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Linking landslide susceptibility to sediment yield in the Romanian Carpathians

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Recent studies revealed the importance of seismic activity in explaining regional patterns of catchment sediment yield (SY). This relation is often explained by the fact that seismic activity induces landslides that contribute to SY. Nevertheless, only a few studies focused on the effects of landslides on SY and even fewer studies have explored the potential of landslide susceptibility as a predictor for SY. The objective of this study is therefore to explore the potential of landslide susceptibility maps to explain the spatial variation of SY in the Romanian Carpathians, a region with moderate to high seismicity.

133 catchments, covering 63% of Romania, for which SY was measured during a period of at least 10 years and for which SY was not significantly affected by upstream reservoirs, were compiled and selected. 78 of these catchments were 'less disturbed', being covered for at least 50% by forest and semi-natural areas and confined to the Carpathian mountains. Landslide susceptibility in each catchment was assessed, using an earlier published state of the art landslide susceptibility map of Romania.

Mean landslide susceptibility for each catchment shows a highly significant correlation with SY (r^2 = 0.44). This indicates that landslides are an important contributor to SY in Romania and suggests that regional and national landslide susceptibility maps can indeed be a useful tool to predict SY. Nevertheless, the susceptibility map did not explain much more of the observed variance in SY than some other individual catchment characteristics such as seismicity (r^2 = 0.40) and lithology (r^2 = 0.33). Also taking into account the spatial patterns of landslide susceptibility within the catchment did not significantly improve the observed correlations. Surprisingly, topography showed a nonsignificant correlation with SY, which can be attributed to the overwhelming effect of seismicity and lithology. Overall, our results suggest that seismicity is indeed a highly relevant factor to determine patterns of average SY across the Romanian Carpathians, with landsliding as the main process to explain this.