

# THE PLATA BASIN: HYDROLOGICAL ISSUES

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# **La Hidrología de la Cuenca del PLATA**

**Distintas posibles visiones:**

**Gerenciamiento  
Problemas transfronterizos  
Ecología  
Cambio climático  
Social y Salud  
ETC**

# **La Hidrología de la Cuenca del PLATA**

**Gran número de Proyectos  
internacionales**

**GEF:**

**El Guaraní**

**El Pantanal**

**El Bermejo**

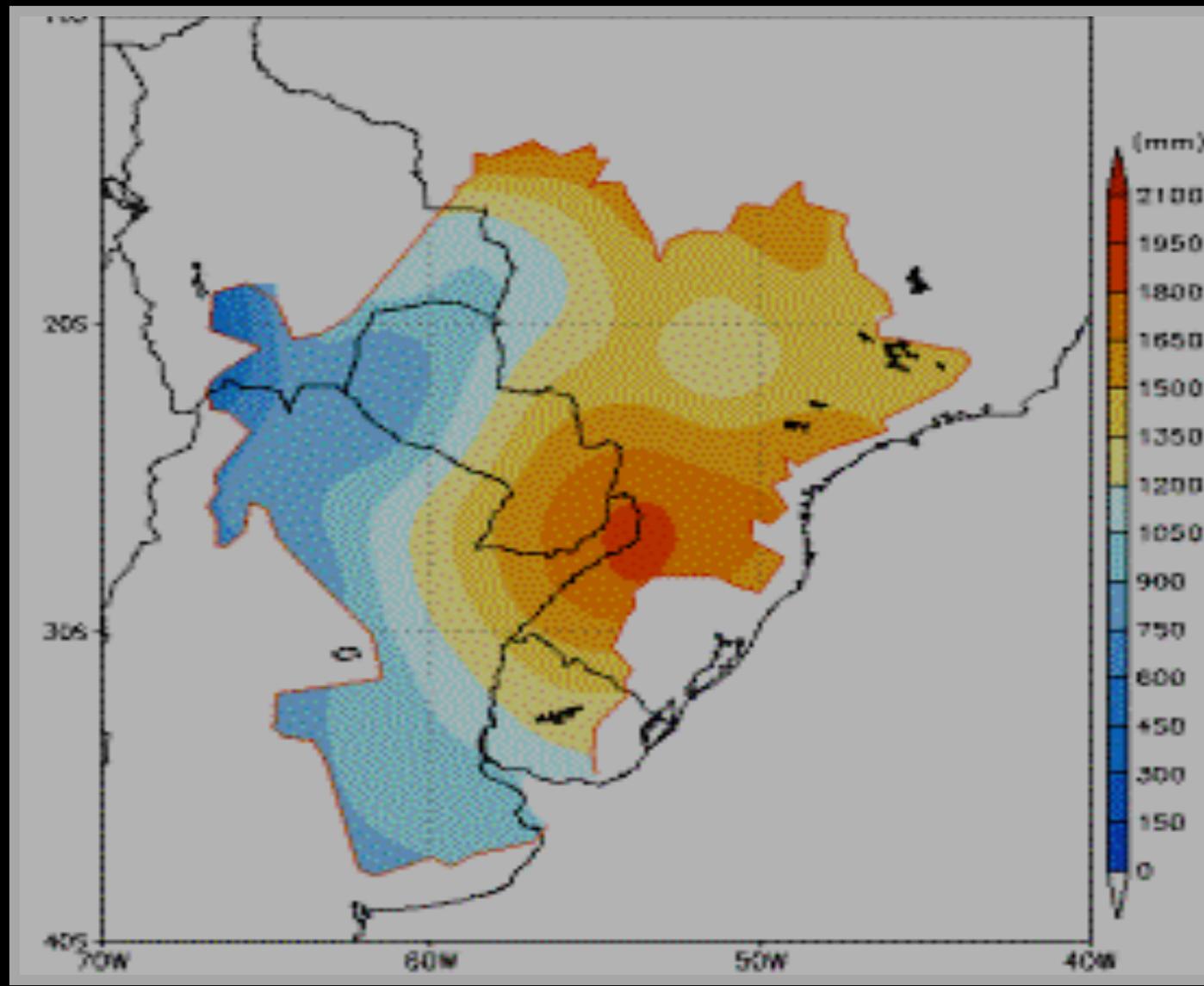
**El Freplata**

**El Proyecto Marco**

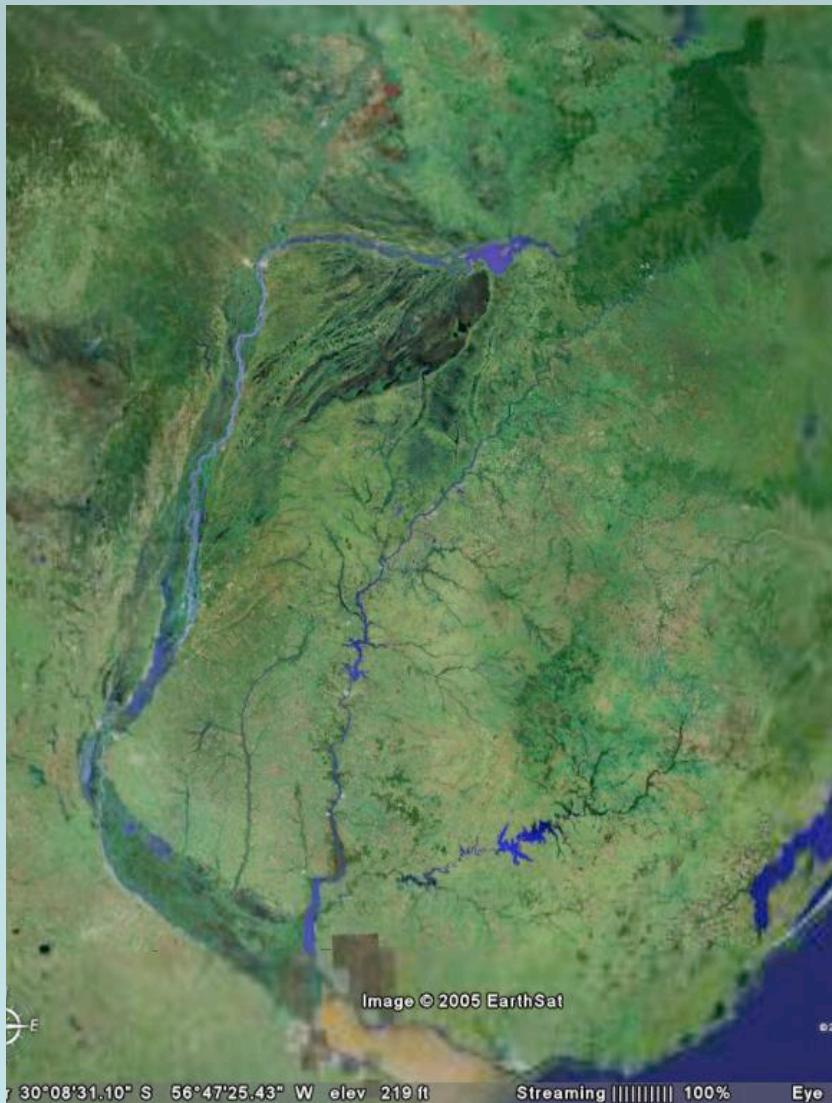
**IAI: Prosur**

**CE: Claris**

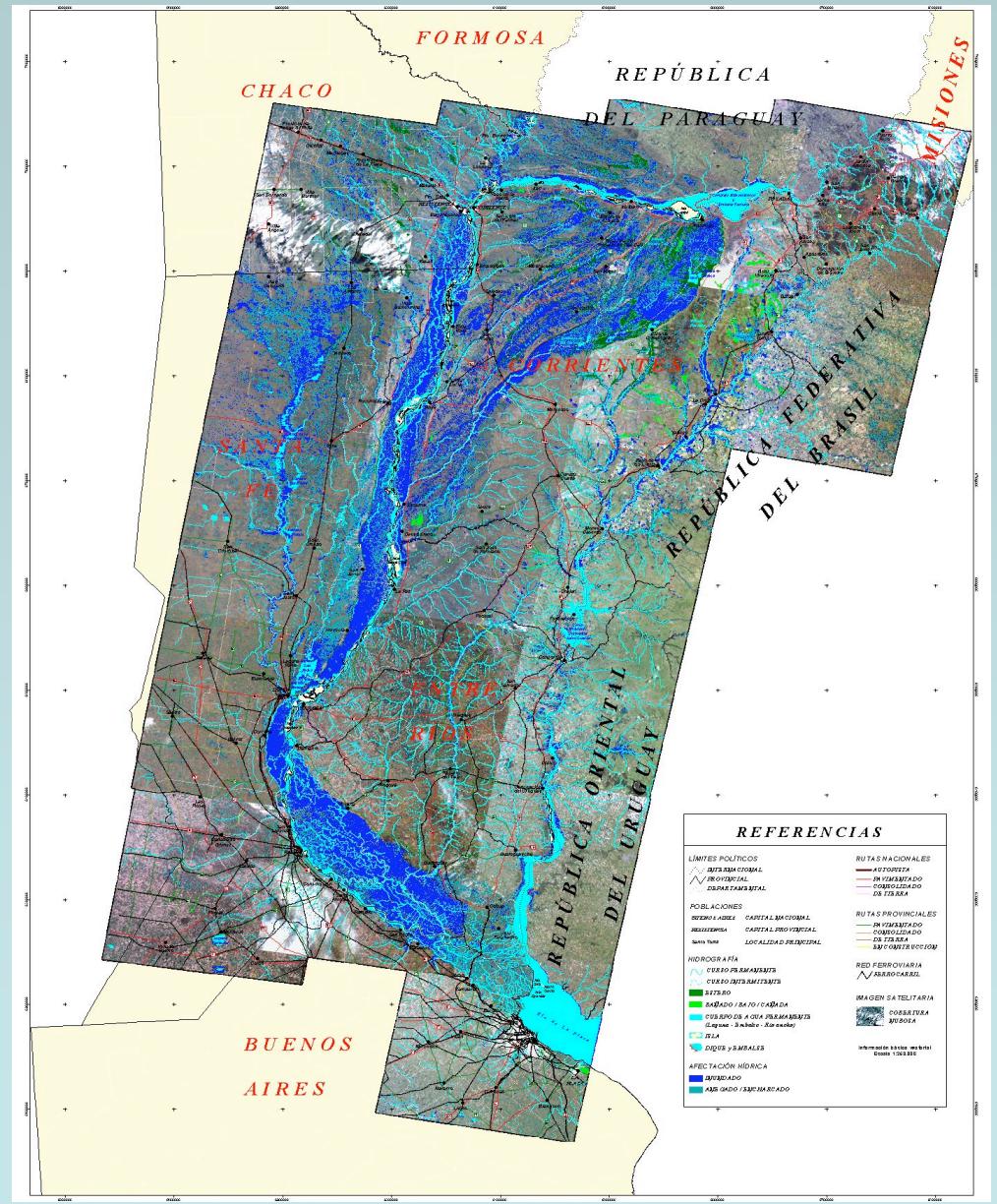
# LLUVIA MEDIA ANUAL



## Normal conditions



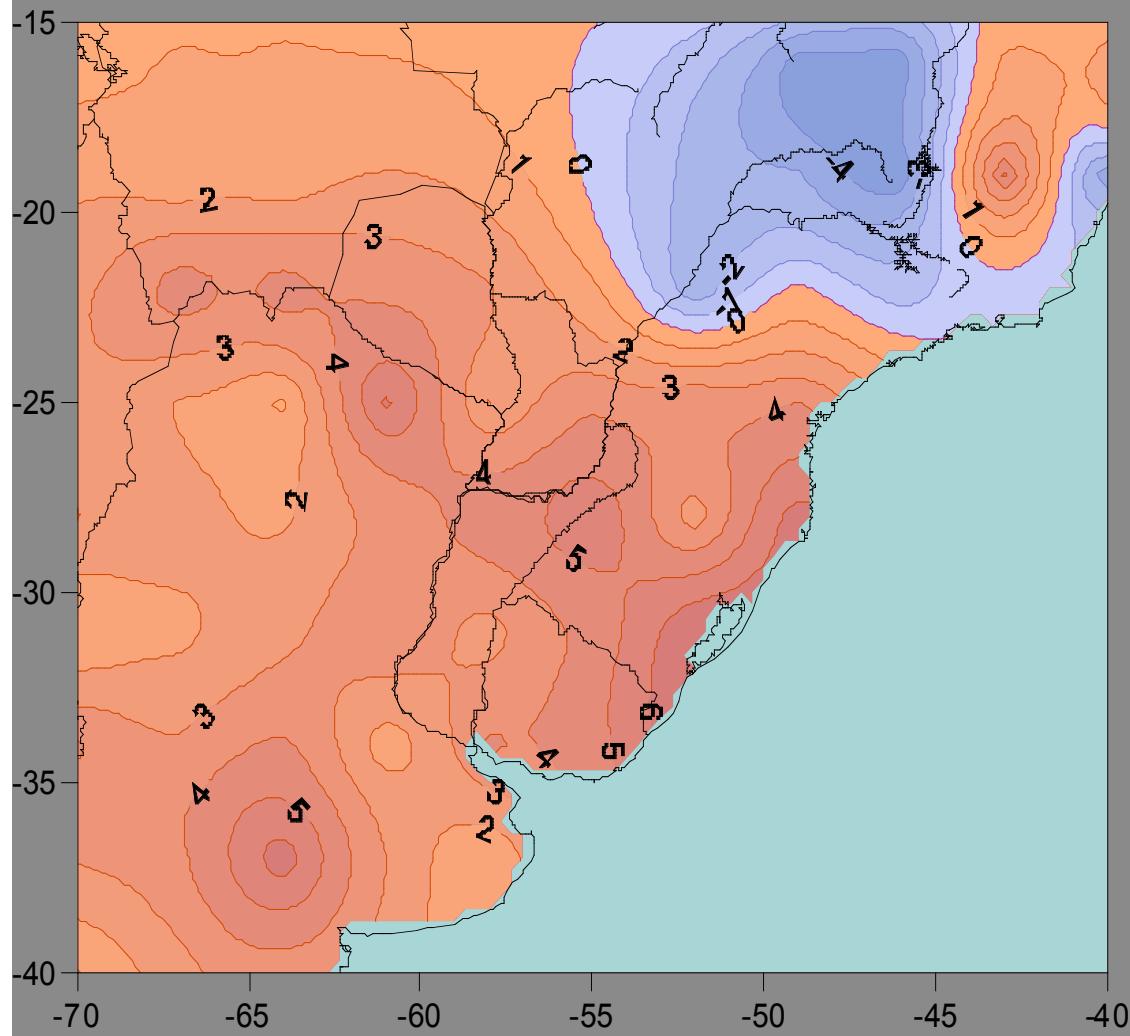
## 1997/98 Flood of the Paraná River (Satellite images from CONAE)





# Great Variability and Trends

# Annual rainfall trends (mm/year): 1960-2000



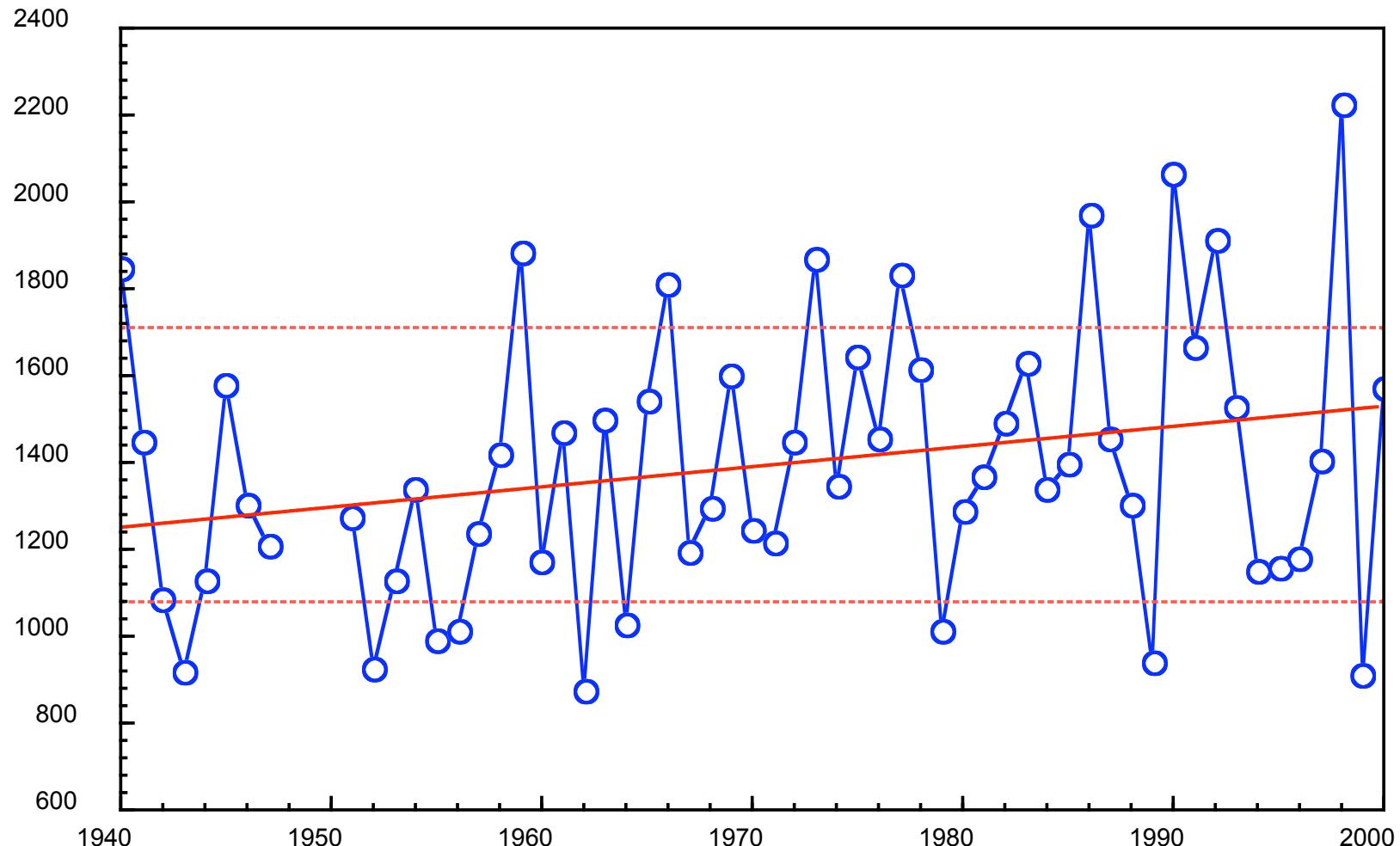
The region has increments in the annual rainfall between 10% and 40%.

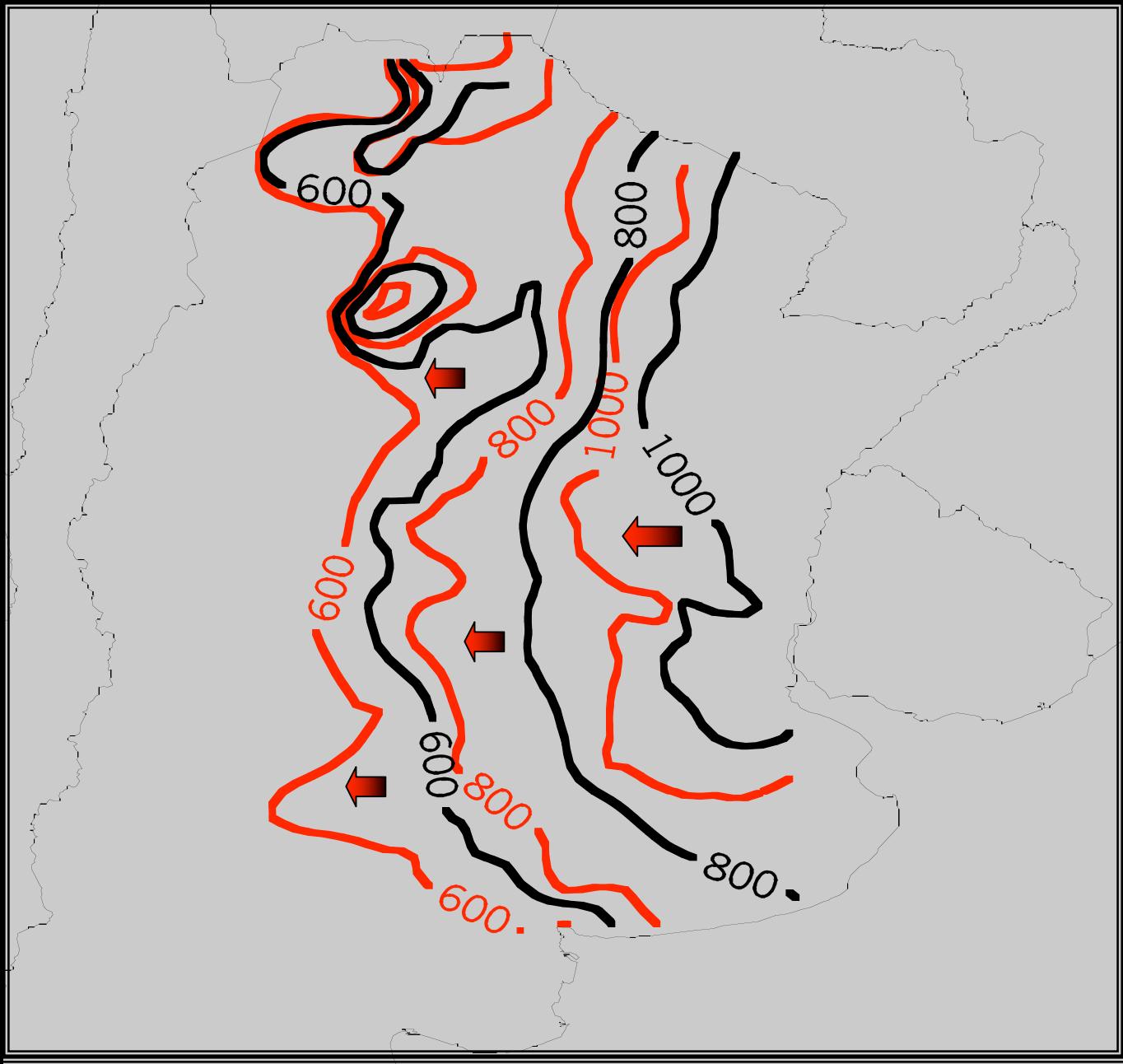
The increments in some regions of the Plata basin were 200 m or more in 40 years.



**IMPACTS**

# Monte Caseros: Annual Precipitation



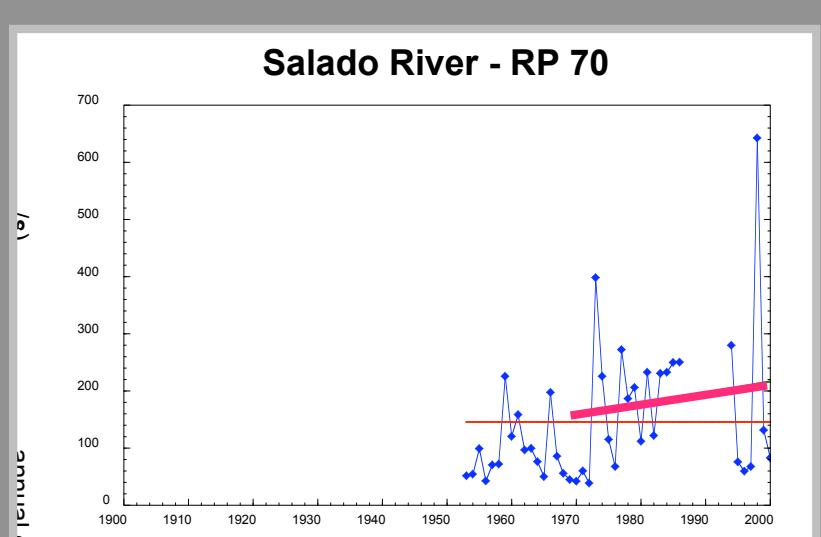
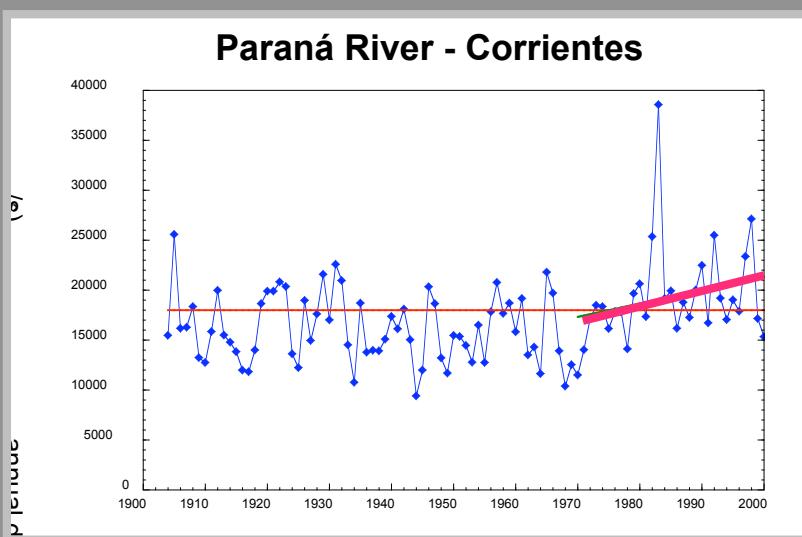
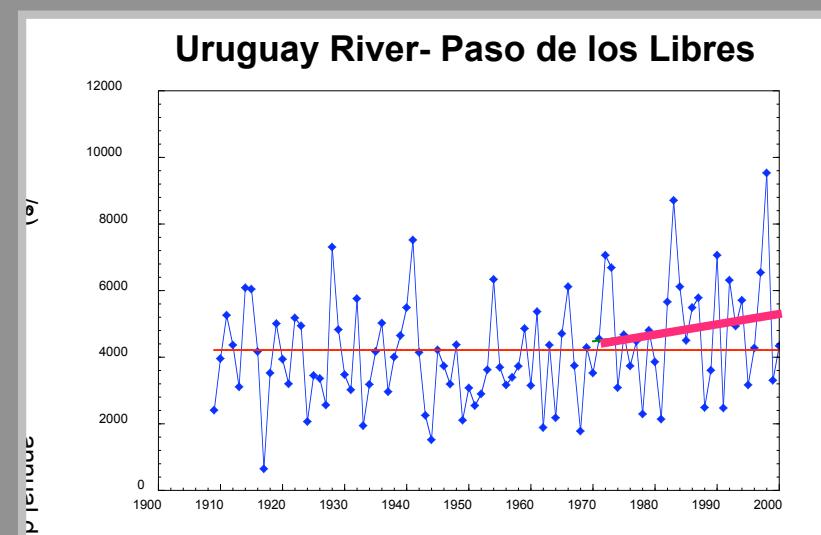
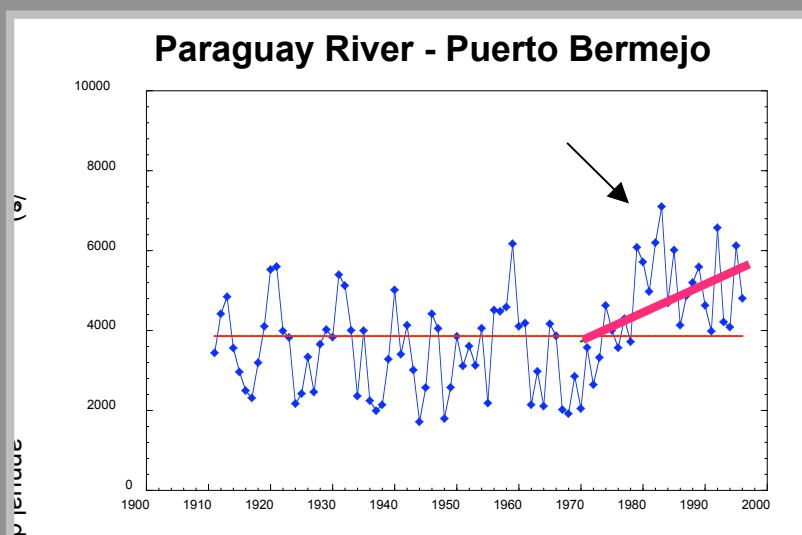


*Isohyets in  
mm*

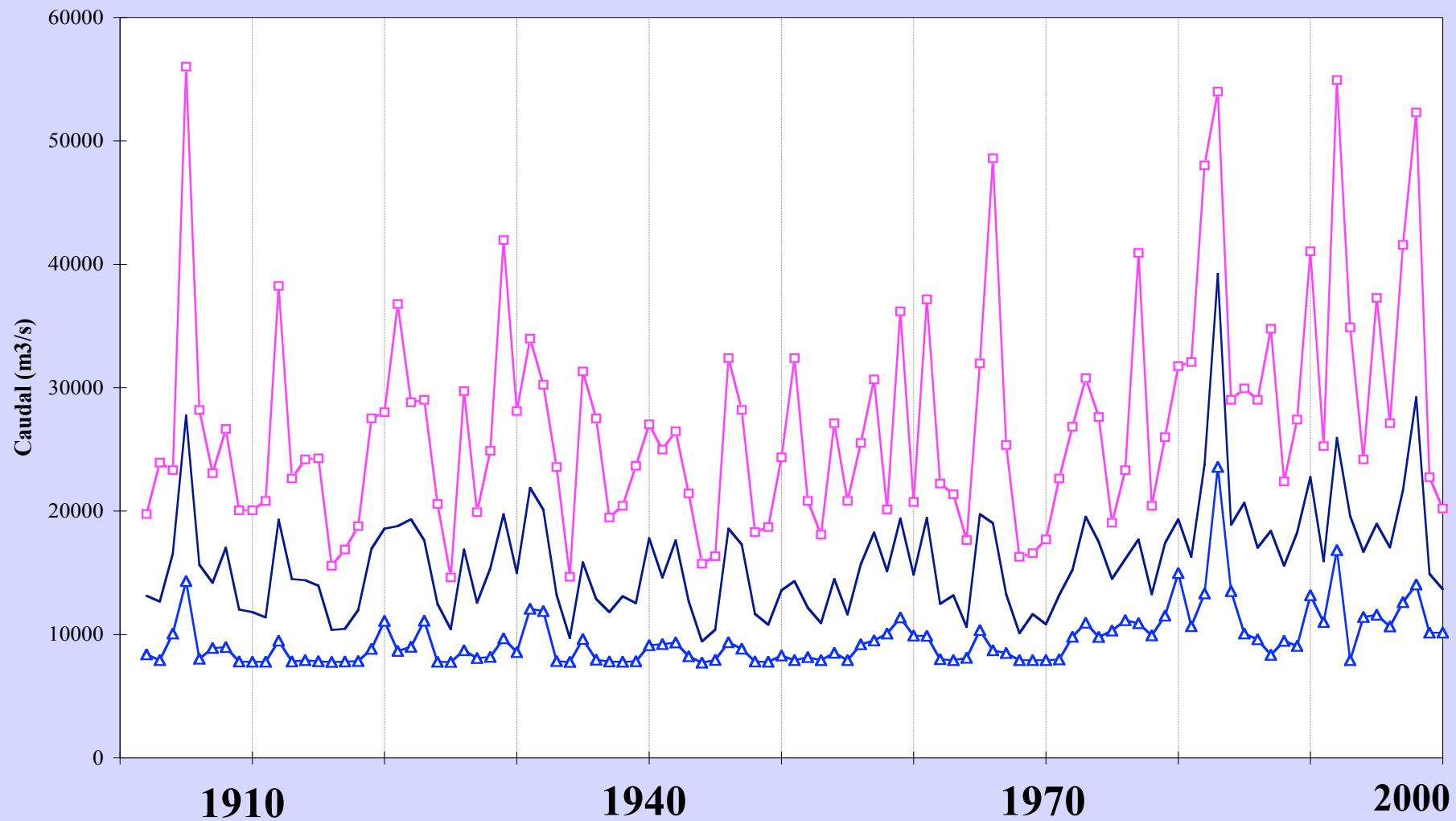
*black :*  
*1950-1969*  
*Red:*  
*1980-1999*

# Impacts in the Hydrology

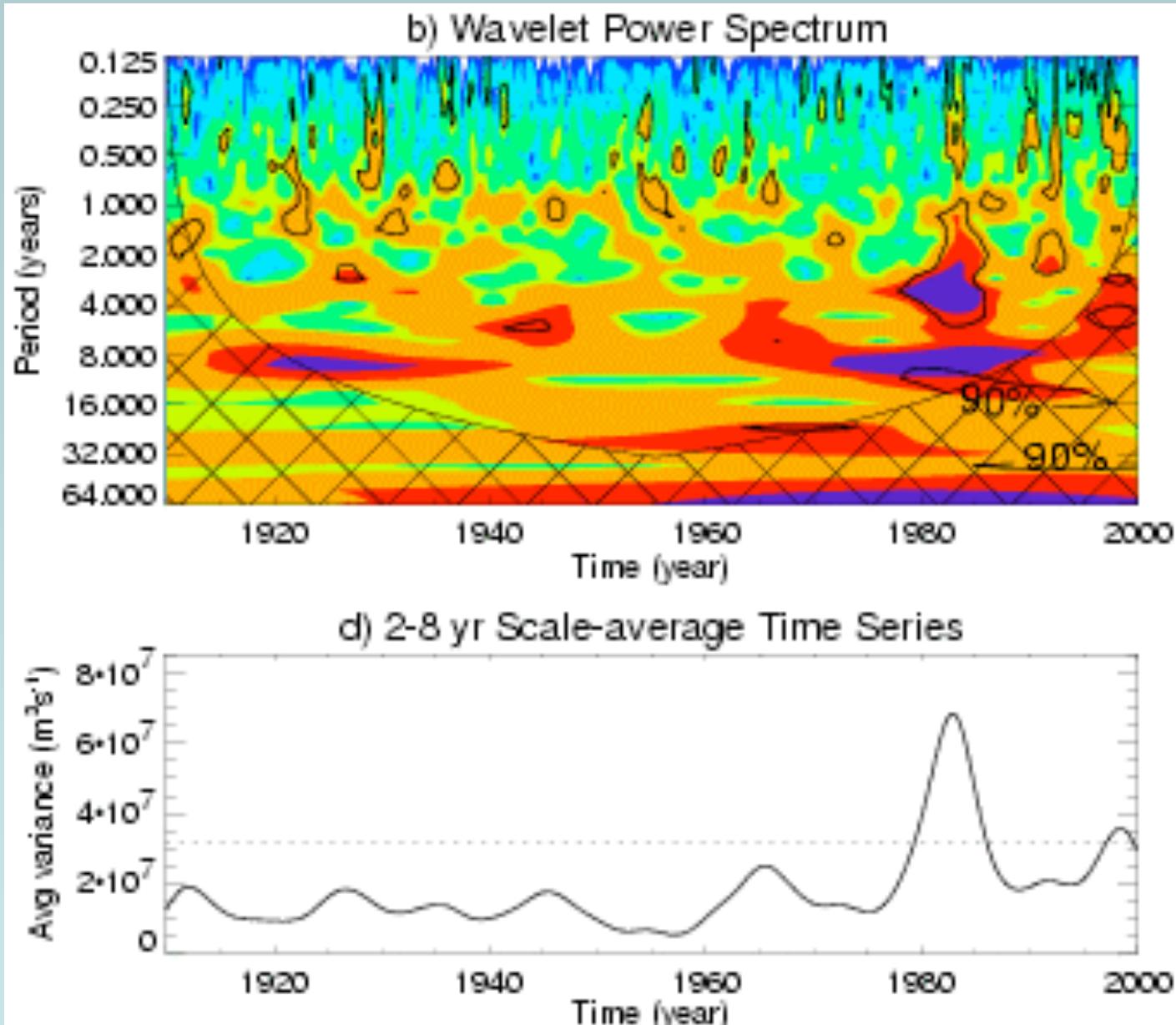
# Impact of rainfall trends: changes in river discharges Río de la Plata basin



*Annual maximum, mean and minimum daily discharge of  
the Paraná river at Santa Fe-Paraná  
period 1902-2000*



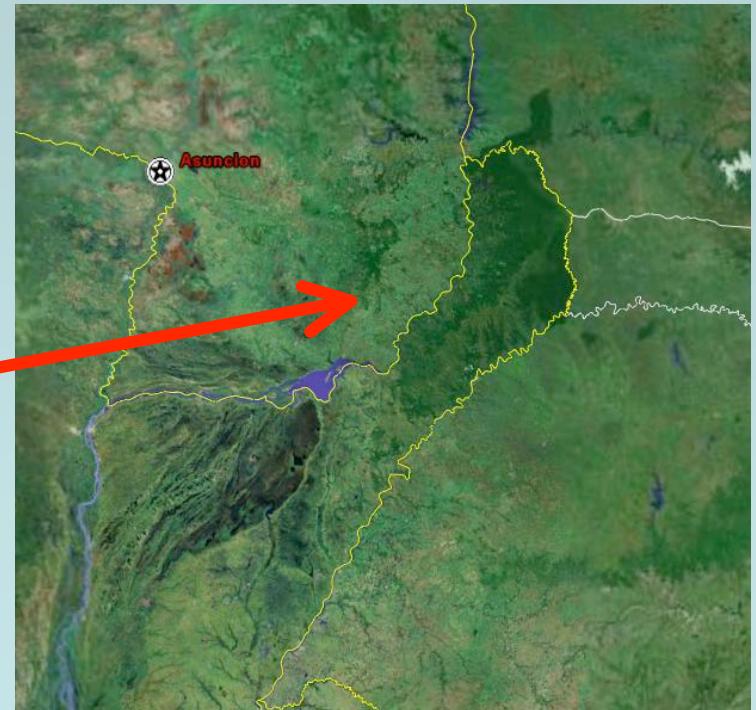
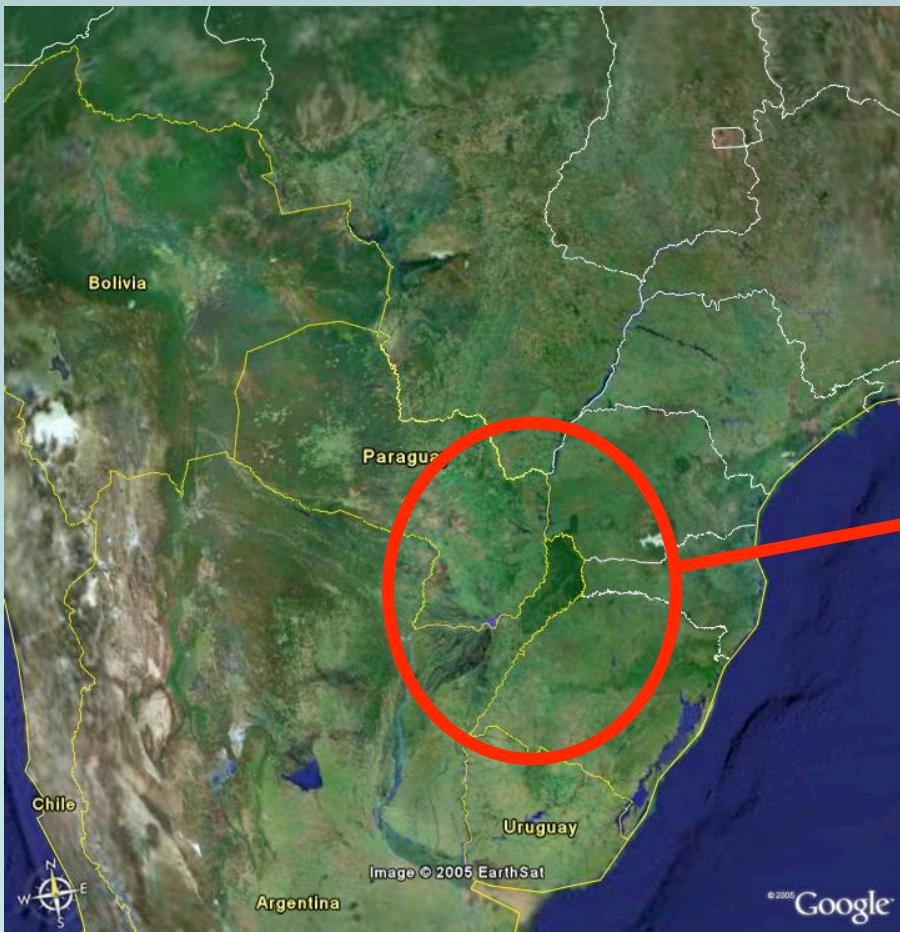
# La Plata river discharge



- *Are the river flow changes resulting from precipitation changes or from the land use change?*

# Land surface effects

# Land cover / Land use



## **Comparación entre valores observados y modelados al cambiar el uso del suelo.**

**La última columna representa el porcentaje de  
variación con respecto al caudal observado.**

	<b>Paso de los Libres</b>		
	<b>Obs (m<sup>3</sup>/s)</b>	<b>Mod (m<sup>3</sup>/s)</b>	<b>Var (%)</b>
<b>Pasturas, sin árboles</b>	<b>5136,7</b>	<b>7165,7</b>	<b>+39,5</b>
<b>Pradera arbolada</b>	<b>5136,7</b>	<b>3898,9</b>	<b>-24,1</b>

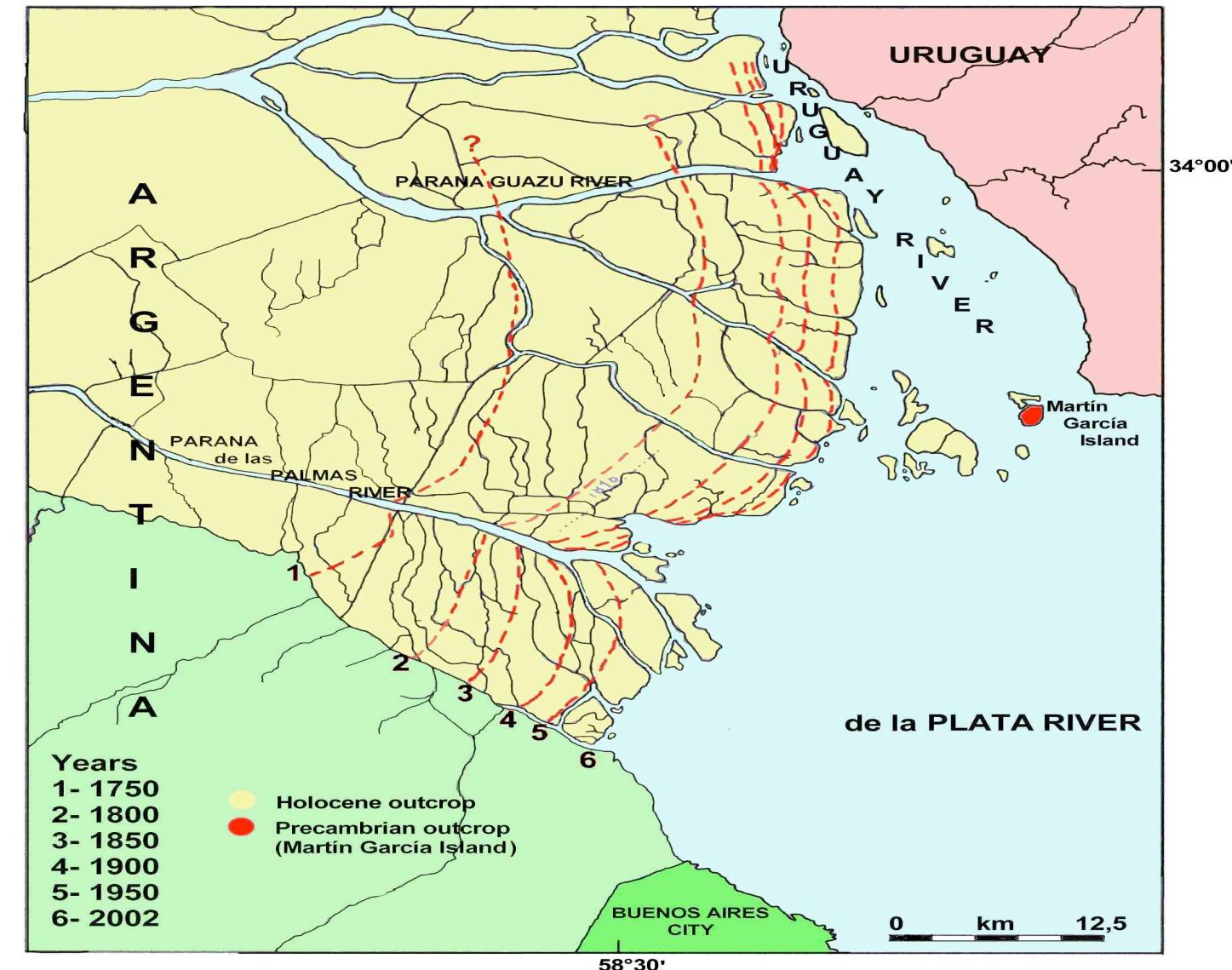
# AMPLIFICACION DE LA PRECIPITACION EN LOS CAUDALES

	Precipitation en the Plata basin ( $m^3 s^{-1}$ )	Streamflow ( $m^3 s^{-1}$ )	Evaporation + Infiltration ( $m^3 s^{-1}$ )
<b>1998</b>	107000	36600	70400
<b>1999</b>	81600	20440	61600
<b>Difference</b>	23 %	44 %	13 %
<b>El Niño</b>	76000	25250	50750
<b>La Niña</b>	71000	21640	49360
<b>Difference</b>	7 %	17 %	3 %
<b>1951-1970</b>	72000	19300	52700
<b>1980-1999</b>	83500	26000	56500
<b>Difference</b>	16 %	35 %	9 %

# SEDIMENTOS:

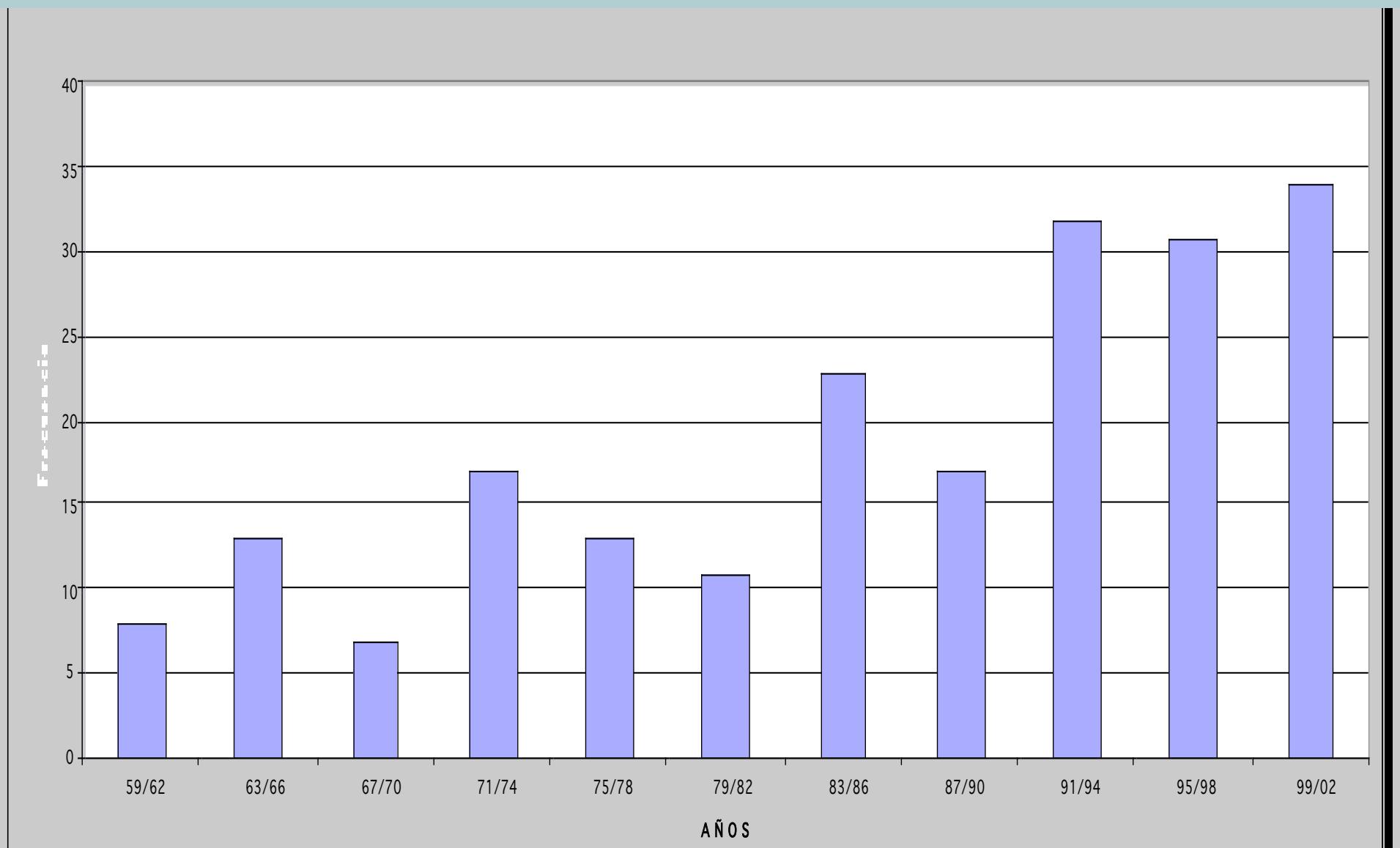
- Problemas en Navegación
- Cambios de morfología

# Avance del Delta del Paraná

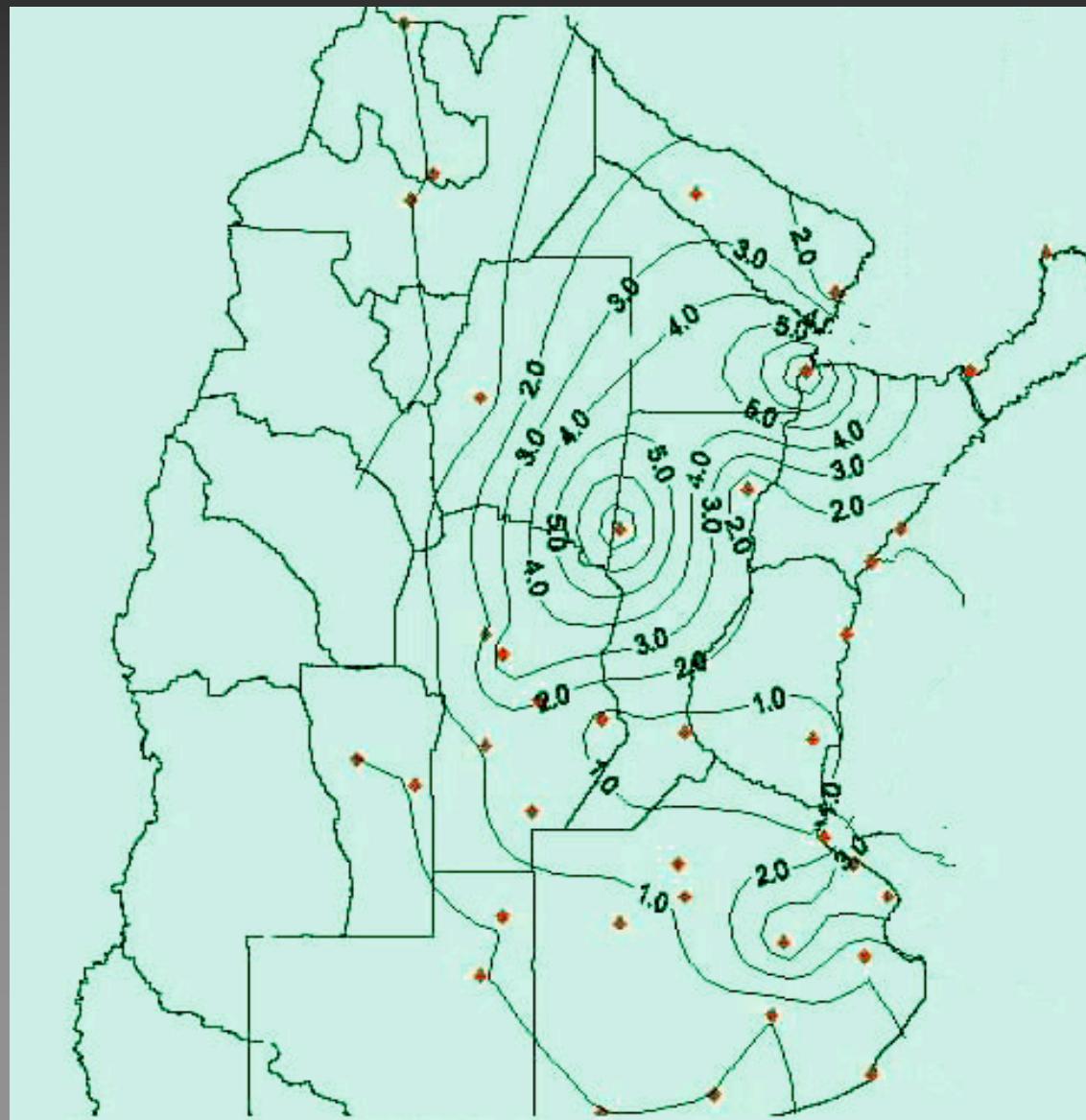


# Extreme precipitation events

# Number of cases with Precipitation > 100 mm/(2 days) for 16 gauging stations over central and northeastern Argentina

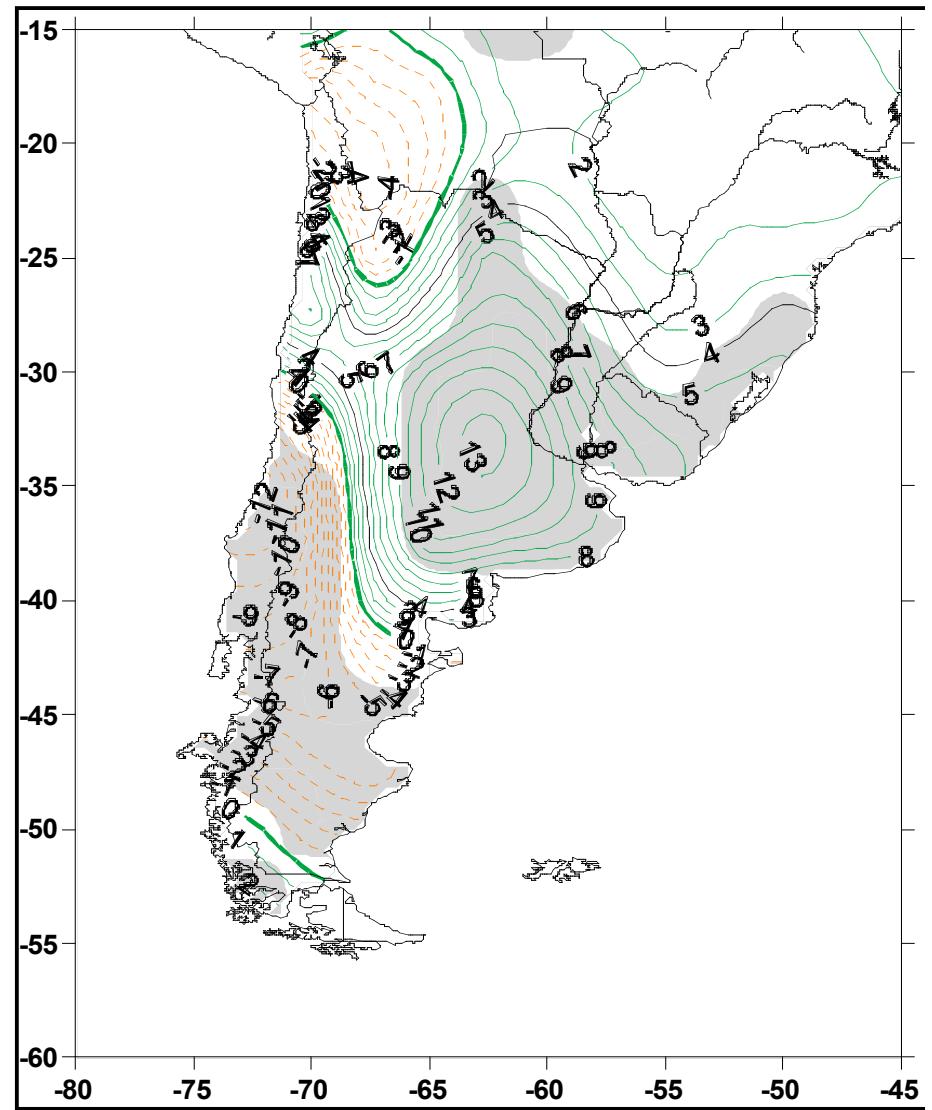
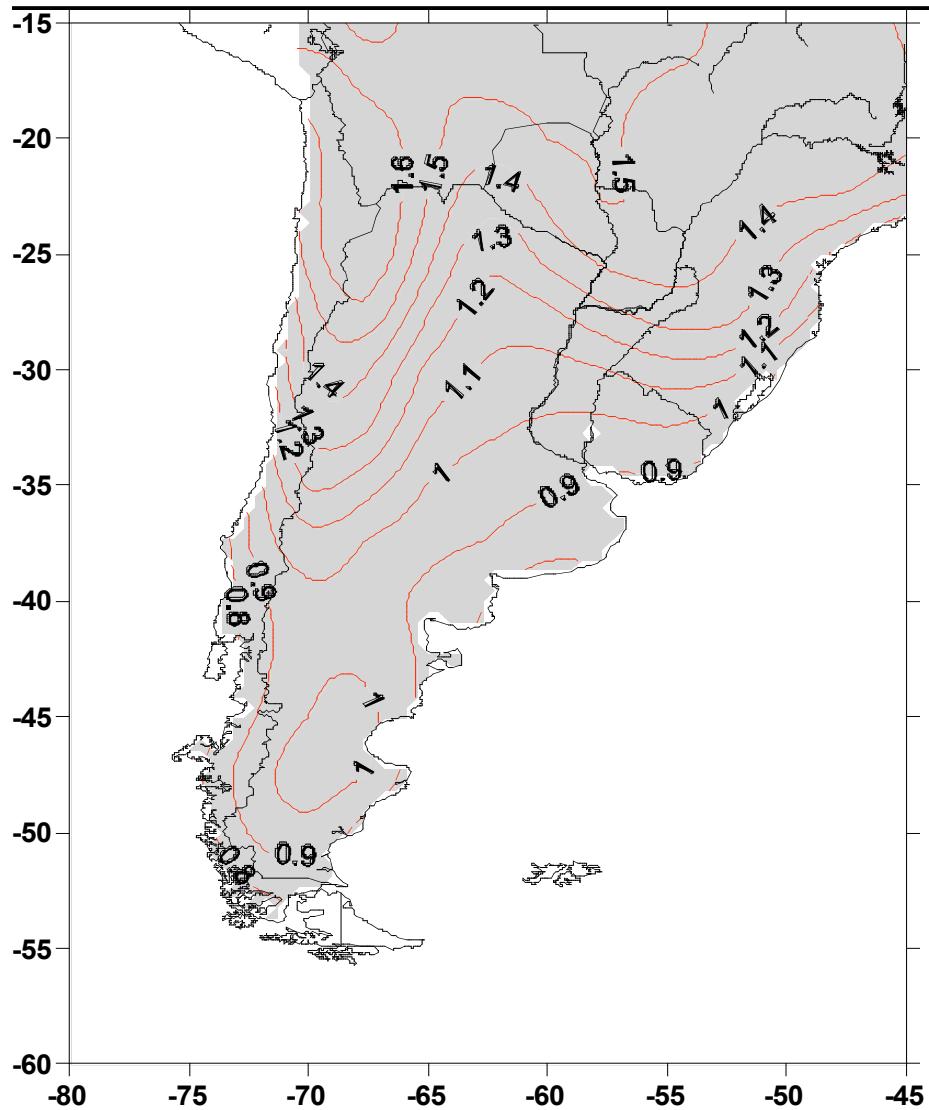


## Precipitation over 150 mm: rate between the annual frequency of the 1983/2002 and the 1959/1978 periods



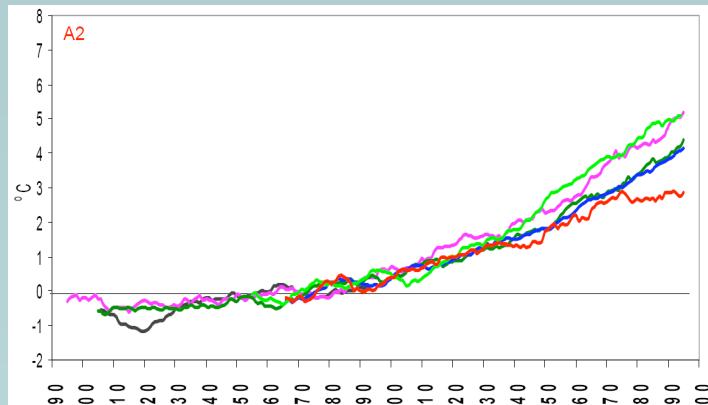
# CLIMATE CHANGE SCENARIOS

*Escenarios de cambio de temperatura anual ( $^{\circ} C$ ) a la izquierda y de precipitación (%) a la derecha para la década 2020-40 respecto de 1961-90 para el escenario A1B. Ensamble de 14 MCGs. Las zonas sombreadas en gris son las muestran cambios significativos*

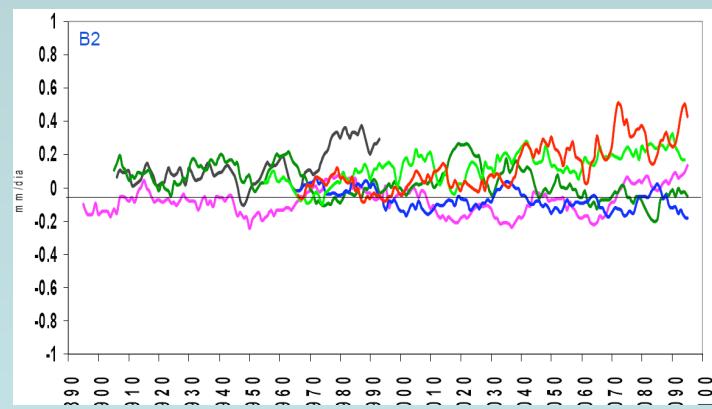
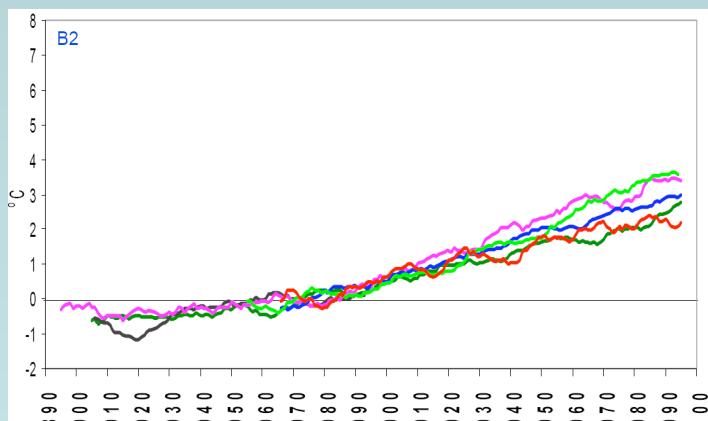
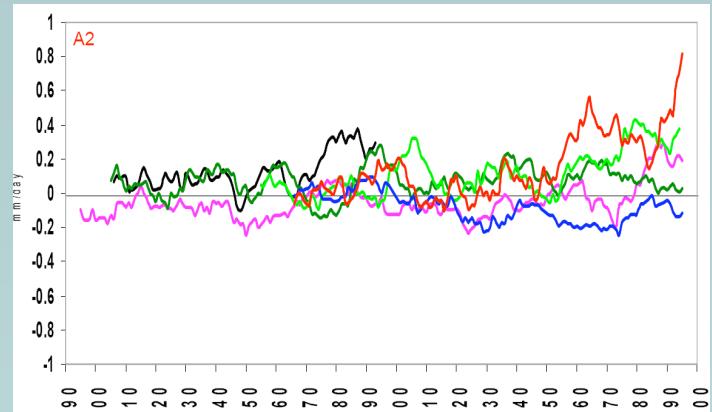


# LPB temperature and precipitation scenarios for 2050-2080

## Temperature



## Precipitation

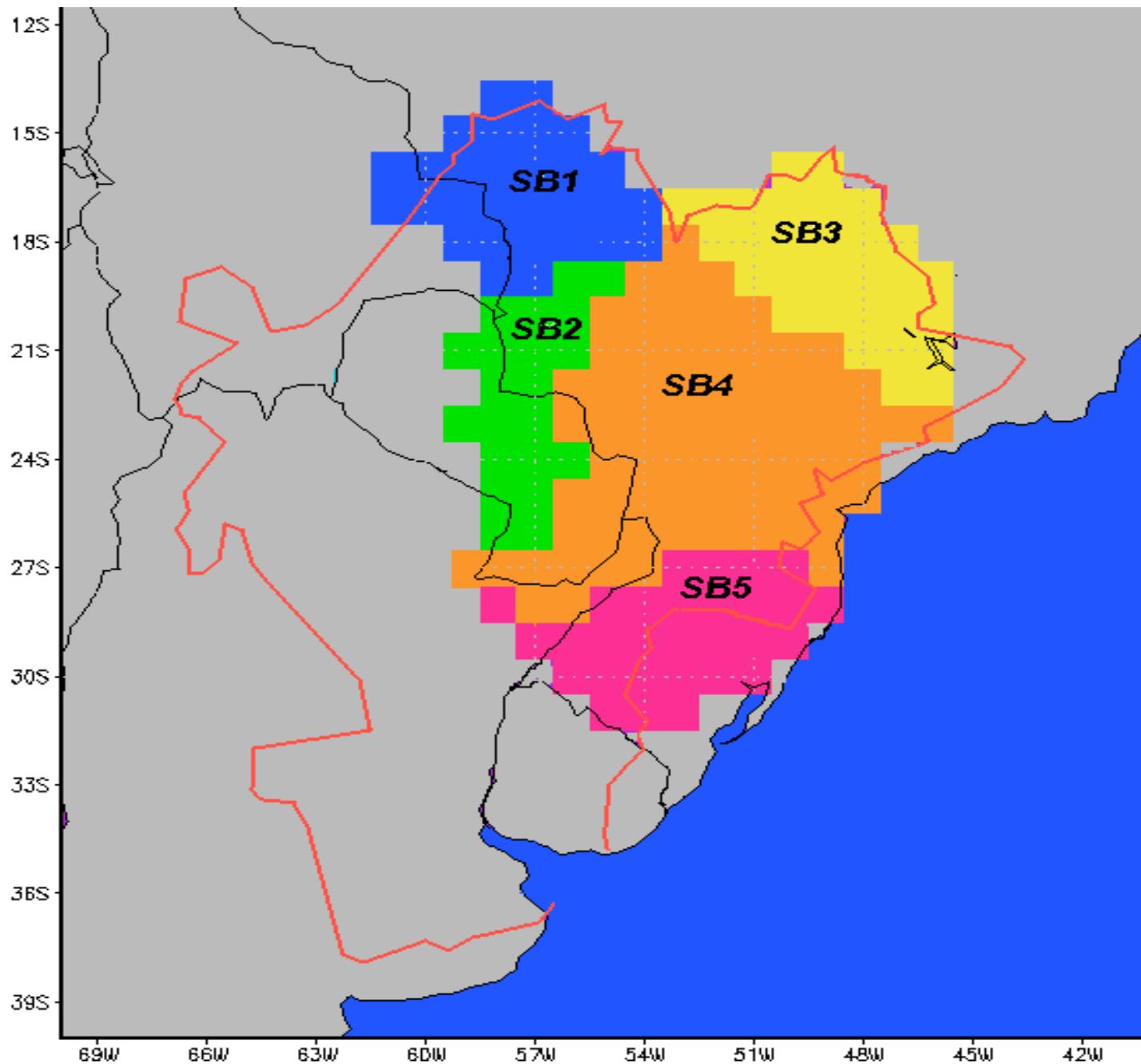


*"In the La Plata Basin, temperatures will be higher and rainfall will tend to be above normal as projected by all IPCC models, especially for the time slices between 2050 and 2080." Courtesy of Marengo*

# PRINCIPALES IMPLICANCIAS DE LOS ESCENARIOS EN EL HORIZONTE DE PLANIFICACIÓN

# **ESTRÉS HIDRICO EN EL NORTE CONSECUENCIAS AGRÍCOLAS Y SOCIALES**

# Hydrologic modeling



**SB1:  
Pantanal**

**SB2:  
Paraguay**

**SB3: Upper  
Paraná**

**SB4: Middle  
Paraná**

**SB5: Upper  
Uruguay**

# Discharge Scenarios: Plata Basin Simple Model

	<b>Present discharge <math>m^3/s</math></b>	<b>+ 2° C Percent change</b>	<b>+ 5° C Percent change</b>
Pantanal	1405	- 37	- 73
Paraguay	2553	- 34	- 72
Upper Paraná	7209	- 15	- 36
Middle Paraná	9714	- 23	- 56
Upper Uruguay	5082	- 19	- 47
Total	25963	- 21	- 51

**Comparación entre valores observados y modelados  
(Modelo VIC) al aumentar la temperatura media en 3,0°C  
y la precipitación anual en 100 mm (Escenario 2050)  
y al aumentar la temperatura media en 4,5°C  
y la precipitación anual en 200 mm (Escenario 2080)**

	Paso de los Libres		
	Obs (m <sup>3</sup> /s)	Mod (m <sup>3</sup> /s)	Var (%)
Escenario 2050	5136,7	4365,6	-15,0
Escenario 2080	5136,7	4180,0	-18,6

**IN THE PLATA BASIN  
75 % OF PRECIPITATION EVAPORATES  
ONLY 25 % REACH the RIVERS**

**RELATIVELY MODEST CHANGES IN  
PRECIPITATION OR IN EVAPORATION MAY LEAD  
TO GREAT PERCENT CHANGES IN THE RUNOFF**

**IN THE CONTEXT OF CLIMATE CHANGE THIS  
MEANS THAT THE**

**HIDROPOWER (BRASIL 90 %)  
NAVEGATION  
WATER SUPPLY  
ARE HIGHLY VULNERABLE**

**Amenaza  
a los humedales  
desde Pantanal hasta el  
delta del Paraná**

¿Intrusion of the salinity front up to  
Buenos Aires?

## OTRO PROBLEMA: EL FRENTE DE SALINIDAD



**El aumento del nivel del mar no  
modificara sustancialmente la posición  
del frente salino**

**El frente salino podría desplazarse  
hasta las nacientes del Plata si los  
caudales se reducen  
suficientemente**

[www.cima.fcen.uba.ar](http://www.cima.fcen.uba.ar)

GRACIAS

