Response to reviewer of “Simulating sea level extremes from synthetic low-pressure systems”

Jani Särkkä, Jani Räihä, Mika Rantanen, and Matti Kämäräinen

We are glad that our major revision has largely satisfied the reviewer. We thank the reviewer for the additional comments and hope that our responses will clarify the rest of the unclear matters.

The point-by-point replies to the comments are below. The comments are marked in black and our responses in blue.

Review on “Simulating sea level extremes from synthetic low-pressure systems” by Jani Särkkä, Jani Räihä, Mika Rantanen, and Matti Kämäräinen

I recommend a revision for this manuscript to be accepted as a publication. My main concerns are on the introduction and result sections.

Major Comments:

Introduction:

The introduction lacks clarity and flow. The author is recommended to restructure the content into clear paragraphs for improved readability and flow. Introduce transition words between sentences to enhance coherence.

The author should consider adding an overview and summarizing the main idea of the manuscript at the end of the introduction.

Thank you for this comment. We have fully revised the introduction of the manuscript. We hope that it is now more readable. The main idea of the manuscript is summarized in the last paragraph of the introduction, as suggested by the reviewer.

In L42-51, the arguments are challenging to follow, and the meaning of "statistical methods" is unclear. To improve, the author should clarify the concept of statistical methods and explain how they relate to natural hazards, particularly focusing on whether they consider outliers or medium-sized events for estimating extreme sea levels.

The phrase "to estimate the lower limits of extreme sea levels" needs clarification for better understanding.

As indicated in the previous answer, we rewrote the introduction text to clarify our objectives. We replaced “statistical methods” with “extreme value analysis methods” and removed the phrase referring to lower limits of extreme sea levels.

At L121, the statement regarding the Baltic Sea and "shallow water" is incorrect. The term "shallow water" involves considerations beyond depth, such as wavelength and amplitude compared to depth. Either remove the sentence or strengthen the argument by addressing these factors.

We agree. We removed this sentence.

Results:

Move the content in L163-165 to the previous section and modify it to mention the limitations of the current study.

We moved the content to Section 2.5 and modified the text (L156-L160)

In L187 and L195, replace "originate" with more appropriate terms like "progress," "propagate," or "approach".

We changed the wording using verbs “enter” and “approach”

In L191, if comparing numerical results, provide details of the study by Averkiev and Klevannyy (2010), including storm speed, pressure, wind speed, etc.

Thank you for this comment. We added details on L191-199 of the numerical parameters used in Averkiev and Klevannyy (2010) to make comparison with our simulation methods.

In L191, if the authors claim that the grid size is the primary reason for the difference, then the authors need to provide more plausible explanations why the grid size is important in St. Petersburg, and not important at other locations.

As we were not sure about the reason, we removed the sentence referring to the spatial resolution in the Averkiev and Klevannyy (2010) study.

Minor Comments:

In L21, replace "it may be assumed" with "it is possible" for clarity and precision.

We modified the text according to the comment.

At L34, it would be beneficial for the authors to provide the average annual number of occurrences instead of just stating "The annual number of."

We modified the text and mention now that there are about five windstorms per month in northern Europe (L34-35)

Remove the term "Somewhat subjectively" at L103, and instead, support statements with references.

Clarify the reason behind "not plausible in the Baltic Sea region" at L106 by providing a reference.

We rewrote the text (L104-108) justifying the limit of 40m/s for mean wind speed and added references.

At L110, explicitly state that the authors fix the radius, wind speed, and the magnitude of the central pressure.

We do not fix directly the wind speed, it is limited by the fixed pressure anomaly and cyclone radius. We added in the text mention on the fixed parameters.

Change "This sea level model" to "which" at L119.

Suggested change would have resulted in a long sentence; we modified the text to increase fluency.

Explain the meaning of "correlation" at L125.

We added explanation in the text.

L141 seems unclear; consider rewriting or removing it.

Remove "entire" from L142.

We rewrote the text to make it clearer.

Replace "largest" with "large" at L146.

We made the suggested replacement.

L161 “For even lower … be still higher” Provide the evidence for this statement. assumptions, the vertical velocity can be ignored. Remove that sentence or strengthen the argument.

We removed the sentence.