

**IAI CRN - 055 CoPIs SECOND MEETING**  
**Asunción, Paraguay, October 10, 11 & 12, 2001**

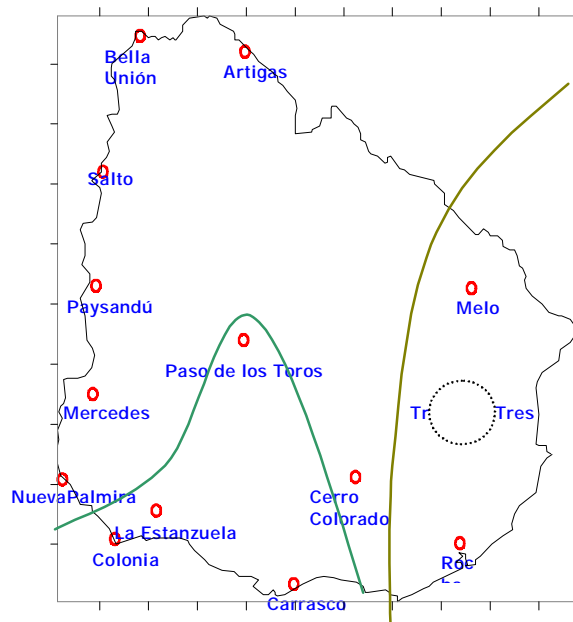
**Using precipitation quintiles for assessing dry spells over Uruguay and for linking monthly variability with regional anomalies in SST, OLR and 850 hPa fields.**

Ruben Mario CAFFERA - Uruguayan CoPi

**Abstract**

Water deficiencies over Uruguay in connection with regional scale circulation patterns were analyzed by means of monthly rainfall. Several months of precipitation inferior to quintile 2 is the base for two different criteria applied in matching dry events: annual based and month spells. From a 14 raingauges sample covering the whole country, those located in Laguna Merín and Atlantic watersheds -the SE region- shows minimum severity of annual drought, during the period lasting from January 1950 to March 2000. Least frequencies of dry month spells occur also in the Southern region, but from Montevideo -Carrasco- through the West of the country. Dry month spells offer a NW ascent. The more severe droughts issued out by both methods are coincident with major La Niña events. 700hPa heights, SST and OLR reanalysis show that Southern position, precocity and enhanced intensity of S.A.C. are in phase with long drought spells. A preliminary contingency analysis of almost 50 cases on dry, rainy or around normal months and the SST anomaly patterns is also pointed out for October and November.

Station	O.M.M.	South	West
	Nº	Latitude	Longitude
Bella Unión	86315	30°16'	57°35'
Artigas	86330	30°24'	56°31'
Salto	86360	31°40'	57°58'
Paysandú	86430	32°31'	58°02'
Paso de los Toros	86460	32°48'	56°32'
Melo	86440	32°22'	54°12'
Mercedes	86490	33°15'	58°04'
Carrasco	86580	34°50'	56°01'
Colonia	86560	34°27'	57°51'
Treinta y Tres	86500	33°13'	54°23'
Rocha	86565	34°30'	54°19'
Estanzuela I.N.I.A.	2698	34°13'	57°25'
Nueva Palmira	2471	34°13'	57°25'
Cerro Colorado	2498	33°56'	55°23'



**1. GENERAL CRITERION**

**1.1 Part one**

- "Hydrological year": from April 1 to March 31 (*Caffera et. al., 1989*).
- Drought events individualization criterion:
  - ⇒ **Annual Basis:** 7 months or more with rainfall < Q<sub>2</sub>, where Q<sub>2</sub> is the second quintile value in each monthly precipitation series.
  - ⇒ **Spells:** 4 or more succeeding months with total precipitation < Q<sub>2</sub>.

**1.2 Part two**

Synoptic short-term features drive the occurrence of floods, while drought is definitively a climatic event. Thus we consider, for defining dry and wet months, the following criteria (*Caffera, 2001*):

- Dry months: 9 sites or more (from a sample of 14 sites), with rain < Q<sub>2</sub>
- Rainy months: 9 sites or more (for a sample of 14 sites), with rain > Q<sub>3</sub>
- Very rainy months: 9 sites or more (for sample of 14 sites), with rain > Q<sub>4</sub>

- Dry or Wet pattern: configuration field depicted in the average map of SST anomalies surrounding South America (as in figures below).
- Comparison between the shape of the fields for each monthly map and the patterns is subjective.

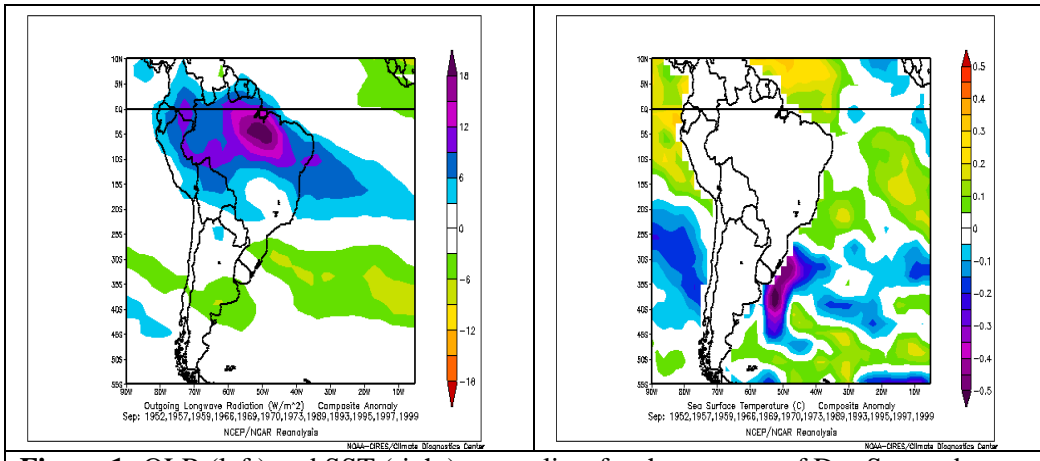
## 2. PICTURES, TABLES AND GRAPHS

	B.Unión	Artigas	Salto	Paysandu	P. Toros	Melo	Mercedes	Carrasco	Colonia	Estanzuela	C.Colorado	T.yTres	Rocha
<b>Total</b>	<b>8</b>	<b>8</b>	<b>7</b>	<b>8</b>	<b>10</b>	<b>5</b>	<b>7</b>	<b>10</b>	<b>12</b>	<b>11</b>	<b>5</b>	<b>6</b>	<b>3</b>
50/51	2	3	2	1	4	5	3	4	2	3	1	3	5
51/52	6	4	5	7	6	5	4	7	7	7	3	4	5
52/53	7	9	6	7	7	7	5	4	5	6	4	6	5
53/54	4	5	6	6	9	4	4	4	3	3	5	8	6
54/55	7	5	5	6	4	4	2	4	4	3	5	6	6
55/56	7	6	8	6	6	5	5	6	5	7	4	5	5
56/57	6	7	6	6	6	7	7	8	7	7	5	3	6
57/58	5	5	5	5	4	5	2	3	6	5	5	4	4
58/59	5	2	6	4	1	3	5	2	1	3	3	5	2
59/60	4	5	4	3	3	5	5	6	4	4	5	6	5
60/61	5	2	5	4	4	3	5	7	7	7	7	5	7
61/62	4	2	7	6	4	6	5	4	8	4	7	1	6
62/63	6	7	7	6	4	4	4	6	3	5	6	4	5
63/64	6	4	3	3	2	1	4	2	3	2	3	6	1
64/65	8	8	10	8	8	7	9	6	7	6	9	3	7
65/66	4	3	3	4	5	3	8	3	6	5	6	2	4
66/67	5	3	4	6	4	6	7	8	6	7	10	8	8
67/68	4	5	6	3	2	3	2	3	3	4	5	2	5
68/69	2	5	5	4	7	3	3	7	7	7	4	6	6
69/70	5	5	2	8	7	6	9	7	7	7	5	3	6
70/71	6	4	5	4	5	2	6	3	2	4	4	5	4
71/72	7	5	5	7	8	6	5	7	6	7	5	5	6
72/73	1	5	2	3	2	3	4	3	3	4	1	5	5
73/74	3	4	4	5	6	4	6	5	7	5	5	6	6
74/75	3	3	2	6	5	6	8	6	7	5	6	7	6
75/76	2	4	2	3	7	3	3	6	3	4	5	3	5
76/77	4	3	4	3	2	3	1	5	2	2	5	0	2
77/78	4	6	1	1	3	1	3	2	5	2	1	5	4
78/79	3	5	5	6	6	4	6	6	5	5	5	6	5
79/80	8	3	5	4	4	4	4	7	6	6	6	4	2
80/81	3	3	6	2	3	4	3	1	2	3	0	5	2
81/82	7	5	4	6	5	4	6	3	3	2	5	6	2
82/83	5	3	2	3	2	5	4	4	4	6	4	5	3
83/84	4	4	4	1	2	3	4	4	3	4	1	5	3
84/85	5	3	4	5	3	3	3	5	4	4	5	3	3
85/86	2	4	3	3	2	3	2	5	4	6	4	7	2
86/87	3	3	3	3	4	2	1	2	3	3	1	4	1
87/88	5	6	4	3	3	5	2	7	3	2	4	6	3
88/89	6	8	8	7	7	7	6	7	10	9	9	2	5
89/90	5	4	3	5	6	4	5	4	3	4	5	5	3
90/91	5	7	6	6	8	5	6	3	6	7	4	6	5
91/92	3	4	2	4	3	3	0	3	1	3	1	5	2
92/93	4	5	6	2	4	1	1	5	4	4	2	1	4
93/94	6	5	6	4	4	1	3	3	4	4	2	3	4
94/95	1	5	3	5	2	3	5	3	6	4	3	7	1
95/96	5	6	6	4	5	3	4	5	7	6	4	3	5
96/97	9	7	7	7	5	4	6	4	4	5	5	7	5
97/98	2	3	4	3	3	1	4	4	3	2	5	3	4
98/99	2	4	5	4	2	3	4	3	4	5	0	3	3
99/00	6	8	7	8	8	8	9	4	8	7	5	6	4

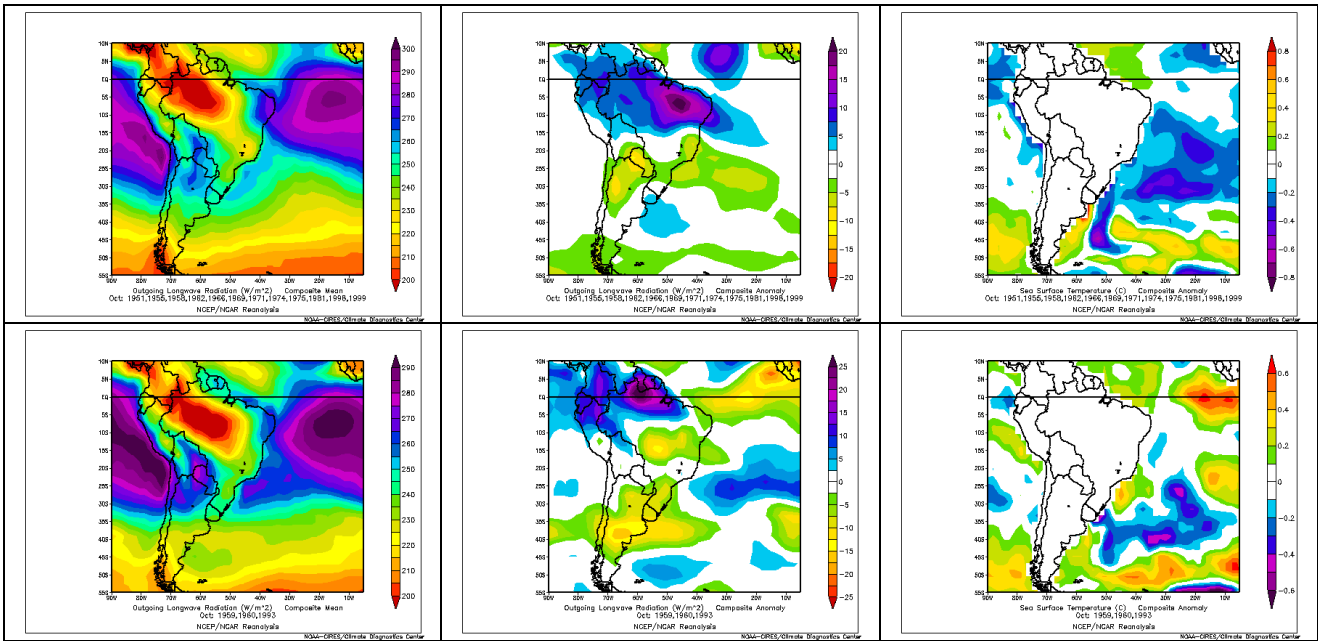
**Table 1.** Number of years with more than 7 dry months (first row). For each annual period, the number of dry months - precipitation below  $Q_2$  - per year, is highlighted yellow when  $\# > 7$ . Note that Eastern and Southeastern stations (Laguna Merín and Atlantic watersheds) have the lesser values of annual dry situations (green cases in "Total"). Major frequencies (red cases) occur in the Center-South and the SouthWest regions. The large number of points with very high number of dry months during 1988/1989 and 1999/2000 is also noticeable. At the first column, "El Niño" years (warm phase) are in red and "La Niña" years (cold phase) in blue.

B.Unión	Artigas	Salto	Paysandú	P. d l Toros	Melo	Mercedes	Carrasco	Colonia	N.Palmira	C.Colorado	T. y Tres	Rocha
10	11	14	10	11	5	9	7	9	6	9	11	4

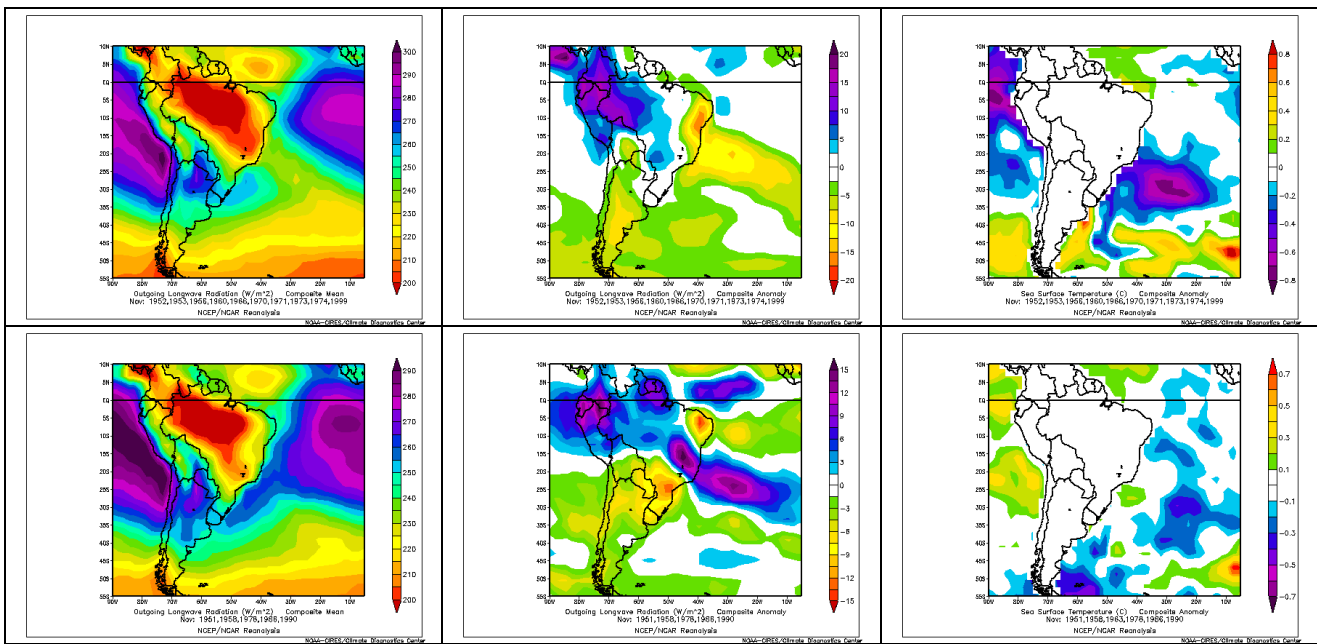
**Table 2.** Number of spells with at least 4 succeeding dry months.



**Figure 1.** OLR (left) and SST (right) anomalies, for the average of Dry Septembers. It is to note that Atlantic SST anomaly pattern for the very rainy Septembers -not shown- don't differ too much from the dry pattern.



**Figure 2.** October. Mean OLR (left), OLR anomaly (center) and SST anomaly (right), for the average of Dry months (up) and very rainy (down).



**Figure 3. November.** Mean OLR (left), OLR anomaly (center) and SST anomaly (right), for the average of dry (up) and very rainy (down).

Contingence tables for Oct. & Nov., 1950-2000 <sup>1</sup>							
OCTOBER SST Anomalies				NOVEMBER SST Anomalies			
As defined before ↓→	Dry pattern	Wet pattern	Other Features	As defined before ↓→	Dry pattern	Wet pattern	Other features
Dry months	11	1	3	Dry months	9	2	5
Wet months	3	10	10	Wet months	3	5	5
Normal, No-wet Or No-dry	0	2	7	Normal, No-wet or No-dry	6	1	10

Some cases were not classified because lack of data or ambiguous SST anomaly feature

### 3. SUMMARY

#### 3.1 Part one:

- Eastern and Southeastern Uruguay present smaller risk of drought, both in terms of territorial as in time extent, and both for annual situations as well as for month spells (with exception of Treinta y Tres).
- The more severe droughts issued out by both methods were coincident with major La Niña events.
- It is noticeable the lack of coincidence of monthly dry spells, except in intense cold phases of ENSO: spatial dispersion is in addition with the well-known interannual variability in the region, all around the seasons.
- Dry spells in spring are more frequent in the whole coast of the Rio Uruguay and in the North (except Bella Union).

#### 3.2 Part two:

- 850hPa heights, SST and OLR reanalysis show that Southern position, precocity and enhanced intensity of S.A.C. are in phase with long drought spells.
- Some anomaly cores seems to be in opposition of phase in dry months and wet months ensembles.

<sup>1</sup> Images provided by the NOAA-CIRES Climate Diagnostics Center, Boulder Colorado from their Web site at <http://www.cdc.noaa.gov/>.

## References

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<sup>2</sup> *fpta*: "Fondos para Promoción de Tecnologías Agropecuarias": *Funds to Promote Agricultural Technologies*, INIA: Instituto Nacional de Investigación Agropecuaria": *National Institute for Agricultural Research*; please see also at [www.inia.org.uy/disciplinas/agroclima/fpta\\_Pron\\_clim/index.html](http://www.inia.org.uy/disciplinas/agroclima/fpta_Pron_clim/index.html).