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[WITHDRAWN]

Space Weathering Impact on Solar System Surfaces and
Planetary Mission Science

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We often look "through a glass, darkly" at solar system bodies with tenuous atmospheres and direct surface exposure to the local space environment. Space weathering exposure acts via universal space-surface interaction processes to produce a thin patina of outer material covering, potentially obscuring endogenic surface materials of greatest interest for understanding origins and interior evolution. Examples of obscuring exogenic layers are radiation crusts on cometary nuclei and iogenic components of sulfate hydrate deposits on the trailing hemisphere of Europa. Weathering processes include plasma ion implantation into surfaces, sputtering by charged particles and solar ultraviolet photons, photolytic chemistry driven by UV irradiation, and radiolytic chemistry evolving from products of charged particle irradiation. Regolith structure from impacts, and underlying deeper structures from internal evolution, affects efficacy of certain surface interactions, e.g. sputtering as affected by porosity and surface irradiation dosage as partly attenuated by local topographic shielding. These processes should be regarded for mission science planning as potentially enabling, e.g. since direct surface sputtering, and resultant surface-bound exospheres, can provide in-situ samples of surface composition to ion and neutral mass spectrometers on orbital spacecraft. Sample return for highest sensitivity compositional and structural analyses at Earth will usually be precluded by limited range of surface sampling, long times for return, and high cost. Targeted advancements in instrument technology would be more cost efficient for local remote and in-situ sample analysis. More realistic laboratory simulations, e.g. for bulk samples, are needed to interpret mission science observations of weathered surfaces. Space environment effects on mission spacecraft and science operations must also be specified and mitigated from the hourly to monthly changes in space weather and from longer term (e.g., solar cycle) evolution of space climate. Capable instrumentation on planetary missions can and should be planned to contribute to knowledge of

interplanetary space environments. Evolving data system technologies such as virtual observatories should be explored for more interdisciplinary application to the science of planetary surface, atmospheric, magnetospheric, and interplanetary interactions.

[2732] MAGNETOSPHERIC PHYSICS / Magnetosphere interactions with satellites and rings

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