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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Variability of mineral dust deposition in the western Mediterranean basin and South-East of France" *by* J. Vincent et al.

Anonymous Referee #3

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The present study shows the result of the quantification of dust deposition obtained for a 3 years period in a network integrated by 5 sites in the Western Mediterranean basin. The study is based on the weekly sampling of the insoluble fraction of dust (deposited by both dry and wet mechanisms) by using the same sampler, the CARAGA collector, devised for automatic collection at remote sites. The study is of high interest and deserves publication. However, the sampling methodology presents some limitations that should be taken into account in the conclusions.

Saharan dust events have a clear impact on mineral dust loadings in particulate matter and on dust deposition. Deposition of mineral dust is a topic of high interest as a source of nutrients. Magnitude of dust deposition may considerably vary depending on sources, transport mechanisms, distant to the source, and deposition processes

(wet/dry). Saharan dust is an important source of nutrients to the Mediterranean Sea. However, the local or regional dust contribution may also be relevant in semi-arid areas (such as those in the Mediterranean region). Contribution of other sources of mineral dust seems to be relevant at the northern sites (Frioul).

The CARAGA collector was devised for automatic sampling of the deposition in remote areas, thus permitting to cover a wide spatial area. As a major limitation, the CARAGA collector permits to sample only the insoluble fraction of deposition. Although, a major fraction of dust is insoluble; solubility may increase during transport by different chemical and physical processes. Moreover, an important fraction of relevant nutrients (nitrogen or phosphorous compounds) is water soluble and therefore is not sampled by using this method. It should be considered by the authors to modify the CARAGA collector in order to sample also the soluble fraction in the future. In this study, some of the sites selected for this study are relatively close to urban/industrial areas; this is a good opportunity for comparison of results obtained by CARAGA with other conventional methods for sampling deposition. CARAGA doesn't permit to differentiate wet/dry deposition. Samples are collected in a filter and washed at the end of the sampling period (defined as a week). Therefore it is no possible to quantify the fraction of deposition accounted by wet or dry processes. As suggested by the other referees, this limitation should be taken into account in the conclusions.

As reported in section 3.1, a number of studies have demonstrated that 1 single strong episode of Saharan dust may account for a high percentage of the total annual deposition of mineral dust. Therefore, it is important to sample continuously in order to have continuous register of deposition without gaps. The use of unattended CARAGA instruments may help to avoid gaps during sampling. However, simultaneous samples were very low during the study period (only 17 weeks –out off 75- with simultaneous samples at more than one site. Is there any explanation for these sampling gaps? Methodology: Filter ash. This method has been used by J.M. Prospero and coworkers since the mid-1960s for ambient particulate matter; see Prospero, J.M., 1999 (JGR,

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104, 15917–15927): These authors performed the chemical characterization of dust. In the present paper, dust was not analyzed. It could be interesting to characterize the samples in order to evidence variations between the different sites and periods.

Minor comments

L202: What is the % of retention of these filters for particles of 1 μm?

L221 L222 L224: add wk-1 to the weekly deposition rates: 3.2 g m-2 wk-1

L232: a gradient of dust with the latitude has been also observed by Pey et al 2013.

L234-L250: taken into account that the present study only considered the insoluble fraction, when comparing with other studies it should be indicated the fraction sampled at each case: bulk deposition; soluble+insoluble. . .

L305. Delete “studies”

L300-L313: this paragraph (and this from L317-L324) could be moved to the Method section

L364-L367: I wonder these differences can be explained by the precipitation events. Wet deposition of Saharan dust can be very important. During these wet episodes, ambient air concentrations not necessarily high. There is a number of papers showing the meteorological scenarios of Saharan dust resulting on wet or dry events. For Lampedusa, as shown in Figure 5, this seems not to be the explanation. AOD reflects the concentration of dust in the whole column; however, as concluded by Marconi et al., Atmos. Chem. Phys., 14, 2039–2054, 2014, at Lampedusa, “ Saharan dust transport occurs above the marine boundary layer, and no significant mixing of the dust below and above the boundary layer takes place; resulting in high difference between boundary layer and free tropospheric dust evolution;

Figure 3. It will help the interpretation to mark the periods with influence of SDE at each site.

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Interactive Comment