Project title: Quantifying nutrient availability in a warming Arctic
Ref: OP2405

Keywords: Tundra; biogeochemical cycling; plant-soil interactions; Arctic greening

One Planet Research Theme:
Climate & Climate Change ☒ | Earth System Processes ☒ | Anthropocene ☐ | Environmental Informatics ☐

Lead Supervisor:
Nick Cutler, Newcastle University

Key Research Gaps and Questions:

How will future climate change influence the fine-scale properties of tundra soils?

How does fine-scale environmental variation affect the availability of soil nutrients in tundra regions?

Can field-scale measurements be robustly extrapolated to a landscape-scale to predict future changes in tundra ecology in response to climate warming?

Project Description:
Tundra ecosystems cover ~20% of Earth's surface; they play a central role in the terrestrial carbon cycle and have a major influence on global albedo. Over the last few decades, increases in temperature and precipitation in tundra regions have led to rapid environmental changes on the ground. Identifying variation and long-term changes in nutrient availability is likely to be of key importance in quantifying the impact of future climate change on tundra ecosystems, because it determines soil fertility, soil processes (notably the release of stored carbon) and plant/soil microbial community composition. Unfortunately, the spatial patchiness of tundra habitats - in terms of topography and vegetation cover - makes it difficult to establish the factors that drive variability in nutrient availability, hampering efforts to model future changes. Our project will address these knowledge gaps by 1) quantifying how nutrient availability and soil conditions vary in a tundra landscape using field measurements; 2) using high-resolution remote sensing data to up-scale these measurements to whole landscapes. The project will include two field seasons in the Scandinavian Arctic, collaborating with Finnish researchers. Training will be provided in experimental design and statistical analysis; field measurement of nutrient availability; plant community and soil analysis and acquisition and analysis of remote sensing data by drones.

Prerequisites:

A background in ecology, physical geography or soil science +experience of soil/vegetation sampling in the field is desirable. Experience in spatial analysis and/or analysis of remotely sensed data sets will be advantageous. For more information, please contact nick.cutler@newcastle.ac.uk