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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Measurement report: Balloon-borne in-situ profiling of Saharan dust over Cyprus with the UCASS optical particle counter" *by* Maria Kezoudi et al.

Anonymous Referee #1

Received and published: 9 December 2020

This paper aims to validate a state-of-the-art sonde for dust profiling based on an in-situ optical particle counter approach. The experimental design is really interesting because it can help, for instance, to explore the lowermost troposphere where lidars are typically blind, leading to complement their measurements for modelling applications. The manuscript is very well structured, allowing for a clear comprehension of the research involved. However, I found some issues to be addressed, mainly minor comments.

General comments:

lines 107-108: It is supposed that the use of Mie scattering has a small effect on the

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calculated size distributions even in the presence of non-spherical particles. Can you provide a quantification of this?

lines 188-189: In the instrumentation section (2.2.) is mentioned that the PollyXT allows for measuring polarized components at 355 and 532 nm. It seems (from the sentence in lines 188-189) that only total signals at these wavelengths are used. Does not GARRLIC use polarized components?

lines 193-199: it would be nice to provide an estimation of the uncertainties of the GARRLIC derived products.

Lines 226-233: How are you sure what is dust and what is not? Taking into account the different origin of air masses shown in figure 3, I recommend to include in fig 1 an additional panel ploting information from depolarization (at least volume linear depol ratio, but particle depol ratio is preferred). This also brings me an additional point. What is the uncertainty for depolarization products? How were those channels calibrated? A detailed description is not needed, some relevant references should be enough.

Lines 413-414: How did you deal with the incomplete overlap region to estimate AOTs?

LInes 426-428: Because you used GRASP in this study combining Sun-photometer and PollyXT data, profiles of refractive index and single scattering albedo can be retrieved. This information might support your argument here.

Figure 1: For the sake of clearness, I recommend to use symbols or colors with more contrast for Limassol and Paphos data.

Figure 4: Is there no information about the horizontal distance above roughly 5 km for the case launch 1?

Figure 8: Why do the Klett profiles shown here? It is well-known that this method can not provide consistent extinction information. Even more, why is the full overlap height different from the extinction and the backscatter profiles shown here?

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