



Figure 2. Aerial photo of the Orravatnsrústir palsa site (A) and examples of iron- and carbon-rich precipitates found in wetland streams in Iceland (B).

Do iron mineral drive of carbon release during permafrost thaw?

Context and objectives:

Permafrost soils are a major stock of soil organic carbon, storing an estimated 1300 Pg of carbon. However, this carbon stock is vulnerable to thaw; a process which releases large quantities of carbon in the form of greenhouse gases (CO_2 and CH_4). Recent research suggests that iron minerals and the iron biogeochemical cycle are principal drivers of carbon release in thawing permafrost soils. However, little is known about coupled iron and carbon dynamics in Icelandic permafrost landscapes, where high rates of aeolian deposition lead to uniquely mineral-rich peat soils and palsas. This project will investigate the role and importance of mineral-bound organic carbon in thawing permafrost soils from Orravatnsrústir; a palsa landscape in the Icelandic highlands, aiming to answer the question ‘To what extent does iron mineral dissolution and precipitation impact carbon release in thawing permafrost soils?’

Techniques / What to expect:

The project will be completed with soil, porewater and stream samples collected from the Orravatnsrústir palsa site. A broad range of field methods will be applied, including sampling of soil cores, soil porewater, and streamwater. Collected samples will be analyzed in the Environmental Chemistry laboratory at UNINE. Planned analyses include sequential extractions of soil samples targeting various iron mineral fractions and subsequent analyses of the amount of carbon found in each fraction.

Working place:

Environmental Chemistry Group, UNINE, Av. de Bellevaux 51, 2000 Neuchâtel.

Timeline:

Field work is planned for early August, processing of soil and porewater samples will be conducted at UNINE beginning in September. Ideally the student should start from the beginning of August.

Collaboration:

The project will be supervised by Prof. Laurel ThomasArrigo (laurel.thomas@unine.ch) and a Postdoc/PhD student in the Environmental Chemistry group (to be determined)

Literature:

Patzner, M. S.; Mueller, C. W.; Malusova, M.; Baur, M.; Nikeleit, V.; Scholten, T.; Hoeschen, C.; Byrne, J. M.; Borch, T.; Kappler, A.; Bryce, C. (2020) *Nature Commun.*, 11(1).