

Interactive comment on “Large Asian dust layers continuously reached North America in April 2010” by I. Uno et al.

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Reply to Reviewer 1 Thank you very much for your kind reviewing of our manuscript. We have revised our manuscript according to your comments and suggestion.

Anonymous Referee #1 This paper reports about the trans-pacific transport of Asian dust to North America with the help of satellite-based lidar and radar data. It is demonstrated in detail how the dust is emitted into the troposphere and transported over the Pacific ocean. The presentation of the results is clear. I recommend the paper to be published in ACP. There are only minor corrections as given next:

#1-1 1) Section 2: S1 of 35 sr was applied where the authors refer to the work of Shimizu et al. (2004). In that work I found an applied value of 50 sr. S1 is important

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to derive the extinction coefficient from backscattering coefficient. Why not using the latter value?

The extinction coefficient for the ground-based NIES lidar was derived based on the backward Fernald method by setting a boundary condition at 6 km and $S1 = 50$ sr. A smaller value of S1 was used in the CALIOP extinction retrieval to obtain the overall semi-quantitative aerosol profile. As a result, the extinction coefficient retrieved from the CALIOP measurement may be smaller than that from the NIES lidar network measurements by a factor of ~ 0.6 ($=30/50$) for optically thinner cases. Fixed S1 might show over-decay within the cloud layer (S1 is around 20), which could lead to overestimation of aerosol under the cloud. However, this is not critical in our study because our main target is semi-quantitative analysis of the dust transport (i.e., a comparison of dust vertical structure and horizontal scale) using the CALIOP measurements. We have added a short description of this issue and our reasoning in the manuscript (please see lines 70–79).

#1-2 2) Last paragraph of section 2: Figure 1 is mentioned. But it is not stated how well the model and the observations fit together quantitatively.

We compared vertical profiles between the model and the NIES lidar observation and found a reasonable agreement of the extinction coefficient in both vertical profile and magnitude. We added short descriptions of this model agreement with observations in the manuscript (please see lines 109–111).

#1-3 3) Last paragraph of section 3.1: ‘reveal’ is used too often.

We corrected this expression.

#1-4 4) Page 12257, Line 6: Remove comma after ‘2010’.

Thank you. We removed this comma.

#1-5 5) Page 12259, Line 11: Remove ‘plot’?

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“Plot” was removed.

#1-6 6) Page 12260, Line 3: Write 'America at least'?

We revised this sentence as follows: Our dust tracking, based on modeled AOT and CALIOP observations, demonstrated that Asian dust reached North America at least five times (episodes 3, 4, 5, 6, and 7) during April 2010 (please see lines 259–261).

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 12251, 2011.