Polarforschung 60 (2): 121–123, 1990 (erschienen 1992)

14. Geological and Structural Field Observations in the Carryer Glacier Area, Bowers Mountains, Northern Victoria Land, Antarctica

By Stefan Matzer*

The lower Paleozoic Bowers Terrane strikes NNW-SSE as a 20 to 30 km wide belt between the Wilson Terrane in the SW and the Robertson Bay Terrane in the NE. The Bowers Terrane has been studied by LAIRD et al. 1976, JORDAN 1981, TESSENSOHN et al. 1981, BRADSHAW et al. 1982, WODZICKI et al.. 1982, LAIRD & BRADSHAW 1983, WEAVER et al. 1984 and WODZICKI & ROBERT 1986.

The Bowers Supergroup consists of the Solidarity Formation (submarine tholeiites), Molar Formation (turbiditic rocks in the south and shelf facies sediments in the north) and Glasgow Formation (tholeiitic and calc-alkaline basalts to rhyolites) of the Middle Cambrian Sledgers Group and the Middle Cambrian to Early Ordovician Mariner Group (a regressive marine sequence). The Leap Year Group is molasse facies and rests unconformably on the Mariner Group, Glasgow or Molar Formation and is partly derived from Granite Harbour Intrusives in the Wilson Terrane (WODZICKI & ROBERT 1986).

The area investigated is located at the southern flank of the Carryer Glacier along an 8 km long profile from the Rennick Glacier to the east. Within the working area, the Carryer Conglomerate (Leap Year Group) crops out in the west and the Glasgow Formation in the east. The Carryer Conglomerate rests unconformably on volcanic breccia of the Glasgow Formation. The contact is overturned by folding to the west. The red coloured polymictic Carryer Conglomerate consists almost entirely of pebbles with sandy matrix and subordinate sandstone and local mudstone. To the east, quartzose sandstone increases. Close to the transition to the Glasgow Formation the quartzose sandstone shows more and more intercalations of red coloured mudstones. The eastern part of the working area was mapped by WODZICKI & ROBERT (1986) as Glasgow Formation. This Formation is subdivided into flows, volcanic breccia and conglomerate with muddy matrix, pillows and intrusive rocks. Lenses of limestones within black schists and turbiditic rocks were observed as well. These latter rocks are described by WODZICKI & ROBERT (1986) as Molar Formation. Within the working area, the Molar Formation interfingers with the Glasgow Formation.

The Glasgow Formation and the older and eastern part of the Carryer Conglomerate, a quartzose sandstone, belong to the limb of an anticline which is overturned to the west. The sequence is younging from E to W. This can clearly be derived from the relation between cleavage and bedding as well as from top and bottom indicators (ripple marks, graded bedding etc.). The cleavage planes (80/80; dip direction: CLAR compass) show a stretching lineation which dips steeply. Pebble elongation and extensional fissures perpendicular to the lineation are related to this stretching feature. Incompetent rocks like volcanic conglomerates or black schists show a well developed cleavage, whereas competent volcanic breccias show almost no cleavage. The Carryer Conglomerate in the west shows a weak open folding with a fanning, spaced-cleavage. The folds verge to the W. Folding, cleavage and stretching lineation are considered as D1-Deformation.

D2 is accompanied by the development of conjugate compressional, shear zones in all types of rocks. The stress ellipsoid has not changed its position between D1 and D2. The kind of the shear zone development depends on the rock type. Within volcanic breccias and conglomerates with coarse-grained matrix, conjugate en-echelon vein arrays are observed, whereas in conglomerates with muddy matrix conjugate sets of antitaxial fibre veins of cal-

* Stefan Matzer, Geol.-Paläontol. Institut, Universität Frankfurt, Senckenberganlage 32, D-6000 Frankfurt am Main, FRG.

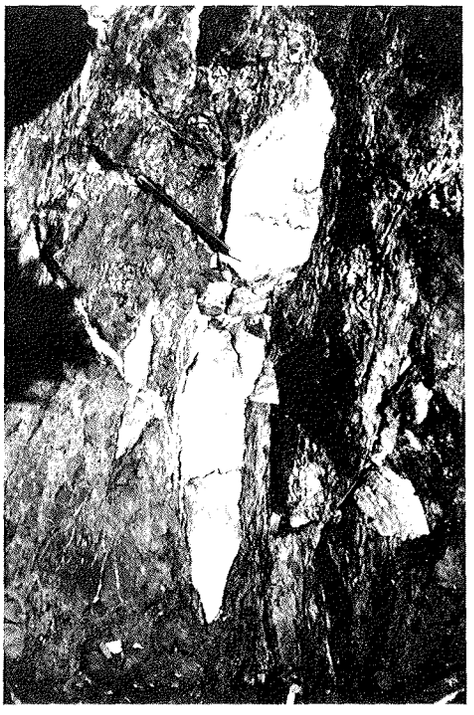

Fig. 1: Two stretched limestone pebbles within vertical cleavage planes (D1). The pen is parallel to one set of the compressional shear zones (D2). The step in the small pebble on the left-hand side indicates top E shear.

Abb. 1: Zwei tektonisch gestreckte Kalkgerölle in der vertikalen D1-Schieferung. Der Stift ist parallel zu einer Schar der kompressiven D2-Scherzone. Der Versatz im kleinen Geröll (links) zeigt ostgerichteten Schersinn an.

Fig. 2: Deformed pebbles in the Carryer Conglomerate. Stretched pebbles are mostly parallel to the cleavage, dipping with about 70° to the E. One set of conjugate compressional shear zones (D2) dips with 35° to the E. The deformed pebble in the middle of the picture indicates top W shear.

Abb. 2: Deformierte Gerölle im Carryer-Konglomerat. Die gelängten Gerölle liegen in der Regel parallel zur Schieferung, die mit ca. 70° nach Osten einfällt. Eine Schar der konjugierenden kompressiven Scherzonen (D2) fällt mit 35° nach E. Das deformierte Geröll in der Bildmitte zeigt westwärtigen Schersinn an.

cite and quartz are developed. Black schists, having a closely spaced cleavage, only show slicken-sides. The antitaxial fibres of D2 are, in contrast to the extensional D1 fibres, not perpendicular to the fissures and can well be used for the determination of shear sense. Often, D1 veins are revived by antitaxial D2 fibre veins. The conjugate shear zones are not equivocal. Mostly, the set of shear zones indicating top W shear (80/30) are more dominant than the set indicating top E (260/40).

The last phase of deformation (D3) is characterized by several thrusts, indicating top W shear. For example, volcanic breccia is thrust onto quartzose sandstone of the Carryer Conglomerate. The tectonic transport at this thrust is 100 to 150 m. Frequently conjugate D2 shear zones are affected by D3 thrusts. Sets of D2 zones, showing top E shear, are displaced and bent by D3 thrusts, whereas sets, indicating top W shear are often revived by D3 thrusts.

It is obvious that the Carryer Conglomerate and the Glasgow Formation have both suffered three phases of deformation. If the Carryer Conglomerate contains granitic pebbles of the Granite Harbour Intrusives, the tectonics in the Bowers mountains must be younger than the metamorphism and the intrusion of the Granite Harbour Intrusives of the Wilson Terrane. It seems, that the tectonic of the working area is related to the accretion of the Bowers Terrane to the Wilson Terrane.

Samples of Husky and Lanterman conglomerates were taken from Index Spur (Lanterman Range) and the Mt. Bruce area (Millen Schists), in order to do strain determinations.

References

Bradshaw, J. D., Laird, M. G. & Wodzicki, A. (1982): Structural style and tectonic history in northern Victoria Land.- In: Craddock, C. (ed.), Antarctic Geoscience.- Univ. Wisconsin Press, 809-816, Madison.

Jordan, H. (1981): Metasediments and volcanics in Frolov Ridge, Bowers Mountains, Antarctica.- Geol. Jb. B 41: 155-199.

Laird, M. G., Bradshaw, J. D. & Wodzicki, A. (1976): Reexamination of the Bowers Group (Cambrian), northern Victora Land, Antarctica (preliminary note).- NZ. J. Geol. Geophys. 19: 275-282.

Laird, M. G. & Bradshaw, J. D. (1983): New data on the lower Paleozoic Bowers Supergroup, northern Victoria Land.- In: Oliver, R.L., James, P.R. & Jago, J.B. (eds.), Antarctic Earth Science.- Austral. Acad. Sci.: 123-126, Canberra.

Tessensohn, F., Duphorn, K., Jordan, H., Kleinschmidt, G., Skinner, D. N. B., Vetter, U., Wright, T. O. & Wyborn, D. (1981): Geological comparison of basement units in north Victoria Land, Antarctica.- Geol. Jb. B 41: 31-88.

Weaver, S. D., Bradshaw, J. D. & Laird, M. G. (1984): Geochemistry of Cambrian volcanics of the Bowers Supergroup and implications for the early Paleozoic tectonic evolution of northern Victoria Land, Antarctica.- Earth Planet. Sci. Lett. 68: 128-140.

Wodzicki, A. & Robert, R. (1986): Geology of the Bowers Supergroup, Central Bowers Mountains, northern Victoria Land.- In: Stump, S. (ed.), Geological Investigations in Northern Victoria Land.- AGU, Antarct. Res. Ser. 46: 39-68, Washington D.C..