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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Alignment of atmospheric mineral dust due to electric field" *by* Z. Ulanowski et al.

Z. Ulanowski et al.

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We are grateful to the anonymous Referee # 2 for numerous suggestions and corrections, which we have incorporated into the final version, with the exception of Comment 10: *"a complication here is that if the conductivity in the layer becomes so limiting, it will no longer be the case that the current density will be the same; there will be a tendency for the current to flow around the obstruction; assumption of constant current will give an overestimate to the field; this is an oversimplification".*
Yes, in general it is a simplification. However, as satellite data testifies Saharan dust layers can be many tens or even hundreds of km in extent, so the assumption we make in section 2.3 that *"the aerosol layer has large horizontal extent"* holds, and the edge effects are not likely to be significant.

Concerning comment 6: *"p. 10, after eqn (14): what are the assumptions that enable*

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a Boltzmann's law term to be written for fluid flow. What particle sizes does this apply to?"
Essentially, there is no size limit, but we have now added a clarification that this analysis is applicable to steady state conditions, i.e. when time constants of the alignment process are much shorter than its lifetime.

Concerning comment 7: *"p.11: a field of 1600 kV/m is cited. This seems very large. How does this compare to thunderstorm electric fields. Would this initiate a discharge?"* Fields in thunderstorms are thought to be at least two orders of magnitude larger, and no discharges would take place at the field strengths we have postulated. However, there is anectotal evidence of lightning discharges accompanying dust storms, so the fields can be much stronger - comparable to those in storm clouds. We clarify this by stating in the text: *"The process we are reporting is similar* [to the alignment of ice crystals in clouds]*, except that it involves slightly smaller particles and electric fields around two orders of magnitude weaker"* (p.13).

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 13203, 2007.