Geoscientific Model Development Discussions

Geosci. Model Dev. Discuss., referee comment RC2
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# Comment on gmd-2021-101

Anonymous Referee #2

Referee comment on "Nemo-Nordic 2.0: operational marine forecast model for the Baltic Sea" by Tuomas Kärnä et al., Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2021-101-RC2, 2021

**Revision of Nemo-Nordic 2.0 by Kärnä et al.**

**Summary:**

The authors present and evaluate Nemo-Nordic 2.0, an operational marine forecast model of the Baltic Sea, which is based on Nemo-Nordic 1.0. The evaluation is sound and covers the most important aspects of the Baltic Sea physical oceanography, and the paper has overall a good structure and is in general well written. This is an important paper that documents the development of the Nemo-Nordic configuration, and deserves being published after revision.

**Major comments:**

-The introduction is not very coherent and needs to be revised. Maybe you could divide it into two subsections, with one about the modelling, and one more detailed about the physical oceanography of the Baltic and the North Sea? Alternatively, you could shorten the part on physical oceanography and only keep the most important aspects. At the moment there is a lot of information on the physical oceanography in there without references (lines 25-34), please add appropriate references that support your description if you want to keep this text.

-The model covers the Baltic Sea and the North Sea, but you only evaluate its performance in the Baltic Sea, and thus only a part of the model. Please describe why you do this. Still, I think that it is important, and that would be of value, if you also evaluate the model in the North Sea. If you want to focus on the Baltic Sea only in the main manuscript, you could maybe put some figures in supplementary information?

-You write that in this paper you evaluate the Nemo-Nordic forecast system. But, doesn't a forecast system also include data assimilation and forecasts? (or hindcasts). Indeed, you call your simulation a hindcast, but you do not evaluate its ability to "predict" the past,i.e. for how long the model manage to reproduce observations if starting from initial conditions created with data assimilation. I do not think that you need to do this in the paper, and that it would be a paper of its own. I think that this is just a question of adding some extra text in the discussion/introduction about this, and/or revising the choice of words.

-Wouldn't it be interesting to show how Nemo-Nordic 2.0 performs in comparison to Nemo-Nordic 1.0?

**Minor comments:**

- lines 4-5: the 1 nautical mile horizontal resolution is an update as well no?
- lines 15-17: These models do not only simulate the circulation… maybe it is better to write: "several ocean circulation models have been set up for the Baltic Sea", or something similar
- lines 84-85: you repeat "as well as" twice in one sentence, please revise
- In section 2 it is not very clear what settings that are updates since Nemo-Nordic 1.0, and what you have kept the same, please clarify this.
- line 110: do you resolve baroclinic eddies in your configuration?
- line 174: 14 months are not enough to spin up the deep Baltic Sea. What did you use to initialize the spin-up run?
- line 244, and also elsewhere in the manuscript: how do you define good, relatively good and other, similar, qualitative words?
- figure captions and in the text discussing these figures: please describe if it is based on daily or monthly output. It should also be mentioned in the methods what time-frequency your analyses are based on. A bit in a similar manner as you do for the comparison with the Ferrybox data.
- Could you put some lines in figure 1 showing the routes of TransPaper and Finnmaid ferries? As it is now it is difficult to relate figures 6-7 to a geographic location.
- I like figure 8, but I have some questions related to it; Why did you choose the upper 10 m for the surface layer? The summer thermocline is generally located deeper. When showing the skill as you do for the surface and deep layer, it does not tell us if the bias is due an eventual mis-placement of the thermocline/halocline, or if it is the modelled temperature/salinity that is off. It would be valuable if you could evolve the text around this and discuss it, a bit like you do for the salinity at BY5.
- figure 9 and 10: please write that the difference shows the model-observations
- section 3.6: please write why you have chosen these specific locations for your analysis
- figure 12: describe in the caption what the blue lines show.
- from figure 9 it looks like the model is too diffuse in the vertical. Maybe you could add this to your discussion on lines 408-416.

- lines 429-430: do you have some references to other baltic sea operational models that you could put here?