

## ***Interactive comment on “An ensemble of AMIP simulations with prescribed land surface temperatures” by Duncan Ackerley et al.***

**Anonymous Referee #1**

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This paper by Ackerley et al. describes a suite of fixed land temperature experiments with a single AGCM and provides a thorough validation of the experiment setup. The fixed land temperature experiments fill an important gap in the current model hierarchy, particularly in terms of understanding the traditional AMIP-style simulations. The paper shows that the land surface temperature can be prescribed in a way that is overall consistent with the free-land setup. These experiments, which are made publically available, therefore are of great scientific value. My only concern with this generally well-written paper is the lack of scientific analysis. While the main purpose of this paper is to provide a description and validation of experiment design, there are a few points that concerns the soundness of the experiments and should be better addressed. Particularly, the positive precipitation bias in the Amazon stands out as perhaps the biggest

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caveat of the fixed land temperature experiments. If these experiments were to be used to study Amazon rainfall, such caveat needs to be better understood. And I suppose this paper should serve that purpose. The authors may expand on the hypothesis provided in a single sentence in L14-15 and elaborate on the mechanism provided in Cox et al. 1999.

Minor points / questions: 1. It might be worth mentioning the aquaplanet simulations that also have prescribed global surface temperature and have been used to indirectly study the impact of land surface temperature changes. For example, the CMIP6 standard aquaplanet simulations (e.g., He and Soden 2017) and the aquaplanet simulations with land-like temperatures (e.g., Tobias and Bjorn 2014). The lack of land in these aquaplanet simulations is an obvious shortcoming and the fixed land temperature experiments are a perfect solution. Tobias, B., and S. Bjorn, 2014: Climate and climate sensitivity to changing CO<sub>2</sub> on an idealized land planet. *J. Adv. Model. Earth Syst.*, 6, 1205–1223, doi:10.1002/2014MS000369. He, J., and B. J. Soden, 2017: A re-examination of the projected subtropical precipitation decline. *Nat. Clim. Change*, 7, 53–57, doi:10.1038/nclimate3157.

2. Page 4, Line 10. Are the land surface types prescribed or allowed to change?

3. Page 7, Line 3. How is the plant physiological effect switched off? Can it be explained in a couple of sentences?

4. Have the authors considered prescribing soil temperature and moisture separately (i.e., fix one and allow the other to change freely)?

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