

Interactive comment on “Uncertainty analysis of a spatially-explicit annual water-balance model: case study of the Cape Fear catchment, NC” by P. Hamel and A. J. Guswa

P. Hamel and A. J. Guswa

perrine.hamel@stanford.edu

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We thank the reviewers for their time and thoughtful feedback, and we are encouraged to see their interest in the questions addressed in the paper. We respond here to the two main suggestions that came out from the reviews. We are currently revising the manuscript to address these comments, and we will post a detailed response to major and minor points raised by the reviewers. We can make this revised copy available to the editor before or after the end of the discussion period.

One common suggestion pertained to the paper's structure. We agree that the paper

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will gain in clarity with a better overview of the methods and the adoption of a parallel structure for the presentation of methods, results, discussion (as suggested by Reviewer 3). We note that the comparison between the lumped and spatially-explicit application of the Budyko framework is of significant interest to the hydrologic community. However, we also wish to put this comparison in the context of predictive uncertainty that arises from parameter uncertainty and variability in climate forcing. As a tool to support ecosystem-service assessments, the purpose of the model is not the exact representation of truth, but reliable indications of effects that can inform decisions. The revised contents will clarify the intent and scope of the uncertainty assessment.

A second question was related to the approaches for testing the model. Reviewer 2, in particular, commented on the lack of spatially-explicit data for validation (and the challenges associated with obtaining such data). We acknowledge these challenges, and, in this paper, have focused on integrated assessments of a model that can accept spatially-explicit inputs. That is, our comparison with data and among model formulations is at the decision scale – at the subcatchment level. In addition, we note that our analyses comprise the comparison of ten subcatchments, thus addressing the question of spatial distribution, although at a different resolution. Future work will focus on evaluation of predictions at the pixel scale via comparison of results with more complex fully-distributed models. While we do not validate the models at the pixel scale in this work, we agree with Reviewer 2 that a presentation of such output might be of interest to our readers, and we have added a figure that presents those results.

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