Daily precipitation and temperature extremes across the Iberian Peninsula, 1960–2011

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The study of weather extremes is critical because of the great impact of extremely high or low temperatures and extremely dry or wet conditions on the environment, economy and society. Identification of areas at greater risk for extreme conditions, and of meteorological situations that give rise to such conditions, enhances understanding of climate risks and helps establish measures to reduce adverse impacts.

In this paper, we analyzed the occurrence of very wet conditions and high/low temperature events in Spain between 1960 and 2011. Thresholds for determining severity of the events were defined using the 90th, 95th and 99th percentiles. First, we identified regions of extreme weather risk, and analyzed trends of extreme events in each weather observatory using the Mann-Kendall test.

To better understand atmospheric processes associated with extreme weather events in each weather observatory, we analyzed synoptic-scale fields of events that exceeded the 99th percentile. By applying non-hierarchical K-means clustering, we defined large-scale atmospheric patterns under which extreme conditions of temperature and precipitation were produced on the Iberian Peninsula.

The results show a clear ability to identify regions exposed to extreme weather hazards, which can assist decision-making toward minimizing vulnerability of those regions. In addition, correct identification of synoptic patterns associated with each type of weather extreme will help predict such events, thereby providing useful information for decision-making and warning systems.