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HEAT WAVES IN NORTHERN MEXICO

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1. INTRODUCTION

The climate of Northern Mexico (North of about the tropic of Cancer) is arid/semiarid (BW and BS). Extremes of temperature are characteristic of this environment. During summer heat waves are not uncommon. Since the 1990's the population has markedly increased in the urban areas located in the border region (from 16.7 million in 1990 to 18.3 million in year 2000; CONAPO, 2001) containing big cities (3) with a little over one million and a large conurbation (Monterrey) with around 3 million inhabitants.
The impact of heat waves on the population of these cities is enhanced by the heat island effect, and being most severe on the elderly and the very young. Another high risk group are the seasonal workers. Every summer unacclimated migrants from central Mexico suffer the rigors of sunstroke when walking unprotected through the US/Mexico border, some of them dying from dehydration and heat exhaustion. The urban poor which constitute a large proportion in those cities and particularly vulnerable to the impact of heat waves. Only a limited number of the population have some access to air conditioning. Since morbidity mortality statistics are scarce and often not easily available impacts of heat waves on the population are difficult to assess.

2. THE DATA

Series of temperature and relative humidity records for 8 cities were available for period 1961-85. Also normals for period 1950-80 were used.

3. METHOD

A heat wave is defined by WMO as a spell of 3 or more days each of which exceeds 32°C or more. This condition occurs quite frequently in the study area. Estimation of the frequency, intensity, duration an trend of heat waves was made using the long-term series of maximum temperature. Evaluation of the impact of heat waves was made by applying the concept of an apparent temperature, e.g. the heat index which involves the combined effect of high temperature and humidity proposed by NOAA (http://weather.noaa.gov/weather/hwave.html). Trend analysis is applied to long-term temperature series.

4. RESULTS

As Figure 1 illustrates, maximum temperatures above 30 to 35 °C prevail in the study area during July the highest values being observed in the northwest (on the Colorado river delta) when on occasions extreme temperatures may reach as high as 55 °C. An example of a heat wave is shown in Figure 2 for the city of Hermosillo for July 1987. On this occasion the event lasted about 15 days (temperature 40-45 °C) peaking with temperatures above 45°C July 13) with a second surge again July 19-25 (Fig. 2ª). The air during these events is however markedly dry with relative humidity of 20-30% (Fig. 2b) thus contributing to mitigate the heat load impact by cooling from sweating. The prevailing hygrothermal conditions during heat waves range from 32°C (90°F) at the initial stages to 61°C (142 °F) expressed by the heat index (or apparent temperature) during the climax of the event (Fig. 2c).
Heat waves have a frequency of one to two events per month normally peaking in July. In some cities the number of days per month with high temperatures (>37°C) shows a positive trend.

CONCLUDING REMARKS

The climate of northern Mexico is characterized by extremes of temperature. In this paper, heat waves are analyzed for several cities in the border region of Mexico with the U.S. Since the study area is located in an arid/semiarid environment, humidity of the hot air during a heat wave is low helping the cooling of the body by sweat evaporation. Every summer heat waves occur in the northern cities at a rate of one to two per month with a duration of several days or even weeks.
In some border cities the number of days with temperatures above 37°C has increased. This could be attributed in part to increased urbanization and also to global warming. Since

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in a warmer world heat waves are expected to become more frequent and severe (IPCC, 2001) it is likely that larger numbers of people in northern Mexico will suffer the adverse impact from these phenomena.

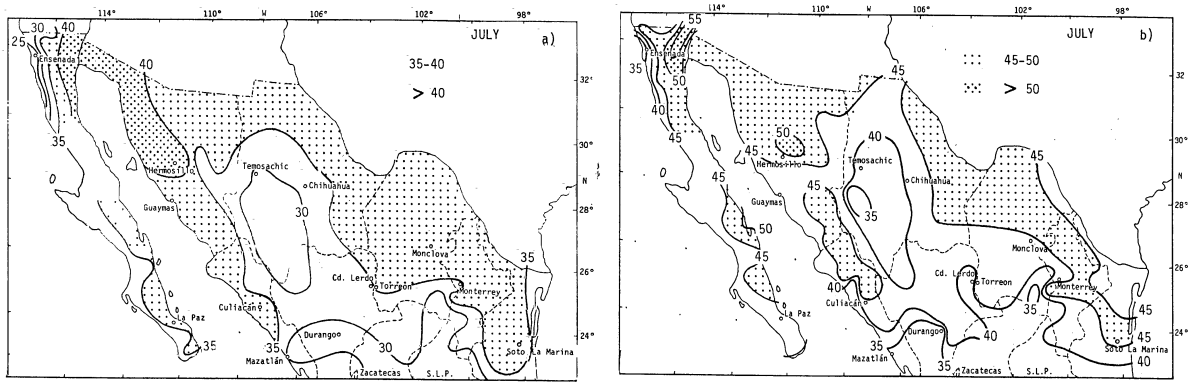
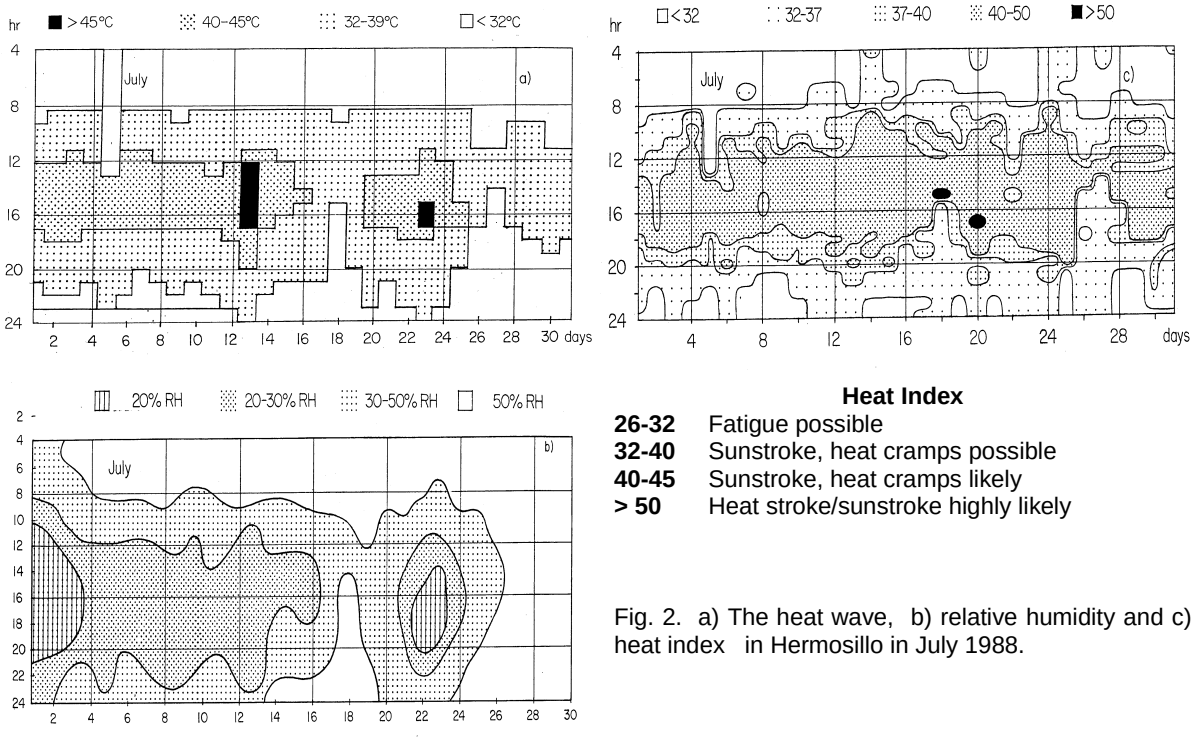


Fig. 1. Mean a) and extreme b) maximum temperatures in July in Northern Mexico. Period 1950-80



Heat Index

26-32	Fatigue possible
32-40	Sunstroke, heat cramps possible
40-45	Sunstroke, heat cramps likely
> 50	Heat stroke/sunstroke highly likely

Fig. 2. a) The heat wave, b) relative humidity and c) heat index in Hermosillo in July 1988.

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