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Earth System
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Discussions

Interactive comment on "On the determination of the global cloud feedback from satellite measurements" *by* T. Masters

Anonymous Referee #3

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This paper presents a useful and necessary assessment of the dependence of any attempt to assess the cloud contribution to feedback on the data used to separate cloudy form clear air. To be sure, it is the all sky data that is ultimately relevant for determining feedback, though breaking down cloudy and clear sky results is of interest. Unfortunately, the complex interaction of clouds with water vapor, and the relevance of changing areas of each, make the breakdown intrinsically less accurate than the full sky results. However, since Dessler used cloudy results, and Masters was examining Dessler's work, Masters had no choice.

In the present case where one is examining feedbacks due to clouds, one must ask whether it is appropriate to use analyzed data where model physics is known to deal poorly with clouds, and where this may bias results toward model results for feedbacks.

In data sparse regions, analyzed "data" is primarily model output, and it is commonly at considerable variance with the actual data. Masters is certainly correct in asking whether the choice of analyzed or raw data makes a difference. If it does, then it may be reasonable to suppose that the use of raw data is less biased.

I think that Masters' response to Dessler on "robustness" is adequate. It should be obvious that results with very low r2 should not be considered robust by any criterion. Masters makes this clear. The point that the separation of cloudy and clear sky using satellite data leads to an apparent negative feedback is adequately qualified by the demonstration of lack of robustness.

Masters properly recognizes that not only the magnitude of non-feedback cloud variations but also the decorrelation time of the resulting noise is important to the contamination of simple regressions. However, in discussing long term versus short term feedbacks, it would be appropriate to note that the primary feedbacks determining model climate sensitivity are all short term feedbacks. The climate response to these feedbacks determines the magnitude of the temperature change, but it also leads to the elimination of radiative imbalance.

As to satellite data issues, Masters has already acknowledged most of important possible data problems. However the following should be noted:

1. For use of CERES, an attempt to resolve the spectral darkening problem may be necessary by multiplying SW flux by the scale factor (up to 1.011) from Matthews et al. (2005).

2. The more recent paper on CERES data also needs to be cited: Wielicki, B.A, and Coauthors, 1998: Clouds and the Earth's Radiant Energy System (CERES): Algorithm overview. IEEE Trans. Geosci. Remote. Sens., 36, 1127-1141.

3. Rcloud is not defined within the manuscript. Is this an upward or downward flux?

4. In association with the above question, there is some confusion on the definition

of CRF. The author (as well as Dessler, 2010) stated that CRF is determined by substracting Rall-sky from Rclear, but the figure implies the opposite, ie. Rall-sky minus Rclear. If Rcloud is a downward flux, perhaps the latter is correct.

5. p.80, L4: WMGHG is not defined within the manuscript. Is this warming greenhouse gas? What is the unit of 0.16?

Interactive comment on Earth Syst. Dynam. Discuss., 3, 73, 2012.