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Effects of experimental summer warming and altitude on soil methane oxidation in an arctic tundra ecosystem

Lena Hermesdorf, Ludovica D'Imperio, and Bo Elberling

Center for Permafrost (CENPERM), Department of Geosciences and Natural Resource Management, Copenhagen University, Copenhagen, Denmark

Well-drained soils in the ice-free part of the Artic have been shown to be a net sink for methane (CH_4) by microbial oxidation. Variations in oxidation rates are linked to soil and landscape types and the magnitude of contribution of arctic landscapes to the global methane budget and their response to climate change as well as the controlling factors of CH_4 oxidation remain uncertain.
Here, we conducted *in situ* CH_4 flux measurements between June and September 2017 at two dry heath sites with 200 m altitude difference in an arctic tundra landscape at Disko Island (West Greenland), including control plots with ambient conditions and plots with enhanced summer air temperature by open top chambers (OTCs). Our results show that both sites were net CH_4 sinks throughout the growing season. At ambient conditions, the high site (HS) consumed 0.05 $\pm$ 0.01 g CH_4-C m^{-2}, while the low site (LS) consumed 0.10 $\pm$ 0.04 g CH_4-C m^{-2}. The warming treatment had a significant effect on the seasonal CH_4 uptake rates at the HS. Compered to ambient conditions it increased at the HS (0.10 $\pm$ 0.02 g CH_4-C m^{-2}). Soil moisture correlated negatively ($p < 0.001$) with CH_4 fluxes, suggesting it to be a strong controlling factor for CH_4 oxidation. However, the site-specific characteristics e.g. hydrology, soil characteristics, plant cover and altitude highlight the importance of careful upscaling when measurements on plot scale are used to project landscape- or regional-integrated methane budgets.