



Precipitation Extremes and their Influence on Soil and Nutrient mobilization by Runoff in Vineyards of NE Spain

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This study analyses the characteristics of precipitation extremes in a Mediterranean vineyard region where an increasing trend of concentration of precipitation in a small number of events has been observed during the last few years. The number of exceptional events (very wet days, $P > 95\%$ percentile) and extreme events (extremely wet days) ($P > 99\%$ percentile), as well as their strength and erosive character, are analysed for the precipitation recorded from 2000 to 2004. The erosive character was evaluated according to the kinetic energy and the maximum intensity in 30-minute periods. Soil and nutrient concentration in runoff caused by these events were evaluated in a vineyard plot representative of the size and characteristics of the study area, which suffered levelling operations before vineyard establishment. Runoff samples were collected in 12 points distributed within the plot. The results show a clear increase in the number of very wet days and extreme events ($P > 95\text{th}$ percentile). The precipitation recorded in these events represented up to 88% of annual rainfall. The strength of the extreme events (precipitation event $-P > 99\text{th}$ percentile) reached values higher than 50 mm almost every year. These values were far exceeded in 2000, when only one extraordinary event recorded 50% of annual rainfall, with a strength of 189 mm, about 80% of total rainfall being lost as runoff. A significant contribution to annual erosivity was made not only by the extreme events, but also by short events of less depth but high intensity. Soil concentration in runoff reached values up to 24 mg L^{-1} , and nitrogen and

phosphorus concentrations in runoff of about 7.4 and 8.5 mg L⁻¹ respectively were recorded. From the observed results we can conclude that most soil and nutrient losses occurred in a small number of events: one or two events every year were responsible for more than 75% of the annual soil and nutrient losses on average.

Soil losses are much higher than the soil loss tolerance. During the study period soil losses of up to 25 Mg ha⁻¹ were estimated in the highest erosive year. Annual losses represented between 3.9% and 7.1% of the annual N intakes and between 16.9% and 33.81% of the annual P intakes, which involves economic losses. In these conditions, if the extreme and exceptional events increase, the sustainability of the vineyards may be seriously affected.