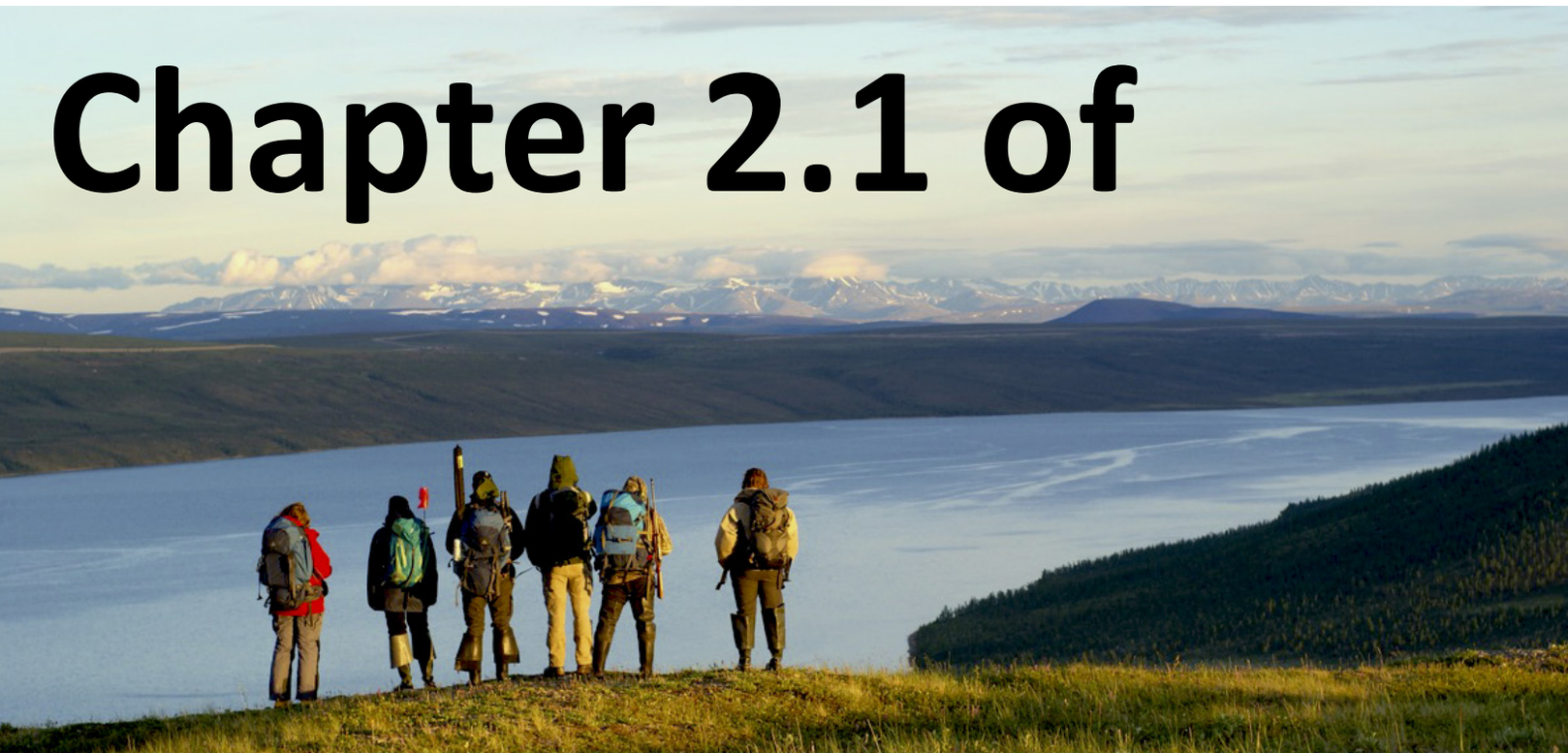
ALFRED-WEGENER-INSTITUT
HELMHOLTZ-ZENTRUM FÜR POLAR- UND MEERESFORSCHUNG

Chapter 2.1 of



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zur Polar- und Meeresforschung

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with contributions of the participants

HELMHOLTZ

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Titel: Das Vegetationsuntersuchungs-Team der Expedition "Chukotka 2018" blickt auf seinem Rückweg zum Feldlager auf den See Ilirney, Tschukotka, von dem lange Sedimentkerne geborgen werden konnten (Foto: Luise Schulte, AWI).

Cover: On its way returning to the field camp, the vegetation survey team of the expedition "Chukotka 2018" is looking at the lake Ilirney, Chukotka, of which long sediment cores could be retrieved (Photo: Luise Schulte, AWI).

2.1 Samoylov Deep Drilling Spring Campaign 2018

Loeka L. Jongejans [1, 2], (Volkmar Assmann [1], Julia Boike [1]: not in the field), Dmitry Bolshiyanov [5], (Niko Bornemann [1]: not in the field), Boris Grigoriev [6], Mikhail Grigoriev [3,4], Andrey Kartoziia [4,7,8], Georgii Maksimov [3,4], Semen Ostreldin [6], Stanislav Ostreldin [6], Waldemar Schneider [1], (Peter Schreiber [1], Leonid Tsibizov [4,7]: not in the field) and Jens Strauss [1]

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Fieldwork period and location
From April 06th to April 27th, 2018 (on Samoylov Island)

2.1.1 Introduction

General scientific rationale and objectives

Permafrost thaw is associated with impacts on climate, land surface and coastal and river bank structures. Processes such as thermokarst and thermo-erosion lead to ground subsidence, which can have drastic effects on the topography. One of the main drivers of surface subsidence vulnerability is the sedimentological composition, including ground ice content, and the temperature state of permafrost.

This drilling campaign aimed to retrieve a deep, frozen sediment core from Samoylov Island to cover several scientific disciplines including geocryology, sedimentology and geochemistry. This campaign provides sample material from much greater depths (65.7 m) than previous boreholes on the island (27 m in 2006) and the analysis of the sediments will therefore lead to a better understanding of the deep permafrost deposits on Samoylov Island. Furthermore, a temperature chain was installed in the borehole for long-term temperature monitoring (see section 2.2). Therefore, the campaign consists of several work packages:

- Work package 1: Cryostratigraphy and lithology of Samoylov deep permafrost
- Work package 2: Biogeochemical characterization of deep delta sediments
- Work package 3: Late Quaternary environmental variability in the central Lena Delta
- Work package 4: Permafrost temperature observatory (in 2019)

Expedition itinerary and general logistics

The field work took place on Samoylov Island in April 2018. The drilling team consisted of 10 people from 6 different institutions in Germany and Russia (Figure 2.1.1 and Figure 2.1.2). The team was accommodated on the Research Station Samoylov Island (Figure 2.1.3). The team and the drilling rig (placed on a truck) were transferred from Tiksi over the Lena by tracked vehicles (Vestikhods) and trucks. The drilling rig and the equipment were set up at the borehole location (approximately 800 m from the station) as well as a tent for describing the cores and a bigger tent for shelter (Figure 2.1.4). Field work materials were transported between the station and the borehole location by tracked vehicles (Figure 2.1.5). A borehole was drilled, after which initial temperatures were measured and a geophone was installed (Table 2.1.1). Unfortunately, the geophone was broken during installation of the temperature chains. The core material was shipped over the Lena to the Melnikov Permafrost Institute in Yakutsk.

Figure 2.1.1: *Participants at borehole from left to right: Dmitry Bolshiyanov, Waldemar Schneider, Semen Ostreldin, Boris Grigoriev, Jens Strauss, Stanislav Ostreldin, Mikhail Grigoriev, Georgii Maksimov and Fedor Sellyakhov; Missing: Loeka Jongejans and Andrey Kartoziia. Photo by Anne Morgenstern*

Figure 2.1.2: *Participants in upper row from left to right: Boris Grigoriev, Stanislav Ostreldin, Dmitry Bolshiyanov, Jens Strauss, Semen Ostreldin, Ivan, Andrey Kartoziia; bottom row from left to right: Mikhail Grigoriev, Georgii Maksimov and Loeka Jongejans. Photo by Lutz Beckebanze*

Figure 2.1.3: *Research Station Samoylov Island. Photo by Loeka Jongejans*

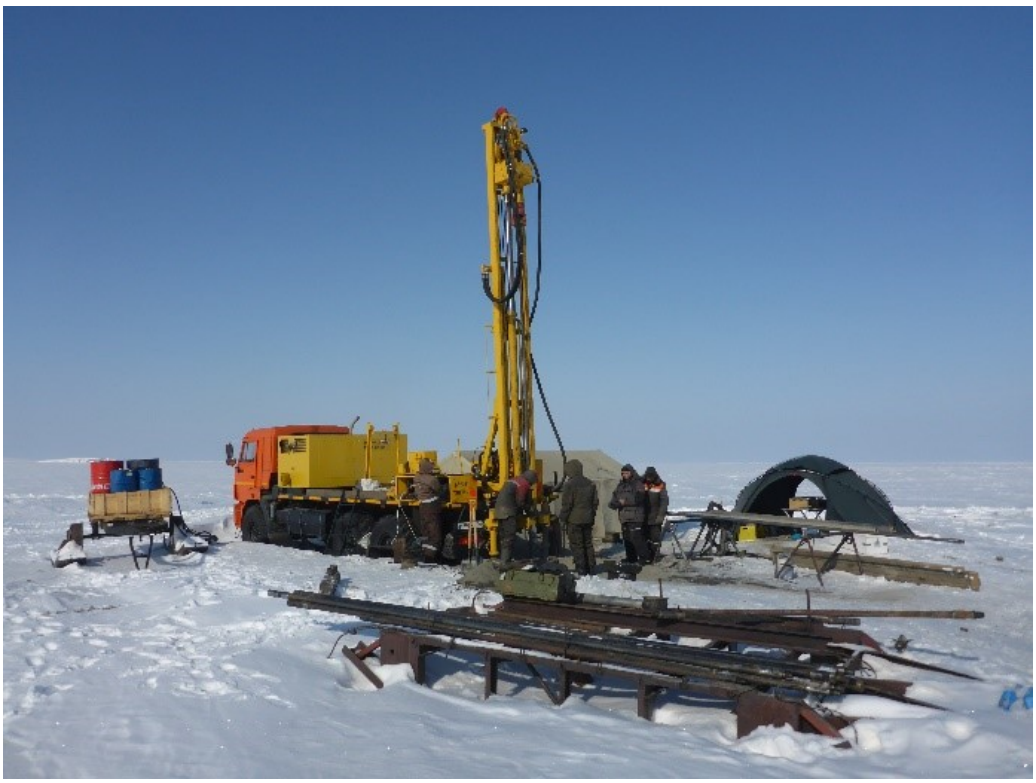

Figure 2.1.4: *Drilling rig on borehole location with tents. Photo by Jens Strauss*

Figure 2.1.5: *Tracked vehicle transporting sample boxes. Photo by Loeka Jongejans*

Table 2.1.1: Time table of field work

Date	Task
April 13th, 2018	Beginning of drilling; cleaning, photographing, describing and packing of cores; field subsampling AARI
April 20th, 2018	End of drilling
April 26th, 2018	Temperature measurement down in the new borehole to the bottom right after drilling
April 26th, 2018	Installing container with geophones (60 mm in diameter) at the borehole bottom
July 2018	Shipping cores to ice cellar of MPI-Y
August 2018	Cutting cores at Melnikov Permafrost Institute and sending samples to partner institutes (AWI, IPGG, MPI-Y)
July 11th 2018	Installing temperature chains and taking station borehole temperature measurements, see section 2.2

2.1.2 Study region

Samoylov Island

Samoylov Island (N 72.36998°, E 126.47532°) (Figure 2.1.6) is situated in the Lena Delta (northeast of Siberia), the largest river delta in the Arctic. The first research activities started in the second half of the 19th Century, when Nikolai Jürgens, Alexander von Bunge and Adolph Eigner started their meteorological and magnetic measurements on the island (Barr and Lüdecke 2010). A research station was built in 1998 on the location of a previously built building of the Lena Delta Nature Reserve. This station is and was used in summer by Russian and German scientific institutes. A new research station, which can host up to 20 scientists, was built in 2013 and is operated by the IPGG (Figure 2.1.3). The station is used all-year round for research expeditions from spring to autumn primarily organized by AWI, AARI and MPI-Y.

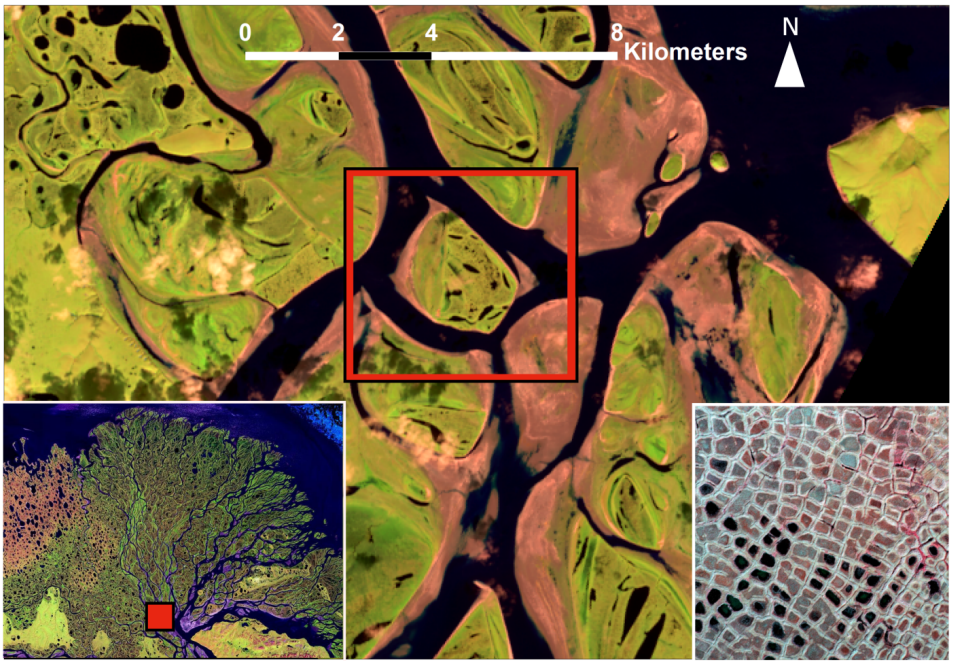

Figure 2.1.6: *Background picture: Samoylov Island in Lena Delta, indicated by red square. Lower left corner: Lena Delta Samoylov Island indicated by red square. Lower right corner: polygonal tundra. Source: Landsat 8 image, USGS/NASA (background picture), Landsat 7 image from the July 27th, 2000, USGS/NASA (lower left corner) and CrestoAleina et al. (2013) (lower right corner).*

Geological and geographical background

Samoylov Island is situated in one of the main channels of the Lena Delta (Figure 2.1.6). Neotectonics block-movement, caused by high seismicity, formed the Lena Delta island archipelago, consisting of over 1500 islands, during the Holocene (Are and Reimnitz 2000) and can be divided into three river terraces. Samoylov island is situated on the first terrace, which is characterized by ice-wedge polygonal tundra, large thermokarst lakes and active flood plains (Boike et al. 2013). The island is located in the zone of continuous permafrost with a thickness of about 500 to 600 m (Romanovskii and Hubberten 2001). It is composed mainly of middle Holocene deposits (Hubberten et al. 2006) and consists of two parts: the western part (3.4 km^2, 1 to 5 m a.s.l.), which is the modern floodplain and is flooded annually in spring, and the eastern part (4.1 km^2, 10 to 16 m a.s.l.), which is characterized by wet polygonal tundra (Boike et al. 2008). The polygonal tundra has a microrelief with elevation differences of 0.5 m due to the presence of low-centered ice wedge polygons (Figure 2.1.6) (Boike et al. 2008).
The Lena Delta Region has a dry continental climate with low temperatures (mean annual air temperature: −14.7 °C) and low precipitation (mean annual precipitation: 190 mm) (Hubberten et al. 2006). The permafrost temperatures on Samoylov Island are extremely low (mean annual temperature at the top: −10.1 °C) (Boike et al. 2008).

Research activities on the island

Several weather stations (soil and climate stations and eddy covariance stations) were installed on the island in 1998 and 2006, measuring climatic parameters such as air temperature, radiation and wind speed and direction. Many field investigations, manual as well as automated, have been performed to measure a wide range of parameters such as vegetation and snow distribution, active layer thickness, lake water level and temperature (Boike et al. 2013).
A previous sediment core was taken in 2006 on the southeastern part of Samoylov Island, close to the station (N 72.36956°, E 126.47511°) in the spring of 2006 to a depth of 27 m. A temperature chain with 23 temperature sensors was installed in the summer of 2006 in the borehole (Boike et al. 2013).

2.1.3 Field methods and sampling strategy

Samoylov deep drilling

We chose the borehole location (N 72.37697°, E 126.48056°) (Figure 2.1.7) on the eastern and higher part of the island, which is not flooded during spring. However, in order not to disturb the weather stations and other measurement devices on the east side, we stayed as far to the west as possible. The sampling location is characterized by low-centered ice-wedge polygons, which are mostly filled with water in summer time. Hence, we picked the borehole location on the edge of a polygonal rim, so that we would not drill directly in the ice wedge and have no stagnating water in summer.

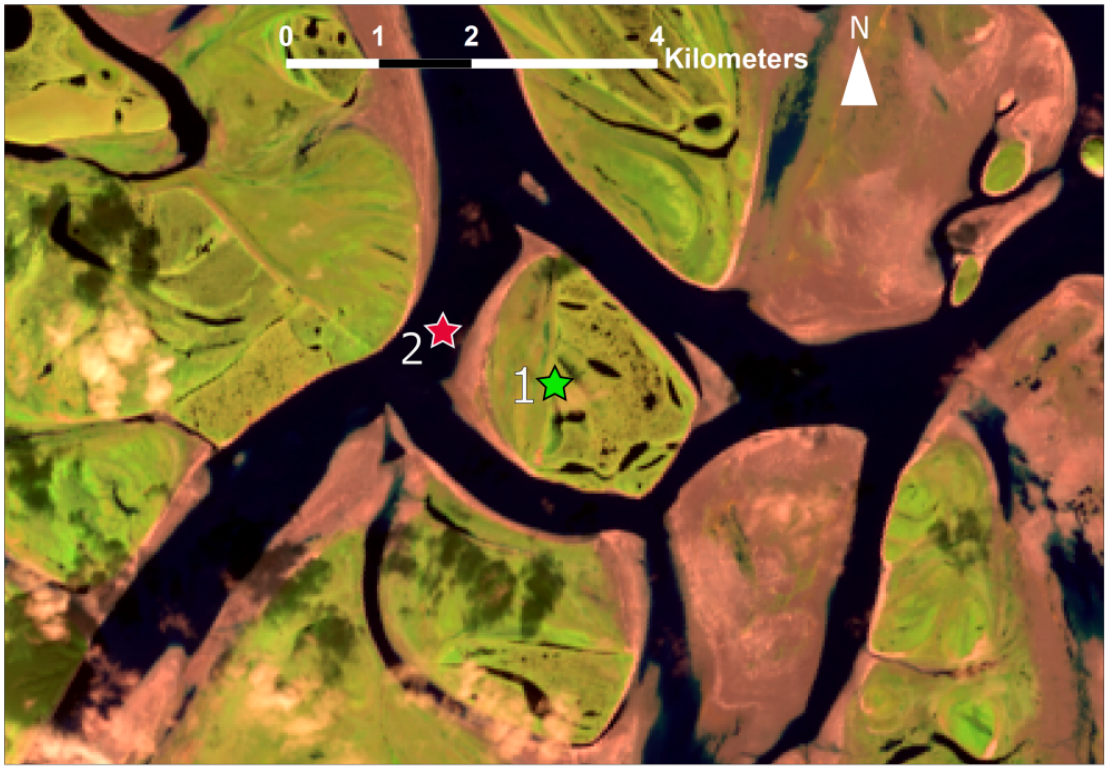

Figure 2.1.7: *Samoylov Island with borehole location of Samoylov Deep Drilling (1; green star) and Lena River drilling (2; red star). Source: Landsat 8 image, USGS/NASA (background picture)*

The borehole was drilled using a URB2-4T drilling rig (Figure 2.1.4) which is operated by two hydraulic cylinders that control the rotating hollow drill rods (approximately 4 m long) and a core barrel (approximately 3.5 m) into the frozen sediments. More drilling rods were placed on the top as the borehole became deeper. For the upper part, a drilling head with the largest diameter (146 mm) was used, after which a smaller diameter was chosen (127 and 108 mm) (Figure 2.1.8).

Core material

The core material was retrieved inside the core barrel and brought to the surface by removing the drilling rods one by one. The hole was then covered to prevent disturbance of the borehole, and the core material was removed from the core barrel using (a combination of) continuous or abrupt vibration and heating. The core (mostly around 1 to 2 m long) was then brought into the tent, where it was cleaned, photographed and described. The core profile description included sediments, ground ice and organic matter properties (see subsection 2.1.4). The borehole depth was compared to the core length every time so that potential core loss was logged. The core material was packed in tube foil and labeled and stored in thermoboxes.

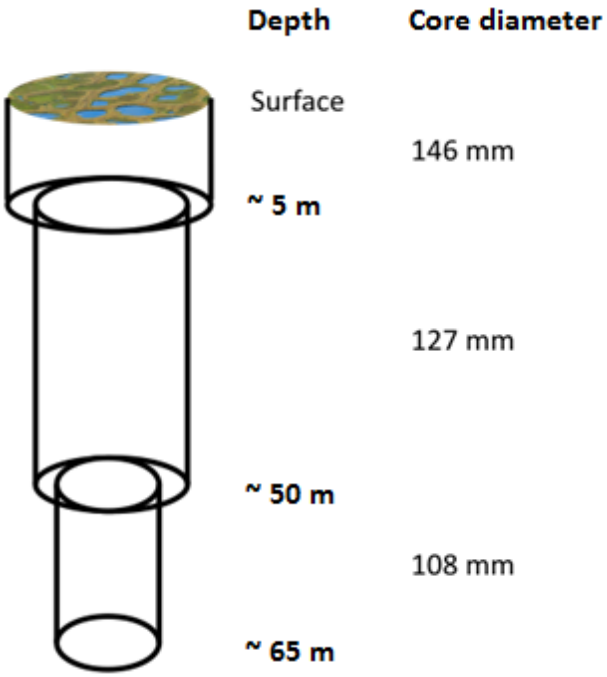

Figure 2.1.8: *Schematic overview of borehole (lateral view) with core barrel diameter per depth interval*

The sample cores were kept frozen before and during transport by ship to Yakutsk, where they were stored in the ice cellar. In August 2018, the cores were sawn into halves in the ice cellar in Yakutsk and repacked. One half was packed for transport to AWI, whereas the other half of the material was subsampled by the IPGG, AARI and MPI-Y. The core material for AWI is planned to be transported to Potsdam in December 2018, where it will be described in more detail and subsampled for laboratory analyses (Work packages 1-3).

Temperature chains
A core barrel was placed in the upper few meters of the borehole to prevent disturbance. A temperature chain was installed in July 2018 (Work package 4) (Figure 2.1.9). The details of the installation and setup are described in the summer expedition report 2018 (see section 2.2).

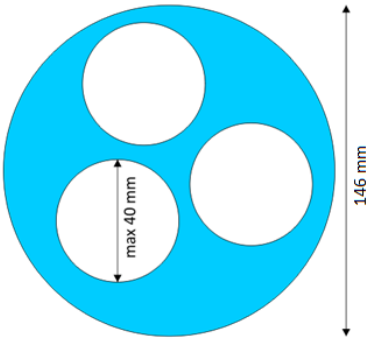

Figure 2.1.9: *Schematic overview of the borehole (top view) with smaller tubes for temperature chains*

Lena River drilling
An additional borehole was made in the Tumatskaya channel of the Lena, just west of Samoylov Island (Figure 2.1.7). The borehole was made in a shallow part of the river so that the ice was ground to the bottom. The same steps in core collection and description were performed as described in the previous chapter.

Water sampling close to Stolb Island
As part of the Changing Arctic Ocean NERC project CACOON (Changing Arctic Carbon cycle in the cOastal Ocean Near-shore), we collected water samples below the ice close to Stolb Island (N 2.39501°, E 126.68014°, Figure 2.1.10). This sampling was done in six repetition at three depths (3, 5 and 7 m) on April 8, 12, 16, 19, 22

and 26th. We filtered the water for dissolved and particulate organic carbon. Also, we took and froze an original sample. The samples were labelled L18 (Lena 2018) - 01 - (for 1 sampling) - 03 - (for the 3 m depth).

Figure 2.1.10: Picture of water sampling close to Stolb Island. Photo by Jens Strauss

2.1.4 Preliminary results

Samoylov deep permafrost sediments

Sediment, ground ice and organic material properties were described of the sediment core (Table A.2.1). An initial stratigraphy is shown in Figure 2.1.11. Pictures of special features are shown in Appendix 3.

Sediments

The upper part of the core (0 to 23 m) shows quite some variation in texture (sand, peat dominated sand, sandy silt). Especially the upper 10 m are very organic rich with many wooden remains up to 10 cm long (Figure A.2-1) in the first 4 meters, and more peaty remains and peat inclusions (at approximately 12 m) lower on (Figure 2.1.11). The lower part (23 m and down) of the core is dominated by coarse sand. From 30 to 45 m, the coarse sand contains many oxidized spots (Figure A.2-2). In the lower part, especially from 45 m, many pebbles are present (Figure A.2-3), some even bigger than the core barrel diameter. Organic-rich layers are visible around 35 (Figure A.2-4), 45 and 50 m.

Cryostructure

Most of the core was retrieved in a frozen state (Figure 2.1.11). However, from 50 m and deeper, the material was mainly unfrozen due to drilling heat. As the drill got deeper into the sediments with many pebbles, a lot of the sediments was ground by the drill and blown out of the borehole by the air pressure through the drilling rods. To avoid the loss of material, we continued drilling without using air pressure, which led to the buildup of drilling heat, thawing the sediments.

Although we drilled on the edge of a polygonal rim so that we would not drill in the ice-wedge, we drilled through the wing of the ice-wedge. In general, the sediments were quite ice-rich, but the structure of the ice was not always visible. The cryostructure includes ice lenses (macro lenses indicated in Figure 2.1.11) and ice bands. Also, vertical ice bands were present in some ice-rich parts of the core (6, 23.5, 27, 28-30, 32 and 48 m). Furthermore, polosatic structures were visible around 27 m (Figure A.2-5). Pure freshwater ice was present at

around 22 m (Figure A.2-6). In two areas (at around 30 and 38 m), we noted the contact of silty and coarse sand, which we identified as cryoturbation (Figure A.2-7).

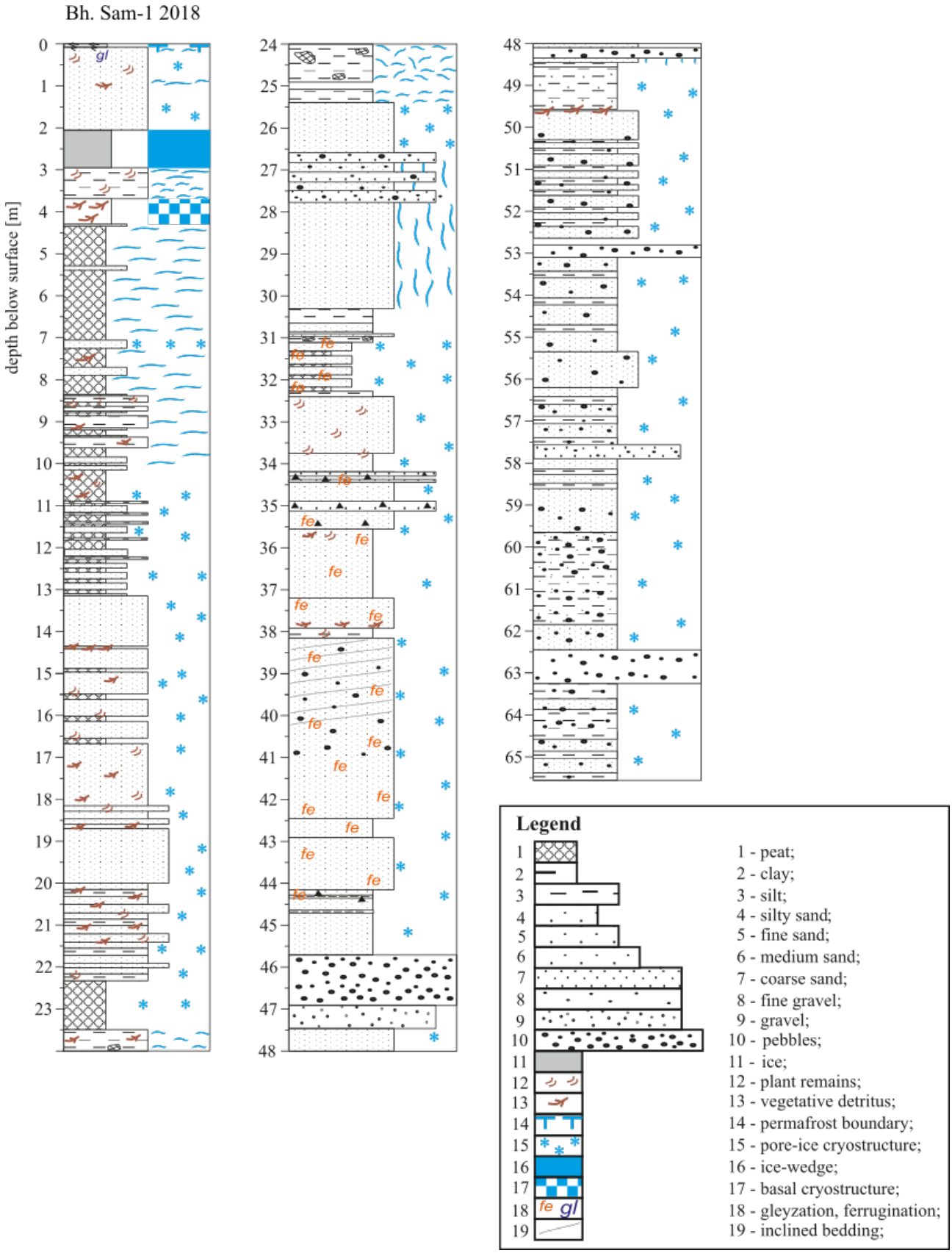

Figure 2.1.11: *Stratigraphy of deep permafrost sediment core. Graph by Georgii Maximov*

Magnetic susceptibility

The volumetric magnetic susceptibility (K) of the sediment cores was measured in the field in April 2018 (Figure 2.1.12a). The magnetic susceptibility (given in SI unit) is dependent on the concentration and type of magnetic minerals. Therefore, it can give insights in different sediment layers with different mineral composition (DaSilva et al. 2015; Wang and Evans 1997). The magnetic susceptibility ranges from 0 to 5.1*10-3 SI and shows most variation in the bottom part (65 to 50 m) (Figure 2.1.12a).

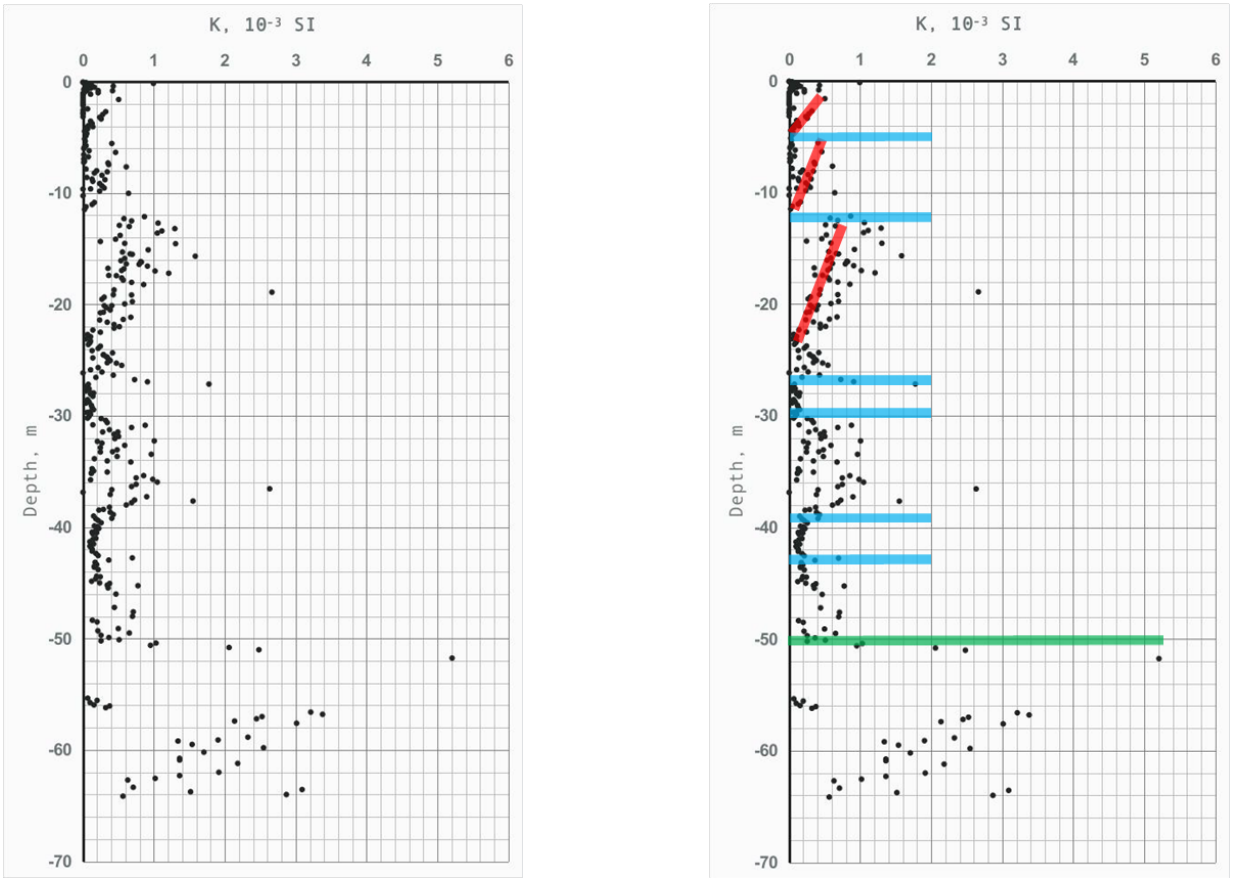

Figure 2.1.12: *Magnetic susceptibility of Samoylov deep sediment core; left) Raw data and right) interpretation*

The first interpretation was made by the IPGG (L. Tsibizov) (Figure 2.1.12b). Several trends were distinguished of decreasing values by increasing depth (red lines), where low values are likely related to high ice content or sandy layers whereas high values could correspond to intensive fluvial sedimentation or a change of sedimentation type (low concentration of magnetic minerals). Transitions within the data are shown with blue lines. The higher values and higher variability in the deposits below 50 m (below the green line) suggests these sediments have a different sediment source. Otherwise, it could also point to higher sedimentation rates. For further interpretation, lithology and grain size data will be included after laboratory analyses.

Ground temperature

Initial temperature measurements were taken in the borehole using a 61 m long chain with 17 temperature loggers (every 0.5 m in the top and every 5 m below) (Figure 2.1.13). The temperature decreases from the surface to the lowest value at a depth of 2 m (−13.4 °C), then increases to the maximum at 10 m deep (−7.6 °C), after which it stabilizes at (−8.5 °C). As the measurements were taken only a few days after finishing the drilling, this initial temperature record is overestimated because of the drilling heat. Measurement that were taken in summer with the newly installed chain, are described in the summer expedition report 2018, as well as a comparison with the old borehole (see section 2.2).

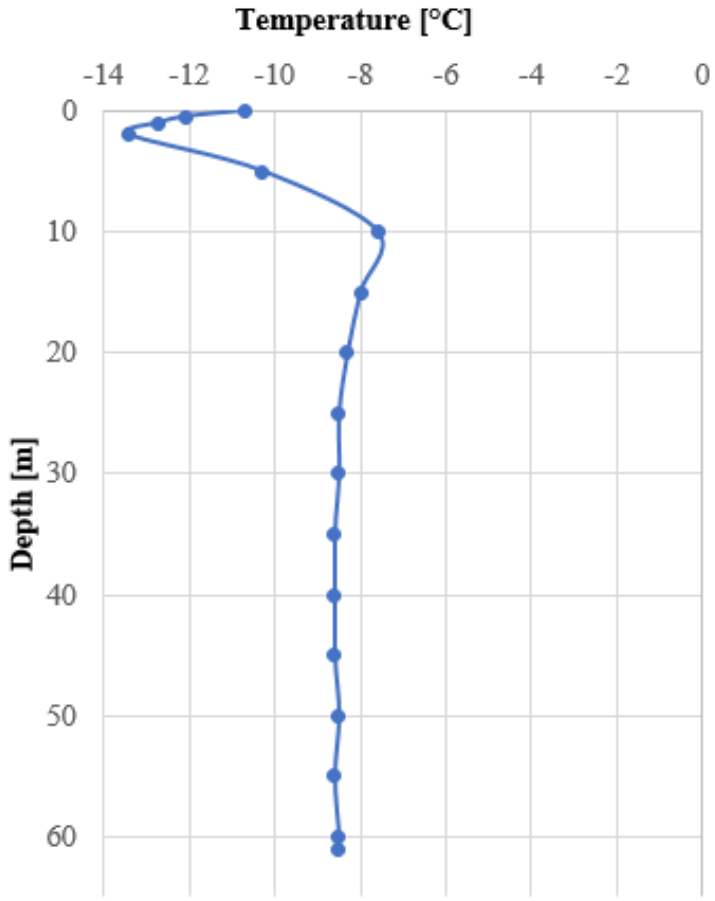

Figure 2.1.13: *Initial temperature profile in borehole. Measured on April 26th, 2018*

Lena River sediments

Sediment, ground ice and organic material properties of the sediment core were described during fieldwork (A.2.2). An initial stratigraphy is shown in Figure 2.1.14.

Sediments

The upper 30 cm was snow cover. All depths were measured from the snow surface. The river ice was 60 cm thick and grounded to the bottom. The ice was clear with a few horizontal cracks and small bubbles from 30 to 47 cm. Sediments were retrieved to a depth of 23.8 m. The sediments were dominated by fine to medium sand Figure 2.1.14. We found peat layers from 100 to 150 cm, 875 to 910 cm, 1650 to 1700 cm and organic-rich layers from 730 to 1095 cm, around 1400 cm and 2155 to 2380 cm.

Cryostructure

The upper 5 m were frozen. Macro lenses were visible in the first 3 m, as well as around 600 cm. We found ice bands up to 3 mm thick around 860 to 875 cm and from 1322 to 1428 cm. From 5 to 20 m, silty parts were unfrozen whereas the sandy parts were frozen. Water coming out of the borehole while drilling suggests that the transition from frozen to unfrozen sediments was around 20 m. It is likely that the talik under the Lena channel here bulges to the sides of the channel. By using just the drilling rods without conserving the sediments, we tried to reach the permafrost table below the talik. However, likely due to the pollution of the drilling rods, we were not able to go deeper than 30 m. This is possibly the permafrost table.

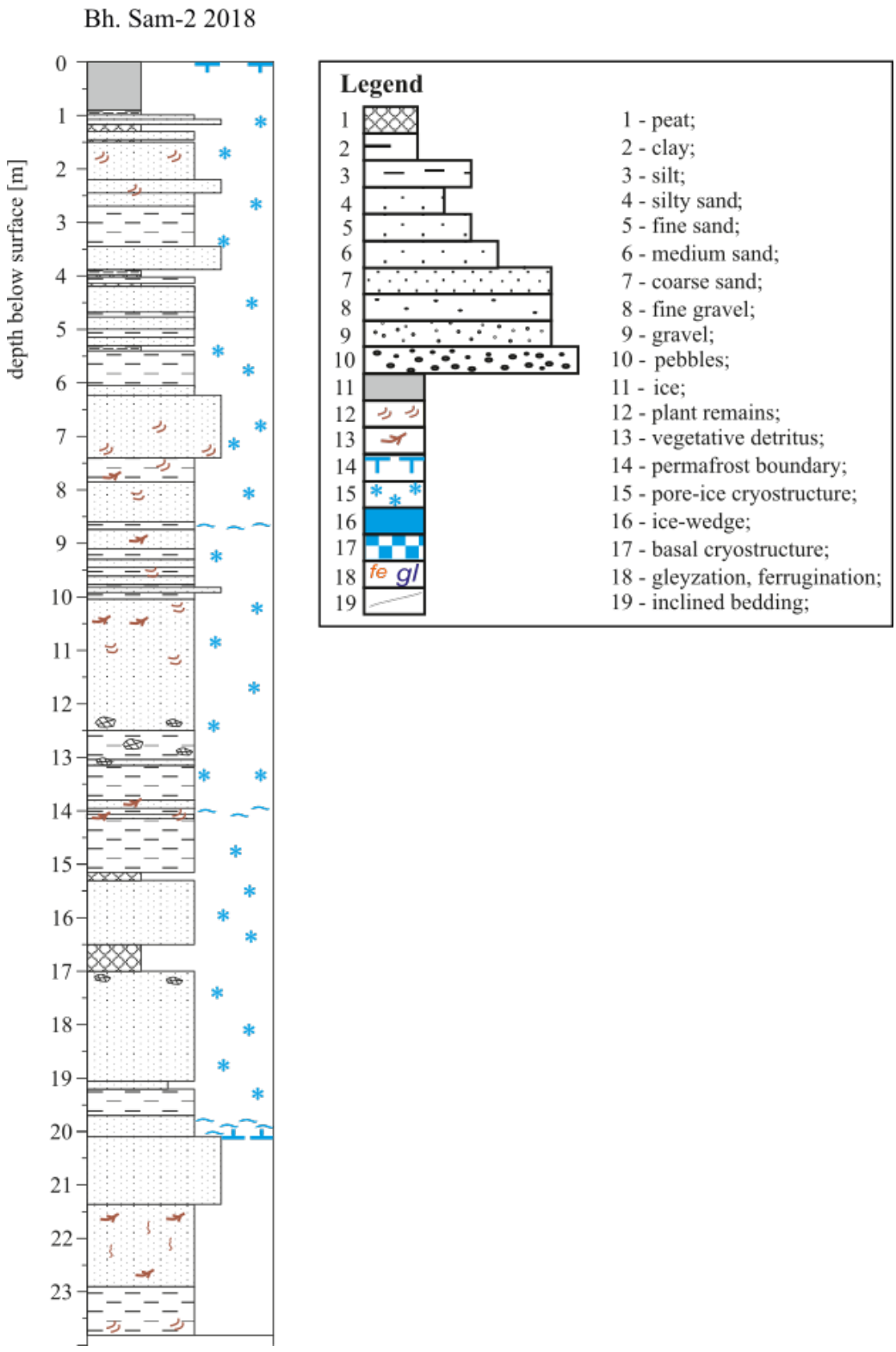

Figure 2.1.14: *Stratigraphy of Lena River permafrost sediment core. Graph by Georgii Maximov*

A.2 Supplementary material to Lena 2018 Expedition

Sediment core pictures - Deep Drilling Campaign Spring 2018

Figure A.2-1: *Wooden remains around 21.5 m (Drive XIX)*

Figure A.2-2: *Oxidized spots in sandy sediments around 42 m (Drive XXXI)*

Figure A.2-3: *Pebbles around 48 m (Drive XXXV)*

Figure A.2-4: *Organic-rich layer around 35.5 m (Drive XXVIII)*

Figure A.2-5: *Polosatic (vertical ice bands) cryostructure around 27 m (Drive XXIII)*

Figure A.2-6: *Pure ice around 22.6 m (Drive XX)*

Figure A.2-7: *Cryoturbation, vertical contact of silty and sandy material around 30.3 m (Drive XXV)*

Table A.2.1: Sediment core description - Samoylov Island sediment core

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		State	Ground ice fabric cryostructure	Organic Matter	Core barrel diameter [mm]
	from	to		from	to		sediment	color				
SAM18-01												
SAM18-01-I	0	8										146
SAM18-01-I	0	3					vegetation, moss to sedge	greenish	frozen			146
SAM18-01-I	3	8					degraded recent vegetation, peaty	brownish	frozen			146
SAM18-01-I			1	0	8	WHIRLPAK						146
SAM18-01-II	8	82										146
SAM18-01-II	8	22					sandy	grey		in between lenticular layers, macro lenses to banded	at 21: wooden remain	146
SAM18-01-II	22	82	1	8	82	CORE FOIL	sand, oxidized brownish lenses at 22-27, 2cm wide, horizontal orientated	grey	frozen	non-visible, structureless		146
SAM18-01-III	82	215										146
core loss	202	215										146
SAM18-01-III	82	92					sandy, like above	grey	frozen	macro lenses		146
SAM18-01-III	92	202					sandy, like above	grey	frozen	non visible to lenticular	wooden remain up to 1 cm diameter	146
SAM18-01-III			1	82	105	CORE FOIL						146
SAM18-01-III			2	105	202	CORE FOIL						146
SAM18-01-IV	215	315										146
SAM18-01-IV	215	277					broken because wing of an ice wedge					146
SAM18-01-IV	277	300					sand	grey		lenticular to layered, macro lenses and bands, connected	sparse wooden remains	146
SAM18-01-IV	300	315					sand	grey		less ice than above		146

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		State	Ground ice fabric cryostructure	Organic Matter	Core barrel diameter [mm]
	from	to		from	to		sediment	color				
SAM18-01-IV			1	215	245	WHIRLPAK						146
SAM18-01-IV			2	245	265	WHIRLPAK						146
SAM18-01-IV			3	265	277	WHIRLPAK						146
SAM18-01-IV			4	277	315	CORE FOIL						146
SAM18-01-V	315	405										146
SAM18-01-V	315	335					sand	grey		ice rich, layered, diagonal oriented bands due to ice wedge uplift	organic remains	146
SAM18-01-V	335	380					sand	grey		ice rich, macro lenses to ataxitic	organic remains	146
SAM18-01-V	380	405					sand	grey		bit less ice	lot of organic, also diagonal oriented, same direction as bands above	146
SAM18-01-V			1	315	405	CORE FOIL						146
SAM18-01-VI	405	515										146
SAM18-01-VI	405	515					sand, to cm thick sand layer at 430	brownish grey		structureless to lenticular, agglomerates of ice non connected	down to 429 more wood, below: more peat, in general organic rich	146
SAM18-01-VI			1	405	487	CORE FOIL						146
SAM18-01-VI			2	487	515	CORE FOIL						146

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		state	Ground ice fabric cryostructure	Organic Matter	core barrel diameter [mm]
	from	to		from	to		sediment	color				
SAM18-01-VII	515	635										127
SAM18-01-VII	515	528					peat dominated sand	brownish grey		lenticular, very ice rich, macro lenses	peaty	
SAM18-01-VII	528	540					sandy silt	grey		lenticular to layered, macro lenses oriented to bands	organic remains	
SAM18-01-VII	540	635					peat dominated sand	brownish grey		in general: lenticular, ice rich, 580 to 598: close to vertical oriented lenses (vertical)	peaty	
SAM18-01-VII			1	515	580	CORE FOIL						
SAM18-01-VII			2	580	635	CORE FOIL						
SAM18-01-VIII	635	725										
SAM18-01-VIII	635	706					peat dominated sand	brownish grey		: lenticular, ice rich,		
SAM18-01-VIII	706	725					silty sand	grey				
SAM18-01-VIII			1	635	725	CORE FOIL						
SAM18-01-IX	725	875										
SAM18-01-IX	725	733					peaty sand	brownish grey		non visible, ice rich	peaty	
SAM18-01-IX	733	775					sandy, peat dominated	brownish grey		lenticular	peaty, at 760 wooden remain of 1.5 cm length	
SAM18-01-IX	775	782					sand interlayered	grey		non visible		
SAM18-01-IX	782	790					sandy, peat dominated	brownish grey		lenticular		
SAM18-01-IX	790	802					sandy	grey		lenticular	brown band at 794	
SAM18-01-IX	802	834					peat wit sandy layer of 3 cm thickness at 811, 819, 826	grey		very ice rich	peaty	

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		State	Ground ice fabric cryostructure	Organic Matter	Core barrel diameter [mm]
	from	to		from	to		sediment	color				
SAM18-01-IX	834	837					sand interlayer	grey		non visible		
SAM18-01-IX	837	875					sand with peaty layers at 843, 857, 870					
SAM18-01-IX			1	725	800	CORE FOIL						
SAM18-01-IX			2	800	875	CORE FOIL						
SAM18-01-X	875	963										
SAM18-01-X	875	890					peaty	greyish brown		ice rich but structureless	peat	
SAM18-01-X	890	963					sand	grey		ice rich, macro lenses, 2 ice bands of 1 cm thickness at 918 and 920	organic remain at 913, piece of woo 7 cm long and 3 cm thick, horizontal, in general organic rich and macro remains	
SAM18-01-X			1	875	963	CORE FOIL						
SAM18-01-XI	963	1083										
SAM18-01-XI	963	980					sandy	dark grey		ice rich, lenticular to layered, 3 bands 0.5 cm thick at 968, 973, 978, in between lenticular		
SAM18-01-XI	980	995					sand	grey		structureless		
SAM18-01-XI	995	1006					sand	grey		micro lenticular, dense		
SAM18-01-XI	1006	1017					sand	grey		structureless		
SAM18-01-XI	1017	1083					sandy	grey		lenticular, ice rich layer 2cm 1030	woody remains up to 2 cm diameter 1044	

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		State	Ground ice fabric cryostructure	Organic Matter	Core barrel diameter [mm]
	from	to		from	to		sediment	color				
SAM18-01-XI			1		1024	CORE FOIL						
SAM18-01-XI			2		1083	CORE FOIL						
SAM18-01-XII	1083	1212										
SAM18-01-XII	1083	1212					sandy	grey		lenticular, macro lenses	wooden remains, 1090 1cm long, 0.5 thick, 1116, 4 cm long diagonal, 1124: 4 cm long diagonal	
SAM18-01-XII			1		1148	CORE FOIL						
SAM18-01-XII			2		1212	CORE FOIL						
SAM18-01-XIII	1212	1415										
core loss	1388	1415										
SAM18-01-XIII	1212	1225					sandy	dark grey		structureless	peat inclusions	
SAM18-01-XIII	1225	1235					sandy silt			lenticular, sparse macro lenses		
SAM18-01-XIII	1235	1388					sandy	grey		structureless	macro remain at 1288, 1383	
SAM18-01-XIII			1	1212	1299	CORE FOIL						
SAM18-01-XIII			2	1299	1415	CORE FOIL						
SAM18-01-XIV	1388	1452										
SAM18-01-XIV	1452	1452					sandy	grey		non visible	woody remains	
SAM18-01-XIV			1	1388	1452	CORE FOIL						

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		State	Ground ice fabric cryostructure	Organic Matter	Core barrel diameter [mm]
	from	to		from	to		sediment	color				
SAM18-01-XV	1452	1695										
SAM18-01-XV	1695	1695					sandy			general_ non visible- ice layers at: 1483, micro lense, 1573-74, micro lenses, 1607: micro lenses, 1765 to 73: 2 diagonal macro lenses	woody remains all across the core, especially large at 1514 5 cm long, 1637: the very bottom is especially organic rich	
SAM18-01-XV			1	1452	1547	CORE FOIL						
SAM18-01-XV			2	1547	1616	CORE FOIL						
SAM18-01-XV			3	1616	1695	CORE FOIL						
SAM18-01-XVI	1640	1830										
SAM18-01-XVI	1640	1744					sand	grey		ice rich interlayers, lenticular	woody remains across the core	
SAM18-01-XVI	1744	1815					sand	grey		structureless, macro lenses and ice band between 1794-98	woody remains across the core	
SAM18-01-XVI	1815	1827					coarser sand	grey		non visible	woody remains across the core	
SAM18-01-XVI	1827	1830					sand	gray		micro lenticular		
SAM18-01-XVI			1	1640	1742	CORE FOIL						
SAM18-01-XVI			2	1742	1830	CORE FOIL						
SAM18-01-XVII	1830	1870										

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		State	Ground ice fabric cryostructure	Organic Matter	Core barrel diameter [mm]
	from	to		from	to		sediment	color				
SAM18-01-XVII	1830	1870					medium sand	grey		non visible	general: woody remains across the core, 1833, circle shaped object 2cm diameter, 1849-53: dense woody remain layer	
SAM18-01-XVII			1	1830	1870	CORE FOIL						
SAM18-01-XVIII	1870	2075										
SAM18-01-XVIII	1870	1950					silty sand, with coarse sand interlayers of , at 1888: 0.5 cm thick, 1934- 1938	grey, coarse sand is lighter		non visible	woody remains in silty interlayers	
SAM18-01-XVIII	1950	1987					coarser sand than above	grey		non visible	1 wooden remain at 1957	
SAM18-01-XVIII	1987	2017					silty sand with sand interlayers, 1997-2002	grey		non visible	wooden remains across, especially in sand interlayer	
SAM18-01-XVIII	2017	2053					medium sand	grey		non visible	sparse black dots up t0 3 mm diameter	
SAM18-01-XVIII	2053	2075					sand with peat			non visible	lots of organic	
SAM18-01-XVIII			1	1870	1913	CORE FOIL						
SAM18-01-XVIII			2	1913	2011	CORE FOIL						
SAM18-01-XVIII			3	2011	2075	CORE FOIL						
SAM18-01-XIX	2075	2230										

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		State	Ground ice fabric cryostructure	Organic Matter	Core barrel diameter [mm]
	from	to		from	to		sediment	color				
SAM18-01-XIX	2075	2127					sandy matrix with silty organic rich interlayers of 1 cm thickness at 2083, 93, 99, 2111			non visible	stem or twig at 2087 , 2 cm diameter, ice lense on top, also 3 cm diameter wood a 2114, surrounded by an ice lense	
SAM18-01-XIX	2127	2157					silty sand like silt band above			non visible	2150: 5 cm organic remain	
SAM18-01-XIX	2157	2204					sandy matrix with silty organic rich interlayers of 1 cm thickness at 2163, 2170, 85, 93			non visible	2202: 4 cm remain	
SAM18-01-XIX	2204	2230					sandy with organic rich ice layer, especial 2213-2230, broken parts because ice rich			ice rich and micro lenticular		
SAM18-01-XIX			1	2075	2140	CORE FOIL						
SAM18-01-XIX			2	2140	2213	CORE FOIL						
SAM18-01-XIX			3	2213	2230	WHIRLPAK						
SAM18-01-XX	2230	2375										
SAM18-01-XX	2230	2284					ice sand mixture, drilling crashed ice/compacted snow			pure ice between 2247 and 60, freshwater ice	sparse wooden remains	
SAM18-01-XX	2284	2343					frozen peat			ice rich	peat	
SAM18-01-XX	2343	2375					silty sand	brownish grey		lenticular, vertical lenses, horizontal bands	brown spots close to ice lenses. Likely oxidized, not OM	

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		State	Ground ice fabric cryostructure	Organic Matter	Core barrel diameter [mm]
	from	to		from	to		sediment	color				
SAM18-01-XX			1	2230	2322	CORE FOIL						
SAM18-01-XX			2	2322	2375	CORE FOIL						
SAM18-01-XXI	2375	2454										
Drilling mud, removed	2375	2370					sand	brown		not that ice rich and a bit softer, you can stick the knife a bit in it		
SAM18-01-XXI	2370	2429					sand	brown		ice rich, lenticular, lenses in all orientations		
SAM18-01-XXI	2429	2437					broken parts			ice rich, layers or banded		
SAM18-01-XXI	2437	2465					sand	brownish grey		lenticular, micro lenses, at 2483: ice band diagonal oriented, 1cm thick		
SAM18-01-XXI			1	2370	2429	CORE FOIL						
SAM18-01-XXI			2	2429	2465	CORE FOIL						
SAM18-01-XXII	2454	2615										
SAM18-01-XXII	2454	2527					silty sand getting coarser to the bottom			structureless	wooden remains at 2477, 2525	
SAM18-01-XXII	2527	2615					sad, getting coarser to bottom			structureless		
SAM18-01-XXII			1	2454	2527	CORE FOIL						
SAM18-01-XXII			2	2527	2615	CORE FOIL						

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		State	Ground ice fabric	Organic Matter	Core barrel diameter [mm]
	from	to		from	to		sediment	color		cryostructure		
SAM18-01-XXIII	2615	2795										
SAM18-01-XXIII	2615	2662					medium to coarse sand			ice rich, non visible		
SAM18-01-XXIII	2662	2744					sand, coarse, rocks at 2685 (2cm) 2712 (2 thick, 4 long)			layered, vertical bandy, polosatic (Kunitsky)		
SAM18-01-XXIII	2744	2795					sand, coarse			lots of visible ice bands, up to 1 cm thick		
SAM18-01-XXIII			1	2615	2717	CORE FOIL						
SAM18-01-XXIII			2	2717	2795	CORE FOIL						
SAM18-01-XXIV	2795	2965										
SAM18-01-XXIV	2795	2965					coarse sand			ice rich, vertical bands, up to 1 cm thick		
SAM18-01-XXIV			1	2795	2884	CORE FOIL						
SAM18-01-XXIV			2	2884	2965	CORE FOIL						
SAM18-01-XXV	2965	3085										
SAM18-01-XXV	2965	3034					coarse sand			ice rich, vertical bands, up to 1 cm thick		
SAM18-01-XXV	3034	3085					vertical contact of silty material and coarse sand (Dima: cryoturbation), bottom cross section looks like breccia (picture)			in silty area slightly diagonal oriented micro lenses		

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		State	Ground ice fabric cryostructure	Organic Matter	Core barrel diameter [mm]
	from	to		from	to		sediment	color				
SAM18-01-XXV			1	2965	3021	CORE FOIL						
SAM18-01-XXV			2	3021	3085	CORE FOIL						
SAM18-01-XXVI	3085	3225										
SAM18-01-XXVI		3097					coarse sand and silty contact, like the end of the previous drive					
SAM18-01-XXVI		3024					finer sand than above, dark sediment until 3103 (corr 3102) with interl. lamination (lake phase?), oxidation lenses/parts					
SAM18-01-XXVI		3096					sand, few layers, dark, but further apart than above, same oxidation spots than above			vertical ice band 0.5cm thick		
SAM18-01-XXVI		3225					fine sand, slightly diagonal oriented, dark layer from 3201 to 3217 (corrected 16 cm lower), oxidized parts					
SAM18-01-XXVI			1		3144	CORE FOIL						
SAM18-01-XXVI			2		3225	CORE FOIL						
SAM18-01-XXVII	3225	3415										
SAM18-01-XXVII	3225	3246					fines sand, dark and light laminated, oxidized layers					
SAM18-01-XXVII	3246	3375					coarse sand, 2 diagonal dark black layers of 2mm thickness at 3327 an 3344, oxidized part from 3350 to 3375					

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		State	Ground ice fabric cryostructure	Organic Matter	Core barrel diameter [mm]
	from	to		from	to		sediment	color				
SAM18-01-XXVII	3375	3385					fine sand, darker than above					
SAM18-01-XXVII	3385	3415					coarse sand, oxidized, black dots at 3388					
SAM18-01-XXVII			1	3225	3322	CORE FOIL						
SAM18-01-XXVII			2	3322	3415	CORE FOIL						
SAM18-01-XXVIII	3415	3575										
SAM18-01-XXVIII	3415	3419					fine sand, darker than below					
SAM18-01-XXVIII	3419	3449					very coarse with pebbles up to 2cm diameter					
SAM18-01-XXVIII	3449	3488					coarse sand with oxidized parts					
SAM18-01-XXVIII	3488	3512					coarse sand with slightly diagonal coalish woody remains, black, in bands, pebble at 3509 (1cm diameter)					
SAM18-01-XXVIII	3512	3517					pebble 6x4cm					
SAM18-01-XXVIII	3517	3575					coarse sand with oxidized parts, pebble at 3550				slightly diagonal coalish black layers at 3548, 3555	
SAM18-01-XXVIII			1	3415	3512	CORE FOIL						
SAM18-01-XXVIII			2	3512	3517	WHIRLPAK						
SAM18-01-XXVIII			3	3517	3575	CORE FOIL						

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		State	Ground ice fabric cryostructure	Organic Matter	Core barrel diameter [mm]
	from	to		from	to		sediment	color				
SAM18-01-XXIX	3575	3760										
SAM18-01-XXIX	3575	3760					coarse sand, oxidized parts, coarser horizon at 3718 - 3760	grey		ice band, 0.5 cm thick at 3704	org rich layer at 3581 (3cm thick with large remain (2cm diameter), detail photo	
SAM18-01-XXIX			1	3575	3663	CORE FOIL						
OSL sample			2	3663	3686							
SAM18-01-XXIX			3	3686	3760	CORE FOIL						
SAM18-01-XXX	3760	4045										
SAM18-01-XXX	3760	3784					coarse sand, oxidized parts					
SAM18-01-XXX	3784	3787					organic layer like at 3581				org rich layer (3cm thick with large remain (2cm diameter)	
SAM18-01-XXX	3787	3807					silty lense in sand, 3802-3807 laminated silt (2mm thick organic dark and lighter bands, possibly cryoturbation					
SAM18-01-XXX	3807	4045					sandy, oxidized parts, special: 3890 - 3904. slightly diagonal dark (org) bands; 4027: org black dots	grey				
SAM18-01-XXX			1	3760	3846	CORE FOIL						
SAM18-01-XXX			2	3846	3920	CORE FOIL						
SAM18-01-XXX			3	3920	3989	CORE FOIL						
SAM18-01-XXX			4	3989	4045	CORE FOIL						

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		State	Ground ice fabric cryostructure	Organic Matter	Core barrel diameter [mm]
	from	to		from	to		sediment	color				
SAM18-01-XXXI	4045	4235										
SAM18-01-XXXI	4045	4055					coarse sand, oxidized parts, gravely up to 1 cm thick					
core loss	4055	4098										
SAM18-01-XXXI	4098	4235					coarse sand, oxidized parts, 4124: stone (4x4 cm), oxidized parts 4189-4200					
SAM18-01-XXXI			1	4045	4055	CORE FOIL						
SAM18-01-XXXI			2	4055	4098	WHIRLPAK						
SAM18-01-XXXI			3	4098	4175	CORE FOIL						
SAM18-01-XXXI			4	4175	4235	CORE FOIL						
SAM18-01-XXXII	4235	4445										
core loss												
SAM18-01-XXXII	4235	4400					coarse sand, oxidized parts					
SAM18-01-XXXII	4400	4445					coarse sand, oxid. parts, silty lenses: 4403-4430; black layers in sandy matrix: 4405-4409, single layers up to 0.5 cm thick	grey				
SAM18-01-XXXII			1	4235	4245	CORE FOIL						
SAM18-01-XXXII			2	4254	4350	CORE FOIL						
SAM18-01-XXXII			3	4360	4445	CORE FOIL						

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		State	Ground ice fabric cryostructure	Organic Matter	Core barrel diameter [mm]
	from	to		from	to		sediment	color				
SAM18-01-XXXIII	4445	4570										
core loss	4545	4570										
SAM18-01-XXXIII	4445	4460					sand, bin finer than below					
SAM18-01-XXXIII	4460	4545					coarse sand, pebbles up to 2x1 cm , 4 times visible, more in the core	grey			4537-39: 2cm layer of coaly wooden remains	
SAM18-01-XXXIII			1	4445	4545	CORE FOIL						
SAM18-01-XXXIV	4570	4690										
SAM18-01-XXXIV	4570	4670										
core loss												
SAM18-01-XXXIV			1	4570	4690	WHIRLPAK	metamorphic rock, calcareous, large stones, bigger than the core diameter, up to 5 cm thick, smaller pebbles round shapes					
SAM18-01-XXXIV												
SAM18-01-XXXV	4690	4855										89
SAM18-01-XXXV	4690	4747					fluvial gravel, 0.5cm, partly rounded					89
SAM18-01-XXXV	4747	4813					finer material, coarse sand matrix with smaller pebbles than above					89
SAM18-01-XXXV	4813	4830					rounded pebbles up 6cm diameter					89
SAM18-01-XXXV	4830	4842					(core part) coarse sand matrix with pebbles, oxidized parts	grey		vertical ice bands up to 3mm thick		89

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		State	Ground ice fabric cryostructure	Organic Matter	Core barrel diameter [mm]
	from	to		from	to		sediment	color				
SAM18-01-XXXV	4842	4855					one clayish sand stone, aleurite, destroyed by manual hammering (Dima)					147
SAM18-01-XXXV			1	4690	4747	WHIRLPAK						
SAM18-01-XXXV			2	4747	4780	WHIRLPAK						
SAM18-01-XXXV			3	4780	4813	WHIRLPAK						
SAM18-01-XXXV			4	4813	4830	WHIRLPAK						
SAM18-01-XXXV			5	4830	4842	WHIRLPAK						
SAM18-01-XXXV			6	4842	4855	WHIRLPAK						
SAM18-01-XXXVI	4855	5010										108
core loss	4855	4910										108
SAM18-01-XXXVI	4910	4930					silty sand	dark grey with brown grey interl of 0.5cm thick				108
SAM18-01-XXXVI	4930	4940					silty sand, broken parts, including 1 big stone of 7 x 3 cm					108
SAM18-01-XXXVI	4940	4955					silty sand	dark grey with brown grey interl of 0.5cm thick				108
SAM18-01-XXXVI	4955	4961					sandy matric with organic				plate like (schuppenartig) organic parts, organic layer	108

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		State	Ground ice fabric cryostructure	Organic Matter	Core barrel diameter [mm]
	from	to		from	to		sediment	color				
SAM18-01-XXXVI	4961	5010					coarse sand, darker band from 4064 to 69 (organic?)	grey				108
SAM18-01-XXXVI			1	4910	5010	CORE FOIL						108
SAM18-01-XXXVII	5010	5110										108
SAM18-01-XXXVII	5010	5035					coarse sand, oxidized parts					
SAM18-01-XXXVII	5035	5057					mix of sand an silt, partly rounded pebbles up to 1 cm		unfrozen due to drilling			
SAM18-01-XXXVII	5057	5077					mix of sand an silt, partly rounded pebbles up to 1 cm		unfrozen due to drilling			
SAM18-01-XXXVII	5077	5094										
SAM18-01-XXXVII	5094	5110										
SAM18-01-XXXVII			1	5010	5035	CORE FOIL						
SAM18-01-XXXVII			2	5035	5057							
SAM18-01-XXXVII			3	5057	5077							
SAM18-01-XXXVII			4	5077	5094							
SAM18-01-XXXVII			5	5094	5110							
SAM18-01-XXXVIII	5110	5195							unfrozen due to drilling heat			
SAM18-01-XXXVIII	5110	5195					sandy with many partly rounded pebbles, big pebble of 10 cm diameter at 5175-5185		unfrozen due to drilling heat			
SAM18-01-XXXVIII			1	5110	5140	CORE FOIL						

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		State	Ground ice fabric cryostructure	Organic Matter	Core barrel diameter [mm]
	from	to		from	to		sediment	color				
SAM18-01-XXXVIII			2	5140	5165	CORE FOIL						
SAM18-01-XXXVIII			3	5165	5195	CORE FOIL						
SAM18-01-XXXIX	5195	5265							unfrozen due to drilling heat			
SAM18-01-XXXIX	5195	5265					silts matrix with pebbles, rounded, at 5202 to 08: pebble bigger than core diameter		unfrozen due to drilling heat			
SAM18-01-XXXIX			1	5195	5265	CORE FOIL			unfrozen due to drilling heat			
SAM18-01-XL	5265	5535							mainly unfrozen			
SAM18-01-XL	5535	5535					sandy sediments, pebbles up to 2 cm diameter, partly rounded, pebbles in part 5282, 5207, up to 8 cm, big stone at very bottom at 5330: 6cm; lower part from 5530 to b was bit coarser matrix		Parts retrieved frozen: 5317-5338, 5376-5380, 5513-5535, rest unfrozen			
SAM18-01-XL			1	5265	5280	WHIRLPAK						
SAM18-01-XL			2	5280	5307	WHIRLPAK						
SAM18-01-XL			3	5307	5338	WHIRLPAK						
SAM18-01-XL			4	5338	5395	WHIRLPAK						
SAM18-01-XL			5	5395	5407	WHIRLPAK						
SAM18-01-XL			6	5407	5440	WHIRLPAK						
SAM18-01-XL			7	5440	5485	WHIRLPAK						
SAM18-01-XL			8	5485	5510	WHIRLPAK						
SAM18-01-XL			9	5510	5535	WHIRLPAK						

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		State	Ground ice fabric cryostructure	Organic Matter	Core barrel diameter [mm]
	from	to		from	to		sediment	color				
SAM18-01-XLI	5535	5620										
SAM18-01-XLI	5535	5620					medium sand, pebbles up to 5cm: 5549 to 5552, also 5559 to 5562, and 5588 to 5591	grey	frozen			
SAM18-01-XLI			1	5535	5620	CORE FOIL						
SAM18-01-XLII	5620	5660										
SAM18-01-XLII	5620	5660					sandy, no stones, very liquid		unfrozen due to drilling			
SAM18-01-XLII			1	5620	5660	WHIRLPAK						
SAM18-01-XLIII												
SAM18-01-XLIV	5660	5770										
SAM18-01-XLIV	5660	5667					bi stone, bigger than core diameter		frozen after being thawed because drilled and retrieved yesterday			
SAM18-01-XLIV	5667	5738					sandy silt, mixed with rounded pebbles up to 3cm	grey	frozen			
SAM18-01-XLIV	5738	5770					bit more silty than part above		frozen			
SAM18-01-XLIV			1	5660	5770	CORE FOIL						
SAM18-01-XLV	5770	5800										
SAM18-01-XLV	5770	5800					gravel in sand with silty composed, one big rounded pebble, 4x3		unconsoli-dated, overheated, not wet			

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		State	Ground ice fabric cryostructure	Organic Matter	Core barrel diameter [mm]
	from	to		from	to		sediment	color				
SAM18-01-XLV			1	5770	5788	CORE FOIL						
SAM18-01-XLV			2	5788	5800	CORE FOIL						
SAM18-01-XLVI	5800	5865										
SAM18-01-XLVI	5800	5865					sand, upper part up to 5814: bit wetter, 2 rocks at 5815, 5830 of 8x6 cm, pebbles up to 2 cm	grey	unfrozen, overheated			
SAM18-01-XLVI			1	5800	5830	WHIRLPAK						
SAM18-01-XLVI			2	5830	5865	WHIRLPAK						
SAM18-01-XLVII	5865	5965										
SAM18-01-XLVII	5865	5965					sand, from 5910 to 5965: rounded pebbles up to 7x5cm, in the part between 5910 and 5930: a bit frozen	grey	unfrozen due to drilling, wet			
SAM18-01-XLVII			1	5865	5910	WHIRLPAK						
SAM18-01-XLVII			2	5910	5930	WHIRLPAK						
SAM18-01-XLVII			3	5930	5965	WHIRLPAK						
SAM18-01-XLVIII	5965	6185										
SAM18-01-XLVIII	5965	6185					silty sand, rounded pebbles up to 10 cm diameter		unfrozen due to drilling, wet			
SAM18-01-XLVIII			1	5965	5992	WHIRLPAK						
SAM18-01-XLVIII			2	5992	6020	WHIRLPAK						

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		State	Ground ice fabric cryostructure	Organic Matter	Core barrel diameter [mm]
	from	to		from	to		sediment	color				
SAM18-01-XLVIII			3	6020	6075	WHIRLPAK						
SAM18-01-XLVIII			4	6075	6105	WHIRLPAK						
SAM18-01-XLVIII			5	6105	6140	WHIRLPAK						
SAM18-01-XLVIII			6	6140	6185	WHIRLPAK						
SAM18-01-XLIX	6185	6245										
SAM18-01-XLIX	6185	6245					silty sand with rounded pebbles up to 10x5 cm,		unfrozen due to drilling			
SAM18-01-XLIX			1	6185	6215	WHIRLPAK						
SAM18-01-XLIX			2	6215	6245	WHIRLPAK						
SAM18-01-L	6245	6285										
SAM18-01-L	6245	6285					silty sand with rounded pebbles, up to 6cm		unfrozen due to drilling, very wet, material surplus, drilling mud incl?			
SAM18-01-L			1	6245	6260	WHIRLPAK						
SAM18-01-L			2	6260	6285	WHIRLPAK						
SAM18-01-LI	6285	6325										
core loss	6295	6325										
SAM18-01-LI	6285	6295					no sediment matrix, but metamorphic rock pebbles, up to 10x10cm, bottom part solid rock, filling the core diam.,					
SAM18-01-LI			1	6285	6295	WHIRLPAK						

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		State	Ground ice fabric cryostructure	Organic Matter	Core barrel diameter [mm]
	from	to		from	to		sediment	color				
SAM18-01-LII	6295	6400										
SAM18-01-LII	6295	6400					no sediment matrix, but metamorphic rock pebbles, up to 8x8cm					
SAM18-01-LII			1	6325	6340	WHIRLPAK						
SAM18-01-LIII	6400	6440										
SAM18-01-LIII	6400	6440					silty sand with pebbles likely drilling mud from above or leftovers from the previous drive					
SAM18-01-LIII			1	6400	6425	WHIRLPAK						108
SAM18-01-LIV	6440	6530										127
SAM18-01-LIV	6440	6530					matrix sandy silty, unfrozen part coarser with larger pebbles up to 4 cm. Frozen part are finer		frozen at 6335-6345, 6370-83, 6432-80.			
SAM18-01-LIV			1	6335	6400	CORE FOIL						
SAM18-01-LIV			2	6400	6485	CORE FOIL						
OSL sample				6455	6470							
SAM18-01-LIV			2.2	6470	6485							
SAM18-01-LIV			3	6485	6535	CORE FOIL						

Table A.2.2: Lena sediment core

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		State	Ground ice fabric cryostructure	Organic Matter	Core barrel diameter [mm]
	from	to		from	to		sediment	color				
SAM18-06, Lena River												
SAM18-06-D1	30	90							frozen			146
SAM18-06-D1	30	90					clear ice with a few horizontal cracks and small bubble from 30 to 47		frozen			146
SAM18-06-D1			1	30	90	CORE FOIL			frozen			146
SAM18-06-D2	90	210							frozen			146
core loss	180	210							frozen			146
SAM18-06-D2	90	93					ice, like above		frozen			146
SAM18-06-D2	93	100					silty band with sand interlayer		frozen	macro lenticular	macro remains, peaty in both layers	146
SAM18-06-D2	100	114					sand getting coarser to the bottom, fine to medium, change a t 106 cm		frozen			146
SAM18-06-D2	114	126					peaty horizon		frozen	structureless, but ice rich	peaty horizon	146
SAM18-06-D2	126	132					sand and silt layers		frozen	micro lenses in silty part	organic layers and macro remains	146
SAM18-06-D2	132	144					sand getting finer to the bottom, fine to medium, change a t 137 cm		frozen			146
SAM18-06-D2	144	150					peat silt sand layers, 1mm thick, laminated, thicker silt layer at the bottom (2cm)		frozen	in the lowest layer, lenticular to reticulate, lenses oriented in all direction		146
SAM18-06-D2	150	180					sand		frozen			146
SAM18-06-D2			1	90	180	CORE FOIL			frozen			146

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		State	Ground ice fabric cryostructure	Organic Matter	Core barrel diameter [mm]
	from	to		from	to		sediment	color				
SAM18-06-D3	180	450							frozen			127
core loss	405	450							frozen			127
core loss	370	405							frozen			127
SAM18-06-D3	180	285					fine to medium sand, 205 to 225: coarse sand and fine sand interbedding, 245:silt band, 2 cm thick		frozen			
SAM18-06-D3	285	292					silt layer		frozen	lenticular at top		
SAM18-06-D3	292	324					fine to medium sand 308 to 325: coarse and fine sand interbedding.		frozen			
SAM18-06-D3	324	370					medium to coarse sand		frozen			
SAM18-06-D3			1	180	275	CORE FOIL			frozen			
SAM18-06-D3			2	275	370	CORE FOIL			frozen			
SAM18-06-D4	370	615							frozen			
core loss	545	615							frozen			
SAM18-06-D4	370	388					coarse sand		frozen			
SAM18-06-D4	388	420					silt and fine sand interbedding. From 409 to 412: coarse sand, from 388 to 393 and 414 to 419: silt layers		frozen		406, and 414 organic layer of 0.5 cm thickness	
SAM18-06-D4	420	505					medium to coarse sand		frozen		organic layers down to 460, brownish bands. No layers visible from 460 to 505	
SAM18-06-D4	505	515					silty layer					
SAM18-06-D4	515	535					fine to medium sand, getting coarser downwards				528 to 31: 1 to 2 mm thick dark bands	
SAM18-06-D4	535	545					silty, talik/drilling mud (packed separately)		unfrozen			

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		State	Ground ice fabric cryostructure	Organic Matter	Core barrel diameter [mm]
	from	to		from	to		sediment	color				
SAM18-06-D4			1	370	467	CORE FOIL						
SAM18-06-D4			2	467	535	CORE FOIL						
SAM18-06-D4			3	535	545	CORE FOIL						
SAM18-06-D5+6	595	680							frozen			
SAM18-06-D5+6	595	605					silty			few macro lenses		
SAM18-06-D5+6	605	623					medium sand					
SAM18-06-D5+6	623	638					silty					
SAM18-06-D5+6	638	680					medium to coarse sand					
SAM18-06-D5+6			1	595	680	CORE FOIL						
SAM18-06-D7	680	930										
SAM18-06-D7	680	740					medium to coarse sand		frozen		731: organic band	
SAM18-06-D7	740	784					sand silt bedding, 1mm thick bands					
SAM18-06-D7	784	860					medium to coarse sand	grey			organic lenses up to 2mm, also wooden remain at 835 of 0.5 cm diameter	
SAM18-06-D7	860	875					matrix silty, frozen		frozen	3mm thick ice bands		
SAM18-06-D7	875	910					medium to coarse sand		frozen		organic layer sup to 1cm thick, also 888 to 894: peat layer	
SAM18-06-D7	910	930					silty		maybe unfrozen			

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		State	Ground ice fabric cryostructure	Organic Matter	Core barrel diameter [mm]
	from	to		from	to		sediment	color				
SAM18-06-D7			1	680	783	CORE FOIL						
SAM18-06-D7			2	783	850	CORE FOIL						
SAM18-06-D7			3	850	930	CORE FOIL						
SAM18-06-D8	930	1160										
core loss	1145	1160										
SAM18-06-D8	930	946					medium to coarse sand					
SAM18-06-D8	946	960					silty				958 to 60: organic layers with silt interbedding of 0.5cm thick	
SAM18-06-D8	960	963					medium sand					
SAM18-06-D8	963	973					silt, maybe unfrozen		maybe unfrozen silty part			
SAM18-06-D8	973	980					medium sand		frozen			
SAM18-06-D8	980	989					silt		maybe unfrozen silty part			
SAM18-06-D8	989	1145					medium sand				down to 1000 dense organic layers, wavy, 0.5 cm thick; org. layer between 1027-1031, also from 1093-1095; down to 1037 there is sparse darker layers	
SAM18-06-D8			1	930	1025	CORE FOIL						
SAM18-06-D8			2	1025	1102	CORE FOIL						
SAM18-06-D8			3	1102	1145	CORE FOIL						

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		State	Ground ice fabric cryostructure	Organic Matter	Core barrel diameter [mm]
	from	to		from	to		sediment	color				
SAM18-06-D9	1145	1355										
SAM18-06-D9	1145	1225					medium sand					
SAM18-06-D9	1225	1250					sand and organic bedding up to 1cm thick					
SAM18-06-D9	1250	1303					silt and organic bedding up to 0.5cm thick					
SAM18-06-D9	1303	1318					organics, silt and sand bedding, all wavy					
SAM18-06-D9	1318	1355					silty			ice band of 3mm at 1322		
SAM18-06-D9			1	1145	1212							
SAM18-06-D9			2	1212	1300							
SAM18-06-D9			3	1300	1355							
SAM18-06-D10	1355	1650										
core loss	1420	1650										
SAM18-06-D10	1355	1380					silt					
SAM18-06-D10	1380	1388					sand organic bedding up to 0.5 cm					
SAM18-06-D10	1388	1395					fine to medium sand				2 organic bands in lower 5 cm	
SAM18-06-D10	1395	1405					silt layer			2 ice bands at 1396 and 1401 of 1 mm thickness		
SAM18-06-D10	1405	1420					sand silt interlayers, sand bands starting from 1417					
SAM18-06-D10			1	1355	1420	CORE FOIL						
SAM18-06-D11	1420	1650										
SAM18-06-D11	1420	1428					silt	dark grey		ice band of 2mm at 1424		
SAM18-06-D11	1428	1516					silty sand, browner than above				1455: organic layer of 0.5mm thickness	
SAM18-06-D11	1516	1530								organic layer with sand inclusions	low degraded roots and leaves visible	

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		State	Ground ice fabric cryostructure	Organic Matter	Core barrel diameter [mm]
	from	to		from	to		sediment	color				
SAM18-06-D11	1530	1650					dryer sand, broken into parts down to 1597					
SAM18-06-D11			1	1420	1493	CORE FOIL						
SAM18-06-D11			2	1493	1530	CORE FOIL						
SAM18-06-D11			3	1530	1560	WHIRLPAK						
SAM18-06-D11			4	1560	1597	WHIRLPAK						
SAM18-06-D11			5	1597	1650	CORE FOIL						
SAM18-06-D12	1650	1905										
SAM18-06-D12	1650	1652					very low degraded peat				low degraded roots and leaves visible	
SAM18-06-D12	1652	1700					peat dominated, with lighter interlayers				especially peaty layers of 1 cm thick at 1675 and 1694	
SAM18-06-D12	1700	1714									fine sand layer with slightly diag. bands down to 1705: dense horiz. bands	
SAM18-06-D12	1714	1825									medium sand	
SAM18-06-D12	1825	1891									broken into parts, dryer sands	
SAM18-06-D12	1891	1905									dryer sediment, not broken	
SAM18-06-D12			1	1650	1741	CORE FOIL						
SAM18-06-D12			2	1741	1825	CORE FOIL						
SAM18-06-D12			3	1825	1891	WHIRLPAK						
SAM18-06-D12			4	1891	1905	WHIRLPAK						

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		State	Ground ice fabric cryostructure	Organic Matter	Core barrel diameter [mm]
	from	to		from	to		sediment	color				
SAM18-06-D13	1905	2135									water came out of the hole while drilling, transition from frozen to unfrozen	
SAM18-06-D13	1905	1923					fine sand		frozen			
SAM18-06-D13	1923	1970					silty matrix dominating, fine interbedding of silt sand and organic layers		frozen		1966-70: organic horizon	
SAM18-06-D13	1970	2000					medium sand; 1970-78: core shape, down to 2000: hockey puck shaped core		frozen		organic remains	
SAM18-06-D13	2000	2013					medium sand like above, but wetter, transition to talik, half frozen		half frozen			
SAM18-06-D13	2013	2135					same sediments		unfrozen, but some frozen interlayers			
SAM18-06-D13			1	1905	2000	CORE FOIL						
SAM18-06-D13			2	2000	2013	WHIRLPAK						
SAM18-06-D13			3	2013	2055	WHIRLPAK						
SAM18-06-D13			4	2055	2095	WHIRLPAK						
SAM18-06-D13			5	2095	2135	WHIRLPAK						
SAM18-06-D14	2135	2380							unfrozen			
SAM18-06-D14	2135	2155					medium sand, broken into parts		frozen			
SAM18-06-D14	2155	2180					sandy matrix, transition from sand to organic layer, broken into parts		frozen		getting more organic rich downwards, roots an twigs up to 5cm length	

Sample-ID	Depth		Sub-sample			Packing type	Sediment type		State	Ground ice fabric cryostructure	Organic Matter	Core barrel diameter [mm]
	from	to		from	to		sediment	color				
SAM18-06-D14	2180	2243					sandy organic horizon, broken into parts				twigs up to 16 cm long, 1 cm diam.	
SAM18-06-D14	2243	2290					sandy, transition from organic to sandy at 2255, broken into parts					
SAM18-06-D14	2290	2380					sharp transition from sand to silt, silty parts are in core shape				2cm thick organic layers at 2320 and 2370, in the parts between organics up to 2cm long	
SAM18-06-D14			1	2135	2155	WHIRLPAK						
SAM18-06-D14			2	2155	2180	WHIRLPAK						
SAM18-06-D14			3	2180	2210	WHIRLPAK						
SAM18-06-D14			4	2210	2243	WHIRLPAK						
SAM18-06-D14			5	2243	2275	WHIRLPAK						
SAM18-06-D14			6	2275	2290	WHIRLPAK						
SAM18-06-D14			7	2290	2380	CORE FOIL						

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