# Effects of lunar topography on charged dust dynamics in the near-surface environment

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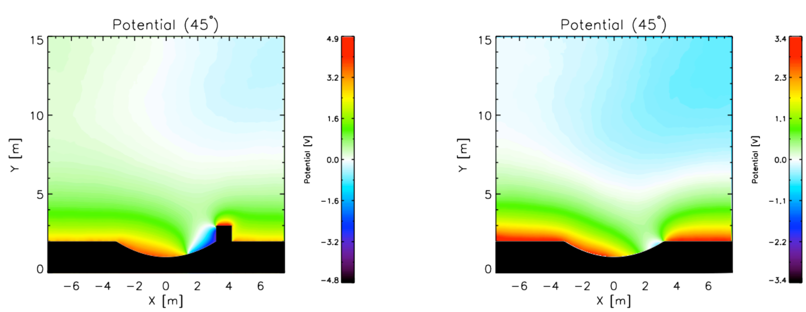
**Abstract**. Due to interactions with the solar wind and ultraviolet radiation, the lunar surface develops a complex plasma environment, especially around features such as craters and boulders. Various phenomena have been observed on the lunar surface, including dust levitation and horizontal dust transport[1,2]. To understand these phenomena a three-dimensional particle-in-cell (PIC) code was run using the high-performance code, VORPAL©. The plasma environment was modeled above two topographies: (1) a crater with a diameter of seven meters; and (2) the same crater with the addition of a 1x1x1 meter block at the edge. Both scenarios were modeled with changing solar angles to simulate a full days worth of plasma conditions. Dust dynamics were then modeled with a test particle approach, where individual dust grains are introduced into the PIC-modeled plasma environment. We simulated multiple lunar days of dust dynamics in order to detect any net transport of the dust. To do this, we interpolated between solar angles to obtain local plasma conditions while continuously ejecting charged dust grains from the surface. A comparison of the effects of the two surface topographies on the dust and plasma environment will be presented.




Electric potential structure above the two topographies

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[1] Dove et al., "Experimental Study of a Photoelectron Sheath."
[2] Sickafoose et al., "Experimental Levitation of Dust Grains in a Plasma Sheath."