



Relationships between mass movements and tectonic uplift in the upper Sinni River valley, Calabria-Lucania border, Southern Italy

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Relationships between drainage network and landslides distribution have been investigated by classical and quantitative geomorphological analysis in an intramontane valley (i.e. the upper valley of the Sinni River) of the southern Italian Apennines in order to assess the influence of fluvial erosion on mass movements processes. The 70 km²-wide test-area is mainly characterized by crystalline-metamorphic rocks affected by very low grade metamorphism and underwent high uplift rates during Quaternary times. We recognized and mapped 537 landslides through the stereoscopic interpretation of one set of about 20 panchromatic aerial photographs 1:33000 scale. Landslides were classified according to both type of movement and relative age. Relative age of landslides was determined according to morphologic appearance (freshness) of the slope failures and also using cross-cut geomorphological relationships. We recognized 3 classes of landslides called: (i) "very old" (possible first-failure landslides), showing to be mostly linked to a different climatic and geomorphological setting than the present one; (ii) "old", slope failures not so fresh but neither obliterated by fluvial erosion or by subsequent mass movements; these mass movements developed mostly in slopes already affected by large, deep seated and very old landslides; (iii) "recent", landslides occurred not so far with respect to the age of the aerial photographs (1991), or mapped through a field reconnaissance survey made in March-April 2009. Generally, these landslides are shallow and triggered by intense and prolonged rainfall. We detected and mapped 37 new landslides after a long rainfall period during the winter 2008-2009. In order to evaluate the role of the fluvial processes on landslides distribution, a quantitative geomorphological analysis of the drainage network has been performed. In particular, the degree of planimetric organization of the fluvial network has been evaluated by the analysis of several morphometric indices, which assume high values in area strongly perturbed by tectonics and/or mass wasting processes. We argued that the medium-high hierarchical anomaly density values can be mostly due to the presence of landslides disturbing the regular development of the fluvial network. Moreover, denudation rates related to recent/active geomorphological system have been obtained by estimating the amount of suspended sediment yield of channels on the grounds of empirical relationships based on the hierarchic arrangement of the fluvial network. In the study area, denudation rates are settled on value of about 0,2 mm/y, whereas the Quaternary uplift rates are between 0.93 – 1.57 mm/y. We argue that the high uplift rate of recent times is a disturbing element within the recent morphogenesis. On the basis of the discussed data, large mass movements in the study area are mainly triggered by Quaternary tectonics, with litho-structural and morpho-climatic factors that assumed a minor role.