Geophysical Research Abstracts
Vol. 15, EGU2013-14065, 2013
EGU General Assembly 2013

On the relevance of non-hydrostatic modeling in the Gibraltar Strait region

Gianmaria Sannino (1), Jose Carlos Sanchez-Garrido (2), Luca Liberti (3), Larry Pratt (4), Debora Bellafiore (5), and Sandro Carniel (5)

(1) Climate and Impact Modeling Lab - Energy and Environment Modeling Unit - ENEA, Rome, Italy (gianmaria.sannino@enea.it), (2) Grupo de Oceanografa Fisica. Dpto. Fsica Aplicada II, University of Malaga, Malaga, Spain, (3) Istituto Superiore per la Protezione e la Ricerca Ambientale, Rome, Italy, (4) Woods Hole Oceanographic Institution, Woods Hole, MA, USA, (5) CNR-ISMAR, National Research Council, Institute of Marine Sciences, Vencie, Italy

For more than 15 years the exchange flows through the Strait of Gibraltar has been investigated by means of numerical models of different complexity. However, among these models, none was fully three dimensional, non-hydrostatic, tidally forced, initialized with realistic climatology and run with very high resolution. To fill this gap, here we present a state-of-the-art model for the Strait of Gibraltar that can be considered as a benchmark for simulating the dynamics of the Strait. The model is based on the MITgcm; it is non-hydrostatic and has a horizontal resolution of about 30m . We investigate the effects produced by the non-hydrostatic assumption, physical parameterization and resolution on the simulated hydraulic regime. To this purpose, a comparison between MITgcm, and the sigma-coordinate hydrostatic POM model implemented by Sannino et al. [2009] is carried out. It is found that while POM captures most of the hydraulic features, some important differences emerge with respect to the z-level model. The most important difference is the reduction of the frequency of appearance of supercritical flow in the eastern end of the Strait simulated by the MITgcm. This difference is due to the excess of spurious diapycnal mixing produced by POM that strongly affects the three-layer thickness and, in turn, modifies the simulated hydraulic regime. On the contrary, non-hydrostaticity has no effect on the hydraulic regime, as well as the increased horizontal resolution adopted in MITgcm.
The comparison method applied in this study proved to be particularly useful to test the robustness of the models, the parameterization and the maximum resolution adopted.
A similar comparison methods will be adopted in the test areas selected within the national flagship RITMARE.