Atmos. Chem. Phys. Discuss., 13, C6201–C6204, 2013
www.atmos-chem-phys-discuss.net/13/C6201/2013/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Projected effects of declining aerosols in RCP4.5: unmasking global warming?" *by* L. D. Rotstayn et al.

Anonymous Referee #1

Received and published: 27 August 2013

Summary Evaluation

Does the paper address relevant scientific questions within the scope of ACP? Yes

Does the paper present novel concepts, ideas, tools, or data? Yes

Are substantial conclusions reached? Yes

Are the scientific methods and assumptions valid and clearly outlined? Yes

Are the results sufficient to support the interpretations and conclusions? Yes

Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? Yes

Do the authors give proper credit to related work and clearly indicate their own new/original contribution? Yes

Does the title clearly reflect the contents of the paper? Yes

Does the abstract provide a concise and complete summary? Yes

Is the overall presentation well structured and clear? Yes

Is the language fluent and precise? Yes

Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? Yes

Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? I have suggested one part (as noted in my specific comments) that could be left out.

Are the number and quality of references appropriate? Yes

Is the amount and quality of supplementary material appropriate? N/A

General Comments

The authors investigate the role of aerosols in determining the modeled climate change in the RCP4.5 scenario, through a series of CSIRO Mk3.6 model simulations where they fix anthropogenic aerosols (AA) to 2005 levels. They examine a series of global diagnostics including global mean and hemispheric mean temperature, and global and hemispheric mean precipitation. They find that AA contribute significantly in the quantities examined, comparable to the effect of greenhouse gases. Based on their results, they examine the behavior of other CMIP5 RCP4.5 (and historical) simulations contrasting the role of aerosols in the projections. They find that models with larger aerosol effective forcing (at 2005 levels relative to preindustrial) are more likely to exhibit larger modeled changes to global and hemispheric mean temperature in the RCP4.5 scenario by the end of the 21st century. The main message of the paper is that AA changes

contribute as much as greenhouse gases in the RCP4.5.

This is a fairly straightforward but important study highlighting and quantifying the role of AA in RCP4.5. While the Levy et al. 2013 study steals some of the thunder of this paper, this is still a valuable contribution to the literature. The comparison of the various CMIP5 models contrasting the aerosol effective forcing to global mean and hemispheric mean changes is a nice touch, and shows how their CSIRO mk3.6 results can translate to interpreting other model simulations.

I have no major comments on this paper, and only a few minor comments below. I recommend publication after the comments are addressed.

Specific comments

p18640 line 18 - Is the inter hemispheric forcing ratio the NH:SH ratio of the TOA ERF shown in Fig 5? Please clarify

Fig 7a - why is there a sudden drop in HIST precipitation around 1960? It can't simply be anthropogenic aerosols, that should be more gradual. Is it a combination of volcanism and AA?

p18640 lines 19-27: is there a way to quantify the relative contributions of ERF vs dynamics in determining the relative responses of NH and SH rainfall in figure 7b? That would be interesting. Presumably one could use the response of global mean precipitation change in fig 7a to get an approximate relationship between ERF and precipitation; and then apply it to each hemisphere.

p18644 lines 9 onwards (until the end of the section): given that the correlation between aerosol atmospheric ERF and hydrologic sensitivity has almost no correlation (Fig 12), I wonder if this is really saying that hydrologic sensitivity simply isn't the right way to took at this? Fig 11 (between aerosol TOA ERF and precipitation) is a more compelling relationship - perhaps best left at that?

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 18621, 2013.