Project acronym: MINPROT

Project title: Mineral protection of organic matter during permafrost thaw in a sub-Arctic peatland

Project leader: Casey Bryce, University of Bristol, UK

Discipline: Earth Sciences & Environment: Global change & Climate observation

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

We sought support to conduct field work at Stordalen mire, near the Abisko Scientific Research Station. We aimed to follow up previous observations that permafrost thaw is resulting in dissolution of soil minerals which previously protected carbon from degradation and release as greenhouse gases.

During the proposed 3-week campaign, we aimed to:

- Conduct high resolution mapping of porewater geochemistry of a region of the mire.
- Establish whether there is a statistically significant correlation between increases of iron and DOC on a large spatial scale.
- Identify the dominant iron phases at each thaw stage in terms of mobility, size, identity and redox state.
- Identify the microbial processes that act to mobilize iron and cycle carbon at different thaw stages.

During the time since the project was funded, feedback on our earlier work highlighted that an appreciation of iron and carbon dynamics during thaw required an even larger spatial scale than we could achieve just by looking at Stordalen mire. During this trip we therefore additionally evaluated these dynamics at 3 other collapsing palsa mires in the wider Tornetrask region: Storflaket, Mellanflaket and Narkervare. Preliminary results suggest that collapse of palsas in these regions also leads to high mobilisation of iron.

With the samples collected we are close to revealing 1) the relationship between mineral loss and carbon release during permafrost thaw, 2) the microbial processes that act to dissolve minerals and degrade organic matter at different thaw stages and, ultimately, 3) the impact of soil minerals in controlling carbon release during thaw.