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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Aerosol Characteristics in the Three Poles of the Earth Observed by CALIPSO" *by* Yikun Yang et al.

Anonymous Referee #1

Received and published: 2 December 2020

Using CALIOP data during 2006-2019, the authors presented a detailed picture of aerosol vertical profiles in three key background regions, i.e., the Arctic, Antarctic, and Tibetan Plateau. Given aerosol's important role in climate research and we are not fully clear how aerosol varies, especially with regard to the vertical profile, this work fills a big gap in this regard. Therefore, I suggest to accept this submission after following issues are addressed. 1. Suggest to add extra analyses based on AERONET data to support CALIOP results or to cite published results to support the results presented here, for example, the seasonal variations. 2. Pls add the standard deviation of monthly mean in Fig. 3. 3. Pls add some words on how to distinguish aerosol types by CALIOP measurements and uncertainty associated with this method. My understanding is that it is very hard to separate polluted dust from smoke, if so, some words discussing un-

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certainty about occurrence of some specific aerosol types should be added. 4. Could you pls present some results on seasonal trend of AOD since long-range transport of external sources to these three regions is seasonal dependent. 5. L35-40, suggest to change to "depends on aerosol charateristics and underlying surface 6. L50, references not suitable, suggest add original AERONET references, for instance, Dubovik and King, 2000; Dubovik et al., 2006 7. L58, it looks strange because sentence before talk AERONET, but after that, you compare passive and active satellite remote sensing, there is no words on passive satellite remote sensing. 8. L97, discussion of dust transport to the TP is originally discussed by Huang et al., 2007 and further supported by Xia et al. (2008), with regarding long-range transport from south Asia, some references should be added including Xia et al. (2011); Lu et al. (2012); Zhao et al. (2015). A detailed discussion on this issue can be found in a overview paper (Xia et al., 2021, AR). 9. L182, pls add standard deviation to the mean value 10 L190-195, it seems transport of dust to the TP mainly occurs in summer, on the other hand, transport of fine particles from South Asia mainly occurs in dry season.

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