



A distributed atmosphere-sea ice-ocean observatory in the central Arctic Ocean: concept and first results

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To understand the current evolution of the Arctic Ocean towards a less extensive, thinner and younger sea ice cover is one of the biggest challenges in climate research. Especially the lack of simultaneous in-situ observations of sea ice, ocean and atmospheric properties leads to significant knowledge gaps in their complex interactions, and how the associated processes impact the polar marine ecosystem.

Here we present a concept for the implementation of a long-term strategy to monitor the most essential climate- and ecosystem parameters in the central Arctic Ocean, year round and synchronously. The basis of this strategy is the development and enhancement of a number of innovative autonomous observational platforms, such as rugged weather stations, ice mass balance buoys, ice-tethered bio-optical buoys and upper ocean profilers. The deployment of those complementing platforms in a distributed network enables the simultaneous collection of physical and biogeochemical in-situ data on basin scales and year round, including the largely undersampled winter periods. A key advantage over other observatory systems is that the data is sent via satellite in near-real time, contributing to numerical weather predictions through the Global Telecommunication System (GTS) and to the International Arctic Buoy Programme (IABP).

The first instruments were installed on ice floes in the Eurasian Basin in spring 2015 and 2016, yielding exceptional records of essential climate- and ecosystem-relevant parameters in one of the most inaccessible regions of this planet. Over the next 4 years, and including the observational periods of the Year of Polar Prediction (YOPP, 2017-2019) and the Multidisciplinary drifting Observatory for the Study of the Arctic Climate (MOSAIC, 2020), the distributed observatory will be maintained by deployment of additional instruments in the central Arctic each year, benefitting from international logistical efforts.