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Trends in low flows in Spain in the period 1949 –2009

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Abstract:

Several studies have been conducted in the last years with the aim of detecting, measuring and evaluating streamflow trends, at either national or trans-national scales. These trends are usually detected applying the Mann-Kendall test, considering various flow indicator series, depending on the flow regime analysed. This study is focused in analysing trends in low flows in Spain in the period 1949-2009, based on daily flow data collected at 60 gauging stations located in near-natural catchments Two low-flow indicators are considered: i) the seven-day annual minimum streamflow and ii) the 10th percentile of the yearly flow duration curve. Catchments are clustered into three regions (Atlantic, Mediterranean and the Pyrenees) in terms of monthly mean flows. The Mann-Kendall test is applied considering four periods between 1949 and 2009. A multi-temporal trend analysis is also applied to the longest series to identify wet and dry periods that could influence the results of the Mann-Kendall test. In addition, a field significance test provides a regional assessment of the at-site detected trends at each region. The results for both indicators reveal a clearly decreasing trend in low flows throughout the northern half of Spain that is found to be field-significant over the Atlantic and Mediterranean regions. A wet period at the beginning of the series and a dry cycle at the end of the series are identified by the multi-temporal trend analysis. Consequently, the generalised detected decreasing trend could be explained by this finding.