**Hydrology and Earth System Sciences Discussions**

Interactive Comment

# *Interactive comment on* "Multi-criteria assessment of the Representative Elementary Watershed approach on the Donga catchment (Benin) using a downward approach of model complexity" *by* N. Varado et al.

**N. Varado et al.**

One can imagine that I was a bit upset by the referee comment.
The answer to the reviewer question "what was the science question" and why the modelling was perform is given in the answer to General comment to referee G. Zhang.
But, it's probably true that the objectives of the paper need to be clarified and disconnected from the whole AMMA project objectives.
Nevertheless, I want to lay emphasis on the fact that my job was the first on this catchment and that the modelling exercise has been undertaken before all the data were available. As soon as new data are available, we understand many more things than when we started the simulations. We must remind that the experimental set up was

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designed with application of the REW model in mind in a first step. In a second step, the modelling work presented in the paper helped in designing new experimentation as soon as something was confusing in the results (mainly for the contribution of groundwater and the importance of quantitative measures of evapotranspiration).

The objective of the study was to focus on the model and the way to validate it, to understand how to improve its structure, from what we know of the catchment behaviour. Referee 5 argues that many other models would have provided similar fits with the data. We do not contest this opinion. However, if the exercise is only to calibrate a model as a black box to reproduce discharge, little can be learned about active processes. And the predictive power of the model is not proven, especially in the AMMA context of rapid change in land use and climate. The study we performed showed that the initial hypothesis, i.e. a high contribution of deep groundwater to the stream flow was erroneous. It will help improving the representation of this catchment behaviour and ends up with more robust simulations, which could be used with more confidence for predictive purpose. We also showed that the REW approach could help in writing subbassin scale equation, even if not every thing is solved by this approach.

Focusing on the hydrogeology of the catchment was not the objective, as a huge hydrogeological survey would be needed and was not (and is still not) available.

Finally Referee 5 mentions the multi-objective approach. It is of course one of the main interests of the results presented in the paper, as we tried to show how the model was working on other variables than discharge. However, the multi-objective evaluation remained qualitative as the uncertainty in the data (wells height) was high due to human extraction and soil moisture data were only available after the studied period. However, these data were relevant to qualify the simulated dynamics and accept or reject functioning hypothesis.

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