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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Estimating high quantiles of extreme flood heights in the lower Limpopo River basin of Mozambique using model based Bayesian approach" *by* D. Maposa et al.

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The authors are comparing here two different estimation methods (Bayesian estimate and MLE estimate) of the flood frequency curve (in water levels) for the Limpopo River. In the current form, the manuscript needs a considerable amount of changes and improvements to consider its publication in NHESS.

General Issues:

Science question and take home message - The scientific relevance of the results presented in the manuscript are unfortunately not sufficient for publication. The authors

are only applying two of the already existent (and well established) methods in parameter estimation for the GEV distribution. Besides, I strongly disagree with the main conclusion that the authors present. Namely, one cannot argue that the Bayesian approach "improves" the estimates for extreme water levels, as compared with the MLE approach only because they are larger. I presume that applying the method of moments will even lead to higher estimates, due to the outlier of the year 2000, and that does not mean it is better, it just means it is more sensitive to extreme extremes. If the authors want to publish this "difference" in estimates, they should e.g. find the reason for this difference. Is it mainly due to the outlier of year 2000? Does this also happen at a regional scale (check if in streamgauges nearby Bayesian systematically gives higher estimates)? Or maybe the authors can give another, perspective, and perform a (very) short flood risk analysis and consider the implications for flood design in e.g. hydraulic structures using one or the other method. But the fact is that I don't entirely understand why the two different methods lead to different results - see next point

Bayesian vs MLE - If I understand correctly you are using the Bayesian MCMC method to estimate numerically the posterior distribution of the parameters. It is not explicitly stated in the manuscript, but I presume an improper flat prior is used. In this case, the posterior distribution is purely proportional to the likelihood function. If this is the case, the mode of the posterior distribution should give the same estimates as the MLE approach. In case the authors choose to evaluate the mean or median of the posterior distribution they should state this, as it is not standard. This could lead indeed to different estimates but, I am purely speculating here, they should not be so extremely diverse, because skewness of the likelihood function is usually low. I would suggest the reviewers to take a deep read to [Viglione, A., R. Merz, J. L. Salinas, and G. Blöschl (2013), Flood frequency hydrology: 3. A Bayesian analysis, Water Resour. Res., 49, doi:10.1029/2011WR010782.], as many of this issues are addressed here. Besides Viglione et al. 2013, other necessary References are

Martins, E., and J. R. Stedinger (2000), Generalized maximum-likelihood generalized

extreme-value quantile estimators for hydrologic data, Water Resour. Res., 36(3), 737–744, doi:10.1029/1999WR900330.

Martins, E., and J. R. Stedinger (2001), Historical information in a general- ized maximum likelihood framework with partial duration and annual maximum series, Water Resour. Res., 37(10), 2559–2567.

Gaume, E., L. Gaal, A. Viglione, J. Szolgay, S. Kohnova, and G. Blöschl (2010), Bayesian MCMC approach to regional flood frequency analyses involving extraordinary flood events at ungauged sites, J. Hydrol., 394, 101–117, doi:10.1016/j.jhydrol.2010.01.008.

Specific issues:

Last sentence of Abstract is trivial [, which implies....]

Avoid the expression "had a return period in excess of XXX years", use "had a return of XXX years"

page 5402 Line 21 [The hydrology...] to page 5403 line 8 should go to section 2, new subsection defining the case study.

page 5405, lines 4 to 8, irrelevant to list all the distributions.

page 5405, line 19 to page 5406 line 3, trivial to 99.99% of the readers.

I would finish the introduction with page 5405, line 15-18, so I would move page 5406 lines 4-26 before this (and also explain here shortly the MCMC approach).

Page 5407, sect 2.2 trivial, I would substitute this section with the basics of the MLE approach, which is missing in the manuscript

Page 5409, a mention to the prior distribution used is needed here.

Plots - I would like to see the two different flood frequency curves in the same plot, to ease the comparison

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 2, 5401, 2014.