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ESTIMATIONS OF MOON DUST AND SURFACE ELECTRICAL FIELD FOR FUTURE SURFACE
MEASUREMENTS VIA A LUNAR MICRO-ROVER MISSION

Abstract

The moon dust and surface electrical field estimations are important to future human and robotic activities on the surface of the moon. Apollo astronauts had witnessed the maintaining of micron- and millimeter sized moon dust up to meters level while walked on the surface of the moon. The characterizations of the moon dust would enhance not only the scientific understanding of the moon but also the future technology development for the surface operations on the moon. It has been proposed that the maintaining and/or settlement of the small-sized dry dust are related to the size and weight of the dust particles, the level of the surface electrical fields on the moon, and the impaction and interaction between lunar regolith and the solar particles. The moon dust distributions and settlements obviously affected the safety of long term operations of future lunar facilities. Through analyzing the imaging of the legs of the moon lander, the cover and the footwear of the space suits, and the envelope of the lunar mobiles, we estimated the size and charges associated with the small moon dust particles, the gravity and charging effects to them along with the lunar surface environment. We also calculated the surface electrical fields due to the impaction of the solar winds in several conditions. These estimation results that the maintaining of meters height of the micron size of moon dust is well related to the electrical field and the solar angle variations, as expected. These results could be verified and validated through future on site and/or remote sensing measurements and observations of the moon dust and the surface electrical field in a lunar micro-rover mission.