

## **Long-term variability of heat waves in Argentina and recurrence probability of the severe 2008 heat wave in Buenos Aires**

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Heat waves are one of the main concerns related to the impacts of climate change because their frequency and severity are projected to increase in a future climate. The objective of this work is to study the long-term variability in the occurrence of heat waves over Argentina, and to estimate recurrence probability of the most severe heat wave in Buenos Aires (observed in 2008). The number of days in heat waves per decade is analysed, considering spells of days with maximum temperature above the 90<sup>th</sup> percentile (MaxTHW), minimum temperature above the 90<sup>th</sup> percentile (MinTHW), and both maximum and minimum temperatures above the corresponding 90<sup>th</sup> 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 result 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 show 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 show a clear positive trend in MinTHW and decadal variability in MaxTHW, with the largest EHW cases in the last decade. We also estimate recurrence probability of the longest and most severe heat wave in Buenos Aires (over 1909-2010, according to intensity measured by cumulative excess of maximum daily temperatures above the 90<sup>th</sup> percentile) that occurred from 3 to 14 November 2008. We use simulations with a stochastic first-order autoregressive model that reproduces structure of the time series of daily maximum temperatures. The results shown that the recurrence probability of such long and severe heat wave is small in the present climate but it is likely to increase substantially in the near future even under a moderate warming trend.