



Project acronym: RADAR

Project title: Radar based Assessment of permafrost Degradation Across Remote landscapes

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Discipline: Earth Sciences & Environment: Other - Environment

Station(s): Abisko Scientific Research Station (Sweden)

Permafrost underlying many Arctic landscapes is thawing, causing subsidence and flooding of previously frozen land surfaces. This is a major concern as permafrost soils store $1,035 \pm 150$ Pg carbon which may be released if the ground thaws. Furthermore, flooding can dramatically increase emissions of methane, a powerful greenhouse gas. Given this level of threat to Arctic ecosystems there is a pressing need to quantify the scale of the problem as a means of justifying rapid action on climate change. However this is extremely difficult as permafrost occurs in remote and inaccessible areas.

A technological solution to this problem is interferometric synthetic aperture radar (InSAR), a low cost space borne technology that can map subsidence over space and time. These measurements have the capacity to quantify the extent of permafrost thaw and to assess how it is related to changes in the Arctic climate. The target of this project is to determine exactly what components of the surface (e.g. vegetation, ground layers) the radar signal interacts with and what surface properties impact the signal. For this we will carry out field vegetation and soil surveys and ground and air (UAV) InSAR, optical and thermal data collection for three sub-Arctic peatlands with permafrost in northern Sweden in July-Aug 2022. The data will complement satellite based InSAR mapping carried out in 2021. The project is highly interdisciplinary bringing together expertise in ground and satellite based InSAR, plant ecology, and permafrost dynamics.