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Annual precipitation extremes and their impact on erosion processes in rainfed vineyards of North Eastern Spain

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The objective of this research is to analyse annual precipitation extremes and their impact on soil and nutrient losses by erosion in a Mediterranean vineyard region. The number of exceptional events (P> 95th percentile) and annual extreme events (P> 99th percentile), as well as their strength, erosive character and return period are analysed in detail for 2000-2004, and compared with the values recorded during the last 50 years. The erosive character was evaluated according to the R-factor (kinetic energy x maximum intensity in 30-minute periods). Soil and nutrient losses caused by these events were evaluated by combining field sampling and estimations of runoff in a vineyard plot. The results show a clear increase in the number of very wet days and extreme events (P>95th percentile), which represented up to 88% of annual rainfall. The severity of the extreme events (TS = event precipitation - P>99th 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 the annual rainfall, with a TS= 189mm, in which about 80% of total rainfall was lost as runoff. The events with a return period higher than two years were the responsible of the higher erosion rates, which are increasing their frequency during the last years. 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. A part from an exceptional event recorded in 2000, which produce more than 200 Mg/ha soil losses, annual soil losses up to 25 Mg/ha were recorded, which are much higher than the soil loss tolerance.