2.2. Climatology and Glaciology

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In a frame of the Polar Ecology Course, meteorological observation and glaciological survey were performed in the coastal ice-free zone of Petuniabukta and selected glaciers in the period from July 20 to August 3, 2014. The main goal of the fieldwork activities was to carry out the standard meteorological measurements and observations at Petuniabukta according to the Guide to Instruments and Methods of Observations No. 8 prepared by the World Meteorological Organization. Moreover, students focused on evaluation of the relationship between prevailing weather conditions, cloudiness, cloud genera and atmospheric circulation pattern over the central part of Spitsbergen. During the fieldwork activities the students regularly carried out the observations every hour during a day and every two hours at night time. They observed cloudiness (total cloud cover), cloud genera, cloud type and varieties, height of the cloud base, visibility, present and past weather conditions during last hour. Especial attention was devoted to measurement of precipitation amount and occurrence of the selected phenomena such as rain, drizzle, fog, photometeors, etc. (Figs. 2.2.1., 2.2.2 and 2.2.3.).

Fig. 2.1.1. Example of weather situation with the high-level, middle-level and low-level clouds (*cirrus*, *altocumulus and stratocumulus*) occurring at Petuniabukta on July 20, 2014.

Fig. 2.1.2. Irization on *altocumulus* clouds at Petuniabukta (Billefjorden, Spitsbergen).

Fig. 2.2.3. Rainbow on the low-level clouds at Petuniabukta (Billefjorden, Spitsbergen).

Other activities included installation of new meteorological station on the Bertilbreen glacier at the height of 280 m a. s. l. The measurements of air temperature, relative humidity, net radiation, surface wind speed and direction were put into operation at the beginning of August (Fig. 2.2.4a.). Moreover, new anemometer was installed on the top of the Mumien Peak (Fig. 2.3.4b.).

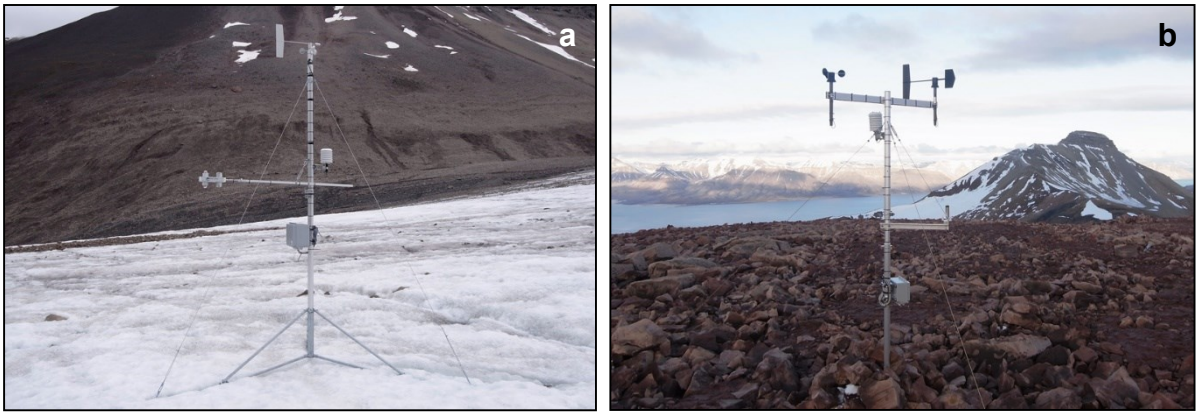

Fig. 2.2.4. Meteorological instruments on **(a)** the Bertilbreen glacier and **(b)** Mumien Peak.

Glaciological observations were carried out on Bertilbreen and Ferndinandbreen glaciers. These glaciers are situated northwest and north of Pyramiden settlement. Bertilbreen is one of the glaciers on which long-term measurement of ablation and glacier changes are carried out under the Centre of Polar Ecology (Univ. South Bohemia). In summer 2014, geodetic and ground penetrating radar (GPR) survey was conducted on Ferdinandbreen (Fig. 2.2.5.). Surface elevation data obtained using dual-frequency differential GPS receiver will be used for calculation of glacier surface DEM. Glacier volume and subglacial topography will be derived from GPR data. Together with the last year GPR measurement on Bertilbreen, we are able to estimate ice thickness, areal and volumetric changes, which are important indicators of regional climate changes.

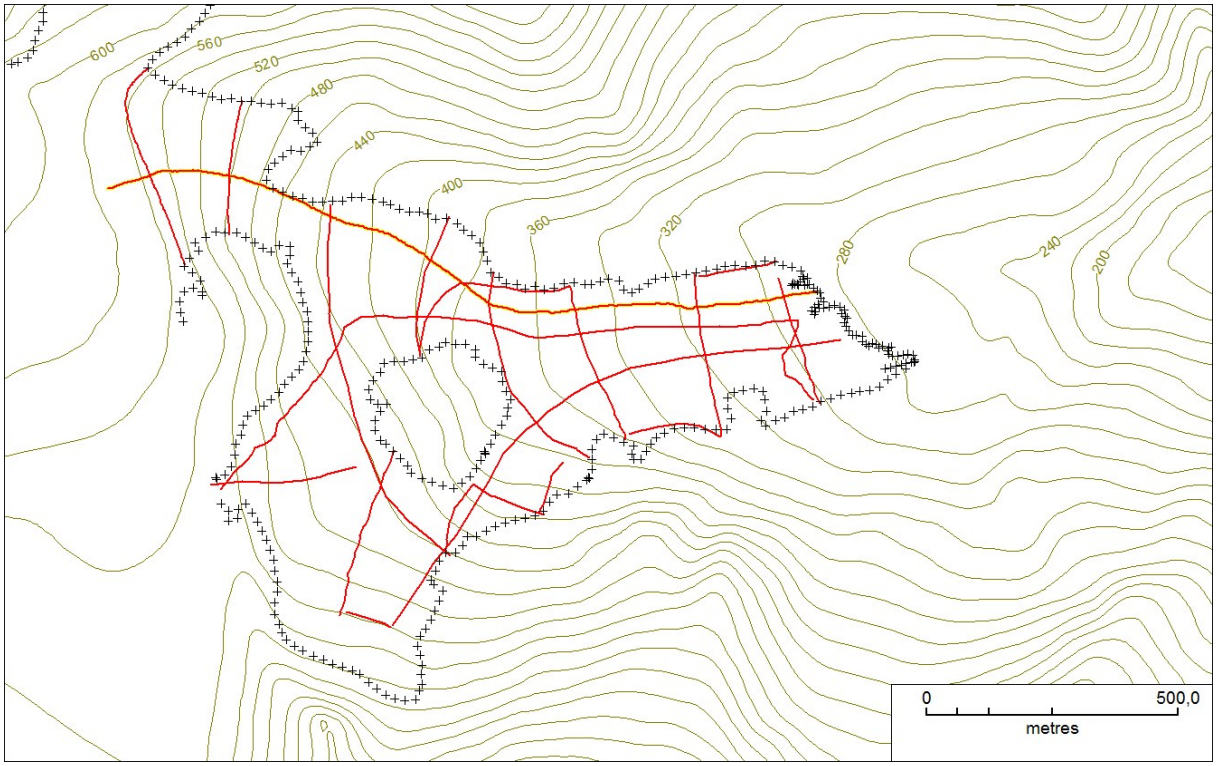

Fig. 2.2.5. Location of GPR transects (red lines) on Ferndinand Glacier. Cross symbols mark the boundary of the glacier during the survey conducted July 31, 2014.

The short-term study of spatiotemporal variation of surface temperatures has been undertaken in the coastal zone of Petuniabukta. We compare a set of thermal images provided by the infrared camera OPTRIS. The system was used to measure differences in surface temperatures on the selected coastal areas of Petuniabukta (Fig. 2.2.6.). We mainly focused on the sites with specific vegetation cover, occurrence of plant species, pattern grounds, etc. The results were evaluated for different categories of tundra vegetation, global radiation intensity and surface wetness.

Fig. 2.2.6. Measurements of surface temperature in the coastal area of Petuniabukta by the OPTRIS infrared camera system.