

## ***Interactive comment on “Robust global sensitivity analysis of a river management model” by L. J. M. Peeters et al.***

### **Anonymous Referee #1**

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This manuscript applies a density-based sensitivity analysis to an idealised river management model. The case study investigates the effects of variations in the forcing data (the inflow, precipitation data and potential evapotranspiration) on several output variables. Overall the paper is well written and all the figures and tables are well presented. However, I believe that major revisions are needed to the paper before it is accepted for publication.

#### General Comments

My main concern is a lack of a research/scientific question presented in the paper and I struggled to see the wider application of the results. For me, the contribution of the paper is a sensitivity analysis of the river management model, however for this to be

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relevant and useful for the wider scientific community the paper should include a sensitivity analysis of both the model parameters and the driving forces. At the moment, the model results are very much based on the model parameters used in the study and could change significantly if you were to vary the model parameters as well. This limits the wider applicability of the results found in this paper.

Moreover, there is a distinct lack of description of both the model and the data. Although the sensitivity analysis was well described, there was little to no description of how the model was set up, calibrated or how well the model performed. As the model and the data are the two major components of the study, it made it quite difficult to review and comment on the results and conclusions from the paper as the modelling process was not clear.

#### Specific Comments

1. In general there needs to be a greater discussion of the model including how it was set up and calibrated - the reference provided was not a sufficient description of the model. Here are my suggestions to improve this :

a) It would be good to have a schematic of the model as one of the figures. It would provide some context to the model and make it easier to understand when you are describing it in section 3.

b) Why have you decided to use this model? Do other researchers use it? What can other scientists learn from applying a sensitivity analysis to this model? Moreover, why did you decide to use the simplified version - why not use the full model version? This needs to be made clear to the reader.

c) Although the model outputs are well described, the model description needs to be more informative. What are the parameters in the model? How are these calibrated? Would the results remain unchanged with a different parameterisation?

2. As you are assessing the sensitivity in the forcing factors, I felt more information

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needed to be given for the inflow and climatic data. For example, did you use daily data? What is the total length of the time series for the climatic and inflow data? What is the quality of this data?

3. The range of multiplier for each variable described in the result section needs to be better justified – why have you chosen a range of 0.5 – 1.5? The size of your ranges can have a big impact on your results (for example see Wang et al, 2013). Generally, I think that using a multiplier is unrealistic for a weather time series and you should use a more realistic model to perturb the weather time series (for example see Baroni and Tarantola, 2014)

4. In the results section, you compare each daily time series from the changed forcing data with a randomly selected reference simulation. I have a few concerns about this. Firstly, I do not see the relevance of using a randomly selected reference simulation and this needs to be better justified - why is there no comparison with observational data? Secondly there are no screening procedures for poor model simulations and this could greatly affect the results (see Pappenberger et al, 2008 for a nice discussion of this).

5. The discussion section needs expanding with greater reference to previous works – are the results similar to what has been found in the past? What is the significant outcome?

6. In your conclusion you really need to highlight what is novel about the paper. There needs to be more to the paper than applying a well established sensitivity analysis to the model - what have you learnt and what can other researchers take away from the paper?

#### Technical Comments

1. P 3482 Line 3. 'will quickly results in' change results to result
2. P 3487 Line 25. 'are to designed to establish' remove the first to

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3. P 3491 Lines 13 – 15. This sentence does not make sense and needs rewording

4. P 3492 Line 14. 'not in the least the uncertainty' should be 'not least the uncertainty'

#### References

Baroni, G., S. Tarantola, (2014) "A General Probabilistic Framework for uncertainty and global sensitivity analysis of deterministic models: A hydrological case study." *Environmental Modelling & Software*, 51, 26-34.

Pappenberger, F., Beven, K. J., Ratto, M., and Matgen, P. (2008). "Multi-method global sensitivity analysis of flood inundation models." *Advances in Water Resources*, 31(1), 1–14.

Wang, J., Li, X., and Fang, F. (2013). "Parameter sensitivity analysis of crop growth models based on the extended Fourier Amplitude Sensitivity Test method." *Env. Mod. & Soft.*, 48, 171–182.

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