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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Climate extremes in multi-model simulations of stratospheric aerosol and marine cloud brightening climate engineering" *by* V. N. Aswathy et al.

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The paper by Aswathy et al. is investigating climate extremes in climate engineering simulations. The paper is well written and structured and is another important contribution to the discussion on how climate engineering would affect climate extremes with focus on temperature and precipitation. The impact of two different climate engineering methods are compared using three different Earth system models.

I have one major comment to the paper. One new finding of this study is that temperature and precipitation extremes are more or less equally affected by climate engineering

as the mean values. I am somewhat concerned about this conclusion, since this has implications for the calculation of social costs of geoengineering (as stated in the text) and I am not convinced that this statement is true. Some more analysis or at least discussions would be helpful to support this conclusion. The study does only investigate annual changes and does not look into seasonal variations, in particular important for precipitation. Is this sufficient? Would an extension of the analysis to different seasons and somewhat refined regions (tropics, mid-latitudes, high latitudes) change the result? Another caveat of the findings is that the models used here do not simulate the effect of volcanic aerosols on dynamics and chemistry, which may change the results.

Specific Comments: Introduction: Line 7: There are many studies following Crutzen's paper, I suggest to add "e.g.," before the citation list.

Section 2: Line 25: It seems that all the climate models used in this study prescribe AOD and effective radius for the G3 experiment. So, these models do not inject SO2 directly. Please clarify if any of these models simulate the impact of aerosols on stratospheric dynamics or chemistry, and if not, could this change the results?

Section 2.1 The climate extreme analysis may be misleading, since there is no separation between seasons. Please comment. Also, from Table 2, P10 and P1 is not shown for precipitation. As shown in Tilmes et al., 2013, P10 and P25 indicate changes in light precipitation and a reduction is an indication for droughts, while the increase of higher intensities, like P90 or P99, indicates increasing heavy precipitation and therefore flooding.

Page 32400, Line 5: Please clarify how maximum and minimum temperatures are defined, are these daily minimum/maximum temperatures or maximum and minimum temperatures of daily mean temperatures?

Section 3: Tables 2-4 only show multi-model mean values. Adding values from single models would be helpful to see how those vary. Also, a separation between Tropics, mid-latitudes (North and South) and global would be interesting, as well as the corre-

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sponding discussion in the text.

Section 3.1: Page 32401, Line 15: Reference in brackets.

Line 22: Instead or in addition to Figure 1, it would be helpful to show a PDF for example for the northern mid-latitudes over land, to easier identify the statement that there is "no shift in the tail of the temperature distribution". It seems to me that there is more warming over northern Europe and Canada in looking at P10. Again, differentiating in seasons may show a stronger signal than the annual average.

Line 32402, Line 4: Is this really only the case for northern high latitudes, or also mid-latitudes (30-60N)?

Line 13ff: This statement needs the addition, that only annual averages were considered and seasonal changes may be much larger.

Line 18: Reference in brackets.

Figures 6-8: these are too small to read. Maybe 4 rows and two column would work better?

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 32393, 2014.