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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Comparative study of flood projections under the climate scenarios: links with sampling schemes, probability distribution models, and return level concepts" *by* Lingqi Li et al.

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The paper discusses the estimation of flood return levels in the nonstationary context and applies the ENE (Expected Number of Exceedances) concept for both block maxima and Peak Over Thresholds approaches. It is an interesting, well presented and documented study using pertinent methodologies. The flow data used for the application extend over the period 1960-2009, which leads to 50 annual maxima, which is good but not perfect for a robust statistical fitting. Could you argue why other distributions than the asymptotic limit GEV distributions are considered for fitting annual maxima?

LP3 is pointed as the best choice, but it is the one with the largest standard errors on the parameter estimations in the stationarity case Concerning the POT approach, in theory, under stationary conditions, the return levels should be the same whatever the approach used to estimate them, which is the case here if we compare POT2 and GEV with their confidence intervals (which are larger for GEV because the fitting is made with less values). I have questions concerning the POT approach: Threshold choice: there are some rules to choose a convenient threshold for the POT estimation, based on the mean excess plot and/or the constancy of the shape and modified scale parameters. Considering the very different results obtained with POT4 compared to POT2 or 3 (and GEV), it is doubtful that the threshold used for POT4 is a convenient threshold Seasonality: the threshold exceedances have to be independent (which is correctly dealt with in the excesses selection) and identically distributed. This second condition is not considered here, but may not be straightforward for environmental variables, because of seasonality and possibly inter-annual variability. Regardless of inter-annual variability, is there a preferred season for the occurrence of floods in this basin? If so, then it may be necessary to restrict the analysis to this season. This has an impact on the estimated Poisson intensity. The Poisson process however does not need to be homogeneous, when nonstationarity is introduced, it is a non-homogeneous Poisson process. Arrival rate: the use of a Negative Binomial is interesting, but it brings one more parameter to estimate with still quite few values. Could you discriminate the advantage brought by this approach compared to this necessity to estimate another parameter? Then the sensitivity analysis is very interesting, as well as the variations in return levels induced by the separate increases of Ptotal and Tmean. It could be much more informative if a choice had been done previously of the best model for the estimation.

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