Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2017-434-RC3, 2017

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Impacts of Stratospheric Sulfate Geoengineering on Tropospheric Ozone" *by* Lili Xia et al.

Anonymous Referee #3

Received and published: 23 July 2017

This manuscript examined the effects of stratospheric sulfate aerosol and solar insolation reduction on tropospheric ozone and surface ozone. The study also examines the both chemical and transport mechanisms of tropospheric ozone changes to SRM techniques. The findings of this paper help us get a better understanding of effects of SRM. In general, I found the main points and the structure of this manuscripts are clear. Below are my comments for making the manuscript more concise. I recommended the paper to be published with minor revision.

Detailed comments:

Line 54: Add one or two references of sulfate aerosol effects in the stratosphere.

Caption for Figure S1: What do you mean about the 10N to 10S gridded present day

Printer-friendly version

Discussion paper

MLS/OMI satellite data? Doesn't the data cover the extra-tropics?

Line 159: move "the last 40 years of geoengineering" in line 161 to here.

Line 163: Figure 3a and 3b: why there is significant temperature increase over north Atlantic? More explanations of temperature changes between SRM runs and RCP 6.0 would be helpful.

Line 164-166: In Figure 3c: I did not see clear warming signal in Asia. And 'warming' here is confusing: both G4SSA and G4SSA-S show temperature decrease compared to RCP6.0. The red color in Figure 3c just means that G4SS4 has less temperature reduction than G4SS4-S.

In Figure S3, surface temperature in G4SS4 does show a significant warming over northern Europe and Asia compared to RCP6.0 in winter. I think that is the feature that agrees with the characteristic "winter warming" from volcanic stratospheric aerosol (Robock, 2000).

Line 168-170: around 50 hPa in the tropics, the G4SSA-S also shows the significant warming.

Line 173: would be better to switch the sequence of Figure 2b and Figure 2c

Line 207: How the halogen changes over these three runs?

Line 361: mid-high latitude: are you talking about the lower stratosphere $\sim$ 100 hPa? Adding the location of tropopause in Figure 8 would be much helpful.

Line 364: temperature changes in which direction?

Line 364: "Altogether, this results in year-round lower stratospheric ozone loss worldwide that peaks during the return of sunlight at high SH latitudes." Which figure describes this feature?

Line 368: Figure 8b: Confused here: in Figure 4b, temperature shows an increase

in the tropics around 50-70 hPa. Other regions show temperature reduction. You mentioned that ozone increase in Figure 8b is due to temperature decreases. While the regions with T increases (tropics, 50-70 hPa), ozone has a maximum increase. It would be much easier to understand if you mention lat/pressure when describing figures. Lower stratosphere in the polar region could reach as low as 400 hPa. Adding a tropopause in Figure 8 would be much helpful.

Line 383-384: Why tropical upwelling response differently between this study and Aquila et al 2012? Please be more specific?

Line 394: (Fig. S12). . delete one period

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2017-434, 2017.

Printer-friendly version

Discussion paper