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The ASIBIA sea-ice facility: First results from the Atmosphere-Sea-Ice-Biogeochemistry in the Arctic chamber

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Working in the natural ocean-ice-atmosphere system is very difficult, as conducting fieldwork on sea-ice presents many challenges ice including costs, safety, experimental controls and access. The new ASIBIA (Atmosphere-Sea-Ice-Biogeochemistry in the Arctic) coupled Ocean-Sea-Ice-(Snow)-Atmosphere chamber facility at the University of East Anglia, UK, we are aiming to perform controlled first-year sea-ice investigations in areas such as sea-ice physics, physicochemical and biogeochemical processes in sea-ice and quantification of the bi-directional flux of gases in various states of first-year sea-ice conditions.

The facility is a medium sized chamber with programmable temperatures from -55°C to +30°C, allowing a full range of first year sea-ice growing conditions in both the Arctic and Antarctic to be simulated. The water depth can be up to 1 m (including up to 25 cm of sea-ice) and an optional 1 m tall Teflon film atmosphere on top of the sea-ice, thus creating a closed and coupled ocean-sea-ice-atmosphere mesocosm. Ice growth in the tank is well suited for studying first-year sea-ice physical properties, with in-situ ice-profile measurements of temperature, salinity, conductivity, pressure and spectral light transmission. Underwater and above ice cameras are installed to record the physical development of the sea-ice.

Here, we present the data from the first suites of experiments in the ASIBIA chamber focussing on sea-ice physics and give a brief description of the capabilities of the facility going forward. The ASIBIA chamber was funded as part of an ERC consolidator grant to the late Prof. Roland von Glasow and we hope this work and further development of the facility will act as a lasting legacy.