Nat. Hazards Earth Syst. Sci. Discuss.,
doi:10.5194/nhess-2016-378-RC1, 2017

Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Homogenous regions based on extremogram for regional frequency analysis of extreme skew storm surges" *by* Marc Andreewsky et al.

Anonymous Referee #1

Received and published: 7 May 2017

This interesting paper illustrates a methodology for local extreme value analysis using Regional Frequency Analysis (RFA). The technique, given a certain location (let's call it A), identifies a region characterized by the same typology of the extremes and statistically homogeneous, then estimates the return levels of the location of interest as a function of the extremes of the whole area, increasing the sample size and decreasing the uncertainty of the fit. This technique is general, and can be in principle applied to any variable. Here it has been applied by the authors to the skew storm surges.

The identifications of areas of homogeneity of the extremes is an important problem, and this study surely represents an interesting contribution to this topic. I recommend this manuscript for publication after minor revisions.

A limitation I see in this technique is that the extremes hitting locations very close to location A are likely generated by the same events hitting also A, and so add little knowledge. On the other hand, locations far from A (or better, with an extremogram coefficient close to the threshold) are probably hit by many extreme events that do not hit location A, but that are also related with other climates, and therefore it is questionable if we can use them to enlarge the sample of location A.

Anyway I think the advantages of this technique overcome the limitations, also considering that the return levels in specific locations are often very uncertain due to very scant local statistics.

Follows a list of specific comments:

-> In my opinion the word "extremogram" should be defined more clearly. The authors should state that it is a sort of "graph" illustrating the similarity between the extremes of location A and other locations, by means of a measure called extremogram coefficient. I would suggest to give a very synthetic explanation also in the abstract.

-> line 26, pg 1: I would write "... is often too low to obtain accurate estimations of the return levels (associated ..."

-> Eq. 1: the meaning of the superscript -1 is unclear.

-> Eq. 2: this formula is rather unclear to me. What does the "I" in the sums represent? Is this rho the number of peak over threshold occurring in both locations divided by the size of the POT at location A? I would suggest to clarify.

-> line 31, pg 6: lambda == 1: isn't this number of events per year too low? Considering a few events per year would increase the sample, and would be in most cases fitted correctly by a GPD.

-> line 32, pg 6: "is carried out".

-> same line: isn't the KS test too strict? The statistics of the extremes will likely be

slightly different in different locations, due to local conditions, say, of a few percent, much less than the uncertainty in the return levels. But as the sample would increase, the KS test would unavoidably fail beyond whatever risk level, just because the two distributions are slightly different.

-> Figure 1: in the map the names of the locations often overlap. Consider increasing the size of the map, or numbering the locations in the table.

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