

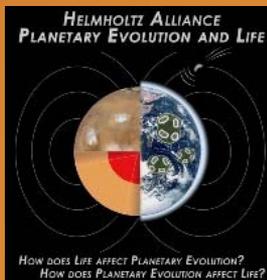
Field investigations of periglacial structures on Brøgger Peninsula (Svalbard) as analogues for Martian landforms

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Overall Topic

A variety of surface features on Mars (e.g. polygons, cracked mounds, lobate debris aprons, shallow depressions) has been interpreted as periglacial in origin (thermal contraction cracks, pingos, rock glaciers, and thermokarst depressions). If this interpretation is correct, these features reflect climate conditions in connection with permafrost dynamics. The study of their characteristics, distribution and spatial associations will therefore allow conclusions on the climate history of Mars. Dedicated studies of terrestrial analogues in periglacial landscapes are required. These field studies provide reference information to interpret the remote sensing data of Mars.

Field work in 2008 focussing on morphometric measurements of periglacial features as Mars analogues was carried out at and around the Hjortfjellet mountain massif (Adventfjorden, Spitsbergen), and Kurungnakh Island (Lena Delta, Siberia) and shall be continued in 2009 with a field campaign on Brøgger Peninsula and on Prins Karls Forland.

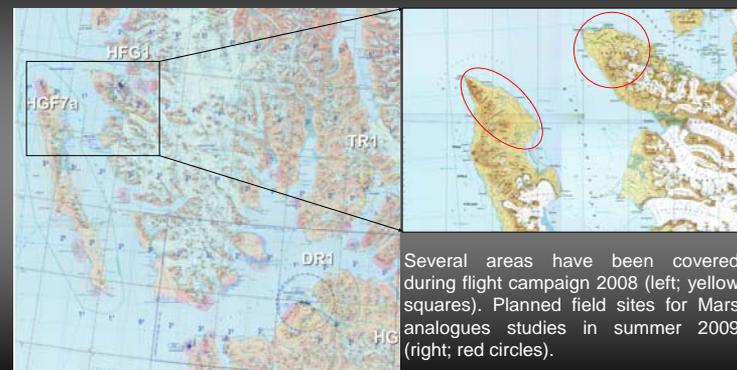


Spitsbergen field campaign in summer 2008. (a) Collapsed pingo in Adventdalen. (b) Retrogressive thaw slump near Advent City. (c) Morphometric measurements of channel with levees on alluvial fans in Hannaskogdalen.



Investigation of periglacial features in the Lena Delta in summer 2008. (a) Tachymetric measurement of a pingo on Kurungnakh Island. (b) Retrogressive thaw slump on a thermokarst depression slope. (c) Typical Ice Complex deposits in the Lena Delta.

Locations for field work in 2009 will be defined and optimized on the basis of geomorphological analyses of the 2008 aerial images.



Several areas have been covered during flight campaign 2008 (left; yellow squares). Planned field sites for Mars analogues studies in summer 2009 (right; red circles).

We will investigate ice-wedge polygons, sorting features (e.g., sorted circles, stripes), rock glaciers (protalus ramparts), and gelifluction materials.

The following work is planned within 3 weeks in July / August 2009:

- Survey and selection of representative periglacial structures sites
- GPS measurements as ground control points for airborne remote sensing data
- Morphometric measurements of periglacial structure sites using DGPS
- Insolation and albedo measurements using a photopyranometer
- Field spectrometry using an ASD FieldSpec Pro
- Geophysical measurements along transects using ground penetrating radar (GPR)

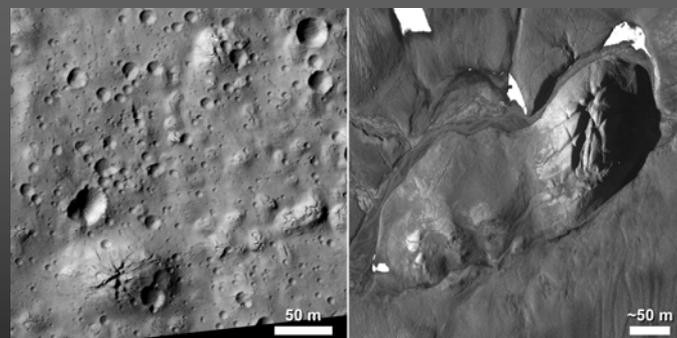
The German Aerospace Center's (DLR) Institute of Planetary Research acquires extremely high-resolution images and topographic information of periglacial landforms on Svalbard with an airborne version of the HRSC camera, which is the "sister" instrument to HRSC-AX currently orbiting Mars on board the ESA mission Mars Express.



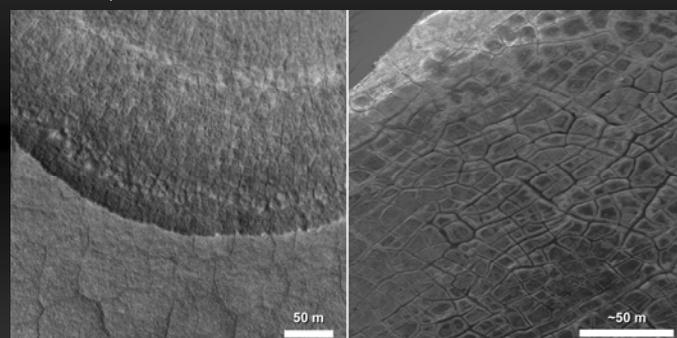
DLR aircraft on Longyearbyen airport (left) and Ny-Ålesund seen with the HRSC camera in July 2008 (right; geometrically uncorrected image).

Large parts of the Brøgger Peninsula were covered in the 2008 flight campaign. New acquisitions are planned for July 2009.

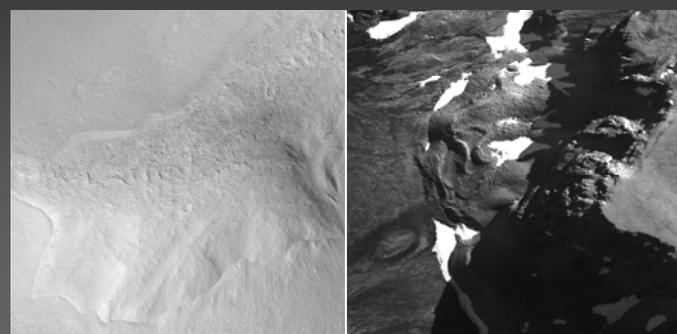
The Brøgger Peninsula exhibits a great inventory of periglacial landforms many of which are similar to Martian periglacial-like landforms. The first campaign in summer 2008 was highly successful and resulted in many spectacular images in high resolution (ground pixel sizes of 7 to 15 cm) which can directly be compared to Mars.



Mounds with cracked surface on Mars (left; HiRISE image) in comparison to pingo in Eskerdalen on Spitsbergen (right; geometrically uncorrected HRSC-AX image acquired in summer 2008).



Polygons on Mars (left; HiRISE image) in direct comparison to ice-wedge polygons in Adventalen (Spitsbergen) (right; geometrically uncorrected HRSC-AX image acquired in summer 2008).



Lobate debris apron as possible rock glacier on Mars (left; HiRISE image) in comparison to a real rock glacier on Brøgger Peninsula (Spitsbergen) (right; geometrically uncorrected HRSC-AX image acquired in summer 2008).