

Answer to reviews for ms amt-2018-25 - Formenti et al., Aerosol optical properties derived from POLDER-3/PARASOL (2005-2013) over the western Mediterranean Sea: I. Quality assessment with AERONET and in situ airborne observations

We thank Referee #2 for evaluating the manuscript and providing us with feedback on its scientific content. Detailed responses are presented in the body of text here below in blue.

Anonymous Referee #2

General comments:

The topic of the study is very important: an analysis of the quality of POLDER satellite measurements of aerosol properties over the Mediterranean. This analysis and error information can then be used by other researchers in the CHARMEX project.

The paper constitutes a very comprehensive study, and gives a clear overview of the Aeronet and aircraft measurements, together with their error sources. The thorough discussion of measurement methods and their errors and characteristics, including the supplementary material, is welcomed and is an excellent example for other similar studies.

The paper is well written. The methods are well described, with extensive referencing. However, some figures could be clarified (see comments below).

In the introduction the title should be explained. The reader may wonder what the topic of part 2 will be. This should be clarified, e.g. at the end of the discussion. The fact that the interesting Figure 12 is only given at the end of the paper is probably a cliff-hanger to paper 2 ? There is no information on trends in aerosols over the West-Mediterranean from POLDER and Aeronet data. That is a pity – is 8 years too short? Or will the trends be described elsewhere?

We have now added a sentence in the introduction and modified the sentence at the end of the discussion to clarify that the topic of part 2 would be the analysis of spatial distribution and temporal variability, including trends, provided by the analysis of POLDER-3 retrievals over the western Mediterranean.

Specific comments:

1. Please say in the introduction why there is no attention given to the spatial distribution of aerosols in the West-Mediterranean area. The text given on lines 608-611 should be given in the introduction as well.

This is now done

2. l. 131 ff: All symbols, like m , D , etc., should be in italics (slant font). This does not hold for acronyms, like AOD.

This is now done

3. Header Table 1: N_{bpol} is an unclear quantity; please define.

To increase readability, the caption was changed as “Table 1. List of AERONET stations available in the western Mediterranean region retained for this study. The number of ocean POLDER pixel within 0.5° from the position of the station is indicated (N_{PIXEL}). The number of observations by POLDER-3 and AERONET between March 2005 to October 2013, and the number of coincident days (within brackets) are also reported.” N_{bpol} was changed into N_{PIXEL} .

4. Table 4: AOD, AE, etc. are acronyms and not symbols, so they should be in upright font.

This is now done.

5. Figure 2: What do the green boxes mean?

As indicated in the caption, green boxes indicate the input values from airborne measurements (size distribution, scattering and extinction coefficients) and the initial values of the complex refractive indexes estimated from published literature.

6. Caption Figure 4: What does daily AOD mean in the case of a polar orbiting satellite at 13:30? The individual data points of POLDER averaged over the 1x1 deg² box?

Yes, daily indicates the average of individual data points of POLDER averaged over the 1x1 degree box every day.

7. Figure 4: Why is Nb used instead of N for the number of points?

This is now corrected.

9. Caption Figure 5: Note that the definition of fine and coarse modes is probably not the same for POLDER and Aeronet.

A sentence has been added to the Figure caption.

10. Figure 6: I find this figure difficult to understand. $D_{cut-off}$ is the threshold value itself, so it should be $D > D_{cutoff}$ and $D < D_{cutoff}$. Is here D_{cutoff} itself a variable quantity? I also do not understand the difference between the left and right figures.

There was a problem with the order of panels in Figure 6 (see answer to Reviewer #1) which is now corrected. In Lines 180-182 we clarify this point but modifying the sentence as "The fine and coarse modes of the retrieved volume size distribution are defined as the modes below and above a threshold diameter ($D_{cut-off}$) corresponding to the minimum of the size distribution. The $D_{cut-off}$ value is not fixed but can vary between 0.44 and 0.99 μm ". This sentence is also added to the Figure caption.

11. Please always give the physical quantity in the axis label, so e.g. in Fig. 5, 6, and 7 AOD should be given in the label.

This is now done.

12. Figure 9: Please indicate the three AE ranges with horizontal boundary lines.

This is now done.

13. Caption Fig. 10: $n_s > N_S$. Please say that f_{NS} also is a fraction in terms of total optical depth.

Done

14. Caption Fig. 12: Please use capitals for CNS, NS,

Done

15. Caption Fig. 12: the AOD > AOD, classes > class, curves > curve

Done

16. Concluding remarks: Could a recommendation be added on how to determine the cut-off diameter between fine and coarse aerosols?

A sentence has been added

17. Suppl. Table S1: what is the imaginary part of the refractive index?

The imaginary part of the refractive index is zero in the ocean retrieval algorithm. This is now added in the caption of Table S1

18. Suppl. I. 24: at which wavelength does this refractive index value hold?

The wavelength value has been added

19. Suppl. I. 74: change > changes

Done

20. Suppl. Table S3: please use a better alignment of words and numbers to avoid ugly breaks.

Done

21. Suppl. L. 168: particle > particles

Done

All the textual corrections / suggestions have been accepted