

Review on

Optical properties and shape-dependent retrievals of the imaginary part of the refractive index of freshly emitted Saharan Dust

by Yus -Diez et al.

General comments: First of all, I must appreciate the amount of work authors did to improve the article. It is a rare sight to see such dedication to keep pushing and publish almost unsalvageable work, and to meddle and reshape it into something of actual use to the community. I apologize for being late on my review, remembering what was provided almost a year ago, and meaningfully ingesting a supplementary material that itself worth a separate publication takes some effort. I do see a significantly stronger methodology and much more robust conclusion justification in the resubmitted article. However, I still see minor issues, that have to be addressed prior to publishing, I provide the details below.

Minor comments:

Once again, I could not stress enough what an impressive analysis authors did in the OSSE section of the supplement. Provided clarifications addressed all of my concerns that were raised in the previous review. Technically I should have nothing to complain, however, the OSSE study is provided in an additional supplement which is barely related to the document itself. The fact that it is referenced in document only twice gives an impression that authors what to swipe some dirt under the carpet. Indeed, the OSSE provided is very detailed, and analyses robustly the error propagation of the methodology of k retrievals. I would suggest integrating it better with the main document discussion.

The OSSE uses synthetic perturbations of unspecified/generic magnitude I would suggest include detailed descriptions of these, ideally link to to the realistic estimations of the observation noise from the main document. Also it is not clear how PSD were perturbed, S11 figure shows some perturbations but it is not clear are they related to shape assumption, refractive indices, FIDAS uncertainty (or all three combined), please provide these details.

Table 1. AAE_370-950: Why values so different for full period as compared to others? Is this a typo or a dataset bias? Please discuss.

I do believe mentioning Lin et al., 2018 is well justified in the scope of this article (authors ignored this suggestion from the previous review for some reason). This team made amazing job in tackling non-sphericity of dust

Lin, W., Bi, L., & Dubovik, O. (2018). Assessing superspheroids in modeling the scattering matrices of dust aerosols. *Journal of Geophysical Research: Atmospheres*, 123, 13,917–13,943. <https://doi.org/10.1029/2018JD029464>

Technical comments:

Line 295: It is not clear if any assumed filter convolution was used in the conversions, or instrument was assumed to be monochromatic, does this choice affect conversions? Please specify and discuss.