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Solar Influences on Plasma Flows and Near-Surface Environments Around Airless Bodies

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Recent studies examining the effects of extreme solar events on the lunar plasma environment show enhanced concentrations of pick-up/reflected ions in the solar wind and electric field development in shadowed craters and wake regions near the poles and terminators, resulting in hazardous electrostatic charging at the surface. The same solar drivers regulate plasma and charging environments around small airless bodies such as asteroids and moons of Mars. Finding safe ways to dissipate accumulating electrostatic charge on human systems and equipment is a critical requirement for future exploration of these airless bodies. We present a series of numerical simulations using a grid-free 2D plasma code to investigate the effects of extreme solar events on the plasma flow and near-surface environment of airless bodies as a function of obstacle size, focusing on the wake refilling process and resulting near-surface electric fields.