Geophysical Research Abstracts
Vol. 16, EGU2014-5557, 2014
EGU General Assembly 2014

The importance of earthquake-triggered landslides for catchment sediment yield: a case study of the Siret basin (Romania)

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Recent studies have shown that seismic activity may have an important influence on catchment sediment yields (SY, [t/km^2/y]), e.g. due to earthquake-triggered landslides (EQL). Nonetheless, relatively little is known about the overall importance of EQL for SY. Therefore, this study explored the role of seismic activity in explaining spatial and temporal variation in sediment export for the Siret Basin (Romania), a catchment characterized by a very large variability in seismic activity.

Based on long-term (> 30 years) sediment export measurements for 38 subcatchments of the Siret, we found that spatial variation in annual SY, is mainly explained by the degree of seismic activity (R^2 = 0.74) and catchment lithology (R^2 = 0.67) of each catchment. The combination of these two factors accounted for ca. 80% of the observed variation in SY. Other factors (e.g. topography, land use, climate, runoff) did not significantly contribute to the explained variance.

To investigate the role of EQL in explaining this seismic control, we studied the temporal changes in sediment concentrations before and after the 7.4 Mw earthquake of 1977 for ten subcatchments of the Siret. Results showed a significant increase in sediment transport in the first years after the earthquake with median sediment concentrations at unit runoff discharge being up to 6 times larger in the year after the earthquake. However, these increases in sediment transport were only observed for rivers that were relatively far away from the epicenter (> 70 km). A possible explanation for this is that rivers close to the epicenter already had a very high sediment input from earlier EQL-events, resulting in no clear increase in sediment transport after the 1977 earthquake. Also available river cross-section data indicate patterns of aggradation close to the epicenter, suggesting that these rivers could not evacuate the increased sediment input.