Response to Reviewer 2 Comments

The paper presents the results from a 3D hydrodynamic ocean model's twin experiment 1) with 2) without the tides. The paper is very informative. Good review and well written. Here is a few comments regarding the paper.

Response: We thank the reviewer for comments to revise the manuscript. Please find below our responses to address the reviewer's suggestions.

Point 1: In line 22-23, authors stated that "There are two common approaches to include tides in the ocean model simulations: either with direct simulation or parameterization". Could authors specifically address the parameterization process to include the tides (for example bottom friction coefficient, etc. …)? How to do it? Especially in this prefect occasion of twin experiment?

Response 1: In this model setup, tides are included by calculating the astronomical tidal potential and the tidal harmonic forcing in the open boundaries. The latter is derived from 11 constituents of the TPXO7.1 tidal model. For the estimation of the bottom drag coefficient, we use a quadratic formulation of a logarithmic law (Maraldi et al., 2013). This calculation is made online, taking into account the water column dynamical variations in the lowest bottom cell thickness. This approach leads to a more realistic representation of the bottom stress over the continental shelf (considering also the bottom roughness), as opposed to other non-dynamical parameterizations (e.g. constant values or formulation of the bottom drag).

We note that for this twin-experiment, both simulations have identical model setups regarding the bottom drag coefficient and the vertical mixing scheme, and the only difference is the vertical velocity shear and the stretching of the water column due to tidal amplitude, when tides are activated in the model. This information is now included in the revised manuscript (new lines: 86-87; 94-105; 110-111; 113-116).

Point 2: In the twin experiment, it seems there is lack of observed data to quantify/qualify the advantage of including the tides or vice versa. Could authors address question of observed data and reason why lack of it?

Response 2: We have used the OSTIA satellite data to validate the SST when tides are activated in the model. We haven't used data from altimetry missions, because the observations are filtered and de-tided, making the model SSH and data SLA comparison difficult with the present tools at hand. Following the reviewer's suggestion, we have used in-situ observations of surface temperature from a station in the English Channel (the only available observations we could find for our period of investigation), to quantify model performance with and without tides (Supplementary Figure S1; new lines: 190-193).

Point 3: Please check the figure caption of Figure 6.

Response 3: We revised the figure caption (cf. new Figure 7).