

EGU22-6164

<https://doi.org/10.5194/egusphere-egu22-6164>

EGU General Assembly 2022

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Submesoscale dynamics in the central Arctic Ocean during MOSAiC: optimising the use of observations and high-resolution modelling.

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Submesoscale features with profound impact on ocean dynamics and climate-relevant fluxes are frequently observed in the upper ocean including Arctic region. Yet, modelling these features remains a challenge due to the difficulties in the parameterization of submesoscale processes and high resolution required, in particular, in the polar regions. The most effective way to study such phenomena is joint modelling and observational work. Several autonomous observation platforms have been deployed as part of Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAIC) experiment within an approximately 50 km radius around the central observatory. Data from these buoys in combination with data from the central observatory provide a unique opportunity to reconstruct 3D water properties and velocity by constraining a numerical model that resolves the dynamics of the (sub-)mesoscale. It turns out that a minimum root mean square error between results of an optimal interpolation and observations indicates a characteristic length scale of about 7.5 km, corresponding approximately the first-mode baroclinic Rossby radius in the area of investigation. However, results of the interpolation are questionable at the sub-mesoscale due to the distribution of the buoy observations in time and horizontal space. In order to describe the in-situ data to achieve a better characterization and understanding of (sub-)mesoscale dynamics we developed and applied a modification of the 3D regional model FESOM-C. The observed temperature and salinity were used to nudge the model to obtain an optimized solution at the resolution of the models. A series of simulations with different horizontal resolutions and model parameters make it possible to analyze the ability of models of this type to reproduce the observed dynamics, to estimate eddy kinetic energy and power spectra, and to compare findings with the observations used to nudge the model. We will show the eddy-induced fluxes and characteristics of eddies along the track of the beginning winter MOSAiC drift.