

## ***Interactive comment on “Regionalised spatiotemporal rainfall and temperature models for flood studies in the Basque Country, Spain” by P. Cowpertwait et al.***

### **Anonymous Referee #1**

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**GENERAL COMMENTS** The authors present two stochastic models for synthetic generation of spatial-temporal rainfall and temperature fields in three distinct regions of the Basque Country. Their emphasis is on flood studies in regions where historical records of flood discharge need an extension through rainfall-runoff modelling. The paper discusses model formulation and parameter fitting and presents and application to the Urola catchment case study.

The topic is relevant for the audience of Hydrology and Earth System Science, the objectives are clearly identified, the methodology for the analysis is adequate and the

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conclusions are relevant and correctly supported by the results and discussion. The rainfall and temperature models show excellent behaviour in reproducing observed mean statistics and there is a good agreement between the distributions of observed and simulated flood flows in the case study. Therefore, I believe the paper deserves publication in Hydrological Processes.

SPECIFIC COMMENTS I also think that there are several aspects of the paper that deserve a deeper discussion, such as the following:

a) On page 10374 (lines 20 to 22) the authors state that 73% of the rainfall data were missing over the period 1041-2010, and that one aspect of the project was to provide a model for infilling the missing data. Does that mean that the fitted stochastic rainfall model was used to fill the gaps in the dataset? How was that done? Or was another model developed to fill the gaps, and then the completed series was used to fit the stochastic rainfall model?. If this is the case, how were the gaps filled?. This aspect should be discussed properly.

b) The emphasis of the paper is on flood studies, and therefore, maximum rainfall values are of interest. How does the model reproduce the rainfall extreme values? I think the paper would benefit from a comparison between the distribution of annual maxima of daily rainfall in simulated and observed series.

c) I am a bit confused with the presentation of the calibration of the rainfall-runoff model Tetis. It is stated that the model is intended for continuous operation, and the model is indeed run continuously for the Urola catchment for a period of 500 years. However, the calibration is only performed over a selection of 13 events. How was the model initialized in these 13 events during calibration? How does one guarantee that the models performs adequately the moisture accounting between storms?

d) The authors refer to the paper by Velez et al. (HESS 13, 229-246, 2009), where a calibration of the Tetis model was performed for all basins in the Basque Country. The Urola basin is included among those analyzed by Velez et al., 2009. It would be

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interesting to see a comparison of the correction factors found in this work with those found by Velez et al., 2009, since both works have different emphasis (flood analysis in this study and water resources in Velez et al., 2009).

**TECHNICAL CORRECTIONS** From the formal standpoint, the paper is well written, correctly organized and adequately illustrated with tables and figures. Although I am not a native English speaker, I believe the following expressions contain typographical errors that should be corrected:

On page 10367, line 6, ...that are too coarse for the intended application... (coarse?).  
On page 10371, line 8, ...do not need to fitted separately. (be fitted?). On page 10376, line 4, ...each month to gives twelve estimates... (to give twelve?) On page 10379, line 27, ...temporal parameter estimates obtain in Step 1 of the ... (obtained in Step 1?)  
On page 10381, line 16, ...where t is time measure in days and ... (time measured in days?) On page 10383, line 21, ..., and the daily rainfall Table 5).... (daily rainfall (Table 5)?)

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