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Interactive comment on “Geoengineering by stratospheric SO₂ injection: results from the Met Office HadGEM2 climate model and comparison with the Goddard Institute for Space Studies ModelE” by A. Jones et al.

Anonymous Referee #2

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Geoengineering of SO₂ in the stratosphere is a very sensitive issue and possible consequences need to be scientifically seriously considered. The best method for this are state of the art climate models with necessary extensions for handling aerosols and their physics. Geoengineering will cause a strong impact on meteorological parameters with consequences for e.g. temperature and precipitation pattern. As different models simulate these parameter differently, this study including a model inter-comparison is strongly appreciated and should be considered for publication in ACP after major revisions.

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Anyhow, some important issues are missing, mainly regarding the setup of the experiments. The model description is very short and information on the vertical extension of the model used in this study are missing. The vertical extension is crucial for such simulations and might not be sufficient in this case.

Heckendorn et al (2009) show the impact of the experiment design regarding the emissions of SO₂ on the results. The here reviewed paper misses almost any information on the simulated aerosol. A short description of the aerosol physics is essential for the reader. In order to understand the results and to put them in the context with previous results, 2d informations on the aerosol distribution and structure should be given. See Heckendorn et al (2009) and Rasch et al (2008) on details, e.g. lifetime of the aerosol, AOD, SAD, and radiative forcing.

Another weak part of the paper is the experimental design and the missing information of the aerosol behavior. The design of the experiments is rather simple compared to previous publications. Following the results of Heckendorn et al (2009) it is strongly questionable, if the experimental design is sufficient similar for a comparison to be useful as mentioned by the authors. The globally uniform injection of SO₂ is for sure not realistic. The aerosols are transported poleward anyhow. Aerosol physics is very different for emissions into one box, as done for ModelE, compared to global emissions, resulting in very different radiative impact of the aerosols (Heckendorn et al (2009)). As no distribution of the aerosol is given in the paper, the reason for described differences remains unclear, especially as the given SW radiation is calculated differently. Please, add also a word if you show clear sky or all sky conditions. I strongly recommend to change the design of the HadGEM2 experiments toward a more realistic approach and toward a more similar one to the ModelE simulations and repeat the comparison. This would bring this paper to a state of the art level regarding previous publications.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 7421, 2010.

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