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Geoscientific Model Development Discussions

Interactive comment on "A global eddying hindcast ocean simulation with OFES2" *by* Hideharu Sasaki et al.

Anonymous Referee #1

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This paper presents description and assessment for a new quasi-global eddying ocean hindcast simulation, OFES2, conducted by a Japanese ocean modeling group. Compared to the previous version (OFES), OFES2 has incorporated several physical processes such as a sea-ice model and a tidal mixing scheme into the model, and is forced by a new surface atmospheric dataset. As a result, many improvements are identified in OFES2 relative to OFES, motivating further analyses using OFES2.

It is very important for users of the OFES2 dataset if a reference paper describing the model settings and simulation results is provided. Thus, I am highly supportive of publication of this paper.

In the following, I will raise several specific points that I would like to ask authors to consider before the paper is published.

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L.94 and Table 1 (River runoff): If I recall correctly, COREv2 dataset is providing monthly mean climatology of river runoff.

Table 1 (Atmospheric Forcing): Please swap horizontal resolutions between JRA55-do and NCEP.

L.112: It would be informative if the restoring time scales for SSS are normalized as days over a 50 m length scale and compared with Table 2 of Danabasoglu et al. (2014).

L.156: "OFES2" should perhaps read "OFES".

L.161 (Figure 5): Please describe the standardization, or specifically global offsetting, applied to the model and AVISO sea levels. Is a common area used to compute offsetting factors for models and AVISO?

L.182: I think that the "eddy killing" effect of using relative wind for computing wind stress (e.g., Renault et al. 2019) is contributing to the improved representation of the northward extent of SSH variability west of South Africa.

L.183: The section number should perhaps read "3.2", not "3.1.2".

L.207: My take on Figure S2 is that NPIW in OFES2 is slightly improved relative to OFES presumably owing to incorporating the tidal mixing scheme.

L.210: The section number should perhaps read "3.3", not "3.1".

L.230: Then, what kind of processes or parameterizations are needed to represent the entrainment of surface water to the Mediterranean outflow near the Strait of Gibraltar in models?

L.342: Please insert "as" after "such".

L.343: Recently, Renault et al. (2018) showed that the surface oceanic currents make imprints on the surface atmospheric winds through surface momentum flux in the cou-

pled atmosphere-ocean system. Accordingly, it would not necessarily be appropriate to subtract the full surface oceanic current from the surface wind vector in computing surface momentum fluxes in uncoupled ocean simulations. Several recipes are compared and discussed by Renault et al. (2020). If the approach of correcting relative wind is used (Note that this approach is not the most recommended recipe by Renault et al. 2020), a value around 0.7 should be multiplied to the surface ocean current before it is subtracted from the surface wind for computing surface momentum fluxes. It would be appropriate to refer to these recent works here. Also, it might be of interest for both authors and users to conduct a sensitivity experiment applying this modification to the method of computing momentum fluxes and to check its impact on SSH variability in OFES2 in the future.

L.346: "southeast wind" should perhaps read "southeasterly wind".

L.355-357: I thought that it would not be rather difficult for the authors to check and report in this paper whether the realistic water mass structure present in the initial condition is gradually decaying by 1970 or the applied forcing is destroying the structure abruptly around 1970.

References:

- Danabasoglu et al. (2014): Ocean Modelling, https://dx.doi.org/10.1016/j.ocemod.2013.10.005

- Renault et al. (2018): Scientific Reports, https://doi.org/10.1038/s41598-017-17939-1

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