Atmos. Chem. Phys. Discuss., 8, S7560–S7566, 2008
www.atmos-chem-phys-discuss.net/8/S7560/2008/


Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "Monthly-averaged anthropogenic aerosol direct radiative forcing over the Mediterranean from AERONET derived aerosol properties" *by* A. Bergamo et al.

**A. Bergamo et al.**

Received and published: 26 September 2008

Dear Dr. Dulac,

Thank for your interesting comments. We have done our best to answer to them. We believe that your suggestion to group the sites by latitude has allowed a better understanding of the results. Thanks. A marked copy of the revised manuscript has also been sent to the Editor, to easily show the changes introduced in the manuscript, in accordance with your comments and the ones made by the anonymous reviewer. The answers to your specific comments are reported below.

Specific Comments



Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

1.

at page 9, line 250 of the revised manuscript we have added the following sentence:

The recent paper on the spatial and temporal variability in aerosol properties over the Mediterranean basin by Papadimas et al. (2008) that is based on 6-year (2000-2006) MODIS data, support last comments. The AOD interannual variability in the Mediterranean basin has also been analyzed by Papadimas et al. (2008). Hence, that paper is rather useful to evaluate the specificity of the 2003-year AOD values (used in this study) with respect to the corresponding ones over the 2000-2006 periods and can allow inferring to what extent the AERONET sites of our study are representative of the Central Mediterranean.

2.

We have decided to leave Table 5. However, in accordance with the comments of the anonymous reviewer we have avoided generalizing the conclusion drawn.

3.

O.K. The DRE by anthropogenic aerosols has been calculated at a marine area off the Lampedusa island (paragraph 5.3). In particular at page 7, line 201 of the revised manuscript we have added the following sentence:

Monthly averaged surface albedo values retrieved over a marine area (34.500 N, 14.500 E ) off the Lampedusa island are also shown for comparison in Fig. 2 by grey crosses..

Results on DREa are presented and discussed in section 5.3.

4.

At page 7 line 203 the revised manuscript we have added the following sentence:

Percentage differences between 16-days and monthly averaged surface albedo values



**ACPD**

8, S7560–S7566, 2008

are on average smaller than few percents.

5.

Done.

6.

We have added before the introduction the: Table of Contents

7.

We believe that Table 3 provides all required information on the differences between total and anthropogenic aerosol parameters. We have avoided adding new figures in order to not lengthen the paper. It also worth mentioning, that the fine-mode fraction plots also help inferring the role of the anthropogenic component at the different locations.

8.

We believe that the sentence on page 5, line 129of the revised manuscript:

In particular, aerosol parameters retrieved at Ispra, Venice, Oristano, Lecce, Lampedusa, and Crete, which span more than 17° in longitude and 10° in latitude and are differently affected by natural and anthropogenic aerosols, are used to investigate the dependence of the anthropogenic aerosol impact on the site location.

is sufficient to explain the selection criteria.

9.1

The following sentence has been added at the beginning of Section 4 (page 14, line 430 of the revised manuscript): To this end, it is worth recalling that AERONET measurements are essentially clear-sky and that it is assumed in this work that the average aerosol properties derived from AERONET can be extrapolated to all sky conditions.

9.2



ACPD

8, S7560–S7566, 2008

NO. In our model we use only AERONET size distributions and refractive indices.

9.3

YES. According to AERONET Version 2 (V2) inversion algorithm (V2 products are used in this study), aerosol particles are assumed to be partitioned into two components: spherical and non-spherical. Inversion results also provide the percentage of spherical particles.

9.4

Done

10.

Aerosol direct radiative effects mainly depend on AODs (a measure of the magnitude of the aerosol extinction due to scattering and absorption), single scattering albedo (SSA) values (a measure of the relative importance of absorption and scattering), and asymmetry-factors (a measure of the angular distribution of the scattering radiation). As a consequence, we have believed more significant to discuss AOD, SSA, and g values, which are derived from size distribution and refractive index values. We do not believe that some numbers on refractive indices and size distributions would have provided additional data to the traceability of final results.

11.

Extreme values of the imaginary refractive index observed during high dust events (as the one that has affected Lampedusa on 16-17 July 2003) are within the variability range of the sensitivity study.

12.

Infrared refractive indices have been replaced and as a consequence new infrared DREa plots are provided in the revised paper. In particular, on page 8, line 222 of the revised manuscript the previous sentence on far-IR refractive indices has been



**ACPD**

8, S7560–S7566, 2008



replaced with the following:

For the far-infrared spectral region the refractive indices for tropospheric aerosol (Paltridge and Platt, 1976) are used.

13.

Done

14.1

Done. On page 13 line 408, of the revised manuscript, the following sentence has been added:

Seasonal variations are neglected.

14.2

In accordance with our model results, both the DRE and the DREa values are not very sensitive (less than few percent) to the aerosol vertical profile, as we have mentioned in the manuscript and shown in Tafuro et al., 2007.

14.3

O.K. It has been changed. Normalized AOD has been replaced with AOD Fraction since the plot provides the AOD fraction within different layers.

15.

We do not have investigated the cloud coverage inter annual variability. We have decided to use multi-annual average cloud parameters by taking into account that, as you have also underlined that: AERONET measurements are essentially clear-sky and it is assumed in this work that the average aerosol properties derived from AERONET can be extrapolated to all sky conditions.

16.



**ACPD**

8, S7560–S7566, 2008

Done

17.

We believe that the seasonal cycle in SSA or g is mainly affected by aerosol property changes.

18.

At page 11, line 322, the following sentence has been added:

Summer forest fires represent a contributing factor (Pace et al., 2005).

19.

Your findings and hence your comments have partially been determined by the fact that we have made round figures in Table 3. However, we have partially solved the problem in the revised paper: the mean AODa/AOD% ratio was calculated by averaging monthly ratios and as a consequence it can provide under- or over-estimates of the total mean AOD, if it is used to calculate mean AODs. Nevertheless, we believe that it is not necessary to add mean AOD values in Table 3.

20.

We prefer do not follow your suggestion.

21.

We have added the following sentence at page 17, line 548:

We mention that IPCC (2007) provides a summary of the principal atmospheric components responsible of DREs, which can be rather useful to compare the results of this paper with those provided by other authors both for the aerosol and other atmospheric components.

Technical comments:



**ACPD**

8, S7560–S7566, 2008



Line 14-15

Done

-End of page 12776:

We believe that it is convenient do not move end of page 12775 since it allows understanding how AOD, eta, SSA and g values are calculated.

Line 1 to Line 14:

Done

Line 20:

Done, the Zhou reference has been deleted and Yu g value has been changed.

Line 2, p. 12783 to Line, 24

Done

-Legends:

Done

-Table 3

Done

Table 6

O.K. We have grouped Table 6 and 7 in Table 6 and Table 8 and 9 in Table 7.

---

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 12769, 2008.



**ACPD**

8, S7560–S7566, 2008

Interactive Comment