Field survey of weather stations in southern Baja California, Mexico

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1. Introduction

According to the *Comisión Nacional del Agua* of Mexico (*CNA* 2001; technical report 67-02) , a weather station is a set of outdoor instruments that allow measurement of atmospheric parameters in a given environment. These instruments meet the recommendations of the World Meteorological Organization.

There are more than 3,500 stations throughout Mexico, which provide official climate reports to *Servicio Meteorológico Nacional* (*SMN*). In general, these sites cover a 4x4 m area and are located in open terrain. Factors considered for installing a station include: a) lack of significant obstacles, b) close location of an observer, and c) easy access for maintenance and repairs.

Instruments inside a station include: 1) a Six-type thermometer (covered by a wood shelter) for recording daily maximum and minimum temperatures, 2) a galvanized rain gauge for measuring precipitation, 3) a metal evaporimeter, and 4) a wind vane with a swinging-plate anemometer. Figure 1 shows a typical placement of the equipment, plus other instruments that may be available for recording weather data.

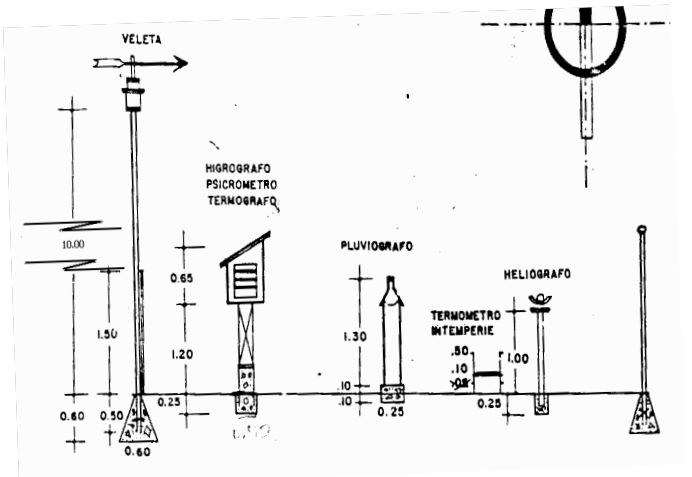

Figure 1. Schematic diagram showing placement of instruments inside a weather station. Source: *Servicio Meteorológico Nacional*, "Meteorological instrumentation and observation methods" (in Spanish).

2. Study area

Geographically, the Baja California Peninsula is an extension of the Sonora Desert (~23º to 33º N).

Figure 2 shows the southern half of the peninsula (state of Baja California Sur) and adjacent areas of the Gulf of California and mainland Mexico. The state is about 730 km long (NW-SE), varies in width from 45 to 200 km, and has a coastline of over 2000 km.

Among the salient topographic features of the peninsula are the southern (23.0-24.0°N) and central (24.8-27.6°N) mountains, with maximum elevations above 600 and 900 m, respectively.

During the summer, a well-defined concentration of rainfall (>400 mm) occurs in the southern range and decreases to the north and west. Sources of rainfall are tropical cyclones from the Pacific Ocean and circulations associated with the North American Monsoon System.

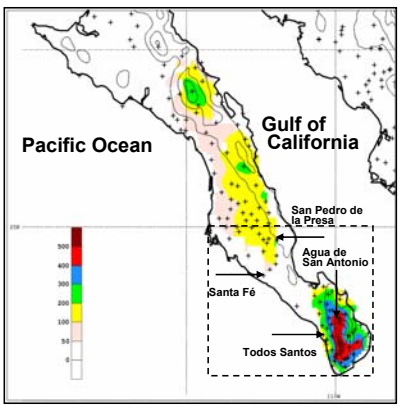

Figure 2. Average precipitation (filled contours, mm) from July to September, 1991-2004. Terrain elevations (solid lines) are 300, 600, and 900 m. Plus signs (+) represent rain-gauge sites that are part of the CNA network.

3. Objectives

This project documents the regional network within the southern part of the state of Baja California Sur (dashed box in Figure 2). From June through September 2006, a survey of the weather stations is being undertaken. Specific objectives are to:

1) Determine the current status of the equipment at the weather stations,
2) Meet the observers and learn their measuring techniques,
3) Compare the position of the weather stations with the official database,
4) Document the characteristics of the terrain around the weather stations, and
5) Select potential locations to install state-of-the-art stations in the near future.

4. Methodology and preliminary results

During this summer, I am visiting several weather stations from the network managed by *CNA* in southern Baja California Sur (≤25ºN).

Each week, one trip is taken in a 4x4 pickup truck to a particular locality. Information is collected using a digital camera, a GPS unit (model Geko 101 manufactured by Garmin) and a pocket altimeter (by Barigo). Additionally, I carry information on station names, positions, and observers which was supplied by the *CNA* office in La Paz.

So far, I have visited 40 stations and driven over 2,844 km for more than 65 hours. Figure 3 shows a sample of 4 stations in areas with different accumulations of (average) summer rainfall.

The following list contains significant facts learnt, to date, from these trips:

1) Most stations are located in rural areas that are difficult to find without a good map or directions from someone who has been there before.
2) All stations have a thermometer, a rain gauge and a wind vane with anemometer, but only a few evaporimeters have been installed.
3) Most stations are located on the observers' property; in few cases, stations are located on public land.
4) A few stations have a radio-frequency systems to transmit the information on a daily basis; in contrasts, most stations return the data to *CNA* every 6 months.
5) For most stations, the difference between the GPS position and the location in the *CNA* database is less than 2 km. However, in a few cases, I identified departures between 2 and 3 km. Differences in elevation are in the range 0-75 m.
6) Birds nesting in the thermometer shelter is a common problem, as are difficulties with the doors of these shelters.
7) Observers are glad to share their experience about the collection of observations, problems with the instruments, and help needed from the CNA office.
8) There is limited communication between the observers and CNA personnel visiting most stations only a few times each year.
9) Observers are not aware of how the data is used and know little about the other stations in the state.

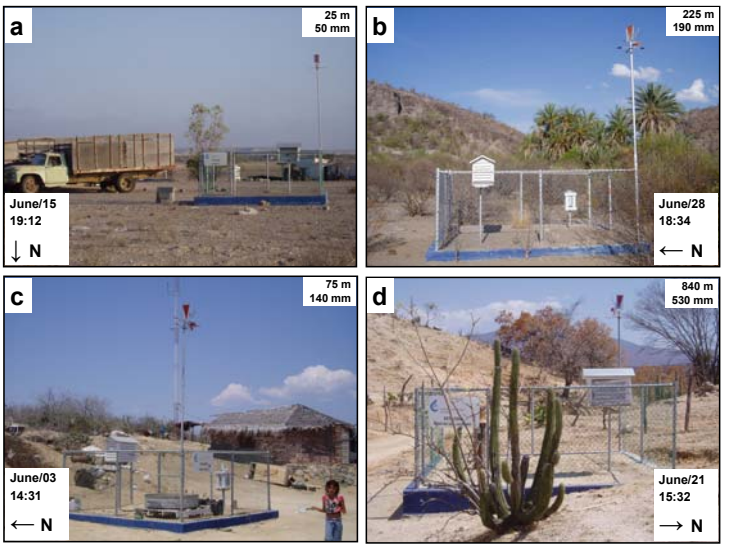

Figure 3. Weather stations from several locations inside the area of study: (a) Santa Fé, (b) San Pedro de la Presa, (c) Todos Santos and (d) Agua de San Antonio. Upper-right labels represent station elevation (m) and average, summer accumulations of precipitation (mm). Lower boxes indicate date and (local) time of picture; the direction arrow points to the north (N). Station locations are shown in Figure 2.

5. Summary

This poster provides preliminary results from a field survey of weather stations in the southern part of the state of Baja California Sur, in northwestern Mexico.

During June and July 2006, I have visited 40 stations to document the status of the *CNA* network. Most of these stations report extreme temperatures and rainfall over 24-hour periods. Some problems, associated with the stations instrumentation and communication with *CNA* personnel, have been identified. There are some differences between my GPS positions and those provided by *CNA*.

Future plans include to visit more stations, mainly in the southern part of the state, during August and September.

Acknowledgments

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