

# ***Interactive comment on* “Environmentally dependent dust chemistry of a super Asian dust storm in March 2010: observation and simulation” by Qiongzhen Wang et al.**

## **Anonymous Referee #2**

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The paper describes an interesting case study on interaction between dust and air pollution. The measurements of water-soluble ions showing heterogeneous reactions are especially interesting. I feel the subject is similar to that described in Pan et al., recently, though the observation methods are different. Pan et al. showed the change in morphology of dust by interaction with air pollution in Beijing (Pan et al., 2017, Real-time observational evidence of changing Asian dust morphology with the mixing of heavy anthropogenic pollution, Scientific Reports 7, 335, doi:10.1038/s41598-017-00444-w). I think it would be better to cite the paper and give a discussion.

Specific comments:

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What is the definition of the depolarization ratio (DR)? Is it volume depolarization ratio (total depolarization ratio)? or particle depolarization ratio (aerosol depolarization ratio)? They are different and should not be confused. Depolarization ratio shown in Fig. 3 is probably volume depolarization ratio (including molecular scattering), but the particle depolarization ratio must be used in the analysis for partitioning dust and non-dust particles.

Is the measured volume depolarization ratio calibrated? It is essential if the authors discuss the value of the particle depolarization ratio. It is also essential for partitioning dust and non-dust.

Is the correction to the geometrical form factor (overlap function) applied? The decrease of the extinction coefficient near the surface in Fig. 8 seems not true. The correction should be applied if not. Unreliable part of the figure should be masked at least.

What is reason to show attenuated backscattering coefficient (BSC) in Fig. 8? It doesn't make sense to me. Dust extinction coefficient, non-dust extinction coefficient, and total extinction coefficient (dust + non-dust) should be indicated in the upper panels. The depolarization ratio in the lower panels must be the particle depolarization ratio.

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2017-438>, 2017.

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