Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2018-293-RC1, 2018

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Quantifying the large-scale electrification equilibrium effects in dust storms using field observations at Qingtu Lake Observatory" *by* Huan Zhang and Xiaojing Zheng

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Received and published: 13 September 2018

MS No.: acp-2018-293

Quantifying the large-scale electrification equilibrium effects in dust storms using field observations at Qingtu Lake Observatory Author(s): Huan Zhang and Xiaojing Zheng

This paper presents the results and analysis of a field campaign studying the electric field generated by a series of dust storms. This work is of high interest to those studying Aeolian processes, atmospheric electricity, aspects of planetology and especially the

electrification of aerosols and granular materials. This is one of only a few such studies and it appears to be thorough and in depth applying a range of experimental sensor techniques.

General comments Generally in this paper the distinction between sand and dust is unclear, an example is line 155 in which the size distribution of saltating particles (by definition these must be sand) are used to make arguments about dust events. By definition sand grains cannot be suspended and are transported at low altitude (typically <1m), cohesion effects for sand are typically negligable. Dust cannot saltate and it is unclear whether they can/do in fact collide while in suspension, it may be that if in contact dust grains will cohere (aggregate). It is my impression that this study focusses on atmospheric dust in which case this should be made clear.

Specific comments It is of some interest whether the field measurements made here are consistent with dust being typically electrified negatively, the authors might want to comment upon this.

The consecutive acquisition of charge (Line 73-80) through collisions and a so called equilibrium charge has been observed only in some laboratory studies (mostly using sand sized particles), it is not demonstrated in all experiments and is not generally accepted that electrification of dust in fact involves multiple collisions. Recent laboratory work implies that it is not (e.g. Alois et al. 2017, 2018). Similarly it seems that the work presented here is not in fact in agreement with a model based upon multiple collisions (e.g. line 259, 406). (Alois, S., Merrison, J., Iversen, J.J., Sesterhenn, J., (2017) Contact electrification in aerosolized monodispersed silica microspheres quantified using laser based velocimetry, Journal of Aerosol Science 106 1–10., Alois, S., Merrison, J., Iversen, J.J., Sesterhenn, J., (2018), Quantifying the contact electrification of aerosolized insulating particles, Powder Technology 332, 106–113)

As the authors point out in laboratory studies it appears that the charge concentration (per surface area) is a more useful physical parameter than charge to mass ratio (μ),

e.g. line is it possible to derive such a parameter from these measurements?. Alternatively information of charge per dust particle might in this case also be valuable.

It is of great interest that the observations presented here show a dependence upon RH especially as stated by the authors that the composition of the dust (soil) might imply a sensitivity to surface moisture (line 309). As the authors also point out some studies demonstrate dependence upon RH and others do not (line 337-347). Recent work has also shown that electrification can occur at extremely low RH but that high RH may greatly enhance electrification for some materials. This appears to present a consistent picture (Alois 2018).

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