Hydrology and Earth System Sciences Discussions

Interactive comment on **"Hydrologic responses of the Zwalm catchment using the REW model: incorporating uncertainty of soil properties"** *by* **A. El Ouazzani Taibi et al.**

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We would like to thank the referee for the critical review.

- The referee stated "it is an application of the REW approach to distributed modelling".

However, the manuscript is not just an application of the REW. It also shows the use of the Monte Carlo method as a tool of handling uncertainty in model parameters (in our case Ks). Actually, uncertainty is a hot issue in the field of both surface and sub-surface hydrological modeling. The MC method is a very general method in handling uncertainty. The application of the MC method in the framework of the REW approach is new. One of the authors target is to draw the attention of the readers to the use of

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such a tool in surface hydrology within the framework of the REW approach. It can also be applied to any other hydrological model.

- The referee stated "I have serious concerns about the quality of the main contributions and the quality of the presentation".

For the best of the authors knowledge that the Monte Carlo approach used in the framework of the REW approach is original and this has not done before. The way the authors implemented the method seems simple but not low quality. It scientifically sounds because it assumes a probability density function of the saturated hydraulic conductivity and draw realizations from that distribution to feed the model and produces model output to each realization of Ks (noting that once we have generated a Ks value the whole Ks-S curve will be deferent in each realization. This means that the uncertainty in the Ks-S curve will play a role in the whole model by changing the Ks value).

Regarding the presentation, the authors have made changes (see the new manuscript).

1) This point has been done.

2) The referee stated that "Why they limit their uncertainty analysis to the hydraulic conductivity"

The authors believe that infiltration is a curial process in hydrological models to account for the model response (Runoff). Many studies (including our own) have indicated that infiltration and subsurface flow processes areăcurialăfor hydrological models (especially those physically-based models such as the REW approach based models) to simulate/predict catchment response. In such models, a key parameter is the saturated hydraulic conductivity, Ks, which determines the infiltration flux, groundwater recharge and exfiltration fluxes, and hence the runoff. As a result,ăthis workătakes it into account as a major parameter in the analysis. Second reason is that in this manuscript the authors tried to describe the methodology that may be extended in the future to

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handle many uncertain parameters. Third reason is that the data available enables us to handle only the uncertainty in Ks. The authors wanted to emphasize that the approach is not sensitivity and it is uncertainty. This is because in the sensitivity one may change parameter in a systematic way and look at results. However, in uncertainty analysis the parameters are described in probability density functions (pdf). These pdf are not always known for many parameters and need to be specified a prior and the corresponding parameters have to be estimated. Future work has to be done in this area to get pdf for atmospheric forcing etc.

3) The authors have not only make application of the REW on the Zwalm catchment there are two aspects included in the paper: the calibration procedure and the Monte Carlo uncertainty analysis. Getting bounds of uncertainty of the model output is important for itself because it provides you with the range of variability of the model output given the variability of the model input (this is one of the goals of the stochastic approach applied through Monte Carlo method. It is way to quantify uncertainty).

4) The problem of incorporating uncertainty of more parameters is related to the availability of the data. This is one of the reasons that we only considered Ks uncertainty (see point 2).

5) The authors think that they give the convening reply to the referee according their understanding of the comments. If things are not clear please let us know.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 3, 69, 2006.

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