

## ***Interactive comment on “Advection patterns and aerosol optical and microphysical properties by AERONET over south-east Italy in the central Mediterranean” by M. Santese et al.***

**M. Santese et al.**

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Interactive comment on [Advection patterns and aerosol optical and microphysical properties by AERONET over south-east Italy in the central Mediterranean](#) by M. Santese et al.

M. Santese et al.

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First, the study period may be problematic and affect the results, since it does not encompass two complete years. Specifically, it extends from March 2003 to October 2004. Given that aerosol properties have a seasonal dependence, this may affect the

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computed aerosol parameters whenever those are given on an annual basis. This problem should be addressed. It appears that Perrone et al. (2005) have performed such an analysis for the same region, and for a complete year (March 2003 to March 2004). So, the authors could rely on the findings of that study to address the above issue.

\*\*\*\* We believe that the study period does not represent a problem. The use of 19 month data can allow improving the statistical analysis. The main goal of the paper is to assess the influence to the aerosol load of long-range transport from various regions. We do not investigate in the paper the dependence on seasons of main advection patterns. Multi-year data would be required for this study considering that rather few measurement days (3%) have been ascribed in the paper to long-range transport from Sector B and C, respectively. However, according to the Referee comment, we have replaced in the paper the words "yearly average value" with "average value".

Second problem is the paper structure and length. I do not find the structure very attractive, especially the division of paper in sections using the different sectors as a criterion. The authors can actually follow the suggestion of the anonymous Referee 1. Besides, the length of the paper can be reduced by omitting repetitions throughout the text, while the number of Figures can be substantially decreased by combining Figures (see below).

\*\*\*\* We have followed the suggestion of Referee 1.

### Specific

Abstract When referring to sectors, better name them based on their geographical spatial coverage rather than utilizing the symbols A, B, C and M, to which the reader is not familiar from the beginning. \*\*\*\* Text has been changed.

### 1. Introduction

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1. Page 16073, line 12: Replace 'classes'; by 'types';.

\*\*\*\* Text has been changed.

2. Page 16073, line 19: Delete 'of its';.

\*\*\*\* Text has been changed.

3. Page 16075, lines 19-20: The study period does not cover complete years (see general comment).

\*\*\*\* The answer has been given above.

4. Page 16075, line 23: Replace 'Ionic ...'; by 'Ionian ...';.

\*\*\*\* Text has been changed.

5. Page 16075, line 24: Replace 'Balkan peninsula ...'; by 'western Balkan peninsula ...';.

\*\*\*\* Text has been changed.

2. AERONET sun/sky radiometer measurements and retrievals

1. Page 16076, line 12: How far from the coast is located the instrument (building)?

\*\*\*\* At ~ 20 km away from both the Ionian and the Adriatic Sea, as reported in the Introduction.

2. Page 16076, line 20: Please, provide uncertainties for AERONET aerosol parameters used in the study.

\*\*\*\* The following sentence has been added: 'In particular, the AOD accuracy is of  $\pm 0.01$  in the range 440-1020 nm, while the accuracy of SSA and  $g$  at 440 nm is  $\pm 0.03$  and  $\pm 0.02$ , respectively.'

3. Aerosol source regions by 5-day backtrajectories

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1. Page 16079, 2nd paragraph: Since sector A is associated, based on your results, with fine-mode aerosols, it should be justified why Middle-East, which is also found within the sector A and includes desert areas, does not contribute essentially.

\*\*\*\* Figure 2 (old Fig. 3) clearly shows that generally air masses from Middle-East desert areas are not advected over south-east Italy.

2. Page 16079, lines 21, 24, 27: which levels exactly out of the four available?

\*\*\*\* Table 1 provides data on the levels that are out. However, the text has been changed to better explain the constraint.

3. Page 16080, lines 3-4: please, provide a few words on how sensitive can be the results on the selected criteria.

\*\*\*\*A comment has been added in the text.

4. Page 16080, lines 17-18: The sentence is not clear, please explain better.

\*\*\*\* Text has been changed and in particular lines 17-18 have been deleted.

5. More information can be obtained by performing the analysis on a seasonal basis. Then, the unclassified cases would be probably reduced.

\*\*\*\* The unclassified cases cannot be reduced by a seasonal analysis. The chosen criteria to identify source Sectors do not depend on seasons.

4. Aerosol properties and source regions

1. Page 16081, lines 22-24: Sentence ‘Latter observation ... Sector A, B, and C’; awkward.

\*\*\*\* Text has been changed.

2. Page 16082, line 1: Replace ‘Sector C and B, respectively’; by ‘Sectors C and B, respectively’.

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\*\*\*\* Text has been changed.

3. Page 16082, line 25: the upper limit of the range 0.08-0.96 cannot be seen.

\*\*\*\* The text has been changed to avoid the problem due to the AOD scale of Fig. 6a (old Fig. 9a).

4. Page 16082, line 25, &#8217;yearly&#8217;; it is not correct to use the term &#8217;yearly&#8217; since winter is missing.

\*\*\*\* The term &#8220;yearly&#8221; has been deleted.

5. Page 16083, lines 18-19, &#8217;... the contribution of fine-mode particles is larger for the aerosol affected by biomass burning particles&#8217;; this is hardly seen in Fig. 10.

\*\*\*\* O.K. The sentence has been deleted.

6. Page 16083, lines 19-26: you may want to provide yearly average SSA and g values for BB and not-BB cases (Figs. 11, 12).

\*\*\*\* No, since we refer to the grey line of Fig. 11 and 12 (now Figs. 8a and 9a).

7. Page 16085, lines 15-16: Replace the sentence &#8217;In addition, these air masses ... burning aerosol&#8217; by &#8217;In addition, during summer, these air masses are responsible for rather high aerosol loads (AOD > 0.5) contributed by biomass burning aerosol&#8217;.

\*\*\*\* Text has been changed.

5. Sector B: aerosol parameter analysis

1. Page 16085, line 25, &#8217;The larger contribution ...&#8217;; larger with respect to what?

\*\*\*\* Text has been improved.

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2. Page 16086, line 13: Please, explain what do you mean exactly by "spheroid model".

\*\*\*\*Text has been changed as follows: "The particle non-sphericity leads to a not-negligible reduction of the backscatter efficiency compared to the one of surface equivalent spheres (e.g. Barnaba et al., 2005). As a result, there have been numerous efforts to account for particle nonsphericity in aerosol retrieval algorithms (e.g. Dubovik et al., 2002; Mishchenko et al., 2003). It was shown by Dubovik et al. (2006) that in dust dominated environments the use of polydisperse, randomly oriented spheroids leads to a significant improvement in retrieving the size distribution and real refractive index (Dubovik et al., 2002). A spheroid (ellipsoid of revolution) is the simplest nonspherical shape that can generalize the spherical shape (a sphere is a spheroid with an axis ratio equal to one)."

3. Page 16086, line 20, "55±13 sr"; Table 1 reads "56±13 sr"; make these values consistent.

\*\*\*\* O.K. Text has been changed.

4. Page 16086, line 20: Replace "Last results ..."; by "These results ...".

\*\*\*\* Text has been changed.

5. Page 16086: In the discussion you refer to peak lidar ratio values, but you do not talk about its physical meaning.

\*\*\*\* A comment on the dependence of the backscatter efficiency and lidar ratio on particle shape has been added in the text.

6. Page 16087, line 10: Replace "... being south-east Italy more away from desert ..."; by "... since south-east Italy is at a larger distance from desert ...".

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\*\*\*\* Text has been changed.

7. Page 16088, line 8: make the value  $0.3 \pm 0.2$ ; consistent with  $0.27 \pm 0.2$ ; given in

\*\*\*\* Text has been changed.

Table 1.

8. Page 16089, line 27: Replace "... area and the Mediterranean"; by "... area in the Mediterranean";.

\*\*\*\* Text has been changed.

6. Summary and conclusion

1. Page 16091, line 24: Replace "...were used to ..." by "...were also used to ...";.

\*\*\*\*Done

2. Page 16093, 2nd paragraph: the percentages make me to believe that they refer to the total number of classified measured data. Is this correct? If so, please correct the text making this clear.

\*\*\*\* It is correct and the text has been improved.

References

Page 16096, line 18: Replace "...Hatziianzstassiou"; by "...Hatziianastassiou";.

\*\*\*\* Done.

Tables

1. Page 16100, Table 1: why no large differences are seen in g and SSA values between the sectors (especially A and C)?

\*\*\*\* No large differences are seen in g and SSA values since continental average aerosol; and maritime-polluted aerosol; is advected from Sector A and C, respectively and g and SSA values are rather similar for both aerosol types. However, this point is also discussed in the conclusion Section.

## Figures

1. Figure 6 can be probably omitted.

\*\*\*\* The figure has been omitted.

2. Figure 9: Remove 'classes' from y-axis title.

\*\*\*\* Done

3. You may combine Figures 10-11-12-13 and 14-15-16-17 as well.

\*\*\*\* Done.

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Interactive comment on Atmos. Chem. Phys. Discuss., 7, 16071, 2007.

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