



Landslides, threshold slopes, and the survival of relict terrain in the wake of the Mendocino Triple Junction

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Establishing the coupled fluvial-hillslope response to uplift is critical for interpreting sediment fluxes, stream channel characteristics, hazard potential and topographic development. Threshold-slope models purport that landslide fluxes obtain a balance with river incision in response to rapid rock uplift, but a lack of observations and constraints in most settings prevents us from quantifying the process-linkages required for channels and hillslopes to adjust to tectonic forcing. We mapped landslides and knickpoints and extracted topographic metrics across the northern Californian Coast ranges, where the landscape is responding to a wave of rapid uplift related to the migration of the Mendocino Triple Junction (MTJ). We find a tightly coupled channel-landslide-hillslope response to uplift from catchment to regional scales. Locally, landslide erosion rates estimated from historical air photo analyses approach 1 mm yr⁻¹, consistent with published cosmogenic nuclide and suspended sediment erosion rates as well as modeled isostatic uplift associated with crustal thickening proximal to the MTJ. Landslides are concentrated along channel reaches downstream of migrating knickpoints generated by base level fall at channel outlets and hillslope gradients and relief become invariant with the onset of significant landslide erosion. Following passage of the MTJ, this coupled response becomes inhibited by subsidence due to crustal thinning and landslide-derived coarse sediment delivery that suppresses catchment-wide channel incision and knickpoint migration. As a result, substantial portions of the landscape escape comprehensive adjustment to increased uplift and retain the signature of a gentle and slow-eroding relict landscape.