



EGUsphere, author comment AC1
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Reply on RC2

Gustavo M. Marques et al.

Author comment on "NeverWorld2: an idealized model hierarchy to investigate ocean mesoscale eddies across resolutions" by Gustavo M. Marques et al., EGU Sphere, <https://doi.org/10.5194/egusphere-2022-186-AC1>, 2022

We are grateful to Dr. Takaya Uchida for taking the time to carefully read the manuscript and provide thoughtful comments.

Below are our detailed responses (in bold) to all the comments.

Marques et al. introduce a new purely adiabatic primitive equation model which is computationally cheap and easy to run. As they note, a cheap and versatile model to test mesoscale eddy parametrizations has indeed long been a needed tool for the ocean modeling community and their configuration would be a great resource for the community. NeverWorld2 (NW2) being part of the MOM6 module also provides confidence in the stability of their model. The manuscript is well written and I only provide minor points listed below.

- Some discussion regarding how computationally cheap NW2 is compared to a non-adiabatic, isopycnal primitive equation model where the equation of state for density is linear (e.g. the density linearly depending only on temperature without salinity) would be nice to have. While I understand the adiabatic nature of NW2 allows the user to focus on the dynamics and isolate mesoscale processes, a non-adiabatic isopycnal model is closer to reality, also allowing for a surface mixed layer.

We appreciate the reviewer's comment on this point. We have made the choice of using an adiabatic model to indeed isolate the effects of mesoscale eddies. Unfortunately, we cannot give the exact cost of running NW2 in the diabatic mode because this configuration does not exist. The main reason for using an adiabatic configuration is that the model achieves an equilibrated state significantly faster than with a diabatic mode. It would take 1000's years for the deep ocean to equilibrate in a diabatic setup, while we were able to achieve this in 10's years for the ¼ degree configuration. Thus, roughly, the cost of NW2 is 100x less than that of a diabatic run. In addition, running the model in the diabatic mode would require an increased number of vertical levels to represent the surface boundary layer, which would make the model more computationally expensive.

- Figure 13: Is any tapering applied prior to taking the Fourier transform to make the data periodic?

Thank you for the question. Yes, when computing the spectra we use the XRFT Python package (<https://xrft.readthedocs.io/en/latest/>) with a Hann window to taper the data. Since the data are not periodic and influenced by boundary effects, we also cut off 2.5 degrees from the Western and Eastern boundaries before computing the spectra. We added text to the caption of Figure 13 and additional discussion of the spectra at the end of Section 5 to address these points.