

## Response to Reviewers

We thank the reviewers for their reports and, in particular, reviewer #2 for their helpful suggestions. In the revised manuscript, we have addressed reviewer #2's comments in the following manner:

### General comment:

Sometimes the authors refer the reanalysis results purely as "model data/results". "Model" is very general. My suggestion is to always use "reanalysis" and standardize along the text.

- We have replaced "model data" by "reanalysis data" and have generally homogenized the manuscript in this respect. The Baltic Sea physics reanalysis product is now either abbreviated with the newly introduced acronym (BAL-MYP) or simply addressed with "reanalysis", wherever it is clear that the BAL-MYP is meant.

### Specific comments:

(line 61) What is the reason to cite BACC Author Team (2008) and Gröger et al. (2022)? What did they study?

- We have now specified this in lines 60-62.

(line 81) replace "Of" with "Regarding".

- done

(line 84) replace "... Baltic Proper. The SST observations..." with "... Baltic Proper where the SST observations..."

- done

(line 88) You can also specify Baltic Sea physics reanalysis product with an acronym.

- done: BAL-MYP (introduced in line 89, added to Table 1)

(lines 102-104) Cite the corresponding MHW reference which defines the MHW categories.

- The citation is already mentioned in line 101. We have added a colon to clarify that lines 102-104 describe this classification of MHW categories.

(line 106) "MYP" is very general. My suggestion is to refer to the Baltic Sea physics reanalysis here (and along the manuscript) using a proper acronym for the Baltic Sea reanalysis as it was recommended in line 88. Multi-year product (MYP) is a specific nomenclature used mostly by Copernicus Marine Service to define different products such as an ocean reanalysis.

- done (as mentioned above)

(line 106-107) Move "the following statistical metrics" to the end of the sentence as follows: "MHWs are computed at every third surface grid point of the MYP, resulting in a resolution of approximately 5.4 km for the following statistical metrics: ..."

- done

(lines 119-120) Move the following sentence to the section 2.3: "The MYP data has already been extensively validated in the corresponding Quality Information Document (QuID; Panteleit et al., 2023)".

- As section 2.5 is specifically dedicated to the validation of the BAL-MYP with respect to its ability to accurately quantify MHWs, we would prefer to leave this sentence here. Furthermore, the following lines (lines 121-125) present selected results from the QuID that are relevant for this study.

(lines 121-124) Again, my suggestion is to move these results to an appropriate section in "Results".

- These lines do not represent results made in our study. We have rewritten the text to clarify that these results stem from the QuID.

(lines 220-222) "This also coincides with the onset of significantly higher temperatures at the surface compared to the climatological mean, though these were initially not high enough to result in a MHW (Fig. 5e)". Figure 5e shows two MHW events at 0.5 m, right? Rewrite or clarify.

- We have rewritten the section to clarify that the results near the surface are based on reanalysis data at 0.5 m depth.

(lines 222-226) Specify these lines describe the results at 0.5 m (Figure 5e).

- done, see above

(lines 208-238) the following subsection “3.2.2 Analysis of vertical MHW distribution at Northern Baltic” still requires writing improvements.

- We have improved the overall wording in this section

(line 278) Appendix A1 is not well connected with the text. Clearly explain why the analysis and results in Appendix A1 are important.

- Appendix A1 is referenced and summarized in the main article (lines 126-141), where it is stated that this clustering approach was used as an additional validation of the BAL-MYP, in order to highlight its ability to accurately capture both surface and subsurface MHWs over the entire domain. We have now clarified this at the beginning of Appendix A1 in lines 281-282.

(line 279) “hydrodynamic model”. Reanalysis?

- Yes, this has been rewritten accordingly

(line 496) replace “model data” with “reanalysis data”. See the above general comment.

- done