Geophysical Research Abstracts
Vol. 18, EGU2016-8298, 2016
EGU General Assembly 2016
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Ice-tethered measurement platforms in the Arctic Ocean: a contribution by the FRAM infrastructure program

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The Arctic Ocean has been in the focus of many studies during recent years, investigating the state, the causes and the implications of the observed rapid transition towards a thinner and younger sea-ice cover. However, consistent observational datasets of sea ice, ocean and atmosphere are still sparse due to the limited accessibility and harsh environmental conditions. One important tool to fill this gap has become more and more feasible during recent years: autonomous, ice-tethered measurement platforms (buoys). These drifting instruments independently transmit their data via satellites, and enable observations over larger areas and over longer time periods than manned expeditions, even throughout the winter.

One aim of the newly established FRAM (FRontiers in Arctic marine Monitoring) infrastructure program at the Alfred-Wegener-Institute is to realize and maintain an interdisciplinary network of buoys in the Arctic Ocean, contributing to an integrated, Arctic-wide observatory. The additional buoy infrastructure, ship-time, and developments provided by FRAM are critical elements in the ongoing international effort to fill the large data gaps in a rapidly changing Arctic Ocean. Our focus is the particularly underrepresented Eurasian Basin. Types of instruments range from snow depth beacons and ice mass balance buoys for monitoring ice growth and snow accumulation, over radiation and weather stations for energy budget estimates, to ice-tethered profiling systems for upper ocean monitoring. Further, development of new bio-optical and biogeochemical buoys is expected to enhance our understanding of bio-physical processes associated with Arctic sea ice.

The first set of FRAM buoys was deployed in September 2015 from RV Polarstern. All datasets are publicly available on dedicated web portals. Near real time data are reported into international initiatives, such as the Global Telecommunication System (GTS) and the International Arctic Buoy Programme (IABP).

The additional data acquired by FRAM buoys facilitate the validation of model results and remote sensing products, play an important role in understanding the linkages between the atmosphere, sea ice and upper ocean, and help assess the physical, biological and biogeochemical states of the future Arctic Ocean. Here we present our recent work and future plans, but are also aiming for additional collaborations, especially on technical developments, scientific questions and deployment logistics.