



The evolution of temperature extreme events over Portugal; reporting on recent heatwaves

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In order to study changes in temperature extremes in Portugal, daily maximum and minimum temperatures from 18 climatological weather stations covering the country were analysed for the period comprised between 1941 and 2006. Here we have used indices corresponding to the 90th and 10th percentile for both maximum and minimum temperatures. Furthermore we have computed a heatwave and cold spell duration indices with results being aggregated on an annual and seasonal basis. Trends were computed for the entire period (1941-2006) as well as for two consecutive 31-yr periods (1945-1975 and 1976-2006). The most striking results are related with the last period that reveal a significant increase of heat extreme events for both spring and summer seasons, and a decrease of cold extremes in winter.

The last few years have been characterised by an abnormal high number of heatwave episodes in Portugal. One of the most intense heat events in Portugal (and most western European countries) occurred in the summer of 2003 and was characterised by extremely high temperature values, notability during the first two weeks of August. This outstanding event had major socio-economic impacts in continental Portugal, namely on excessive mortality (about 2.000 extra deaths) and wildfire activity (roughly 450.000 ha). Despite the uniqueness of 2003 event we show that, since then, the following three summers had also heatwave record breaking characteristics. Southern Portugal province (Algarve) was hit by an intense heatwave (albeit short lived) in July 2004, with an all time new national record for minimum temperature (32.0°C). The number of extreme hot days (above the 90th percentile) during summer 2005 reached

record breaking length for several stations located in the interior of Portugal. Finally, the summer of 2006 was characterised by the largest number of heatwaves that took place in a single summer season, with 5 distinct events occurring between May and September.

Here we use NCEP/NCAR reanalyses data to characterize the extent of these different heatwaves that occurred in the last 4 years. The daily evolution of maximum and minimum anomalous temperature values are explained based on the corresponding anomalies of dynamic fields such as the SLP, 500 hPa geopotential height and near surface winds.