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Synergies between geomorphic hazard and risk and sediment cascade research fields: exploiting geomorphic processes' susceptibility analyses to derive potential sediment sources in the Olteț river catchment, southern Romania

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Identifying sediment sources and sediment availability represents a major problem and one of the first concerns in the field of sediment cascade. This paper addresses the on-site effects associated with sediment transfer, investigating the degree to which studies pertaining to the field of geomorphic hazard and risk research could be exploited in sediment budget estimations. More precisely, the paper investigates whether results obtained in assessing susceptibility to various geomorphic processes (landslides, soil erosion, gully erosion) could be transferred to the study of sediment sources within a basin.
The study area is a medium-sized catchment (> 2400 km2) in southern Romania encompassing four different geomorphic units (mountains, hills, piedmont and plain). The region is highly affected by a wide range of geomorphic processes which supply sediments to the drainage network. The presence of a reservoir at the river outlet emphasizes the importance of estimating sediment budgets.
The susceptibility analyses are conducted separately for each type of the considered processes in a top-down framework, i.e. at two different scales, using scale–adapted methods and validation techniques in each case, as widely-recognized in the hazard and risk research literature. The analyses start at a regional scale, which has in view the entire catchment, using readily available data on conditioning factors. In a second step, the suceptibility analyses are carried out at a medium scale for selected hotspot-compartments of the catchment. In order to appraise the extent to which susceptibility results are relevant in interpreting sediment sources at catchment scale, scale-induced differences are analysed in the case of each process. Based on the amount of uncertainty revealed by each regional-scale analysis in comparison to the medium-scale ones, decisions are made on whether the first are acceptable to the aim of identifying potential sediment source areas or if they should be refined using more precise methods and input data. The three final basin-wide susceptibility maps are eventually coverted, on a threshold basis, to maps showing the potential areas of sediment production by landslides, soil erosion and gully erosion respectively. These are then combined into one single map of potential sediment sources.
The susceptibility assessments indicate that the basin compartments most prone to landslides and soil erosion correspond to the Subcarpathian hills, while the one most threatened by gully erosion corresponds to the piedmont relief. The final map of potential sediment sources shows that approximately 34% of the study catchment is occupied by areas potentially generating sediment through landslides and gully erosion, extending over most of the high piedmont and Subcarpathian hills.
The results prove that there is an important link between the two research fields, i.e. geomorphic hazard and risk and sediment cascade, by allowing the transfer of knowledge from geomorphic processes' susceptibility analyses to the estimation of potential sediment sources within catchments. The synergy between the two fields raises further challenges to be tackled in future (e.g. how to derive sediment transfer rates from quantitative hazard estimates).