

The Atmosphere Sea-Ice Biogeochemistry In the Arctic (ASIBIA) facility: A coupled ocean-sea-ice-atmospheric chamber

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Bringing the Polar Oceans to the Laboratory

The ASIBIA facility was the brainchild of the late Prof. Roland von Glasow and is being continued to be developed with the aim of creating a world class robust and versatile facility. The facility is a highly instrumented chamber which couples ocean and atmosphere, capable of growing first-year sea-ice up to thicknesses of ~25cm. The focus of the measurements is to collect real-time data which can be viewed and analysed mid-experiment, allowing a more dynamic and adaptable approach to experiments. The “ocean” is equipped with up to three salinity and temperature probes, user controlled circulation and a gas equilibration system. Ocean heat flux is controlled through heating pads at the base of the chamber. The sea-ice is monitored with a range of high (1cm depth interval) resolution instruments gathering continuous information on sea-ice temperature, resistivity and pressure. Fibre optic probes can be deployed to monitor the light field within the ice for UV-Vis wavelengths. Above the ice, the atmosphere is contained in a PTFE-FEP enclosure with sampling ports allowing measurement of gases such as CO₂, CH₄, O₃ and NO_x along with spectral radiation and temperature. Above the atmosphere is a UVB-UVA-Visible lighting rig.

The data to be presented here will be the first data on gas flux experiments to come out of the ASIBIA facility along with much of the proof of concept work on the sea-ice growth and physical properties that has been ongoing. Methane will be injected into the water column prior to freezing and also below sea-ice which has formed at varying temperature and of varying thicknesses. We hope this will allow a more detailed understanding of the role of a sea-ice cap under varying sea-ice conditions in facilitating / retarding the flux of methane from the ocean to the atmosphere in polar regions.