

***Interactive comment on “In situ measurements of desert dust particles above the western Mediterranean Sea with the balloon-borne Light Optical Aerosol Counter/sizer (LOAC) during the ChArMEx campaign of summer 2013” by Jean-Baptiste Renard et al.***

**Jean-Baptiste Renard et al.**

jbrenard@cnr-orleans.fr

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Reviewer: The technical descriptions of measurements are scattered throughout the manuscript (ie LIDAR, airborne, satellite). It is strongly recommended that all technical details are given in a separate section described as material and methods, preferably before 2.Experimental strategy that could be a subsection. This will allow the reader to focus on the observations rather the technical details. Answer: Following the reviewer

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comments, we have gathered the technical descriptions. Section 2 is now subdivided in 3 sub-sections, the second one being devoted to the other instruments and measurements used for the cross-comparisons.

Reviewer: Line 213: "July 2. Answer: Correction done.

Reviewer: Line 244: Refer to the corresponding Figure 5. Answer: Correction done.

Reviewer: Line 327: In this paragraph comparison to AERONET is briefly discussed and in Figure 12 a single measurement is presented to support the statement that LOAC and AERONET are in very good agreement. More data need to be presented, there must be several AERONET profiles available to compare. These data will be useful to the AERONET community as well, since these measurements may provide validation data for the inversion algorithms. Otherwise, that statement should be limited to a single day that good agreement was observed. Answer: We have now added in Figure 12 the whole set of comparisons available between AERONET and LOAC. We have added in the text: "The LOAC volume size distribution is compared to that derived from the AERONET remote-sensing photometer during the 15-30 June 2013 dust events. On average, the AERONET and LOAC data are in good agreement regarding both the overall amplitude of the concentrations, and the position and the concentration of the coarse mode at about 3 micrometers in radius. The better agreement is on the 16 June morning; the discrepancies for the other dates could be due to the local variability of the plume content since the LOAC and AERONET measurements are not conducted at the same time. Nevertheless, strong discrepancies sometimes occur for the smallest sizes (below 0.4 micrometers in radius) and for the largest sizes (above 10 micrometers in radius). The small-radius discrepancies could be due to local variability in the dust content, like on the 27 June when AERONET retrieves a concentration increase centred on 0.25 micrometers in radius, and to respective uncertainties of both methods. On the other end of the particle size range, AERONET retrieval is not very sensitive to the particles larger than 7 micrometers in radius and the largest size class considered in the algorithm (15 micrometers in radius) is limited

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to particles smaller than about 19.7micrometers in radius (Dubovik and King, 2000; Hashimoto et al., 2012). Thus, LOAC could have detected large particles that were not retrievable from AERONET observations.” Reviewer: Line 344: This paragraph should be incorporated in Experimental strategy section, you are describing once again the flight patterns here. Answer: We have incorporated some parts of the paragraph in the new section 2.3 and we have rewritten the beginning of the section 4: “Figure 13 presents results from the BLPB flights performed inside dust plumes. In particular, the 27-28 June and the 2-3 July BLPB flights were the longest ones, with duration of about 1 day. Day-night transitions were thus encountered, leading to a decrease in float altitude during the night of more than 100 m due to the cooling of the balloon gas and associated loss in buoyancy, so that the night-time and daytime measurements were not conducted in exactly the same air mass.”

Reviewer: Line 454: Evidence has to be given that this correlation exists otherwise this is rather a speculation and the sentence has either to be rephrased as a hypothesis or removed. Answer: We have changes the text to: “In contrast, an offset increase coincident with the increase in dust particle concentration was detected for 5 flights when crossing a dust plume, as shown in Figure 16 . Such an offset increase was never observed outside the plumes. Laboratory tests have shown that the LOAC electronics is indeed very sensitive to electromagnetic fields, with an increase of the offset.”

Reviewer: Figure 5. The same height resolution should be used, it is easier for the reader to compare the two plots. Answer: Done.

Reviewer: Figure 11: Although the logarithmic scale shows good agreement between various instruments, it would be better to present concentrations in linear scale. Answer: Log-scale is necessary to see both high and low concentrations and the whole size distribution (which is always presented in log-scale in the literature). Such representation will be impossible in a linear scale. We prefer to maintain the figure as it is.

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2017-720>, 2017.

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