

Interactive comment on “The transferability of hydrological models under nonstationary climatic conditions” by C. Z. Li et al.

Anonymous Referee #2

Received and published: 4 November 2011

This is an interesting paper adding to the current discussion on parameter estimation of hydrological models in a changing climate. This paper is an interesting contribution, but I have a few issues that the authors should address. The authors should also ensure that their paper reflects the current literature. Detailed comments are made below.

GENERAL COMMENTS

But a main issue is that future conditions might be outside the range of observed historical variability. What to do then?

Most people would use a very long period for calibration that includes both dry and wet periods. This ensures the general stability of the model parameters. How does such a

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calibration compare to the shorter wet/dry calibration?

Just looking at the calibration/validation performance is interesting, but really only part of the story. Which (optimized) parameters vary between wet and dry periods and do they vary in a predictable manner is equally important. The authors start doing so, but do not really finish the analysis. If parameters vary in a controlled manner then one could consider the changing conditions in the parameterization of the model. If they vary randomly, then this would be a big problem! The authors should assess how the parameters vary between the different periods (is there structure in this change?). Also, which parameters vary? This is closely related to the issue of sensitivity as discussed below (See Merz et al. and van Werkhoven et al.).

LITERATURE

Link your work to the current discussion going on in HESS-D. For example Singh et al. (2011, HESS-D) present an approach to consider the time-varying change in optimal parameters with climate beyond the historical variability.

There have also been other studies addressing the same issue as mentioned in this paper. Most notably the stuffy by Merz et al. (2011) in *Water Resources Research* that the authors should relate their work to.

Another issue is that it is not just optimal parameters that vary with time, but also the parameters of the model that are sensitive. This is an important consideration since different parameters might controls the response, and there will respond during calibration, for different climatic periods. Van Werkhoven et al. (2008, in *Water Resources Research*) demonstrated this issue by analyzing a conceptual model similar to the one studied here across watersheds in different climatic regions of the US. The related question is also whether certain parameters are calibrated during wet periods, while others are calibrated during dry periods. If different parameters are active during different periods, then this is not a problem. However, if the same parameter has to take on different values, then that is a real issue!

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 8701, 2011.

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