Czech Arctic Research Infrastructure
"Josef Svoboda Station"
Svalbard

Winter Arctic Expedition 2018

Centre for Polar Ecology
Faculty of Science
University of South Bohemia in České Budějovice
Czech Republic

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Josef Svoboda Station
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CENTRE FOR POLAR ECOLOGY

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2018

Report on Winter Arctic Expedition to Svalbard

In March and April 2018, the Winter Arctic Expedition of the Centre for Polar Ecology took place at the Josef Svoboda Station (JULIUS PAYER HOUSE and Field Station NOSTOC).

Participants:

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The participants worked on several projects:

1. Annual cycle of freshwater diatoms in the High Arctic
2. UV intercomparison and integration in a High Arctic environment
3. Microalgal communities in the cryosphere, controls and connectivity from glaciers to sea ice, Billefjorden
4. Microbial communities in glacier ice caves of Svalbard

Annual cycle of freshwater diatoms in the High Arctic

(RiS-ID 10853, supported by GAUK 20217)

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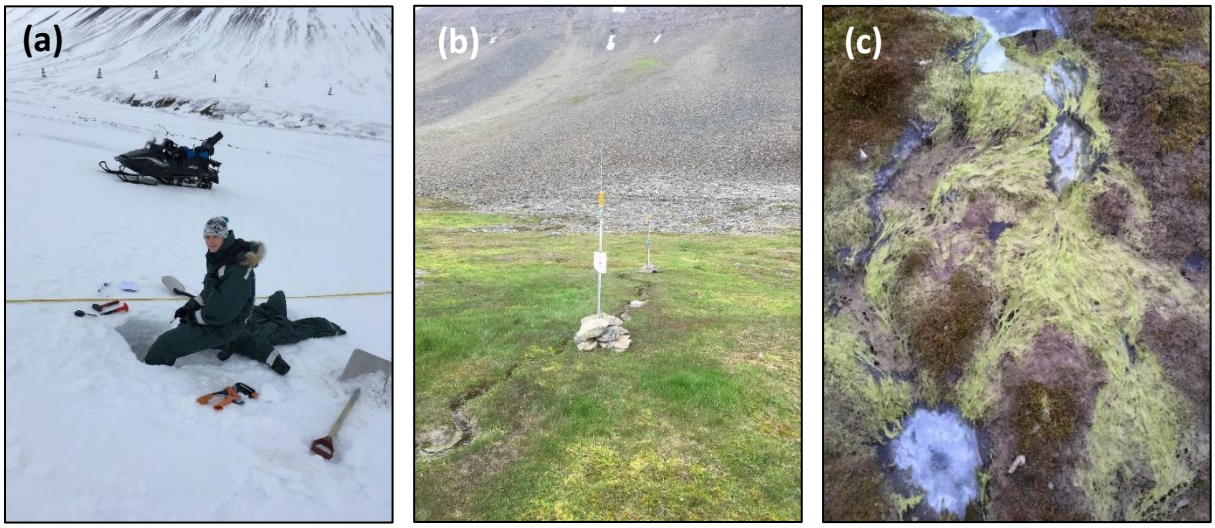
The main aim of the project is to study an annual cycle of freshwater polar diatoms to reveal their overwintering strategy. Diatoms are very important primary producers in the extreme environment of the High Arctic. However, it remains unknown, which strategy enables them to survive long polar winters. Morphology and viability of diatom cells are studied in natural samples collected during one year (including winter period,). We hypothesize that only a small amount of cells survive winter season and diatoms do not form any morphologically different stages for survival. Four sampling sites, shallow wetland, seepage and streams with high abundance of diatoms are situated close to Longyearbyen (Figs. 1 and 2). For viability evaluation, a multiparameter fluorescent staining (SYTOX Green, CTC and DAPI combination) is used in combination with light microscopy.



↑ **Fig. 1.** Experimental site **(a)** during winter, **(b)** during summer. **(c)** Detail of the community

← **Fig. 2.** Exposure chamber.

UV intercomparison and integration in a High Arctic environment

(RiS-ID 10871)

Josef Elster[1], Marie Šabacká[1], Kamil Láska[2], in collaboration with Norwegian Institute for Air Research (NILU, Kjeller, Norway), National Research Council – Institute of Atmospheric Sciences (ISAC-CNR, Bologna, Italy) and Institute of Geophysics – Polish Academy of Sciences (IGF-PAS, Warsaw, Poland)

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There is a need to homogenize observations of UV irradiance, ozone and related parameters in Svalbard by (i) integrating the existing stations in a regional network with a common data protocol and data processing methodologies and (ii) reinforcing/secure the cooperation among the corresponding research teams. The establishment of the network with instruments in Ny-Ålesund, Hornsund, Barentsburg and Longyearbyen require several steps: A) The most important point is the availability of reliable instrumentation that imposes the necessity of an inter-comparison campaign, which will provide information about the capability of the devices to produce data of sufficient quality. B) The next step is the elaboration of the common data format protocol and procedures for the initial data processing in order to achieve an acceptable homogeneity of data set provided by the network. C) Another important activity is to establish common products and perform joint analysis of the data collected until now so that a climatology and an integrated set of products is created in a form allowing to be used by other scientists in their studies. Inter-comparison campaign in Ny-Ålesund with the opportunity to check the quality of the instrumentation was performed.

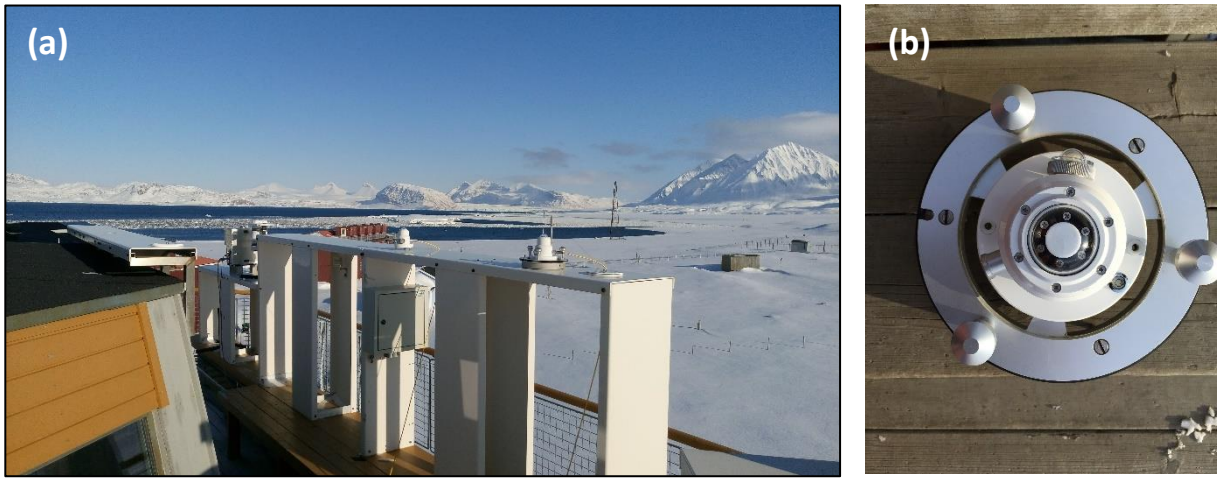

Fig. 3. (a) Radiometers at the Sverdrup Research Station (Norwegian Polar Institute), Ny-Ålesund, **(b)** detail of the Czech radiometer.

Microalgal communities in the cryosphere, controls and connectivity from glaciers to sea ice, Billefjorden

(RiS-ID 10889)

Marie Šabacká[1], Josef Elster[1], Eva Hejduková[2], Linda Nedbalová[2] in collaboration with University of Tromsø - The Arctic University of Norway (UiT, Tromsø, Norway), Norwegian University of Science and Technology (NTNU, Trondheim, Norway) and Swedish University of Agricultural Sciences (SLU, Uppsala, Sweden)

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Microbial communities in high Arctic fjords (Fig. 4a) can be affected by sea ice formation and glacial meltwater input. Both processes are changing drastically with a changing climate. Sea ice can act as a habitat for specific sea ice algae, adapted to low light but dependent on substrates. Glaciers are known to harbor a large variety of specific snow algae and cyanobacteria, as well as chemolithoautotrophic bacteria and archaea. These organisms have been shown to be important for supplying the glacial system with nutrients, such as reduced iron, and nitrogen. We investigated microbial communities, their biomass and viability together with potential environmental controls, such as nutrient concentrations. We studied the role of microbial communities and physiology on downward export fluxes. Microbial community structures were studied in the field (Fig. 4), using Nanopore MinION sequencing technologies for sequencing 16S and 18S genes and microscopy. Fluxes were measured via short term sediment traps. Multivariate analyses will be used to investigate the connectivity and most important environmental controls on bacteria, archaea, microalgae, microzooplankton, and ichtyoplankton communities in the fjords.

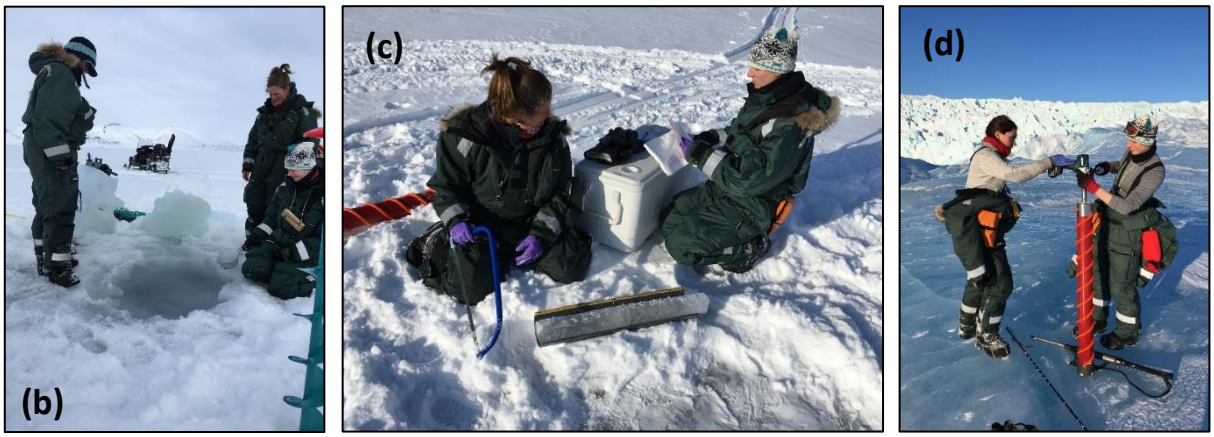

Fig. 4. (a) Community od the sea ice algae, **(b-d)** sampling in the field.

Microbial communities in glacier ice caves of Svalbard

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Ice caves represent highly preserved and relatively unexposed ice environments constituting a unique archive for studying the impact of climate and anthropogenic pollution on the microorganisms living there. Still there is only scarce information about the indigenous ice-microbiota, and their vulnerability to climate change. In this project we studied the total and active microbial communities from two Svalbard ice caves in order to understand the microbial diversity and metabolisms along a Chrono sequence model reflecting the impact of both climate and environmental pollution on cave ice microbiomes. This project is part of a global comprehensive study of ice cave microbiology (sites include Norway, Romania, Argentina and Chile).

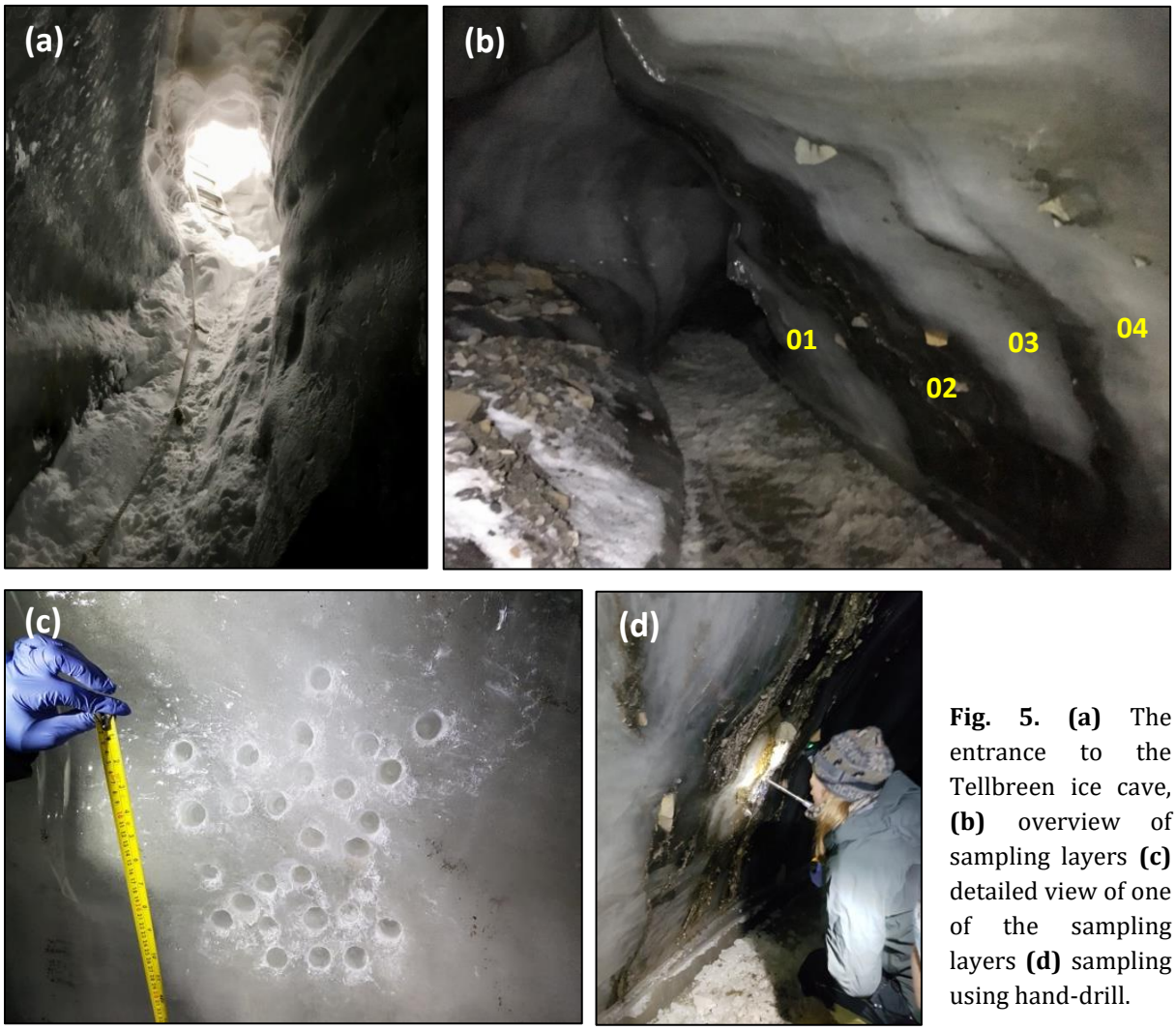

Fig. 5. (a) The entrance to the Tellbreen ice cave, **(b)** overview of sampling layers **(c)** detailed view of one of the sampling layers **(d)** sampling using hand-drill.