The Effect of Oscillation Sheath on the Movement of Lunar Dust

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Dust levitation on the lunar surface can cause troubles, such as abrading key component, compromising seals, disabling sensitive materials and so on, for astrovehicle and astronaut. The main reason for the levitation of lunar dust is electrostatic transport which caused by the intense electric field in lunar terminator region. It can be found that the sheath on lunar surface is an oscillation sheath and it plays a significant role in the movement of lunar dust in terminator region. In order to study the effect of oscillation sheath on the movement of lunar dust, a finite element numerical simulation method, which is based on Immersed Finite Element Particle-In-Cell method, is developed. The Immersed Finite Element method adapts Cartesian meshes which is independent of the interface for resolving the electric fields accurately in a domain with complex boundary/interface geometry and the Particle-In-Cell method is one of the major methods for electromagnetic field simulations. The research work on the oscillation sheath in lunar terminator region and its effect on the movement of lunar dust has a significant meaning for the dust removal/prevention design of spacecraft.