Hydrol. Earth Syst. Sci. Discuss., 9, C3910–C3912, 2012
www.hydrol-earth-syst-sci-discuss.net/9/C3910/2012/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Distributed hydrological modeling in a large-scale watershed of Northern China: multi-site model calibration, validation, and sensitivity analysis" *by* S. Wang et al.

Anonymous Referee #2

Received and published: 20 August 2012

The authors investigated the effect of two calibration protocols (single-site calibration and multi-site calibration) on the performance of MIKESHE model for simulating hydrological processes within a large mountainous watershed in China. The topic is of interest and importance since the model calibration is a complex process for distributed hydrological model. Generally, the paper was well written and presented. The research presented in this paper represents a valuable contribution to the MIKESHE modeling studies. I suggest that this paper be accepted with minor revisions:

1. There are a number of typos in the paper

2. Page 5708, line 6-9: “the model generally underestimated the streamflow of flow regime ranging 1 to 10 m^3 s^{-1} around, whilst over-predicted when the flow regime was lower than 1 m^3 s^{-1} around. The systemic underestimations of low flow suggested that there existed errors on ground water simulation.” – it is unclear what is the range of “low flow” in this paper. Is it meaning flow between 1 and 10 m^3 s^{-1}? In fact, it can be observed from Fig. 2 that the model had a consistent underestimation for the three stations when the flow was greater than 1 m^3 s^{-1} except for the Dage station during the 1991-1996 period. If the “low flow” was meaning “flow less than 1 m^3 s^{-1}”, then the statement should be “systemic overestimations”.

3. As compared with the single-site calibration protocol, the multi-site calibration protocol is generally associated with lower “R” and “EF” values for the three stations during the validation period as observed from Table 2. Therefore, the conclusion “We conclude that to account for the different hydrological process of watershed with large heterogeneity, it is necessary to employ a multi-site calibration protocol to reduce prediction errors” seems not very strong although Fig. 4 shows that the EF value was improved for two years (1997, 1999) during the validation period of 1996-1999. In fact, by comparing Fig. 2 with Fig. 3, it can be found that the multi-site calibration protocol had a worse performance than the single-site calibration protocol in simulating the recession limbs of hydrographs for almost every year during the 1991-1999 period for all of the three stations. This may need further discussions or explanations.

4. For both calibration protocols, it can be found that the MIKESHE model cannot well simulate the hydrological processes in the first half of 1991 for all of the three stations. This may need a brief explanation in the text.

5. It would be great if there is a Table to list the values of the calibrated parameters under the two calibration protocols.

HESSD
9, C3910–C3912, 2012

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 5697, 2012.

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9, C3910–C3912, 2012

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