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Heat waves in Argentina: how unusual was the 2008 heat wave in Buenos Aires?

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We examine temporal variability of heat waves over Argentina, and estimate recurrence probability of the most severe heat wave in Buenos Aires that occurred in November 2008. The number of days in heat waves per decade was analysed, considering spells of days with maximum temperature above the 90th percentile (MaxTHW), minimum temperature above the 90th percentile (MinTHW), and both maximum and minimum temperatures above the corresponding 90th percentiles (EHW) for the October-March period. Decadal values in Buenos Aires experienced increases in all definitions of heat waves, but at other stations, combinations of different trends or decadal variability resulted in some cases in a decrease of extreme heat waves, as shown in Córdoba (central Argentina) and Las Lomitas (northern Argentina). In the northwestern part of the country, La Quiaca and Tinogasta showed a strong change in the last decade, mainly due to the increment in the persistence of extreme MinTHW but also accompanied by increases in MaxTHW. In general, other stations showed a clear positive trend in MinTHW and decadal variability in MaxTHW, with the largest EHW cases in the last decade.
Using simulations with a stochastic first-order autoregressive model (AR1), which reproduces the structure of time series of daily maximum temperatures, we estimated recurrence probability of the longest and most severe heat wave in Buenos Aires (over 1909-2010, according to intensity measured by cumulative excess of daily maximum temperatures above the 90th percentile) that occurred from 3 to 14 November 2008. The results showed that the recurrence probability of such long and severe heat wave is small in the present climate but increases substantially even under a moderate warming trend. The return period of such heat wave is estimated to be in the order of several hundreds years in the present climate while in a climate warmer by 1 °C, the return period declines by an order of magnitude, and in a climate warmer by 4 °C, such heat waves are likely to occur regularly (once every 1-2 years).