



Analysis of the runoff and soil loss temporal variability in a small experimental olive orchard catchment in Southern Spain

Encarnación V. Taguas (1), Rafael Pérez (1), Jose Luis Ayuso (1), and Jose A. Gómez (2)

(1) University of Córdoba, Agronomist and Forest Engineering School, Rural Engineering, Cordoba, Spain (evtaguas@uco.es, rperez@uco.es, ir1aymuj@uco.es), (2) Sustainable Agricultura Institute, CSIC, Alameda del Obispo, Córdoba, Spain (joseagomez@ias.csic.es)

Although studies that examine a range of hydrological erosive processes on different scales are essential to evaluate the suitability of specific soil use and management, most studies on runoff and soil loss from olive orchards are concentrated on the plot scale. Soil erosion and runoff over five hydrological years (2005-2010) were monitored in an olive orchard microcatchment of 6.1 ha under non-tillage with a grass spontaneous cover in order to evaluate their temporal variability (event, seasonal and annual scale) as well as the impact of the management.

Statistical analysis (histograms, statistics and Principal Components Analysis) were applied to interpret the rainfall-runoff-sediment load patterns in the catchments for a period characterized for the high variability of the annual rainfall (from 325 to 621 mm).

At event scale, although the runoff was better-correlated with the rainfall depth than the maximum intensity of 30 minutes (I30), high correlations of I30-peak flow and sediment load-peak flow were found, illustrating the importance of Hortonian flow in the hydrological and erosive balance. The seasonal distribution of the events was independent on the accumulated precipitation and showed a marked bimodal behaviour. The events occurred for the spring summer period were mainly characterized by low intensities as well as low values of runoff, peak flow and sediment load while the highest storms were concentrated for the period of autumn-winter. In addition to the impact of rainfall, the soil protection provided by the grass spontaneous cover and the high temperatures for the spring-summer seasons can also explain the response seasonal differences of the catchment. The contribution of the most year erosive event to the annual soil losses varied from 46% until 94% of the total sediment load. Finally, the annual values of runoff coefficient and the sediment load showed a substantial variability, with values between 2.0 and 12.3 % and between 0.6 to 5.9 Mg.ha⁻¹.year⁻¹, respectively.

Despite of the fact of the annual soil losses for the wet periods are not very high, they resulted in the formation of new gullies. According to our results, the efforts for the soil protection must be concentrated for the autumn and winter seasons when the maximum events occur.