

## Response to the comments of Anonymous Reviewer #1

We would like to thank the reviewers for their constructive and helpful comments! We give our response as:

*Reviewer comment* – **Authors' response where needed** – **Changes to manuscript**.

*Title: Consider changing the title. I'm not sure if explaining is the right word. The study leaves many questions open, so maybe studying would be more appropriate word.*

**We change the title to "Investigating drivers of interdecadal salinity changes in the Baltic Sea in a 1850-2008 hindcast simulation"**

*Introduction: In the introduction, you could also introduce some literature related to the drivers of the salinity variation you are discussing later on; e.g. NAO, AMO and how their effects to the Baltic Sea dynamics have been studied earlier. Please avoid introducing your results in the introduction (e.g. line 60)*

**We include more references to existing research and remove the results from the introduction.**

*Material and Methods: In the dataset-section, consider using subtitles. It is easier to find, what you are looking for, when one is later on returning to this section to check what was said here.*

**We structure section 2.1 by introducing the following headings: "ICES T and S observations", "HIRESAFF v2 atmospheric reconstruction", "River runoff", "Baltic Inflow reconstruction" and "Climate indices".**

*Model validation: Consider putting surface and bottom salinities to different figures or use larger image size. With the current size, scales and colours it is difficult to see the differences between the measurements and the model.*

**We find that yet another set of seven figures would be too many, since the manuscript is already packed with figures.**

**We will ask the typesetter to skip the width limitation which makes the figure substantially smaller than the two-column text. We will also use a broken y-axis at strongly stratified stations to increase the vertical scale of the temporal variations.**

*Results of the wavelet analysis: The amount of stations and parameters studied is bit exhausting and it is not easy to form a consistent overview of the different effects and time scales. Would it be possible to summarize the main findings in a table?*

**Thank you for this excellent suggestion!**

**We add a table summarizing the main findings of the wavelet analysis method.**

*Discussion: In discussion of the things affecting the model accuracy in the beginning of the model period, you could also include the accuracy of the atmospheric forcing. I do not know the details of the forcing dataset used here, but typically the amount of data assimilated in the models increases the nearer we come to present and therefore typically also the accuracy improves. This would also affect the accuracy of the ocean model as the simulation of the MBI's are sensitive to the accuracy of the atmospheric forcing.*

**We will add this point to the discussion.**

*Drivers and variation: I would like to see more discussion on the combined effect of the different drivers. Although it is now easy to study this, you could at least discuss the possible joint effects of the different drivers, as they are not independent from one another.*

We see your point. However, we cannot go into detail in this study since obviously numerous interactions can exist.

We mention the possibility of non-linear interactions between different drivers in the outlook section.

*Conclusions and outlook: I would avoid using the word realistic, when talking about hindcast simulation. Maybe some other term related to quality?*

We omit "realistic".