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Seasonal variability of the two-layer tidally forced flow through the Strait of Gibraltar

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A three-dimensional free-surface numerical model is used to study the seasonal variability of the tidal flow within the Strait of Gibraltar. The model used is the Princeton Ocean Model in a very high resolution configuration, both in horizontal and vertical. The horizontal resolution is less than 400 m while in the vertical 32 sigma levels are used achieving a resolution less than 1m both at surface and bottom. Model domain extends from the Gulf of Cadiz at west to the whole Alboran Sea.

In order to study the seasonal variability of the tidal forced flow, 12 experiments, differing only for the initial conditions, have been performed. In particular a typical lock-exchange initial condition has been used: the western and eastern part of model domain have been initialized, at every vertical level, by monthly Levitus and MED6 data respectively.

All experiments are forced at the two open boundaries through the specification of the semidiurnal (M_2 and S_2) tidal surface elevation. Each experiment simulates, after a first spin-up phase of 200 days, a complete spring-neap tidal cycle (fortnightly period).

Results obtained from these 12 experiments have been used to compute volume, heat and salt transports through the Strait. After that a first attempt in parametrizing the transports within the Strait has been performed in terms of temperature and salinity difference between Mediterranean (LIW, WMDW) and Atlantic (SAW, NACW) waters and tidal forcing.