

## ***Interactive comment on “Robust uncertainty assessment of the spatio-temporal transferability of glacier mass and energy balance models” by Tobias Zolles et al.***

### **Anonymous Referee #2**

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This is a well written and technically adept article describing the application of uncertainty and sensitivity analysis to glacier mass and energy balance models. I enjoyed the paper, but do have three questions regarding the utility and objectives of this study:

1) The paper executes sensitivity and uncertainty analyses of a glacier mass balance model with the goal to "target a clear separation of the concepts of sensitivity and uncertainty". I often struggle with this, because as much as we want these two concepts to be different, they are inherently linked, as they are in your approach to investigate this model. Beyond this, I searched for a clear objective as to why this study was being performed. Why use all of these methods with a single model? What is the targeted

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outcome? Why would you encourage others to do the same? More clear statement of these goals upfront and then tying to these goals in the end will help to tie the paper together. In my experience, others don't necessarily see why such a robust and technical approach to modeling is needed - I think you have great fodder to demonstrate why.

2) Many of the figures I struggled to extract the key meaning. In particular, Figure 4, Figure 5, and Figure 6. You might consider, instead, some sort of conceptual figure that aims to bring out your key findings/messages in terms of the sequential application of methods you took. What is learned, and how can you represent this more clearly to others? I enjoyed the other conceptual figures in the manuscript.

3) There is often discussion of the feedback between models and observations. What role does the need for observations play in your study? So much of the discussion was focused on parameters, and I found myself wondering often about the observations.

Minor comments:

-Did you test for convergence in your sensitivity indices? Given the number of model runs, I'm not sure this is needed, but you could get the same results with fewer runs, which might be valuable information for other researchers (and make this type of approach seem more tractable to them)

-It's not clear to me why in Section 3.2.1 why analysis of 10,000 parameter samples is reported, as well as analysis with 300,000 simulations is reported. Why report the 10,000 runs?

-Abstract - line 2 - 'they' is ambiguous

-Figure 3 - consider grouping your parameters by type and using some color or labeling

-Figure 4 - Quite difficult to get anything out of Fig 4(d) – consider making a few more subplots and grouping results, or adding labeling

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