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Atmospheric Chemistry and Physics Discussions

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

Zhijuan Zhang et al.

zhangzj2010@lzu.edu.cn

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Anonymous Referee #2

General Comments:

Unfortunately, the paper is unacceptable. The location of the lidar observations (SACOL site) is excellent. The lidar data set is probably of high quality. So I would like to encourage the authors to resubmit the paper after considering my suggestions. The main reason for rejection is that the authors fail to provide a clear definition and thus separation of pure dust and anthropogenic dust cases. A clear definition can be

done by means of the particle linear depolarization ratio. But the authors only present volume depolarization ratios. These values vary with the relative amount of dust, and thus can be low even in the case of pure dust, and large, even in the case of polluted dust. So the only way is: Compute the particle depolarization ratio and use this parameter to distinguish polluted (or anthropogenic) and pure dust cases. If the particle depolarization ratio is > 25% one may call the event a pure dust case and if we have <25% then we may call it a polluted dust case. Furthermore, most of the results are simply given in terms of attenuated backscatter. This quantity varies with the amount of aerosol, so with the amount of dust and/or pollution. We need the particle backscatter coefficient to describe aerosol properties with height. The overall impression is: The paper is to 80% just based on 'opinions', and not on'objective' facts. The lidar community dealing with dust research would be upset if this low-quality paper gets published in its present form. The authors may want to resubmit their paper. Then the analysis must be fully based on (a) particle backscatter coefficients for 532 and 1064 nm, (and not on 532 nm attenuated backscatter) and (b) on particle depolarization ratios (and not on volume depolarization ratios). The particle depolarization ratio can be easily computed from the volume depolarization ratio and the 532 nm particle backscatter coefficient (see the cited publication of Freudenthaler 2009, or some papers from the NIES group). And then introduce a clear criterion for anthropogenic dust, based on the particle linear depolarization ratio.

Thank you for your serious review. First, we just used the data from SACOL and not involved in the observation and inversion process. Second, linear volume depolarization ratio is provided by SACOL group and is used as a part to detect pure dust and anthropogenic dust. This method is the same with Huang et al. (2015) and Liu et al. (2005). This work is mainly to further prove the detection method of anthropogenic dust in Huang et al. (2015). On the other hand, we all think using the particle depolarization ratio and particle attenuated backscatter coefficient is more accurate when detecting pure dust and polluted dust. And after we received your suggestion, we were always trying to calculate particle backscatter coefficients for 532 and 1064 nm and the par-

ticle linear depolarization ratio following the method in the literature of Fredenthaler et al. (2009). But time is not enough, we have not obtained satisfied results. And we will insist with improving our detection method and get more accurate results in the future research.

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