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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Summertime surface PM_1 aerosol composition and size by source region at the Lampedusa island in the central Mediterranean Sea" *by* Marc D. Mallet et al.

Anonymous Referee #2

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This study presents results on composition of fine PM fraction (approx. PM1) in Lampedusa, an island site in the southern central Mediterranean), by using a cToF-AMS. Results were obtained during the first CHARMEX Special Observation Period (SOP1) in summer 2013. Results were compared with similar studies performed in the Mediterranean region in different periods and specifically with those obtained at Ersa site, Corsica, during the sampling period. The novelty of this work lies in the fact that it is the first study of this type carried out on an island in the central Mediterranean. One of the main concerns of this study is the short duration of the sampling period (less than one month). This can affect its representativeness, the comparison with other studies and the interpretation of the results. However, results can be considered of interest in

the framework of the CHARMEX SOP1.

Variations in PM1 composition are interpreted as a function of the origin of air masses. Higher concentrations of sulfate were obtained during transport from eastern Mediterranean, probably due to the impact of emissions from this region. A clear variation was also observed for the LO-OOA/MO-OOA ratios, with a higher contribution of the most oxidized aerosols with transport form the east.

Authors attempt to study the aging of aerosols during transport by comparing PM1 composition at Lampedusa and Ersa, when affected by the "same" air masses. Comparison was performed for the different clusters defined. This comparison was mainly focused on sulfate; differences were related to the accumulation of SO4 and the SO2 conversion (mainly related to the shipping emissions). A significant increase was obtained for sulfate concentrations during transport of air masses form the East. As shown in Figure 13, during transport from eastern Mediterranean, it seems that the Lampedusa site is affected by other air masses different to those impacting at Ersa. Thus, higher concentrations of sulfate at Lampedusa may be related to the impact of air masses from the East, that are not impacting at Ersa. Therefore, the proposed methodology has some limitations for estimating the aging under these scenarios.

Minor changes

Line 99 (e.g. FLEXPART; (Stohl et al., 2005)

Line 108: (PMF; (Paatero, 1997;

Lines 144-146: is the first "detailed characterization" in the Central Mediterranean, at Lampedusa, or during the CHARMEX project?

Line 162: Please, indicate the sampling flow

Line 167: for major inorganic and organic. . .

Line 175: please indicate flow for MOUDI; did you use the same TSP inlet for all the

instruments?

Line 177: which kind of filters did you use?

Line 179: Denjean et al. (2016)).

Line 214: by (Ovadnevaite et al., (2012).

Line 215: High uncertainty estimation of the sea salt

Line 299: please, specify the time period of the concentrations (hourly basis; 30 minute?)

Lines 312, 313, 314, 565: SO42-

Line 314: (see Supplementary Figure S2).

Lines 319-322: this is estimation, more measurements, for a wider period are necessary for demonstrating this.

Lines 416-418: This comparison will depend on the sampling periods. This study was performed in summer, where high concentrations of sulfate are expected. The study by El Haddad et al (2013), also in summer, showed higher concentration of sulfate than OA

Line 438. In figure 8: concentration of sulfate and ammonium seem higher during E – NE air masses; not north west as stated here; a similar pattern to that described for MO-OOA (Line 448).

Line 450: Pattern of LO-OOA is similar to that of HOA

Lines 463-466; Section 3.4. Figure 6. There is a clear difference between the ratio LO-OOA/MO-OOA during the eastern and western air masses; any comment on this? –

Section 3.5. The measurements of size distribution are limited to the 14-600 nm fractions. The lower size is relatively high for studying the nucleation episodes. Moreover

the different air humidity measured for the air clusters defined (sampling was at ambient conditions – Line 469-472) may affect these measurements.

Lines 485-487: Has the “nucleation mode ratio” been previously defined? Can you add a reference?

Line 501: Please, add a reference for shipping emissions

Figure 6. caption: "less oxidized" (LO-OOA) . . .

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