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ASPECT-DEPENDENT REGOLITH FLUX REVEALED BY METEORIC ^{10}BE

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We use a combination of high resolution, LiDAR-derived digital topography and the cosmogenic radionuclide meteoric ^{10}Be to measure rates of regolith transport along six hillslopes in three *en echelon* watersheds, test transport rules, and elucidate the mechanisms acting to transport regolith materials at the Susquehanna Shale Hills Critical Zone Observatory (SSHO). Topographic observations reveal a systematic asymmetry at SSHO, where north-facing hillslopes exhibit steeper gradients than south-facing hillslopes. Despite this asymmetry, our meteoric ^{10}Be results suggest that regolith flux is similar along all six hillslopes, and that the landscape is steadily lowering at ~ 20-30 m/My. We compare our measured regolith fluxes with two frequently invoked transport rules; one that sets regolith flux linearly proportional to topographic slope, and one that sets regolith flux linearly proportional to the product of slope and a probability distribution of disturbance events with regolith depth. These comparisons suggest that downslope regolith transport is depth-dependent at SSHO, and that regolith transport efficiency is consistently higher on south-facing hillslopes than north-facing hillslopes by a factor of two. Our results imply that subtle differences in insolation between north- and south-facing slopes impact the frequency of expansion-and-collapse regolith transport processes (i.e., wetting-drying cycles, freezing-thawing cycles), driving more frequent cycles and thus higher transport efficiencies on south-facing slopes. This interpretation is supported by seasonal δ^{18}O measurements in soil pore-waters on north- and south-facing slopes at SSHO, as well as heat flux models for the SSHO watershed. We contend that the differences in regolith transport efficiency between north- and south-facing slopes at SSHO have conspired to drive the evolution of asymmetric topography over geologic time.

Session No. 332

T45. Tracking Sediment Movement across Earth's Surface
Wednesday, 22 October 2014: 1:00 PM-5:00 PM

208/209 (Vancouver Convention Centre-West)
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Back to: T45. Tracking Sediment Movement across Earth's Surface

<< Previous Abstract | Next Abstract >>