Hydrology and Earth System Sciences Discussions

Interactive
Comment

Interactive comment on "Comparing model performance of two rainfall-runoff models in the Rhine basin using different atmospheric forcing data sets" *by* A. H. te Linde et al.

A. H. te Linde et al.

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The referee explains what steps would be necessary to gratify the goal to verify whether or not physically based distributed models better represent observed discharges than conceptual lumped model approaches do, as the referee states is our goal in the current paper. We show that there is an ongoing debate on this subject, but as goal of our paper we say it 'is to compare the hydrological models HBV and VIC by testing their performance for simulating historical discharge' (p. 4328, lines 14 - 15).

We will react on the specific numbered comments by the referee.

1. In line with Ref 1, Ref 2 comments that VIC is a SVATS with a focus on runoff

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processes, more than a hydrological physically based model. We fully agree on this comment and, as we said above, we will eliminate any description of VIC being a physically based model.

2. The referee suggests evaluating the model on other quantities than discharge, such as the soil moisture or the water table. We subscribe to this suggestion and wish to compare both models on other quantities in the near future. An important integrated model output is discharge, where the current paper is focused on.

3. The referee points out that the VIC model has been forced only with the re-analysis data (ERA15), which leaves out the comparison of model performance using observed values. We fully agree on this comment and already decided some weeks ago to re-run the VIC model, using CHR observed values. These new results are incorporated in the paper.

4. The referee argues that a physically based model should not be calibrated, but the parameters should refer to measures or at least to reasonable estimation. When we do not describe VIC as a physically based model in our revised paper, this comment declines. We would like to comment that even those models that are considered physically based, contain physically meaningless parameters that need calibration to improve model performance (Troy et al., 2007). All available models are still a simplification, when compared to nature's complexity (Sivakumar, 2008).

5. The referee points out that HBV is more extensively calibrated than VIC, which in his/her view disturbs an objective performance. HBV is indeed more extensively calibrated than VIC, but only with the observed CHR dataset. The model was recalibrated using the ERA15 dataset for exactly the same period as VIC.

6. The referee rightfully suggests that the poor correlation at daily basis between ERA15 and CHR could be the main reason of the poor performance of VIC, a result we also mention in our conclusion when we say that forcing data has a considerable influence on model performance, irrespectively to the type of model structure (p. 4342,

lines 22-23). A comparison of HBV-CHR and VIC-CHR is added in the reviewed version of our paper.

7. The referee suggests showing the recession limb in Fig. 3. We agree that this part of the hydrograph is important, but chose to show only the calibration period in Fig. 3, and the whole period, including recession limbs in Fig. 4. We will broaden Fig. 4 in order to improve visibility.

8. We agree and we have added discussion on the main futures of the hydrographs in Sect. 5.2.1.

9. Answer: we have computed monthly discharge by averaging the daily results.

10. We agree and have re-written the conclusions. We have added results of simulations with the VIC model, forced with CHR data. The terms physically based were removed and replaced by land surface model. The added results did not change our conclusions significantly. We can still conclude that HBV performed much better than VIC. We are still convinced that both VIC and HBV should be able to perform better, when both models are revised and longer calibration periods are used. The observation of the considerable influence of forcing data on model performance, irrespectively to the type of model structure, also remains. We still think that HBV is preferred over VIC in the application of hydrological modelling in climate scenario studies.

Sivakumar, B., 2008. Undermining the science or undermining Nature. Hydrological Processes, Early view.

Troy, T., Sheffield, J. and Wood, E., 2007. Temporal and spatial scales in hydrological model calibration, European Geosciences Union General Assembly 2007. Geophysical Research Abstracts. EGU, Vienna, Austria.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 4, 4325, 2007.

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