Geophysical Research Abstracts,
Vol. 11, EGU2009-8066, 2009
EGU General Assembly 2009

Landsliding rates revisited

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Landslides are purportedly the dominant agents of erosion in humid and tectonically active mountain ranges. The rate of landsliding is also thought to compensate for effects of rock uplift on mountainous landscapes by maintaining threshold hillslopes and limiting growth of topographic relief. Still few data exist to corroborate this widely held notion. Here I review rates of landslide erosion from around the world, and show that they vary by at least six orders of magnitude, i.e. from 10^{-3} to 10^{2} mm/yr. Part of this variability is systematically linked to the timescales of interpolation, such that mean rates are hardly meaningful let alone representative. The highest rates are invariably tied to tectonically active mountain belts that experience frequent earthquake shaking, high precipitation, and sustain dense forest vegetation. Landslide erosion rates derived for short-term periods (10^{0}–10^{2} yr) rely on higher data density, but are prone to bias by regional triggering events such as earthquakes and rainstorms, anthropogenic changes to land cover, and the occurrence of large, infrequent landslides. In contrast, the considerably lower long-term landslide erosion rates (10^{3}–10^{4} yr) suffer from incomplete records because of erosional censoring, and thus remain underestimates. Despite this shortcoming, there is strong evidence that the larger landslides are dominating volumetric sediment production in tectonically active mountain belts. At a global scale, soil erosion appears to be the only other process capable of matching the rates of landslide erosion. Yet, data on specific yields of mountain rivers and glacier-dominated drainage basins indicate that landslide-produced sediment may be routed more or less at capacity in many settings.