Geophysical Research Abstracts
Vol. 17, EGU2015-12992, 2015
EGU General Assembly 2015

New model on the relations between surface uplift and erosion caused by large, compressional earthquakes

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Large earthquakes deform Earth's surface and drive topographic growth in
the frontal zones of mountain belts. They also induce widespread mass wasting, reducing relief.
Preliminary studies have proposed that above a critical magnitude earthquake would induce more erosion than uplift. Other parameters such as fault geometry or earthquake depth were not considered yet. A new, seismologically consistent model of earthquake induced landsliding allows us to explore the importance of parameters such as earthquake depth and landscape steepness. In order to assess the earthquake mass balance for various scenarios, we have compared the expected eroded volume with co-seismic surface uplift computed with Okada's deformation theory. We have found the earthquake depth and landscape steepness to be dominant parameters compared to the fault geometry (dip and rake). In contrast with previous studies we have found that the largest earthquakes will always be constructive and that only intermediate size earthquake (Mw $\sim$7) may be destructive. We have explored the long term evolution of topography under seismic forcing, with a Gutenberg Richter distribution or a characteristic earthquake model, on a fault system with different geometries and tectonic styles, such as transpressive or flat-and-ramp geometry, with thinned or thickened seismogenic layer.