

Statistical analysis of spacecraft charging environment in the medium earth orbit

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Analysis of spacecraft surface charging in the medium earth orbit (MEO) is important for spacecraft designs and operations, because the surface charging sometimes cause spacecraft anomalies due to discharging arcs. We study the surface charging environment using the Electric Field and Wave instruments (EFW) and the Helium Oxygen Proton Electron (HOPE) data of the Van Allen Probes and the Low energy Experiments (LEP) data of the ARASE satellite. We analyze the relationship between the observed spacecraft potential and the average electron temperature which show an approximate power law relationship in the geostationary earth orbit (GEO). However, we cannot find such a power law relationship in MEO. Therefore we calculate other plasma environmental parameters, for instance, from multi-temperature treatments using a discriminant analysis for the energy flux distributions. We will discuss the relationships between the spacecraft potential and these plasma environment parameters in MEO.

Keywords: Spacecraft surface charging, Medium earth orbit (MEO), ARASE satellite