Hydrology and
Earth System
Sciences
Open Access

Discussions

Interactive comment on "Multi-objective parameter optimization of common land model using adaptive surrogate modelling" *by* W. Gong et al.

Z. Hou (Referee)

Zhangshuan.Hou@pnnl.gov

Received and published: 21 October 2014

Comments on hessd-11-6715-2014 "Multi-objective parameter optimization of common land model using adaptive surrogate modelling" by Gong etal

This is an interesting study applying adaptive surrogates for multi-objective optimization in a land surface model. The surrogate development and optimization approaches are reasonable. I offer the following suggestions:

Page 6716, line 20: the number of runs depends on the choice of weighting function, in addition to the choice of the output variables. It could be more reasonable to use a probability-based weighting system, instead of using NRMSE.

Page 6720, line 16: NRMSEs were calculated individually for each of the 6 outputs, and used as linear weights in the multi-objective function. Although it is good to look at several output variables at the same time, the outputs in this study are dependent on each other (in fact, sensible heat and latent heat would be strongly corrected). Therefore a linear combination of the misfits is questionable. I wonder if a weighting system based on their covariance matrix or joint pdf would be applicable.

Page 6720, line 6: the river basin has different land use types, but the study uses data from a single station at the upstream. SO which land use type is used in the study? In addition, is the data from the station representative of the big modeling domain?

Page 6720, line 16: "the" should be "then"? What soil properties are linearly interpolated? If the authors meant soil temperature and moisture, how about measurements and interpolation of the other hydraulic properties? Are they vertically and horizontally heterogeneous?

Page 6721, line 29: a solid evaluation of the developed surrogate is to break the dataset into training and testing subsets, and evaluate NRMSE for both. A reasonable surrogate should have low training and testing errors by considering both goodness of fit and avoiding over-fitting.

Page 6723, line 19: "sample size does not . . ." not true for the latent heat and soil moisture data.

Page 6723, line 23: "200 sample points might be sufficient. . ." the number of samples needed should vary for different observational data (e.g., sensible heat vs soil temperature)

Page 6724, line 19: I agree that for practical reasons, we want to have a single best parameter set, but people have preferences assigning the weights to data. It is fine to assign higher weights to better-simulated outputs (i.e., smaller NRMSE). However, Table 4 shows that the authors assigned higher weights to outputs with larger NRMSE,

that is, more poorly-simulated ones.

Moreover, a probability-based weight (i.e., $W_i \sim \exp(-NRMSE_i\hat{\ }2)$) could be easier to interpret than NRMSE itself.

Page 6726, line 6: Figures 4/5: the performance for soil temperature is worse, due to the low weight assigned to the temperature data.

It is useful to expand the discussion, including the mathematical form and shape of the surrogates.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 6715, 2014.