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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Shortwave radiative forcing and efficiency of key aerosol types using AERONET data" *by* O. E. García et al.

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The paper addresses the important topic of shortwave radiative forcing of aerosols of various kinds and regions throughout the world. As such, this well-written paper is appropriate for publication in ACP, especially in the special issue dedicated to Didier Tanré, but as written needs additional work and clarification, as suggested by Reviewer #2. In addition, I suggest the following changes:

Figure 1 - caption refers to gray triangles, brown squares, green diamonds, etc., but the figure as actually drawn has all symbols in white. Clean up the figure in this regard, which is not difficult.

Page 32652, line 28ff - reference is made to 'the surface spectral reflectance was

modeled using climatological values provided by MODIS. . .' MODIS provides surface albedo every 16-days at 7 spectral wavelengths, and thus there is seasonal, spectral, and geographic values. There is no reference given in the text or elsewhere, and presumably the work being used is Moody et al. (2005, 2008). References should be given, and elsewhere throughout the manuscript when surface albedo is mentioned, only one value is given (what wavelength, broadband, etc.). This is not arbitrary and is characteristic of a specific AERONET location, though it does change seasonally. Since this is such an important impact on radiative forcing, along with the aerosol properties (optical thickness, size distribution, and single scattering albedo), some attention to this detail should be given throughout the manuscript.

Page 32654, line 16 - 'BC' is defined here as Background Continental, but throughout the rest of the paper, CB is used (including in Table 1) and refers to Continental Background. The easiest is simply to change the reference in line 16 to CB and define it as Continental Background.

Page 32655, line 7 - change 'In a lesser extends' to 'To a lesser extent'.

Table 1 - change MD 'Arabic Peninsula' R3 to MD 'Arabian Peninsula' R3. Also change BB 'South Africa' R6 to 'Southern Africa' BB.

Page 32658, line 5 - the text states that 'In the Northern Hemisphere the biomass burning period is the winter, while in the southern Hemisphere the summer.' This is not correct. In the boreal forest of North America it is in summer, and in the Southern Hemisphere it is winter to spring (August-September). August-November is the dry season with little precipitation in the cerrado and Amazon basin of Brazil, not a cold period per se.

Page 32658, line 11 - change 'Skukuba' to 'Skukuza'.

Page 32660, line 11 - correct sentence from 'they are still are greater' to 'they are still greater'.

Page 32661, line 23 - correct awkward sentence from 'mainly due to there are more sources...' to 'mainly due to there being more sources...'

Page 32661, line 27 - change 'Central and South Africa' to 'west and southern Africa'.

Page 32663, line 13 - mentions considering a unique value of the spectral SA for each measurement. This depends on location and time of year. The text mentions using a spectral average of surface albedo from the V2 AERONET algorithm, which I believe is Moody et al. (2005) in origin, but then extrapolated to the 4 AERONET wavelengths. In the paper, these four are again averaged for a single value. Again this does depend on a specific AERONET site and on time of year, but it is not clear what the paper used, whether they just considered broad areas of surface albedo or site-specific and time of year specific values. Some clarification of this is important.

Page 32665, line 5 - change 'given in the Sect. 3' to 'given in Sect. 3'.

Page 32666, line 1 - change 'South Africa' to 'southern Africa'.

Page 32667, line 12 - change 'which leads lower values...' to 'which leads to lower values...'

Page 32667, line 19 - change 'efficiency values is necessary...' to 'efficiency values it is necessary...'

Page 32667, line 27 - change 'in part of the higher...' to 'in part to the higher...'

Page 32668, line 7 - change 'what aforementioned...' to 'the aforementioned...'

Figure 7 caption and supporting text - delete the tauˆ-1 as a 'unit' in the forcing efficiency. The definition of forcing efficiency is forcing per unit of optical depth, and the units are just W mˆ-2. I see no reason to have inverse tau in the units at all.

Page 32670, line 24ff - change this awkward sentence to something like 'Nonetheless, special attention should be paid to aerosol emissions and their transport in highly reflective areas (deserts or snow)...'

General observations

Throughout the manuscript the radiative forcing is done only for a solar zenith angle of $\sim 60^{\circ}$. It would be more valuable to do it for a daily average (since these are daytime forcing properties), and the length of day and solar zenith angle variation varies by location and time of year. Consider amplifying this analysis, which would be more climatologically significant than a fixed solar zenith angle representative of no particular time of year.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 32647, 2011.