Atmos. Chem. Phys. Discuss., 12, C1916–C1917, 2012
www.atmos-chem-phys-discuss.net/12/C1916/2012/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Aerosol radiative forcing during African desert dust events (2005–2010) over South-Eastern Spain" *by* A. Valenzuela et al.

Anonymous Referee #4

Received and published: 27 April 2012

The manuscript discusses the calculations of aerosol radiative forcing (ARF) at surface and the top of the atmosphere for the desert dust events at Granada (Southeastern Spain) from 2005 to 2010 in 0.3-2.8 microns spectral range. For that, SBDART radiative transfer code is employed using as input aerosol parameters retrieved from CIMEL sun-photometer measurements in principal plane (PP). The manuscript is a continuation of authors' previous work where the inversion technique and analysis of aerosol retrievals are presented. The monthly ARF and instantaneous ARF efficiency values are presented and discussed. ARF computations are compared with those from AERONET network. I believe that the subject of manuscript is in scope of ACP and could be published after all of the comments will be answered.

Comments. 1. My major concern is the quality assurance of both measurements and

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retrieved aerosol parameters. On line 25 (Introduction) authors write that aerosol retrievals by AERONET from PP are not publicly available as compared to almucantar (ALM) retrievals. There is a good reason for this: the quality assurance for PP observations is much harder than for ALM. For ALM, the symmetry check along with the averaging of left and right parts of ALM sky radiances ensures that uncertainties due to the cloud contamination, aerosol in-homogeneity, and angular pointing bias are minimized. The PP measurements do not have the symmetry so the above criteria cannot be applied. It is not clear from the text how quality assurance of sky radiances was done. For example, what criteria, if any, were used to reduce effect of cloud contamination? I believe authors should describe in details how the quality assessment of PP sky radiances was performed, maybe even in a separate paragraph. 2. Quality assurance of aerosol retrievals also should be discussed. In particular, uncertainties of retrieved aerosol parameters should be assessed. For single scattering albedo, for example, these uncertainties are the function of AOD and solar zenith angle (SZA) and therefore are subjected to temporal and seasonal variability. 3. It is unclear what values of aerosol complex refractive index were used outside of CIMEL spectral range. Were they extrapolated? Or some other sources were used? 4. Surface reflectance. It is unclear whether any spectral dependence of surface albedo was included in calculation or it was assumed to be spectral independent. In addition, what is the uncertainty due to not accounting for surface reflectance directionality (BRDF)?

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 6593, 2012.