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APPLICATION OF METEORIC ^{10}BE, ^{137}CS AND ELEMENTAL PROFILES TO STUDIES OF SOIL MIXING AND EROSION—A FRONT RANGE PERSPECTIVE

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Accumulation profiles and inventories of cosmogenic nuclides such as meteoric ^{10}Be, weapons-derived radionuclides such as ^{137}Cs, and weathering-derived metals (Zr and pedogenic Fe (Fed)) allow estimates of soil residence time and erosion rates, and provide insight into geomorphic processes at short, millennial and longer time scales. Met ^{10}Be and ^{137}Cs profiles integrate surface erosion and vertical mixing whereas Fed and Zr reflect mainly bottom up accumulation and rates of vertical mixing. Manganese and Zn profiles reflect vegetative cycling and the control of mobility by organic matter. We report data from stable soils, mobile regolith on slopes, and alluvium from the Colorado Front Range where parent material is granitic, climate is cool, dry, and vegetation is coniferous. Profiles on stable surfaces generally reflect depositional and pedogenic processes, but on 24° slopes, vertical mixing of met^{10}Be is incomplete in mobile regolith that has residence times of 10 to 20 ky. Zr values are irregular, likely reflecting local parent material variability, and accumulation profiles at many sites may derive from enrichment in fine, eolian-derived material, rather than strain. Catena studies using met^{10}Be and ^{137}Cs show that inventories are highest in toeslopes and in adjacent alluvial fans, demonstrating recent erosion and downslope transport of near-surface materials. Steady-state assumptions do not provide a complete description of slope evolution in the changing climates of latest Pleistocene and Holocene time. Reconnaissance sampling of toeslope and flood deposits suggests that near-surface processes following fires may profoundly alter the inventory of cosmogenic isotopes and organically mediated elements in hillslope soils. On the slow-weathering slopes of the Front Range, in-situ cosmogenic techniques may provide better descriptions of long-term slope evolution.

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

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