

Interactive comment on “Surface and top-of-atmosphere radiative feedback kernels for CESM-CAM5” by Angeline G. Pendergrass et al.

Anonymous Referee #2

Received and published: 16 November 2017

This paper presents a new set of radiation kernels that can be used for feedback analysis. This affords a useful means for GCM inter-comparison and for understanding their differences in climate sensitivity. I recommend publication after the following issues are properly addressed.

Two major suggestions are: 1. Provide comparisons between this new set of kernels and other kernels and note their differences. This would serve the community greatly to understand whether (and how) feedback determined using the kernel method is sensitive to the kernel dataset used.

2. Document more extensive validation tests. Currently only global mean values from one case (2096-2006) are reported (Fig. 4, 5); it is not clear whether the percentage errors reported are representative. Error statistics based on global maps of radiation

changes and time series of global means would make a more rigorous assessment.

Additional comments Page 1, Line 21. It is not a correct statement. New TOA and surface kernels computed from EARi atmosphere have been made available by Huang et al. (2017). This should be referenced here.

Page 2, Line 7. Note there is strong inter-annual variations of atmospheric states, e.g., El Nino vs. La Nina, which affects kernel values quantitatively. In relation to Suggestion 2 above, it is worth discussing, and if possible demonstrating, (in)accuracy in feedback, e.g., in the central tropical Pacific region, related to this issue.

Fig. 1. I am surprised to see the temperature sensitivity maximize in the middle tropical troposphere ($\sim 600\text{hPa}$) here, which is noticeably different from other kernel datasets (e.g., Soden et al. 2008, Huang et al. 2017) - that may be due to misplaced clouds in CAM?

Fig. 2. I am also surprised by that the surface radiation sensitivity to temperature and humidity doesn't maximize in the lowermost atmospheric layer. These results do not agree with radiative transfer-based expectations.

References Huang, Y., Y. Xia and X. Tan, (2017), On the pattern of CO₂ radiative forcing and poleward energy transport, J. Geophys. Res.-Atmos., doi: 10.1002/2017JD027221

Interactive comment on Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2017-108>, 2017.

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