

# Referee comment on “Aerosol variability over oceans using micro-pulse lidar and photometer: Insights from TRANSAMA ship-based campaign” by Sanchez-Barrero et al.

Anonymous Referee

This is a short-term campaign (April–May 2023) that could prove useful for improving current techniques related to photometers installed on board mobile platforms. However, this task seems to have already been addressed in a previous article (Torres et al., 2025), which made use of three years of measurements from the same platform described in the present work, and which, in fact, includes the period covered by this article.

The main objective of this article, namely to improve our understanding of aerosol properties in a marine environment, appears rather ambitious given the very limited measurement period employed. Nevertheless, this article can provide valuable experience for the deployment of aerosol observations on oceanic platforms, which are essential to enhance our knowledge of their global-scale concentrations and of their possible interactions within cloud formation processes and other climatic processes.

Therefore, this is a paper that provides necessary and useful information for the scientific community, is well-written, and is supported by high-quality data, perfectly aligning with the scientific objective of this journal. I thus recommend its publication in AMT with some scientific and technical comments.

## **General comments:**

I wonder whether the main objective of this study is to increase our knowledge of aerosols in marine regions. From my point of view, the importance of this article lies in the simultaneous measurement on board a vessel of a photometer (already presented in a previous article) and a lidar (a clear novelty introduced in this study). At first, I understood that this work was intended to lay the foundations for mobile measurements with both instruments, but after completing the reading I am not entirely sure what Section 3 of the article actually contributes. I do not understand Figures 3 and 4, and initially I thought that new quality-control level criteria adapted to ship-based measurements were being introduced. Later I realized that this was not the case. In short, I do not clearly understand the main objective of this article nor the information presented in Section 3.

What is clear, however, is the usefulness of the synergistic information presented in this article for performing real-time atmospheric monitoring during the vessel transects. A clear example is the information shown in Figure 6. Section 4 presents relevant and useful information for continuous monitoring, but it perhaps includes too many variables and explanations, which may cause the reader to lose track of the sequential objective of the paper.

### **Scientific/Technical comments:**

Paragraph 45-56: In this paragraph, the authors describe the current efforts to fill the observational gaps that still exist in the study of marine aerosols. They list a series of interesting campaigns and technical efforts that form part of the state of the art. However, and somewhat surprisingly, they do not include the scientific article that reports on the three-year dataset obtained with the mobile device designed for the same vessel by the same authors. It is not until line 78 that this article is referenced. Please revise the state of art about marine photometric campaigns.

Line 60: Forest fires are not included here?

Line 63: Is there any example of mobile Raman lidars to be added here?

Line 116: Please include here the reference to Giles et al. (2019).

Line 122: This sentence seems incomplete. Maybe it has sense if “which” is replace by “from”?

Line 132: The use of the connector “nevertheless” in this sentence appears somewhat confusing.

Line 132: Regarding the PLASMA measurements, although they are not included in the current manuscript, were they conducted successfully? Do the authors plan to report them in a future publication? In my view, if the availability of PLASMA measurements is mentioned in the text, it would be helpful to provide some additional details about them to inform the reader. However, this is merely a suggestion for clarity and completeness.

Line 141: If the objective of this paper is to lay the foundations for lidar measurements on board a mobile platform, I believe it is necessary to provide details on how frequently cleaning should be performed, as well as additional technical information that could be useful for other similar experiences.

Line 204: Is there any difference compared to the values found “on the ground”?

Line 236: Is Eck et al. 2014 a correct reference to state here the definition of AERONET Level 1 algorithm? In this regard, I must admit that I find this paragraph generally confusing. Perhaps it stems from a misunderstanding on my part, but I understand here that AERONET Level 1 is based solely on triplet filtering according to a threshold. However, later on, in line 262, it is stated that there are additional requirements for a measurement to progress from Level 0 to Level 1, according to Giles et al. (2019). Could the authors please clarify this point?

Line 240: The authors clarify that Level 2 is not yet available for mobile data. Consequently, the following sentence regarding the possible presence of aerosol or cloud layers suggests that, due to the absence of Level 2, such structures may result in erroneous

measurements. Additionally, I wonder whether the term "uncertainty" is the most appropriate in this context, or if another term might better convey the intended meaning.

Line 250: Why is "Ve" used as the acronym for triplet measurements? The same for HPRé.

Sect. 3.2.1: At this point, this referee was expecting the definition of specific quality levels for ship-based photometric measurements. WS, HPRé, CC, and Ve are introduced, and Figures 3 and 4 are presented. I have many questions regarding this.

- In line 259, it is stated that these figures illustrate the filtering process. However, it seems that they actually provide an insight of the real conditions under which the AERONET criterion filters the data, is that correct? Or is a new process being introduced here?
- How are the 37% and 40% values in line 261 obtained? Are they averages of all data classified as subset frequency data L1?
- I may not have fully understood Figures 3 and 4 (a) and (b), but shouldn't the sum of all bars for each variable equal the total number of L0 and L1 data points? For example, in Figure 3(a), the total L0 is 3786. The sum of counts by WS is 3786, which is as expected. However, for HPRé it is 3737, and for Ve it is 7572. Could the authors please clarify this point?
- Subset frequency data refers to the amount of data passing and specific screening?
- In summary, I find it difficult to quickly and effectively interpret the information presented in these figures. Has the information provided here been used to offer measurement guidance or advice that could be useful for improving the filtering criteria designed for on-ground instrumentation? I do not see any other reference to these numbers throughout the text. I leave it to the authors to decide whether this information is sufficiently relevant to be included in the manuscript, or whether it should rather be summarized or removed from the final version.

Line 284: Which reference is this estimate based on?

Line 329: Why is "clean" placed in quotation marks? I believe it would be more appropriate to provide a bibliographic reference for such conditions.

Line 426: It would be very illustrative to include the value obtained here again.

Line 428: The authors found a negative correlation between AOD and WS. Could they elaborate further on the hypothesis regarding the origin of this unexpected anticorrelation?

References: The reference to Torres et al. (202) appears to be incomplete.