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The Ecology of the Icy Satellites of Saturn

Bonnie Buratti (1), Robert Brown (2), Roger Clark (3), Gianrico Filacchione (4), Joel Mosher (1), Michael Hicks (1), Kevin Baines (1), and Phillip Nicholson (5)

(1) JPL/Caltech, Pasadena, CA, USA (bonnie.buratti@jpl.nasa.gov), (2) Univ. Arizona, Tucson, AZ, USA, (3) USGS, Denver, CO, USA, (4) IASF-INAF, Rome, Italy, (5) Cornell University

After nearly 6 years in orbit around Saturn, the Cassini spacecraft has obtained measurements of the large and small satellites of Saturn over a full range of viewing geometries. The combined wavelengths of the Visual Infrared Mapping Spectrometer (VIMS) and the Imaging Science Subsystem (ISS) cover over 99% of the solar spectrum. These two factors enable a detailed study of the optical properties and interactions among the satellites of Saturn and the rings. Besides obtaining spectra from which composition can be derived, VIMS and ISS have collected measurements that are ideally suited to understanding both global and disk-resolved scattering properties of the surfaces of these satellites, as well as physical characteristices such as roughness, surface particle size and compaction state, and bolometric Bond albedos.

An important tool of planetary geophysics is the correlation of geologic terrains with albedo and color to understand the relative ages, alteration processes, and composition of surfaces, and geologic events. For the saturnian system, exogenous alteration processes complicate this process profoundly. Perhaps most important is the effect of Saturn's E-ring, which is sustained by icy particles from the plumes of Enceladus. This ring coats not only the surface of Enceladus - including old, cratered terrains - but substantial portions of the other main inner Saturnian satellites (Mimas, Tethys, Dione, and Rhea). The inner small satellites such as the "shepherd" satellites and the coorbitals are also affected by the main ring system. Finally, small, low albedo particles eroded from Phoebe and possibly the other outer satellites migrate into the inner part of the system to coat the leading side of Iapetus, Hyperion, and to a lesser extent the other inner satellites. These exogenic processes render it more difficult the understand the provenance of both large and small satellites, as the preexisting composition of the surfaces is obliterated.

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