

INVESTIGATION OF STRUCTURE AND FUNCTION OF TERRESTRIAL ECOSYSTEMS AT JAMES ROSS ISLAND, ANTARCTICA

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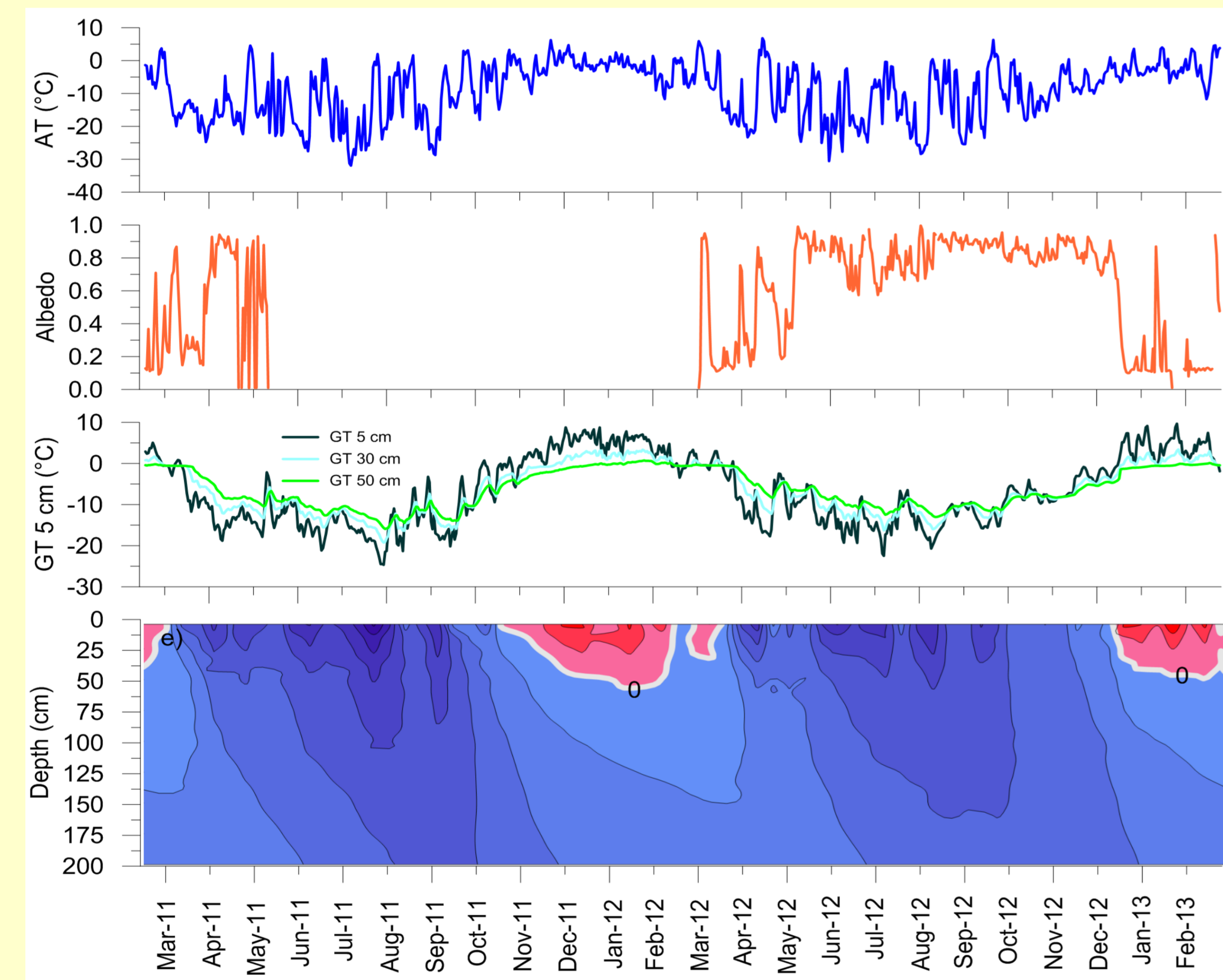
Introduction

Since 2007, long-term research of structure and function of Antarctic terrestrial ecosystems has been carried out on northern part of James Ross Island (JRI). In this abstract, we present an overview of field activities taken by Antarctic expedition crew in the period January-February 2015. Main attention was devoted to these directions: Climatology, Glaciers and permafrost, Hydrology and limnology, Terrestrial Biology, Environmental Science, Medical Science, and Technical and Material Science.

Overview of research activities

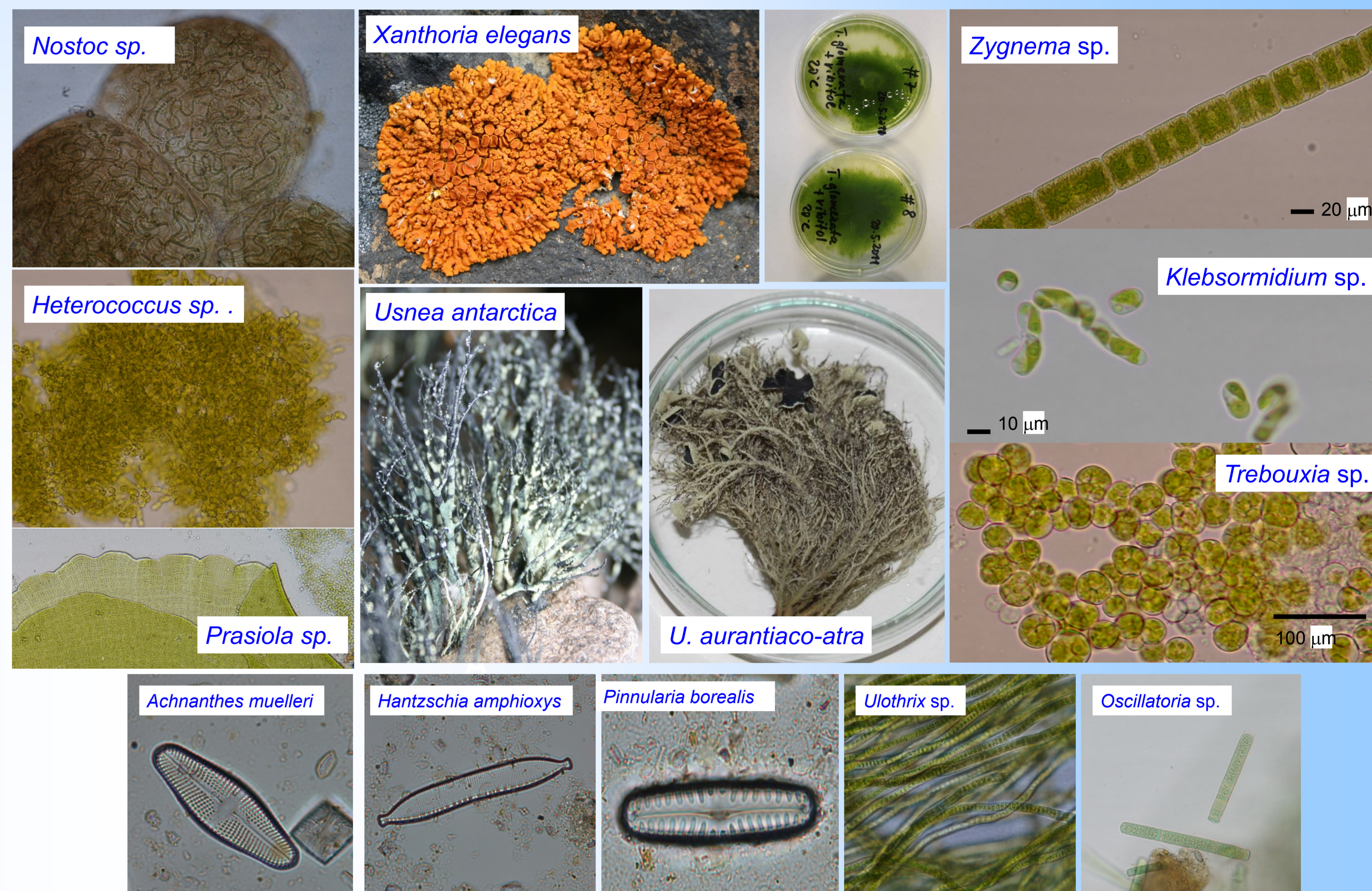
Local climate and active layer monitoring

Meteorological observation, ground temperature and active layer properties are monitored at the Czech Johann Gregor Mendel Station, Johnson Mesa, and 8 other localities on Ulu Peninsula, which is one of the largest ice free territory on the northern part of James Ross Island, close to eastern coast of Trinity Peninsula. Main meteorological parameters (air temperature, relative humidity) and ground temperature data are measured at 60-min time interval at all sites. Moreover, global and reflected radiation, ground surface temperature, soil heat flux, wind speed and direction, and snow depth are monitored at Mendel Station located in marine terrace and at the high-elevated plateau of Johnson Mesa. Active layer thickness is investigated along a 5.4 km long transect ranging from the altitude of about 4 to 323 m a.s.l. using probing rod.



Experimental species

lichens, algae, cyanobacteria



Field work in Jan-Feb 2015 Microbiology, OTC, Human medicine

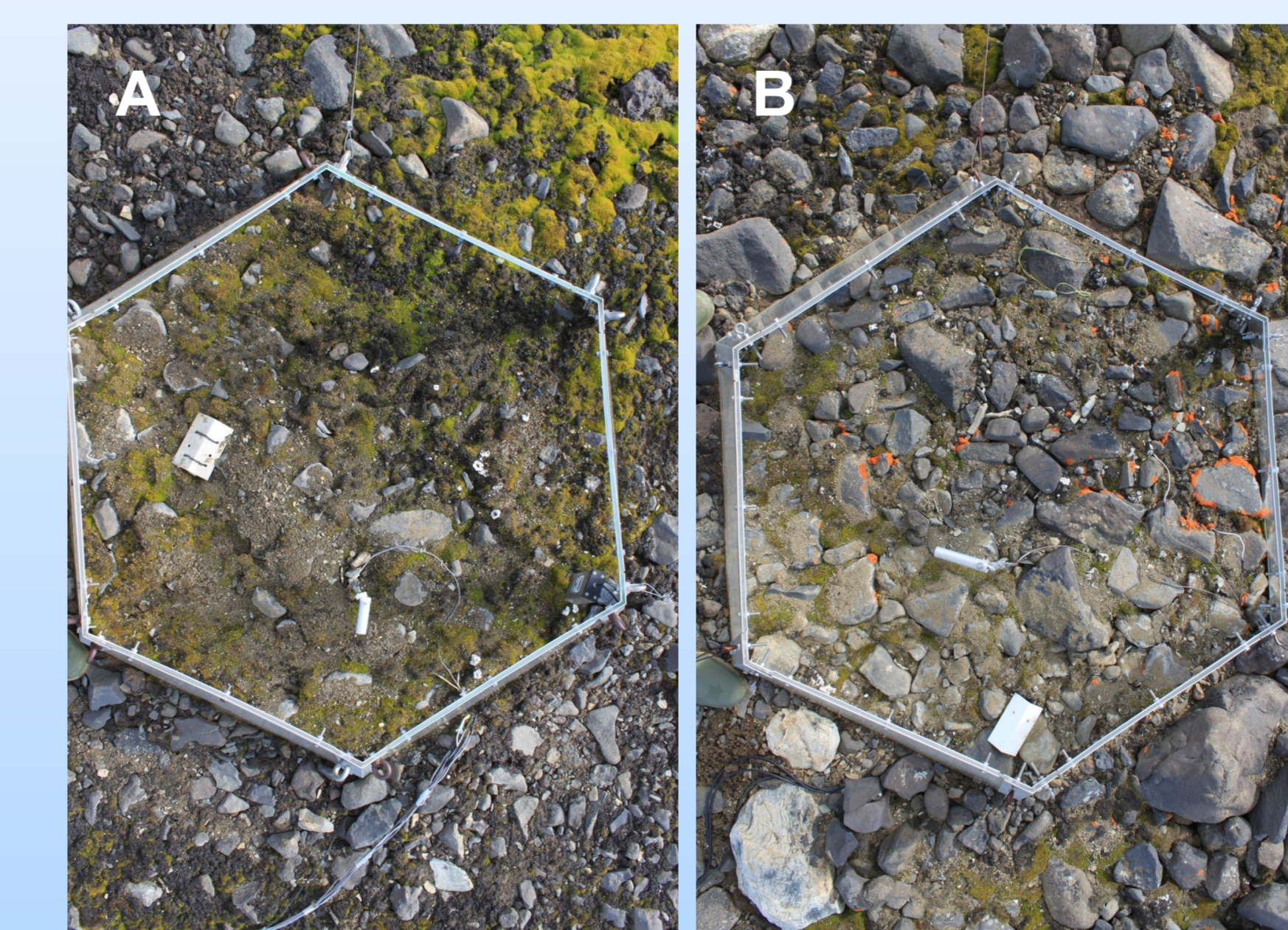


Environmental and lake ecosystem studies

Within long-term projects, emphasis was given to climate characteristics and an experiment with manipulated warming of vegetation cover using open top chambers (OTCs, measurements since 2007) approach. In Jan-Feb 2015, vegetation cover as well as microclimate in 12 OTCs, located in three contrasting localities of JRI, were investigated. Photosynthesis of *Bryum* sp. was evaluated by effective quantum yield of photosystem II using field installations of fluorometers. Since 2012, heavy metal contents, mercury in particular, have been analysed regularly in different JRI ecosystems. In Jan-Feb 2015, 150 samples from lakes, ponds, streams, soils, sediments, and lichen thalli were collected as a part of a follow up study. Using a field system composed of oxygen electrodes, thermocouples, PAR sensors, and data loggers, *in situ* long-term (1 month in 5 min step) monitoring of dissolved oxygen concentration (DOC) was carried out in 2 ponds.

Biodiversity studies

Samples of soil, lichens, mosses and microbiological mats, seepages, wet rock walls, cryoconites from more than 120 individual sampling sites located on deglaciated part of JRI were taken to estimate biodiversity of Antarctic terrestrial diatoms, algae, cyanobacteria, and soil nematodes. Special attention was devoted to follow-up studies of diatoms and colonization of seal carcasses— see Fig. The samples represented small pieces of skin, bony tissue, substrate affected by organic matter input from decaying seal bodies and unaffected control (mineral substrate in close neighbourhood of the carcasses). Diatoms, cyanobacteria and algae were isolated from the samples and cultivated on a Z and WC agars. Colonization of seal carcasses by lichens and mosses was studied as well with the main emphasis given to the species richness in a close neighbourhood of the carcasses as dependent on liquid water availability and stage of disintegration of seal remnants. To continue previous studies, microbiological samples were collected from different terrestrial ecosystems in order to isolate Antarctic *Pseudomonas* sp. The main goal is to detect and identify new bacteriocins (antibacterial proteins) in Antarctic *Pseudomonas* sp.



Bryum sp. (A) and *Xanthoria elegans*-dominated vegetation cover (B) in OTC close to J.G.Mendel station (Czech Rep.)



Crew members were sampled before the expedition and then on d 24, and d 45. Analysis of 17 haematological and immunological parameters were made from blood samples.

Summary

In Jan-March 2015, the following subprojects were carried out at James Ross Island:

- Climatology
 - Long-term measurements of local climate
 - Long-term monitoring of solar radiation
- Glaciers and permafrost
 - Mass balance of glaciers
 - Permafrost monitoring plots
- Hydrology and limnology
 - Hydrological characteristics of streams and lakes
 - Daily courses of dissolved oxygen in small-area ponds
- Terrestrial Biology
 - Biodiversity of terrestrial diatoms
 - Seal carcasses colonization
 - Long-term manipulated warming of in OTCs
 - Microbiology
 - Soil nematodes
 - Biodiversity of autotrophs
 - Biologically active compounds
- Environmental Science
 - Case study of mercury
 - Vegetation mapping
 - Magnetic field measurements
 - All-terrain vehicles impact assessment
 - Measures to prevent alien introduction
- Medical Science
 - Cardiovascular system parameters
 - Hematological and immunological param.

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