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Atmospheric Chemistry and Physics Discussions

Interactive comment on "On realistic size equivalence and shape of spheroidal Saharan mineral dust particles applied in solar and thermal radiative transfer calculations" *by* S. Otto et al.

J. Gasteiger

josef.gasteiger@lmu.de

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This in an interesting and useful study which deserves publication in ACP. However, I hope the author consider this comment which is related to the conclusion "volume-to-surface equivalent spheroids ... are most realistic" (line 7-8 of the abstract).

In the present study, the authors simulate optical depths for a 19 May 2006 case of the SAMUM campaign assuming different definitions for the particle size of prolate and oblate spheroids. By comparison of simulated backscatter coefficients with those from lidar, it is clearly shown that prolate spheroids are more realistic (Fig. 9). The comparison of modeled optical depths with the corresponding values from Sun photometer

(Tab. 1) shows that the agreement is best for the size definition VSEQV (+1%). For VEQV (-5%) and SEQV (-8%), the agreement is slightly worse.

To exclude one of the candidates (VSEQV, VEQV, or SEQV) by this comparison, the uncertainties of the different input parameters of the model, the model itself, and the measurement should be considered. There are different potential sources of uncertainty (non-exclusive list):

1) Method for derivation of vertical profile of number concentration (I believe, a brief outline of the main steps of this method would improve the paper)

2) Spatial and temporal averaging of the number concentration profile used as model input. At the beginning of Sect. 5 of Otto et al. (2009), the authors describe that the vertical profile is averaged from 10:50UTC to 12:20UTC. As data from aircraft is used, spatial averaging implicitly took place, also. I would except a some percent uncertainty for the modeled AOD from this averaging. E.g., the shapes of the vertical profiles in Fig. 9 are not exactly the same for model results and lidar measurements.

3) Is there any aerosol modeled above 5.6 km asl? If not, an aerosol optical depth in the order of 0.01 might be missing in the model.

4) Size distributions

5) Model shapes

6) Aerosol optical depth from Sun photometer

Combining all these uncertainties likely results in an uncertainty of notably more than 8% for the aerosol optical depth. In this case, the size definitions VSEQV, VEQV, and SEQV are equally valid and a statement like the above-mentioned in the abstract is not useful. The paper would benefit from the consideration of the uncertainties (at least rough estimates of them should be possible).

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 29191, 2010.

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Interactive Comment