Natural Hazards and Earth System Sciences
Discussions

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC2
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Comment on nhess-2022-223

Anonymous Referee #2

Referee comment on "Improvements to the detection and analysis of external surges in the North Sea" by Alexander Böhme et al., Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2022-223-RC2, 2023

In the full review and interactive discussion the referees and other interested members of the scientific and technical communities are asked to take into account all of the following aspects:

- Does the paper address relevant scientific and/or technical questions within the scope of NHESS?

Yes.

- Does the paper present new data and/or novel concepts, ideas, tools, methods or results?

Yes.

- Are these up to international standards?

Yes.

- Are the scientific methods and assumptions valid and outlined clearly?

See comments below.

- Are the results sufficient to support the interpretations and the conclusions?

Yes.

- Does the author reach substantial conclusions?

Yes.

- Is the description of the data used, the methods used, the experiments and calculations made, and the results obtained sufficiently complete and accurate to allow their reproduction by fellow scientists (traceability of results)?

See comments below.

- Does the title clearly and unambiguously reflect the contents of the paper?

Yes.

- Does the abstract provide a concise, complete and unambiguous summary of the work done and the results obtained?

Yes.

- Are the title and the abstract pertinent, and easy to understand to a wide and diversified audience?

Yes.

- Are mathematical formulae, symbols, abbreviations and units correctly defined and used? If the formulae, symbols or abbreviations are numerous, are there tables or appendixes listing them?

Yes, mostly.

- Is the size, quality and readability of each figure adequate to the type and quantity of data presented?

Yes.

- Does the author give proper credit to previous and/or related work, and does he/she indicate clearly his/her own contribution?

Yes.

- Are the number and quality of the references appropriate?

Yes.

- Are the references accessible by fellow scientists?

Yes.

- Is the overall presentation well structured, clear and easy to understand by a wide and general audience?

See comments below.

- Is the length of the paper adequate, too long or too short?

Adequate.

- Is there any part of the paper (title, abstract, main text, formulae, symbols, figures and their captions, tables, list of references, appendixes) that needs to be clarified, reduced, added, combined, or eliminated?

The figure and table captions should be clarified and sometimes added for better understanding.

- Is the technical language precise and understandable by fellow scientists?

See comments below.

- Is the English language of good quality, fluent, simple and easy to read and understand by a wide and diversified audience?

Yes.

- Is the amount and quality of supplementary material (if any) appropriate?

Yes.

General comments

The manuscript " Improvements to the detection and analysis of external surges in the North Sea" by Müller et al. analyses external surges in the North Sea based on existing different datasets. As a result, the knowledge about external surges as well as the detection with an automated algorithm is improved. Also, a new data set is provided to account for past external surges.

External surges can have a significant impact on increasing storm surges. Therefore, they are extremely relevant for coastal protection concerns. In the past, there was always the problem that external surges could only be detected indirectly. Observational data, for example at the Heligoland gauge, or hydrodynamic numerical models were used for this purpose. However, there have always been limitations with regard to the significance and correct contribution of the physical processes, especially during the transition of the external surge to the shelf. Therefore, I was very much looking forward to reading the manuscript.

I liked the approach and the implementation very much. There is a common thread and the graphics are also appealing. A good idea was implemented with proven methodology. To summarize, the manuscript is mostly written in a clear and concise manner whose proposed research outcome has a strong applicative character. There is an undisputed relevance of the methodology and applications presented. However, as my comments below indicate, there is a certain need for discussion and clarification at some points, which can be resolved and clarified with a little more careful work. Therefore, I recommend publication not before a minor revision.

Specific comments

In the manuscript the background, the data and the methodology are described and finally presented and discussed. I have no fundamental reservations about the methodology and the general procedure, nor have I found any errors that are obvious to me. Overall, the paper makes a good impression. But especially the methodology needs a revision. It is difficult to fully follow the aspects and those used. This should be reworked so that a clear structure is recognizable. Also, the assumptions made and the different datasets to finally determine the external surges should be made clearer.

The same applies to the results chapter. I recommend starting with an explanation of the final data sets and then explaining the generated results. Furthermore, structural aspects have been noticed here. Parts of the results should be moved to the methodology, others to the discussion. Then the manuscript becomes a good technical article with a lot of practical usable content.

The last aspect is that it is not always clear to me whether the presented methodology really works in an automated manner. There is always talk of manual additions and adjustments. This should be made clearer again.

Further points can be found in the following paragraph and listing.

Technical corrections

General:

- Please define clearly “surge”, “storm surge”, “surge residual”, “external surge”, “non-tidal residual”, “residual” etc. In between it is written very hard to follow.
- no blank character before “%”
- uniform cross-references (e.g. Figure or Fig.)
- easterly/westerly winds
- try to avoid “in overall good agreement”, “very often”, “highly unlikely” or “relatively small” without quantitative numbers or references
- inverted barometer effect (IBE) or inverted barometer law (IBL)?
- Describe figures and tables before they are shown and referred to them.

Line 18: surges instead of surge

Line 20: tend to occur

Line 29: abbreviation of regional mean sea level is MSL or RMSL? If it is changed then adjust throughout the document.

Line 33: Probably add some sources for studies dealing with the German coastline? E.g. Dangendorf?

Line 36: and interactions of the individual effects…

Line 35-45: Some references are missing for the numbers given and the statements.

Line 57: I’m confused about the start and end year of the data. Please specify.

Line 59: chapter number wrong?

Line 70: Which period?

Line 94: can or cannot?

Line 95: Is there a difference or not? Please clarify.

Line 100: repetition (“still relatively/very rare”)

Line 104: chapter number wrong?

Line 106: expression (“Not only can”)

Line 123: “surges” is missing

Line 123-128: Some references are missing.

Line 133: surge action?

Line 140: more specific: tidal high and low water back to 1843

Line 141: this statement is risky. analyses of the tide gauge in Cuxhaven repeatedly show different behavior compared to other tide gauges in the German Bight. Furthermore, there is a lack of information from references.

Table 1: Can you reduce the size of the table. It seems very large for the relatively little bit of information. Most of the information is given from 151-157 anyway.

Line 159-160: “Mean wind direction (averaged over the last 10 min before the timestamp)” This information is important. But I don't understand how you can average the last 10 minutes when the weather data has a resolution of 1 hour?

Figure 2: what does “surge heights” mean?

Line 168: “(2003)” is missing

Line 171: “The methodology of this step varies” of which step?

Line 175: Did you calculate the astronomical tide? Which method is used? What about uncertainties?

Line 193: What is surge heights here? External surge or residual or non tidal residual?

Line 195: zonal/meridional wind

Line 198: tables

Line 206: with instead of at

Line 210: reference?

Line 212: in line 190ff was mentioned that “The influence of other factors like water and air temperature or wind setup should be taken into consideration during the interpretation of surge heights, nonetheless.”?

Table 2: MLR is not defined yet

Line 220: Function 0 is a constant term…

Table 3: Did I understand that correctly? The methodology of Müller-Navarra and Giese (1999) was used to build AND validate a MLR for Texel. For Cuxhaven only validation was done?

Figure 3: RMSE instead of RMS-error

Line 247: Which significance level? “0.8 and 0.92” is not listed in Table 4. Please use similar digits.

Line 254: and instead of und

Figure 4: You do not mention the overestimation of the hindcast especially in b). Did you check model criteria for the MLR? Probably the MLR does not capture all relevant processes?

Line 286: I miss these analyses at the point, since a new and improved approach is to be developed? Please explain briefly why this is not done here.

Figure 5: Can you further highlight in the figure what you describe in text?

Line 299: and 50 cm higher at Cuxhaven

Line 305: Did you check this manually when these are not detected automatically?

Line 347: winds

Line 361: moving average

Line 386: surge = external surge?

Line 421: significance is always a statistical expression. Did you perform a significance here?

Line 434ff: This is methodology or should be defined earlier.

Line 464: how is the mean high water calculated? How many years? It is essential due to the rising base water level (MSL)

Line 488: In the BMBF-project easy-GSH the tide gauge of Heligoland was used to determine the influence of external surges. Is it possible to compare the results with yours?

Line 494: Please clarify in the methodology which part of the detection is fully automated and which is manually complemented.