Geophysical Research Abstracts, Vol. 7, 02080, 2005
SRef-ID: 1607-7962/gra/EGU05-A-02080

The nature and timing of small mountain catchment response to high-magnitude knickpoint propagation

Reinhardt, L.J. (1), Bishop, P. (1), Dempster, T.J., (1). Hoey, T.B. (1), Barrows, T. (2), Fifield, K. (2) Sanderson, C.W.D. (3)

(1) University of Glasgow, Centre for Geosciences, lreinhardt@geog.gla.ac.uk, (2) Department of Nuclear Physics, Australian National University, (3) Scottish Universities Environmental Research Centre

We quantify catchment response time rate to high-magnitude knickpoint propagation in one of the least understood mountain environments, a small, high-relief catchment dominated by colluvial processes. Current rejuvenation of the small ($21km^2$), high relief ($2km$) Rio Torrente catchment in the western Sierra Nevada, S Spain has resulted in two distinct geomorphic zones: (1) a low angle, denudationally stable (un-rejuvenated) headwater region with thin regolith cover and uniform erosion rates of $0.07 \pm 0.02mm.a^{-1}$ (based on cosmogenic ^{10}Be and ^{26}Al measurements); and (2) a steep, actively rejuvenating lower catchment dominated by landsliding, with erosion rates up to $9.6 \pm 0.3mm.a^{-1}$ (^{10}Be and ^{26}Al). Optically stimulated luminescence of fluvial terrace deposits indicates that rejuvenation of this catchment began $\sim 17ka$ following a rapid, tectonically generated $\sim 50m$ drop in relative base level. The mean rate of river incision into schistose bedrock and $12ka$ fluvial terrace deposits is approximately $5mm.a^{-1}$. A knickzone has migrated headwards up the trunk stream at $\sim 0.5m.a^{-1}$, successively rejuvenating tributaries, and propagating up hillslopes at the significantly slower mean rate of $0.07m.a^{-1}$. Thus the adjacent hillslope response time to base-level lowering is one order of magnitude slower than the axial channel response time, implying that hillslopes may continue to adjust and generate sediments in response to rapid base-level lowering after the re-establishment of an equilibrium channel long profile.