Geophysical Research Abstracts
Vol. 16, EGU2014-10849, 2014
EGU General Assembly 2014

Observing the Arctic Ocean under melting ice – the UNDER-ICE project

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The sea ice cover of the Arctic Ocean is gradually diminishing in area and thickness. The variability of the ice cover is determined by heat exchange with both the atmosphere and the ocean. A cold water layer with a strong salinity gradient insulates the sea ice from below, preventing direct contact with the underlying warm Atlantic water. Changes in water column stratification might therefore lead to faster erosion of the ice. As the ice recedes, larger areas of surface water are open to wind mixing; the effect this might have on the water column structure is not yet clear.

The heat content in the Arctic strongly depends on heat transport from other oceans. The Fram Strait is a crucial pathway for the exchange between the Arctic and the Atlantic Ocean. Two processes of importance for the Arctic heat and freshwater budget and the Atlantic meridional overturning circulation take place here: poleward heat transport by the West Spitzbergen Current and freshwater export by the East Greenland Current.

A new project, Arctic Ocean under Melting Ice (UNDER-ICE), aims to improve our understanding of the ocean circulation, water mass distribution, fluxes, and mixing processes, sea ice processes, and net community primary production in ice-covered areas and the marginal ice zone in the Fram Strait and northward towards the Gakkel Ridge. The interdisciplinary project brings together ocean acoustics, physical oceanography, marine biology, and sea ice research. A new programme of observations, integrated with satellite data and state-of-the-art numerical models, will be started in order to improve the estimates of heat, mass, and freshwater transport between the North Atlantic and the Arctic Ocean. On this poster we present the UNDER-ICE project, funded by the Research Council of Norway and GDF Suez E&P Norge AS for the years 2014-2017, and place it in context of the legacy of earlier projects in the area, such as ACOBAR.

A mooring array for acoustic tomography combined with "standard" oceanographic measurements of current velocity and water mass properties will be deployed in the Fram Strait in September 2014. The dynamic processes in the marginal ice zone, in particular internal waves, mesoscale eddies, and front instabilities, will be explored using model experiments and high temporal resolution measurements. The results of the observational data analysis and model simulations will be integrated and compared with global climate model simulations (CMIP5). Satellite-derived data products will also be included in the synthesis. As part of the UNDER-ICE project, a web portal for Arctic data will be developed, that will offer open access to metadata and observational and model data products to support studies of Arctic climate and climate change.