

Interactive comment on “Long-Term Evolution of the Caspian Sea Thermohaline Properties Reconstructed in an Eddy-Resolving OGCM” by Gleb S. Dyakonov and Rashit A. Ibrayev

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We thank the referee for his/her constructive comments and suggestions. Further the indicated remarks are discussed one-by-one. Attached is the revised manuscript provided in 2 versions for your convenience: with and without mark-up of changes (otherwise, the two documents are identical). Note: only substantial changes are marked-up in the attached manuscript.

1. Referee Comment: It is mentioned that the downsloping cascading process of cold saline waters along the slope of northern and eastern shelves are not fully taken into account by the model. Is this due to using z-level grids in the model? If not, it would be

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interesting to know how this process can be better resolved in numerical models.

Author Response: Yes, this process is rather poorly resolved in z-coordinate grid models. There are methods to better account for downsloping cascading, such as more sophisticated vertical coordinates and various parameterizations. However our attempts to apply some of those parameterizations in the Caspian Sea model had little effect, and this problem remains.

Changes in manuscript: Necessary clarifications were added in subsection “6.2 Middle Caspian”.

2. Referee Comment: The model is validated against sea surface height at Baku and is shown to be able to well reproduce its long-term variability. However, for the salinity and temperature evolution, the comparison against observed data has not been shown (Although it is mentioned that the model is in good agreement with observations). It would be interesting to have a more detailed comparison of the model thermohaline structure against observations shown in Tuzhilkin and Kosarev, 2004. My understanding is that the model shows more salinity stratification in the period of 1960-1978 in the middle Caspian Sea. However, it is hard to reach a conclusion because the results shown in the study are averaged over the entire MidCaspian basin, while the observations are for the deep-water area.

Author Response: Indeed, the model shows somewhat greater salinity stratification in the Middle Caspian as a result of excessive surface freshening. This is one of the most significant model errors. We agree that the paper lacks T and S observational data for comparison and have added section “5 Model validation” including plots for Middle and Southern basins comparing T and S at 100 m in two locations with measurements data from Tuzhilkin and Kosarev (2004). More comprehensive validation against observational data would greatly expand the paper, so, as a compromise, only these two plots and sea level comparison are presented in this section. The paper is also supplemented with section “4 Surface circulation” to better explain the results

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presented.

Changes in manuscript: Sections “4 Surface circulation” and “5 Model validation” were added.

3. Referee Comment: Regarding the abstract, if possible, I think it is useful to have a more extensive abstract that includes some of the results mentioned in the conclusion. For example, the effect of regime shift of global climate on the different regions of the Caspian Sea.

Author Response: Yes, the initial abstract appears to be overly short.

Changes in manuscript: The abstract was extended with main results presented in the paper.

4. Referee Comment: Technical error, misspelling: Line 15, page 7: “compared to” instead of “comparted to”

Author Response: Corrected, thank you.

Changes in manuscript: Misspelling corrected.

Please also note the supplement to this comment:

<https://www.ocean-sci-discuss.net/os-2018-128/os-2018-128-AC1-supplement.zip>

Interactive comment on Ocean Sci. Discuss., <https://doi.org/10.5194/os-2018-128>, 2018.