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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Technical Note: Design flood under hydrological uncertainty" *by* Anna Botto et al.

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The paper "Technical Note: Design flood under hydrological uncertainty" by Botto et al., shows how to quickly find an estimate of hydrologic uncertainty to be added to classical statistical inference for the design flood. The paper is well written and is rather complete in all its sections, and it has the potential to be extremely useful for practitioners and engineers. I believe it is suitable for the publication in HESS as a technical note after some minor improvements, essentially due to miscommunicated reasonings, which, in my view, the authors might consider to take into account. Finally, I think there is enough material for another paper here, so I encourage the authors to consider deepening the analysis in the future, in order to find operational ranges and domains with real world data too, since the presented practical method needs to be as much robust as possible. For instance, an idea could be to extended the presented method using

regional flood frequency analysis, in order to overcome possible unsuitability of the presented procedure in data scarce regions.

Minor comments

1. The authors report that the parameters c and d are site-specific and controlled by topography and land use among others. These two parameters control the magnitude of the total cost function, and, ultimately, the design flood, but in most cases collecting cost data can be a cumbersome process, as they are usually unavailable. As far as I understood, the calibration of the empirical law (Eq. 5) does not need the knowledge of either c or d, so that the resulting coefficients a_0, a_1, a_2, are rather general and independent from a specific site. Is it? Can the coefficients in Table 1 be used without any restriction on the location? I think the authors should address better the following thoughts:

    a) what is the role of the two parameters c and d, how do they transfer their informations about site-specific cost rates to the parameters a_0, a_1, a_2, if any;

    b) or, is this transferring perhaps delivered by the parameters of the flood frequency curve only?;

    c) are the parameters a_0, a_1, a_2 general (independent by site, computed once and for all) or, perhaps, does the end-user have to fit the empirical law when needed on a specific site? If so, it would be useful to have a general point-by-point procedure, like an algorithm, to let the end-user implement it on a specific dataset or location;

    d I think the same sentence L20-23 P1 of supplementary material can be included into the manuscript, or at least the authors should mention exhaustively about the choice of such empirical expression for y.

2. The authors should consider to report the accuracy of the fitted empirical law in the body of the text too, at least for LN3 and GEV distributions.

3. In my view there is ambiguity in the mathematical notation between exact UNCODE solution Q_T^* and predicted (approximated) UNCODE, which is reported with the same variable Q_T^*. The authors might consider to change notation on one of the two, indeed the approximated UNCODE introduces one more source of error brought by the selected empirical law y.

4. L19 P3. The sentence in parentheses is put aside the main sentence, but I think it is rather important for the reader to know that regional analyses can be used where there is lack of data. The author should consider to expand the reasoning here, without parentheses.

Notes and misspellings

1. I agree with reviewer 1, I would remove the citation Botto et al., 2014 from the abstract to let it be more general.

2. L5 P3. Replace “methods” with “method”.

3. L27 P3. I would add the range of variation of the index j, so “The coefficients a_j” will be “The coefficients a_j with $j = 0, 1, 2$”.

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