The points below are our reaction to comments submitted by A&W (Ashpole & Wiacek) on Feb. 11, 2025 (in their Acrobat file "index.php"). Details of our comments that follow had already been transmitted to Wiacek in a Feb. 11 email[1] (outside of the EGUsphere discussion forum). In this current document we react to their "index.php" file comments by limiting ourselves to the most important critical points made in our Feb. 11 Email[2]. Our first 3 critical comments below are the most important.

1. Re the reluctance of the authors to consider any type of validation / evaluation of their FoO (DOD) statistics

We strongly disagree with that point of view. DODs > 0.5 are easy to detect visually over water and over land near the source[3]. It is, given the questionable quality of DB AOD retrievals over the high Arctic, the responsibility of those who would employ DB AOD statistics (as evidence of the presence of optically thick airborne dust over the Arctic) to find concrete illustrations for a handful of their largest DODs. Such cases could be included in the supplementary material to avoid disrupting the general flow of the narrative in the main paper.

2. Re the reluctance of the A&W authors to look into DT (dark target) AOD retrievals over water

In our experience, strong plumes emanating from the land in the CAA (Canadian Arctic Archipelago) can find their way to a body of water[4]. The more believable MODIS DT AOD algorithm over water and the spatial continuity with dust plumes over the land could then be employed to help confirm the all-too questionable quality of DB AODs over the Arctic.

3. ***Re the use of the "BOR" (Sayer, 2019) statistics rather than the PEARL & OPAL statistics that we recommended***

In actual fact 24 out of the 27 "BOR" sites are in the low Arctic tundra[5]. Resolute Bay and Iqaluit (which were not employed by Sayer, 2019) and OPAL and PEARL make up the sites that are in the high Arctic tundra[6]. Those high Arctic tundra statistics are quite marginal[7].

We remain, accordingly, unconvinced by the identification of very large DB AODs[8] as being publishable indicators of large-DOD occurrences. Put another way, we don't think it is appropriate to use largely unvalidated DB AODs over the high Arctic tundra as a form of DOD "ground truth". One can complain about the lack of statistics in the high Arctic tundra … but that only confirms the argument that there isn't enough validation data to support claims of not insignificant numbers of (DOD > 0.5) instances.

4. Persistent dark spots in the imagery associated with large DB AODs

The author's comment[9] ignores the more practical DB retrieval problems that can occur. A dust plume over the darker areas should, in the presence of roughly (spatially) continuous surface reflectance, have produced a brighter reflectance, not a darker reflectance. The more likely culprit is an artifactual decrease in the DB-estimated surface reflectance (and/or a real decrease in the actual surface reflectance caused by a change in surface type or terrain slope (BRDF); see, for e.g., Liu et al., 2017 for the important influence of surface type in the CAA): this would have produced an excessively large DB AOD (we can be reasonably sure that it is excessively large because the DT AOD over water is a much more universal and dependable AOD product).

5. ***Re the use of the O'Neill et al. (2025)***

That citation was taken out of context: it applies to MODTRAN-derived ΔBTD / ΔDOD derivatives that we employed to show that it would require visible-wavelength DODs >~ 0.5 to produce measurable $BTD_{11\text{-}12}$ values[10] (to "extrapolate" that sentence to the remote sensing detection of dust plumes in the visible is inappropriate[11]).

---

[1] that preceeded the deposition of the"index.php" in the discussion forum and for which we received no answer

[2] this is our 2nd reaction to the A&W paper that we have submitted to the EGUsphere discussion forum. Our 1st submission (egusphere-2024 [comments_final].pdf) consisted of comments (annotations) made directly on their submitted pdf.

[3] see, for e.g., Ranjbar et al. (2022), Sayedain et al. (2023) and Sayedain et al. (2025).

[4] Their statement that "We are also not expecting or tracking dust plumes far from their source regions" is an oversimplification in the CAA region.

[5] The ecosystem-based delineation of the Arctic regions: see for e.g., the Britannica website

[6] this was always the focus of all our comments: the high-Arctic tundra region that includes basically all of the CAA.

[7] "The insignificant to marginal correlation coefficients (<= 0.42 for Terra and <= 0.56 for Aqua) and the small number of validation points (we can provide those statistics upon request or the authors can contact Sayer directly) are not the type of scattergram results that one should employ to claim satellite-derived DOD statistics …" (statement from the comment associated with line 76 in our original EGUsphere Discussion forum comments in the "egusphere-2024 [comments_final].pdf" file)

[8] which are transformed to DODs given the constraints that the A&W applied (we have no strong argument with those constraints)

[9] "Perhaps local dust (of a coarser size) is indeed 'hovering' over the source area by actually being repeatedly injected into the atmosphere near the time of the satellite overpass and then settling out at night, while the transported dust fraction (of a finer size) is more mobile."

[10] Values that are also functions of the surface temperature, the amplitude of the temperature change across the inversion layer and the position of the plume relative to the inversion layer. Visible wavelength DODs (rather than TIR DODs) were employed because the visible DOD was a bit of a fixed standard in the literature.

[11] Which is actually what A&W themselves state at the beginning of the same paragraph in their "index.php" file

References

Liu N, Budkewitsch P, Treitz P. Examining spectral reflectance features related to Arctic percent vegetation cover: Implications for hyperspectral remote sensing of Arctic tundra. Remote sensing of environment. 2017 Apr 1;192:58-72.

O'Neill, N. T., Ranjbar, K., Ivanescu, L., Blanchard, Y., Sayedain, S. A., Aboel-Fetouh, Y.: Remote-sensing detectability of airborne Arctic dust. Atmospheric Chemistry and Physics. 2025 Jan 6;25(1):27-44.

Ranjbar, K., O'Neill, N. T., and Aboel-Fetouh, Y.: Comment on "Short-cut transport path for Asian dust directly to the Arctic: a case Study" by Huang et al. (2015) in Environ. Res. Lett., Atmos. Chem. Phys., 22, 1757–1760, https://doi.org/10.5194/acp-22-1757-60, 2022.

Sayedain, S. A., O'Neill, N. T., Ranjbar, K., Gauvin-Bourdon, P., Chang, R., Hayes, P. L., King, J.: Remote sensing of local dust events over the Canadian Archipelago, oral presentation, HLD workshop, Agricultural University of Iceland (AUI), Reykjavik, Iceland, Feb. 12-13, 2025.

Sayedain, S.A., O'Neill, N.T., King, J., Hayes, P. L., Bellamy, D., Washington, R., Engelstaedter, S., Vicente-Luis, A., Bachelder, J., Bernhard, M.: Detection and analysis of Lhù'ààn Mân'(Kluane Lake) dust plumes using passive and active ground-based remote sensing supported by physical surface measurements. Atmospheric Measurement Techniques. 2023 Sep 12;16(17):4115-35, https://doi.org/10.5194/amt-16-4115-2023.

Sayer, A. M., Hsu, N. C., Lee, J., Kim, W. V., Dutcher, S. T.: Validation, stability, and consistency of MODIS Collection 6.1 and VIIRS Version 1 Deep Blue aerosol data over land. Journal of Geophysical Research: Atmospheres. 2019 Apr 27;124(8):4658-88.