

Interactive comment on “Comparison of the optical properties of pure and transported anthropogenic dusts measured by ground-based Lidar” by Zhijuan Zhang et al.

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General Comments:

"Comparison of optical properties of pure dust and transported anthropogenic dusts measured by ground-based Lidar" describes two cases and statistical analysis of pure and anthropogenic dust based on the polarization sensitive lidar observations. The depolarization ratio by lidar is an important parameter for dust studies, but authors utilize "volume depolarization ratio" which represents non-sphericity of particles in qualitative manner because it depends on scattering ratio. At least "particle depolarization ratio" should be used to describe the characteristics of dust quantitatively. Also authors

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should clearly distinguish the mixing of dust and pollutant "internally" or "externally" throughout the study. From these points of view, this manuscript must be fundamentally revised before publication.

Thank you for your serious review. After your suggestion, we are now calculating the particle depolarization ratio and other related work. Owing to the vertical resolution of lidar, we can observe the volume of 6 m high. So in this air column there are many dust aerosols rather than one dust aerosol, so we think the mixing state is needlessly distinguished.

Specific Comments:

1. Spelling "Lidar" is not common. Just "lidar" is adequate. Thank you for your kind reminding. We have corrected in the corresponding position.
2. L128, what is the time resolution of surface weather data? Sorry for our ignorance of that. The time resolution of surface weather data is daily.
3. L134, refer Figure 1. Thank you for your kind reminding. We have corrected in the corresponding position.
4. L190, Winker et al.(2009, not 2006) compared the detectors in CALIOP, not the lidar in SOCAL. Thank you for your kind reminding. We have corrected in the corresponding position. We referred that literature to illustrate we choose attenuated backscatter coefficient at 532 nm to discriminate clouds and aerosols, rather than 1064 nm.
5. L201, the depolarization ratio represents statistical properties of particles in the observed volume, not a single particle. Eq(2), how did author retrieve beta1064? By Fernald method? Yes, you are right. The depolarization ratio represents statistical properties of particles in the observed volume. Also, we retrieve beta1 1064 by Fernald method in Eq(2).
6. L228, does low DEP and high CR correspond to pollution? It seems coarse sphere, like sea salt. According to our results in our manuscript, the DEP of polluted dust is

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relatively low compared with pure dust, but it is relatively high than that of sea salt. Because only when the DEP of aerosols is greater than 0.06, can this kind of aerosols be picked out. The CR of polluted dust is 1.1 and for sea salt it is 0.53. When we pick polluted dust, the threshold of CR is greater than 0.6.

7. L240, if dust is reported at stations and dust layer is detected above PBL by lidar, is it pure or transported? We thought it was pure dust.

8. L318, what is the target of statistical analysis? All data during October 2009 and June 2013? Or, some restriction by scattering ratio? What is the height range? We did statistical analysis to find the threshold between pure dust and polluted dust from the optical perspective and further to improve the detection of different aerosol type in numerical modeling and satellite algorithm. Not all data during October 2009 and June 2013. We have conducted strict quality control. Every case was strictly picked out using IDL source code and after that we confirmed every case personally with our eyes. The original height range is 0 to 18 km, and we choose 0-6 km above the ground.

9. L367, what is the physical meaning of skewness and kurtosis for histograms? Skewness is a measure of the direction and extent of skewness in the distribution of statistical data and is a numerical feature of the degree of asymmetry in the distribution of statistical data. The number of features characterizing the degree of asymmetry of the probability distribution density curve with respect to the mean. Intuitively, it is the relative length of the tail of the density function curve. In our results, take depolarization ratio for example, skewness of pure dust and polluted dust are greater than 0, which means they all located on the right less than the left. But the skewness of pure dust is smaller than that of polluted dust which means for pure dust the number of large values is large. Mean value alone cannot describe the distribution of pure dust and polluted dust, so we add skewness and kurtosis to help us to detect them clearly in the space-born lidar and numerical modelling.

10. Figure 1, describe the time period in which the number of dust events were

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counted. The time period in Figure 1 is 2013, one year data.

11. Figure 3 and 5, unit for panel (a) is unnatural. Is it $10\ddot{E}\ddot{E}-2/\text{km}/\text{sr}$? Thank you for your kind reminding. We have corrected in the corresponding position.

12. Figure 3, PBL height at 0 UTC was above the cloud layer. How lidar can detect it without effective signal? Thank you for your kind reminding. We have picked the cases with strict control. Now we are doing these works.

13. Figure 4 and 6, all trajectories touch the ground. Are these paths reliable? Thank you for your kind reminding. We have picked the cases with strict control. Now we are doing these works.

14. Figure 9, (b) for pure and (a) for anthropogenic dust. Thank you for your kind reminding. We have corrected in the corresponding position.

Technical Corrections:

1. L53, L58, L89 etc, unify the usage of "," and ";".

Thank you for your kind reminding. We have corrected in the corresponding position.

2. References, J. Quant. Spectrosc. Radiat. Transfer

Thank you for your kind reminding. We have corrected in the corresponding position.

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