Dear Reviewer,

We thank you for your willingness to review our manuscript and for your thorough and helpful comments on the manuscript. Please find our responses to your comments in blue below.

Best regards,

Elin Andrée, Jian Su, Morten Andreas Dahl Larsen, Martin Drews, Martin Stendel and Kristine Skovgaard Madsen

This study is a nice example of exploration of potential changes to the existing catastrophic events in future climates. It is based on the perception that extremely dangerous situations in the Baltic Sea are usually formed by a sequence of episodes that are dynamically connected in time rather than a combination of basically random reactions of the sea to various forcing components that are governed by some extreme value distribution. This is a reasonable way forward in the Baltic Sea conditions where the sea level "climate" of several sub-basins may contain statistically almost impossible outliers.

The analysis is sound and professional. All aspects of the modeling efforts have been explained in detail so that even an inexperienced in modeling reader can enjoy the line of thoughts and catch the main points. The use of English and technical aspects of the manuscript are fine. The outcome is carefully justified and the formulated conclusions fully supported.

Therefore, I recommend the manuscript for publication basically as it is.

Thank you very much!

However, there are some fairly minor items, adjustment of which may make the presentation even better. Only one issue definitely needs clarification for inexperienced readers: sea level elevations propagate in many occasions as (long) waves, so what moves is wave energy rather than water mass.

We agree with the reviewer and have changed our wording accordingly in the manuscript to clarify (including as indicated in the comments below). Hence we have for example replaced the phrasing "water mass distribution" with "sea-level pattern" and now use "piling up" and "travelling" or "propagating" exclusively instead of "pushing" or other references to motion that would suggest displacement of mass rather than energy.

Abstract, line 4: it would be better to say "prior conditions may influence".

Yes; revised accordingly.

Line 6: consider saying "certain" instead of "different".

Yes; revised accordingly.

Line 7: consider saying "increase in the water level of 36 cm".

Yes; revised accordingly.

Line 9: it is strongly recommended to say "water mass distributions propagate as (long) waves" (I guess this meant).

Agreed – revised.

Page 2, lines 40–46: it might be useful to mention also wave-driven set-up that may in some occasions provide up to 1/3 of the total surge.

We have added a sentence about the wave setup:

"Wave-driven setup from waves breaking in the shallow surf zone may comprise 20 to 30% or more of the total surge during energetic wind conditions (Lavaud et al., 2020; Woodworth et al., 2019)."

Page 4, line 95: it might be more appropriate to speak about "more unfavourable" preconditioning here, on line 114 and on page 15.

Agreed – revised.

Line 117: from the presentation it seems that "at least two weeks" would be more exact.

Agreed – revised.

Line 121: winds probably caused "intense net transport".

OK – revised.

Lines 121–122: "the maximum …. peaked" sounds strange.

We have exchanged "the maximum … peaked" with "the maximum … occurred"

Line 125: as mentioned above, the release of piled-up waters normally occurs in the form of a (long) wave. This wave travels to the southwest while water velocities in it are fairly small (I guess on the order of 10 cm/s); thus "flow" is conceptually incorrect.

We agree with the reviewer that this is badly phrased. The sentence now reads:

"Consequently, the winds shifted from southwest to northeast, and the piled-up waters in the eastern Baltic Sea were released as a long wave travelling to the southwest."

Line 141: DWD was already explained.

Thanks – revised.

Line 152: check "methods … is described".

Thanks – revised.

Page 6, Caption to Fig. 1: check "forcing … are".

Thanks – revised.

Page 8, line 197: The water level was exceptionally high also in the Gulf of Finland. Soomere and Pindsoo (2016, Continental Shelf Research, 115, 53–64, doi: 10.1016/j.csr.2015.12.016) visualised modelled water levels above 80 cm near Tallinn for more than a week in March 1990.

Thanks, we have added this to the text.

Page 12, line 282: correct "Landort".

Thanks – revised.

Line 304: as above, it was motion of wave (energy), not really flow of water masses.

We have rephrased:

"The maximum water level at Landsort occurred as the piled-up waters were released and propagated south and westwards, reducing the water level in the north and east and causing it to rise throughout the southwestern Baltic."

Page 13, caption to Fig. 4: correct "capitol".

Thanks – revised.

Page 15, lines 338–343: I guess that this almost linear dependence may partially reflect the way how surface drag is calculated from the wind speed. I guess that readers would appreciate a short comment on that.

We have added a comment on this and also refer back to another study where we discussed the parametrisation and formulation of the drag coefficient in the model setup more in detail. The section now reads:

"Amplification of the wind speed resulted in increased peak water levels with an almost linear response (Fig. 6). This finding depends strongly on the model's wind stress parameterisation and drag coefficient, which was discussed in Andrée et al. (2022) for idealized simulations with the same model. The linear response seems to indicate that at least for the peak values, any dynamic changes to the sea-level patterns induced by the enhanced wind are marginal."

Page 17, lines 363–364: it may make sense to add that a decrease in salinity in the Baltic Sea may add to the sea level rise signal at the entrance of Danish straits.

Thank you for this suggestion. There are multiple factors that contribute to the sea level rise signal, including salinity. We opted here not to highlight all components of sea level rise so as not to distract the audience. Rather, we include a reference to a local research on sea level rise (Su et al, 2021).