Project acronym: CH4Cool

# Project title: End members of CH4 oxidation in cold mountain soils

Project leader: Jesper Riis Christiansen, University of Copenhagen, Denmark

Discipline: Earth Sciences & Environment

Station(s): Kluane Lake Research Station (Canada)

The main objective of CH4Cool is to quantify the spatial variability and magnitude of oxidation of atmospheric CH4 in cold mountain soils with differing degree of permafrost. Oxidation of CH4 in these cold, dry soils in the Arctic region can counteract CH4 emissions from wetlands. Recent studies have shown significant rates of net uptake of atmospheric CH4 in these systems due to oxidation within the soil indicating a potential important role for the Arctic CH4 budget. However, considerable uncertainty of the magnitude of the net CH4 sink in these cold, dry systems hinges on a poor understanding of the spatial extent of this process in different climate and permafrost conditions.

We hypothesize (H1) that the depth to permafrost limits the extent of CH4 oxidation in the soil with lower net uptake in soils with more shallow active layers, (H2) that relatively warmer, drier soils have highest net uptake of atmospheric CH4 and (H3) geological parent material promoting development of coarse textured soils have relatively higher net CH4 uptake.

We will perform spatial screening of the flux magnitude in the peak summer season for maximum flux estimates. This will be performed along elevation transects on north and south facing slopes in the Kluane Lake area to obtain comparative data for a wide range climatic and permafrost conditions. With a mobile setup for CH4 and CO2 measurements we will quantify the net exchange of CH4 using the chamber methodology with concurrent in situ measurements of air/soil temperature and moisture. Soil samples will be collected at measurement sites for laboratory incubation studies and subsequent analysis of bulk density, soil pH, total carbon and nitrogen.