



Analysis of heavy-rainfall-induced fast soil erosion: examples the NE Abruzzo clayey hills (Central Italy)

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Soil erosion induced by heavy rainfall deeply affects landscape changes and human activities. It depends on rainfall distribution (e.g., intensity, duration, cumulative) and is controlled by the interaction among several factors including lithology, orography, hydrography, land-use, and vegetation. The Abruzzo piedmont-coastal area features a clayey hilly landscape that is historically affected by heavy rainfalls. In the last decades, it was affected by several heavy rainfall events in close sequence. In this work, we investigated some ~1-day heavy rainfall (>35 mm/h and 100-220 mm/d) events occurred in 2007, 2011, and 2012 that affected the clayey hilly-coastal NE Abruzzo area. We analyzed cumulative rainfall, intensity and duration, mapping triggered geomorphological effects (soil erosion and accumulation) and evaluating average erosion.

The analysis provides contributions to the soil erosion assessment on clayey landscapes that characterizes the Adriatic hilly area, to the estimation of rainfall triggering thresholds for heavy soil erosion, and to a comparison of erosion in single events with rates known in the Mediterranean area. Comparing the different areas and cases investigated, the triggering threshold for heavy soil erosion shows an expected value ~100–110 mm. The estimated average soil erosion is from moderate to high (0.08–3.08 cm in ~1-day heavy rainfall events). The investigated relationships show a good correlation of soil erosion with cumulative rainfall, which results to be the most effective triggering factor, and a poor correlation with peak rainfall intensity. Finally, this work outlines the strong impact of soil erosion on the landscape changes in clayey hilly landscapes largely present in Mediterranean environments, such as in the Abruzzo and Adriatic hilly areas.