Geophysical Research Abstracts
Vol. 18, EGU2016-12418-1, 2016
EGU General Assembly 2016

Coseismic and Post-seismic landsliding: insights from seismological modeling and landslide map time series.

Odin Marc (1), Niels Hovius (1), Patrick Meunier (2), Taro Uchida (3), and Tolga Gorum (4)

(1) Deutsches GeoForschungsZentrum GFZ-Potsdam, Potsdam, Germany (omarc@gfz-potsdam.de), (2) Ecole Normale Suprieure de Paris, Laboratoire de Gologie, 75231 Paris CEDEX 5, France., (3) National Institute for Land and Infrastructure Management, Research Center for Disaster Risk Management, 1 Asahi, Tsukuba City,8 Ibaraki Prefecture 305-0804, Japan., (4) Yildiz Technical University, Natural Sciences Research Center, 34220 Esenler- Istanbul, Turkey

Earthquakes impart a catastrophic forcing on hillslopes, that often lead to widespread landsliding and can contribute significantly to sedimentary and organic matter fluxes.
We present a new expression for the total area and volume of populations of earthquake-induced landslides.This model builds on a set of scaling relationships between key parameters, such as landslide density, ground acceleration, fault size, earthquake source depth and seismic moment, derived from geomorphological and seismological observations. To assess the model we have assembled and normalized a catalogue of landslide inventories for 40 earthquakes. We have found that low landscape steepness systematically leads to over-prediction of the total area and volume of landslides.When this effect is accounted for, the model is able to predict within a factor of 2 the landslide areas and associated volumes for about two thirds of the cases in our databases. This is a significant improvement on a previously published empirical expression based only on earthquake moment. This model is suitable for integration into landscape evolution models, and application to the assessment of secondary hazards and risks associated with earthquakes.
However, it only models landslides associated to the strong ground shaking and neglects the intrinsic permanent damage that also occurred on hillslopes and persist for longer period. With time series of landslide maps we have constrained the magnitude of the change in landslide susceptibility in the epicentral areas of 4 intermediate to large earthquakes. We propose likely causes for this transient ground strength perturbations and compare our observations to other observations of transient perturbations in epicentral areas, such as suspended sediment transport increases, seismic velocity reductions and hydrological perturbations. We conclude with some preliminary observations on the coseismic mass wasting and post-seismic landslide enhancement caused by the 2015 Mw.7.9 Gorkha (Nepal) earthquake.