

Review #2

Author's response to the review of:

Evaluation of the dust-dominated total AOD extracted from the PMAp satellite Climate Data Record

Anu-Maija Sundström, Marie Doutriaux-Boucher, Soheila Jafariserajehlou, Dominika Leskowska, Simone Mantovani, Noemi Fazzini, Bertrand Fougnie, and Federico Fierli

Submitted to Atmospheric Measurement Techniques

In the following, **R2** denotes the reviewer's comments and **A** denotes the authors' responses.

General comments

R2: In general, this paper combines multiple input datasets to create a spatial and temporal description of "DAOD". The resulting data exhibit some inherent weaknesses, although they provide valuable insights into large-scale phenomena and dust occurrences. The methodology and the quality of the results have the potential to improve, particularly with advances in satellite instrumentation and the expansion of ground-based observations.

The author clearly describes both the strengths and weaknesses of the methodology. The selected ground sites correspond to different local conditions, providing an opportunity for a robust evaluation of the PMAp product.

A: *We thank the reviewer for the constructive and thoughtful evaluation of our manuscript. We appreciate the acknowledgment of both the strengths and limitations of our approach. This feedback has been very helpful in guiding our revisions and improving the manuscript. Our detailed responses to the comments are provided below.*

Suggestions for Minor Improvements

R2-1: A further analysis of seasonal patterns would be valuable—both within the final product itself and in comparison to AERONET or other established dust products.

A-1: *The seasonal behaviour is examined both in the AERONET comparisons (time series) and, globally, in Sect. 5. For co-located AERONET–PMAp pairs, the dust-dominated PMAp AOD follows the AERONET seasonal cycle (even though the plot is not specifically shown), and the shapes are broadly consistent. Seasonal cycles derived from AERONET alone can differ from PMAp, however, largely because of PMAp uneven temporal sampling (e.g., sparse winter observations). Sampling effects and their implications are discussed in Sect. 5, where PMAp seasonal variability is shown and discussed over broader dust source and transport regions.*

R2-2: It would be desirable for the authors to quantify the extent of missing data caused by systematic limitations in satellite observations. This would help demonstrate the impact of such limitations on the final results and could highlight potential constraints for the broader application of the method.

A-2: *It is difficult to provide a single definitive estimate because data gaps depend on local conditions: variation of cloudiness, solar zenith angle, seasonal snow cover, and other factors. As an illustration (Fig. 17), over Saharan Africa the number of valid observations in summer (May–August) is more than ten times that in winter (December–January). Over the Atlantic outflow, the seasonal contrast is smaller but still substantial: summer yields roughly four times as many observations as winter. As discussed in Sect. 5 and the Discussion, we recommend analysing the full AOD distributions in parallel with seasonal means or medians to quantify how gaps in sampling (missing data) could influence the inferred patterns.*

Technical Recommendations and Errors

R2-3: Due to the very dense data shown in most of the figures, I recommend using vector graphics formats (e.g., PDF, SVG, EPS) rather than raster formats like PNG or JPEG. This would ensure that the figures maintain full clarity when the article is viewed electronically—particularly for map-based figures such as Figures 1, 3, and 16.

A-3: *The map-based figures have been converted into pdf-format.*

R2-4: In line 430, the text references Figure A2.2, but the actual figure is labelled A2. Additionally, the font size in Figure A2 should be increased for better readability.

A-4: *The labelling has been corrected, and font size in the figure has been increased.*

R2-5: Figures A2.3, A2.4, and A2.10 are mis referenced similarly to A2.2 and should be corrected.

A-5: *Mis-references have been corrected.*

R2-6: Section numbering in the appendix is inconsistent. For example, on page 39, the section is titled “A2.4 Asia 2”, whereas on page 38 it is simply “Asia 1”. This should be standardized.

A-6: *Corrected.*

R2-7: In Figure 15, to improve readability, I suggest using colour scales with continuous transitions. For example:

- When the scale includes negative values, use a **blue–white–red** gradient, with white centered at zero.
- When the scale is non-negative, use a gradient such as **green–red** or **white–red**.

A-7: *We have changed the color scales as continuous, as suggested, and modified the color palettes.*