Abstract Submitted
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Large-eddy simulation of charged particle flows to model sandstorms[1] MUSTAFA RAHMAN, WAN CHENG, RAVI SAMTANEY, King Abdullah University of Science and Technology — Intense electric fields and lightning have been observed in sandstorms. It is proposed to investigate the physical mechanisms essential for production and sustenance of large-scale electric fields in sandstorms. Our central hypothesis is that the turbulent transport of charged sand particles is a necessary condition to attain sustained large-scale electric fields in sandstorms. Our investigation relies on simulating turbulent two-phase (air and suspended sand particles) flows in which the flow of air is governed by the filtered Navier-Stokes equations with a subgrid-scale model in a Large-Eddy-Simulation setting, while dust particles are modeled using the Eulerian approach using a version of the Direct Quadrature Method of Moments. For the fluid phase, the LES of incompressible turbulent boundary layer employs stretched spiral vortex subgrid-scale model and a virtual wall model similar to the work of Cheng, Pullin & Samtaney (J. Fluid Mech. 2015). We will quantify the effects of different sand particle distributions, and turbulent intensities on the root-mean-square of the generated electric fields.

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