Comments on ms. acpd-14-21523-2014 entitled Aerosol properties over the western Mediterranean Basin: temporal and spatial variability, by H. Lyamani et al.

By François Dulac, 17 oct. 2014 (completed version: please ignore the preceding version of 16 Oct. 2014 posted with my previous comment).

I am glad to see scientific valorization of data from the new AERONET station set up on the small remote island of Alborán during the project ChArMEx. Even though the measurement period is relatively short (~7 months), it reasonably covers the two Mediterranean summer and winter seasons. The analysis of this data set is complemented by (i) other coincident data from 3 AERONET stations in the westernmost Mediterranean region, (ii) a much longer time series from the relatively close station of Málaga, and (iii) shipborne data from a cruise across the Mediterranean and neighbouring marine areas of the Black Sea and northeastern Atlantic. I have some suggestions for a minor revision of the manuscript, which are following.

Abstract:

-Line 4: I would name here the 3 additional AERONET stations (Málaga, Oujda, Palma de Mallorca).

-Lines 12-19: I think the abstract would be better structured if the presently final discussion on Málaga data came just after Alborán results (before MAN results); this is because both Alborán and Málaga series appeal the same conclusion (which is not explicited in the present abstract but should be in my opinion since it appears as one of the main conclusions): the dominant role of long-range transport on the aerosol load at the regional scale in the westernmost Mediterranean region.

Introduction:

-P.21525, lines 5-6: it is not correct that all satellite aerosol retrievals have low temporal resolution. MSG/SEVIRI AOD is available over the Mediterranean Sea with a 15 min temporal resolution ().

-P.21525, line 7: cite a reference.

-P.21525, line 23: “transported from European and North African urban”...

-P.21526, line 26: “westernmost part” rather than “western part”.

-P.21527: in my opinion, one of the weakest points of the ms. is that there is no convincing argument that AERONET measurements are adapted to quantify ship traffic emission contribution to the column aerosol load. Unless you can argue the contrary, I would not emphasize this question.

-P.21528: name the three additional AERONET stations and give a minimum of information on the aera covered by the MAN cruise considered. We have no information on the region covered in the Atlantic, which is a huge ocean. Plotting the cruise in a Fig. 1a would be useful.

-Let me mention our paper from Mediterranean AERONET data which I believe should be referred to in the introduction and at several occasions in this manuscript: Mallet et al., Absorption properties of Mediterranean aerosols obtained from multi-year ground-based remote sensing observations, Atmos. Chem. Phys., 2013.

Instrumentation and study sites:

-I suggest using sub-sections and restructure this section: 2.1 AERONET measurements including p.21529 lines 10-28 and p.21530 sentence on line 12-13; 2.2 AERONET stations; 2.3 Maritime Aerosol Network measurements; 2.4 Airmass trajectories.

-p.21529, line 1: any ref. on the ship traffic and associated emissions?

-A table is missing to provide details on the AERONET data sets, including exact period, number of days (for each month) for each stations.

-More details would be welcome on the MAN cruise. I suggest to reproduce the ship track with the different months of the period.

-Trajectories: they were probably computed only for days with AERONET measurements? Are they performed also for MAN observations? Did you check for forest fires along trajectories and did the photometers sample such events in their time series.

-Some information on precipitation occurrences at the sites could be useful.

Results and discussion:

-δ_C and δF could also be discussed in 3.1.

-Bottom of P.21532: can you exclude that air masses from the Atlantic with low δ_a and low α contain some dust after long-range transport from NW Africa?

-P.21533: line 24: the MODIS image is not very convincing; it would be better to show AOD product, especially from MSG/SEVIRI; see for instance the ICARE ChArMEx multibrowse tool at http://www.icare.univ-lille1.fr/browse/?seviri_aer_oc_l2_tau=true&caliop_l1_exp=true&north=50&west=-10&east=40&south=25&size=large&date=2011_08_26&rebuild=false&pointer=zoom.

-P.21533, bottom: which fraction of days would be misclassified?

-P.21534, lines 10-15: can you really exclude dust particles in the fine mode?

-P.21534, line 17: I would add “which indicates that the contribution of mineral dust to the fine mode fraction of AOD is probably significant”.

-P.21535, line 1: such formulation suggests that Italy should be the source, but central or eastern Europe can well be concerned.

P.21537, line 26: it might well also be due to the fact that large scale pollution is dominating the region, independently of the contribution from ship traffic.

P.21538, line 20: I think that Moulin et al. (JGR, 1998) first described this gradient.

-Top of p.21542: rather check δ_C for dust; you could check for a diurnal cycle in the data in relation to the hypothesized breeze effects.

-P.21542, line 13-14: what about δ_F?

-Top of P.21543: you should check the ship traffic evolution since an increase in traffic might compensate lower emissions per ship.

-P.21543, line 9: not clear to me which type of data could effectively be used to apportion the European Directive effects. Please clarify your point.

Conclusion:

-P.21544, line 5: Recall what characterizes “background maritime conditions”.

Tables:

-Table 2: given the type of variability, geometric means would seem more adapted than artithmetic means to average the distribution of values.

Figures:

-Fig. 1 could be complemented with a Fig. 1b plotting the MAN cruise track with the different months along the track.

-Fig. 2 is hardly readable, colour is requested to distinguish the 3 wavelengths; you should stretch axes at the maximum, possibly making 2 different large (full page) figure; I believe that a plot or a 2-D histogram (as in Paronis et al., Aerosol optical thickness monitoring in the Mediterranean, J. Aerosol Sci., 29, 1998) showing α as a function of δ_A, would be very useful for data interpretation.

Fig. 3c: this MSG-derived AOD at 14 UTC) gives a much better evidence of the dust plume in the Alborán Sea (and not in Málaga) (see ICARE web site mentioned above; proper ref. for this product is Thieleux, F. et al., Remote sensing of aerosols over the oceans using MSG/SEVIRI imagery, Annal. Geophys., 23, 1-8, 2005):

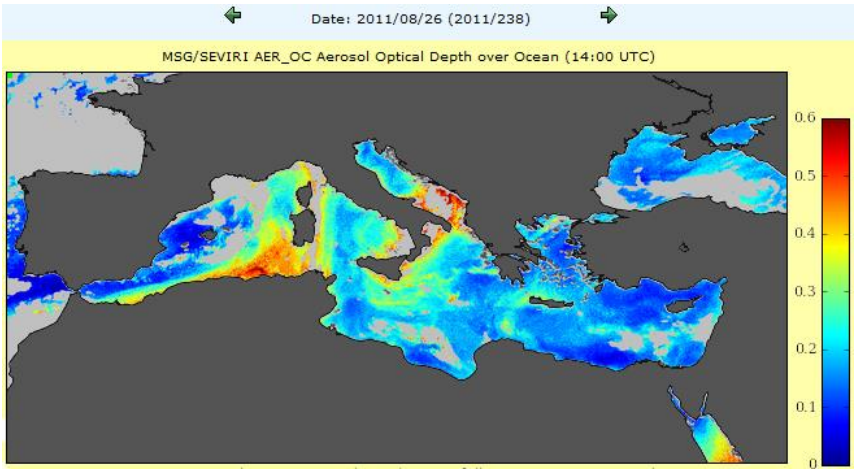

Fig. 5a: it seems that δ_a is not equal to $\delta_F+\delta_C$ in this plot.

Figure 6: I checked data on the AERONET web site and I did not find that level-2 data which are supposed to be used are corresponding to the plot shown in Fig. 6; I had the feeling that level 1.5 data might have been used but for Alborán, there is no data set that corresponds (in particular the early August intense peak of 2 days): please check your data set; intermediate ticks on the time axis would be helpful; it might be useful to add (as a Fig. 6b for instance) a correlation plot between the two series.

Editorial comments:

-P.21525, lines 19 and 24: lower case for “oceans and seas”.

-P.21525, lines 25: “forest fires” (plural).

-P.21526, line 26: “westernmost part” rather than “western part”.

-P.21527, line 24: “there is no study”.

-P.21528, line 8: “a MAN cruise”.

-P.21528, line 10: “implementation”.

-P.21528, line 24: “50 km” (with a space).

-P.21528, line 27: I suggest “There is no significant local anthropogenic emission source at Alborán”.

-P.21529, line 11: specify “automated sun photometer”.

-P.21530, line 19: specify “hand held sun photometer”.

-P.21530, line 28-29: figures seem to indicate that GDAS meteorological data, not CDC1, are used; lower case for “meteorological data”.

-P.21532, line 29: specify “during the wet season from November to July”.

-P.21534, line 24: “there is no[...] activity”.

-P.21535, line 17: “increase”.

-P.21535, line 26: “there was no[...] intrusion”.

-P.21536, line 6: “On the other hand”.

-P.21536, line 23: specify “in comparison with the Alborán station”.

-P.21537, line 24: “it is expected”.

-P.21542, line 12: “the study site”.

-P.21543, line 22: “than reported”.

-P.21545, line 4: “other marine regions”.

-P.21545, line 10: what about δ_F?

-Table 4: last line in table should probably read “Number of coincident measurement days”.

-Figure 4a and b are hardly readable: expand axes at the maximum, use colours for the different wavelengths; comment on the arrows in the legend.

-Legend of Fig. 5b: “Monthly relative frequency”.
