## Reviewer 3

*The research on the fresh water content is a useful approach when addressing estuarine basins. The proposed study aims to make a step towards understanding the evolution of fresh water content in the Baltic Sea based on analysis of BALMFC data. Unfortunately, the manuscript does not provide (1) any validation and error estimates,*

We will add the reanalysis data validation based on the clustering approach by Raudsepp and Maljutenko (2021) in Appendix of the manuscript. In the validation process we include the data that have been used for the assimilation. Argument for that approach is that we like to know how representative the reanalysis product is. Results of the error clustering is shown in Fig. R3 and the statistics are presented in Table R1. Detailed description of the validation procedure and results will be provided in the revised manuscript.

Mutual reanalysis errors of temperature and salinity are used because water temperature is relevant for the ice volume calculations and the salinity for the calculation of the FWC.
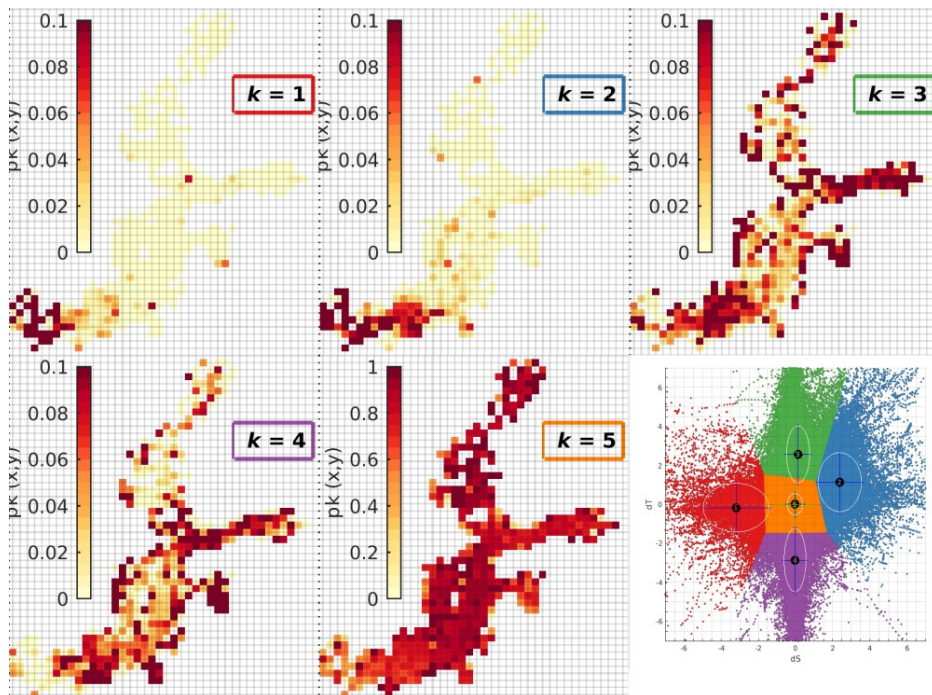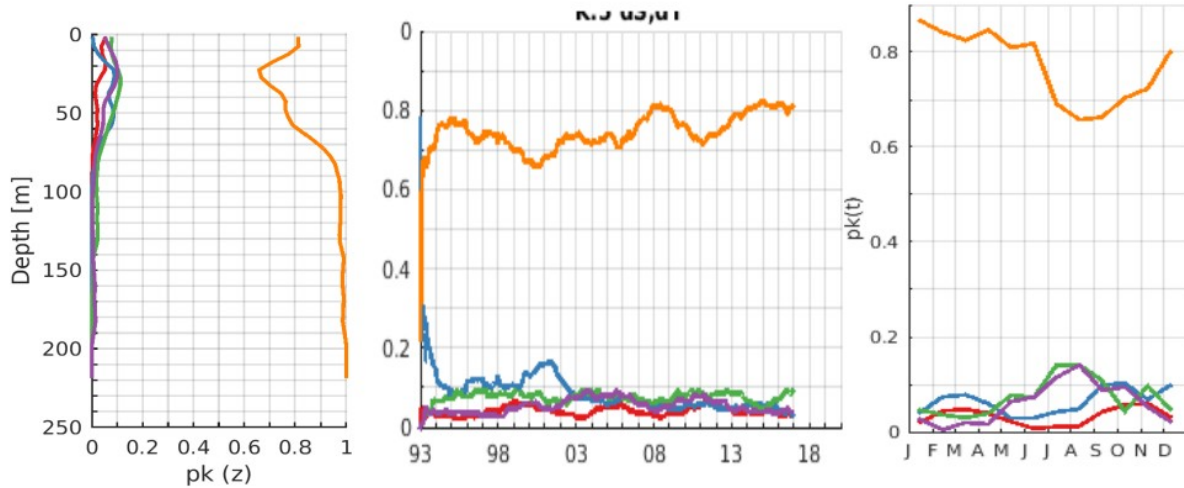
Figure R3. The distribution of the error clusters for K=5. The spatial, vertical, temporal, and seasonal (e) distribution of the share of error points belonging to the five different clusters.

Table R1. The bias, root-mean-square error (RMSE), standard deviation (STD) and correlation coefficient (Corr) for each of five clusters.

| k | BIAS | | STD | | RMSD | | CORR | | |
|---|------|------|------|------|------|------|------|------|------|
| | dS | dT | S | T | S | T | S | T | dSdT |
| 1 | -3.201 | -0.169 | 1.763 | 1.250 | 3.654 | 1.261 | 0.950 | 0.721 | -0.155 |
| 2 | 2.379 | 1.140 | 1.164 | 1.508 | 2.649 | 1.891 | 0.983 | 0.626 | 0.206 |
| 3 | 0.137 | 2.567 | 0.621 | 1.465 | 0.636 | 2.955 | 0.994 | 0.637 | 0.030 |
| 4 | -0.026 | -2.859 | 0.587 | 1.630 | 0.587 | 3.291 | 0.985 | 0.693 | -0.006 |
| 5 | -0.029 | 0.006 | 0.412 | 0.549 | 0.413 | 0.549 | 0.994 | 0.907 | 0.113 |

Raudsepp, U., Maljutenko, I., 2022. A method for assessment of the general circulation model quality using K-means clustering algorithm: a case study with GETM v2.5. Geosci. Model Dev., 15, 535–551. doi:10.5194/gmd-15-535-2022

*and (2) sufficient depth of analysis. With the available from BALMFC data, authors could do much more than just a simple diagnostics.*

In the revised manuscript, we will provide more in depth analysis. Still there is possibility that the analysis of the reasons is not consistent with the evolution of the FWC because salt and heat are not necessarily conserved due to data assimilation. That may concern salt transport through the straits in particular. Keeping that in mind we will provide analysis of the dynamics and discuss emerging discrepancies and inconsistencies in relation to previous studies.

*Abstract: „Copernicus regional reanalysis", right term? May be better say Copernicus Baltic Sea regional reanalysis.*

Corrected

*Line 60 big and small s.*

Corrected

*Estimate the errors in the model by analyzing available in situ and satellite data and data from the reanalysis. This would show how credible your results are.*

We will add reanalysis data validation in comparison to in situ data in the revised manuscript as described above.

*The analysis or fresh water content is show-and-tell like. No deep physical explanation of reasons, dynamics etc. are proposed.*

We will provide explanation of reasons and dynamics based on BALMFC reanalysis data used in this study in the revised manuscript.

*It is not always clear whether authors present their own results or results of others. In Line 116-116: "The variability as well as negative trends are strongest in the southern and the northern Baltic Proper (Fig. 4e,c). The decrease of the FWC is explained by the saline water transport from the North Sea to the Baltic Sea by the Major Baltic Inflows (Mohrholz, 2018), large barotropic inflows (Lehmann et al., 2017) and smaller inflows of barotropic origin (Lehmann et al., 2022)." How exactly, what exactly. Use quantitative analyses (BALMFC) to support these statements. Are authors sure that, in BALMFC, the above conclusion hold. This is particularly important for the straits transport. Discuss the realism of straits transports. You may compare with the estimates of Mohrholz et al. (2015), Gräwe et al. (2915), and Stanev et al. (2018). An important question is whether BALMFC correctly represents straits transports.*

We will separate Results and Discussion sections in the revised manuscript and will provide the analysis of the transport between the straits based on the results of BALMFC. This separation will clarify our results and the results of the other.

*Authors mix introduction and results, one example (there are also others): ". Deep layer water in the Gulf of Finland originates from the sub-halocline layer (110–120 m) of the central Baltic Proper (Liblik et al., 2018)." Please, move this in the introduction and restructure your paper. Alternatively, show this from the results of BALMFC, which is preferable. There are in the paper other similar cases. I am not sure whether what a model different from NEMO simulates (or one data set shows) is reproduced by the BALMFC. Support your conclusions with the results from NEMO.*

We will provide an explanation of our results based on BALMFC reanalysis data.

*Much of what is said in the part "Results" cannot be derived from the results: "In winter, the salt wedge withdraws from the interior of the gulf, the mean salinity decreases and FWC increases." Does this follow from BALMFC or other model. Maljutenko and Raudsepp (2019) is not in the reference list.*

We will separate Results and Discussion sections in the revised manuscript and will provide the analysis based on BALMFC reanalysis data. Reference list will be corrected.

*The paragraph starting in line 157 is unclear. Kattegat-Golf of Riga-The whole basin. Author have to try to carefully explain their idea.*

Will be clarified.

References:

Gräwe, U., Naumann, M., Mohrholz, V., Burchard, H., 2015. Anatomizing one of the largest saltwater inflows in the Baltic Sea in December 2014. J. Geophys. Res. 120, 7676–7697

Mohrholz, V., Naumann, M., Nausch, G., Krüger, S., Gräwe, U., 2015. Fresh oxygen for the Baltic Sea – an exceptional saline inflow after a decade of stagnation. J. Mar. Sys 2015.

Stanev E, Pein J, Grashorn S, Zhang Y, Schrum C, 2018: Dynamics of the Baltic Sea Straits via Numerical Simulation of Exchange Flows, Ocean Modelling 131:40-58