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Study of the exchange flow through the Strait of Gibraltar with the NEMOMED8 Ocean Circulation Model: model validation, interannual variability and trends.

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This work is dedicated to the study of the exchange flow through the Strait of Gibraltar carried out with the Ocean General Circulation Model for the Mediterranean Sea NEMOMED8. In a first validation stage, observations of the Mediterranean outflow velocity, salinity and temperature collected at Espartel sill, the last gate of the Mediterranean waters in its path to the Atlantic Ocean, has been used to perform a sensitivity test of simulations with different forcing, comparing the model outputs and the experimental data in the period October 2004 – December 2010. The results show good agreement in terms of mean transport and seasonal variability, although the outflow composition is not well represented by the model. The parameterization of the mixing with the Atlantic waters in the Tangier Basin seems to be a key issue to achieve a better result.
A second stage has been the study of a long term simulation (1961-2010), in order to describe the mechanisms controlling the interannual variability of the exchange and to identify possible trends. We have found that the water deficit in the Mediterranean basin, the deep water formation rate at the Gulf of Lions and the Alboran Sea circulation are the main forcing for the interannual variability. Positive trends of the outflow salinity and temperature have also been found, as a consequence of warming and salinification of both Levantine Intermediate Waters and Atlantic Waters.