



## **Constraints on post-earthquake elevated landslide rate: towards forecasting of a general mechanism ?**

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We have observed elevated landslide rates after 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. The magnitude and recovery time of these geomorphic perturbations are not correlated with aftershocks or rainfall forcing, but may be related to substrate weakening. From these examples and some proxy observations from other current studies, it appears that the time required for landslide rates to normalize after an earthquake scales with the earthquake magnitude. In addition to these geomorphological observations, we present a seismic wave velocity monitoring technique based on ambient seismic noise, that is sensitive to changes of substrate strength. At several seismic stations in epicentral areas of earthquakes with a strong geomorphic response, we have found a velocity drop associated with the earthquake, followed by a recovery phase lasting several years and approximately as long as the recovery time of landslide rates. Lithology appears to be a dominant control on the post-earthquake evolution of landslide rates as well as the seismic velocities at selected stations. Thus, joint geomorphic and seismic observations could allow precise forecasting of the evolution and decay of landslide risk within epicentral areas, starting from early post-earthquake seismic velocity monitoring.