LABORATORY STUDIES OF THE LUNAR SURFACE POTENTIAL AND PLASMA PROBES FOR IN SITU MEASUREMENTS

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Surfaces in space exposed to plasmas and UV radiation will become charged and develop a sheath region. Typically, the electric field in this region is on the order of a few V/m, too small to lift-off micron sized grains with an expected charge of a single electron on the lunar surface, for example. More dust activities were observed at sunset or sunrise. This can be caused by much higher electric fields developed along neighboring lit and dark surface elements due to differential UV charging. The moving lit/dark boundary can also lead to an increased surface charge density, which in combination with the strong localized electric field could lead to the mobilization and transport of the lunar soil.

We report on a series of ongoing experiments to investigate differential photoelectron charging, and the so-called `super-charging' effect, related to the moving boundaries between illuminated and shadowed surfaces. We will also discuss new plasma diagnostic methods to characterize the spatial and energy distribution of electrons in a dilute photoelectron sheath on the lunar surface.