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Hydrological and erosional response of a small catchment in Sicily

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More than 1/5 of the Italian territory is at risk of desertification involving over 40% of the South. Climate change is expected to worsen the desertification trend already observed. In Sicily, for instance, the semi-arid territory extension had been gradually increasing in the period from 1931 to 2000 up to 20% of the regional territory. Parallel to this, territories classified as humid decreased by 30%. A better knowledge of soil erosion by water is essential for planning effective soil and water conservation practices in semi-arid environment, where accurate soil loss predictions are difficult particularly in the absence of minimal data. In order to give a contribute to the understanding of hydrological and erosional dynamics in Mediterranean areas, a monitoring program of a small catchment started in 1996. The Cannata catchment (1.30 km2) is a mountainous tributary, ephemeral in flow, of the Flascio River located in eastern Sicily. Climate is Mediterranean semi-arid with a mean annual precipitation (1996–2005), measured in three different sites, equal to 715 $\pm$ 163 mm mainly falling between October and January. Mean monthly temperature is between 3°C (January) and 24°C (August). Land use monitoring highlighted the prevalence of pasture areas (ranging between 87% and 92% of the catchment area during the monitoring period). In the Cannata catchment the elevation ranges between 903 m and 1270 m above mean sea level with an average land slope of 21%. Water discharge has been measured continuously for about 10 years at the outlet of the catchment by means of a hydrometrograph station connected to a runoff water automatic sampler for the measurement of sediment concentration in the flow.

Precipitation has a typically Mediterranean seasonal pattern, being minimal in summer and maximal in winter. Monthly runoff follows the pattern of precipitation although somewhat delayed during autumn due to the effect of water deficit in summer.

The analysis of the 170 runoff events recorded shows that rainfall depth was the only significant driver of the response (r2=0.77), whereas rainfall intensity, usually assumed of main importance in Mediterranean semiarid areas, was not significant. Rainfall depths were also the only drivers of peak discharges during the events (r2=0.57); considering just the autumn events, when vegetation cover is lower than in winter and in spring, rainfall intensity was also a significant but fair driver of peak discharge (r2=0.36). Suspended sediment response (observed for 47 events during the observation period) was very linked to the runoff response. Rainfall, runoff and peak discharge of the events were good predictors of total suspended sediment load (r2=0.84, 0.85 and 0.84 respectively); I30 and I5 were just fair drivers of sediment yields (r2=0.40 and 0.28 respectively) independently of seasons.