

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

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Dear Dr. Rafael Rosolem,

We thanks for your comments on our manuscript. These two comments will be very valuable to improve this manuscript. Below is our reply to your comments:

[1]. The analyses of parameter sensitivity are conducted separately for each objective 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 “pseudomultiobjective” approaches, ultimately leading to unavoidable degree of subjectivity. It would

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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.

Our reply: In the multiobjective sensitivity analysis and optimization, our approach (so called “pseudo-multiobjective” approach) is based on the fact: if one factor is sensitive to any objective, then it should be included in the optimization.

Compare our approach to your full multiobjective approach: 1) Our approach is computationally efficient and effective. In this study, the total model runs are 1500, among which Morris method took 800 and SDP took 700. And according to our experience, this does not change too much for different case studies (i.e., different models and their different applications). Your approach is based on Sobol’ method which is computationally expensive and easily requires more than 10,000 model runs. 2) Although our approach can effectively identify the sensitive parameters for multiobjective optimization, and can qualitatively and quantitatively study the factor sensitivity to different objective functions, the factor sensitivity is for individual objective function. The joint effect should seek your full multiobjective approach. 3) Your approach studies total effect while our approach studies the first order and first order interaction

In the revised version, we will cite these two papers (Rosolem et al 2012; 2013) and mention the advantage and limitations of our approach compared to your full multiobjective approach.

[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 possibly indicate a poor choice of original objective function. The authors recognize this result in the Conclusion section but did not discuss implications in depth.

Our reply: Thanks for pointing out this useful information which is also indicated by low correlation coefficient between SRMSE and MARD. And we will add this in the revised

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