Geophysical Research Abstracts
Vol. 16, EGU2014-7212, 2014
EGU General Assembly 2014

Geomorphic and seismic coupled monitoring of post-earthquake subsurface weakening.

Odin Marc (1), Kaoru Sawazaki (2), Christoph Sens-Schönfelder (1), Niels Hovius (1), Patrick Meunier (3,1), and Taro Uchida (4)

(1) GFZ-Potsdam, Potsdam, Germany (omarc@gfz-potsdam.de), (2) National Research Institute for Earth Science and Disaster Prevention, Tsukuba, Japan., (3) École Normale Supérieure de Paris, Laboratoire de Géologie, (4) National Institute for Land and Infrastructure Management, Research Center for Disaster Risk Management,

We present integrated geomorphic data constraining an elevated landslide rate following 3 continental shallow earthquakes, the Mw 6.9 Finisterre (1993), the Mw 7.6 ChiChi (1999) and the Mw 6.8 Iwate-Miyagi (2008) earthquakes. We have constrained the magnitude and decay time of seismically enhanced landslide rates and investigated the mechanism at the source of this prolonged geomorphic response. We provide evidence ruling out aftershocks and rain forcing as possible mechanisms and identify substrate weakening as a likely cause. We have used ambient noise autocorrelation to monitor subsurface seismic velocity within earthquake epicentral areas. Observed station response patterns are diverse, illustrating potential lithological or other local effects. However, some stations were strongly affected by the earthquake in relatively high frequency ranges (1-2 and 2-4 Hz). This may be related to shallow subsurface change. At several stations we have found a velocity drop followed by a recovery over several years, in fair agreement with the recovery time of landslide rates in the area. This prompts a search for common processes altering the strength of the topmost layers of soil/rock in epicentral areas, simultaneously driving a landslide rate increase and a seismic velocity drop. This search requires additional constraints on the seismic signal interpretation. It may yield a useful tool for post-earthquake risk management.