

Report of the PROSUR working group on: Studies of precipitation extreme events over La Plata River Basin

Participants (in alphabetic order): Ambrizzi, Liebmann, Penalba, Vargas and Vera (currently acting as group coordinator).

Objectives:

1. Develop a comprehensive climatology of the frequency of occurrence of extreme precipitation events over la Plata Basin
2. Investigate how synoptic, intraseasonal, interannual and longer-term variations in South America circulation relate to the frequency of those extreme rainfall events.

Work Plan:

During 2001 efforts have been mainly concentrated on:

a) The construction of the precipitation dataset

Investigators of CDC, CIMA and USP are collaborating to produce a set of daily records from more than 2000 stations south of 15°S with a uniform format. These data were obtained from various public and private sources in Brazil, Paraguay, Argentina, and Uruguay. While station density varies substantially in space and the quality of the records differs, most records begin in the mid-1970s and continue until near the end of the last millenium.

b) Development of the precipitation climatology over Parana Basin with emphasis on daily variability.

An climatology of the precipitation over the middle and upper Paraná was performed in order to asses the homogeneity conditions of the region on a statistical basis.

Further works:

In addition, other studies on extreme precipitation events are been done:

- "On the dynamics of daily extreme precipitation events in the state of São Paulo, Brazil" by Vera, Liebmann, Carvalho and Jones.
- "Relationships between Daily Extreme Precipitation Events in the La Plata River Basin and Low-Level Jet Variations" by Liebmann, Vera, Saulo and Kiladis .
- "Interdecadal and Interannual Variability of the Monthly Extreme Precipitation" by Penalba O.C. and Vargas W.M.

Preliminary results:

"Aspects of the Precipitation Climatology in the Paraná Basin"

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The purpose of the present work was to examine daily (?) extreme precipitation events of the Paraná Basin on a statistical basis and determine whether the characteristics of rainfall in different portions of the basin are homogeneous. We are interested in the statistics of extreme events and therefore, since these events are rare, we need many stations in order to compute stable statistics. What this work addresses is how we are trying to determine whether a particular group of stations has more-or-less homogeneous properties. The reason we put a question mark after daily is that we still are not sure whether this is the appropriate time scale to be looking at, or whether events of 2, 3, etc. days duration are more relevant.

The results presented here are based on daily records from 617 stations included in the upper Paraná basin for the period 1976-1997, with an average of 7% of data missing in years with data.

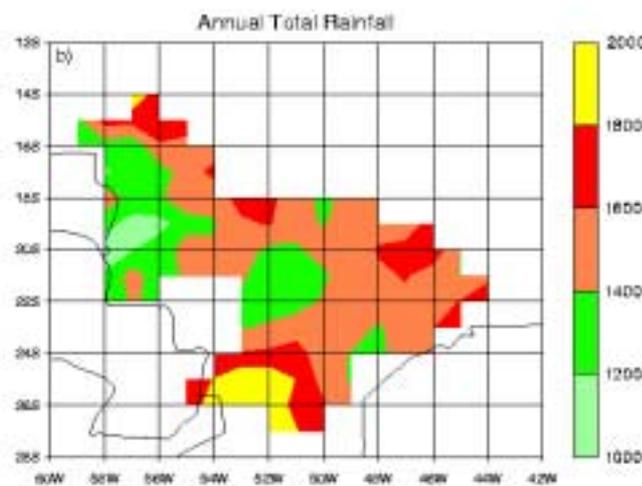


Figure 1: Annual total precipitation gridded map on 2.5°x2.5° resolution

The annual total precipitation field for the upper Paraná basin (Fig. 1) is characterized by a NW-SE oriented band of large amounts of rainfall along the northern part of the basin and by a center of maximum rainfall at around 52°W, 25°S.

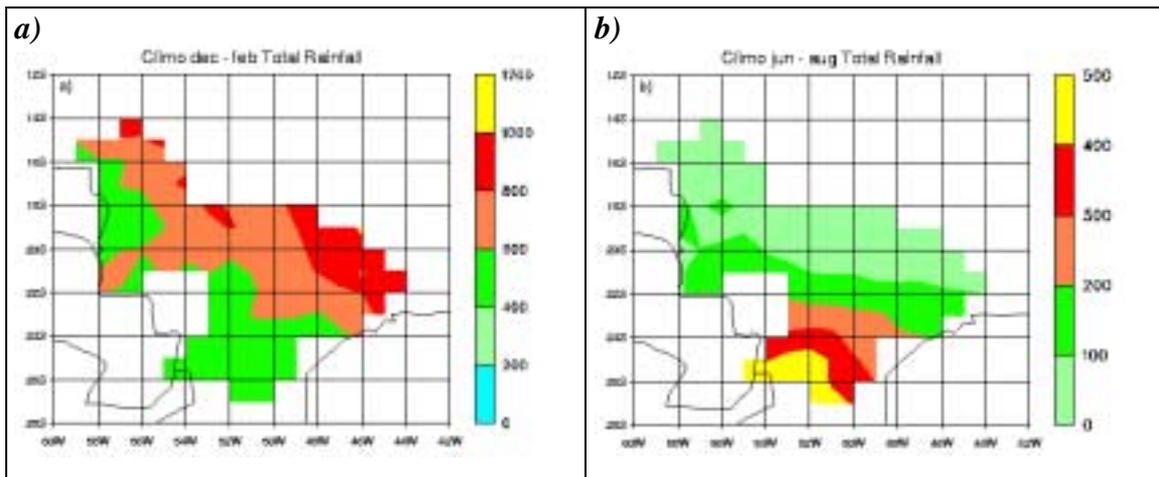


Figure 2: a) Summer and b) winter total precipitation maps

A comparison between summer and winter total precipitation (Fig. 2) shows that summer totals are largest except in the area of the winter maximum, where summer and winter are about equal. Thus, we identified three distinct regions, the northeast with its summer maximum associated with the SACZ, the south with its winter max, and the rest of the basin. The percent of rainfall during the wettest 3 months is presented for individual stations and plotted in color code (Fig. 3). This field exhibits a more stratified structure, with percentages above 50% in the northeast, and only a little more than a quarter in the southern part. This seems to demonstrate how this region of the Paraná basin is a division between a more monsoon environment to the north and a midlatitude environment to the south.

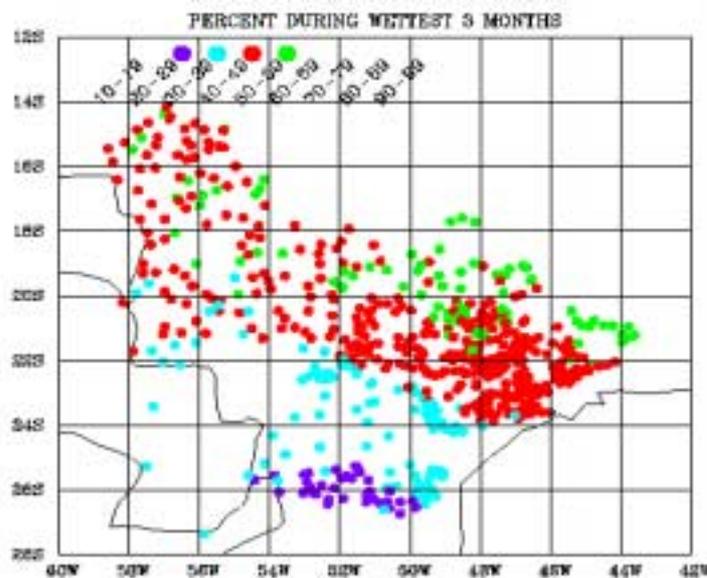


Figure 3: Percent of total annual precipitation during the 3 wettest months

The percent of 3 dry days in a row (calculated as day 1, day2, day 3, then day 2, 3, 4, etc.) shows that along the northern fringe and in the northeast it is rare to go 3 days in a row without rain (Fig. 4a). This result is consistent with percent of 3 day sequences with

3 days of rain, where it virtually never happens in the west and is fairly common in the northeast (Fig. 4b).

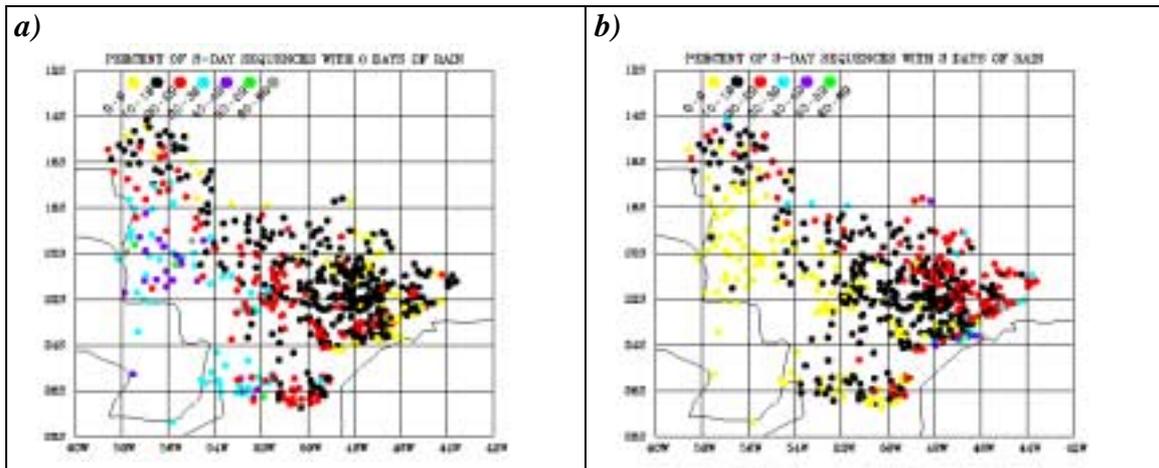


Figure 4: a) Percent of 3-day sequences with null precipitation. b) Percent of 3-rainy day sequences.