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Interactive comment on “Use of historical information in extreme surge frequency estimation: case of the marine flooding on the La Rochelle site in France” by Y. Hamdi et al.

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General comments

The present paper addresses a very important and classical issue: handling the inevitably scarcity of data for extreme value analysis by extending the dataset for extrapolation through historical information. Use of historical information in extreme value analysis has already been addressed by several papers cited by the authors, mostly in hydrology. With regard to meteo-oceanic and more particularly surge hazard, the literature is poorer; hence the interest of this.

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The paper thus presents a tool, or rather two models, that could be of great interest to academics but also and mostly to engineers in charge of the safety of nuclear plants, inhabitants, coastal structures and so on.

Two referees have already made in-depth reviews with many relevant comments, remarks and suggestions. I have access to the main author's point-to-point reply but not to the revised manuscript. Consequently, while fully agreeing with the previous referees reports, I will limit myself to remarks that I have not found in those.

Specific comments

Another means of extending the dataset of local systematic measurements is the spatial analysis. With regard to extreme surges on the French Atlantic coast, see for instance Bernardara et al (2011), Wess and Bernardara (2013) and Weiss et al (2014) that should be cited.

I fully agree with referee #1 that the current notations make the manuscript quite tough to read. Changes such as those he suggested would be very helpful for the reader.

In the introduction, the presentation of BMH and POTH models (p 5651) could (should?) be clearer. The concept of a threshold of perception in a block maxima context might be confusing for the reader, so improved clarity on that sub-section would help. Also, regarding the POTH model, Hmax and OTS data should be better explained. Is there really a difference with exceedances of a threshold of perception used for BMH model? Maybe it would be clearer to present, first the different types of historical data (regardless of the use that will be made of it), then the two different approaches.

Confidence intervals are computed by the Delta method. This is rather common; nonetheless it has the significant drawback of yielding symmetric ICs and lower bounds decreasing with the return period. This is quite worrisome when dealing with very large return periods and outliers. Alternative methods such as parametric bootstrap avoid

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this problem. So discussing of the narrowing of the ICs should be made with care (section 5.2), even though the trend remains significant.

The threshold for POT model is noted u_s . The notation for threshold is usually u , but the notation u_s has been introduced by Bernardara et al. (2014). It stands for “statistical threshold”, in opposition to the “physical threshold” u_p that is used for storm/event identification from the time series. If this notation refers to this, a citation would be needed. Unless the “s” subscript stands for “systematic”?

Technical corrections

1. p 5649, l.2: five plants are located on the Atlantic coast (including the Channel): Blayais, Flamanville, Penly, Paluel, Gravelines.
2. If I am not mistaken, the log-likelihood for the BMH in section 3.1.2 (eq 13) does not mention the e systematic data above the threshold of perception S_t , that are accounted for in the second term. Still, only “exact known historic” is mentioned. To be corrected? Also it is not mentioned in the first line of p 5660 (“the k historical surges above the threshold of perception”).
3. p 5652, l. 15 and 17: “compute of empirical probabilities” -> “compute empirical probabilities”
4. p 56652, l. 23: what is “TMP”? Shouldn't it be “BMH”?
5. p 5664, l. 27: “one extreme event happened” -> “one extreme event that happened”
6. p. 5667, l. 10: “The packages . . . was used” -> “were used”
7. p. 5674, Acknowledgements: “Frank Mazas” -> “Franck Mazas”

References

Bernardara, P., Andreewsky, M., Benoit, M., 2011. Application of regional frequency analysis to the estimation of extreme storm surges. Journal of Geophysical Research

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