

Interactive comment on “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” by Paola Formenti et al.

Anonymous Referee #2

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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

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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?

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.
2. l. 131 ff: All symbols, like m , D , etc., should be in italics (slant font). This does not hold for acronyms, like AOD.
3. Header Table 1: N_{bpol} is an unclear quantity; please define.
4. Table 4: AOD, AE, etc. are acronyms and not symbols, so they should be in upright font.
5. Figure 2: What do the green boxes mean?
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 $1 \times 1 \text{ deg}^2$ box?
7. Figure 4: Why is N_{b} used instead of N for the number of points?

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8. In Figure 4 there are too many points to clearly see the correlation. Could you make a logarithmic AOD scale, to better zoom-in on the small values?

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

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

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.

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

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

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

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

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

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

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

19. Suppl. I. 74: change > changes

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

21. Suppl. L. 168: particle > particles

Textual corrections / suggestions:

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- I. 33: particles
- I. 48: anthropic > anthropogenic
- I. 76-77: Here is probably meant: multi-spectral imagery instruments
- I. 86: operational ocean retrieval algorithm
- I. 121: solar radiance > Earth radiance
- I. 131: nul > zero
- I. 160: due to rounding errors
- I. 185: By clear sky > For clear sky
- I. 255: car > can
- I. 326: the atmosphere
- I. 403: exceeded
- I. 611:paper.
- I. 612: Conclusive > Concluding

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