Review for MS No.: acp-2014-945

Title: Climate extremes in multi-model simulations of stratospheric aerosol- and marine cloud brightening climate engineering by Aswathy et al.

General Comments

This study analyzes model simulations of two solar radiation management (SRM) schemes with regard to changes in mean and extreme temperature and precipitation and compares them to the RCP4.5 scenario simulations of current climate (i.e. year 2010). Results are based on 3 different global climate models and a comparison of 10year time slices to illustrate the effect of the two different SRM schemes compared to future climate change as represented by RCP4.5 scenario for year 2060 and the termination of SRM. The introduction and motivation for this paper are reasonable and well elaborated. However, the discussion of results as well as the conclusion is highly questionable regarding the methods used and illustrated in the paper. If more carefully assessed, some of the conclusions could potentially be very relevant (e.g., extremes are more effected by SRM termination than means, and the warming of the temperature's lower tail is not sufficiently offset by SRM), but the current paper is unable to robustly support these conclusions.

Specific comments

The data basis for the analysis of extremes is insufficient to obtain robust results or support the strong conclusions drawn. 10 years are too short for this kind of analysis, even if simulations are in equilibrium and some models have more than one ensemble member. Information on the latter is not provided in the text, apart from a half sentence in section 3.1. Also I would argue that 3 models are not representative to conclude robust results just from at least two agreeing on the same sign of change (although this kind of measure is used in many GeoMIP papers).

The authors claim that T90 is representative for summer and T10 for winter season, which would reduce the effective sample size even further.

The signal-to-noise ratio in RCP4.5 is low, even in year 2060, to clearly distinguish the SRM effect from internal natural climate variability. The authors did not take this into account (e.g., could at least show variability between ensemble members of a single model). And again 10 years are fairly short to assess the contribution of natural variability.

The discussion of results (and respective conclusions) are merely based on a qualitatively assessment of maps and numbers in various tables. The authors did not make effort to apply any statistical test to support the robustness or significance of their results. For instance, whether the change in the extremes really follows the mean cannot simply concluded by looking at global maps and numbers provided in the tables. (There are many papers on this issue!)

There is no information on the baseline of the extremes indices indicated in the paper (i.e. values for RCP4.5 in 2010) to put the changes indicated in the tables into perspective to the overall magnitude of the respective index in the reference climate.

Results for consecutive dry days (CDD) are highly uncertain. Given the large disagreement between models, and the insufficient data basis, I don't think that such small changes as for instance 0.68 or 1.88 days/yr should even be discussed. See also my comment above. If the definition in Table 1 (i.e. #of consecutive dry days per time period (=10years???)) is correct then one would expect very large numbers in some regions (e.g., Sahel zone) and then a difference of less than 1 or even 10 would be insignificant. Furthermore, the global mean of change in CDD is pretty much meaningless given the very heterogeneous distribution of positive and negative changes as illustrated in figure 3.

What about a model comparison with observation? Maybe the differences found between SRM schemes and RCP4.5 are just as big as the model bias compared to the observations.

Why are there no figures illustrating the termination effect if it is so important to draw conclusions from this analysis? The termination effect is not carefully assessed in this paper; see also my minor comments below.

I highly criticize the conclusion drawn on the implications for the assessment of social costs of SRM (i.e. entire last paragraph of paper). This is pure speculation, not well-grounded in any literature reference, methodological approach or quantitative assessment. "There is no substantial indication for costly side effects" -How do you know? Given the substantial changes in spatial patterns of the extremes indices considered and associated uncertainties, I would not make such a strong statement without reconsidering the data basis and complementing the simple analysis of climate model data with some socio-economic data assessment and modeling approach.

More specific points:

Section 2.1, p. 32399, line 25: Aren't the extremes based on daily time series of minimum (2-m) and maximum temperature? It is mentioned further down (i.e. p.32400, line 5) but completely out of context as TX and TN are not further used in the paper.

Section 3.1, p.32401, line 12: "…models that simulated more than one…"??? Shouldn't that be "…models with more than one ensemble member…"?

p.32402, line 6: "…SRM schemes are simulated to substantially narrow…"??? That sentence does not make any sense. Please rephrase.

p.32402, lines 13-16: This whole paragraph is unclear and does not make any sense as written. Please rephrase.

Section 3.3.1, p.32406, lines 7-9: "The termination of the SRM … compared to G3-SSCE method." Makes no sense as G3-SSCE is a SRM method, isn't it?

p. 32406, lines 12-14: "The models simulate drying …". The models don't even agree on the sign of change in fig. 3, I doubt they do for the termination period. See also my major point on CDD above. "North of Africa"??? Is that Europe?

Section 4, p. 32406, line 26: "…mean global warming caused by the RCP4.5 scenario…" Global warming is not caused by RCP4.5!

p. 32407, line 3: "10-year temporal distribution" of what?

p. 32407, lines 4-6: "In the simulations investigated, …" This sentence makes no sense as written. Please clarify and rephrase.