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Atmospheric Chemistry and Physics Discussions

Interactive comment on "African dust outbreaks over the Mediterranean Basin during 2001–2011: PM_{10} concentrations, phenomenology and trends, and its relation with synoptic and mesoscale meteorology" *by* J. Pey et al.

Anonymous Referee #1

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General comments

The paper by Pey et al. reports an interesting analysis of extended PM datasets at many sites throughout the Mediterranean basin. The results are interesting, corroborate findings of previous studies, and allow to obtain a basin-wide view of the influence of dust on PM10 and air quality.

Few points need to be addressed before final acceptance.

The authors should briefly explain the different techniques (three different methods,

according to table 1) used for PM measurement; the measurements are carried out by different agencies, and it may be worth commenting on the comparability and consistency of the datasets, as well as on the uncertainties.

Although 19 stations are listed in table 1, it appears that few stations are removed from the graphs or the analysis. In some case I found 16, in other 17 data points. The author should explain why some data are not included, or have been removed.

In figure 13 the authors use maps of average temperature to assess the influence of African air masses over the Mediterranean basin. I believe that temperature, which is not a tracer, is not a good indicator of dynamical processes. I would suggest using geopotential height maps, which provide a more direct information on the circulation patterns. The maps in figure A2 may probably fit, although it is not possible to see the details and to identify the values of the geopotential height curves.

Minor points.

The position of the stations on the maps are approximate (for example, the position of Genas, Drome,Lecce, etc., are significantly off). It may be worth to place the stations at the correct coordinates.

For figures 7-10: please enlarge the labels of the graphs inside the maps, or at least indicate the axes extremes in the captions.

Figure 9: please, explain in the capiton which curve is intensity and which is the frequency of occurrence.

The NAF acronym is used in the figures and not defined in the text.

The expression Southern Mediterranean is often used throughout the text. However, except maybe for Viznar, there are no stations on or close to the African coast. In my opinion, no direct information on the Southern section of the basin can be derived from the available database.

ACPD

12, C11323–C11327, 2013

Specific comments

Page 28196, Line 16: "... is due to the elevated annual occurrence ...."

p. 28196, l. 17: ".. over the lower part of Central Mediterranean... " seems inappropriate: there are no stations in this sector of the basin.

p. 28202, l. 25: "... eastern-basin insular areas...": in this part of the basin there are two background stations, both on islands. Thus, I would remove "insular", since it appears unlikely that these high values are linked to the islands; I believe that high values would be observed also in non-insular sites in the same region.

p. 28203, l. 25-27: I would add the reduced precipitation and aerosol wet removal, and the occurrence of a more stable planetary boundary layer over the sea in summer (e.g., Dayan et al., 1989).

p. 28204, l. 3-4: very scarce information on the seasonality of shipping emissions is available. However, although ship traffic linked to tourist activities is expected to have a significant seasonal character, other large ships, producing most of the emissions, show a limited seasonal change. The emissions from the passenger ships are estimated to be small (Jonson et al., 2009), thus probably produce a limited effect on the seasonal distribution of the emissions.

p. 28206, l. 4: linear

p. 28206, l. 5: what is 2E in the formula?

figure 6 a): it may be preferable to remove the value of R2 in the figure; this value is not used and does not provide useful information, as applied to a non linear relationship.

p. 28206, l. 9-11: here and in other parts of the paper latitude is treated as the single leading parameter affecting the dust distribution. However, given the longitudinal distribution of the stations, with all low latitude sites in the eastern basin, part of the longitudinal changes are included in the latitudinal dependency in exp. 1. This aspect

ACPD

12, C11323–C11327, 2013

should be clarified in the discussion of possible applications of the formula.

p. 28207, l. 2-3: the role of synoptic systems in determining the dust transport is discusses here and in several parts of the paper (p. 28198, l. 15-25; p. 28207, l. 2-3; p. 28208, l. 20-28 and p. 28208, l. 1-3; p. 28209, l. 18-23). There is a degree of redundancy in these discussions; repetitions may be avoided.

p. 28209, l. 6-8: I do not agree with this statement. Most of the dust vertical transport is associated with the strong convection occurring in spring and summer. Dust layers were observed at high altitudes also in the central (e.g., Di Iorio et al., 2009), and in the eastern basin (e.g., Gobbi et al., 2001; Papayannis et al., 2008).

p. 28209, l. 16: "flat variation", maybe better "limited variation"

p. 28210, l. 20-21: I do not agree that there is an evident continuous decreasing trend. There is a large variability among stations, and a large interannual variability.

p. 28210, l. 22: maybe "apparent" istead of "feasible"

p. 28210, l. 26: there is a lot of literature on the role of NAO on the dust export. It is worth citing previous studies here (e.g., Moulin et al., 1997, and others).

References

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Di Iorio, T., A. di Sarra, D. M. Sferlazzo, M. Cacciani, D. Meloni, F. Monteleone, D. Fua', and G. Fiocco (2009), Seasonal evolution of the tropospheric aerosol vertical profile in the central Mediterranean and role of desert dust, J. Geophys. Res., 114, D02201, doi:10.1029/2008JD010593.

ACPD

12, C11323–C11327, 2013

Gobbi, G. P., F. Barnaba, R. Giorgi, and A. Santacasa (2000), Altitude resolved properties of a Saharan dust event over the Mediterranean, Atmos. Environ., 34, 5119-5127.

Jonson, J. E., L. Tarrason, H. Klein, V. Vestreng, J. Cofala, and C. Whall (2009), Effects of ship emissions on European ground-level ozone in 2020, Int. J. Remote Sens., 30, 4099-4110

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Papayannis, A., et al. (2008), Systematic lidar observations of Saharan dust over Europe in the frame of EARLINET (2000-2002), J. Geophys. Res., 113, D10204, doi:10.1029/2007JD009028. 91-694.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 28195, 2012.