Response to reviewers' comments

"Two-way coupling between the sub-grid land surface and river networks in Earth system models" by N. W. Chaney, L. Torres-Rojas, N. Vergopolan, C. K. Fisher

We thank the reviewers for their time and helpful comments. We have addressed each point below. Reviewer comments are shown in *blue italics*, while author responses are shown in unformatted text.

Associate Editor #1: The discussion between the reviewer and yourself has convinced me that this is really half a model description with the parametrisation approach to come later. Given the complexity of the model I think a standalone description is worth publishing and that GMD is the appropriate journal for that. However, since the relative performance of the new model is not well understood this should be made very clear to the reader. This is done at the start of the discussion "it remains unclear if this paramerterization improves the macroscale modelling of surface fluxes and inundation…" But I think a similar statement should be made either in the aims, conclusions, or both. Such that it's clear that further research is necessary before the model description is complete.

We appreciate the topical editor for his evaluation of the paper and feedback. We would argue that the implemented two-way coupling between sub-grid tiles and river routing schemes is a parameterization as it enables a way to include this process in a simple yet efficient manner in Earth system models. That being said, we agree that the parameterization has not been robustly evaluated against observations at this point and thus requires further evaluation. As a result, as suggested, we have added the following sentences at the end of the conclusion section:

"Finally, the implemented scheme shows an appreciable impact on the modeled spatial heterogeneity (e.g., spatial variance) of surface fluxes and states; however, its influence on the macroscale spatial means is relatively small. In other words, although the two-way coupling parameterization offers potential to provide more realistic simulated multi-scale spatial patterns, its impact on improving the domain-average response appears to be limited and requires further evaluation."