

Interactive comment on “Exploring the impact of forcing error characteristics on physically based snow simulations within a global sensitivity analysis framework” by M. S. Raleigh et al.

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This study applied Sobol' global sensitivity analysis for testing model sensitivity to co-existing errors in all forcings. Sensitivity analysis can reveal which forcing error characteristics matter most for hydrologic modelling. As there are fewer detailed studies focusing on forcing uncertainty, this work provides insights on the topic and provide a method that could be extended to more complex physically based models such as land surface models and climate models.

It is a very interesting work, and the paper is clear and well structured. I think the paper

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should be considered for publication on HESS. Here, I have only some concerns about the Sobol' SA method used in this paper.

(1) This study is too computational expensive. 1520000 Monte Carlo samples used here is too much, making that it will be impractical to be extended to other complex models. As I know, Sobol' method will cost a lot to estimate the interaction, such as second-order effect. But it can be less expensive to get the first-order effect and total effect. Did the study consider the SA results from fewer samples? In fact, I suggest either RS-HDMR or response surface based Sobol' can be used here to get similar results.

(2) This study used the total effect to quantify the sensitivity of different error type, different error distributions and error magnitudes. As the sum of total effect of each factor will be above 1, in order to quantify the contribution of each factor, I suggest to use the index $ST_i/\sum(ST)$, which is the total effect of one factor divided by the sum of total effect of all the factors.

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