Answers to the editor on the ACPD paper (acp-2015-25)

What is the limit of stratospheric sulfur climate engineering?

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Dear Dr Kravitz,
I send you a revised manuscript and the answers to the reviewers. We did all requested language changes in the text, as well as in the captions and figures. I add some short answers to some remarks of reviewer 2.

With best regards,
Ulrike Niemeier

Specific comments of reviewer 2

Page 3, line 27-28: Revise the sentence by removing both commas, changing "if" to "of", and adding "the" before "RCP8.5" "This raises the question of whether or not it will be possible to counteract strong GHG forcing, like the RCP8.5 scenario, for example, down to a level anticipated for 2020." Also, please give the reader an idea how large the RF needs to be (in 2070, 2100?) to maintain the 2020 RF level.
We added to the text: This would require a reduction of -5.5 W m^{-2} in 2100.

Page 5, line 10: Precursor species are generally thought to be source gases which are precursors to other species of interest, such as OCS is a precursor to SO2, or N2O is a precursor to NO and NO2. I think the term is used incorrectly here. In this context, OH, NO2 (or do you mean NO3?), and O3 act as radical species which react with SO2. Also, is there no surface emission of SO2? Is SO2 prescribed at the tropical tropopause? If not, your model is missing a significant fraction of the sulfate aerosol burden in the very lowest stratosphere under nonvolcanic, non-geoengineering conditions. Though that shouldn't matter for this study. "The gaseous precursor species (OH, NO2, and O3) are prescribed. . . "
The assumption of the reviewer regarding the SO2 emissions is right. The set up of the aerosol model is for stratospheric conditions only. This set up should not be used for non-volcanic studies on tropospheric conditions. For this kind of studies the original version of ECHAM-HAM should be used. We mention earlier in the text: Within this stratospheric HAM version we treat only the sulfate aerosol and, apart from the injected SO_2, only natural sulfur emissions are taken into account in the simulations. Further details are described by Niemeier2009.
We changed the text to: This scheme uses prescribed oxidant fields of OH, NO_2, and O_3 on a monthly bases,...

Page 22, line 11: Ferraro needs a year (2011) for the citation.
The citation is Ferrara and Charlton-Oerez (2011).