

Geosci. Model Dev. Discuss., referee comment RC2
<https://doi.org/10.5194/gmd-2022-131-RC2>, 2022
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Comment on gmd-2022-131

Anonymous Referee #2

Referee comment on "Global Sensitivity Analysis of the distributed hydrologic model ParFlow-CLM (V3.6.0)" by Wei Qu et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2022-131-RC2>, 2022

General comments

This paper applied a global sensitivity analysis, named LH-OAT, to a distributed hydrological model ParFlow-CLM at the Stettbach catchment. The sensitivity analysis was carried out for 12 parameters, 3 different slopes, and 3 different meteorological conditions. The results investigated the sensitivity of various simulation variables to the above input factors (i.e., parameter, slope, meteorology). The paper does not develop new models or methods, nor does it fully evaluate previously published models, so I don't think it fits the scope of the Geoscientific Model Development journal. The innovation of this paper is limited, and the paper is not well written. Therefore, I suggest rejection.

Major comments to the authors

- Lack of innovation. My main concern of this paper is lack of innovation. The authors applied an existing global sensitivity analysis method to an existing hydrological model and a small catchment. May authors clarify what the innovation this paper has in comparison to existing publications. In addition, sensitivity analysis results differ from catchment to catchment and are also dependent on the parameterizations of different hydrological models and simulation periods. Findings of this paper are based on one case study and one model, so they are likely not useful to other readers. How can the findings of this paper benefit broad readers?
- Justifications of LH-OAT. Section 2.2. Eq. 6 of this paper is different from Eq. 7 of van Griensven et al. (2006). The latter uses an absolute value. Therefore, I hope the authors can justify why Eq. 6 is used and why it makes sense in this paper. In addition, please justify why 30 LHs are selected. I personally think they are not sufficient.
- Unfortunately, the presentation of this paper hasn't met the publication criteria yet. I provided a list of places where I think there are syntax errors. I hope the authors can make improvements.
- Are the 12 parameters and all the meteorological inputs, such as precipitation, are

spatially uniform over the catchment?

Minor comments to the authors

- Please check syntax errors of the following sentences: Lines 42, 207-209, 235-236, 256-259, 261-263, 301, 318-319, 321-322, 325-326.
- Please use a consistent format for date throughout the paper.
- Line 161. You mean 2900m*2700m?
- Figure 3. Please check the temperature y-axis tick label of the second subplot.
- Please use meaningful and easily understood terms to represent model output variables. For instance, in Table 2, the first column, these short names are hard to understand, and I need to refer to the descriptions below the table and go up and down multiple times. You can directly use their full name in the table. The same suggestions to Figures 6 and 7. In addition, I think using a table full of numbers is not recommended. Instead, you can consider plotting them in a 2D format, in which the partial effects are differentiated by colors.