

Interactive comment on “The E3SM version 1 Single Column Model” by Peter A. Bogenschutz et al.

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The authors thank reviewer 1 for taking the time to provide us with a careful review of our paper and for the positive feedback and helpful suggestions. Please see our responses below, that are reflected in our revised document and track changes.

1. Could the authors briefly explain how the surface conditions are prescribed for the SCM, and describe the options that are available for the surface conditions?

Author reply: We added a discussion on the surface fluxes at the beginning of section 2. The new text reads as:

"Similar to SCAM, surface fluxes in E3SM can be prescribed, and is the default setting if this information is available in the case forcing file. Otherwise, the surface fluxes are

computed interactively via the land model or the data ocean model, using prescribed sea surface temperatures."

2. Is there a plan to develop an ocean-atmosphere SCM for studying coupled atmosphere-ocean processes (e.g. Hartung et al., 2018), considering that the E3SM includes these components? Do authors have an opinion if such coupled SCM would be useful from the point of parameterization development?

Author reply: There is currently no such plan for this extension in the E3SM SCM. However, we cite Hartung et al. 2018 and mention the importance that this functionality could provide with the following statement at the beginning of section 2:

"The E3SM SCM does not currently support running an interactive ocean model, such as the work presented in Hartung et al. (2018), that may be a useful framework towards understanding parameterization feedbacks and climate sensitivity."

3. I really like a study of precipitation bias over the SGP and AMAZON sites and discussions about the representativeness of SCM model results for the three-dimensional model. Is there a way to predict this representativeness before conducting SCM experiments? I would naively think that comparing the dynamical and physical tendencies from the three-dimensional model could be a way to do this.

Author reply: This is an excellent question and this is something the authors feel should be explored in future work as it would serve as a large benefit to the community. While we do not have a conclusive answer to this question, at the end of section 5.2 we state:

"Having comprehensive a priori knowledge on what particular biases and regimes could faithfully be replicated within a SCM framework would be invaluable for GCM development and improvement. However, this is currently poorly understood and should be the subject of future work."

4. I think recent work by Smalley et al. (2019) on the SCM development and its use for parameterization testing and development deserves to be mentioned. We agree and

have added the following text to the introduction:

Author reply: "Smalley et al. (2019) use the SCM to construct a novel modeling framework that is forced by reanalysis to simulate a variety of environmental conditions in the subtropics to evaluate their parameterization suite."

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