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Statistical patterns of hot and cold events in NE Spain, years 1950-2004

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Spatial patterns and statistical models for hot and cold events affecting Catalonia (NE Spain) are obtained from the analysis of a set of daily extreme temperatures recorded at 65 for the period 1950-2004. The study is based on the Crossing Theory, thus assuming that daily temperatures are normal distributed and previous data treatment (removal of trends and periodicities) assure their stationary character. With the aim of facilitate comparisons among different records, hot and cold events are defined as departures, given in standard deviations, of daily temperatures from daily averages. From the statistical viewpoint, the initial date of the events fits a normal distribution. The event magnitudes, defined as the absolute value of their maximum departures, follow an exponential distribution and the event lengths can be modelled by a Markovian process with a Gaussian noise component. The number of events per year fits a Poisson distribution only for relatively high departures. Thus, strictly speaking, hot and cold events are defined as episodes accomplishing the Poisson model. The number of hot and cold events decays exponentially with the increasing departure for the whole thermometric network. The spatial features observed for the number of events, initial date, magnitude and length depict quite complex spatial patterns due to the orography and the vicinity to the Mediterranean Sea. Additionally, a simple assignment of hot events to summer and cold events to winter must be discarded according to the empirical averaged initial dates and their standard deviations, and the percentage of events detected in the four seasons. Finally, an extreme hot event (the 2003 summer heatwave) and an extreme cold event (a north-eastern outbreak in February 1956) are

shown as relevant examples.