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Effect of explicit tides in an eddy resolving Mediterranean model with increased resolution at Gibraltar.

G. Sannino and A. Carillo
ENEA, UTMEA-CLIM, Rome, Italy (gianmaria.sannino@enea.it)

It is well known that one of the key place of the entire Mediterranean Thermohaline Circulation (hereinafter MTHC) is the Strait of Gibraltar. If we consider the Mediterranean Sea as a human body, the Strait represents its throat, and as such it is responsible for the amount of water entering in the Mediterranean "body". Such a regulation is carried out through multiple hydraulic controls acting on the water flowing through the Strait. The strong tides present in the Strait trigger the multiple hydraulic controls. Despite the key role played by the Strait of Gibraltar on the MTHC, up to now none of the ocean model developed in the last 15 years for the Mediterranean Sea is able to fully simulate the Strait dynamics. Such limitation is basically due to the low horizontal resolution adopted for the Strait and the omission of tidal forcing. In the present work the effects produced by tides on MTHC have been evaluated by means of two numerical experiments performed with an eddy-resolving Mediterranean ocean model. The numerical model is based on the Massachusetts Institute of Technology general circulation model (MITgcm). The model domain extends over the entire Mediterranean Sea including the Gulf of Cadiz at west in the Atlantic Ocean. It is covered by a nonuniform curvilinear orthogonal grid with a maximum horizontal resolution of about 1/200° x 1/200° reached in the Strait of Gibraltar. From the Strait the resolution smoothly degrades to 1/16°x1/16° toward east and west.
Such a model configuration represents a novelty respect to any other model implemented in the same region in the past. The first experiment includes the stretching grid only, while the second one includes also an explicit tidal forcing. Both internal (equilibrium tides) and lateral (coming from the Atlantic Ocean) tidal forcing has been included in the model. The inclusion of tides in a fully baroclinic Mediterranean model represents another improvement respect to any other model implemented in the same region in the past. The main differences resulting from the analysis of the two experiments will be discussed.