

Interaction between terrestrial plasma and the Moon: Kaguya (SELENE) observations

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The moon stays in the Earth's magnetosphere for several days around the full moon period. The plasma in the magnetosphere has different properties from the solar wind, such as in density and energy, and interacts with the lunar surface. Most electrons in the magnetosphere gyrate around the magnetic field line with a smaller Larmor radius than Kaguya's orbital height which is nominally 100 km. However, some electrons in the plasma sheet have the Larmor radii greater than or equal to 100 km (a 1 keV electron has a Larmor radius of 107 km in a 1 nT magnetic field). When the magnetic field is parallel to the lunar surface, these relatively high-energy electrons strike the lunar surface and are absorbed. This can be observed as an empty region in the electron distribution function, which is isotropic in the Earth's plasma sheet. By analyzing the data obtained by MAP-PACE and MAP-LMAG onboard Kaguya (SELENE), the electron distributions just as expected were found. The empty regions in the observed distribution are consistent with the patterns of forbidden region obtained by reversed particle tracking calculation.

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