Atmos. Chem. Phys. Discuss., 8, S5175–S5182, 2008
www.atmos-chem-phys-discuss.net/8/S5175/2008/

Atmospheric Chemistry and Physics Discussions

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

D. Santos et al.

Received and published: 22 July 2008

Main comment

The authors agree with the reviewer point, therefore decide to extend the study and evaluate the DSARF at the surface, for specific situations. The aims of this paper are twofold: the assessment of the surface spectral reflectance over two regions of Portugal, having different vegetations cover types, but homogeneously distributed; assessment of the DSWARF over these two sites for two main types of aerosol events, being these sites, spatially apart by about 150km. In this sense it is worth to evaluate the effect of the same aerosol event (Desert Dust - DD) over the two separate sites and the effect of the time evolution of the same aerosol type (Forest Fire - FF) over the same region. These two situations have direct impact on the DSWARF at the TOA, at the Surface, and, consequently, of the entire atmosphere. This fact justifies the choice of the authors to estimate the DSWARF at the Surface as well, only for these two particular situations (presently Figure 13b). The calculation of the DSWARF at the surface for all the cases under study would mean an additional effort and would imply an increase of the number of figures and text. Therefore, the authors choose to present the results only of the two above mentioned cases (DD over two separate sites and FF over the same region).

Specific comments

1. The abstract was condensed and the specific aspects required were added. The quantitative results are presented in the last paragraph of the abstract.

2. The aspect of radiative forcing of aerosols throughout the atmosphere was added in the Introduction.

3. The period of the study was added to the abstract.

4. The authors agree that the reference to Fig. 1 was misplaced therefore the reference to Fig 1 is now inside sections 2.3 and 2.4, where the methodology is explained.

5. MODIS spectral bands were chosen in order to match AERONET CIMEL radiometer spectral channels used (400, 675 and 870 nm), keeping the highest spatial resolution possible (250 to 500 m). The 6S code takes into account and corrects the gaseous absorptions bands, including the Ozone Chappuis band absorption.

6. The expression was rephrased summarizing then the procedure of Costa et al. (2004).

7. Eq.1: - Yes, μ(miu) is the cosine of the viewing zenith angle, it was an error and it was already corrected. - I is calculated using the 6S code and the gas absorptions are considered and corrected by the 6S code using a mid-latitude atmospheric profile.

8. Yes, the H2O absorption is included and the information is taken from 6S database.

9. The statement was added in the last paragraph of section 2.4.

10. The main concern in obtaining the surface spectral reflectance, for the regions

ACPD

8, S5175–S5182, 2008

under study, was to avoid areas of no homogeneity, such as concrete areas. Also the areas under study are mainly rural. For these reasons, the concrete areas represent only a small contribution, with respect to the total area under study, and therefore are not take into account.

11. The maritime aerosols in Cabo da Roca were not filtered from the analysis (were included). For that region (the most western location of the European continent, where maritime aerosols is a pervasive component of the regional atmosphere, in the frontier between land and ocean, this is the typical, usual situation, that is, a mixture of marine and continental aerosols are always present, having a much lower aerosol optical thickness (AOT) than the cases under study (Desert Dust and Forest Fires). Their contribution can be and was already assessed, in terms of the AOT and Angstrom exponent (Gerrit de Leeuw (ed.), Jolanta Kusmierczyk-Michulec, Ana Maria Silva, Thierry Elias, Paola Formenti, Sérgio Pereira, Frank Wagner- Final Report of the European Project EVK-CT-2002-00174 - Deliverable D10 - on “Scientific assessment of aerosol optical depth, types and properties at the Aeronet Sites in The Hague and Cabo da Roca”, (October, 2006)).

12. This suggestion is indeed very interesting; however the authors feel that this would be out of the scope of the present work. This is a subject that will be addressed in a near future research work of the group.

13. DSWARF as a function of AAOT (linear fitting) has a symmetric slope relatively to the corresponding DSWARF as a function of AOT (linear fitting). Nevertheless the authors consider that a deeper exploitation of this dependence would be out of the scope of the paper.

14. The SSA values are calculations obtained from MIE theory using the spectral complex refractive indexes and aerosol size distribution values obtained from AERONET ground based observations over Évora and Cabo and Roca. These spectral SSA values, obtained by the authors, are in good agreement with corresponding AERONET

ACPD

8, S5175–S5182, 2008

Interactive Comment

SSA data (http://aeronet.gsfc.nasa.gov).

15. The day 19Jun was removed since it was a mistake.

16. This work has two objectives; the first one is the development of a methodology to estimate the surface spectral reflectance and the second one to estimate the aerosol radiative forcing. In this way, former figures 3, 4, 5 and 6 show the results corresponding to the surface spectral reflectance assessment. As for former figures 7, 8, 10, 12, 13, 14, 16 and 17 refer to the results of the DSWARF and Fe (former Eq. 5). In order to reduce the total number of figures, former figures 3 and 4 were combined, as well as figures 5 and 6.

Textual comments per page

P.8586:

l. 13: It was replaced.

l. 20: The articles were added.

P.8587:

l. 18: It was replaced.

P.8588:

l. 10: It was replaced.

l. 16: It was corrected.

P.8589:

l. 7: It was corrected.

P.8590:

l. 2/l. 3: It was removed.

ACPD

8, S5175–S5182, 2008

Interactive Comment

l. 28: It was corrected.

P.8591:

l. 12: It was rephrased.

l. 24: It was replaced.

P.8592:

l. 5: These are the internal wavelengths of the 6S code. Nevertheless the authors decide to remove the sentence since it could be misleading.

P.8593:

l. 3: It was replaced.

l. 13: It was replaced.

l. 24: It was corrected.

P.8594:

l. 1: It was removed.

l. 5: It was corrected.

l. 11: It was corrected.

l. 18: It was added.

l. 25: It was removed.

P.8595: l. 14: It was replaced.

l. 16: It was added.

P.8596: l. 10: It was added.

l. 26: The explanation was added on the text.

ACPD

8, S5175–S5182, 2008

Interactive Comment

P.8597: l. 4: It was replaced.

l. 13: It was added.

l. 16: It was added.

l. 21: It was written.

P.8598:

l. 9: It was replaced.

l. 13: According to the suggestion of the other reviewer, the authors decide to replace by the word ‘Pure’.

l. 15 - 19: The text was shortened.

l. 25: It was added.

l. 27: It was removed.

P.8599:

l. 1: It was added.

l. 15: It was replaced.

l. 18: It was corrected.

l. 18: It was corrected.

l. 25: It was rephrased.

P.8600:

l. 1: It was corrected.

l. 1 - 5: The sentence was shortened.

l. 26: It was corrected.

ACPD

8, S5175–S5182, 2008

Interactive Comment

P.8601:

l. 6: It was replaced.

l. 11: It was replaced.

P.8602:

l. 4: A reference was added in the text to answer this.

l. 7: It was replaced.

l. 8: It was replaced.

l. 8 - 9: It was corrected.

l. 16: It was removed.

l. 18: It was corrected.

P.8603:

l. 2: It was replaced.

l. 4: It was corrected.

l. 16: The R value was added to the text.

P.8604:

l. 9: The sentence was rephrased.

l. 15: It was added.

l. 18: It was corrected.

l. 22: It was removed.

P.8605:

l. 24: The DRGF explanation was added to the text.

Dubovik et al. (2002) reference was added to the text.

Table 3: The symbols were explained in caption. The averaging procedure is explained in section 3.1. Database is the one explained in section 3.1 and is now referenced also in table 3.

Figure 2: The units are now given.

Figure 3: The labels were added.

Figure 4 and Figure 3 were combined.

Figure 6 and Figure 5 were combined. The legend was added.

Figure 7: DSWARF explanation was added in the caption. DD and FF explanation is already in the caption.

Figure 8: CR explanation was added in the caption. Urb explanation is already in the caption.

Figure 14: It was now explained in the figure caption.

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

ACPD

8, S5175–S5182, 2008

Interactive Comment