

Project acronym: GLADWRAG

Project title: Tracing Eskers Beneath Glaciers

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Discipline: Earth Sciences & Environment

Station(s): Czech Arctic Research Station of Josef Svoboda (Svalbard)

Glacial meltwater plays an important role in influencing ice dynamics (a key uncertainty in future sea-level rise predictions), but is poorly understood. Ancient eskers (long sinuous ridges of sand/gravel formed in glacial meltwater channels) can be used to reconstruct meltwater flow, but we do not know how far eskers extend beneath glaciers, and so how to interpret the past record.

This project will use Ground Penetrating Radar (GPR) to reveal the sedimentary architecture of an esker emerging from Hørbyebreen, a glacier in Svalbard close to the Czech Station in Petuniabukta. Hørbyebreen is an ideal test site since it has a well-developed esker system that is currently emerging from the glacier terminus. The esker (and associated channel) will then be traced beneath the ice using a novel combination of rugged terrain GPR antennas at different frequencies (50 MHz, 100 MHz, 160 MHz, 200 MHz and 450 MHz) to provide a range of penetration/resolution combinations to allow the first imaging of eskers and meltwater channels beneath ice.

The GPR data will be spatially constrained using a differential GPS. UAV acquired high resolution aerial imagery will provide an orthophoto of the glacier and esker, and Structure from Motion photogrammetry will be used to produce a high-resolution (~10 cm) Digital Elevation Model of the system. This remotely sensed data will be used to map relevant features of the glacier and esker system (such as crevasses, moulins, supraglacial streams, esker ridges) to constrain the behaviour of meltwater on, in and beneath the glacier.