Earth Syst. Dynam. Discuss., 3, C299–C301, 2012
www.earth-syst-dynam-discuss.net/3/C299/2012/

Earth System
Dynamics
Discussions

Interactive comment on "Climate response to imposed solar radiation reductions in high latitudes" *by* M. C. MacCracken et al.

Anonymous Referee #1

Received and published: 17 August 2012

Review of MacCracken et al.

Although this paper represents a lot of work, I recommend that before it is published it needs substantial revision. The fundamental problems are listed here:

1. The experiments conducted are totally unrealistic. The authors need to add an explanation of why such artificial, impossible forcing scenarios are being used. Do they propose any technology that could implement any of the forcing scenarios? Global forcing might be achieved with sulfate aerosols injected into the tropical stratosphere, and hemispheric forcing might be achieved with high latitude sulfur injection, but the sulfur could not be confined to the polar region. The claim that such a scenario could remove the negative effects of other proposals is unjustified if the scenario is impossible. I can think up lots of other impossible, imaginary ways of reducing global warming.

Why should we even consider this one? The way the paper is written, it seems to advocate for such geoengineering responses to global warming, but it is irresponsible to slant it this way. For example, on line 10 on p. 726, the paper says, "the polar reductions appear to have the potential for moderating warming." This is an example of ignoring that fact that imposition of such a forcing is impossible. Or on line 8 of p. 733, it says, "Solar reductions over high latitude regions may also be more feasible." This is again wrong. The authors have not shown that application of this forcing is feasible.

2. I don't understand why the experiments were done. If it is to better understand the climate system response, then the model and diagnostics used are quite primitive. There is no analysis of how atmospheric modes of circulation might change. Not using an ocean GCM precludes studying ENSO responses and coupling between atmospheric and oceanic circulation. The claims that the atmospheric system responds to forcing in one hemisphere by changes in atmospheric circulation, when using a model that does not allow oceanic responses, makes it hard to accept the results. The authors need to much better explain their experimental design and why we should accept such results. A model without even ice motion gives a simplistic and unrealistic sea ice response. How well does this model simulate precipitation for the current climate and for the past century? How well can we trust its precipitation simulations? And what is new about these compared to previous work by the same team?

3. The cloud feedbacks shown in Fig. 8 look very strange, and need to be investigated. Why should forcing in one hemisphere produce a large positive feedback and in the other a negative one?

4. The introduction is overly long. There have been summaries of geoengineering research and global warming published before, and there is no need to repeat this here. And the first two sentences of the abstract have no business there – they are not the result of work in this paper. You can put them in the introduction, but not in the abstract.

5. The figures leave much to be desired. Postage stamps cannot be read. I agree that if one has a high-resolution monitor and greatly zooms in on the pdf file, each figure can be seen. But it is not acceptable to cram so many panels into one figure. Certainly a printed version of the paper will have illegible figures. It you must, put them into an appendix and then use much larger, simpler figures to illustrate the results. As is, for some, there are too many contour intervals, and values cannot be read off the maps. You need to label the contours. The sea ice maps are impossible to read, looking just blue and white, with no latitude lines or explanation of what projection is used. Specific comments on the annotated manuscript discuss these and other issues in detail.

Please also note the supplement to this comment:
http://www.earth-syst-dynam-discuss.net/3/C299/2012/esdd-3-C299-2012-supplement.pdf

---

Interactive comment on Earth Syst. Dynam. Discuss., 3, 715, 2012.