



Seismic controls on contemporary sediment yields in Italy: the link with landslide susceptibility

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Recent studies showed that contemporary catchment sediment yields (SY, [t/km²/y]) at regional and continental scales are strongly correlated to spatial patterns of seismic activity. Nonetheless, we currently have little insights into the mechanisms that explain these correlations. We therefore investigated how spatial patterns of SY in Italy are linked to patterns of seismic activity.

Based on inventories of registered and historical earthquakes in Italy we generated maps indicating the cumulative peak ground acceleration (PGA) associated with different ranges of earthquake magnitudes and explored to which extent these maps explained observed spatial patterns in SY for 106 catchments across Italy. Results showed that SY was significantly correlated to the cumulative PGA associated with small ($M_w < 3$) but frequent (i.e. thousands per year) earthquakes, but not to the cumulative PGA associated with large earthquakes ($M_w > 6$) that occurred over the past 1000 years. Analyses of a dataset of ca. 500 000 landslides across Italy showed very similar trends: spatial patterns of landsliding are correlated to seismicity. However, landslides in similar lithological units were generally stronger correlated to patterns of weak but frequent seismicity than to the occurrence of large earthquake events.

Differences in catchment sediment yield were also correlated to spatial patterns of mapped landslides and landslide-prone lithological units. This clearly indicates that seismicity may lead to higher sediment yields by increasing the occurrence of landslides. However, these increases are more likely attributable to an increased landslide susceptibility than to the direct triggering of landslides. This also suggests that, on average and at a regional scale, the geomorphic impact of weak but frequent earthquakes can be much larger than the geomorphic impact of large but rare earthquake events.