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Assessing different turbulence close schemes in the North Aegean: Preliminary results

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The North Aegean Sea potentially constitutes one of the deep-water formation sites of the Mediterranean Sea. The production of deep water however is highly controlled by the inflow of Black Sea waters forming a thin insulating surface layer over a large part of the region. For this reason, extensive replenishment of the deeper-than-400 m basins takes place infrequently, at intervals several years long. After the recorded major deep water formation events of 1987, 1992 and 1993, several smaller magnitude formation events have been observed in the 2000s. Long stagnation periods separate successive formation events, during which turbulent exchange through the interface between the deep, secluded locally-formed water mass and the overlaid, laterally flowing water masses is the major factor determining the evolution of the deep-layer properties. In this work we test different diapycnal mixing schemes via comparing the results of long-term hindcasts of the evolution of the deep-layer properties to successive observations in three deep basins of the North Aegean.

The Regional Ocean Model System (ROMS) was used for the hindcasts. All the available turbulence closure schemes - KPP, GLS and Mellor - Yamada 2.5 - were used for the experiments. A rectangular grid covering the Aegean sea was developed (longitudinal range: 22.50 E - 28.37 E, latitudinal range: 36.43 N - 41.12 N) with a 1/40 degree ($\sim$ 2.5 km) resolution in both directions and 30 vertical sigma layers. The initial and boundary conditions used refer to the 1985 - 2013 period, and have been provided by GNOO. Atmospheric forcing fields from ERA - interim data set were used with spatial resolution 0.5×0.5 degrees and three-hour time step. The Black-sea water inflow is temporally variable and has been provided by Vladimir Maderich based on Black and Marmara Sea budgets and hydraulic control at Bosphorus and Dardanelles Straits. The preliminary results of the numerical experiments are hereby presented and discussed. We also assess the ability of ROMS to simulate mixing during the stagnation periods, as well as discuss the rising new requirements for the observational strategy of such processes.

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