

CHARACTERISTICS OF SUMMER MAXIMUM TEMPERATURE IN MENDOZA, ARGENTINA DURING THE LAST TWO DECADES

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ABSTRACT

The general goal of this work is to analyze the characteristics of summer maximum temperatures in Mendoza Aero (SAME) located at 32.50°S 68.47°W during the last two decades to obtain any signal of warming in the global climatic change scenario.

The particular aim is to study the prevailing meteorological conditions during the occurrence of three Extreme Maximum Temperature Episodes (EMTE) from synoptic, thermodynamic and dynamic point of view to establish differences and similitude between them.

Over western Argentina there are three Heat Wave Episodes (HWE) with an important recurrence period: one observed at the end of December, known as “Christmas Heat Wave” (CHW), other during the second fortnight of January, generally after the 20th, and the third on February first fortnight

A HWE is defined when the minimum temperature (mt) is greater than the Average of the Higher monthly minimum temperature (AHmmt), and when the Maximum Temperature (MT) is greater than the Average of the Higher monthly Maximum Temperature (AHmMT). This definition is valid for the central west of Argentina and must occur at least during two days.

During the CHW 2000, the MT reached 40.1°C at 18:15 local time (21:15 UTC) on December 25th, (EMTE-D). On February 9th 2001 the MT reached 39,6°C (EMTE-F) at 17:30 local time (20:30 UTC) was registered. The highest MT (44,4°C) in SAME since records exist was registered on January 30th 2003 at 17:15 local time (20:15 UTC) (EMTE-J).

Surface data were obtained from Servicio Meteorológico Nacional (SMN) Argentina and Dirección Meteorológica de Chile (DMC); the aerologic data reconstructed from NOAA Air Resources Laboratory Real Time Environmental Applications and Display System (ARL). The re-analysis from the National Center for Environmental Prediction and the National Center for Atmospheric Research (NCEP/NCAR).

The Skew-T of SAME and Quinteros (Chile), and several surface data for each EMTE episodes, were used for the initialization of the Mendoza Argentina Convection Statistical Model (MASCm) (Simonelli, 2000) to obtain the probability of convection occurrence. This model was used to see the competition between the descending air (subsidence) and ascending air (convection).

The synoptic condition of this EMTE showed a baric configuration very similar to the mean baric field of Zonda wind days

The Zonda is a warm, dry wind on the leeside of a mountain range (Andes Cordillera in this case) the warmth and dryness of the air being due to adiabatic compression upon descending the mountain slopes

In all analyzed episodes at the 925 hPa level the baric configuration is very similar to Zonda wind conditions.

At the SAME latitude the height pattern at 600 hPa level showed a downward trough during EMTE-D and EMTE-F, and the presence of a height wedge with a cut off high in EMTE-J

The specific humidity (q) analysis always showed a minimum value over the area and during EMTE-F there was a strong increment to the east of SAME.

In all EMTE analyzed zonda wind episodes of different intensity were present.

Another common element is the presence of a cold front. In all cases the extreme maximum temperature was registered some hours before the cold front arrived to SAME.

The EMTE occurrence is not a Hest Wave synonymous.

For example EMTE-D was associated to a Zonda wind event on the surface like in winter, characterized by a cold front approaching and a deep trough associated over the Pacific Ocean close to the continent, but in this episode the MT is above the critical value only on December 24th and December 25th; and the mt is under AHmmt so this EMTE does not satisfied the HWE definition.

The MASCM output for each EMTE showed the inhibition of convection because of Zonda wind effect before the occurrence of the MT.

For the analysis of 1986/2005 December Extreme Temperature records, there is no clear tendency for mt and the tendency is roughly ascendant for MT which is higher than 40°C in five episodes.

For January, in the same period, mt shows roughly positive tendency and is not clear for MT.

Finally, for February in the same period, mt is without clear tendency and MT shows descendent tendency.

To improve EMTE'S prediction in the growing global warming scenario it would be necessary to adjust regional mesoscale models and use satellite imagery.