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Modeling of the upper ocean winter (sub)mesoscale variability in the central Arctic Ocean during the MOSAiC drift.

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The dynamics of the boundary layer of the ocean significantly affect the interaction between ocean and atmosphere and, as a result, global climate. The sub-ice boundary layer of the ocean and its dynamics have not been thoroughly studied because of the extremely difficult conditions for observation, in particular during winter. Current understanding of spatial-temporal variability of (sub)mesoscales of the upper Arctic Ocean is extremely limited.
At the same time, one of the most important features of the upper ocean layers are the small-scale processes that influence and possibly determine the vertical and horizontal transport of heat, salt, and biologically relevant substances. As a consequence, mathematical models, in particular climate models, experience serious difficulties in parameterization of processes not resolved by the models because of the lack sufficient knowledge to detail the spatial variability at the (sub-)mesoscale.
To a better characterization and understanding of (sub)mesoscale dynamics and its role in vertical transport of energy and mass we apply a 3D regional ocean model FESOM-C. The observed vertical hydrological structure and a corresponding reconstructed horizontal temperature and salinity fields were imposed as a part of the forcing for the numerical model. These fields and information about the vertical hydrological structure were utilized by the model as initial conditions and for constraining (nudging) during the spin-up period. After the initial spin-up period, once the model had adjusted to our initial conditions, we performed several free runs.
We expect that our 3D numerical studies of eddy properties will contribute to a better characterisation and understanding of (sub)mesoscale dynamics in the Arctic Ocean and its role in the vertical transport of energy and mass.