Ion Sputtering and Backscattering from the Regolithes and Iced Surfaces in the Solar System

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The ion sputtering and backscattering are plasma / surface interaction processes that produce release of neutral atoms well above the thermal equilibrium. The emitted spectrum is up to few hundreds of eV, hence allowing remote sensing of the surface process. We focus on the cases of Mercury, the Moon, and Europa. In all cases, the absence of a dense atmosphere allows the direct precipitation of plasma onto the surface. However, while the regolith surfaces of Mercury and the Moon undergo the precipitation of solar wind protons, high-energy heavy ions of the Jovian magnetosphere hit the icy surface of Europa. We compare simulations and recent ENA data to study the dependence of the emitted spectrum versus the characteristic of both the surface and the precipitating plasma. Estimations of the erosion rates due to the various neutral emission processes are made for both Europa and Mercury.