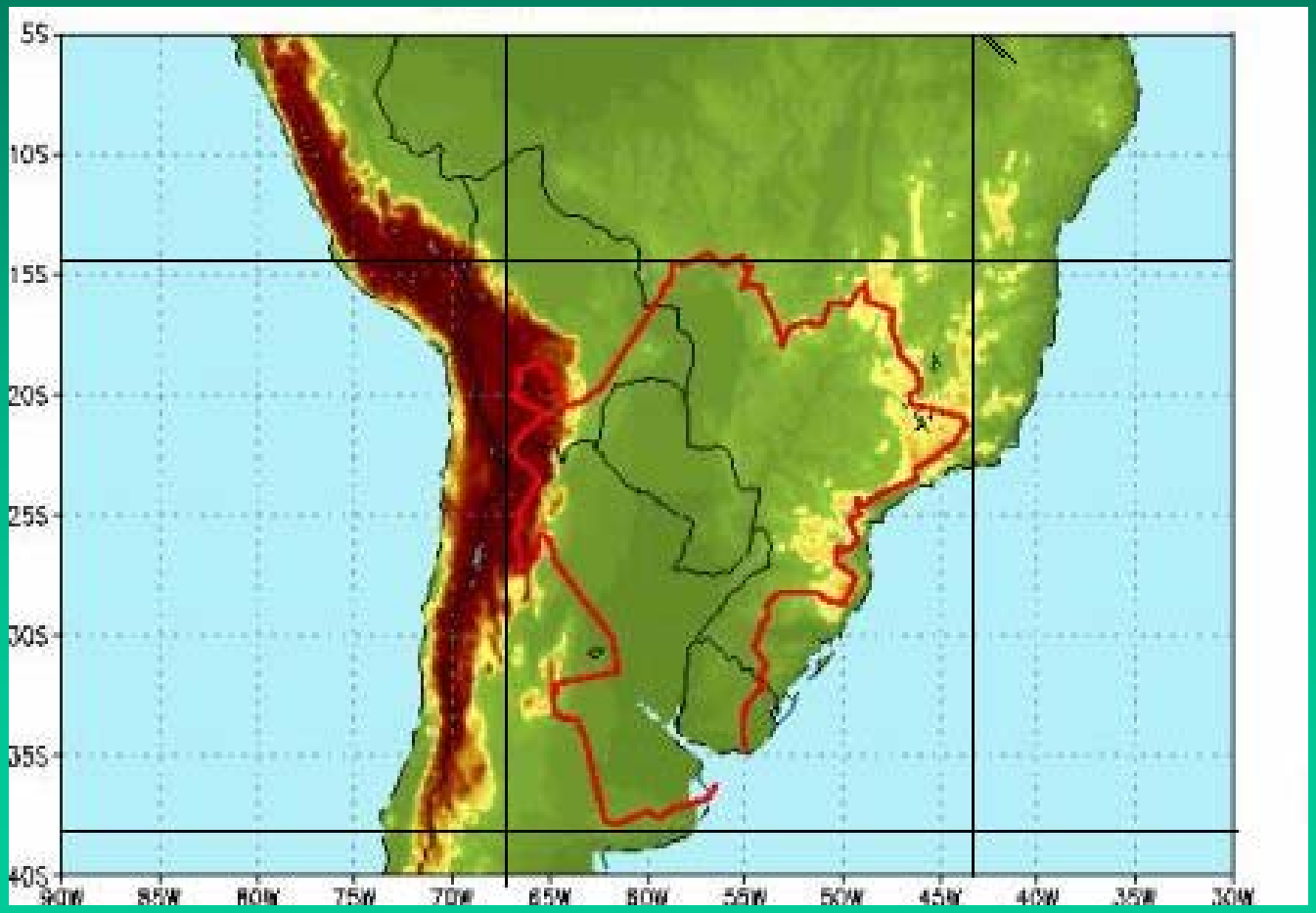
LAS PREVISIONES PARA LA GESTIÓN DE LOS RECURSOS HÍDRICOS EN RELACIÓN CON LA VARIABILIDAD Y EL CAMBIO CLIMÁTICO EN LA CUENCA DEL PLATA

TALLER DE GESTION INTEGRADA DE RECURSOS HÍDRICOS

QUITO
19 Junio 2006

Vicente Barros



PROGRAMA MARCO PARA LA GESTION SOSTENIBLE DE LOS RECURSOS HIDRICODS DE LA CUENCA DEL PLATA EN RELACION CON LOS EFECTOS HIDROLOGICOS DE LA VARIABILIDAD Y EL CAMBIO CLIMATICO

Comité Intergubernamental de la Cuenca del Plata

WHY INTEGRATE CLIMATE CHANGE IN THE PLATA BASIN PROGRAME?

1: Chaco

2: Pantanal

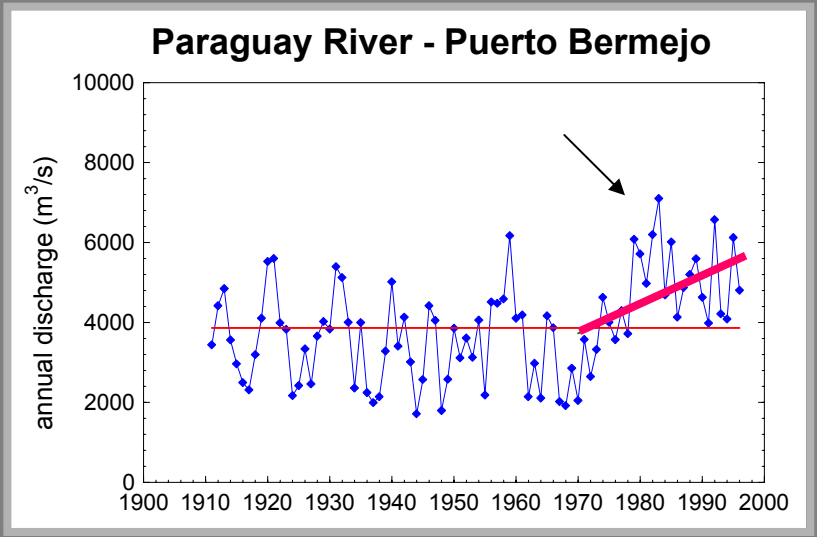
3: Middle Paraguay

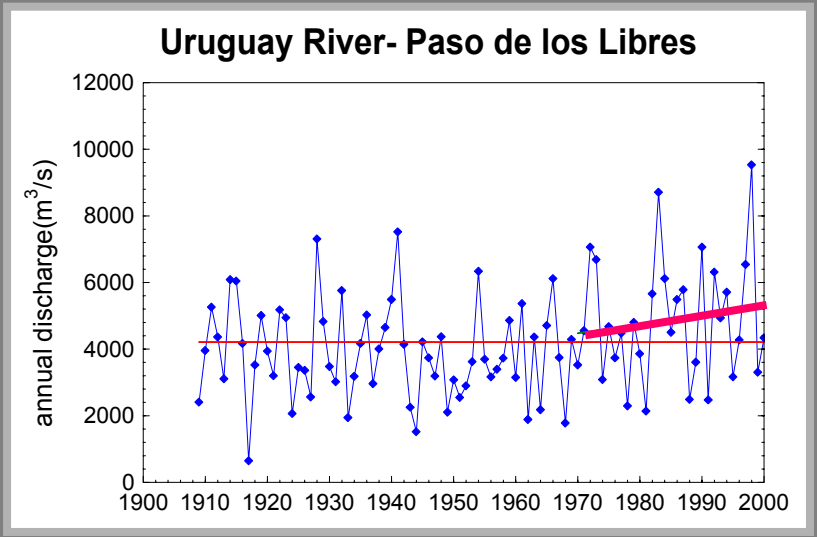
4: Upper Paraná

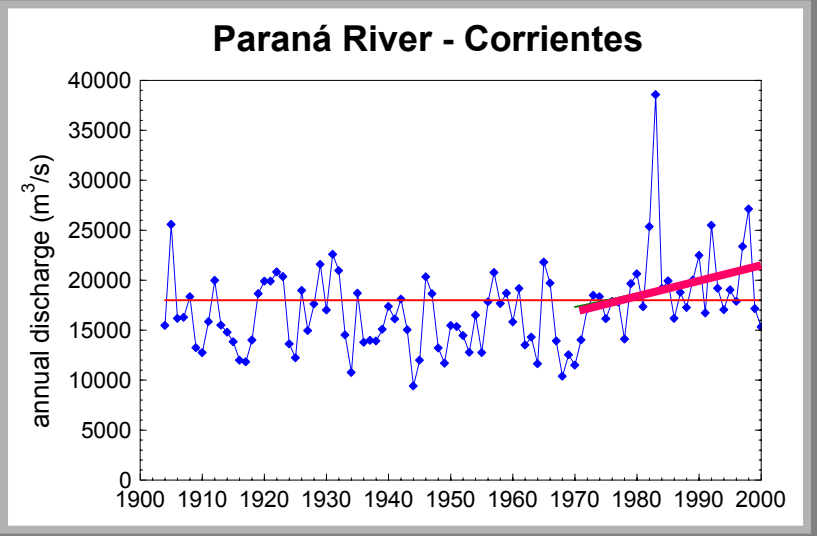
5: Middle Paraná

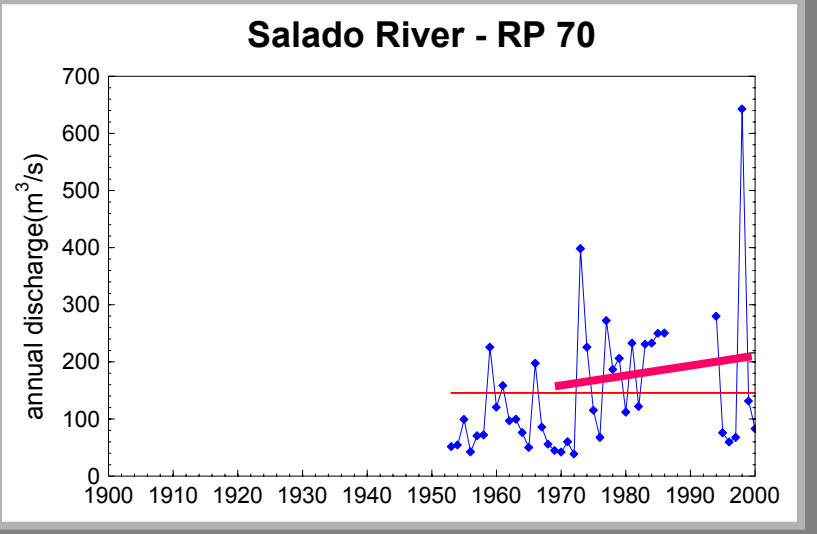
6: Upper Uruguay

Changes in river discharges
Río de la Plata basin





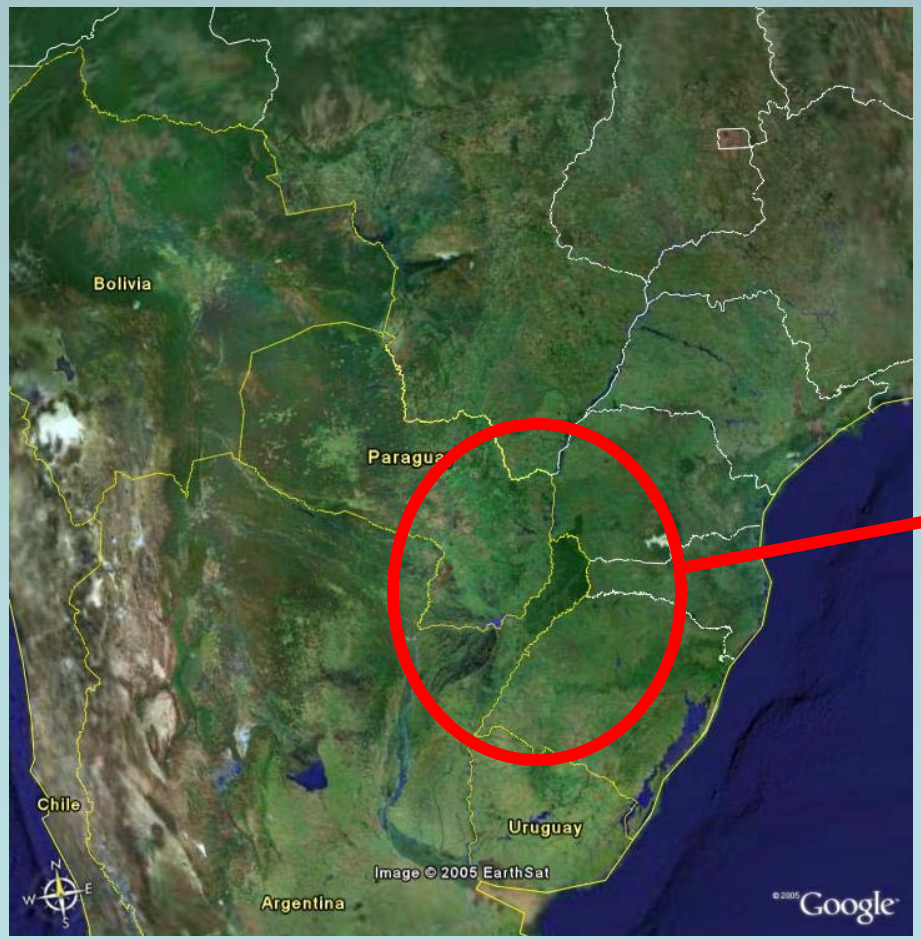


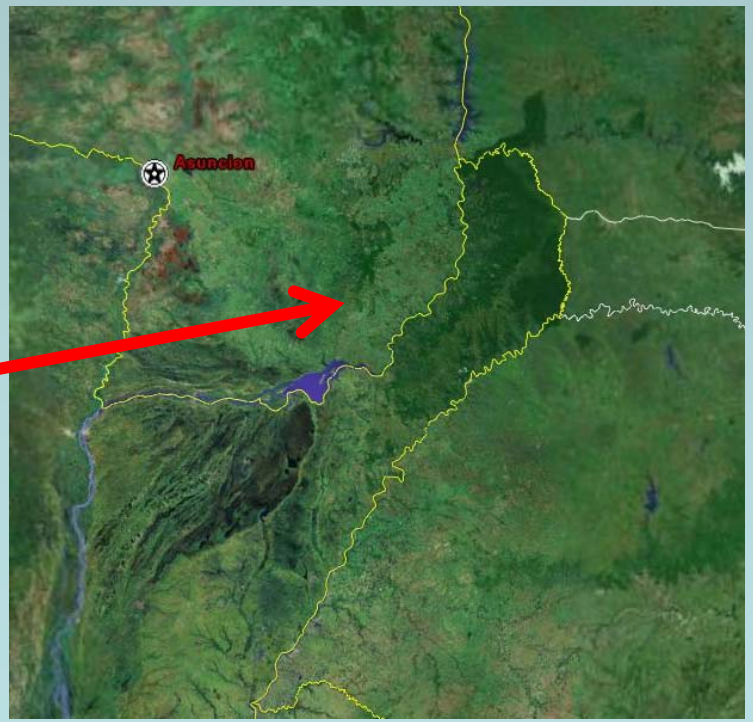


- *Are the river flow changes resulting from precipitation changes or from the land use change?*

Land surface effects

Land cover / Land use





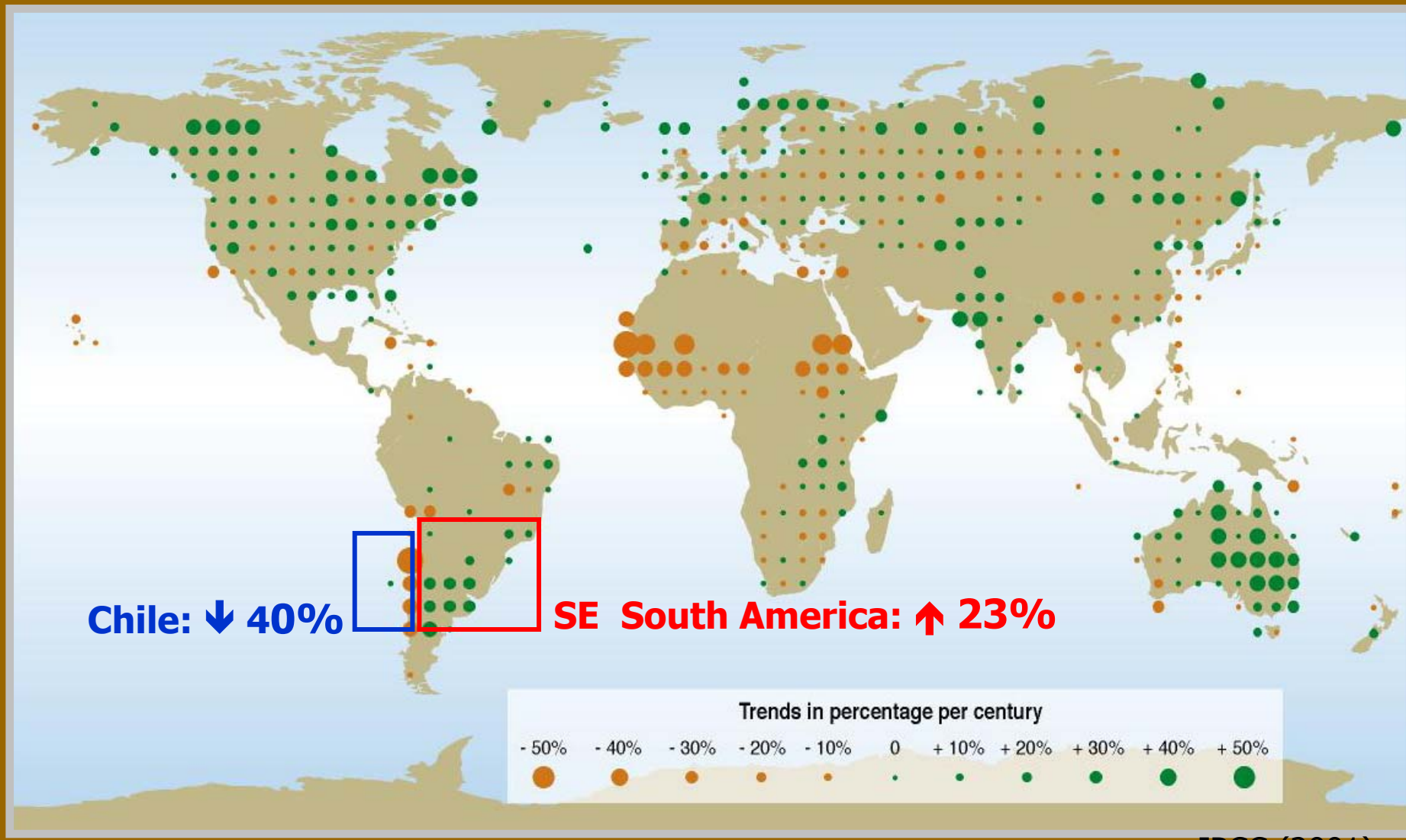
¿ How much of the change should be attributed to precipitation change and how much to land use change?

AMPLIFICATION OF THE PRECIPITATION VARIABILITY IN THE RIVER FLOWS

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

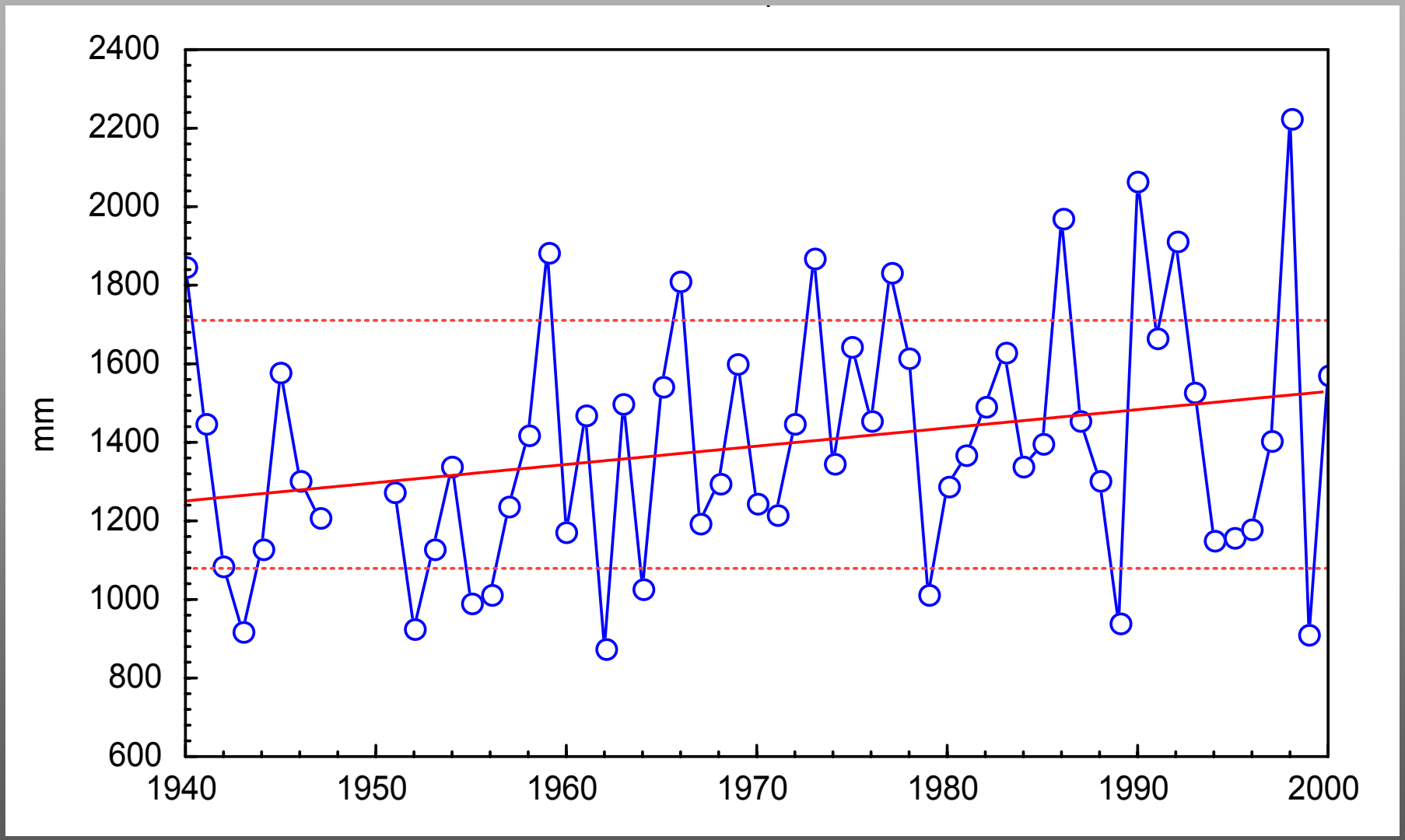
PRECIPITATION CHANGES

Annual precipitation trends 1900-2000

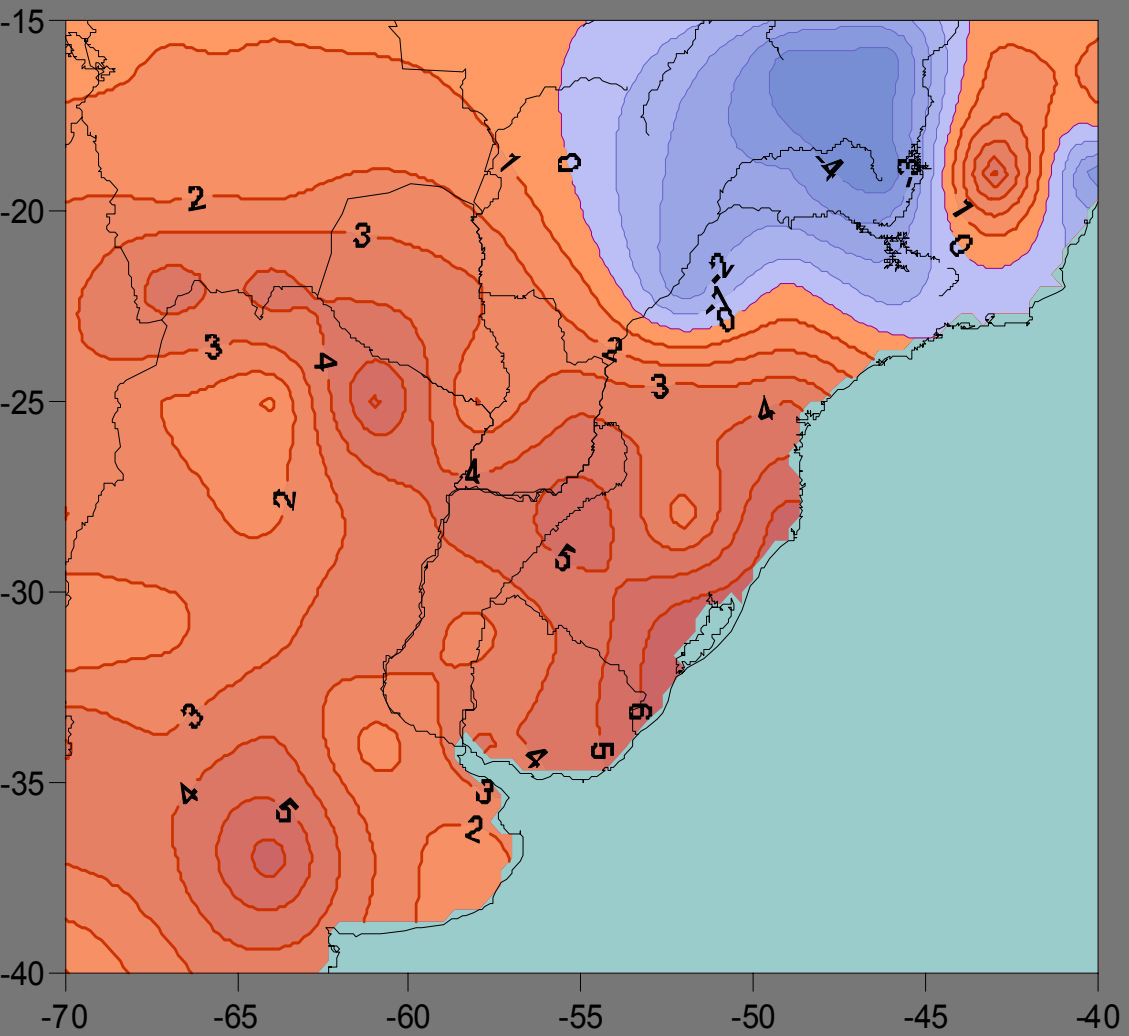


IPCC (2001)

Monte Caseros: Annual Precipitation



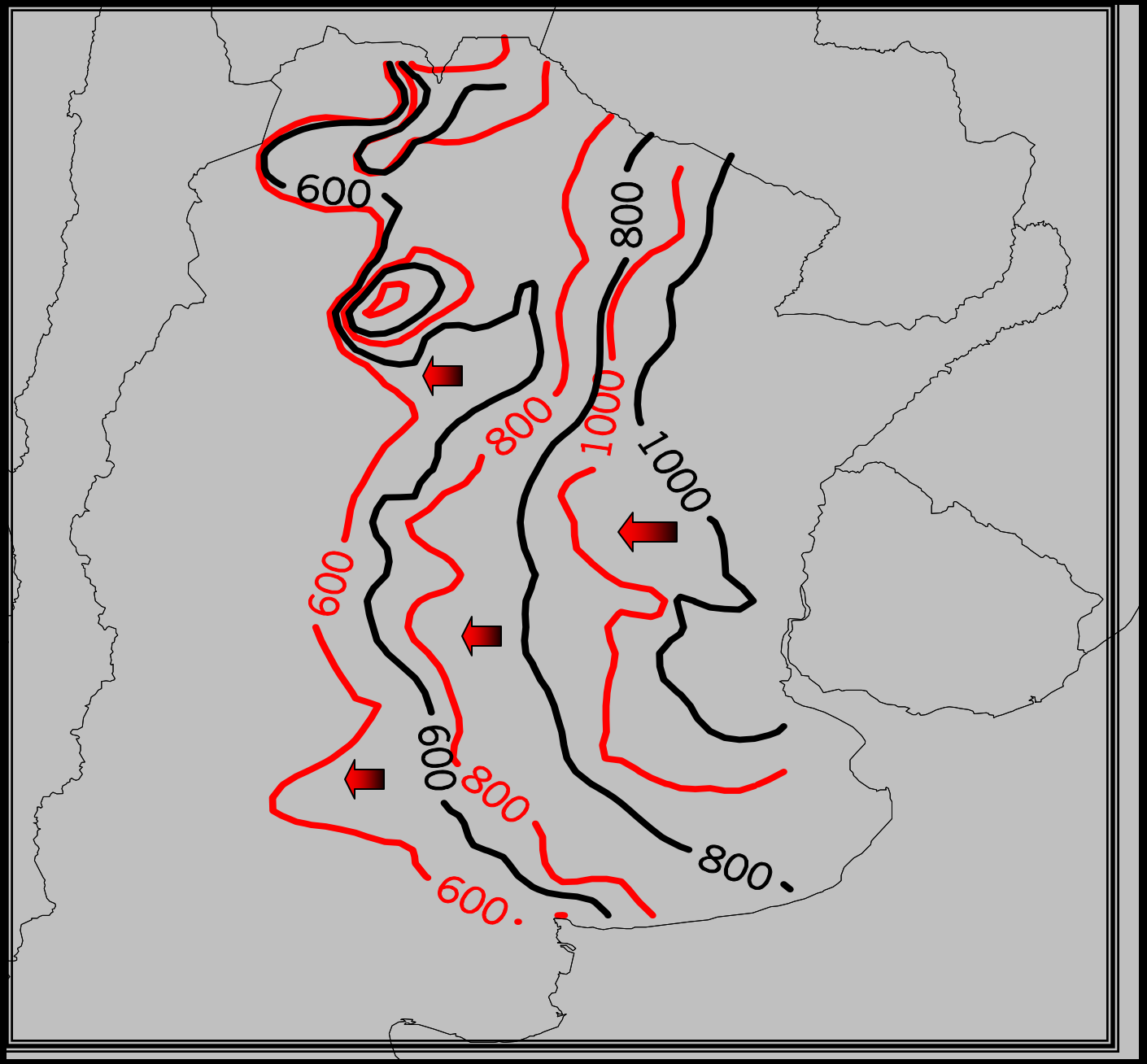
Annual rainfall trends (mm/year): 1960-2000



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

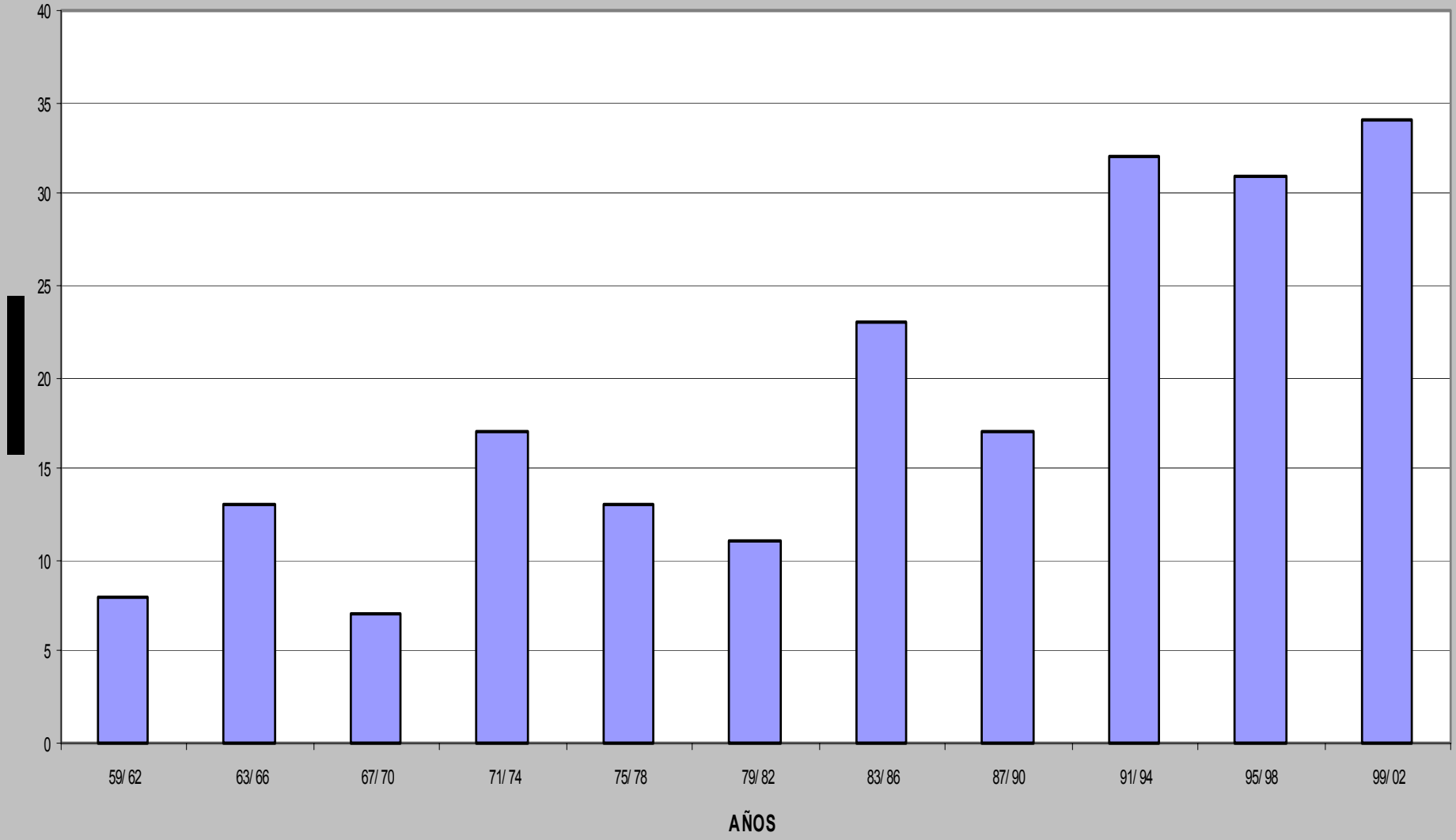


Isohyets in mm

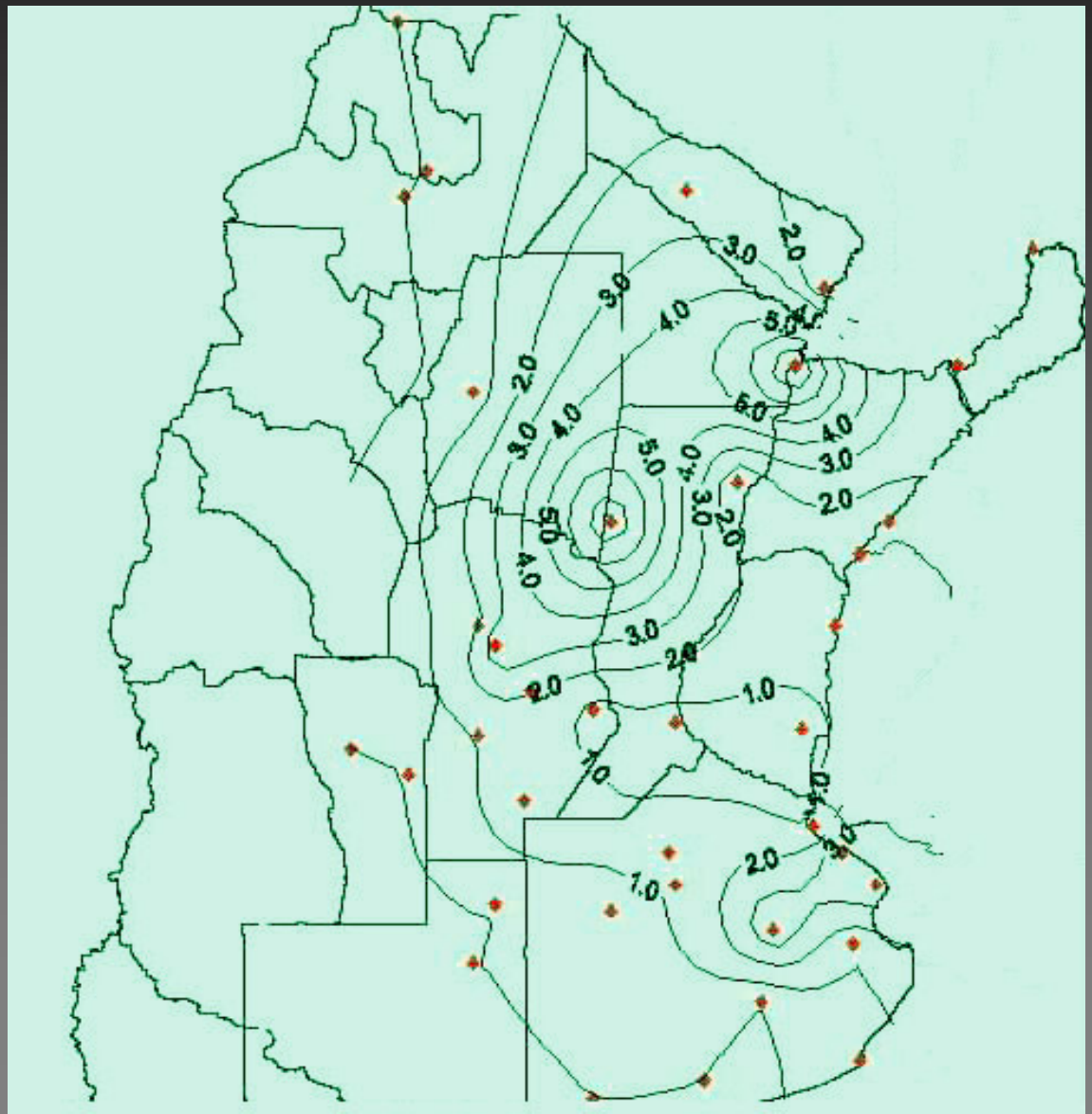
black : 1950-1969
Red: 1980-1999

Extreme events

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



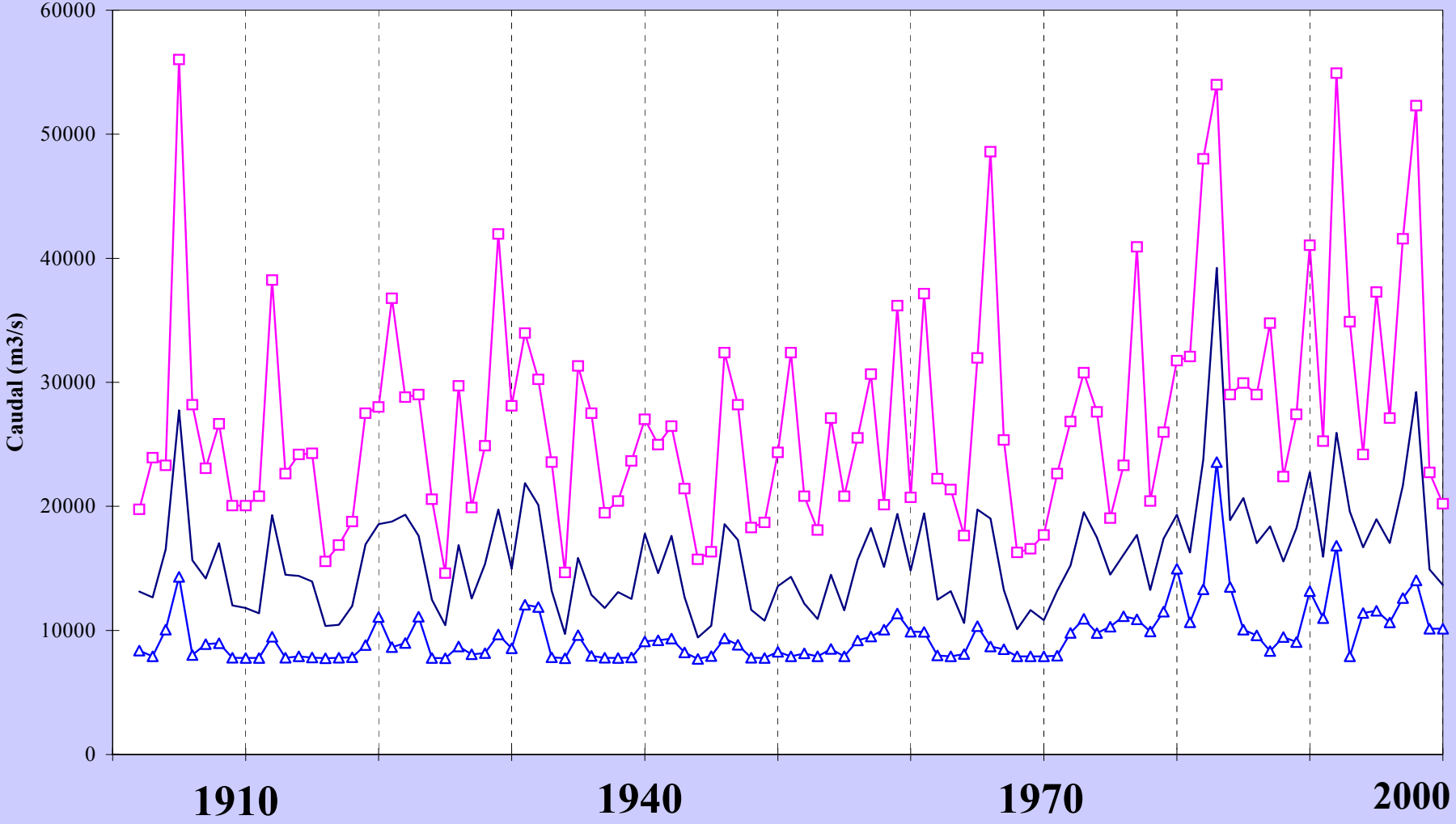
Precipitation over 150 mm: rate between the annual frequency of the 1983/2002 and the 1959/1978 periods



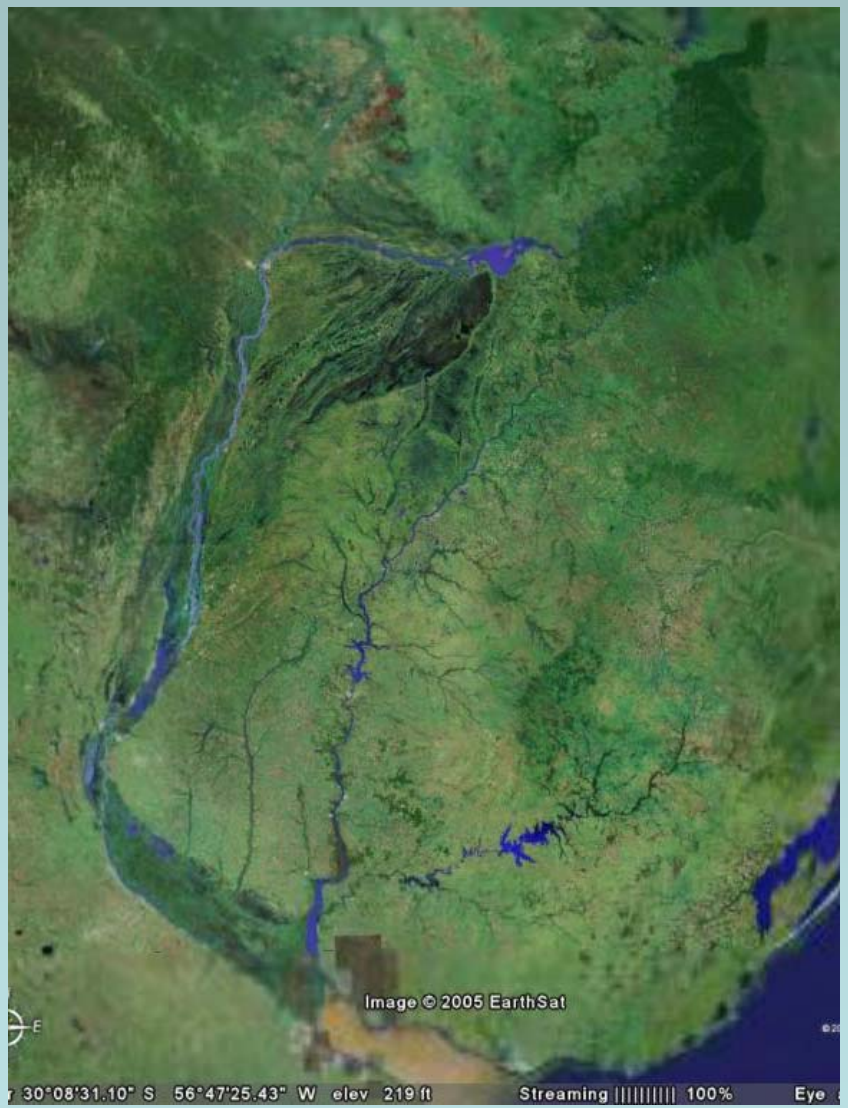
Impacts in the Hydrology

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

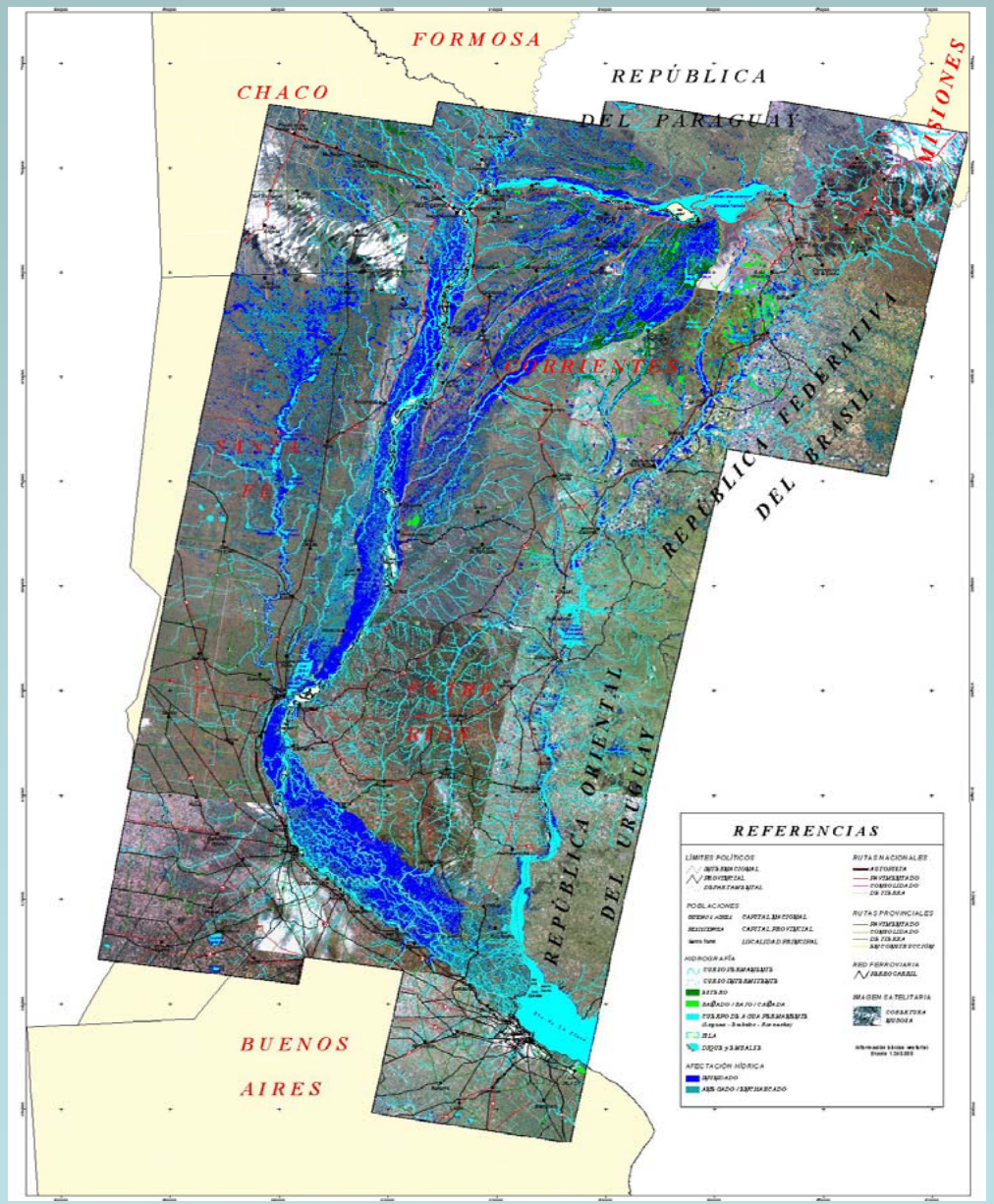
period 1902-2000



Normal conditions

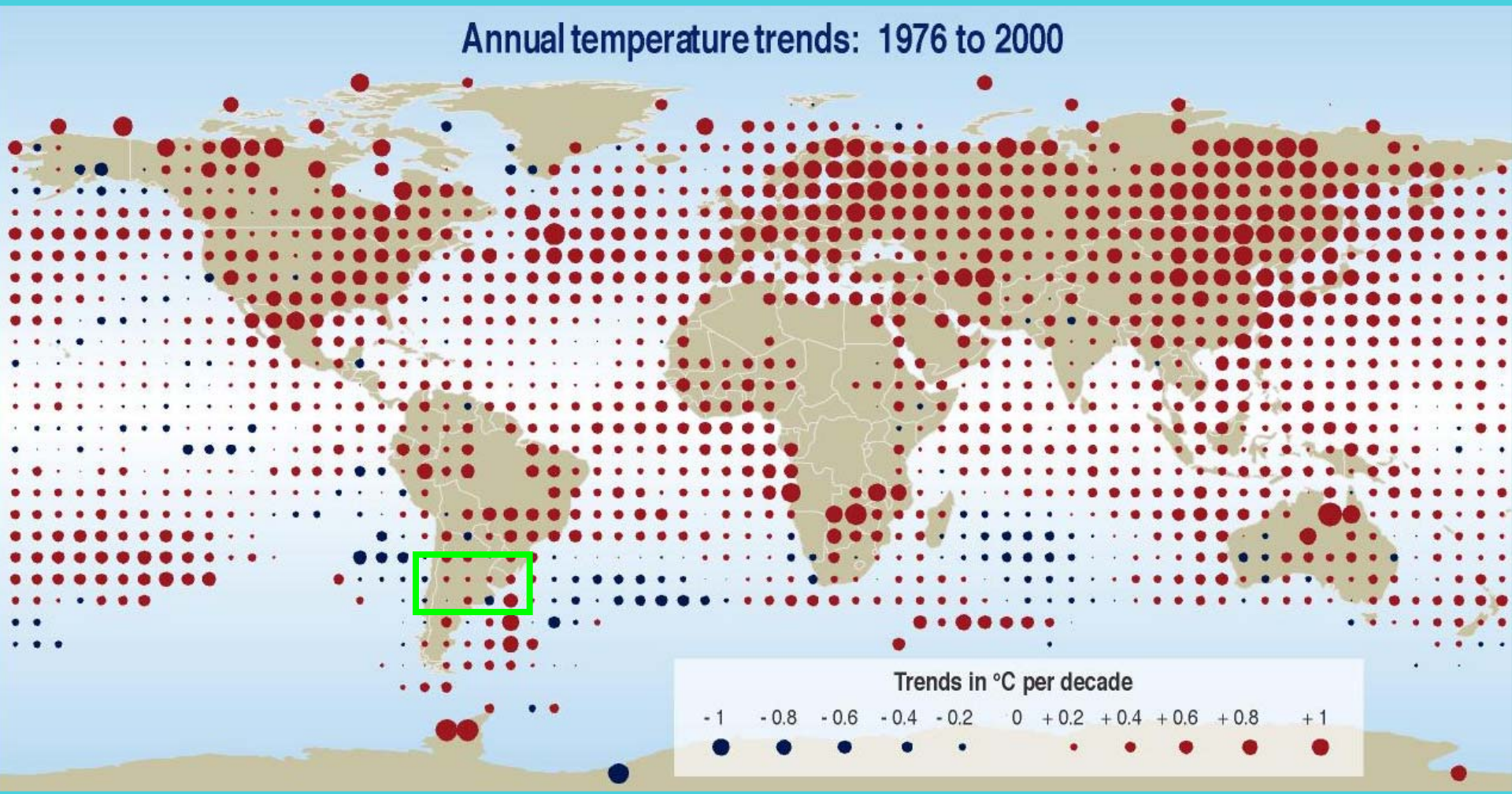


1997/98 Flood of the Paraná River (Satellite images from CONAE)



TEMPERATURE

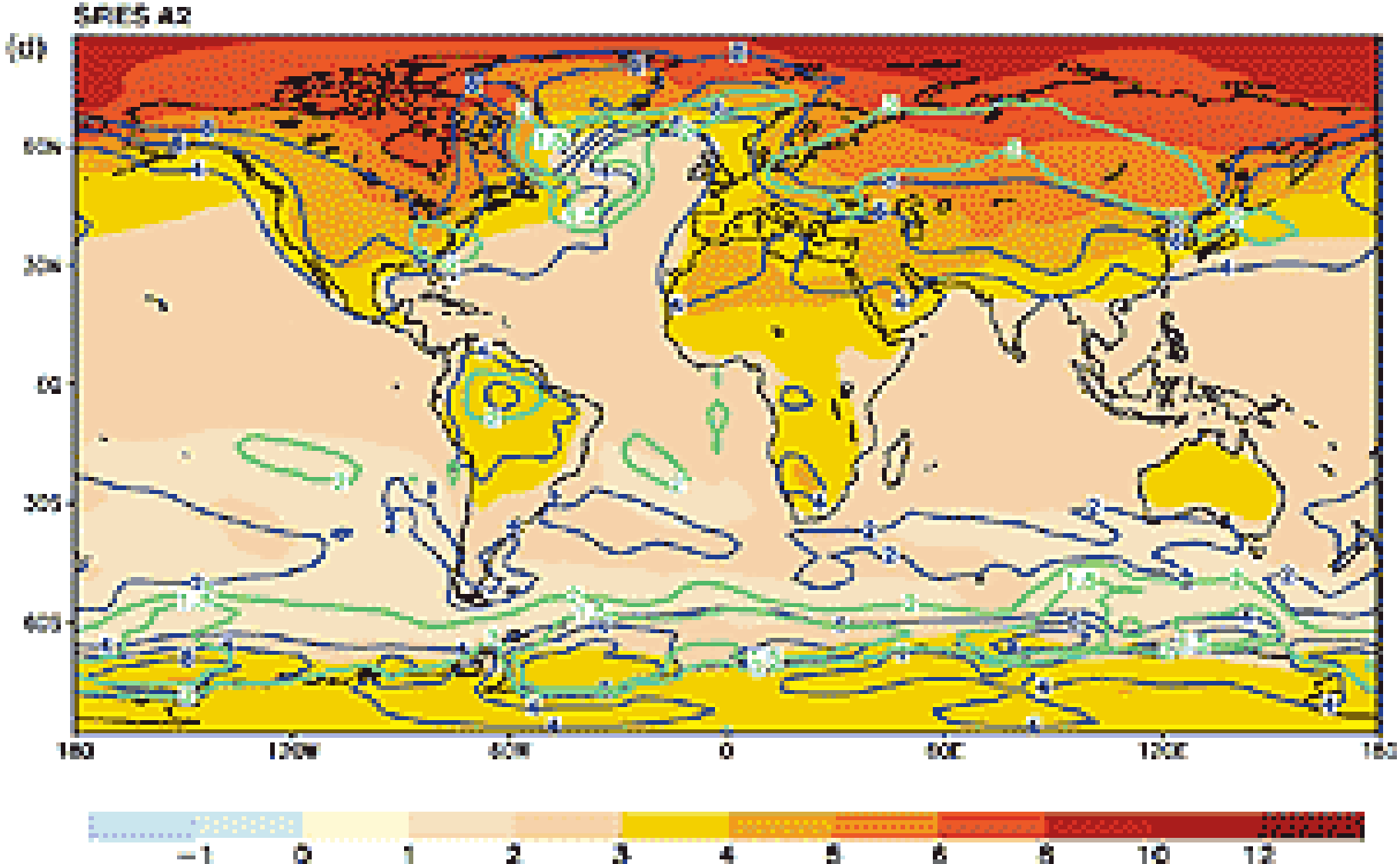
Global annual temperature trends: 1976-2000



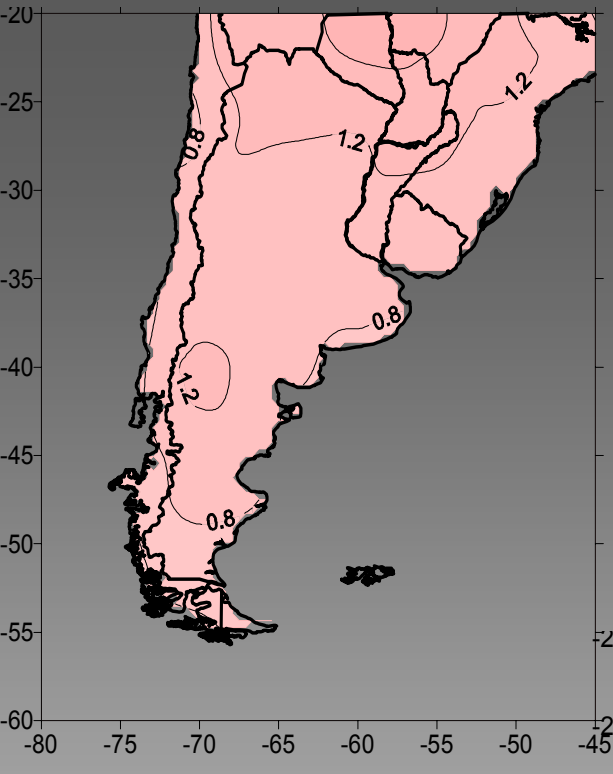
IPCC (2001)

CLIMATE CHANGE SCENARIOS

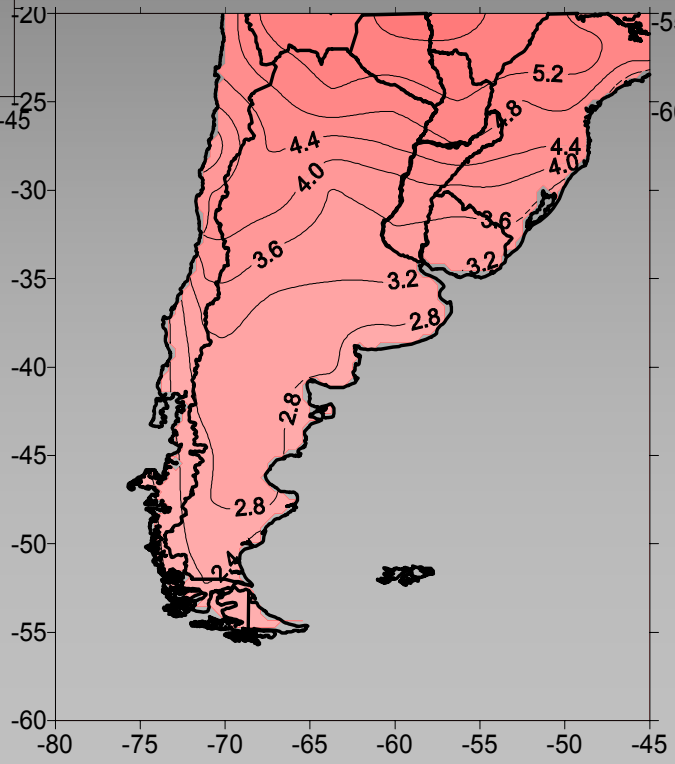
Average of various models: Mean annual temperature difference 2071/ 2100 minus 1961/ 1990 (colors), range (blue lines) (in °C). (IPCC, 2001)



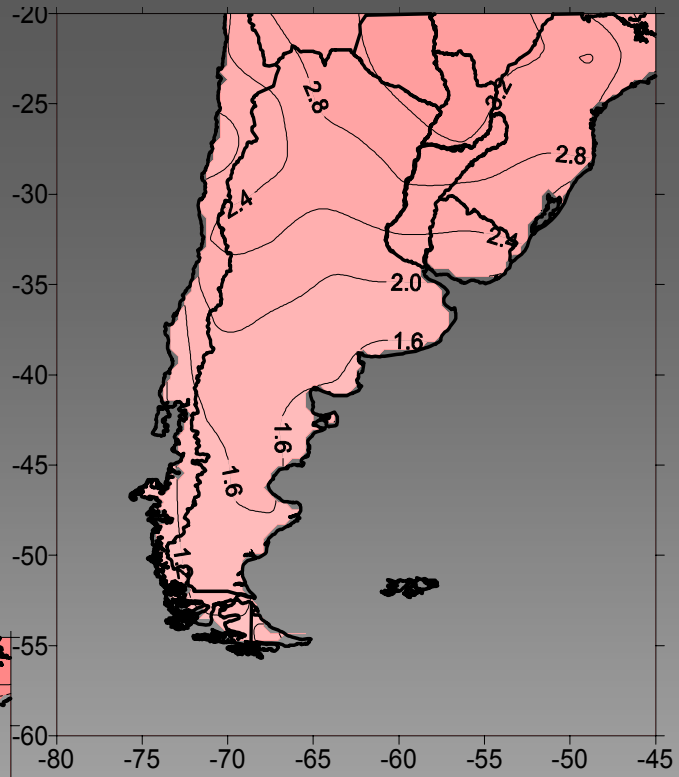
HADCM3 model Scenario A2 : Difference of temperature (°K) with present (1961-90)



2020/2030



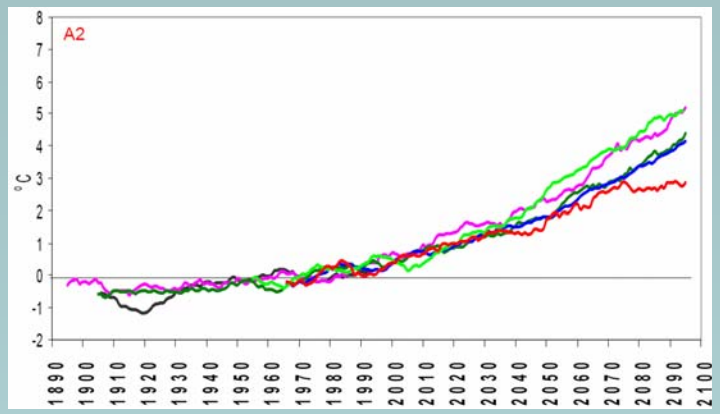
2070/2080

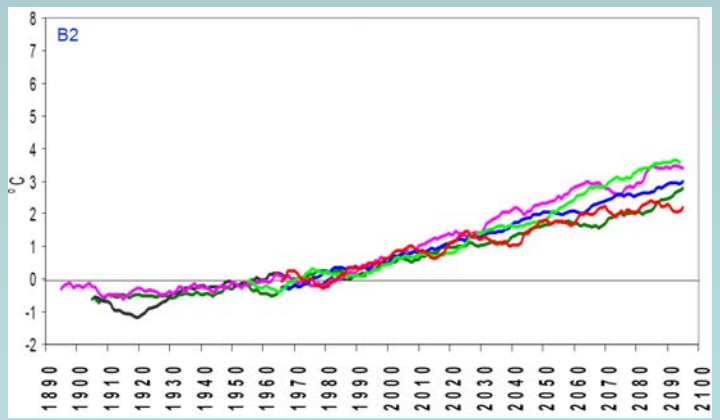


2050/2060

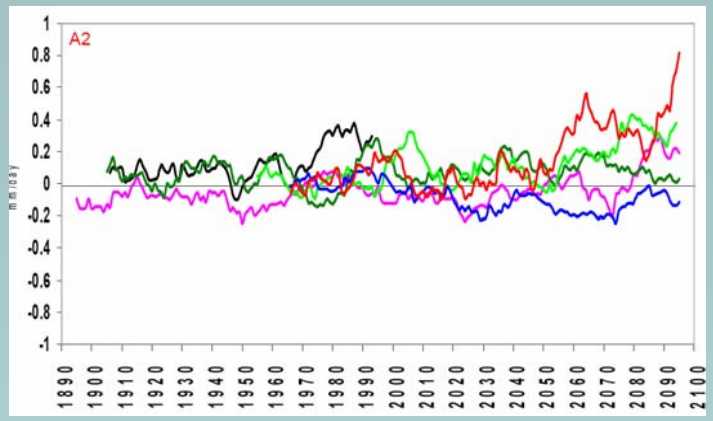
LPB temperature and precipitation scenarios for 2050-2080

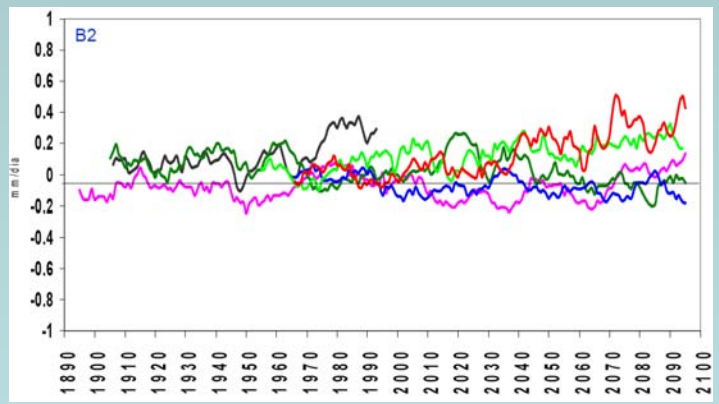
Temperature





Precipitation





In the La Plata Basin, temperatures will be higher and rainfall will tend to be above normal or not as projected by all IPCC models, especially for the time slices between 2050 and 2080*. Courtesy of Marengo*

Hydrologic modeling

Discharge Scenarios: Plata Basin

	Present discharge m^3/s	+ 2° C Estimated m^3/s	+ 2° C Percent change	+ 5° C Estimated m^3/s	+ 5° C Percent change
Pantanal	1,202	760	-37	329	-73
Paraguay	2,435	1,512	-34	691	-72
Upper Paraná	6,614	5,652	-15	4,230	-36
Middle Paraná	10,435	7,993	-23	4,541	-56
Upper Uruguay	5,329	4,293	-19	2,836	-47
Total	26,012	20,311	-21	12,627	-51

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

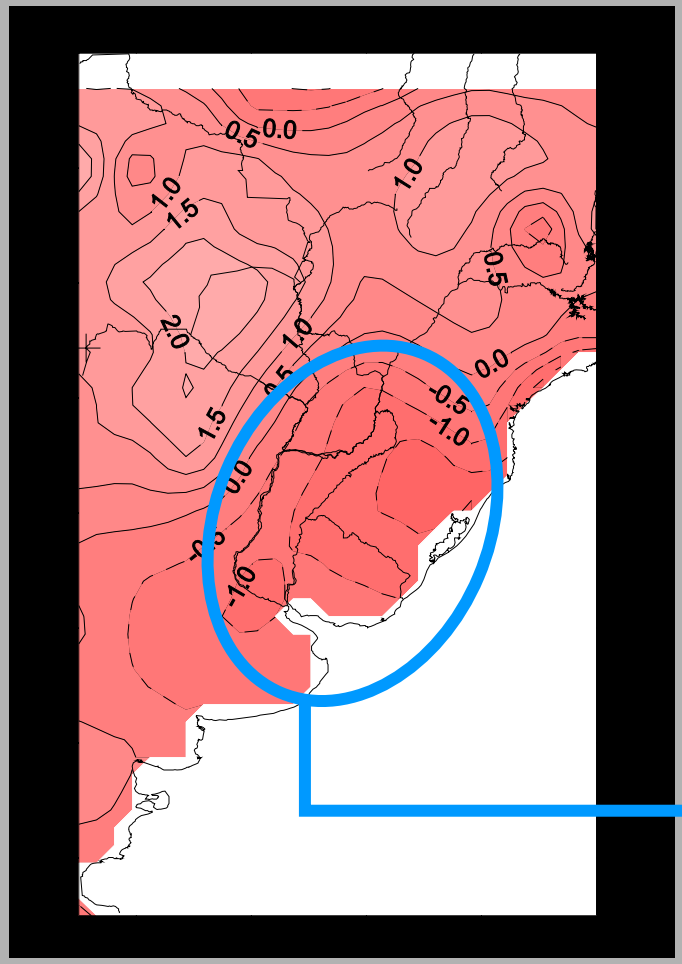
RELATIVELY MODEST CHANGES IN PRECIPITATION OR IN EVAPORATION MAY LEAD TO GREAT PERCENT CHANGES IN THE RUNOFF

IN THE CONTEXT OF CLIMATE CHANGE THIS MEANS THAT THE

HIDROPOWER (BRASIL 90 %)
NAVEGATION
WATER SUPPY
ARE HIGHLY VULNERABLE

THE BEST GLOBAL CLIMATE MODELS DO NOT REPRODUCE THE MAIN FEATURES OF PRECIPITATION AND TEMPERATURE OVER THE PLATA BASIN

Verification of rainfall fields



Difference between observed annual precipitation and simulated by the HADCM3 model (mm/day)

~ 35 % lower than observed

PART OF THE PROJECTED CLIMATE CHANGE IS UNAVOIDABLE

IT IS ALREADY TAKEN PLACE

REGIONAL CLIMATE PROJECTIONS HAVE LARGE UNCERTAINTIES

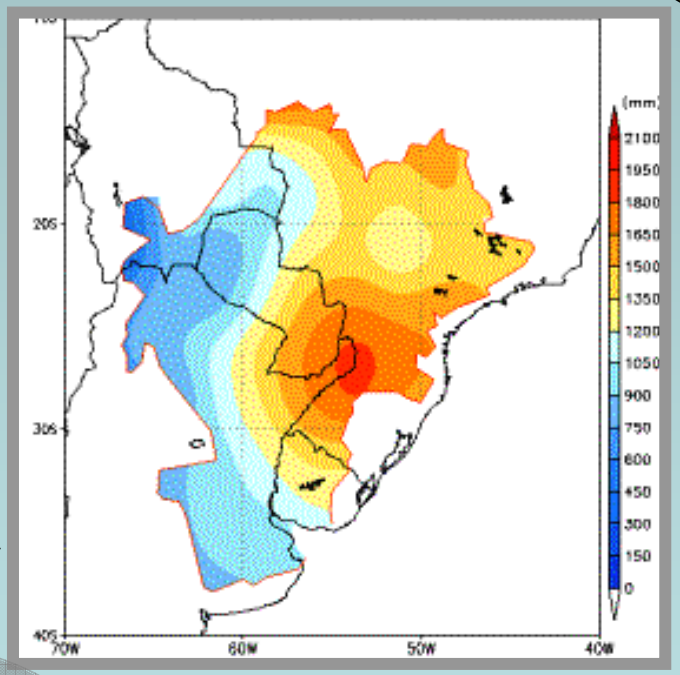
SOCIETY NEEDS BETTER PROJECTIONS TO START ADAPTATION

GOVERMENTS NEED BETTER PROJECTIONS TO ASSESS THEIR NATIONAL INTERESTS

La Plata Basin Priority areas

Land surface effects

Extreme events



Variability and trends

Hydro-climate Prediction

Climate change scenarios

Planned activities

- Climate change scenarios, vulnerability and adaptation

. Land use change

. Improvement of the diagnostic and prediction system (weather and climate)

- Improvement of the diagnostic and prediction system (hydrology)

- Enhanced monitoring

- Field experiment


Thank you!...