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Explicit modelling of external and internal tidal waves in the global 1/12° NEMO ocean model

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Ocean tides play a major role in ocean mixing, and setting up water properties, both in the deep and the shallow ocean. Whether parameterized or explicitly simulated, tides can not be ignored in modern ocean prediction models. Representing them explicitly, the approach followed here to prepare the upcoming CMEMS (Copernicus Marine Environment Monitoring Service) global prediction system, allows for the generation of a large quantity of internal waves propagating at great distances. This is a useful information for future high resolution wide swath altimetry missions but also for forcing regional systems, enabling remotely generated internal waves to enter the user domain, providing in some places an important part of the high frequency energy.

In the present work, we review numerical aspects in the NEMO ocean model influencing the explicit representation of both external and internal tidal waves in a global 1/12° configuration. The numerical core of NEMO has indeed largely evolved recently to simulate tides, by now including the lunisolar tidal potential, Self Attraction and Loading effects, a split-explicit barotropic solver but also Lagrangian vertical coordinates to limit the spurious numerical diffusion. We report here the effect of various parameters, using data assimilative tidal models and altimetry data as references. Semi-diurnal energy budgets are also computed. Throughout this work, a systematic comparison to HYCOM results (Ansong et al. 2015 and Buijsman et al. 2016) is performed.

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