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# Evaluation of alluvia generating hillslope processes relevant for fine sediment transfer in the Jiu River Basin, Romania

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When analysing sediment sources and transfer at the river basin scale, a key step is understanding the role of geomorphic processes in sediment delivery. The purpose of this paper is to analyze geomorphic processes functioning as fine sediment sources in a fluvial system with a high sediment dynamics. More precisely, this paper investigates the processes originating from the adjacent hillslopes and to what degree are they capable to explain the suspended sediment loads variability.

The study focuses on the Jiu river basin (the most important tributary of Danube river in south-western Romania) upstream Isalnita reservoir (180 ha and 1.4 mil.$m^3$), which is subject to intense silting. The Jiu River basin is well-known for its coal-bearing deposits (lignite and hardcoal), the exploitation of which greatly affected water turbidity and fine sediment quality. Across its 7748.3 sq.km, the study area overlaps a region with high rate of suspended sediment load (exceeding 10 t $ha^{-1}$ $yr^{-1}$), considered to be the second in Romania in terms of the amount of fine sediment transited, after the Curvature Subcarpathians. The multiannual suspended sediment load of the Jiu River reaches 165 kg•$s^{-1}$ downstream the Isalnita reservoir (at Podari gauging station).

To address the issue of fine sediment sources, a detailed mapping of geomorphic processes was conducted within a buffer of 1 km on each bank along the main rivers. To gain more insight into hillslopes' capacity to mobilize and supply rivers with sediments, a multitemporal approach (2005 – 2012) was adopted, using remotely sensed images. Landslides, rill and gully erosion were taken into account as sediment generating geomorphic processes, their further evaluation including mechanism classification, estimating dimensions, deriving movement rates and recurrence intervals. The relation between daily liquid discharge (Q) and suspended sediment loads (R) from the analyzed period served to establish a discharge threshold able to discriminate between hillslope and in-channel sediment sources. Additionally, the relation between sediment sources and delivery was validated by means of geochemical fingerprinting of coal content in fine sediments.

The geomorphic processes inventory led to identifying potential sediment sources in terms of slope deposits, including man-made ones. In this sense, priority was given to mapping and evaluating the degree of hillslope – riverbed coupling in the area of coal spoil heaps, which are very unstable and behave as a supplier of fine sediments for the rivers during storm events. The relative contribution of hillslope sources to suspended sediment transport was estimated to be above 80% during summer high waters and flood periods, while during low water intervals in winter, it can drop even below 20%. Established R-Q relation allowed for the prediction of the relative contribution of the hillslope domain in the suspended sediment yield for river sections where sediment measurements were not available. Uncertainties are discussed in terms of frequency-magnitude relations affecting sediment detachment and transport processes.

The findings on slope-processes providing fine sediment inputs are regarded as a preliminary research in understanding sediment connectivity, especially in relation to Jiu river basin's sediment dynamics strongly affected by coal mining.