Geophysical Research Abstracts, Vol. 9, 07776, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-07776

Application of 3D Lagrangian multi-size sediment transport model to the simulation of dense water cascading due to winter shelf convection and turbidity

I. Brovchenko, V. Koshebutskyy, V. Maderich, K. Terletska
Institute of Mathematical Machine and System Problems, e-mail: vladmad@gmail.com

This investigation was motivated by interest to the role of fine sediment in the triggering and amplification of cascading in the Barents Sea. A coupled system of 3D free surface hydrostatic/nonhydrostatic POM model and 3D Lagrangian multi-size sediment transport model was applied to simulate dense and sediment laden gravity current due to winter shelf convection and turbidity. Lagrangian model simulates transport of mixture of fractions of different size of cohesive and non-cohesive sediments. Following approach by van Ledden (2003) we assume that erosion of mixtures of cohesive ("mud") and non-cohesive sediments ("sand") is non-cohesive if clay content is below critical. Above critical clay content the bed behaves cohesively. In the non-cohesive regime exchange of sand and mud with bottom is independent, whereas in cohesive regime an erosion of mud and sand occurs simultaneously as cohesive sediment. The deposition is independent process for cohesive and non-cohesive sediments. The stochastic differential equations describing transport processes in a Lagrangian framework were solved in Random Displacement Model (RDM) approximation. A number of runs for idealised shelf were done including pure TS cascading and sediment transport without coupling and TS cascading coupled with sediment transport. It was found that turbidity current can be triggered by density plume and in turn amplify downslope current in the conditions of the Novaya Zemlya shelf. The detailed data on sediments on the shelf and slope are necessary to verify possibility of such mechanism in the Eastern Barents Sea.

This work was performed within INTAS Project No. 03-51-4620.