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“Assessing extreme total water levels across Europe for large-scale coastal flood analysis”

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Reviewer Summary

This manuscript presents a high-resolution hindcast of Total Water Level (TWL) for Europe, addressing an important and often overlooked aspect of coastal hazard assessment, the contribution of wave-driven processes to TWL. The authors describe multiple approaches for deriving wave setup and evaluate their influence on flood extent, representing a meaningful advancement over methods that either omit wave contributions or approximate them coarsely.

In addition, they are very thorough in assessing the impacts of different components and how they are created. e.g. variable POT thresholds to capture, 1, 2 or 3 events per year. They also clearly show the uncertainty around the different components.

The methodology for constructing the individual TWL components appears well-conceived, the manuscript is clearly written, and the effort invested is evident throughout. The authors also clearly highlight the limitations in their approach, e.g. variability of coastlines and how their approach could be improved in future works.

I recommend acceptance subject to minor revisions, as detailed below.

Comments

1. Linear summation of TWL components

While the individual component datasets appear robustly constructed and are validated in the hindcast context, the linear summation approach used to combine them warrants further discussion. The authors acknowledge this but then do not really consider any other approaches for constructing TWL in such contexts, including joint probability analysis of tide and surge, or the use of derived metrics such as skew surge, which better captures the statistical dependence between tidal phase and surge magnitude. A reasoning why they did not use these approaches would be beneficial.

2. Length of the results section

The results section is lengthy and could benefit from condensation. The authors may wish to consider whether even more material could be moved to supplementary information without diminishing the paper.

3. Downscaling/Interpolation of components

The authors state that the nearest grid point was assigned for each CTP for some variables and for others hourly time series were “obtained”. A clearer explanation of how the datasets were downscaled/interpolated or why they used nearest neighbour is needed.

4. Issue with Figure

Figure 2: it’s hard to see the different time series for each location across all the parameters particularly Tide and TWL.