GSA 2014
19-22 October | Vancouver, BC, Canada
THE GEOLOGICAL SOCIETY OF AMERICA®

2014 GSA Annual Meeting in Vancouver, British Columbia (19–22 October 2014)

Paper No. 92-10
Presentation Time: 10:50 AM

METEORIC ^{10}BE, HILLSLOPE EROSION AND LANDSCAPE EVOLUTION ALONG THE COLORADO FRONT RANGE

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Fallout radionuclides, such meteoric ^{10}Be, are valuable as geochronometers and as tracers of hillslope sediment transport, vertical mixing, and residence time. Meteoric ^{10}Be is particularly useful for long-term geomorphic assessments because it readily adsorbs to mineral matter in the near surface and its half-life is long (~1.36 Ma). Here, we discuss the application of meteoric ^{10}Be to study hillslope erosion and landscape evolution along the Colorado Front Range. Local calibration of meteoric ^{10}Be deposition is essential for geomorphic studies. Meteoric ^{10}Be inventories for 6 dated landforms indicate: (1) long-term deposition varies spatially and temporally across this mountain landscape; (2) soil erosion and site-specific deposition from snowdrifts account for differences; (3) the region has 30-50% higher deposition over past 20ka than predicted by current models. Meteoric ^{10}Be depth profiles for 10 hillslope pits indicate that concentrations consistently decrease with depth over ~40 cm. Shallow bulges and lower overall concentrations on south-facing hillslopes compared to exponential/declining profiles and higher overall concentrations on north-facing hillslopes imply that more rapid vertical mixing and lateral transport and significantly greater erosion have stripped fines and meteoric 10Be over the last 15-20 ka. Meteoric ^{10}Be inventories for 40 hillslope locations within Gordon Gulch watershed indicate that average soil residence time for mobile regolith is ~19 ka, but that significant spatial variation exists. Meteoric ^{10}Be inventories consistently increase downslope on north-facing hillslopes, but not on south-facing slopes. Regolith thickness patterns and meteoric ^{10}Be age constraints indicate transport of hillslope material to toeslope areas prior to and during the colder climates associated with the end of the last glacial maximum, with latest Pleistocene and Holocene regolith currently stored at the bottom of hillslopes. Meteoric ^{10}Be inventories can be compared with inventories of fallout radionulcides ^{137}Cs and ^{210}Pb, which measure sediment movement over the past century, to analyze behavior at short vs. long timescales. Recent fire activity in the region allows us to use meteoric ^{10}Be to evaluate the role of wildfires in longer-term hillslope evolution.

Session No. 92

T42. Landscape Evolution through the Lens of Cosmogenic Nuclides
Monday, 20 October 2014: 8:00 AM-12:00 PM

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Geological Society of America *Abstracts with Programs.* Vol. 46, No. 6, p.241

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