

Response to Referee #1

We thank the Referee for the appreciation of the manuscript and the comments and suggestions. In the following we will address the Referee's main concern. All of the minor suggestions were also taken into account and incorporated in the final revised version of the manuscript.

... (b) I did not see a comparison between the numbers of model and observed eddies, dipoles etc. This point (b) might be discussed although I can imagine that the surface expression of Meddies etc. can be rather uncertain or obscured to confuse the comparison. ... Point (b) above has a bearing on section 4.3; any estimate of Meddy contribution to transports depends on their numbers as well as their character. If this point is discussed I can recommend publication with only very minor amendments...

We absolutely agree with the Referee in that a quantification of the meddy contribution to the “real ocean” westward salt and volume transports depends highly on the realism of the simulation concerning meddy population. The latter is determined on one hand by the presence of several generation sites along the western Iberian continental slope (Portimao Canyon, Cape St. Vincent, Estremadura Promontory, Cape Finisterre) each of which were shown in published works to have different associated mechanisms (boundary current barotropic/baroclinic instability and/or current separation at topographic features). On the other hand, the meddy population at a certain instant depends on the frequency of formation at each generation site, but this is intrinsically determined by the generation mechanism (meddies take some time to form at each site, depending on flow parameters and regimes, and when they detach a new generation event is possible). Finally, the population in a given volume also depends on meddy interactions with other eddies and with topography, which might lead to meddy disruption, and on meddy movement (self-propagation, eddy interaction and background current advection).

Given all of the above, it is of course possible that our simulations might fail in one or other aspect. However, we recall that observational results are also few. Bower et al. (1997) estimated a formation frequency of about 17 meddies per year (Cape St. Vincent + Estremadura Promontory) based on subsurface float trajectories and gave valuable kinematic properties of meddies with which we compared our simulated meddies. Richardson et al. (2000) pointed to a meddy population in the Iberian Basin (until 43°N) of about 11 meddies during 1994, but it is hard to imagine that they have sampled all of the population. During the model instant shown in our manuscript, about 20 meddies can be counted, thus close to the observational inference (but our study area encloses one more generation site – Cape Finisterre). An estimate of the complete meddy population based on remote sensing data seems unachievable since not all of the meddies have a clear surface expression (in particular when they are away from the coastal ocean) and remote measurements do not have adequate spatial and temporal resolutions (due to mission characteristics and/or cloud cover).

Since our domain includes all (according to current knowledge) of the Iberian generation sites and our model is successful (partly due to high horizontal/vertical resolution) in simulating key aspects of the MW undercurrent (for instance its penetration level, its thickness and salinity maxima), we thus believe that the undercurrent dynamics are well

represented and that realistic generation mechanisms are present in the model leading to realistic formation frequencies. Simulated meddies have dimensions and peak vorticities comparable to those reported in the literature. Furthermore, eddy interactions (and dipole formation), as shown in the manuscript to be comparable to remote sensing data, assure the realism in meddy propagation out of the coastal region. In conclusion, although we are led to believe that our estimates might have some realism, a proper validation can certainly not be conducted.

We have integrated some of the above discussion in Section 4.3, which now acknowledges the uncertainty of our meddy contribution estimates in view of the possibly unrealistic number of meddies present in the simulations.