Reply to reviewer 2's comments:

We would like to thank reviewer 2's helpful comments on this paper. In response to reviewer 2's suggestions, we have modified the manuscript listed below.

Anonymous Referee #2

Received and published: 25 January 2011

Review of " Saharan and asian dust: similarities and differences determined by CALIPSO, AERONET and a coupled climate-aerosol microphysical model" by L. Su and O. B. Toon

Recommendation: Accepted with stated minor revision

The dust aerosol has important effects on global and regional climate. This manuscript compares the Saharan and Asian dust mass transportation, deposition and dust aerosol optical depth, size distribution and single scattering albedo form a three-dimensional coupled climate-aerosol microphysical model simulations and AERONET and CALIPSO observations. In general, I found the paper well written and appropriate for ACP audience. I recommend accepted this paper for publication in ACP with addressing those comments listed below:

1. Author should provide a subsection for describing the CALIPSO and Aeronet data.

Subsection 3 describing CALIPSO and AERONET data has been added into the manuscript (see page 6, lines 28-31; page 7, lines 1-12).

2. The model simulation results cover the whole year of 2007, so we can see the monthly variations of Saharan and Asian dust transportation and deposition. However there are only one month observation data for optical depth and couple of days for size distribution and single-scattering albedo. Few observation data may not be sufficient to represent Saharan and Asian dust properties, and the author should be careful to draw the conclusions.

We present only a few case studies in this paper. However, we have done a systematic assessment of the model simulations in a separate JGR paper (Su and Toon, 2009) titled "Numerical simulations of Asian dust storms using a coupled climate-aerosol microphysical model (J. Geophys. Res., 114, D14202, doi:10.1029/2008JD010956, 2009) ". We validated the simulations against observations from the ACE-Asia field campaign. We also used the observational datasets including AERONET data at six study sites as well as the NIES lidar data to constrain the model simulations in Su and Toon (2009).

3. Author claimed that 'Fig. 17 shows two volume modes, one near 0.5 μm and one near 2 μm radius. The Saharan distribution is unimodal with a peak slightly smaller than 2 μm'. However the figure obviously is not the same as the author described.

To address reviewer 2's concerns, we have modified the description in the manuscript based on Fig. 15, 16 and 17 as stated in the manuscript (see page 18, lines 24-30; page

19, lines 1-11).

4. Some study report that the SSA value of Asian dust are range from 0.73 to 0.85 at 0.5um, which is much smaller than those from Africa dust (Pandithurai et al., 2008, Ge et al., 2010). Author should refer those two results. 1) Ge, J., Su, J., T. P. Ackerman, Fu, Q., Huang, J., and Shi, J.: Dust aerosol optical properties retrieval and radiative forcing over northwestern China during the 2008 China-U.S joint field experiment, J. Geophys. Res., 115, D00K12, doi: 10.1029/1009JD013263, 2010. 2) Pandithurai, G., Dipu S., Dani K. K., Tiwari S., Bisht D. S., Devara P. C. S., and Pinker R. T.: Aerosol radiative forcing during dust events over New Delhi, India.. J. Geophys. Res., 113, D13209, doi: 10.1029/2008JD009804, 2008.

These two references and the discussion have been added into the manuscript as suggested by reviewer 2 (see page 20, lines 22-29). However, as we discuss both may refer to dust that is contaminated by pollution.

5. The units for y axises in Fig. 16 and 17 are wrong.

It should be um3/um3 in this study. We defined the volumes of particles per volumes of air in the size range lnr to lnr + dlnr.

6. Page 29513, the first letter of 'asian' in the title should be capital.

"asian" has been modified to "Asian" (see the manuscript title)

7. Page 29532, line 20. 'there as' should be deleted

It has been deleted.

8. Page 29555. The title of Fig.6 is wrong. 'Modeled monthly dust wet deposition between 10_ S to 40_ N for longitudes between 10_ E to 35_W, 35_W–80_W, and 80_W–125_W for Saharan dust in' should be deleted.

I found most of the figure titles including this one have errors in the published ACPD paper. However, the originally submitted version is correct (see Fig. 6).

9. Page 29558. The first two sentences in the figure title should be removed or make the figure caption more clear.

Same as #8 (see Fig. 8).

10. Page 29559. The first two sentences in the figure title should be removed or make the figure caption more clear.

Same as #8 (see Fig. 9).

11. Page 29566 The first sentence in the title should be removed or make the figure caption more clear.

Same as #8 (see Fig. 17 and Fig. 18).