Hydrol. Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/hess-2017-382-RC2, 2017

Hydrology and Earth System Sciences
Discussions

Interactive comment on "Time varying parameter models for catchments with land use change: the importance of model structure" *by* Sahani Pathiraja et al.

Anonymous Referee #2

Received and published: 6 September 2017

This manuscript tested a time varying model parameter framework at a river basin under significant land cover changes in the last few decades. The employed framework is based on Locally Linear Dual EnKF proposed by the authors in the previous studies and is applied to the two conceptual hydrologic models (i.e. HBV and HyMOD).

The manuscript shows interesting result and well written in general. However, I have concerns regarding practical applications of the tested approach and the objectives of this research from the following aspects.

1. In the abstract, the authors stated "rapid land use change impacts on catchment hydrology" and "therefore modeling methodology of such change is important" in the

Printer-friendly version

Discussion paper

first and second sentences. First of all, please clarify “for what purpose” such modeling representing the land cover change is thought to be needed. This could be, for example, estimating future water resources under further land cover and climate changes or identifying the physical mechanisms of the impact of land cover change on hydrology. Please explain in the introduction for what objective the authors think the modeling with time varying parameter is necessary.

2. Based on the firs point, please explain how the applied framework with the EnKF can achieve the objectives. Obviously the presented approach requires a full set of input and output to estimate the parameter changes. Suppose that this approach now successfully estimates the time-varying parameters in the HBV model, how can this information be useful for water management, given already land cover change has happened and streamflow change has been already detected in the actual catchment.

3. Related to the above point, please state clearly the main objective of this research in the introduction. Is the main objective here to test the time varying model parameter framework in the data limited catchment? In such case, what is the criteria to conclude the objective has been achieved. The EnKF may show the parameter changes, but is it enough to validate the method? Or is the main objective here to compare the two model structures?

With the above main review comments, I have the followings minor comments.

1. Abstract L18 and L57: "it serves as an effective tool for separating the influence of climatic and land use change": is this really true? As a result of the EnKF, it is possible that the both effects of land cover and climate changes may be reflected in the wrong way. Given such an ill-identified potential, please explain the logic and actual steps to distinguish the impacts of the two changes.

2. P7 L122 Subsection of "2.1 " may be eliminated because no "2.2" exists.

3. P10 L206 Is the covariance matrix (sigma) also updated in the sequential Kalman

Filter algorithm? Please clarify this part and show the equation if it is also updated.

4. P10 L218 The same comment is also applied to the Kalman gain of the model parameters.

5. P12 L261 How did you select the tuning parameter s2? The used values in this manuscript should be shown. Table 4 shows "Initial s2 (VVM)" which confuses me because I thought that s2 were set as constant value for each parameter.

6. P17 "a MASH undertaken..." Please add a brief explanation of the MASH approach.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2017-382, 2017.