

Interactive comment on “Size-Resolved Stratospheric Aerosol Distributions after Pinatubo Derived from a Coupled Aerosol-Chemistry-Climate Model” by Timofei Sukhodolov et al.

Anonymous Referee #2

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Here authors use SOCOL-AER model to simulate stratospheric aerosol properties following Mt Pinatubo eruption in June 1991. Authors also use observational data sets to evaluate simulated model response. As expected model sensitivity simulations highlight importance of QBO phase in controlling stratospheric aerosol lifetime and well as spatial distribution. They also find that inclusion of van de Waals forces improves effective radii comparison against observations but it deteriorates aerosol lifetime comparison. Overall, this is well written manuscript and I will like to recommend it for a publication, if authors can address some of the minor comments listed below

C1

Minor Comments: 1. With 14 Tg and 10 Tg SO₂ injections, SOCOL simulates higher AOD and relatively more warming in the tropical lower stratosphere, so it would be better if you could (only if it is possible) to add an additional simulation with 10 or 8 Tg SO₂ injection? I agree that you want to follow previous studies, but it will be good idea to show if AOD/ lower stratospheric warming comparison improves if you reduce the SO₂ amount.

2. Page 2 Line 21-31: I think you should rewrite this paragraph as both sectional and modal models have their own strengths and weaknesses. And almost all the modelling studies point out that it's not only aerosol microphysics but also input parameters (e.g. SO₂ injection amount, plume height) play key role in determining evolution of stratospheric aerosol evolution following any major volcanic eruption, hence having sectional scheme does not guarantee that modelled aerosol evolution would be accurate.

Technical corrections:

1. Title : What about “ Simulating evolution of stratospheric aerosol after Pinatubo eruption using coupled aerosol-chemistry climate model (SOCOL). 2. Abstract : line 4: 40 size bins with radii spanning from 3. Also next statement “Radiative forcing is computed .. “ should not be in abstract 4. Line 7: We performed series of simulations (delete “a”) Page 2 : Line 7: considered as main forcing constraint Line 8: and better understanding about the evolution of stratospheric aerosol layer is crucial

Page 3: Line 19 : describing Table 1: Experiment QBO should be “noQBO” and next one should be “noQBOnoRAD”

Page 6 Line 4: composites is presented in Revell et al., 2017 Page 15 : Line 9: wrong. Ozone response is more pronounced at mid-latitudes Do you get large hemispheric differences in ozone losses (e.g Poberaj et al, 2011, JAS< Aquila et al., 2013, JAS, Dhomse et al, 2015, GRL)

Page 16: Line 17 : spelling “explore the role of QBO”

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