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Interactive Comment

Interactive comment on "Development and testing of a desert dust module in a regional climate model" *by* A. S. Zakey et al.

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Extinction coefficient calculation.

The point, outlined by F. Dulac, on considering a long range transport distribution type, vs a source distribution is a key point which should have been more explicit in the paper. The problem we face comes from the fact that the emission size distribution depends itself on the soil textures as well as wind patterns and intensity, and so determining a mean representative distribution for climate application is not straightforward. To be more quantitative, we redid some Mie calculations (using substep of wavelength and diameters) considering the 3 mode Alfaro emission distribution presented in the paper. The amplitude of each mode depends on soil texture and surface wind. We performed the calculation for two cases presented in Alfaro and Gomes, 2001 considering

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different arid soil component and friction velocities. The cases were chosen to define a range of emission distribution from a intense emission (number distribution dominated by the fine mode) to weak emission (number distribution dominated by coarse and intermediate mode). Result are presented for kext on table 1. For the fine bin, the most efficient in term of climate forcing, the range we obtained varies from 1,87 to 2.99 m2.g-1. A simple first order average gives a kext estimation which is very close to the kext = 2.4 m2.g-1 obtained with the Zender long range distribution. Nevertheless, in intense outflow conditions, the underestimation of kext could be a factor contributing to the underestimation of the simulated AOD in the Sahara outflow. A more refined approach would be to determine average friction velocity / soil texture conditions, and resulting mean size distribution over the domain : this requires further simulation and testing.

Transport bin size 0.01-1 1-2.5 2.5-5 5-20 Kext A 2.99 0.92 0.41 0.16 Kext B 1.87 0.67 0.35 0.12 Table 1: extinction coefficient calculated for two case studied in Alfaro and Gomes, 2001. A : u* = 80 cm.s-1 on Coarse Sand, B : u*=30cm.s-1 on alumino silicated silt.

3 Model satellite comparison.

The regional seasonally averaged MODIS AOD have been added to this reply (Figure3). Initially we just presented MISR, because MODIS AOD misses data over bright desert. Nevertheless, we agree that MODIS brings an interesting information over the seas and we plan to add them in a revised version of the paper. Also, as suggested by F.Dulac, we performed a scatter plot of simulated and measured AOD for a latitudinal band dominated by dusts from 5 to 40 N (figure 4), correlation coefficients obtained are about 0.8 in both cases. As for the cloud contamination in satellites products, we used already averaged MISR and MODIS data (Level 3 product). To estimate how representative are the satellite AOD average regionally, the MODIS AOD standard deviation and the MISR AOD count can be used (cf fifure 5): This figure can possibly be added and used for a point about variability and uncertainties in the revised version. Several

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quality assessment outlines that satellite seasonal averages might be dominated by intense event (dust or biomass burning) and thus could be overestimated. In addition, references to MISR and MODIS validation papers (vs AERONET data) will be added to the revised version. The suggestion of filtering the model output to build the average simulated AOD in function of coincident daily observations is very appropriate, but requires a priori significant data acquisitions (daily products) and treatments that may exceed the delay of reviewing processes. However, as suggested, the use of daily data filtering will be used in future model/satellite comparison.

ps; Figure has been sent directly to the comment author

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 1749, 2006.