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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Direct SW aerosol radiative forcing over Portugal" *by* D. Santos et al.

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GENERAL COMMENTS

The manuscript presents some computations on direct short wave radiative forcing (DSWRF) due to atmospheric aerosol. The focus is on Top of the Atmosphere, TOA, DSWRF. The analyses have been done using atmospheric aerosol properties retrieved from two AERONET stations and MODIS images. The AERONET retrievals have been used to derive the surface reflectance and for the computation of the DSWRF. Different types of aerosol have been analysed in two different regions.

The topic is relevant for Atmospheric Chemistry and Physics. The manuscript presents an appropriate structure.

The abstract gives a general insight on the manuscript, but it would be worthy to include

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the coordinates of the study areas and the temporal period covered by the study.

The title must clearly state the limitation of the radiative forcing study to the Top of the Atmosphere; otherwise the analyses must be extended with results of radiative forcing computed at the Earth’s surface and the atmosphere. This addition would improve the manuscript and explain additional features of the differences in single scattering albedo, SSA, of the analysed aerosols.

PARTICULAR COMMENTS

Section 2. Methodology. It would be worthy to present a short discussion on Figure 1 and general aspects of the methodology. It is likely that doing this some missing aspects of the methodology would be clarified (see bellow the comment on SSA).

Section 2.2 Classification of the aerosol case studies. Additional details on the constrains used in the HYSPLIT model are necessary, i.e. model used: isobaric, vertical velocity….

Section 3.5. The use of AERONET 1.5 level data must be explained together with some discussions about the restriction associated to the use of this type of data.

P-8598-8599. The statement: "When aerosols are present over a land surface with high reflection, their impact on solar radiation is very significant because the radiation reflected from the surface below would interact again with the aerosols present above.", supports the convenience of additional analyses on the forcing at the atmosphere and Earth's surface.

Section 3.2.1. The results on single scattering albedo, SSA, shown in figures 10, 12, 14 require additional explanation. These SSA are not direct retrieval from AERONET, because they present an extended spectral range. On the other hand, it would be necessary to discuss about the confidence on the SSA, in case they were based on AERONET retrieval, when the aerosol optical thickness, AOT, are rather low.

P-8600. The next statement:" For the days presenting negative TOA DSWARF values

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(upper panel of Fig. 13), namely 29 March, 13 April, 15 and 24 May, SSA values are, accordingly, higher.“ needs rewording. The appropriate reasoning would be that the larger values of SSA retrieved during the mentioned dates are the cause of the TOA DSWARF negative values

P-8600-L-17. The authors state: "For 17, 18, 19 June and 10 July 2005, no information concerning fire occurrences was available, nevertheless the AERONET aerosol optical thickness values obtained for Évora and the aerosol type classification presented in Table 1, allowed to consider the "Forest Fire" aerosol type." Nevertheless, the SSA values for 19 June are close to unity. This could be interpreted as evidence that the classification of aerosol types in terms of AOT and Angström exponent is far from complete. Why maintain 19 June as forest fire type in that case?.

Section 3.2.4. According to Figures 16 and 17 the positive values of DSWARF are associated to small AOT. Considering the uncertainty in the AERONET SSA retrieval for low AOT the authors must revise these cases, because the positive magnitude of the DSWARF could be similar to the uncertainty associated to the Radiative Forcing computation. On the other hand, it is not clear the convenience of determining the forcing efficiency as the slope of DSWRF versus AOT including positive and negative forcing values. The differences in sign must be interpreted in terms of the SSA and the surface reflectance values, and the positive and negative efficiencies computed separately, in case they provide statistically significant results. In this last sense, the radiative forcing efficiency derived with a 0.36 correlation coefficient is not relevant.

The discussion on DSWRF and radiative forcing efficiencies would improve including additional comparisons with other authors, especially in the case of studies in close regions under similar types of aerosol.

MINOR COMMENTS

P-8587_L-25. Substitute "Instrumental Payload" by "instrumentation". P-8588_L-10. Substitute "up welling" by "upwelling".

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P-8594_L-24-25. The explanation on Equation 1 needs rewording and the suppression of the term solar.

P-8597_L13. Substitute "completely" by "pure".

P-8598_L-18-19. Substitute "purely scattering" by "pure scattering aerosol" and "purely absorbing" by "pure absorbing aerosol".

Please correct Figure caption of Figure 17.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 8585, 2008.

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Interactive Comment