Hydrol. Earth Syst. Sci. Discuss., 7, C2543–C2545, 2010
www.hydrol-earth-syst-sci-discuss.net/7/C2543/2010/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Estimation of high return period flood quantiles using additional non-systematic information with upper bounded statistical models" *by* B. A. Botero and F. Francés

B. A. Botero and F. Francés

ffrances@hma.upv.es

Received and published: 29 September 2010

Reaction to new comment on 9, page 5416:

I don't agree with referee#1: this sentence IS essential in our work. So, we can modulate the strength of our affirmation, but we cannot eliminate it. Concerning the supporting of this idea, referee must see our figure 5, our comment in the previous reply and the next comments.

Referee#1 introduces a new and pertinent (I was expecting it from any referee!) idea against the use of upper bounded distributions: central limit theorem and extreme-

value theory. Of course he is right in the sense extreme-value theory gives statistically (at the end, physically) arguments to use classical extreme value distributions (EV), which are upper unbounded for positive skewness coefficients. But we cannot forget these distributions are LIMITING functions. I.e., for limited parent samples they are just good approximations and not the exact distributions of the sample mean and sample maximum, respectively. In particular, if the random variable of interest is the annual maximum flow, the sample from the parent population (continuous flows through the year) cannot be considered as a very large INDEPENDENT sample.

It is true the central limit theorem and extreme-value theory is applicable also for UPPER BOUNDED parent populations. But in this case, the normality of the distribution of the sample mean or the use of an EV for the annual maxima will introduce significant errors if we are interested on quantiles located in the right tail. Very easy: because sample mean quantiles and annual maximum quantiles cannot be bigger than the upper bound of the parent population. Or in other words, if our quantile estimated using an unbounded distribution (Normal or EV, respectively) is bigger than the parent population upper bound, the error must be significant. And sample mean and sample maximum have the same upper bound than the parent population! It is true that for a given probability (or return period) the quantile error will decrease as the independent sample increase. In the limit (infinite sample size) there is no error, because the limiting distributions will collapse to Dirac deltas, located on the population mean and the upper bound respectively. But the sample size is given (one year for annual maximum) and we cannot change it.

And this is the reason why in our Figure 5 the TCEV has significant errors for 10 000 years return period quantiles (but only with very high skewness coefficient) and the GEV for any high return period quantile and both skewness coefficient scenarios.

We will add all these new comments in the Introduction and/or in the Robustness Analysis and/or Conclusions.

Reaction to new comment on line 5, page 5421:

Concerning “years without information”, it depends. If there is no information during some years of the non-systematic period (historical or palaeoflood), it will be usually because the flood was below the threshold level of perception and, therefore, they must be considered as UB data. But I think, the referee#1 is pointing at the case “we don’t know what happened”. In this case, the solution is the same than we traditionally do when dealing with the systematic record: do nothing and assume there is not a bias to miss the very high floods or very low ones. Very rare for historical information, but it can happen for example with slackwater deposits (a big flood can remove evidences of previous ones). But this is the reason palaeoflood studies look for information in more than one location, in order to reduce the possibility of missing floods over the threshold level of perception. In any case, information errors will increase estimation uncertainty.

Concerning “data dating”, if the process is stationary (in our paper, parameters don’t have the subindex indicating year) there is no need for an exact dating (only to determine the length of the non-systematic period). On the opposite, if the process is non stationary, it will be crucial to date all information. But this is another story under research.

Interesting questions and both should be answered also in the final version.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 5413, 2010.