

Geosci. Model Dev. Discuss., referee comment RC2
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Comment on gmd-2021-100, NEMO-Bohai 1.0: a high-resolution ocean and sea ice modelling system for the Bohai Sea, China

Anonymous Referee #2

Referee comment on "NEMO-Bohai 1.0: a high-resolution ocean and sea ice modelling system for the Bohai Sea, China" by Yu Yan et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2021-100-RC2>, 2021

This paper describes the set up and validation of a coupled ocean-ice model over the Bohai Sea, with a focus on sea ice. The analysis was done using a 22-year hindcast simulation, and the intention is to use this model for long term and climate change studies - which a feature that makes it different to the other models developed for this area.

The presence of sea ice in the Bohai Sea, with it being at such a low latitude is interesting and it would be nice to include an explanation as to why it occurs.

Sea ice is the main focus of this paper however the underlying ocean dynamics of the Bohai Sea are not presented. I think that this article is lacking in the presentation of what is happening in the ocean and this needs to be addressed before publication.

Specific points/questions:

1. You state that "a regional model for the Bohai Sea based on NEMO has not yet been developed, until now" but unfortunately this is not correct, as Li et al. 2021 have also set up a coupled NEMO model in this area:

Li, R., Lu, Y., Hu, X. et al. Space-time variations of sea ice in Bohai Sea in the winter of 2009–2010 simulated with a coupled ocean and ice model. *J Oceanogr* **77**, 243–258 (2021). <https://doi.org/10.1007/s10872-020-00566-2>

2. When using FRS boundary conditions, the number of cells over which the relaxation is

applied (nn_rimwidth) is typically between 8 and 10. I am interested as to why you have chosen to set it to 1 here.

3.It would be good to include some background information on the circulation of the ocean. Ocean currents play a role in determining the position of ice floes, so it would be beneficial to show that this model is simulating this properly before then going on to show how the model performs in predicting details in sea ice.

4.Instead of solely concentrating on surface plots, it would be good to include some vertical profiles of temperature compared to observations in the validation section. Perhaps also some transects of salinity and temperature across key areas in the results section, which would show the presence of any stratification of the ocean in different seasons.

Technical:

*There are quite a few mistakes in the language throughout the manuscript (too many to list here) and these need be corrected before publication.

*On pages 6 – 10, the odd symbols made it quite hard to read whilst reviewing. This should also be corrected in the manuscript before publication.

*Salinity units should be in PSU.

*Figure 4. Ensure that the number of ticks on the y axis is the same (c, f, h have more).

*Page 16, line 342: "Sea ice volume is defined as the total ice over the whole Bohai Sea, which is calculated through sea ice concentration times ice thickness in all grids."

This should be replaced by: "...sea ice concentration multiplied by ice thickness in all grids."