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A Numerical Study of Deep and Intermediate Water Formation in Arctic Ocean

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There are a few problems to be solved in case of numerical simulation of deep water formation. The first one is that regions of dense water formations are distant from deep ocean. Most of them are located on the shelf and in marginal seas. Second is that characteristic length scale of corresponding motion is small (about 5 km) to be resolved in OGCM (Ocean Global Circulation Model). Besides, there is some evidence that diurnal atmospheric variations are also important.
In this presentation it will be examined several ways to incorporate the processes of dense water formation, its transport and sloping down the shelf break. The cross-isobath motion along the sloping bottom of density anomaly forced by the gravity could be parameterized by means of increased lateral diffusion flux or by increasing bottom Ekman transport (setting an appropriate value to the bottom drag coefficient). It was found that most effective way was the application of displacement method. The idea of the method is that the dense water anomalies propagate along the routes which could be found from fine resolution bathymetry analysis and while dense core moves down the route, it subducts the lighter ambient water and displaces it upward. A set of numerical tests was conducted using regional model of Barents and Kara Seas shelf and global scale coupled sea-ice model.