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Hydrology and Earth System Sciences Discussions

Interactive comment on "Recent floods in the Middle Ebro River, Spain: hydrometeorological aspects and floodplain management" *by* S. Domenech et al.

Anonymous Referee #3

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General comments:

This paper presents a study of flood regime changes in the middle Ebro river basin in Spain. The main reason for this temporal change is the construction of reservoirs. The paper describes the hydrometeorological behaviour of the basin and a detailed evolution of the recent floods in February 2003 and March-April 2007. The study is based on the analysis of the number of days with a ratio between peak discharge and mean annual discharge over a threshold.

The paper is not scientific based and there are not references to another methodologies

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Interactive Discussion
Discussion Paper

applied to the analysis of temporal trends of floods. Firstly, discharges series in gage stations without any upstream reservoir should be analyzed to identify temporal trends in natural precipitations and floods. Then, influence of construction of reservoirs in peak and mean annual discharges must be analyzed and this is not an easy task, because of reservoir operation rules change in time and demands increase with the subsequently increase of the intercepted water volume by a reservoir in a year. In addition, the Ebro basin is a very complex system with multiple cascade reservoirs, as it is stated in the last paragraph of the paper. But in this paper, that complex problem has been simplified by a ratio between the peak and the mean annual discharge, while their changes by reservoir management have not been studied, and that ratio is not justified by references to other published papers. Changes in the flood regime are due to the increasing number of reservoirs, but these reservoirs are not described and their management rules are not presented. Temporal trends are identified sorting the data in three temporal series, the last one with a length of ten years. An increasing trend is identified from this very short length and is proved by two floods occurred in that period, ignoring the natural variability of climate and floods.

It is concluded that flood seasonality has changed, but a seasonal analysis of floods has not been carried out. It concludes that the number of high waters has been reduced, but a hydrological analysis has not been made and a threshold to identify a flood as a high water has not been selected. A POT analysis should be carried out to identify these temporal trends.

In conclusion, this paper is very weak. Hydrological techniques have not been used. Statistical techniques have been used without justification. The proposed methodology has not any reference to hydrological literature. A revision of the state of the art should be carried out. As it is said in the last paragraph, this paper gives an overview of the problem and a real research work must be carried out in the future. But a paper published in an international journal like HESS can not be an overview.

Specific comments:

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P. 5940. The main objective of the paper is to identify temporal trends of floods. An exhaustive revision of methodologies used in this field must be included in the introduction.

P. 5941, L. 19. The annual mean discharge is not a robust measure in the case of the number of reservoirs increases during the period of recorded data. In addition, the contributions presented in Fig. 3 do not take into account the water volume stored in the upstream reservoirs, as shown in Fig. 9.

P. 5942. The methodology chapter is supposed to include the scientific basis of the study. A simple review of available data and tools is presented. There is not any description of the proposed methodology. Description of statistical techniques and references to other methodologies must be included.

P. 5945, L. 8. Flood frequency curves in Zaragoza and Castejon gages should be included. The method used to obtain the return periods for the floods included in Table 1 must be described. What is the length of the series?

P. 5945, L. 19. Importance of a flood is set by the ratio between peak discharge and mean annual discharge. This assumption is arguable. Reservoirs modify flood regime and peak and mean annual discharges are changed. Does that ratio keep constant? This is a very complex task and has been solved by an unjustified ratio.

P. 5947, L. 2. The February 2003 flood is assigned a return period of 10.9 years in Castejon (Table 1), so it can not be named as a historical flood.

P. 5947 L. 18. Return periods have been estimated by the fit of a Gumbel distribution. There should be a description of the selection of that distribution of two parameters over other distributions of three parameters like Generalized Extreme Distribution of Log-Pearson Type III.

P. 5949, L. 14. Where is the statistical study of seasonality? Which methodology has been used?

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P. 5949, L. 19. The Spearman's rho correlation measure has been used to identify trends. This statistical measure should be described.

P. 5949, L. 23. Most of reservoirs were constructed before 1960, but operation strategies of the dams can have changed in time and water demands can have increased. Volume of water accumulated in the reservoir during each year must be shown in addition to the reservoir capacity in Figure 9.

P. 5950, L. 10. Temporal trends are usually identified by the cumulated peak discharge over time. Natural variability of floods can yield to wrong results in a plot like that of the Figure 10. It should be changed.

P. 5950, L. 25. Flood frequency trends are analyzed by the number of days exceeding a threshold, based on the ratio between peak and mean annual discharges. Firstly, the selection of a ratio equal to three must be justified, why not two or four? In addition, changes in temporal trends in a basin with reservoirs should be carried out from precipitation data.

P. 5951, L. 7. A temporal trend can not be identified from a period of two years, it could be due to temporal variability.

P. 5951, L. 18. Changes in the seasonality must be analyzed by traditional methodologies collected in the scientific hydrological literature.

P. 5954, L. 13. Effects of reservoir management over hydrographs shape must be analyzed over a greater ser of hydrographs, not only four.

P. 5956, L. 10. Temporal trends can not be identified from short records as ten years.

P. 5956. L. 15. Reduction of the number of floods must be analyzed by hydrological techniques like POT analysis. Conclusions about the effect of reservoirs over the hydrograph shapes have been made from only four hydrographs.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 5937, 2009.