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### **EROSION, TRANSPORTATION, AND DEPOSITION ON OUTER SOLAR SYSTEM SATELLITES: LANDFORM EVOLUTION MODELING STUDIES**

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Mass movement and landform degradation reduces topographic relief by moving surface materials to a lower gravitational potential. In addition to the obvious role of gravity, abrasive mechanical erosion plays a role, often in combination with the lowering of cohesion, which allows disaggregation of the relief-forming material. The identification of specific landform types associated with mass movement and landform degradation provides information about local sediment particle size and abundance and transportation processes. Generally, mass movements can be classified in terms of the particle sizes of the transported material and the speed the material moved during transport. Most degradation on outer planet satellites appears consistent with sliding or slumping, impact erosion, and regolith evolution. Some satellites, such as Callisto and perhaps Hyperion and Iapetus, have an appearance that implies that some additional process is at work, most likely sublimation-driven landform modification and mass wasting. A variant on this process is thermally driven frost segregation as seen on all three icy Galilean satellites and perhaps elsewhere. Titan is unique among outer planet satellites in that Aeolian and fluvial processes also operate to erode, transport, and deposit material. We will evaluate the sequence and extent of various landform-modifying erosional and volatile redistribution processes that have shaped these icy satellites using a 3-D model that simulates the following surface and subsurface processes: 1) sublimation and re-condensation of volatiles; 2) development of refractory lag deposits; 3) disaggregation and downward sloughing of surficial material; 4) radiative heating/cooling of the surface (including reflection, emission, and shadowing by other surface elements); 5) thermal diffusion; and 6) vapor diffusion. The model will provide explicit simulations of landform development and thusly predicts the topographic and volatile evolution of the surface and final landscape form as constrained by DEMs. We have also simulated fluvial and lacustrine modification of icy satellites landscapes to evaluate the degree to which fluvial erosion of representative initial landscapes can replicate the present Titan landscape.

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