

## ***Interactive comment on “A Consistent Prescription of Stratospheric Aerosol for Both Radiation and Chemistry in the Community Earth System Model (CESM1)” by R. R. Neely III et al.***

### **Anonymous Referee #1**

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#### General comments

The manuscript describes the prescription of the stratospheric aerosol for radiation and chemistry calculations in the Community Earth System Model (CESM1). The subject of the manuscript is appropriate to GMD, because it will help all CESM1 users to understand technical details of the new method. The authors illustrated the performance of the new scheme simulating the response of the atmosphere and climate to Mt. Pinatubo eruption using SAGE-4lambda stratospheric aerosol data set recommended for the CCMI participants. The obtained results revealed much better agreement of the simulated global mean surface cooling and tropical lower stratosphere

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warming with observations, which makes the new approach interesting also for wider community. I think, the manuscript provides potentially interesting information and can be recommended for publication with moderate revisions.

#### Specific comments

1. Introduction should be extended to better review other methods used for the prescription of the stratospheric aerosol in the climate models. It is interesting to put the described approach into the context.
2. It is interesting which one of the introduced changes is responsible for the obtained major improvement. Is it the new SAGE dataset, new radiation codes implemented in CESM, introduced dependency of the aerosol property on particle size distribution or something else. This information will be highly appreciated by the modeling community, because it can show how to improve simulated response to volcanic eruptions.
3. The authors illustrated their approach using the SAGE based dataset which includes effective radii. It should be discussed how to treat stratospheric aerosol for the simulation of the past/future climate when this information is not readily available.

#### Technical corrections

1. Page 10712, Line 9: Which global temperature is mentioned? I guess it should be explained.
2. Page 10715, Line 20:  $R_g$  is used, but explained only later.
3. Page 10716, Line 6: What is asymmetric scattering? Probably asymmetry factor is better?
4. Page 10717, Lines 4-9: I do not understand this paragraph. Why  $R_g$  is equal 1.25? Which experiment is described here?
5. Page 10719, Line 12: “The for original file was ...” Something is wrong here.

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6. Page 10719, Line 26: needed?

7. Page 10724, Line 20: I think it is not allowed to use reference to the paper "in preparation". What potential reader should learn from this?

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