

## ***Interactive comment on “Wave height return periods from combined measurement–model data: A Baltic Sea case study” by Jan-Victor Björkqvist et al.***

### **Anonymous Referee #2**

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The manuscript that the authors presented is overall well written and discuss an interesting and important issue of how to compare and combine model and observational data. Further the authors use this new combined dataset to investigate return values of extreme significant wave heights in the northern Baltic Sea. I generally recommend this manuscript for publication after minor revision, I would like to encourage the authors to address the following comments.

Comments on the homogeneity of the new combined datasets.

The authors stated that they construct a time series of two hindcast simulation and one observational dataset. To account for the different variability in the datasets they us-

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ing a low pass filter for the observation and adding variability to the model data. They analyse and discuss the different methods and the results. I would suggest that combining datasets from different hindcasts, with different atmospheric forcing and different temporal resolution should lead to some inhomogeneity. The authors stated that there is some kind of trade-off between homogeneity and preserving the “true” wave field when merging observations and model data. The manuscript would benefit to also discuss possible effects of combining different models datasets to the analysis of extreme values.

If correctly understand, the two data series marked with WAM and SWAN only differ between the period 1979-2010 (30 out of 55 years). On one hand, the results of the return period differ quite a bit (especially using the GEV), on the other hand, some results seem to have almost no difference. Is there any explanation of these different outcomes? Could it be the one model dominates the distribution?

#### Technical comments

There is a discrepancy between the time series plotted in Figure 5, the text in section 4.2 and the colour coding in Figure 6. Whereas it is described and visible in Figure 5 that the model overestimates the observations, the coloured squares in Figure 6 indicate higher wave height for the observations (orange (8-9m) square over yellow (7-8m) area). Also, it is stated that large parts of the Bothnian Sea show a significant wave height above 8m, but the orange to red area in Figure 6 is about a third to a quarter of the Bothnian Sea area. On the other hand, it is stated that the maximum in the Bothnian Bay is above 6m, which is confirmed by the image.

The titles of the four panels in Figure 7 show two times “SWAN-X2” and two times “SWAN-filtered”. If this is correct it is at least confusing for the reader as I would expect filtered vs X2 and annual maxima vs POT. Also it is not mentioned which buoy is represented in the Figure 7, Bothnian Sea buoy or Finngrundet buoy.

Finally, probably “:5(216)” are missing at the end of the DOI for reference Forristall et

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al. 1994, DOI [https://doi.org/10.1061/\(ASCE\)0733-950X\(1996\)122:5\(216\)](https://doi.org/10.1061/(ASCE)0733-950X(1996)122:5(216))

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