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Hydrology and Earth System Sciences Discussions

Interactive comment on "Improving pan-european hydrological simulation of extreme events through statistical bias correction of RCM-driven climate simulations" *by* R. Rojas et al.

Anonymous Referee #3

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General Comments

The publication is well written, though lengthy at times and repetitive in some places. It is an interesting piece of work with extensive diagrams and analysis, though in some places long winded . It is suggested that the paper might be split into two papers, on to look at the bias correction of the data sets and discuss the various aspects, the second on the use of this data set in conjunction with LISFLOOD and more importantly the effect of climate change on extreme events as the paper suggests. Some of the diagrams are very small and difficult to read, the space on the pages is not used effectively, the

axis on the return period plots not used efficiently to display the spread of the data.

The previous reviewers have commented on a number of issues in particular in terms of technical corrections and these shall not be repeated here any further, I concur in particular with comments made on validation of the hydrological model and concerns about the discrepancies of the percentages (Table 3).

Specific comments

The authors have decided to use a Gumbel Distribution instead of the GEV distribution or a combinations of both. They argue that this results in a reduction in terms of uncertainty. Using the GEV simply adds another degree of freedom to the fitting of the distribution, which is not necessarily an increase in uncertainty. Even though that Dankers and Feyen (2008) showed that neither of the GEV or Gumbel function is preferable over the other, this doesn't justify using only one.

I don't understand Figure 10 and don't believe the r2 values if they are Nash-Sutcliffe, if they are simple correlation coefficients on the annual average discharges, the correlation still seems to be very high, what is EF.

Figure 11 is of limited value in its present form, as the fit between observed and simulated values is not displayed in such a way that it is visible. I don't see the reason for plotting the biased values here, it is clear from the previous section that these will display dramatic differences compared to the observed values. In some instances the fit between the simulated and observed discharges (n.b. they are either levels or discharges, not both) is very poor (Guadiana, Danube, Themse, Nemunas, Daugava, Garonne, Rhone, Ebro, Kenijoki, Duero). A considerable number of the streams modelled in this study are in fact man controlled and thus the extreme discharges cannot be replicated without implementing the control strategy for the basin. This would obviously go beyond the scope of the study, however it is not mentioned and the way the diagrams are laid out could suggest that the poor fit in terms of extremes is deliberately hidden by the authors. I don't see the quality of fit as a major issue if it is acknowl-

edged and relevant suggestions are made. Another point I find strange is the number of observed values in figure 10 and the return period of the largest value. If these are observed values and the data series are more extensive than the modelling period, then only values from within the modelling period should be used. For most large European basins the assumption of stationarity is definitely not valid over a longer time scale. Also plotting values up to return periods of 1 in 1000 are questionable based on data covering 30 years.

I am not entirely sure what Figure 12 adds to the paper, surely the reader does understand by now, (if not already before reading this paper), that the use of uncorrected climate variations will result in considerable errors on both over and under estimation of average and extreme runoff values. Instead additional detail on the changes of extremes would be suitable such as looking at different return period events, e.g. 25 year versus 100 year.

Technical corrections

Page 3894 top, should this be wet days per month, per season or per year?

Figures 2, 4 5 & 6 are far too small to be readable and appreciated by the reader.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 3883, 2011.