Hydrol. Earth Syst. Sci. Discuss., 7, C4593–C4595, 2011
www.hydrol-earth-syst-sci-discuss.net/7/C4593/2011/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Hydrological real-time modeling using remote sensing data" *by* P. Meier et al.

Anonymous Referee #3

Received and published: 5 January 2011

The paper by Meier et al. is an interesting study of the application of coarse resolution soil moisture observations for hydrologic modelling. It is one of the first studies in this domain. The paper is of particular interest to the HESS audience considering the recent availability of SMOS, AMSR-E and ASCAT data and the foreseen launch of the SMAP mission. All four missions provide a similar type of observations which so far have not fully been exploited by the hydrologic community.

The results are encouraging as since 3 years data from the ASCAT mission is available. This data has a better temporal coverage and a higher quality. Especially the improved temporal sampling could have a significant positive impact. I therefore would like to encourage the authors to repeat the study with data from the ASCAT sensor in a follow

up paper. A follow up study could also investigate if a local calibration of the parameters (on a pixel or subcatchment basis) could improve the results.

Before publication in HESS following issues shall be clarified:

1. The setup of the Kalman Filter is not very clear to me. Which state variables are updated? If I understand correctly soil moisture and discharge is used. If both are used it would be interesting to see which of the two has the largest impact on the forecast. For example the model could be run with and without discharge updates.

2. Please give an explanation what deterministic and adaptive mode means.

3. What is the implication of using the SWI. The SWI is a measure of profile soil moisture which is derived from the remotely sensed surface observations using a simplified infiltration model which is characterised by the parameter T. Strictly speaking the T parameter should be calibrated like the k parameters. Also the question arises how the T parameter impacts the k parameters, clearly they are not independent. Especially in the Luangwa catchment characterised by steeper slopes and faster water flow the use of surface observation instead of the SWI could be beneficial. Also the observation that the model is not capable of correctly reproducing peak discharge could partly be explained by using the SWI. As the model to derive the SWI acts as low pass filter peaks are suppressed.

4. For the uncertainty of the BWI the authors used a number that comes from a comparison study of SWI and in-situ observations. What is the implication of doing this. The BWI is a different quantity. Mathematically it is a simple average (which should decrease the error), physically it represents a different measure (which could imply that the uncertainty measure can not directly be used). Also to my knowledge the uncertainty was derived using a different T value. Considering the criticality of uncertainty measures in the Kalman Filter I suggest to carry out a sensitivity analysis to investigate how the selected uncertainty influences the results.

5. In the results and discussion section there are several statements without further proof. E.g. the authors state on p 8820, l 20 "...the soil properties in the two catchments are similar ...", on p 8822, l 2 "...the flow is attenuated by the wetlands...". Although results of the study suggest that the statements are valid they are somewhat speculative without providing any other evidence. Either provide some evidence from an independent source or add a statement that these observations need further proof.

6. In the discussion the authors state that a better spatial and temporal resolution will greatly improve modelling efforts. I don't understand this statement in the context of this study. While the impact of a better temporal resolution is evident the impact of a better spatial resolution is not clear considering that the data is anyway average over the entire basin.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 8809, 2010.