

Charged particle weathering of the Saturnian satellites

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Abstract

The inner satellites of Saturn are in extremely different charged particle environments and it is our expectation that their surfaces are all weathered in very different ways. Broadly speaking, the satellite Tethys is in a transition region between satellites that are deep within the planetary radiation belts and those that are in the region of space dominated by the planetary ring current. Data from the Magnetospheric Imaging Instrument (MIMI) on Cassini have confirmed that satellites such as Janus, Mimas, and Enceladus efficiently absorb high fluxes of MeV ions associated with the planetary radiation belts. These satellites are also heavily bombarded along their leading hemispheres by electrons in the few MeV energy range and just above. Finally this inner group is not heavily weathered by charged particles in the tens to hundreds of keV energy range. Such particles do not survive at high fluxes in the region occupied by the densest part of the neutral gas cloud (and grain environment). Satellites whose orbits lie outward of Tethys are more affected by a different population of particles. While these satellites receive much lower doses of MeV particles compared to the satellites mentioned above, they are more likely to be bombarded by tens to hundreds of keV ions and electrons. In this talk, we will discuss the charged populations in the inner magnetosphere of Saturn, the relative bombardment of the various satellites and the predicted consequences for their surfaces.