



## Seasonal trends in extreme daily precipitation indices in Northern of Portugal

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Extreme climate events represent a major source of risk for human societies, motivating the current need for more research on these events. Currently, long-term past changes on precipitation are not well understood, although it is generally accepted that they are complex and vary regionally (López-Moreno et al. 2010). Therefore, this study is focused on the spatial and temporal variability of selected extreme daily precipitation indices in the Northern Portugal region.

The mean annual precipitation in the study region ranges between 500 mm at the Douro river valley and 3000 mm at Peneda-Gerês mountain system, exhibiting strong spatial contrasts on its average annual rainfall. Data from 39 precipitation gauge stations with daily precipitation series in the period 1950-2000 were collected accessing the website of SNIRH (National Information System for Water Resources) of the Water Institute (INAG, Portugal). Tests of homogeneity (e.g. Van Neumann ratio test, standard normal homogeneity test (SNHT), Buishand and Pettit) were performed for all the data collected from the gauge stations, in order to identify and select the useful rain-gauges to time variability analysis. After these procedures, four daily indices of precipitation extremes were computed: the maximum 5-day precipitation amount (Rx5day); number of days with precipitation amount  $\geq 30$  mm (R30mm); very wet days, with  $RR > 95$ th percentile (R95p); and total precipitation in wet days ( $RR > 1$  mm) (PRCPTOT). The indices were calculated seasonally as follows: December to February (DJF), March to May (MAM), June to August (JJA) and September to November (SON). The seasonal trends for these indices are analyzed using the nonparametric Mann-Kendall (M-K) test and the statistic of this Theil-Sen test (B), in order to estimate the magnitude of the trends (Haylock, 2000, Rodrigo, F. et al, 2007, Costa, 2009, Gallego, 2011).

The results show, that between 1950 and 2000, there was a small decreasing trend of the Rx5day, R30 mm, R95p and PRCPTOT in almost all series, but not all are statistically significant. The main results indicate a decreasing trend, statistically significant, in two series, in all indices, in winter and in six series for R30 mm and R95p indices and in five series in PRCPTOT and Rx5day indices, in spring. In autumn, there is an increasing trend, statistically significant, in one series in the R30mm index. In summer, one series presents a decreasing trend, statistically significant, in R30mm index.

### References

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