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Interactive comment on "Multiobjective sensitivity analysis and optimization of a distributed hydrologic model MOBIDIC" *by* J. Yang et al.

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The study by Yang et al. recognizes the difficulties of model calibration due to large number of parameters and multiple and often conflicting objective functions. The authors present a multi-objective sensitivity and optimization approach applied to a hydrologic model and tested in the Davidson watershed in North Carolina. The procedure applied consists of two-step analyses: first, a multi-objective sensitivity analysis and then optimization.

I notice similar aspects in this manuscript related to two of our work on land surface models published recently (Rosolem et al. 2012, 2013). Hence, I have two comments:

[1] The analyses of parameter sensitivity are conducted separately for each objec-

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tive function, and ultimately a choice is made to identify sensitive and insensitive parameters in a multi-objective context. This is what we called "pseudo-multiobjective" sensitivity analysis in our studies. The last paragraph in Section 5.1 exemplifies the known difficulties associated with choosing sensitive parameters using those "pseudo-multiobjective" approaches, ultimately leading to unavoidable degree of subjectivity. It would be nice if the authors could discuss how their method compares to one of the "pseudo" methods as well as with the fully-multiobjective criteria approach proposed by Rosolem et al (2012,2013), and discuss advantages and limitations.

Rosolem, R., H. V. Gupta, W. J. Shuttleworth, X. Zeng, and L. G. G. de Gonçalves (2012), A fully multiple-criteria implementation of the Sobolấš method for parameter sensitivity analysis, J. Geophys. Res., 117(D7), D07103, doi:10.1029/2011JD016355.

Rosolem, R., H. V. Gupta, W. J. Shuttleworth, L. G. G. Gonçalves, and X. Zeng (2013), Towards a comprehensive approach to parameter estimation in land surface parameterization schemes, Hydrol. Process., 27(14), 2075–2097, doi:10.1002/hyp.9362.

[2] The fact that both sensitivity analysis approaches show MARD results being nearly the same as those obtained with SRMSE may indicate that those were not conflicting/competing objective functions chosen by the authors. This could possible indicate a poor choice of original objective function. The authors recognize this result in the Conclusion section but did not discuss implications in depth.

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