Geophysical Research Abstracts
Vol. 17, EGU2015-10720, 2015
EGU General Assembly 2015

Pathways of Atlantic Waters into the Arctic Ocean: Eddy-permitting ocean and sea ice simulations

Claudia Wekerle, Wilken-Jon von Appen, Sergey Danilov, Thomas Jung, Torsten Kanzow, Ursula Schauer, Ralph Timmermann, and Qiang Wang

Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Climate Dynamics, Bremerhaven, Germany (claudia.wekerle@awi.de)

Fram Strait is the only deep gateway connecting the central Arctic with the North Atlantic. Boundary currents on each side are responsible for the exchange of water masses between the Arctic and North Atlantic. The East Greenland Current (EGC) carries fresh and cold Arctic waters and sea ice southward, whereas the West Spitsbergen Current (WSC) carries warm Atlantic Waters (AW) into the Arctic Ocean. The complex topography in Fram Strait leads to a branching of the northward flowing WSC, with one branch recirculating between 78°N and 81°N which then joins the EGC. To date, the dynamics as well as the precise location of this recirculation are unclear.

The goal of this research project is to quantify the amount and variability of AW which recirculates immediately in Fram Strait, and to investigate the role of atmospheric forcing and oceanic meso-scale eddies for the recirculation. We use simulations carried out with a global configuration of the Finite Element Sea ice-Ocean Model (FESOM) at eddy-permitting scales. The advantage of this model is the finite element discretization of the governing equations, which allows us to locally refine the mesh in areas of interest and keep it coarse in other parts of the global oceans without the need for traditional nesting.

Here we will show the first results of the model validation. The model has $\sim$9 km resolution in the Nordic Seas and Fram Strait and 1 deg south of 50°N. We assess the model capabilities in simulating the ocean circulation in the Nordic Seas and Fram Strait by comparing with the available observational data, e.g. with data from the Fram Strait oceanographic mooring array. The ocean volume and heat transport from the Atlantic Ocean into the Nordic Seas and at the Fram Strait are analyzed. Our results show that the model can capture some of the observed key ocean properties in our region of interest, while some tuning is required to further improve the model. In the next phase of this project we will focus on understanding the dynamics of the ocean circulation by carrying out different sensitivity experiments.