



**Project acronym:** Arc-N2O

**Project title:** Pan-arctic N2O flux screening network

**Project leader:** Maija Marushchak, University of Eastern Finland, Finland

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

**Station(s):** Arctic Station (Greenland/Denmark), Czech Arctic Research Station (Svalbard/Czech Republic), Tarfala Research Station (Sweden), Finse Alpine Research Centre (Norway), CNR Arctic Station “Dirigibile Italia” (Svalbard/Italy), Toolik Field Station (USA)

Traditionally it has been thought that N<sub>2</sub>O emissions are negligible from the Arctic, but recent evidence is pointing towards great potential of permafrost soils for N<sub>2</sub>O release under present and future climate. However, information on sources and sinks of N<sub>2</sub>O from the Arctic remains extremely sparse and measurements have been published from only a handful of sites.

Without increased observational coverage any discussion on Arctic N<sub>2</sub>O fluxes, their importance compared to Arctic CH<sub>4</sub> and CO<sub>2</sub> emissions, and their potential climate change feedback remains elusive.

Here we propose to coordinate, for the first time, a large-scale field survey of N<sub>2</sub>O emissions across the Arctic. Using the data collected under this remote access, and follow-up projects, we aim at answering the following questions:

- 1) What is the spatial variability of N<sub>2</sub>O emissions across the northern permafrost region, and which landforms are the most important sinks and sources of this gas?
- 2) What are the main environmental drivers controlling N<sub>2</sub>O emissions across the pan-arctic?
- 3) What is the present circumpolar N<sub>2</sub>O budget?

As the first step towards these goals, data will be collected during the peak summer season at a wide range of sites representing different geographical regions, climatic conditions and land-forms. In addition to the seven RA sites included in this proposal in Scandinavia, Greenland, Svalbard and Russia, data will be collected from Finnish permafrost sites.

We will use simple, harmonized methods, easily applicable at all kinds of sites by anyone. This

includes static chamber measurement and soil gas sampling for determination of N<sub>2</sub>O fluxes and concentrations; surface soil sampling; temperature and moisture measurements; and vegetation description with photographs of the sites. The sampling protocols and all the necessary equipment will be provided by UEF, and the gas samples and small-sized soil samples (when possible) will be shipped to UEF, Kuopio, for further analysis.

The data gained during this remote access, together with already existing N<sub>2</sub>O data, will be collected to a new pan-arctic N<sub>2</sub>O database that will be opened for further use by, e.g., process modelers.