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Trends in daily rainfall erosivity in relation with NAO, MO and WeMO during 1955–2006 for the Ebro basin, NE Spain

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Rainfall erosivity regards the rainfall energy and intensity linking together atmospheric dynamics and rainfall properties with soil erosion. The impact of raindrops on the surface—rainsplash—represents an important mechanism of detachment of soil particles. Despite its importance as a fundamental erosion process very few studies have addressed the climatology of rainfall erosivity. It is a known fact that in the long term (e.g., cumulative annual values) rainfall erosivity is determined by a few heavy events. This study analyses trends in interannual variability of daily rainfall erosivity in NE Spain during the period 1955–2006, and its connection with atmospheric circulation patterns influencing rainfall in the region, namely the North Atlantic Oscillation (NAO), the Mediterranean Oscillation (MO) and the Western Mediterranean Oscillation (WeMO). A decreasing trend in annual and seasonal rainfall erosivity is generally found. We also find that the erosive power of rainfall is stronger during negative phases of the three atmospheric circulation indices, and weaker during positive conditions. Daily rainfall erosivity series were adjusted to a Generalized Pareto probability distribution for positive and negative days of the atmospheric circulation indices, for assessing their effects on rainfall erosivity extreme events. Results showed higher values expected for a given return period in most of the area under negative conditions of all indices, especially at the Mediterranean coast. Overall, WeMO showed the highest influence on daily rainfall erosivity extremes. An increasing trend in rainfall erosivity values was found in areas most closely related with MO and WeMO dynamics.