Hydrol. Earth Syst. Sci. Discuss., 5, S2539–S2542, 2009
www.hydrol-earth-syst-sci-discuss.net/5/S2539/2009/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Analysing the temporal dynamics of model performance for hydrological models" *by* D. E. Reusser et al.

D. E. Reusser et al.

Received and published: 3 February 2009

We would like to thank Clark (2009) for the encouraging and constructive comments. We really appreciate him taking the time to comment here even though he wasn't an assigned reviewer. His comments will help us to improve the manuscript and will be incorporated in the revised version.

Specific comments

1. I would personally find the paper easier to read if the definition of the clusters in Figure 8 was presented before the analysis of skill metrics in Figure 7. Also, before introducing Figure 7, it would be helpful to include a table that describes the types of error associated with each cluster (essentially the reverse of Table 5).

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

We will present Figure 8 before Figure 7 in a revised version. We will also present a table that presents the types of (artificial) errors associated with each cluster.

2. Also for clarity, I suggest extracting the SOM assignment figure from the top left of Figure 5, and the cluster assignment figure from the bottom right of Figure 5, and presenting these plots as separate figures.

We agree that splitting the figure will clarify the manuscript and we will include the suggested changes.

5. A relevant paper (from a different field) that should be cited is [Abramowitz et al. (2008), Evaluating the Performance of Land Surface Models, Journal of Climate, 21, 5468-5481]. This paper used SOMs to evaluate the temporal dynamics of errors in land surface models.

We would like to thank for pointing out this reference. Abromowitz et al. (2008) use SOMs to sort their data according to the climatological input data for their model - thus investigating the temporal variability. In each class of climatological conditions they look at the probability density function (pdf) for the model output and compare it to the pdf of the observation. The difference in the pdf is called conditional bias in their work. As this difference is changing from one class to the other, the error can be analysed depending on the meterological conditions. The two approaches differ in that in [Abromowitz et al. (2008)] the meteorological input data is sorted using SOMs while we sort our data according to the error "finger print".

6. The philosophy that underlies Reusser's paper is consistent with the theory of diagnostic signatures recently introduced by Gupta et al. [Gupta, H.V., T. Wagener, and Y. Lui (2008) Reconciling theory with observations: elements of a diagnostic approach to model evaluation. Hydrological Processes, doi: 10.1002/hyp6989]. It may be worthwhile to include some discussion of the Gupta et al. paper in the discussion section.

We were not aware of the recent work of Gupta et al (2008). They present a "concept

HESSD

5, S2539–S2542, 2009

Interactive Comment

of a diagnostic evaluation approach . . . employing the notion of signature indices that measure theoretically relevant system process behaviors." They argue, that a single criterion is not sufficient for diagnosis of current environmental models. Instead, multiple diagnostic signatures should be derived from theory and used to compare modelled and observed behavior. Differences between model and observation should then be related to relevant model components.

In the revised version we will include a short discussion of Gupta et al. (2008) and point out that our approach is in agreement with this framework.

7. In the summary and discussion section I suggest listing the model weaknesses identified using this approach as a set of bullet points. This would help to highlight the capabilities of the method.

We agree that the discussion will improve if a list of model weaknesses as a set of bullet points is included. We will change the revised version accordingly.

8. Also in the summary and discussion section, it would be nice to have more discussion on the implications for model design. For example, how exactly would you modify the structure of a hydrological model based on what you learned from the SOM-based model evaluation exercise?

We will briefly discuss how we will modify the hydrological model based on what we have learnt from our model evaluation. For WaSiM-ETH further analysis of the snow melt periods indicated that we observe intermediate to large snow melt events during periods with temperatures well below freezing. We will check whether calibration of the snow melt component is more successful after including radiation induced snow melt. We will also address the limitations of the model causing the constant underestimation of the summer discharge in the revised manuscript. For the Catflow model, the first step for model improvement will be to include a snow module. The long-term storage behaviour could probably be improved by coupling the model with a ground water model. Moreover, the evaluation exercise shows that the observed discharge

HESSD

5, S2539–S2542, 2009

data needs to be preprocessed in order to remove variability/noise on the very short time scales.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 5, 3169, 2008.