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Extreme rainfall indexes at Ebro River Basin

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Extreme rainfall events are a serious concern for regional hydrology and agriculture in the Ebro River Basin. Repeated anomalous rainfall in recent decades has had a devastating impact on this region, both socially and economically. Some studies developed in Italy and USA have shown that there is a change in seasonal patterns and an increasing frequency of extreme rainfall events, whereas other studies have pointed out that no global behaviour could be observed in monthly trends due to high climatic variability. The aim of this work is to test which of these scenarios is the case for the Ebro River Basin.

For this purpose, 14 meteorological stations were selected based on the length of the rainfall series and the climatic classification to obtain a representative untreated dataset from the river basin. Daily rainfall series from 1957 to 2002 were obtained from each meteorological station. First, classical climatic indexes were analysed with an autoregressive test to study possible trends in rainfall. The results can be explained following the evolution of the NAO and WeMO indexes, which indicate that the initial period should be subdivided in two periods (1957–1979 and 1980–2002) to assume stationarity and to analyse the rainfall distribution functions.

The general results obtained in this study for both subperiods, through the generalised Pareto distribution (GPD) parameters and the maximum expected return values, do not support the results previously obtained by other authors that affirm a positive trend in extreme rainfall indexes and point to a slight reduction indicated by others. Three extreme precipitation indexes show negative statistical significant trends. GPD-scale parameters decrease except for only one rain gauge, although this decrease is only statistically significant for two rain gauges. Another two locations show statistical significance decreased for maximum expected return values.