

# POLAR MOSES - Developing cross-compartment strategies investigating the dynamic behaviour of greenhouse gas emissions and influencing factors in Arctic environments

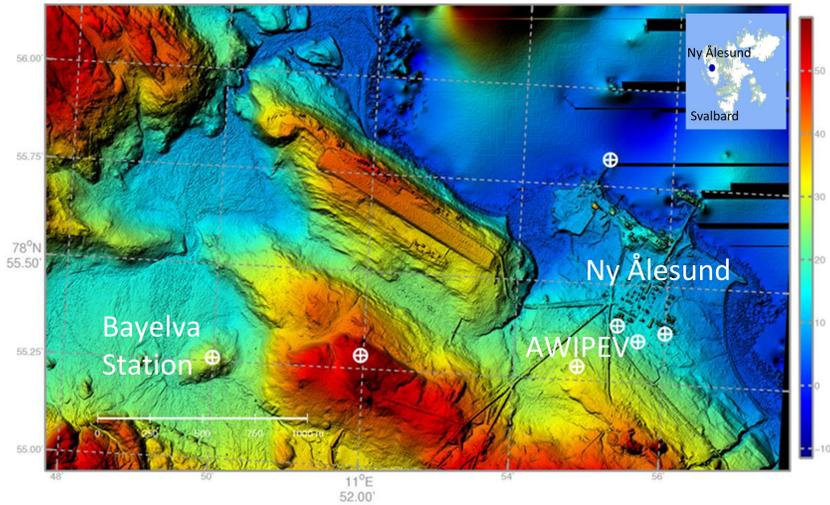


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2 AWI, Helmholtz Centre for Polar and Marine Research

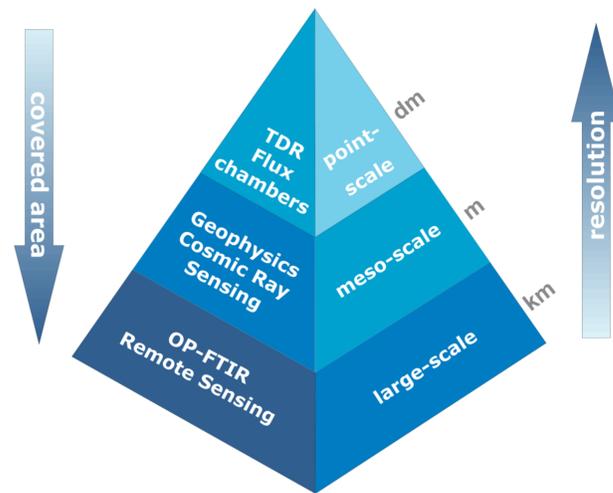
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## Research questions

- What are the contributions of each compartment to the landscape-level GHG fluxes?
- Do the GHG fluxes of the different compartments show similar responses to varying meteorological and near-surface conditions?
- What are the main controlling factors for landscape-level GHG fluxes?



## Approach



### Hierarchical approach:

cover large spatial areas with an efficient monitoring system recording data in adequate spatial and temporal resolutions



### Cross-compartment approach:

observe atmospheric, terrestrial and aquatic systems including the compartmental interactions

## Methods

Deployment of a set of harmonised and multi-disciplinary methods at different scales for a comprehensive understanding of:

- (1) characteristics of emission processes
- (2) related cross-compartment impacts

**Atmosphere**  
Open-Path Fouriertransform Infrared spectroscopy (OP-FTIR)  
Ambient atmosphere greenhouse gas concentration mapping  
Meteorological variables

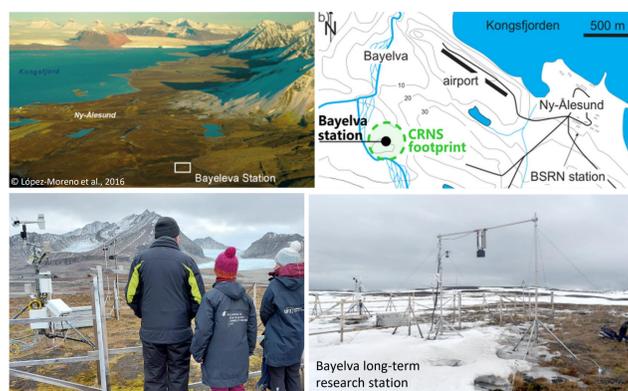
**Land surface**  
Soil moisture / temperature mapping using TDR probes  
Soil moisture and snow water monitoring with Cosmic Ray Neutron sensing (CRNS)  
Greenhouse gas flux mapping with mobile flux chambers

**Subsurface / active layer**  
Geophysical sensing with Electromagnetic Induction (EMI) and geoelectrics  
Direct push methods

**Marine hydrosphere**  
Water temperature sensing

## Field campaign Ny Ålesund 2023

- Preparation started in September 2022
- Field work in July-August
- Two teams
- Focus on
  - Atmospheric gas composition measured with OP-FTIR across the terrestrial and marine environment
  - Geophysical characterization of the active layer at Bayelva station
  - Installation of the northernmost long-term CRNS station for soil moisture / snow water content monitoring



## • What we offer:

- **Hydrological and atmospheric research in an exceptional area strongly affected by climate change**
- Interdisciplinary research network
- Access to long-term data base (climate, hydrology, ...)
- Experiences in campaign organization
- Long-term data product of hectare-scale average water content for application
- Cosmic-radiation spectrometry at low geomagnetic rigidity for fundamental research

## • What we need:

- Support to solve the addressed research questions
- Support from modelers, e.g. catchment runoff hydrology models, glacier development models
- Support in terms of remote sensing data products for snow cover, soil moisture, vegetation cover, ...

## • Collaboration partners:

- Linked to PoF Topic 1, 2, 3, 6
- MOSES Permafrost working group
- Helmholtz: AWI, HMGU
- DFG RG Cosmic Sense
- University of Innsbruck
- RIs: eLTER, Svalbard Integrated Arctic Earth Observing System SIOS

## • Stakeholder involvement:

- In progress ...

## • Important Links:

- <https://sios-svalbard.org/>
- <https://www.awi.de/en/expedition/stations/awi-pev-research-base.html>
- <https://www.awi.de/en/science/geosciences/permafrost-research/permafrost-long-term-observatories/ito-bayelva.html>