NERC-funded Research Experience Placement (REPs) Summer 2025

Project title

In search of ice nucleating particles in Arctic snow and sea ice

Lead supervisor

Markus Frey

Project description

The Arctic is warming four-times more than the rest of the globe. However, the drivers of this so-called Arctic Amplification are still poorly understood. Ice nucleating particles (INP) may play an important role as they determine cloud optical properties and lifetime and therefore have a strong impact on surface warming or cooling, which is also referred to as the indirect radiative effect. Yet few INP observations exist, in particular in the Central Arctic, and INP source contributions from snow, sea ice, open ocean or more distant land masses are highly uncertain. Better knowledge of INP sources, abundance and nucleation (activation) temperature is however paramount in order to assess the INP impact on clouds and climate in a rapidly changing Arctic with warming temperatures and declining sea ice.

In this project you will measure INP concentration and activation temperature in samples collected during the MOSAiC 2019-20 drift, the to date largest scientific expedition to the Central Arctic. The focus will be on the potential role of surface snow and open leads as a source of atmospheric INPs using a case study during March 2020, when a lead opened in the pack ice for about 24 hours. Available aerosol filters and surface snow samples will be analysed with an existing INP freeze assay method in our laboratory at the British Antarctic Survey. You will interpret the results within the context of the observed meteorology, air mass origin as well as snow and sea ice conditions. All observations are readily available through the MOSAiC database.

By the end of the project you will have learned a physical laboratory method of measuring INPs in Arctic samples under ultra-clean conditions, related data processing and analysis as well as interpretation of your results supported by a range of available polar observations.

Project restrictions

Ideally the student spends a good portion of the time at BAS for the lab component of the project and to also have the full experience of working at BAS.

Working arrangements

The project has a practical laboratory focus, therefore some time should be spent at BAS in Cambridge. There are possibilities to put more emphasis on the statistical analysis of existing measurements from MOSAiC and their interpretation, which can be done remotely. You will be based at BAS and fully integrated in the TROPCHEM research group I lead, and participate in group meetings, paper discussions and seminars (hybrid option).