

Atmos. Chem. Phys. Discuss., referee comment RC1  
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## Comment on acp-2021-652

Anonymous Referee #1

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Referee comment on "Comment on "Short-cut transport path for Asian dust directly to the Arctic: a case Study" by Huang, Z., J. Huang, T., Hayasaka, S. Wang, T. Zhou and H. Jin (2015) in Environ. Res. Lett." by Keyvan Ranjbar et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-652-RC1>, 2021

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Review of "Comment on "Short-cut transport path for Asian dust directly to the Arctic: a case Study" by Huang, Z., J. Huang, T., Hayasaka, S. Wang, T. Zhou and H. Jin (2015) in Environ. Res. Lett."

General Comments:

Huang et al. 2015 uses ground-based lidar as the primary determination of the dust presence and presents ground-based sun photometer results as a verification of those measurements. The premise of the importance of the potential dust pathway from Asia to the Arctic region is maintained but the Arctic impact of the extremely weak dust layer provided in the example case remains in question. In general, the Reviewer is in agreement with the Authors comment with the misinterpretation of dust transport to the Arctic station, PEARL, on March 25, 2010.

Specific Comments:

Line 11:

The event occurred on March 24, 2010, and not "2020" as stated.

Line 26:

On March 24, 2010, the backscatter and depolarization signals appear extremely weak and approach background levels. Is it possible the lidar detects only the edge of the dust plume?

Line 30:

Avoid the wording that "We believe"; the comment should be based on evidence and scientific interpretation.

Line 37: State that these are the spectral deconvolution algorithm (SDA) AODs.

Lines 52-56:

Optical depth changes suggest an extremely weak dust plume, 0.005. Do the Author's maintain that this extremely small change in AOD (apparently corresponding to dust) has a significant impact on the Arctic region? For example, lidar does not indicate a descending layer near the ground for deposition of dust in the region of PEARL. While Huang et al., 2015, indicates that "dust from 25.2% of Asian dust events generated during this period has potentially been transported directly to the Arctic," their example period (and verified by this current manuscript) shows an extremely small amount of dust reaching the Arctic likely due to deposition resulting from dynamic meteorological processes, precipitation removal, and/or uptake via cloud condensation nuclei for cloud ice crystals. Further elaboration is needed here in regard to these issues.

Figure 1:

The sun photometer is viewing the sun at approximately 78 degrees solar zenith angle during these measurements at PEARL, which is significantly different than the zenith viewing angle of the HSRL. Do the Authors have further evidence of homogeneous spatial distribution of the dust plume and clouds to perform a more direct comparison with sun photometer measurements? If not, then this uncertainty must be clearly stated and discussed in context of these challenges in the Arctic environment. Further, please state the uncertainty of the fine and coarse mode AOD in the caption or text.