JGR-A 2013JD020840 (Editor - Steven Ghan)

Reviewer #2 (Comments to Author):

This is an interesting analysis of uncertainty using a simple but remarkably accurate model of climate sensitivity. Unfortunately, the author makes a fatal error in attributing systematic bias in simulated cloud forcing to uncertainty in simulated energy balance.

Lines 114-117. Examples of uncertainty propagation:
Stainforth, D. et al., 2005: Uncertainty in predictions of the climate response to rising levels of greenhouse gases. Nature 433, 403-406.
M. Collins, R. E. Chandler, P. M. Cox, J. M. Huthnance, J. Rougier and D. B. Stephenson, 2012: Quantifying future climate change. Nature Climate Change, 2, 403-409, DOI: 10.1038/NCLIMATE1414.

Lines 168-169. The CO2 forcing does not vanish when the condition holds. It becomes progressively smaller.

Line 256. What is meant by pristine?

Line 261. Where do the numbers 269.3 and 283.7 come from?

Line 263. We cannot expect this fraction to remain invariant as CO2 increases.

Line 369. Is lag-1 a one-year lag? Please specify.

Lines 382-383. Such probabilities seem incredible. What is the basis for the estimates?

Lines 405-412. This analysis assumes all clouds produce the same cloud forcing, which is absolutely false. Low clouds produce a very strong cooling of up to 100 W/m2, while high thin clouds produce a strong warming. High thick clouds produce a small forcing due to balancing between solar cooling and longwave warming. Given the variety of radiative forcing by clouds, one cannot translate a global cloud fraction error into an error in cloud radiative forcing. In addition, the term "cloud feedback" is reserved for the response of cloud radiative forcing to changes in surface temperature, the diversity of which drives much of the diversity in sensitivity of simulated warming to increasing CO2.

Lines 414-418. Your estimate of radiative flux uncertainty cannot be compared with the greenhouse gas forcing. All climate models are adjusted to ensure the Earth is in radiative energy balance (to within less than 1 W/m2) before CO2 is changed. Otherwise the simulated climates will drift even without increasing CO2.

The above considerations render the rest of the analysis meaningless. If the simulated Earth energy balance were as off as the author suggests, none of the climate simulations

would be realistic. The author should consult the IPCC AR5 for extensive evaluation of historical simulations of climate change for the last century.