryst of zonal plagioclase (0.8 mm). Groundmass: hyalopilitic (intersertal?) texture; microlites and laths of plagioclase (0.2–0.5 mm, andesine [An_{42-48}]), small isometric grains of clinopyroxene, and glass (30%). Vesicles (20%, 0.2–0.3 mm): empty or infilled with glass.

Alteration: plagioclase phenocrysts are almost completely replaced by carbonate.

Sample 59-448A-15R-1, 14–19 cm (Piece 1B), Unit 13 [Z-326]

Plagioclase-phyric basalt, fine grained, vesicular. Phenocrysts: platy crystals of plagioclase (20%); occasionally, they form glomerophyric segregates. Single rounded crystals of K-feldspar are present. Vesicles (25%–30%): irregularly rounded in shape. Groundmass: intergranular texture; various grains of pyroxene, laths of plagioclase, and opaque minerals. Interstitial brownish black volcanic glass is present.

Alteration: slight to moderate (~15%–20%); walls of vesicles are lined with smectites.

XRD: smectite; chlorite(?) in trace amounts.

Sample 59-448A-16R-1, 47–52 cm (Piece 4B), Unit 13 [Z-327]

Plagioclase-phyric basalt, fine grained, almost completely crystallized, vesicular. Phenocrysts: platy crystals of plagioclase (15%). Single phenocrysts of pyroxene and K-feldspar are present. Groundmass: intergranular texture; various grains of pyroxene, laths of plagioclase, and opaque minerals. Interstitial brownish black volcanic glass is present. Vesicles: various sizes and irregular shapes.

Alteration: slight (~15%); vesicles are empty or partly filled with smectites, occasionally with admixtures of carbonate.

XRD: smectite is heterogeneous; trace hydromica(?).

Sample 59-448A-20R-1, 142–147cm (Piece 3B), Unit 14 [Z-328]

Aphyric basalt, poorly crystallized, highly vesicular. Single phenocrysts of plagioclase are present. Groundmass: hyalopilitic texture; black volcanic glass with opaque dust and laths of plagioclase. Vesicles (20%–25%): rounded in shape; filled with black volcanic glass and smectites.

Alteration: moderate (~25%); vesicles are partly filled with smectites.

XRD: smectite.

Sample 59-448A-22R-1, 11–14 cm (Piece 1C), Unit 15 [Z-536]

Aphyric andesite-basalt, sparsely vesicular. Rock: pilotaxitic texture; microlites and microlaths of plagioclase (0.1–0.4 mm, andesine [An_{38-42}]), small grains (0.1 mm) of pyroxene, greenish brown volcanic glass with opaque crystals, and opaque minerals (5%–7%).

Alteration: rock is fresh.

Sample 59-448A-26R-2, 134–137 cm (Piece 3A), Unit 17 [Z-1160]

Crystallo-vitroclastic tuff. Rock: very small (0.01–0.2 mm) angular fragments of plagioclase crystals, colorless and black volcanic glass, fragments of carbonate (80%), and clay minerals with foraminifers.

Sample 59-448A-26R-3, 72–75 cm (Piece 1H), Unit 17 [Z-538]

Litho-vitroclastic tuff. Rock: fragments of green volcanic glass (0.2–0.4 mm) and angular fragments of andesite-basalt with oxidized glass, and microlites of plagioclase.

XRD: mixed-layer smectite-illite minerals (~50%–60% mica layers).

Sample 59-448A-30R-1, 95–99 cm (Piece 4B), Unit 19 [Z-539]

Vitroclastic tuff. Rock: angular fragments of green volcanic glass (0.1–0.3 mm).

Sample 59-448A-32R-1, 67–69 cm (Piece 1G), Unit 20A [Z-540]

Aphyric andesite-basaltic microdolerite, massive. Rock: intersertal-microdoleritic texture; microlites and microlaths (0.1–0.4 mm) of plagioclase (60%, andesine [An_{42-44}]), small grains or segregates of clinopyroxene (20%), and glass (20%).

Alteration: interstitial glass is replaced by green clay minerals.

Sample 59-448A-33R-2, 10–15 cm (Piece 1A), Unit 20 [Z-329]

Aphyric basalt, incompletely crystallized, massive. Rock: intersertal texture; laths of plagioclase (50%), xenomorphic pyroxene (40%), opaque minerals (1%–3%), and interstitial glass (7%).

Alteration: moderate (~25%); interstitial glass is replaced by smectites.

XRD: smectite; trace hydromica (~20% swelling layers).

Sample 59-448A-38R-2, 88–90 cm (Piece 3A), Unit 23 [Z-330]

Aphyric basalt, fine grained, inequigranular, vesicular. Rock: pilotaxitic texture; laths of plagioclase, xenomorphic and elongated-prismatic crystals of clinopyroxene, and brownish green volcanic glass (~25%–30% each). Vesicles (20%) are small.

Alteration: moderate (~25%–30%).

XRD: smectite with ~10% mica layers.

Sample 59-448A-41R-2, 81–85 cm (Piece 5A), Unit 27 [Z-541]

Aphyric andesite-basalt, crystallized, vesicular. Rock: intersertal-microdoleritic texture; microlites and laths of plagioclase (60%, andesine [An_{47}]), small xenomorphic grains of clinopyroxene (15%), and gray-green volcanic glass (5%). Vesicles (20%, 0.1–0.9 mm): empty or completely infilled with glass or carbonate.

Sample 59-448A-45R-1, 69–71 cm (Piece 1D), Unit 31 [Z-331]

Aphyric basalt, fine grained, incompletely crystallized, vesicular (5%–10%). Rock: intersertal texture; laths of plagioclase (40%), xenomorphic clinopyroxene (40%), glass (10%), and opaque minerals (3%–5%).

Alteration: moderate (~20%); vesicles are filled with smectites.

XRD: smectite with ~10% mica layers.

Sample 59-448A-47R-1, 90–95 cm (Piece 1E), Unit 33 [Z-332]

Aphyric basalt, fine grained, incompletely crystallized, massive. Rock: intersertal texture; laths of plagioclase (50%), xenomorphic clinopyroxene (35%–40%), interstitial glass (5%), and opaque minerals (5%).

Alteration: moderate (~25%).

XRD: smectite and cristobalite(?).

Sample 59-448A-50R-3, 116–121 cm (Piece 8), Unit 36 [Z-542]

Crystallo-vitroclastic tuff. Fragments of volcanic glass (0.1–0.2 mm) cemented by ash. Fragments of plagioclase grains are present. Ash is partly replaced by clay minerals.

XRD: smectite with ~10% mica layers; trace amphibole.

Sample 59-448A-51R-1, 98–102 cm (Piece 9D), Unit 37 [Z-333]

Aphyric basalt, fine grained, incompletely crystallized, vesicular. Rock: intersertal texture; laths of plagioclase (45%), xenomorphic grains of clinopyroxene (40%), interstitial glass (10%), and opaque minerals (1%–3%). Small vesicles (2%–5%) are rounded in shape.

Alteration: moderate (~20%); vesicles are filled with smectites.

XRD: smectite; trace cristobalite(?).

Sample 59-448A-51R-3, 49–52 cm (Piece 3A), Unit 37 [Z-543]

Sparsely plagioclase-phyric andesite-basalt, massive. Phenocrysts: plagioclase (2%–3%) represented by prismatic grains (0.5–0.8 mm, labradorite [An_{53}]). Groundmass: intersertal-microlitic texture; microlites and microlaths of plagioclase (50%, 0.1–0.3 mm), small (up to 0.1 mm) grains of clinopyroxene (30%), brownish interstitial glass (15%), and opaque minerals (5%).

Alteration: palagonitized glass.

Sample 59-448A-53R-3, 0–5 cm (Piece 1A), Unit 40 [Z-1164]

Crystallo-vitroclastic breccia. Single large (2.5 mm) fragment of plagioclase and fragments (2–5 mm) of greenish brown volcanic glass with perlitic texture (andesite, andesite-dacite?). Matrix: small angular fragments of glass and zeolite.

Sample 59-448A-54R-3, 124–128 cm (Piece 8C), Unit 41 [Z-544]

Sparsely plagioclase-phyric andesite-basalt, massive. Phenocrysts: plagioclase (2%–3%); prismatic grains (0.4–0.5 mm). Groundmass: microlitic texture; microlites and microlaths of plagioclase (0.05–0.2 mm, andesine [An_{44}]), grains of clinopyroxene, greenish brown interstitial glass, and opaque minerals (5%–7%).

Alteration: plagioclase phenocrysts are partly replaced by pelite.

Sample 59-448A-57R-1, 33–36 cm (Piece 1D), Unit 43 [Z-545]

Aphyric andesite-basalt, vesicular. Rock: microlitic texture; laths of plagioclase (40%, 01–0.7 mm, andesine [An_{42-44}]), very small grains of clinopyroxene (45%), dark brown interstitial glass (10%), and opaque minerals (5%–7%). Vesicles (2%–3%) are empty or infilled with glass.

Alteration: interstitial glass is replaced by clay minerals.

XRD: smectite and cristobalite; trace mixed-layer smectite-chlorite mineral(?).

Sample 59-448A-62R-1, 98–102 cm (Piece 2), Unit 49 [Z-334]

Plagioclase-phyric basalt, fine grained, incompletely crystallized, massive. Phenocrysts: plagioclase (25%–30%); platy crystals that also form segregates. Groundmass: intersertal texture; plagioclase, clinopyroxene, interstitial glass, and opaque minerals.

Alteration: moderate (~20%); interstitial glass is filled with smectites.

XRD: smectite; trace cristobalite(?).

Sample 59-448A-65R-2, 10–15 cm (Piece 1B), Unit 51 [Z-335]

Aphyric basalt, fine grained, incompletely crystallized, vesicular. Rock: intersertal texture; laths of plagioclase (40%–45%), clinopyroxene (40%), interstitial glass (10%–15%), and opaque minerals (5%). Vesicles (1%–3%) are small and rounded in shape.

Alteration: moderate (~20%–25%); vesicles are filled with smectites.

XRD: smectites with various composition of interlayer cations (Na-K and Mg-Ca); trace cristobalite(?).

Sample 59-448A-66R-2, 78–83 cm (Piece 1D), Unit 51 [Z-546]

Aphyric andesite-basalt, vesicular. Rock: microlitic texture; microlaths of plagioclase (50%, 01–0.4 mm, andesine [An_{45}] and [An_{38}]), brown grains of clinopyroxene (30%, up to 0.1 mm), light brown interstitial glass (15%), and opaque minerals (5%, up to 0.1 mm). Vesicles (2%–3%) are present.

XRD: smectite; trace cristobalite.

Parece Vela Basin (Hole 449)

Sample 59-449-15R-2, 17–20 cm (Piece 1B), Unit 6a [Z-336]

Aphyric basalt, fine grained, poorly crystallized, vesicular. Rock: pilotaxitic texture; black volcanic glass with opaque dust and needle-shaped laths of plagioclase. Vesicles (0.1–0.2 mm) are rounded in shape.

Alteration: moderate (30%); vesicles are filled with green smectites; clayey-carbonate vein 3–5 mm thick is registered.

XRD: smectite with ~30%–40% mica layers; trace calcite, chlorite and talc(?).

Sample 59-449-17R-2, 2–6 cm (Piece 1A), Unit 6b [Z-337]

Aphyric basalt, fine grained, incompletely crystallized, vesicular. Rock: intergranular texture; laths of plagioclase, xenomorphic clinopyroxene, glass, and opaque minerals. Small vesicles (<1%) are rounded in shape.

Alteration: slight (15%); vesicles are filled with smectites and opaque minerals; interstitial glass is replaced by smectites.

XRD: smectites with ~30% mica layers; trace calcite and chlorite(?).

Mariana Trough and Mariana Forearc Region (Leg 60)

Hole 453

Sample 60-453-50R-2, 45–50 cm (Piece 6), Upper Polymict Breccia [Z-338]

Gabbro, large-crystalline, massive. Rock: hypidiomorphic-granular texture; clinopyroxene (up to 3 mm, 80%), plagioclase (up to 2.5 mm, 15%), olivine (1 mm, <5%), and opaque minerals (0.3–1 mm).

Alteration: slight (5%); secondary minerals are represented by smectite-chlorite aggregates, carbonate, and opal; clinopyroxenes are dissected by numerous cracks filled with ferrugineous chlorite-smectite aggregates; carbonate and opal occur in clinopyroxene as spots.

XRD: chlorite, smectite, and amphibole; trace talc(?).

Sample 60-453-51R-1, 8–12 cm (Piece 1), Upper Polymict Breccia [Z-339]

Gabbro, large-crystalline, massive, cataclastic. Rock: hypidiomorphic-granular texture; plagioclase (0.8–2.0 mm, 80%, labradorite [An_{62}]), clinopyroxene (0.5–2.5 mm, 15%), orthopyroxene (5%), and single grains of chrome spinel (0.5 mm).

Alteration: slight to moderate (15%–20%); pyroxenes suffered cataclasis, cracks are filled with chlorite, serpentine, and opaque minerals.

XRD: chlorite, smectite, and amphibole; trace talc(?) and hydromica(?).

Electron micrograph: b = 9.22 Å.

Sample 60-453-51R-3, 54–58 cm (Piece 4B), Upper Polymict Breccia [Z-340]

Gabbro, large-crystalline, massive, cataclastic, serpentinized. Rock: hypidiomorphic-granular texture; clinopyroxene (up to 6 mm, 70%), plagioclase (0.4–5 mm, 20%), individual crystals of amphibole, and isometric segregates of opaque minerals.

Alteration: moderate (30%); pyroxenes suffered cataclasis, cracks are filled with chlorite, serpentine, and opaque minerals; some grains of clinopyroxene are almost completely replaced by serpentines; clinopyroxene is replaced by amphibole along grain margins; cleavage faces in plagioclase are filled with clay minerals.

XRD: serpentine and chlorite; trace amphibole and talc(?).

Electron microscopy: lizardite; shape is close to quadrangle.

Sample 60-453-52R-2, 113–118 cm (Piece 10), Upper Polymict Breccia [Z-341]

Gabbro, large-crystalline, massive, cataclastic, amphibolitized. Rock: granoblastic texture; clinopyroxene (up to 6 mm, 80%), plagioclase (up to 6 mm, 20%), single crystals of chrome spinel (0.2–0.5 mm, 2%), and nonoxidized opaque minerals (0.3–0.5 mm, 0.5%). Chrome spinel tends to occur as inclusions along margins of plagioclase and pyroxene crystals.

Alteration: moderate (30%); pyroxenes suffered cataclasis; cracks are filled with serpentine and opaque minerals; amphibole and clay minerals occur in marginal and brecciated areas of clinopyroxene.

XRD: chlorite, serpentine, and amphibole; trace smectite and talc(?).

Electron micrograph: b = 9.21 Å (trioctahedral mineral).

Electron microscopy: lizardite is represented by flat crystals with various orientation, sizes, and shapes.

Sample 60-453-53R-3, 19–24 cm (Piece 3D), Upper Polymict Breccia [Z-342]

Olivine gabbro, large-crystalline, massive. Rock: granoblastic texture; plagioclase (0.25–5 mm, 80%), clinopyroxene (up to 5 mm, 15%), olivine (1.5–2.5 mm, <5%), and opaque minerals: magnetite (~20%). Chrome spinel tends to occur as inclusions along margins of plagioclase and pyroxene crystals.

Alteration: slight (15%); crystals of plagioclase and clinopyroxene are dissected by numerous cracks filled with clay minerals and carbonate; olivine is replaced by chlorite; cracks are filled with opaque minerals.

XRD: chlorite, serpentine, and amphibole; trace hydromica(?).

Electron microscopy: lizardite.

Electron micrograph: b = 9.25 Å (trioctahedral mineral).

Sample 60-453-53R-5, 88–91 cm (Piece 9B), Upper Polymict Breccia [Z-343]

Olivine gabbro, large-crystalline, massive. Rock: hypidiomorphic-granular texture; plagioclase (1–2.5 mm, 60%, labradorite [An_{56}]), olivine (0.8–2.5 mm, 25%), clinopyroxene (up to 1.5 mm, 15%), and opaque minerals:

magnetite (~20%). Chrome spinel tends to occur as inclusions along margins of plagioclase and pyroxene crystals.

Alteration: slight (15%).

XRD: chlorite and serpentine; trace amphibole.

Electron micrograph: b = 9.29 Å (trioctahedral mineral).

Electron microscopy: lizardite in small amounts relative to nonserpentine minerals.

Sample 60-453-55R-3, 50–55 cm (Piece 3I), Upper Polymict Breccia [Z-344]

Troctolite. Rock: olivine (40%), plagioclase (55%, 0.4–2.5 mm, labradorite [An_{56}]), clinopyroxene (up to 1.5 mm, 15%), and xenomorphic grains of black oxidized chrome spinel (5%).

Alteration: moderate (35%); olivine is almost completely replaced by serpentine and magnetite; limonite (goethite?) replaces magnetite; rock is oxidized (10%–15%).

XRD: serpentine and chlorite; trace smectite, mixed-layer chlorite-smectite mineral, amphibole and talc.

Electron micrograph: b = 9.26 Å (chrysotile).

Electron microscopy: lizardite is present as the flat crystals; trace of chrysotile of $2M_{c1}$ polytype.

Sample 60-453-55R-3, 142–147 cm (Piece 10B), Upper Polymict Breccia [Z-1165]

Basite-ultrabasite breccia. Rock: fragments (0.1–8 mm) of serpentinites, orthopyroxenes, clinopyroxenes, and plagioclases.

Alteration: serpentinite is replaced by brownish black aggregates of clay minerals, Fe hydroxides, carbonate, and hydromica; fragments of gabbro are replaced by chlorite and serpentine; zeolite replaces large (up to 2.5 mm) tabular grains of plagioclase.

XRD: chlorite; minor amphibole and hydromica; trace smectite, mixed-layer smectite-chlorite minerals, natrolite(?), and prenite(?).

Sample 60-453-55R-4, 82–84 cm (Piece 9A), Upper Polymict Breccia [Z-1166]

Basite-ultrabasite breccia is the same breccia of Sample 60-453-55R-4, 82–84 cm (Z-1165).

Alteration: slight (~10%).

XRD: chlorite, hydromica, and quartz; minor analcime; trace smectite.

Sample 60-453-55R-4, 127–131 cm (Piece 12C), Upper Polymict Breccia [Z-1167]

Gabbro, large-crystalline. Rock: plagioclase (70%, 0.7–5 mm, labradorite [An_{68}]), tremolite (25%, 0.1–0.7 mm), and dark green (hercynite) spinel (5%).

Alteration: moderate (25%); tremolite replaces pyroxene; single grains of plagioclase are partly replaced by aggregates of mica (1%).

Sample 60-453-56R-1, 40–45 cm (Piece 4C), Upper Polymict Breccia [Z-1168]

Basite breccia. Rock: large (up to 5 mm) fragments of sosuritized plagioclase (50%), more small (40%, up to 1 mm) angular fragments of plagioclase, clinopyroxene and orthopyroxene, and chloritized fragments of clinopyroxene(?). Matrix consists of dark brown clay minerals.

XRD: chlorite and smectite with ~20%–30% mica layers; minor hydromica; trace amphibole, talc, and analcime.

Sample 60-453-56R-2, 33–35 cm (Piece 6A), Upper Polymict Breccia [Z-1169]

Gabbro, large-crystalline. Rock: large (2.5–6 mm, labradorite [An_{60}]) isometric grains of plagioclase and segregates of small xenomorphic grains (0.5–2 mm) of plagioclase. Plagioclase is ~80% of rock volume.

Alteration: moderate (20%–25%); cracks (0.1–1.7 mm thick) are infilled with chlorite, tremolite, and granoblastic aggregates of quartz.

Sample 60-453-56R-2, 85–87 cm (Piece 12A), Upper Polymict Breccia [Z-1170]

Gabbro, medium grained. Rock: isometric grains of plagioclase (80%, 0.5–4 mm) and grains of pyroxene (20%).

Alteration: moderate (25%–30%); cracks (0.2–0.4 mm thick) infilled with chlorite; plagioclase is replaced by hydromica; pyroxene is completely replaced by chlorite and tremolite.

Sample 60-453-57R-4, 2–7 cm (Piece 1), Upper Polymict Breccia [Z-345]

Olivine gabbro, medium grained. Rock: granoblastic texture; plagioclase (0.5–3 mm, 80%, labradorite [An_{68}]), olivine and pyroxenes (up to 2.5 mm, 20%), opaque minerals (up to 0.5 mm), and chrome spinel.

Alteration: slight (10%); olivine and pyroxenes are strongly altered, they are replaced by serpentine and chlorite-smectite aggregate; cracks in olivine are filled with opaque minerals; chlorite-smectite aggregate fills cracks along cleavage faces in plagioclase.

XRD: serpentine and chlorite; trace smectite, amphibole and talc.

Electron micrograph: b = 9.28 Å (trioctahedral mineral).

Electron microscopy: lizardite is the predominant mineral with various in shape.

Sample 60-453-61R-1, 30–35 cm (Piece 5), Upper Polymict Breccia [Z-1171]

Breccia of tuff. Rock: fragments of andesite(?) and glass (15%) with perlitic texture.

Alteration: plagioclase is pelletized, chlorite replaces glass; matrix is replaced by carbonate.

XRD: mixed-layer smectite-chlorite minerals (~10%–20% swelling interlayers).

Sample 60-453-63R-1, 80–83 cm (Piece 4A), Upper Polymict Breccia [Z-1172]

Gabbro; granoblastic texture. Rock: plagioclase (45%, 0.5–2.5 mm, labradorite [An_{58-62}]), clinopyroxene (50%, 0.3–5 mm), opaque minerals (5%), and biotite (1%).

Alteration: rock is fresh.

Sample 60-453-63R-1, 130–135 cm (Piece 5l), Upper Polymict Breccia [Z-1173]

Gabbro, medium grained. Rock: xenomorphic grains of plagioclase (70%–75%, 0.7–2.5 mm, labradorite [An_{60}]), xenomorphic rounded grains of pyroxene (20%, 0.1–0.7 mm), and titanomagnetite (7%–8%, 0.4–0.9 mm).

Alteration: rock is fresh.

XRD: smectite with ~10% mica layers; trace chlorite.

Hole 454A

Sample 60-454A-5R-1, 3–7 cm (Piece 1), Unit 1 [Z-1174]

Aphyric basalt (microdolerite), crystallized, vesicular. Rock: microdoleritic texture; plagioclase (50%), clinopyroxene (30%), and vesicles (20%). Plagioclase is replaced by laths (0.2–0.8 mm, labradorite-bitovnite [An_{70}] and labradorite [An_{55}]) and xenomorphic grains, possibly more acid in composition. Pyroxene forms xenomorphic grains (0.1–0.5 mm). Vesicles (0.5–1.6 mm): empty, single vesicle is infilled with carbonate.

Alteration: rock is fresh.

Sample 60-454A-5R-1, 128–132 cm (Piece 17A), Unit 1 [Z-346]

Sparsely plagioclase-phyric, almost completely crystallized; sparsely vesicular (0.1–0.38 mm, 5%). Phenocrysts: large grains of plagioclase (0.4–1 mm, 15%). Groundmass: intergranular, subvariolitic, texture; laths of plagioclase, clinopyroxene, and opaque dust.

Alteration: slight (5%); walls of vesicles are lined with smectites and carbonate; interstitial glass is replaced by smectites and carbonate.

XRD: smectite with ~20% mica layer; trace talc(?).

Electron micrograph: b = 9.22 and 9.12–9.22 Å (serpentine).

Sample 60-454A-5R-2, 50–55 cm (Piece 4), Unit 1 [Z-1175]

Aphyric basalt, almost completely crystallized; sparsely vesicular. Rock: microlitic (microdoleritic) texture; needle-shaped laths (0.3–1.2 mm) of plagioclase (30%, labradorite [An_{55}] and andesine [An_{44}]), clinopyroxene (35%), volcanic glass (5%), and vesicles (30%). Vesicles (0.3–0.8 mm, 5%) are empty.

Alteration: rock is fresh.

Sample 60-454A-5R-3, 115–118 cm (Piece 6A), Unit 1 [Z-347]

Aphyric basalt, medium grained, almost completely crystallized, sparsely vesicular. Rock: intergranular texture; laths of plagioclase, clinopyroxene, devitrified volcanic glass (5%), olivine, and opaque dust. Vesicles (0.3–0.8 mm, 5%) are empty.

Alteration: slight (5%); several vesicles are lined with smectite; carbonate and clay mineral replace interstitial glass.

XRD: smectite with ~30% mica layer; talc and hydromica with swelling interlayers (~10%) occur in trace amounts.

Sample 60-454A-5R-4, 10–15 cm (Piece 2), Unit 1 [Z-1176]

Aphyric dolerite, medium grained, vesicular. Rock: intersertal-doleritic texture; prismatic and tabular grains of plagioclase (35%, 0.2–2 mm, labradorite [An_{60}] and andesine [An_{46}]), xenomorphic (0.3–0.7 mm) or prismatic

(1.5–1.7 mm) grains of clinopyroxene, olivine (10%, 0.2–0.5 mm), greenish brown volcanic glass (20%), and opaque minerals (1%–2%). Vesicles (15%, 0.2–0.8 mm) are lined with glass.

Alteration: slight (5%–10%); clay minerals replace interstitial glass.

Sample 60-454A-8R-1, 100–106 cm [Z-348]

Tuff.

XRD: smectite.

Electron micrograph: b = 9.20 Å (trioctahedral smectite).

Sample 60-454A-10R-1, 45–49 cm (Piece 2), Unit 3 [Z-349]

Aphyric basalt, medium grained, high vesicular (0.2–0.4 mm, 40%). Rock: hyalopilitic texture; laths of plagioclase (50%), clinopyroxene, devitrified volcanic glass, and opaque dust.

Alteration: slight (~10%); walls of vesicles are lined with smectites and carbonate; interstitial glass is replaced by smectites and carbonate.

XRD: smectite; hydromica, chlorite, amphibole, and talc(?).

Electron micrograph: b = 9.22 Å (trioctahedral smectite).

Sample 60-456A-11R-1, 58–62 cm (Piece 9) [Z-350]

Mudstone.

XRD: chlorite and quartz; trace smectite.

Sample 60-454A-11R-1, 102–109 cm (Piece 11), Unit 4 [Z-351]

Sparsely plagioclase-phyric basalt, incompletely crystallized, vesicular. Phenocrysts: plagioclase (0.3–0.6 mm, 10%), clinopyroxene (0.4–0.8 mm, 8%), and single grains of olivine (up to 0.3 mm). Groundmass: intersertal texture; laths of plagioclase, clinopyroxene, devitrified volcanic glass, and opaque dust. Vesicles (0.1–2 mm, 30%): vary from rounded to isometric and elongated in shape.

Alteration: moderate (20%); walls of vesicles are lined with smectites; interstitial glass and olivine are replaced with smectites.

XRD: smectite.

Electron micrograph: b = 9.22 Å (trioctahedral smectite).

Sample 60-454A-11R-2, 125–128 cm (Piece 7A), Unit 4 [Z-1177]

Aphyric basalt, incompletely crystallized, vesicular (65%). Rock: vitrophyric-microdoleritic texture; microlites (0.1–0.4 mm) of plagioclase (prismatic grains: labradorite [An_{55}], and microlites: andesine [An_{40}]), very small grains of clinopyroxene, black-brown volcanic glass (15%), and opaque dust. Vesicles (0.1–0.6 mm) are empty.

Alteration: slight; veinlets consist of clay minerals; several vesicles (<1%) are infilled with clay minerals.

Sample 60-454A-11R-4, 92–97 cm (Piece 5), Unit 4 [Z-352]

Sparsely olivine-clinopyroxene-plagioclase-phyric basalt, incompletely crystallized, vesicular. Microphenocrysts: plagioclase (0.2–0.4 mm, 5%), clinopyroxene (0.1–0.3 mm, 2%), and single grains of olivine (0.1–0.4 mm). Groundmass: intersertal, partly subvariolitic, texture; laths of plagioclase, clinopyroxene, devitrified volcanic glass, and opaque dust.

Alteration: slight (15%); walls of vesicles are lined with smectites; interstitial glass and olivine are replaced with smectites.

XRD: smectite with ~30% mica layers; trace hydromica.

Electron micrograph: b = 9.21 Å (trioctahedral smectite).

Sample 60-454A-12R-1, 116–120 cm (Piece 13), Unit 4 [Z-353]

Aphyric basalt, incompletely crystallized, vesicular (0.1–2 mm, 10%). Occasionally, microphenocrysts of plagioclase (0.3–0.5 mm, 5%) form glomerophyric segregates. Clinopyroxene (0.2–0.4 mm, <1%) and single grains of olivine are present. Groundmass: hyaline, occasionally subvariolitic, texture; laths of plagioclase, clinopyroxene, devitrified volcanic glass, olivine, and opaque dust.

Alteration: slight (15%); walls of vesicles are lined with smectites; interstitial glass and olivine are replaced with smectites.

XRD: smectite with ~40% mica layers; trace hydromica (with 10% swelling interlayers).

Electron micrograph: b = 9.23 Å (trioctahedral smectite).

Sample 60-454A-12R-2, 30–34 cm (Piece 3B), Unit 4 [Z-1178]

Sparsely plagioclase-phyric basalt, crystallized, vesicular. Single glomerophyric segregate of plagioclase (<1%). Groundmass: microlitic texture; needle-shaped laths of plagioclase (25%, 0.1–0.7 mm, laths, 0.7 mm: labradorite [An_{60}] and microlites: andesine [An_{42}]), segregates of clinopyroxene microlites (25%), black and green volcanic glass (10%), and opaque dust (~5%). Vesicles (40%, 0.1–0.8 mm, 30%) are present. Large vesicles (2%–3%, 0.8 mm) are empty; part of small vesicles (10%) are completely replaced by green glass, other parts of small vesicles (27%–28%) are empty.

Alteration: rock is fresh.

Sample 60-454A-13R-1, 11–15 cm [Z-354]

Sediment.

XRD: smectite.

Sample 60-454A-16R-1, 25–30 cm (Piece 5), Unit 5 [Z-355]

Aphyric basalt, incompletely crystallized, fine grained, highly vesicular. Sparse microphenocrysts of clinopyroxene (0.3 mm) are present. Groundmass: variolitic texture; laths of plagioclase, clinopyroxene, devitrified volcanic glass, and opaque dust. Vesicles (0.1–1.5 mm, 50%): rounded in shape.

Alteration: slight (10%); walls of vesicles are lined with smectites and microdruses of chlorite(?); interstitial glass is replaced by smectites.

Electron micrograph: b = 9.23 Å.

Hole 458

Sample 60-458-28R-1, 106–110 cm (Piece 14), Unit 1-1 [Z-356]

Aphyric basalt, medium grained, almost completely crystallized, highly vesicular (0.2–1 mm, 40%). Single microphenocrysts of clinopyroxene (0.1–0.3 mm). Groundmass: intergranular, occasionally subvariolitic, texture; laths of plagioclase, clinopyroxene, devitrified volcanic glass, olivine, and opaque dust. Single large vesicles are filled with volcanic glass and opaque dust.

Alteration: slight (3%); walls of vesicles are lined with smectites.

XRD: smectite; amphibole and chlorite in trace amounts.

Sample 60-458-29R-1, 103–108 cm (Piece 17), Unit 1-1 [Z-357]

Aphyric basalt, incompletely crystallized, vesicular (5%). Groundmass: hyalopilitic texture; laths of plagioclase, clinopyroxene, devitrified volcanic glass, and olivine.

Alteration: slight (15%); walls of vesicles are lined with smectites; interstitial glass is replaced by smectites.

XRD: smectite.

Electron micrograph: b = 9.26 Å (trioctahedral smectite).

Sample 60-458-30R-1, 111–113 cm (Piece 17), Unit 1-1 [Z-358]

Aphyric basalt, fine grained, incompletely crystallized, vesicular. Groundmass: hyalopilitic texture; laths of plagioclase, clinopyroxene, devitrified volcanic glass, olivine, and opaque dust. Vesicles (0.2–0.4 mm, 5%): rounded and elongated in shape.

Alteration: slight (10%); walls of vesicles are lined with smectites; interstitial glass and olivine are replaced by smectites.

XRD: smectite.

Electron micrograph: b = 9.24 Å.

Sample 60-458-31R-1, 116–120 cm (Piece 18), Unit 2-1 [Z-359]

Aphyric basalt, fine grained, almost completely crystallized, vesicular (0.2–1 mm, 15%). Groundmass: intergranular texture; laths of plagioclase, clinopyroxene, devitrified volcanic glass, and opaque dust.

Alteration: slight (~7%); walls of vesicles are lined with smectites; interstitial glass is replaced by smectites.

XRD: smectite with ~20%–25% mica layers and cristobalite; trace hydromica and amphibole.

Sample 60-458-32R-3, 90–95 cm (Piece 12A), Unit 2-1 [Z-360]

Aphyric andesite, almost completely crystallized, sparsely vesicular (0.2–0.5 mm, 3%). Groundmass: intergranular texture; laths of plagioclase, clinopyroxene, single grains of olivine, and devitrified volcanic glass with opaque dust.

Alteration: slight (5%); walls of vesicles are lined with smectites; interstitial glass and olivine are replaced by smectites.

XRD: cristobalite(?); smectite with ~30% mica layers; hydromica and amphibole in trace amounts.

Electron micrograph: b = 9.21 (very slight) and 9.10 Å.

Sample 60-458-33R-1, 32–37 cm (Piece 4), Unit 2-2 [Z-1179]

Aphyric andesite-basalt (boninite), crystallized, vesicular. Rock: microlitic texture; microlites and laths of plagioclase (30%, labradorite [An_{60}] and andesine [An_{43}]), segregate of clinopyroxene microlites (25%), and light greenish brown glass (5%). Vesicles (60%, 0.1–1.5 mm): isometric and empty.

Alteration: rock is fresh.

XRD: smectite; minor hydromica; trace quartz; veinlet: mixed-layer vermiculite-hydromica mineral; minor smectite with ~50% mica layers.

Sample 60-458-33R-2, 129–131 cm (Piece 14), Unit 2-3 [Z-361]

Aphyric andesite-basalt (boninite?), medium grained, incompletely crystallized, sparsely vesicular (0.2–0.4 mm, 2%). Groundmass: intergranular texture; laths of plagioclase, clinopyroxene, single grains of olivine, and devitrified volcanic glass with opaque dust.

Alteration: slight (~5%); walls of vesicles are lined with smectites; interstitial glass and olivine are replaced by smectites.

XRD: smectite; minor cristobalite(?); trace hydromica (~5% swelling interlayers).

Electron micrograph: b = 9.10 Å.

Sample 60-458-34R-2, 14–19 cm (Piece 1B), Unit 2-3 [Z-362]

Aphyric andesite-basalt, medium grained, almost completely crystallized, sparsely vesicular. Groundmass: intergranular texture; laths of plagioclase, clinopyroxene, single grains of olivine, and devitrified volcanic glass with opaque dust. Single vesicles have sizes of 0.2–0.8 mm.

Alteration: slight (~5%); interstitial glass and olivine are replaced by smectites.

XRD: smectite with ~10%–30% mica layers, cristobalite(?); minor hydromica.

Electron micrograph: b = 9.12 Å.

Sample 60-458-35R-2, 12–18 cm (Piece 2), Unit 2-4 [Z-363]

Aphyric basalt, fine grained, almost completely crystallized, vesicular (0.2–3 mm, 15%). Groundmass: subvariolitic texture; laths of plagioclase, clinopyroxene, single grains of olivine, and devitrified volcanic glass with opaque dust.

Alteration: slight (10%); walls of small vesicles are lined with smectites; large vesicles are filled with carbonate; interstitial glass is replaced by smectites.

XRD: smectite with ~10% mica layers and cristobalite; minor hydromica.

Sample 60-458-36R-1, 125–128 cm (Piece 18), Unit 2-4 [Z-1180]

Aphyric andesite-basalt (boninite), vesicular (10%, 0.1 mm). Rock: hyalopilitic texture; needle-shaped (0.1–0.2 mm) microlites of plagioclase (15%, labradorite [An_{50-52}] and andesine [An_{38}]), microlites of clinopyroxene (20%, 0.1–0.2 mm), hornblende(?) (2%–3%), and glass (50%).

Alteration: rock is fresh.

XRD: smectite.

Sample 60-458-37R-2, 70–75 cm (Piece 8C), Unit 2-6 [Z-364]

Aphyric olivine basalt, medium grained, incompletely crystallized, vesicular (0.2–0.5 mm, 10%). Phenocrysts: olivine (0.1–0.2 mm, 7%). Groundmass: intersertal, occasionally subvariolitic, texture; laths of plagioclase, clinopyroxene, olivine, devitrified volcanic glass with microlites of plagioclase and with opaque dust.

Alteration: slight (~5%); walls of vesicles are lined with smectites; interstitial glass and olivine are replaced by smectites.

XRD: smectite with ~10% mica layers; trace cristobalite, hydromica (~10% swelling interlayers), and amphibole.

Sample 60-458-39R-1, 100–102 cm (Piece 12A), Unit 3-1 [Z-365]

Aphyric basalt, fine grained, poorly crystallized, vesicular (0.2–0.5 mm, 5%). Groundmass: hyalopilitic texture; laths of plagioclase, clinopyroxene, olivine, devitrified volcanic glass, and opaque dust.

Alteration: slight (~15%); walls of vesicles are lined with smectites; interstitial glass, olivine, and partly clinopyroxene are replaced by smectites.

XRD: smectite with interlayer Na-K and Mg-Ca cations; trace hydromica (~20% swelling interlayers).

Sample 60-458-39R-2, 60–65 cm (Piece 6), Unit 3-1 [Z-1181]

Aphyric andesite-basalt (boninite), poorly crystallized. Rock: hyalopilitic texture; needle-shaped microlites (0.05–0.2 mm) of plagioclase (10%, andesine [An_{40}]), microlites of pyroxene (15%), and brown glass.

Alteration: rock is fresh.

Sample 60-458-40R-1, 143–147 cm (Piece 1Q), Unit 3-1 [Z-1182]

Aphyric andesite-basalt (boninite), vesicular. Rock: hyalopilitic texture; microlites (0.05–0.1 mm) of plagioclase (10%, andesine [An_{40}]), pyroxene (15%), brownish green grains (0.03–0.05 mm) of hornblende(?) (5%–7%), and brownish green glass (60%). Vesicles (10%, 0.1–0.4 mm) are empty.

Alteration: rock is fresh; single vesicle (0.8 mm) and microcrack (0.3 mm in thickness) are infilled with zeolite.

XRD: smectite with ~10% mica layers; veinlet: smectite with ~10% mica layers; trace analcime and phillipsite(?).

Sample 60-458-41R-1, 2–7 cm (Piece 1), Unit 4A-1 [Z-1183]

Plagioclase-phyric basalt, vesicular. Phenocrysts (2%–3%): prismatic grains (0.5–0.6 mm) of plagioclase. Groundmass: pilotaxitic texture; needle-shaped microlites (0.1–0.3 mm) of plagioclase (30%, andesine [An_{42}]), very small (<0.1 mm) grains of opaque minerals (7%–8%), and brown glass (35%). Vesicles (15%, 0.5–1 mm) mainly are empty.

Alteration: slight (10%–15%); interstitial glass (10%) replaced by clay minerals.

XRD: smectite with ~10% mica layers; trace cristobalite, hydromica, amphibole, and chlorite.

Sample 60-458-41R-1, 102–107 cm (Piece 1), Unit 4A-1 [Z-1184]

Sparsely clinopyroxene-phyric basalt, vesicular. Single (<1%) prismatic (2 mm) phenocryst of clinopyroxene. Microphenocryst (0.5 mm) of opaque minerals is present. Groundmass: pilotaxitic texture; microlites (0.05–0.1 mm) of plagioclase (30%, andesine [An_{44}]), very small (<0.1 mm) grains of opaque minerals (5%), and brown glass (55%). Vesicles (10%, 0.3–0.8 mm) are empty.

Alteration: rock is fresh.

Sample 60-458-41R-2, 40–45 cm (Piece 1), Unit 4A-1 [Z-1185]

Aphyric basalt, poorly crystallized. Rock: hyalopilitic texture; needle-shaped microlites (0.05–0.1 mm) of plagioclase (10%, andesine [An_{42}]) and brownish black glass.

Alteration: rock is fresh.

XRD: smectite with ~20% mica layers and cristobalite; trace hydromica.

Sample 60-458-42R-1, 60–65 cm (Piece 6), Unit 4B-1 [Z-1186]

Aphyric basalt, poorly crystallized, vesicular. Rock: hyalopilitic texture; needle-shaped microlites (0.1–0.4 mm) of pyroxene (25%) and light cream glass. Vesicles (5%, 0.2–0.5 mm) are empty.

Alteration: moderate (35%); pyroxene is partly (5%) or completely replaced by tremolite; clay minerals replace interstitial glass (50%).

Sample 60-458-43R-2, 45–50 cm (Piece 7), Unit 4B-1 [Z-1187]

Aphyric andesite-basalt (boninite). Rock: hyalopilitic texture; microlites (0.05–0.2 mm) of pyroxene (10%) and light cream glass.

Alteration: rock is fresh.

Sample 60-458-44R-1, 140–145 cm (Piece 11), Unit 4B-1 [Z-1188]

Aphyric andesite-basalt (boninite), poorly crystallized, vesicular. Rock: pilotaxitic texture; microlites (25%, 0.1–0.5 mm) of plagioclase, microlites of pyroxene (20%, 0.05–0.2 mm), dark green grains of amphibole (5%, 0.2–0.4 mm), and glass (50%). Vesicles (20%, 0.1–0.5 mm) are empty.

Alteration: slight (15%); clay minerals replace glass (15%).

XRD: veinlet: smectite.

Sample 60-458-45R-1, 130–135 cm (Piece 15A), Unit 4B-3 [Z-366]

Aphyric basalt, fine grained, poorly crystallized, vesicular (0.3–0.5 mm, 5%). Groundmass: subvariolitic texture; laths of plagioclase, clinopyroxene, olivine, devitrified volcanic glass, and opaque dust. Vesicles are filled with devitrified glass with opaque dust.

Alteration: slight (~15%); walls of vesicles are lined with smectites; interstitial glass, olivine, and partly clinopyroxene are replaced by smectites.

XRD: smectite.

Sample 60-458-46R-1, 89–91 cm (Piece 8), Unit4C-1 [Z-367]

Aphyric basalt, fine grained, poorly crystallized, sparsely vesicular (0.2–0.4 mm). Groundmass: hyalopilitic texture; laths of plagioclase, clinopyroxene, olivine, devitrified volcanic glass, and opaque minerals.

Alteration: slight (~10%); walls of vesicles are lined with smectites; interstitial glass is replaced by smectites.

XRD: smectite.

Sample 60-458-47R-1, 133–136 cm (Piece 17), Unit 5-1 [Z-368]

Aphyric basalt, fine grained, massive. Groundmass: trachytic texture; laths of plagioclase, clinopyroxene, devitrified volcanic glass, and opaque minerals. Vesicles have sizes of 0.1–0.3 mm (10%). Veins are as thick as 0.2–0.5 up to 1–1.5 mm.

Alteration: slight (~10%); walls of vesicles are lined with smectites; interstitial glass is replaced by smectites; microveins contain needle-shaped crystals of smectites.

XRD: smectite; trace amphibole.

Sample 60-458-48R-1, 42–47 cm (Piece 1), Unit 5-2 [Z-1189]

Sparsely clinopyroxene-phyric basalt, poorly crystallized, vesicular. Three prismatic phenocrysts of augite (2%, 0.8 mm). Groundmass: hyalopilitic texture; microlites (0.05–0.2 mm) of plagioclase (10%, andesine [An_{42}]) and dark brown glass (80%–85%). Vesicles (5%, 0.4–0.8 mm): rounded and lined black glass with zeolite.

Alteration: moderate (25%); clay mineral replaces glass (25%).

XRD: smectite.

Hole 459B

Sample 60-459B-59R-2, 50–55 cm [Z-369]

Sediment.

XRD: smectite with ~20% mica layers; trace hydromica (~20% swelling interlayers), chlorite, heulandite(?), and amphibole(?).

Sample 60-459B-60R-1, 125–127 cm (Piece 11), Unit 1 [Z-370]

Aphyric olivine basalt, medium grained, almost completely crystallized, vesicular (0.3–0.5 mm, 10%). Groundmass: intergranular texture; laths of plagioclase, clinopyroxene, olivine, devitrified volcanic glass, and opaque minerals.

Alteration: slight (~10%); walls of vesicles are lined with smectites; interstitial glass is replaced by smectites.

XRD: smectite; minor cristobalite; trace hydromica (~5% swelling interlayers).

Sample 60-459B-60R-2, 90–95 cm (Piece 8), Unit 1 [Z-371]

Aphyric olivine basalt, almost completely crystallized, vesicular (up to 0.5 mm, 10%). Groundmass: intergranular, occasionally intersertal, texture; laths of plagioclase, clinopyroxene, olivine, devitrified volcanic glass, and opaque minerals.

Alteration: slight (~15%); walls of vesicles are lined with smectites; interstitial glass is replaced by smectites and carbonate.

XRD: smectite with ~10% mica layers, cristobalite; trace hydromica (~10% swelling interlayers).

Sample 60-459B-61R-1, 19–22 cm (Piece 2), Unit 1 [Z-373]

Aphyric olivine basalt, incompletely crystallized, medium grained, vesicular. Groundmass: intersertal texture; laths of plagioclase, clinopyroxene, olivine, devitrified volcanic glass, and opaque minerals.

Alteration: slight (~15%); walls of vesicles are lined with smectites; interstitial glass is replaced by smectites.

XRD: smectite with ~20%–25% mica layers; minor cristobalite; trace hydromica (~20% swelling interlayers) and amphibole.

Sample 60-459B-61R-1, 141–145 cm (Piece 14), Unit 1 [Z-372]

Aphyric dolerite, vesicular. Rock: intersertal texture; laths of plagioclase (40%, 0.3–0.9 mm, labradorite [An_{55}] and andesine [An_{42}]), clinopyroxene (40%), and greenish gray glass with skeletal crystals of opaque minerals. Vesicles (0.6 mm) are empty.

Alteration: rock is fresh.

XRD: smectite with ~30% mica layers; minor cristobalite; trace hydromica (~10% swelling interlayers).

Sample 60-459B-62R-1, 44–46 cm (Piece 4), Unit 1 [Z-1190]

Aphyric dolerite, fine grained. Rock: intersertal-doleritic texture; laths (0.3–0.9 mm) of plagioclase (40%, 0.3–0.9 mm, labradorite [An_{58}] and andesine [An_{42}]), xenomorphic grains (0.1–0.4 mm) of clinopyroxene and their segregates (35%), black glass (20%), and opaque minerals (5%).

Alteration: rock is fresh.

Sample 60-459B-63R-1, 25–28 cm (Piece 3A), Unit 2 [Z-1191]

Aphyric andesite-basalt, poorly crystallized, vesicular. Rock: hyalopilitic texture; microlites of plagioclase (10%, 0.1–0.3 mm, andesine [An_{47}]), microlites (0.1–0.3 mm) of clinopyroxene (5%), and light gray-cream glass (70%). Vesicles (15%, 0.1–0.4 mm) are empty.

Alteration: rock is fresh.

Sample 60-459B-64R-1, 24–28 cm (Piece 2B), Unit 2 [Z-374]

Aphyric basalt, fine grained, vesicular (0.1–0.1 mm, 10%). Groundmass: hyalopilitic texture; laths of plagioclase, clinopyroxene, devitrified volcanic glass, and opaque minerals.

Alteration: slight (~25%–30%); walls of vesicles are lined with smectites; interstitial glass is replaced by smectites.

XRD: smectite; trace hydromica.

Sample 60-459B-65R-1, 82–85 cm (Piece 9), Unit 2 [Z-375]

Aphyric basalt, fine grained, vesicular. Groundmass: hyalopilitic (partly trachytic) texture; laths of plagioclase, clinopyroxene, devitrified volcanic glass, and opaque minerals. Vesicles have sizes of 0.1–2 mm (20%).

Alteration: moderate (~20%); walls of vesicles are lined with smectites; interstitial glass is replaced with smectites.

XRD: smectite; trace hydromica (~10% swelling interlayers) and quartz.

Sample 60-459B-66R-1, 40–45 cm (Piece 4B), Unit 3 [Z-376]

Aphyric andesite-basalt, medium grained, almost completely crystallized, massive. Rock: laths of plagioclase and K-feldspar(?) (0.4–0.5 mm, 65%), clinopyroxene (5%), quartz (0.2–0.4 mm, up to 5%), and single grains of amphibole. Groundmass: poikiloblastic texture; devitrified volcanic glass with microlites of clinopyroxene.

Alteration: slight (~3%); interstitial glass is replaced by smectites.

XRD: smectite with ~10% mica layers; trace hydromica (~10% swelling interlayers) and chlorite.

Sample 60-459B-67R-1, 107–112 cm (Piece 8B), Unit 3 [Z-377]

Aphyric andesite-basalt, coarse grained, incompletely crystallized, massive. Rock: ophitic texture; large laths of plagioclase (0.8–1.5 mm, 60%), clinopyroxene (0.2–0.4 mm, 5%), olivine (0.2–0.3 mm, ~5%), devitrified volcanic glass, and opaque minerals (up to 0.2 mm).

Alteration: slight (~10%); interstitial glass and olivine are replaced by smectites.

XRD: smectite with ~40% mica layers; minor cristobalite and hydromica.

Sample 60-459B-68R-1, 38–42 cm (Piece 3), Unit 3 [Z-378]

Aphyric andesite-basalt, fine grained, highly vesicular (0.3–1 mm, 50%). Groundmass: intersertal texture; laths of plagioclase, clinopyroxene, single grains of olivine, devitrified volcanic glass, and opaque minerals.

Alteration: moderate (~40%); vesicles are filled with smectites.

XRD: hydromica and smectite contains ~20% of mica layers; minor cristobalite.

Sample 60-459B-69R-1, 84–87 cm (Piece 12), Unit 4 [Z-379]

Aphyric andesite-basalt, fine grained, incompletely crystallized, vesicular (0.2–2 mm, 15%). Rock: intersertal texture; laths of plagioclase, clinopyroxene, olivine, devitrified volcanic glass, and opaque minerals.

Alteration: slight (10%); interstitial glass is replaced by smectites; walls of vesicles are lined with smectites.

XRD: smectite and cristobalite (?); trace hydromica.

Sample 60-459B-70R-1, 85–90 cm (Piece 6), Unit 4 [Z-1192]

Sparsely plagioclase-clinopyroxene-phyric andesite-basalt, vesicular. Phenocrysts (1%–2%): represented by tabular and prismatic grains (0.5–0.7 mm) of plagioclase and glomerophyric segregates of clinopyroxene xenomorphic grains (0.2–0.4 mm). Groundmass: hyalopilitic texture; needle-shaped microlites (0.1–0.3 mm) of plagioclase (15%, andesine [An_{45}]), opaque minerals (5%), and brown glass (70%). Vesicles (10%, 0.1–0.4 mm) are empty.

Alteration: rock is fresh.

Sample 60-459B-70R-1, 105–110 cm (Piece 7), Unit 4 [Z-1193]

Aphyric basalt, poorly crystallized, vesicular. Rock: pilotaxitic texture; microlites (0.1–0.2 mm) of plagioclase (30%, andesine [An_{47}]) and brownish black glass (50%). Vesicles (20%, 0.1–0.6 mm) are empty.

Alteration: rock is fresh.

Sample 60-459B-70R-2, 30–35 cm (Piece 2), Unit 4 [Z-1194]

Aphyric basalt, poorly crystallized, vesicular. Rock: hyalopilitic texture; microlites (0.1–0.4 mm) of plagioclase (25%, andesine [An_{43}]) and brownish black glass (70%). Vesicles (5%, 0.1–0.6 mm) are empty.

Alteration: rock is fresh.

Sample 60-459B-71R-1, 138–141 cm (Piece 8), Unit 4 [Z-380]

Aphyric basalt, fine grained, incompletely crystallized, vesicular. Rock: intersertal, occasionally hyalopilitic, texture; laths of plagioclase, clinopyroxene, devitrified volcanic glass, and opaque minerals. Vesicles have sizes of 0.2–0.5 mm (10%).

Alteration: moderate (~20%); interstitial glass is replaced by smectites; walls of vesicles are lined with smectites.

XRD: smectite; trace cristobalite and hydromica.

Sample 60-459B-72R-1, 124–128 cm (Piece 1), Unit 4 [Z-381]

Aphyric basalt, fine grained, incompletely crystallized, highly vesicular. Rock: intersertal texture; laths of plagioclase, clinopyroxene, devitrified volcanic glass, and opaque minerals. Vesicles: 0.05 mm and 0.3–0.6 mm (20%); are empty or lined by chlorite.

Alteration: moderate (~25%); interstitial glass is replaced with clay mineral; vesicles are lined with clay mineral.

XRD: smectite and cristobalite; trace hydromica (~5% swelling interlayers).

Sample 60-459B-73R-1, 0–5 cm, Unit 4 [Z-1195]

Aphyric andesite-basalt, crystallized, vesicular. Rock: pilotaxitic texture; microlites and microlaths (0.1–0.4 mm) of plagioclase (40%, andesine [An_{43}]), small grains (0.1 mm) of clinopyroxene (15%), glass (40%), and opaque minerals (1%–2%).

Alteration: slight to moderate (~20%); interstitial glass is replaced by clay minerals.

Sample 60-459B-73R-1, 120–125 cm, Unit 4 [Z-1196]

Sparsely pyroxene-plagioclase-phyric andesite-basalt, poorly crystallized, vesicular. Phenocrysts: single (<1%) prismatic grains (0.6–0.8 mm) of pyroxene and plagioclase. Groundmass: hyalopilitic texture; needle-shaped microlites of plagioclase (10%, andesine [An_{47}]), volcanic glass (85%), and opaque minerals (2%–3%). Vesicles (2%–3%, 0.6–0.7 mm): partly or completely infilled with brown and green glass.

Alteration: moderate to strong (~55%); glass is replaced by clay minerals.

XRD: smectite with ~20% mica layers; trace chlorite.

Sample 60-459B-73R-2, 75–80 cm, Unit 4 [Z-1197]

Sparsely plagioclase-phyric andesite-basalt. Phenocrysts (2%–3%): prismatic grains (0.3–0.8 mm, labradorite [An_{55}]) of plagioclase. Groundmass: hyalopilitic texture; needle-shaped microlites (0.1–0.2 mm) of plagioclase (15%, andesine [An_{48}]) and gray-cream volcanic glass (80%) with crystals of pyroxene and opaque minerals.

Alteration: rock is fresh.

Sample 60-459B-73R-3, 84–88 cm, Unit 4 [Z-382]

Aphyric basalt, fine grained, incompletely crystallized, vesicular. Rock: intersertal (partly hyalopilitic) texture; laths of plagioclase, clinopyroxene, devitrified volcanic glass, and opaque minerals. Vesicles have sizes of 0.2–1.5 mm (10%).

Alteration: slight (~10%); interstitial glass is replaced with smectites; walls of vesicles are lined with smectites.

XRD: smectite; trace hydromica and amphibole(?).

Japan Sea (Legs 127 and 128)

Hole 794C

Sample 127-794C-1R-1, 48–50 cm (Piece 7), Unit 2 [Z-1457]

Plagioclase-phyric dolerite, massive. Phenocrysts: prismatic grains (0.5–2.5 mm) of plagioclase (15%, labradorite [An_{60}]). Groundmass: intersertal-doleritic texture; unoriented prismatic grains (0.1–0.4 mm) of plagioclase (55%, labradorite [An_{60}]). Interstitial spaces are filled with altered volcanic glass (20%), grains of quartz (2%–3%), and skeletal grains of opaque minerals (10%).

Alteration: moderate (20%–25%); clay minerals completely replace interstitial glass.

Sample 127-794C-1R-1, 111–113 cm (Piece 9), Unit 2 [Z-234]

Plagioclase-phyric basalt (dolerite?), coarse grained, almost completely crystallized, vesicular. Phenocrysts: plagioclase (0.5–2.5 mm, 60%). Interstitial spaces are filled with devitrified volcanic glass. Groundmass: intergranular texture. Vesicles (0.2–0.5 mm, 10%): empty; walls are lined with smectites.

Alteration: moderate to high (~40%); smectites replace interstitial glass and femic minerals.

XRD: smectite; trace chlorite and defective chlorite.

Sample 127-794C-1R-1, 138–139 cm (Piece 11A), Unit 2 [Z-1458]

Plagioclase-phyric dolerite, fine grained, massive. Phenocrysts: prismatic grains (2–4 mm) of plagioclase (30%, labradorite [An_{68}]). Groundmass: intersertal-doleritic texture; prismatic grains (0.2–0.7 mm) of plagioclase (35%, labradorite [An_{55}]). Interstitial spaces are filled with greenish black volcanic glass (20%), segregates of very small (<0.1 mm) grains of clinopyroxene (5%), and opaque minerals (8%–10%).

Alteration: slight (~5%); clay minerals partly replace interstitial glass.

Sample 127-794C-4R-2, 82–84 cm (Piece 7G), Unit 2 [Z-235]

Plagioclase-phyric basalt (dolerite?), coarse grained, almost completely crystallized, vesicular. Phenocrysts: plagioclase (0.5–3 mm, 60%), clinopyroxene (0.3–0.8 mm, 8%), and olivine (0.2–0.5 mm, 5%). Groundmass: doleritic texture; devitrified volcanic glass, microlites of clinopyroxene, and opaque minerals. Vesicles (0.2–1 mm): filled with chlorite-smectite aggregates.

Alteration: moderate (~30%–35%); interstitial glass is filled with smectites.

XRD: smectite; trace chlorite and hydromica.

Sample 127-794C-7R-1, 56–61 cm (Piece 5A), Unit 3 [Z-1459]

Plagioclase-phyric dolerite, fine grained, massive.

Sample 127-794C-7R-1, 120–122 cm (Piece 6D), Unit 3 [Z-236]

Plagioclase-phyric basalt (dolerite?), medium grained, vesicular. Phenocrysts (0.4–0.8 mm, 60%): plagioclase. Groundmass: ophitic texture; devitrified volcanic glass, microlites of clinopyroxene, olivine, and opaque minerals. Vesicles (0.3–1 mm): filled with chlorite-smectite aggregate.

Alteration: strong (50%); interstitial glass and femic minerals are filled with clay minerals.

XRD: smectite with ~10% mica layers; trace defective chlorite and hydromica.

Sample 127-794C-10R-1, 85–87 cm (Piece 7E), Unit 4 [Z-237]

Sparsely plagioclase-phyric basalt, medium grained, vesicular. Phenocrysts (0.5–0.8 mm, 50%): plagioclase. Microphenocrysts (0.2–2 mm, 3%): clinopyroxene. Single grains of olivine occur sporadically. Groundmass: intersertal texture; devitrified volcanic glass, microlites of clinopyroxene, and opaque minerals. Vesicles (0.3–2.5 mm, 20%–25%): filled with chlorite-smectite aggregates.

Alteration: strong (50%); interstitial glass is filled with clay minerals.

XRD: smectite; trace hydromica.

Sample 127-794C-12R-1, 46–48 cm (Piece 1A), Unit 5 [Z-238]

Sparsely plagioclase-phyric basalt, medium grained, vesicular. Phenocrysts (0.4–1 mm, 40%): plagioclase. Groundmass: intersertal texture; devitrified volcanic glass, microlites of clinopyroxene, olivine(?), and opaque minerals. Vesicles (0.5–2.5 mm, 20%): filled with smectites.

Alteration: moderate (~25%); interstitial glass is filled with clay minerals.

XRD: smectite; trace hydromica (~20% swelling layers) and quartz.

Sample 127-794C-12R-6, 91–93 cm (Piece 1I), Unit 5 [Z-239]

Olivine-phyric basalt, fine grained, vesicular. Microphenocrysts (0.3 mm, 3%): plagioclase. Groundmass: intergranular texture devitrified volcanic glass, plagioclase, microlites of clinopyroxene, olivine, and opaque minerals. Vesicles (0.1–0.5 mm, 20%): empty; walls are lined with opaque dust and chlorite-smectite aggregate.

Alteration: scarce (~1%).

XRD: smectites with interlayer Na-K and Mg-Ca cations; trace defective chlorite, chlorite, and hydromica.

Hole 794D

Sample 128-794D-10R-2, 25–28 cm (Piece 1B), Unit 6 [Z-768]

Aphyric andesite-basalt, vesicular. Rock: pilotaxitic texture; microlaths and microlites (0.3–2 mm) of plagioclase (30%–35%; albite-oligoclase), interstitial glass, and opaque dust. Vesicles (50%; 0.1–0.5 mm): oval and oval-isometric in shape.

Alteration: very strong (70%); phenocrysts of plagioclase partly replaced by pelite; interstitial glass replaced by clay mineral; vesicles are filled with clay mineral.

XRD: mixed-layer smectite-chlorite mineral (~60% swelling interlayers); trace chlorite.

Sample 128-794D-11R-1, 39–43 cm (Piece 3E), Unit 6 [Z-769]

Sparsely plagioclase-phyric andesite-basalt, vesicular. Phenocrysts: single prismatic grain (2 mm) of plagioclase. Groundmass: microdoleritic-intersertal texture; microlaths (0.1–0.7 mm) of zonal plagioclase (from andesine [An_{32}] to andesine [An_{45}]) containing inclusions of glass. Interstices: segregates of very small grains (<0.1 mm) of clinopyroxene (30%), glass with opaque dust, and opaque minerals (~5%).

Alteration: moderate (40%); glass from plagioclase and interstitial glass are replaced by clay minerals.

Sample 128-794D-11R-1, 89–95 cm (Piece 3J), Unit 6 [Z-1483]

Aphyric dolerite, vesicular. Rock: doleritic texture; laths (0.3–0.6 mm) of plagioclase (30%, andesine [An_{40-42}]). Interstices: isometric small (0.1–0.2 mm) grains of clinopyroxene (30%), opaque minerals (10%), and greenish brown glass (5%). Vesicles (25%; 0.2–0.7 mm): isometric in shape.

Alteration: moderate (30%); interstitial glass is replaced by clay minerals; vesicles are filled with clay minerals (central parts of vesicles have more light color: celadonite?).

XRD: smectite; trace mixed-layer smectite-chlorite minerals(?) and chlorite.

Sample 128-794D-11R-2, 26–29 cm (Piece 1B), Unit 6 [Z-770]

Sparsely plagioclase-phyric andesite-basalt with microlitic-intersertal texture, vesicular. Rock is identical to Sample 128-794D-11R-1, 89–95 cm (Z-1483).

Sample 128-794D-11R-3, 108–112 cm (Piece 4), Unit 6 [Z-771]

Sparsely plagioclase-phyric andesite-basalt (microdolerite), vesicular. Phenocrysts: single grains (0.5–0.7 mm) of plagioclase (labradorite [An_{50}]). Groundmass: microdoleritic-intersertal texture; laths (0.2–0.7 mm) of plagioclase (andesine [An_{38}] and andesine [An_{42}]) with inclusions of glass. Interstices: segregates of small grains (up to 0.3 mm) of clinopyroxene, glass with opaque dust, and opaque minerals (~5%–7%). Vesicles (20%; 0.1–1.5 mm): present.

Alteration: moderate (30%); interstitial glass replaced by clay mineral; vesicles are filled with clay mineral.

XRD: smectite; trace chlorite and mixed-layer smectite-chlorite mineral.

Sample 128-794D-12R-1, 24–26 cm (Piece 2A), Unit 7 [Z-772]

Aphyric dolerite (andesite-basalt), medium grained. Rock: doleritic texture; laths (0.2–2 mm) of plagioclase (30%, from andesine [An_{43}] to andesine [An_{32}]). Interstices: segregates of small (up to 0.5 mm) grains of augite, rounded grains (0.2–0.4 mm) of olivine, and glass.

Alteration: slight; olivine partly replaced by clay minerals; clay minerals replace interstitial glass.

Sample 128-794D-12R-3, 107–111 cm (Piece 4C), Unit 7 [Z-773]

Aphyric dolerite (andesite-basalt), medium grained, massive. Rock: poikilophitic-intersertal texture; elongated-prismatic or isometric grains (0.2–2 mm) of plagioclase (andesine [An_{32-35}]), grains of augite with inclusions of plagioclase grains, opaque minerals (5%–7%), and glass (~20%).

Alteration: slight to moderate (20%); clay minerals replace interstitial glass.

Sample 128-794D-13R-1, 73–76 cm (Piece 3G), Unit 7 [Z-774]

Aphyric dolerite (andesite-basalt), medium grained, massive. Rock: doleritic-intersertal texture; prismatic and tabular grains (0.8–2 mm) of plagioclase (from andesine [An_{38}] to andesine [An_{43}]), small (0.2–0.4 mm up to 0.8 mm) isometric grains of augite with inclusions of plagioclase grains, opaque minerals (5%), and interstitial glass (~15%).

Alteration: slight (15%); clay minerals replace interstitial glass.

Sample 128-794D-14R-1, 72–76 cm (Piece 6A), Unit 7 [Z-775]

Aphyric dolerite (andesite-basalt), medium grained, massive. Rock: intersertal-doleritic texture; elongated-prismatic and tabular grains (0.5–2.5 mm) of plagioclase (andesine [$An_{42–45}$]) with inclusions of glass, isometric (0.3–0.8 mm up to 0.8 mm) grains of augite, Ti augite which contains inclusions of plagioclase grains, and skeletal micrograins of opaque minerals in interstitial glass.

Alteration: strong (60%); plagioclase is partly replaced by pelite; glass from plagioclase replaced by clay minerals; interstices consist of albite, hydrobiotite, needles of apatite, and pelletized orthoclase; clinopyroxene partly replaced by clay minerals.

XRD: smectite.

Sample 128-794D-15R-1, 79–85 cm (Piece 10A), Unit 7 [Z-1617]

Aphyric dolerite, medium grained, massive. Rock: intersertal-ophitic texture; prismatic and tabular grains (0.4–0.8 mm) of plagioclase (50%, labradorite [An_{55}] and andesine [An_{42}]), xenomorphic (0.1–0.7 mm) grains of clinopyroxene (30%), opaque minerals (5%), and brownish green interstitial glass (15%).

Alteration: slight (15%); interstitial glass replaced by clay minerals.

XRD: smectite; trace mixed-layer smectite-chlorite minerals and calcite.

Sample 128-794D-16R-1, 110–117 cm (Piece 12), Unit 8 [Z-1484]

Aphyric basalt, vesicular. Rock: intersertal-microlitic texture; microlites and large laths (0.7–1.4 mm) of plagioclase (50%, andesine [$An_{40–42}$]), very small segregates of clinopyroxene microlites (20%), and interstitial glass (20%). Vesicles (5%; 0.5–0.6 mm): sparse, isometric in shape; walls are lined with brownish green and black glass.

Alteration: slight to moderate (~20%); interstitial glass replaced by clay mineral.

Sample 128-794D-17R-1, 87–93 cm (Piece 8), Unit 8 [Z-1485]

Aphyric dolerite, medium grained. Rock: intersertal-ophitic texture; elongated-prismatic laths (0.5–1 mm) of plagioclase (45%, labradorite [An_{55}] and andesine [An_{44}]), xenomorphic grains (0.3–0.6 mm) of clinopyroxene (30%), opaque minerals (5%), and interstitial glass (20%).

Alteration: slight to moderate (~20%); interstitial glass replaced by clay minerals.

XRD: mixed-layer smectite-chlorite minerals; minor smectite; trace swelling chlorite.

Sample 128-794D-18R-1, 40–47 cm (Piece 6), Unit 8 [Z-1486]

Aphyric dolerite, medium grained. Rock: doleritic texture; prismatic and elongated-prismatic laths (0.5–1.5 mm) of plagioclase (40%, mainly andesine [$An_{42–44}$]), isometric grains and segregates of clinopyroxene (45%), opaque minerals (5%), and interstitial glass (10%).

Alteration: slight (10%); interstitial glass replaced by clay minerals.

XRD: smectite; trace swelling chlorite, mixed-layer smectite-chlorite minerals, and chlorite; dark brown veinlet: smectite; trace mixed-layer smectite-chlorite minerals.

Hole 795B

Sample 127-795B-35R-1, 60–62 cm (Piece 4), Unit 1 [Z-240]

Aphyric basalt, fine grained, vesicular. Groundmass: intergranular, trachytoid texture; volcanic glass with opaque dust, laths of plagioclase, microlites of clinopyroxene, and sparse olivine. Vesicles (0.2–1 mm, 10%): rounded and irregular in shape, filled with clay minerals. A crack (thickness 0.3–0.4 mm) is filled with clay minerals and opaque minerals.

Alteration: slight (~10%); interstitial glass is replaced with smectites.

XRD: smectites with Na-K and Mg-Ca interlayer cations.

Sample 127-795B-37R-1, 33–35 cm (Piece 3), Unit 3A [Z-696]

Clinopyroxene-plagioclase-phyric andesite-basalt (boninite?), vesicular. Phenocrysts (15%): prismatic grains (0.5–0.8 mm) of plagioclase (several grains are zonal) with inclusions of glass; segregates of partly idiomorphic grains (0.2–0.5 mm) of clinopyroxene. Groundmass: pilotaxitic texture; microlaths of plagioclase (andesine [An_{38-42}]) and oxidized black glass (nonoxidized parts of glass have greenish brown color). Vesicles (10%–15%; 0.3–1.5 mm): rounded and oval in shape.

Alteration: moderate; phenocrysts of plagioclase replaced by pelite and albite; glass in plagioclase replaced by clay mineral; interstitial glass is oxidized (partly); walls of vesicles are lined green glass, central parts of vesicles are filled with clay mineral.

Sample 127-795B-38R-1, 6–8 cm (Piece 1B), Unit 3A [Z-241]

XRD: smectite.

Sample 127-795B-38R-2, 87–92 cm (Piece 3B), Unit 3A [Z-1461]

Clinopyroxene-plagioclase-phyric andesite-basalt, vesicular. Phenocrysts (10%): prismatic grains (0.2–0.7 mm) of plagioclase (5%) with numerous (90%) inclusions of glass. Clinopyroxene (5%) forms xenomorphic grains and their segregates. Groundmass (80%): pilotaxitic texture; microlaths and microlites (0.1–0.5 mm) of plagioclase (50%, andesine [An_{45}]) and glass (25%). Vesicles (10%; 0.1–0.6 mm): rounded and oval in shape.

Alteration: moderate; glass in plagioclase partly replaced by clay mineral; small vesicles (8%) almost completely are filled with glass; walls of large vesicles (2%) are lined with glass (central parts of vesicles are filled with clay mineral).

Sample 127-795B-38R-4, 28–30 cm (Piece 2A), Unit 3A [Z-242]

Aphyric basalt, fine grained, vesicular. Groundmass: intersertal texture; volcanic glass with opaque dust, laths of plagioclase, microlites of clinopyroxene, and sparse olivine. Vesicles (0.3–1.2 mm, 30%): rounded and irregular in shape; some join to form microveins. A vein (0.8–1.5 mm thick) is filled with devitrified glass with microlites of clinopyroxene.

Alteration: moderate (~40%); interstitial glass is replaced by smectites; veins consist of smectites and probably zeolites.

XRD: smectite; trace hydromica and heulandite(?).

Sample 127-795B-39R-2, 22–24 cm (Piece 1B), Unit 3A [Z-1462]

Clinopyroxene-plagioclase-phyric andesite-basalt, vesicular. Phenocrysts (20%): prismatic grains (0.4–1.2 mm) of plagioclase (12%, labradorite [An_{62}]) with numerous inclusions of greenish brown glass. Clinopyroxene (8%) forms prismatic (0.6–0.7 mm) or xenomorphic (0.3–0.4 mm) grains and their segregates. Groundmass (40%): pilotaxitic texture; microlites of plagioclase (20%, andesine [An_{45}]), pyroxene (5%), and glass (15%). Vesicles (40%; 0.2–1.2 mm): oval in shape.

Alteration: moderate (40%); glass from plagioclase partly replaced by clay mineral; vesicles are lined with brown glass (central parts of vesicles are filled with clay mineral).

Sample 127-795B-40R-1, 27–29 cm (Piece 3B), Unit 3B [Z-243]

Aphyric basalt, medium grained, highly vesicular. Groundmass: intergranular texture; volcanic glass with opaque dust, laths of plagioclase, microlites of clinopyroxene, and sparse olivine. Vesicles (0.3–0.5 to 2.5 mm, 40%): filled with smectites, some vesicles are filled with zeolite, occasionally with devitrified glass.

Alteration: moderate (45%); interstitial glass, olivine, and plagioclase are replaced with smectites.

XRD: smectite; trace heulandite(?).

Sample 127-795B-40R-2, 123–125 cm (Piece 13), Unit 3B [Z-244]

Aphyric basalt, fine grained, highly vesicular. Groundmass: intergranular texture; volcanic glass with opaque dust, laths of plagioclase, and microlites of clinopyroxene. Vesicles (0.2–1.5 mm, 40%): filled with smectites, some filled with zeolite.

Alteration: strong (50%); interstitial glass and plagioclase are replaced by smectites.

XRD: smectite.

Hole 797C

Sample 127-797C-9R-1, 43–53 cm (Piece 9), Unit 1 [Z-1477]

Plagioclase-phyric basalt, crystallized, massive. Phenocrysts: prismatic grains (0.5–1.2 mm) of plagioclase. Groundmass: microlitic texture; microlites (0.1–0.3 mm) and microlaths (0.5–0.8 mm) of plagioclase (60%, mainly andesine [An_{38}] and [An_{43}]), segregate of very small (<0.1 mm) grains of clinopyroxene (15%), altered volcanic glass (in small amounts), and opaque minerals (5%).

Alteration: slight (15%–20%); interstitial glass is replaced with clay mineral.

Sample 127-797C-10R-1, 90–92 cm (Piece 2J), Unit 2 [Z-1478]

Sparsely plagioclase-phyric basalt, crystallized, massive. Phenocrysts: prismatic grains of plagioclase (5%, labradorite [An_{55}]). Groundmass (95%): microlitic texture; microlites and laths (0.1–0.6 mm) of plagioclase (65%, andesine [An_{48}]), very small (<0.1 mm) grains of clinopyroxene (10%), brown volcanic glass (20%) with crystals of opaque minerals.

Alteration: rock is fresh.

Sample 127-797C-10R-2, 125–127 cm (Piece 8E), Unit 2 [Z-245]

Aphyric basalt, fine grained, massive. Groundmass: intergranular, occasionally subvariolitic, texture; volcanic glass with opaque dust, laths of plagioclase, microlites of clinopyroxene, and olivine.

Alteration: slight (~10%); interstitial glass, olivine, and sparsely plagioclase are replaced with chlorite-smectite aggregate.

XRD: smectite with ~20% mica layers; trace chlorite.

Sample 127-797C-12R-2, 91–93 cm (Piece 1F), Unit 3 [Z-246]

Olivine-plagioclase-phyric basalt, coarse grained, massive. Rock: doleritic texture; laths of plagioclase (0.2–0.4 mm, 60%), devitrified volcanic glass (in small amounts), microlites of clinopyroxene (0.2–0.4 mm, 10%), opaque minerals, and olivine.

Alteration: slight (~15%); interstitial glass and olivine are replaced with chlorite-smectite aggregate.

XRD: smectites with ~20% mica layers and contain various interlayer cations (Na-K and Mg-Ca); trace chlorite and amphibole(?).

Sample 127-797C-12R-4, 85–89 cm (Piece 4D), Unit 3 [Z-756]

Sparsely plagioclase-phyric dolerite, fine grained, massive. Phenocrysts (3%–5%): prismatic grains (up to 1.5 mm, labradorite [An_{55}]) of plagioclase. Groundmass: doleritic-intersertal texture; laths (0.3–0.8 mm) of plagioclase (andesine [An_{42-43}]). Interstices: segregate of small grains of augite (~45%–47%), glass (~45%–47%), and opaque minerals (3%–5%).

Alteration: slight (10%–15%); interstitial glass replaced by clay mineral.

Sample 127-797C-13R-2, 99–102 cm (Piece 6C), Unit 3 [Z-757]

Sparsely plagioclase-phyric dolerite, fine grained, massive. Rock is identical to Sample 127-797C-12R-4, 85–89 cm (Z-756).

Sample 127-797C-14R-1, 88–94 cm (Piece 12A), Unit 4 [Z-1479]

Aphyric basalt, massive, brecciated. Rock: fragments of basalt and glassy crust. Basalt: microlites and laths of plagioclase (80%) and glass (20%).

Alteration: very strong (90%–95%); glassy crust completely replaced by clay minerals; rock replaced by aggregate of secondary minerals: albite, orthoclase, sericite, smectite, and chlorite.

XRD: smectite; trace chlorite (~10% swelling interlayers); clay matter from veinlet: smectite; trace swelling chlorite(?), and talc(?).

Sample 127-797C-16R-1, 53–55 cm (Piece 5B), Unit 5C [Z-247]

Olivine-plagioclase-phyric basalt (dolerite?), coarse grained, massive. Rock: ophitic texture; laths of plagioclase (0.5–1.5 mm, 60%), olivine (0.3–0.5 mm, 15%), clinopyroxene (0.2–0.4 mm, 10%), opaque minerals (0.1–0.3 mm, 5%), and devitrified volcanic glass (in small amounts).

Alteration: slight to moderate (~20%); interstitial glass and olivine are replaced by chlorite-smectite aggregate.

XRD: smectite; trace chlorite.

Sample 127-797C-16R-2, 64–68 cm (Piece 2C), Unit 5C [Z-758]

Sparsely plagioclase-phyric dolerite, fine grained with doleritic-intersertal groundmass texture, massive. Rock is identical to Samples 127-797C-12R-4, 85–89 cm (Z-756), and 13R-2, 99–102 cm (Z-757).

Sample 127-797C-19R-2, 51–53 cm (Piece 3B), Unit7 [Z-248]

Sparsely olivine-clinopyroxene-plagioclase-phyric basalt (dolerite?), coarse grained, massive, doleritic texture.

Alteration: slight (~15%); interstitial glass and olivine are replaced with chlorite-smectite aggregate.

XRD: smectite; trace chlorite and amphibole.

Sample 127-797C-19R-4, 2–5 cm (Piece 5B), Unit 7 [Z-759]

Plagioclase-phyric dolerite, medium grained, massive. Phenocrysts (15%): glomerophyric segregates of tabular grains (0.8–2 mm, labradorite [An_{50}]) of plagioclase. Plagioclase consists of inclusions of glass. Groundmass: doleritic texture; by laths (0.3–0.8 mm) of plagioclase (andesine [$An_{42–44}$]). Interstices: small (0.1–0.2 mm) rounded grains of olivine (2%–3%) and segregates of xenomorphic grains of augite with grains of opaque minerals (5%).

Alteration: slight (5%–7%); olivine partly replaced by clay mineral.

Sample 127-797C-19R-4, 51–56 cm (Piece 7A), Unit 7 [Z-1480]

Sparsely plagioclase-phyric basalt, massive. Phenocrysts (2%–3%): prismatic grains of plagioclase. Groundmass: pilotaxitic texture; microlites and laths of plagioclase (andesine [An_{49}] and labradorite [An_{52}]). Interstices: small (<0.1 mm) grains of clinopyroxene (20%), brown glass (10%), and opaque minerals (7%–8%).

Alteration: slight (2%–3%); glass partly replaced by clay minerals.

Sample 127-797C-20R-2, 104–108 cm (Piece 1D), Unit 8 [Z-1481]

Aphyric basalt, massive. Rock: pilotaxitic texture completely replaced by secondary minerals (albite, sericite, smectite, chlorite, and orthoclase?).

Alteration: very strong (95%).

XRD: smectite with ~10% mica layers and mixed-layer smectite-chlorite minerals (~10% swelling interlayers); minor corrensite; trace chlorite; veinlet: smectite and corrensite-like mineral; trace chlorite.

Sample 127-797C-21R-1, 55–57 cm (Piece 10), Unit 8 [Z-249]

Sparsely clinopyroxene-plagioclase-phyric basalt (dolerite?), coarse grained, massive, poikilophitic texture.

Alteration: slight (~10%); interstitial glass and olivine are replaced by chlorite-smectite aggregate.

XRD: smectite; trace chlorite, hydromica, and amphibole(?).

Sample 127-797C-21R-1, 76–80 cm (Piece 10), Unit 8 [Z-1482]

Aphyric dolerite, medium grained, massive. Rock: ophitic texture; prismatic grains (0.4–1.6 mm) of plagioclase (45%; labradorite [An_{55}] and andesine [An_{42}]), xenomorphic grains (0.2–1.7 mm) of clinopyroxene (35%), small (0.2–0.5 mm) grains of olivine (10%), glass (5%), and opaque minerals (5%).

Alteration: slight (15%); olivine completely replaced by green iddingsite; clay minerals replace interstitial glass.

XRD: mixed-layer smectite-chlorite minerals; minor smectite.

Sample 127-797C-21R-4, 110–112 cm (Piece 2B), Unit 8 [Z-760]

Aphyric dolerite, medium grained, massive. Rock: intersertal-doleritic texture; laths (0.2–2 mm) of plagioclase (andesine [An_{45}]), xenomorphic grains (0.3–0.7 mm) of augite, glass, and opaque minerals (3%–4%).

Alteration: slight to moderate (15%–20%); clay minerals replace interstitial glass.

XRD: smectite and mixed-layer smectite-chlorite minerals (~10% swelling interlayers); trace amphibole(?).

Sample 127-797C-21R-6, 10–14 cm (Piece 2), Unit 8 [Z-761]

Aphyric dolerite, medium grained, massive. Rock: intersertal-doleritic (occasionally, intersertal-ophitic) texture; by laths (0.3–2 mm) of plagioclase (80%, andesine [$An_{40–42}$]), xenomorphic grains of clinopyroxene (25%), glass (20%), and opaque minerals (5%). Single grains of clinopyroxene (up to 0.8 mm) with inclusions of plagioclase are present.

Alteration: slight to moderate (20%); clay minerals replace interstitial glass.

XRD: swelling chlorite and mixed-layer smectite-chlorite minerals; trace talc.

Sample 127-797C-24R-1, 95–97 cm (Piece 5D), Unit 9 [Z-250]

Plagioclase-phyric basalt (dolerite?), coarse grained, vesicular (0.2–0.8 mm, 10%), poikilophitic texture.

Alteration: slight (~15%); interstitial glass and olivine are replaced by chlorite-smectite aggregate; the latter fills vesicles.

XRD: smectites with interlayer Na-K and Mg-Ca cations; minor chlorite; trace talc.

Sample 127-797C-24R-4, 130–132 cm (Piece 7A), Unit 9 [Z-762]

Aphyric basalt (andesite-basalt: boninite?), massive. Rock: intersertal texture; laths (0.3–1.2 mm) of plagioclase, skeletal and needle-shaped grains of opaque minerals (25%) with hydrobiotite, completely altered clinopyroxene, and glass.

Alteration: strong to very strong (70%–75%); plagioclase replaced by clay minerals and albite; clinopyroxene completely replaced by brown secondary minerals; clay minerals replace interstitial glass.

XRD: smectite; minor mixed-layer smectite-chlorite minerals; trace chlorite; dark green veinlet: smectite and mixed-layer smectite-chlorite minerals; trace chlorite.

Sample 127-797C-24R-6, 64–66 cm (Piece 4), Unit 9 [Z-251]

Clinopyroxene-plagioclase-phyric basalt (dolerite?), coarse grained, vesicular (0.2–0.8 mm, 10%). Groundmass: poikilophitic texture.

Alteration: slight (~10%); interstitial glass and olivine are replaced by chlorite-smectite aggregate; the latter fills vesicles.

XRD: smectite; minor chlorite; trace amphibole(?).

Sample 127-797C-26R-1, 115–118 cm (Piece 17), Unit 10 [Z-763]

Aphyric basalt (andesite-basalt: boninite?), sparsely vesicular. Rock: microintersertal (pilotaxitic) texture; microlaths (0.1–0.5 mm) of plagioclase (35%–40%, oligoclase [An_{28}]), glass impregnated by dustlike magnetite, and small skeletal and needle-shaped grains (up to 0.1 mm) of opaque minerals (15%). Vesicles (0.4–0.6 mm): sparse; rounded in shape.

Alteration: strong (70%); plagioclase replaced by pelite and clay minerals; clay minerals replace interstitial glass; vesicles are filled with clay minerals.

XRD: corrensite-like mineral.

Sample 127-797C-27R-1, 68–70 cm (Piece 4G), Unit 11 [Z-252]

Aphyric basalt, fine grained, vesicular (0.2–0.8 mm, 15%). Groundmass: intergranular texture.

Alteration: slight to moderate (~20%); interstitial glass and olivine are replaced by clay minerals; vesicles are filled with clay minerals.

XRD: smectites with interlayer Na-K and Mg-Ca cations; trace hydromica.

Sample 127-797C-29R-1, 80–83 cm (Piece 2H), Unit 12 [Z-764]

Sparsely clinopyroxene-plagioclase-phyric basalt (andesite-basalt: boninite?), massive. Phenocrysts: single prismatic grains (up to 2 mm) of plagioclase (2%–3%, andesine [An_{42}]). Groundmass: microdoleritic-intersertal texture; laths (0.2–0.8 mm) of plagioclase (andesine [An_{38}]) with undulatory extinction, segregate small grains (<0.1 mm) of clinopyroxene (30%), greenish brown glass, and opaque minerals (7%–8%).

Alteration: slight.

XRD: smectite.

Sample 127-797C-31R-3, 114–116 cm (Piece 1E), Unit 13 [Z-253]

Aphyric basalt, vesicular (0.2–0.5 mm, 10%), intergranular texture.

Alteration: slight (~10%); interstitial glass and olivine are replaced by chlorite-smectite aggregate; the latter fills vesicles.

XRD: smectites with ~10% mica layers and with interlayer Na-K and Mg-Ca cations; trace hydromica.

Sample 127-797C-33R-1, 10–13 cm (Piece 2B), Unit 14 [Z-765]

Aphyric basalt (andesite-basalt). Rock: intersertal texture; laths (0.1–0.3 mm) of plagioclase, green glass, opaque dust, and small (0.1 mm) skeletal grains of opaque minerals (5%). Vesicles: (0.4–0.6 mm) sparse; rounded in shape.

Alteration: moderate (20%–25%); plagioclase is replaced by pelite and albite; clay minerals replace interstitial glass.

XRD: corrensite-like mineral.

Sample 127-797C-34R-1, 49–51 cm (Piece 3C), Unit 15 [Z-254]

Aphyric basalt, fine grained, vesicular (0.2–0.4 mm, 7%), intergranular texture.

Alteration: slight (~10%); interstitial glass and olivine are replaced by chlorite-smectite aggregate and carbonate; the latter fills vesicles.

XRD: smectites with interlayer Na-K and Mg-Ca cations; trace chlorite.

Sample 127-797C-41R-1, 42–44 cm (Piece 1A), Unit 19 [Z-255]

Sparsely plagioclase-phyric basalt, vesicular (0.2–0.5 mm, 20%), intersertal texture.

Alteration: moderate (~25%); interstitial glass and olivine are replaced by chlorite-smectite aggregate; the latter fills vesicles.

XRD: smectite; minor corrensite-like mineral; trace chlorite.

Sample 127-797C-44R-3, 47–49 cm (Piece 4A), Unit 20 [Z-256]

Andesite-basalt, coarse grained, vesicular (0.3–1 mm), intersertal texture.

Alteration: moderate (~25%); interstitial glass and olivine are replaced by chlorite-smectite aggregate; the latter fills vesicles.

XRD: corrensite-like mineral; minor chlorite.

Sample 127-797C-45R-1, 1–5 cm (Piece 1A), Unit 21 [Z-766]

Aphyric andesite-basalt, massive. Rock: intersertal texture; laths (0.3–0.8 mm, up to 2 mm) of plagioclase (from oligoclase [An_{28}] to andesine [An_{32}]), small (<0.1 mm) grains of clinopyroxene, green glass, and opaque minerals (7%–8%).

Alteration: moderate (40%–50%); plagioclase replaced by pelite and albite; clay minerals replace interstitial glass.

XRD: smectite; minor mixed-layer smectite-chlorite mineral.

Sample 127-797C-45R-4, 8–11 cm (Piece 1), Unit 21 [Z-767]

Aphyric dolerite (andesite-basalt), massive. Rock: intersertal-doleritic texture; laths and tabular grains (0.3–2 mm) of plagioclase (50%, from labradorite [An_{50}] to andesine [An_{32-8}]), small (0.2–0.5 mm) xenomorphic grains of augite, brownish green glass, and opaque minerals (5%–7%).

Alteration: moderate (20%); clay minerals replace interstitial glass.

XRD: smectite and swelling chlorite.

Lau Basin (Leg 135)

Hole 834B

Sample 135-834B-8R-2, 7–10 cm (Piece 1A), Unit 2 [Z-801]

Aphyric andesite-basalt, crystallized, vesicular. Rock: microdoleritic texture; microlites and microlaths (0.05–0.3 mm) of plagioclase (andesine [An_{45}]), segregates of small (up to 0.2 mm) isometric grains of clinopyroxene, and glass (<1%). Vesicles (20%; 0.2–1.2 mm): isometric in shape, empty, walls are lined with glass.

Alteration: slight; interstitial glass and glass from vesicles replaced by clay minerals.

Sample 135-834B-8R-2, 12–18 cm (Piece 1B), Unit 2 [Z-1487]

Aphyric andesite-basalt, crystallized, vesicular. Rock: microlitic (microdoleritic) texture; microlites and microlaths (up to 0.7 mm) of plagioclase (35%, andesine [An_{40-42}]), small (0.1–0.2 mm) isometric grains of clinopyroxene (30%), opaque minerals (7%), and brownish green volcanic glass (8%). Vesicles (20%; 0.2–0.7 mm): lined with clay minerals.

Alteration: slight (3%–5%); interstitial glass and glass from vesicles replaced by clay mineral.

Sample 135-834B-11R-2, 79–82 cm (Piece 3A), Unit 5 [Z-802]

Plagioclase-phyric andesite-basalt (dolerite), massive. Phenocrysts (20%): prismatic grains (1.2–2.5 mm) of plagioclase (labradorite [An_{50}]) and their segregates. Groundmass: ophitic texture; laths (0.3–1 mm) of plagioclase (andesine [An_{43-45}]). Interstices: xenomorphic grains (0.2–0.5 mm) of clinopyroxene and opaque minerals (~2%–3%).

Alteration: moderate (25%); plagioclase phenocrysts partly replaced by albite; clinopyroxene partly or completely replaced by hornblende (uralite).

Sample 135-834B-11R-3, 86–89 cm (Piece 3A), Unit 5 [Z-1488]

Aphyric dolerite, fine grained, vesicular. Rock: intersertal-poikilophitic texture; large (1.2–5 mm) grains of clinopyroxene (40%) with abundant laths of plagioclase, unoriented laths (0.2–0.7 mm) of plagioclase (25%, from andesine [An_{48}] to andesine [An_{42}]), small (0.1–0.2 mm) skeletal grains of opaque minerals (5%–7%), and volcanic glass (~10%). Vesicles (20%, 0.5–1.5 mm): isometric in shape.

Alteration: slight (10%–12%); interstitial glass replaced by clay minerals; walls of vesicles are lined with greenish brown radial-radiant clay minerals.

XRD: smectite; trace mixed-layer smectite-swelling chlorite mineral and cristobalite(?).

Sample 135-834B-12R-4, 130–134 cm (Piece 2), Unit 5 [Z-803]

Sparsely plagioclase-phyric basalt (dolerite), massive. Phenocrysts: single phenocryst of plagioclase (segregate of two oval-prismatic grains, up to 2 mm each). Groundmass: poikilophitic-intersertal texture; large (1.5–2.5 mm) isometric grains of clinopyroxene with inclusions of plagioclase microlaths. Interstices: microlaths (0.2–0.5 mm) of plagioclase (labradorite [An_{54}]), sparse small grains of pyroxene, green glass, and opaque minerals (~3%–4%).

Alteration: slight (15%); interstitial glass replaced by clay mineral.

Sample 135-834B-13R-1, 134–139 cm (Piece 4), Unit 5 [Z-1489]

Plagioclase-phyric dolerite, fine grained, vesicular. Phenocrysts (15%): glomerophyric segregates of tabular and prismatic grains (0.5–1.7 mm) of plagioclase (labradorite [$An_{60–62}$]). Groundmass: intersertal-poikilophitic texture; isometric grains (0.5–1.7 mm) of clinopyroxene (30%) with abundant inclusions of plagioclase laths (0.2–0.7 mm, andesine [An_{42}]). Interstices: opaque minerals (~5%–7%) and glass (10%). Vesicles (15%; 0.5–0.7 mm): isometric in shape.

Alteration: slight (10%–15%); interstitial glass replaced by clay mineral; walls of vesicles are lined clay mineral.

Sample 135-834B-13R-1, 139–142 cm (Piece 4), Unit 5 [Z-804]

Sparse plagioclase-phyric dolerite (basaltic composition) with intersertal-poikilophitic texture groundmass, sparsely vesicular. Rock is identical to Sample 135-834B-13R-1, 134–139 cm (Z-1489).

Alteration: slight (15%); interstitial glass replaced by clay mineral.

XRD: smectite; trace mixed-layer smectite-swelling chlorite mineral and cristobalite(?).

Sample 135-834B-22R-1, 87–90 cm (Piece 14A), Unit 7 [Z-805]

Plagioclase-phyric dolerite, massive. Phenocrysts (20%): tabular grains (0.5–1 mm) of plagioclase (labradorite [An_{58}]) and their segregates. Groundmass: doleritic texture; laths (0.3–0.5 mm) of plagioclase (andesine-labradorite [An_{50}] and andesine [$An_{46–48}$]). Interstices: segregates of small (<0.1–0.4 mm) grains of clinopyroxene, glass (1%–2%).

Alteration: slight; clay minerals replace glass; microcracks (5–6 mm) filled with pelite.

Sample 135-834B-28R-2, 76–78 cm (Piece 4B), Unit 7 [Z-806]

Plagioclase-phyric dolerite, fine grained, massive. Phenocrysts (20%): tabular and zonal elongated-prismatic grains (0.5–2 mm) of plagioclase (labradorite [An_{56}]) and their segregates. Small grains (0.2–0.4 mm) of olivine are present. Plagioclase grains contain inclusions of glass. Groundmass: doleritic texture; laths (0.2–1 mm) of plagioclase (labradorite [$An_{50–52}$]). Interstices: segregates of small grains of clinopyroxene, opaque minerals (7%–8%).

Alteration: rock is fresh.

XRD: smectite; trace mixed-layer smectite-swelling chlorite minerals and cristobalite.

Sample 135-834B-33R-2, 103–105 cm (Piece 5I), Unit 7 [Z-807]

Plagioclase-phyric dolerite, medium grained, massive. Phenocrysts (20%–25%): tabular and prismatic grains (0.8–2.2 mm) of plagioclase (labradorite [An_{60}]). Groundmass: doleritic texture; laths (0.2–0.8 mm) of plagioclase (labradorite [$An_{56–58}$]). Interstices: small isometric grains of clinopyroxene (90%), small (0.2–0.4 mm) rounded grains of olivine (6%), and glass (4%).

Alteration: slight; glass replaced by clay minerals.

Sample 135-834B-34R-2, 10–14 cm (Piece 1A), Unit 7 [Z-808]

Plagioclase-phyric dolerite, medium grained, with doleritic groundmass texture, massive. Rock is identical to Sample 135-834B-33R-2, 103–105 cm (Z-807).

Alteration: slight.

Sample 135-834B-47R-1, 71–74 cm (Piece 10), Unit 12 [Z-809]

Aphyric basalt, vesicular. Rock: pilotaxitic texture; microlites and laths (up to 0.8 mm) of plagioclase (labradorite [An_{50}]) and isometric grains of clinopyroxene (0.1–0.4 mm, up to 0.7 mm), often with grains of plagioclase. Isometric grains (0.3 mm) of olivine are present. Glass is black with abundant opaque dust. Opaque minerals (5%–7%) are present. Vesicles (20%–25%; 0.05–3 mm): rounded and isometric in shape. Small vesicles are partly or completely filled with green palagonitized glass; large vesicles are empty.

Alteration: slight.

XRD: trace cristobalite(?).

Sample 135-834B-49R-1, 97–100 cm (Piece 14B), Unit 12 [Z-810]

Sparsely plagioclase-phyric andesite-basalt, vesicular. Phenocrysts: single elongated-prismatic crystal (0.8 mm) of plagioclase. Groundmass: microdoleritic-intersertal texture; microlites and laths (0.3–1 mm) of plagioclase (60%, from andesine [An_{38}] to andesine [$An_{42–43}$]); large laths of plagioclase labradorite [An_{52}]. Interstices: segregate or small (up to 0.2 mm) grains of clinopyroxene. Greenish brown glass is present (<10%). Vesicles (10%; 0.2–0.5 mm) are empty or lined with glass.

Alteration: rock is fresh.

Sample 135-834B-49R-1, 131–135 cm (Piece 16), Unit 12 [Z-1490]

Aphyric basalt, vesicular. Rock: pilotaxitic texture; laths (0.1–0.8 mm) of plagioclase (35%, andesine [$An_{42–46}$]). Interstices: small (0.1–0.3 mm) rounded grains of clinopyroxene (25%), opaque minerals (5%), and greenish black glass. Vesicles (15%; 0.3–0.5 mm) are present. Walls of vesicles are lined with greenish black glass.

Alteration: rock is fresh.

Sample 135-834B-53R-1, 60–62 cm (Piece 5B), Unit 12 [Z-811]

Aphyric andesite-basalt, vesicular. Rock: pilotaxitic texture; microlites and laths (0.1–0.8 mm) of plagioclase (35%, from andesine [An_{38}] to andesine [An_{42}]). Interstices: small (0.1–0.3 mm) rounded-isometric grains of clinopyroxene (often with plagioclase) and black glass. Vesicles (30%–35%; 0.3–0.5 mm) are empty. Walls of vesicles are lined with glass.

Alteration: rock is fresh.

Bering Sea (Leg 19)

Hole 191

Sample 19-191-16R-1, 25–31 cm [Z-1101]

Olivine-plagioclase-phyric basalt, vesicular. Phenocrysts: idiomorphic grains (0.5–0.7 mm) of olivine (2%–3%) and glomerophyric segregates of tabular and prismatic grains (0.4–2 mm) of plagioclase (10%, labradorite [An_{52}]). Groundmass: hyalopilitic texture; skeletal caselike microlites and laths of plagioclase (15%) and black glass with crystals of plagioclase and pyroxene. Vesicles (5%, 0.5–0.7 mm) are rounded in shape and filled with black glass.

Alteration: slight; olivine is oxidized.

XRD: smectite.

Sample 19-191-16R-1, 78–83 cm [Z-1102]

Plagioclase-phyric basalt, vesicular. Phenocrysts: glomerophyric segregates of tabular grains (0.5–0.9 mm) of plagioclase (5%–7%, labradorite [An_{60}]). Groundmass: pilotaxitic texture; microlites and laths of plagioclase (40%, andesine [$An_{40–42}$]) and glass with crystals of clinopyroxene. Two brownish red grains (0.3 mm) of olivine(?) are present. Vesicles (5%, 0.2–0.5 mm) are rounded in shape and filled with black glass.

Alteration: slight (2%–3%); olivine(?) is oxidized; several vesicles consist of clay mineral.

XRD: smectite with ~15% mica layers; trace chlorite.

Sample 19-191-16R-1, 110–113 cm [Z-1103]

Plagioclase-phyric basalt, vesicular. Phenocrysts: glomerophyric segregates of small (0.1–0.6 mm) tabular and short-prismatic grains of plagioclase (5%, labradorite [An_{60}]). Groundmass: hyalopilitic texture; microlites and laths of plagioclase (20%, andesine [An_{46}]) and black glass. Vesicles (10%, 0.2–0.6 mm) are rounded in shape and filled with brown glass.

Alteration: fresh.

XRD: smectite with ~10% mica layers.

Southwest Indian Ridge (Leg 118)

Hole 735B

Sample 118-735B-7R-1, 41–43 cm (Piece 5), Unit 1 [Z-173]

Apogabbroic cataclasite, coarse grained, inequigranular, highly tectonized, dissected into fragments, which are cemented with medium-grained aplitic rock composed of quartz and feldspar. Relics of gabbro are represented by pseudoamorphic aggregate composed of amphibole, muscovite, and chlorite. Chlorite replaces a femic minerals (olivine or pyroxene). Texture is allotriomorphic-granular.

Alteration: very strong (80%); secondary minerals are quartz, chlorite, and amphibole.

XRD: paragonite(?), amphibole, and chlorite.

Sample 118-735B-12R-3, 99–101 cm (Piece 2I), Unit 2 [Z-174]

XRD: amphibole and chlorite; trace talc(?).

Sample 118-735B-19R-3, 19–21 cm (Piece 2A), Unit 2 [Z-175]

XRD: amphibole.

Sample 118-735B-20R-1, 73–75 cm (Piece 2E), Unit 2 [Z-176]

Gabbro, coarse grained, massive, tectonized, allotriomorphic-granular texture; plagioclase, amphibole replacing pyroxene, and olivine. Chlorite occurs sporadically in endocontact zones of amphibole. Olivine is replaced with chlorite along cracks. Mosaic quartz occurs sporadically, resulting in the formation of trondhjemite. Chlorite is localized in the interstitial space between crystals.

Alteration: strong (60%).

XRD: amphibole.

Sample 118-735B-24R-1, 17–19 cm (Piece 1B), Unit 2 [Z-177]

Gabbro, medium–coarse grained, tectonized, allotriomorphic-granular texture; plagioclase, clinopyroxene, amphibole, and olivine. Chlorite occurs at the contacts between rock-forming minerals. Olivine is replaced with chlorite along cracks. Often, olivine is surrounded by a rim composed of amphibole-chlorite aggregate with opaque dust and minerals resembling talc.

Alteration: moderate (~40%).

XRD: amphibole; trace chlorite and talc(?).

Sample 118-735B-32R-4, 4–6 cm (Piece 1A), Unit 2 [Z-178]

Gabbro, coarse grained, tectonized, allotriomorphic-granular texture; plagioclase, clinopyroxene, amphibole replacing pyroxene(?), and olivine. Amphibole (actinolite-tremolite) and chlorite occur at contacts of rock-forming minerals as grown celiphytic rims.

Alteration: moderate (~40%).

XRD: amphibole; trace chlorite and talc(?).

Sample 118-735B-41R-1, 36–38 cm (Piece 2A), Unit 3 [Z-179]

Gabbro, coarse grained, tectonized, allotriomorphic-granular texture; feldspar, clinopyroxene, amphibole, olivine, and quartz. Chlorite occurs in contacts of rock-forming minerals as grown celiphytic rims.

Alteration: moderate (30%).

XRD: amphibole; trace chlorite and talc(?).

Sample 118-735B-44R-2, 87–89 cm (Piece 1F), Unit 3 [Z-180]

Gabbro, coarse grained, tectonized, allotriomorphic-granular texture; feldspar, clinopyroxene, amphibole replacing clinopyroxene, and olivine. Feldspar predominates. Chlorite occurs in contacts of rock-forming minerals.

Alteration: slight to moderate (20%).

XRD: amphibole; trace chlorite and talc(?).

Sample 118-735B-49R-1, 57–59 cm (Piece 3C), Unit 4 [Z-181]

Gabbro, coarse grained, tectonized, allotriomorphic-granular texture; feldspar, clinopyroxene, amphibole, opaque minerals, and some admixture of quartz. Opaque minerals (~20% abundance) are located between rock-forming minerals. Chlorite-amphibole aggregate occurs at contacts of rock-forming minerals as celiphytic rims.

Alteration: moderate (25%).

XRD: amphibole and chlorite; trace talc(?).

Sample 118-735B-55R-3, 103–105 cm (Piece 4C), Unit 4 [Z-182]

Gabbro, medium grained, tectonized, granoblastic texture; large (0.9–3 mm) blastophyric grains of clinopyroxene (35%) and granoblastic aggregate of isometric grains (0.1–0.8 mm), plagioclase (30%), orthoclase (5%), and quartz. Opaque minerals (~20% abundance) cemented several areas of granoblastic aggregate.

Alteration: rock is fresh.

XRD: amphibole and chlorite; trace talc(?).

Sample 118-735B-58R-3, 26–28 cm (Piece 1B), Unit 5 [Z-183]

Gabbro, giant grained, fissured; feldspar, clinopyroxene, and amphibole. Cracks are filled with chlorite and quartz-feldspar aggregate.

Alteration: slight (10%).

XRD: amphibole and chlorite; trace talc(?).

Sample 118-735B-62R-1, 75–77 cm (Piece 2D), Unit 5 [Z-184]

Gabbro, coarse grained, tectonized, allotriomorphic-granular texture; feldspar, clinopyroxene, amphibole replacing pyroxene and olivine. Chlorite is scarce at the contacts between rock-forming minerals.

Alteration: scarce.

XRD: trace chlorite.

Sample 118-735B-73R-5, 63–65 cm (Piece 3), Unit 5 [Z-185]

Gabbro, coarse grained, tectonized, allotriomorphic-granular texture; plagioclase, clinopyroxene, amphibole, and single crystals of olivine. Chlorite occurs at the contacts between rock-forming minerals as thin celiphytic rims.

Alteration: slight (15%).

XRD: trace amphibole, chlorite, and talc.

Sample 118-735B-79R-5, 87–89 cm (Piece 6A), Unit 6 [Z-186]

Gabbro, coarse grained, tectonized, allotriomorphic-granular texture; plagioclase, clinopyroxene, and amphibole. Plagioclase sharply predominates. Chlorite occurs at the contacts between rock-forming minerals as thin celyphytic rims.

Alteration: slight (5%).

XRD: trace amphibole, chlorite, and talc.

Sample 118-735B-82R-6, 22–24 cm (Piece 3), Unit 6 [Z-187]

Gabbro leucocratic, coarse grained, tectonized, allotriomorphic-granular texture; plagioclase, clinopyroxene, amphibole, olivine(?), and opaque minerals. Chlorite-amphibole aggregate occurs at the contacts between rock-forming minerals as thin celyphytic rims and pockets.

Alteration: moderate (30%).

XRD: trace amphibole, chlorite, and talc(?).

Sample 118-735B-85R-7, 95–97 cm (Piece 6), Unit 6 [Z-188]

Gabbro, coarse grained, fissured, allotriomorphic-granular texture; plagioclase (labradorite [An_{55}], 1.2–3 mm, 60%). Interstices infilled with microcline (40%). Chlorite occurs at the contacts between rock-forming minerals as thin celyphytic rims.

Alteration: slight (7%).

XRD: amphibole and chlorite; trace talc(?).

Sample 118-735B-86R-3, 51–53 cm (Piece 1F), Unit 6 [Z-189]

Gabbro, coarse grained, tectonized, allotriomorphic-granular texture; plagioclase, clinopyroxene, and olivine(?). Rock is cut by a microvein filled with amphibole-chlorite-serpentine aggregate which contains hydrotalcite. Olivine is highly altered and chloritized. Chlorite occurs at the contacts between rock-forming minerals. Often, amphibole replaces clinopyroxene.

Alteration: moderate (~30%).

XRD: amphibole and chlorite; trace talc(?).

Sample 118-735B-88N-1, 60–62 cm (Piece 2C), Unit 6 [Z-190]

Gabbro, coarse grained, tectonized, allotriomorphic-granular texture; plagioclase, clinopyroxene, amphibole, and olivine. Chlorite-serpentine aggregate occurs at the contacts between rock-forming minerals as celyphytic rims and pockets (up to 2 mm).

Alteration: moderate (20%).

XRD: chlorite, serpentine(?), and amphibole.

Galicia Margin (Leg 103)

Hole 637A

Sample 103-637A-24R-1, 64–67 cm (Piece 4C) [Z-148]

XRD: calcite and serpentine.

Electron micrograph: b = 9.30 Å (serpentine).

Electron microscopy: chrysotile has length-slight fiber in shape with the clear central empty of fiber; structure type is tube-in-tube; there are the next polytypes of chrysotile: $2O_{rc1}$, $2M_{c1}$, and D_c; lizardite: in small amounts relative to chrysotile and represented as isometric particles; small amounts of aligned particles.

Sample 103-637A-25R-1, 66–69 cm (Piece 8B) [Z-149]

Apoperidotitic serpentinite. Rock: serpentine with small individual relics of olivine, orthopyroxene, and clinopyroxene. Relics of primary minerals are <1% abundance. Single crystals of picotite smashed into pieces are registered.

Alteration: very strong (90%); highly oxidized. Secondary minerals: serpentine and carbonate.

XRD: serpentine and calcite; trace talc(?).

Electron micrograph: b = 9.30 Å (serpentine).

Electron microscopy: chrysotile has length-slight fiber in shape; length/width usually close to 10–15, rarely ~1–2; most crystals have uncured layers with defects; the particles have the central empty of fiber; such chrysotile is named as "large fiber diameter chrysotile" or "Povlen-type chrysotile" because selected area electron diffraction pattern; there are aggregates with small particles of chrysotile and lizardite that correspond to initial stage of serpentinization; polytypes of chrysotile: $2O_{rc1}$, $2M_{c1}$, and D_c; a typical shape of chrysotile is tube-in-tube; lizardite: in small amount and crystals has structural defect.

Sample 103-637A-26R-2, 53–56 cm (Piece 1E) [Z-150]

Apoperidotitic serpentinite, tectonized. Rock: serpentine with small single relics of olivine, orthopyroxene, and clinopyroxene. Relics of primary minerals are <1% abundance. Single grains of picotite are registered.

Alteration: very strong (~90%); highly oxidized. Secondary minerals: serpentine of various generations and carbonate; it is probable that serpentinite is formed upon lherzolite.

XRD: serpentine and calcite; trace Fe smectite(?).

Electron micrograph: b = 9.26 Å (serpentine).

Electron microscopy: chrysotile is represented as subordinate minerals; it has length-slight fiber with the central empty of fiber; there is chrysotile-asbestos also; more common is chrysotile D_c polytype and rare disordered polytype $2M_{c1}$; Povlen-chrysotile has two polytypes: D_c and $2O_{rc1}$; the central empty of fiber is unclear; very often we can see joints of two crystals along their long axis; lizardite is represented as polycrystal aggregate having complicated shape with rough edges and curved layers; there are pseudomorphs of lizardite on host minerals; Fe oxide as cubic crystals.

Sample 103-637A-27R-1, 112–115 cm (Piece 15C) [Z-151]

Apoperidotitic serpentinite, tectonized. Rock: serpentine with small single relics of olivine and orthopyroxene. Picotite is <1% abundance.

Alteration: very strong (~90%–95%); highly oxidized; secondary minerals: serpentine and carbonate.

XRD: serpentine and calcite; smectite(?) and talc(?) in trace amounts.

Electron microscopy: chrysotile has length-slight fiber in shape with the central empty of fiber; some morphological defects of crystals; common polytype is D_c; Povlen-chrysotile has two polytypes: D_c and $2O_{rc1}$; the central empty of fiber is absent; lizardite has small particles; well-ordered crystals with sharp edges.

Sample 103-637A-28R-3, 103–106 cm (Piece 14) [Z-152]

Apoperidotitic serpentinite, tectonized. Rock: by serpentine with small single relics of olivine and orthopyroxene. Picotite is <1% abundance.

Alteration: very strong (~90%–95%); highly oxidized. Secondary minerals: serpentine and carbonate.

XRD: serpentine and calcite; trace amphibole and goethite.

Electron micrograph: b = 9.30 Å (serpentine).

Electron microscopy: chrysotile is length-slight fiber in shape with the clear center empty of fiber; cone in shape of chrysotile; some aggregates of parallel-oriented crystals were found with uncured layers; chrysotile probably transforms into lizardite or antigorite; morphological type is tube-in-tube; the polytypes are $2M_{c1}$ and D_c; lizardite is represented as monocrystals with sharp edges; antigorite was found as crystals with sharp edges.