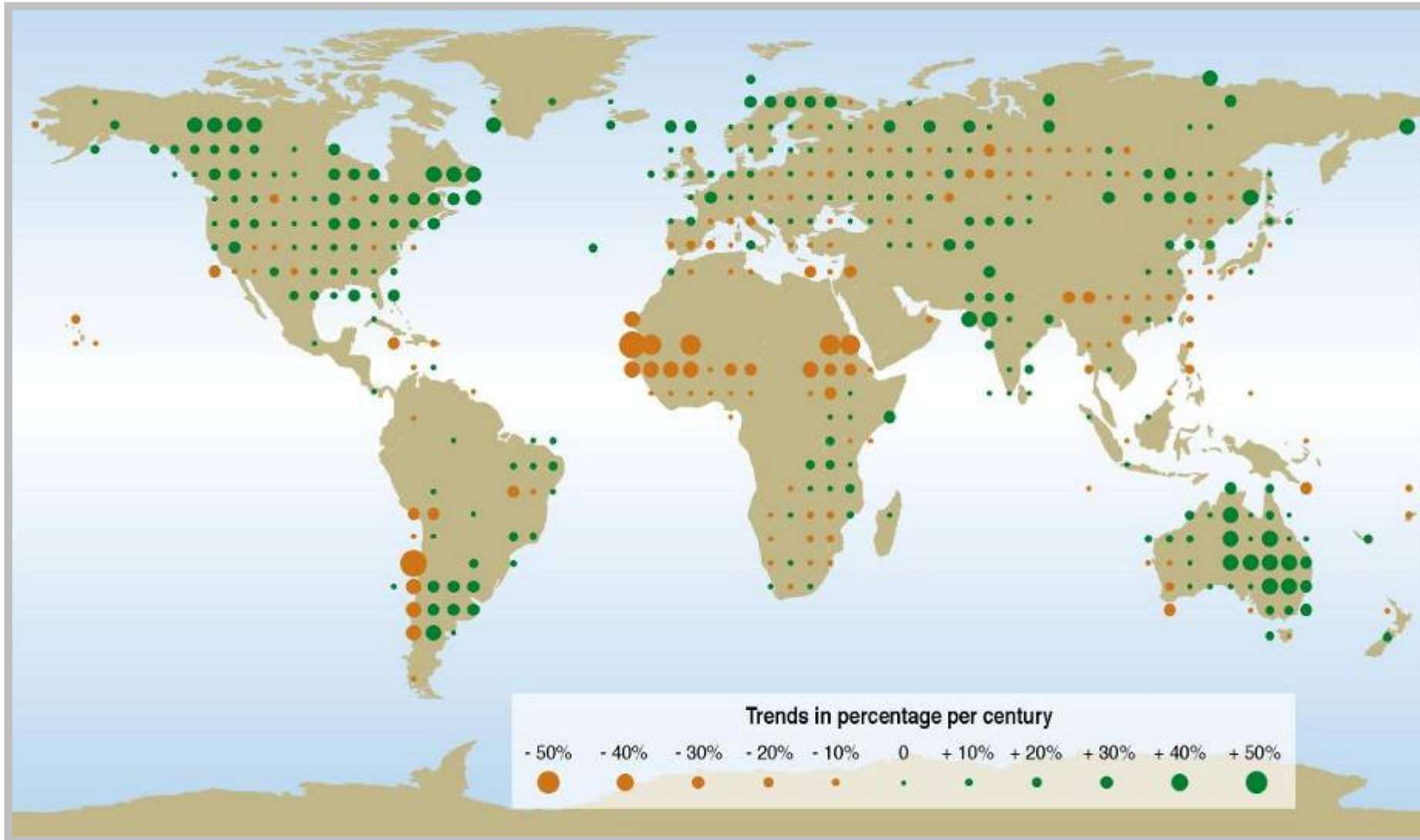


# **Climatic Change and threats to power supply**

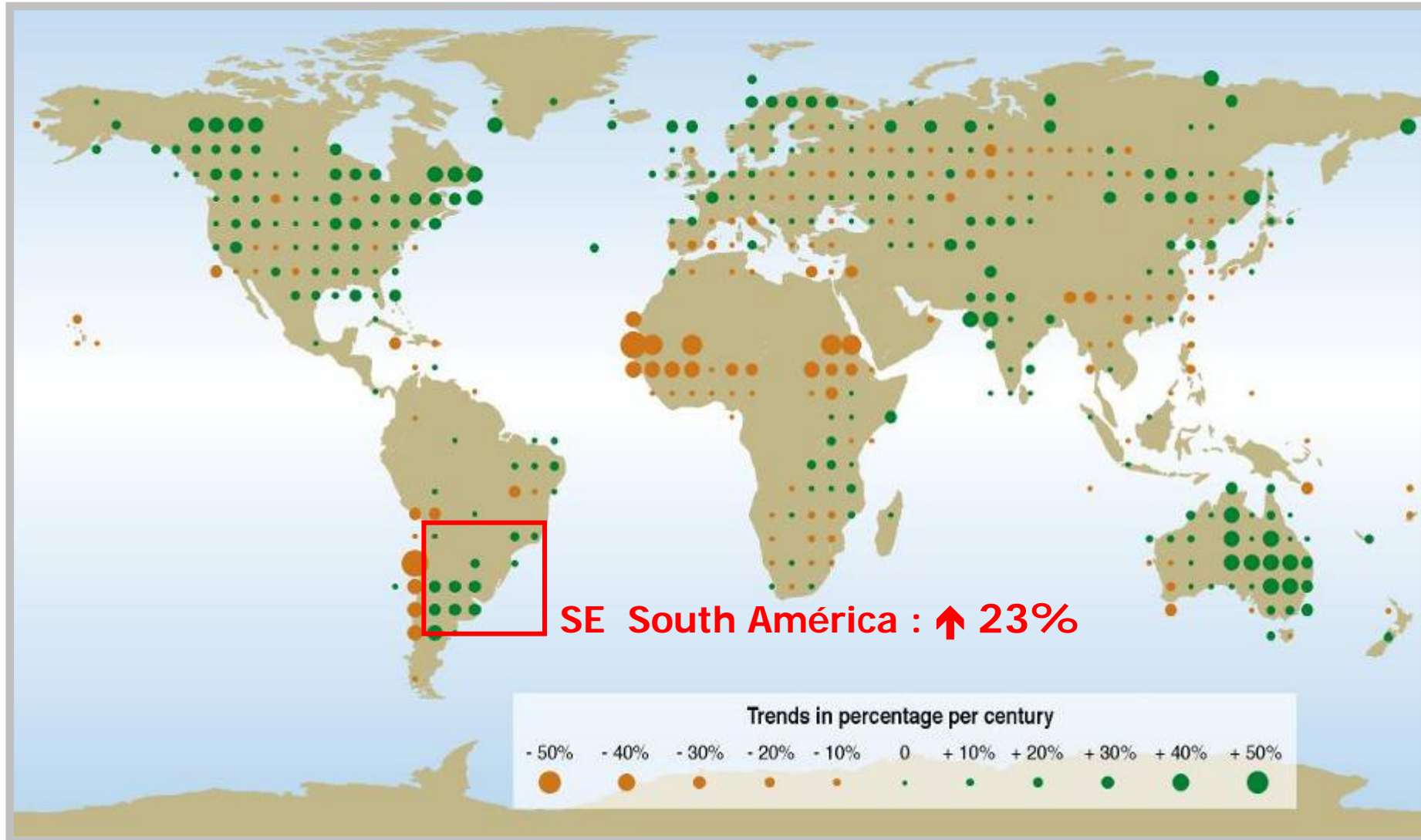
## **III Conferência Regional sobre Mudanças Climáticas: América do Sul**

*São Paulo,  
5 de novembro 2007  
Vicente Barros*

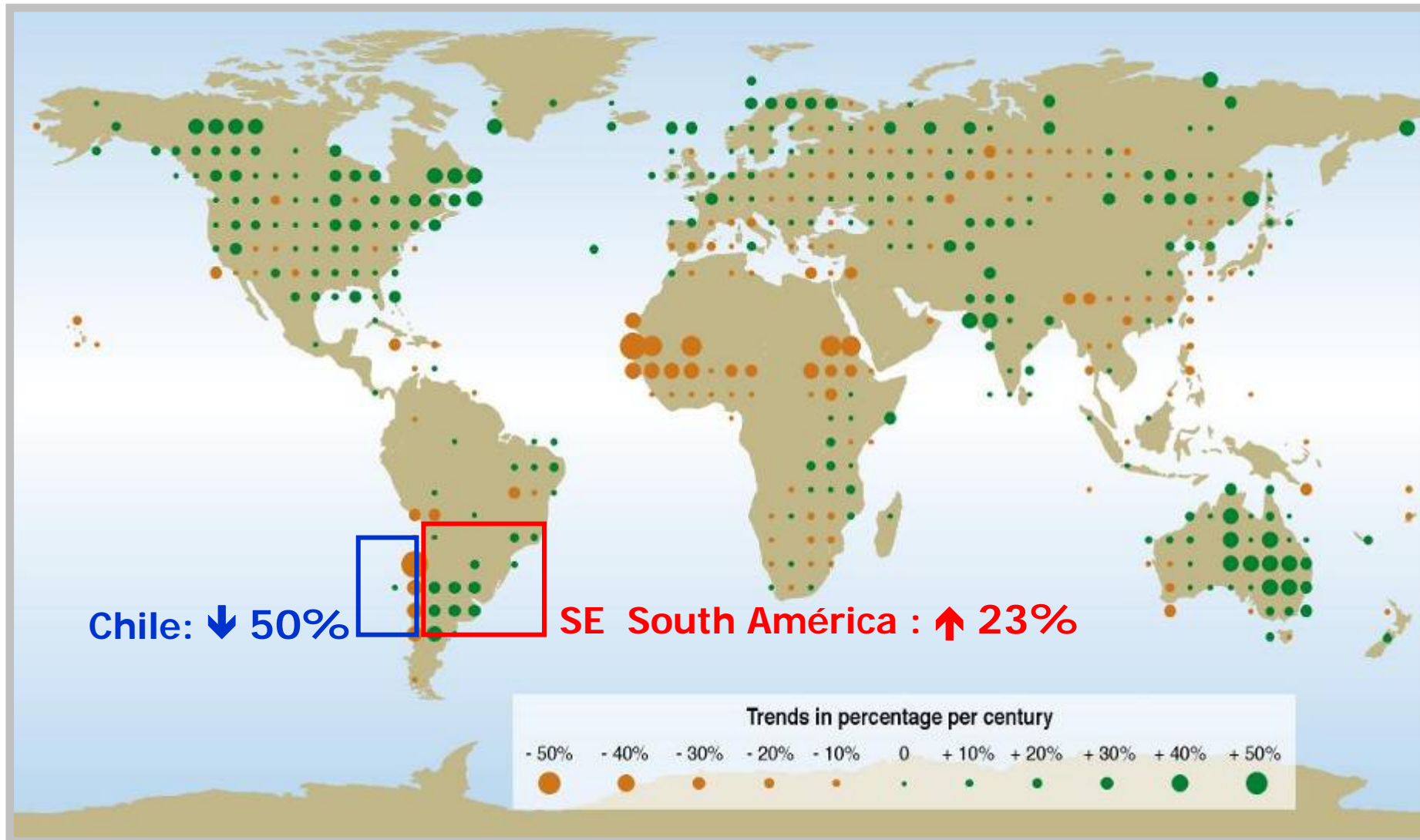
# Annual precipitation trends 1900-2000



# Annual precipitation trends 1900-2000



# Annual precipitation trends 1900-2000

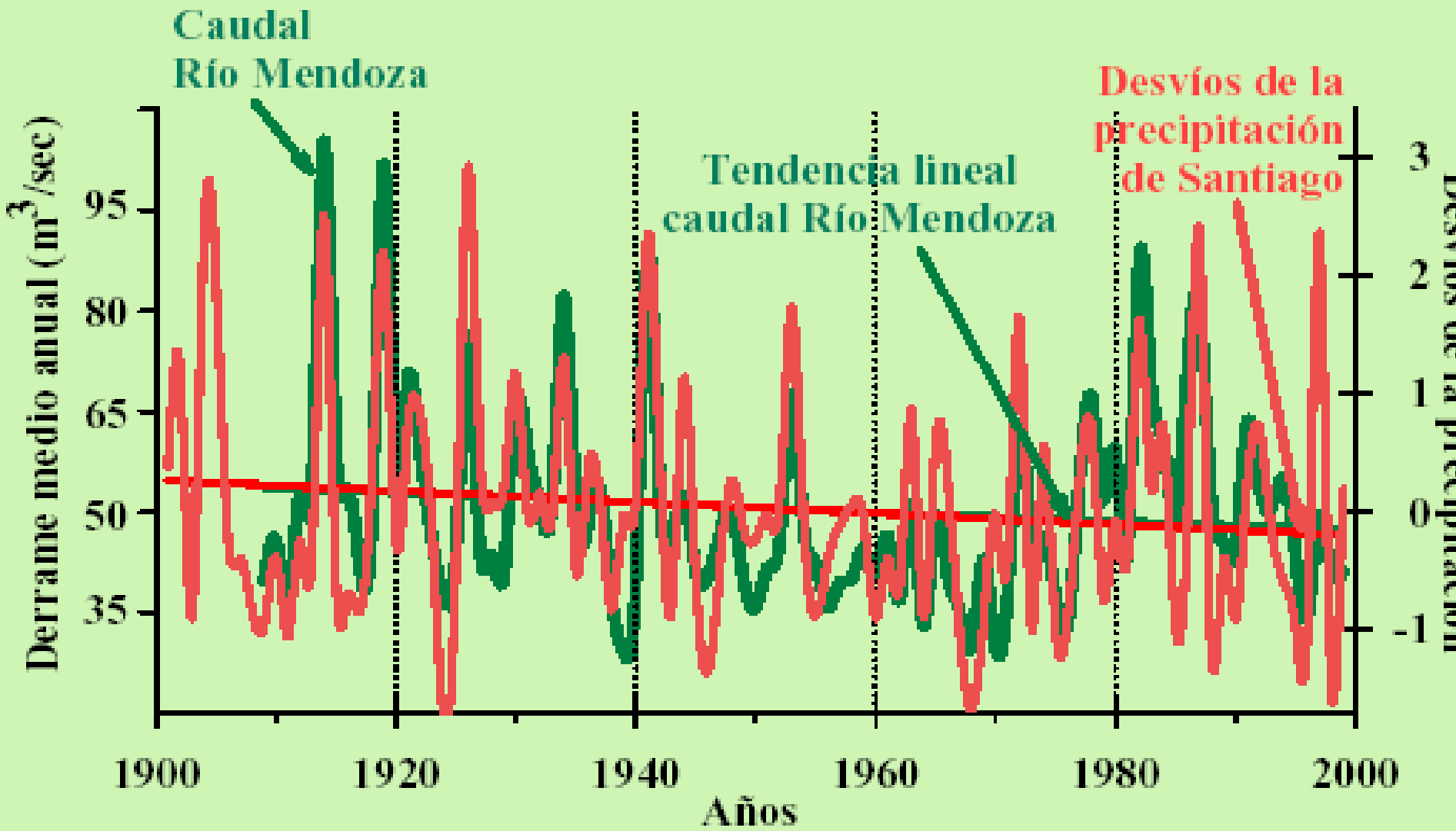


# Argentine Hydroelectric Power (GWH)

	<b>Plata</b>	<b>Andes origin Atlantic and Pacific</b>	<b>Inland</b>	<b>Total</b>
<b>Present</b>	<b>10.650</b>	<b>21.980</b>	<b>545</b>	<b>31.175</b>
<b>Under construction</b>		<b>700</b>		<b>700</b>
<b>Planned</b>	<b>4.500</b>	<b>1.385</b>		<b>5.885</b>
<b>Subtotal</b>	<b>15.150</b>	<b>22.065</b>	<b>545</b>	<b>37.760</b>
<b>Additional inventory</b>	<b>59.665</b>	<b>36.200</b>	<b>390</b>	<b>96.255</b>
<b>Total</b>	<b>74.815</b>	<b>58.265</b>	<b>935</b>	<b>134.015</b>

Source: Proyecto Energético IAE. September/october 2007

# THE RIVERS ORIGINATED IN THE ANDES

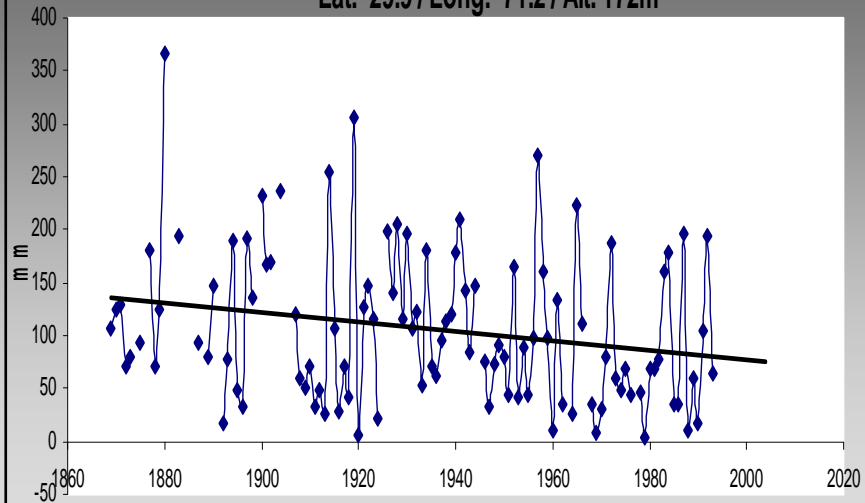


**Annual discharge of the Mendoza River and Santiago de Chile precipitation**

From Boninsegan and Villaba 2006

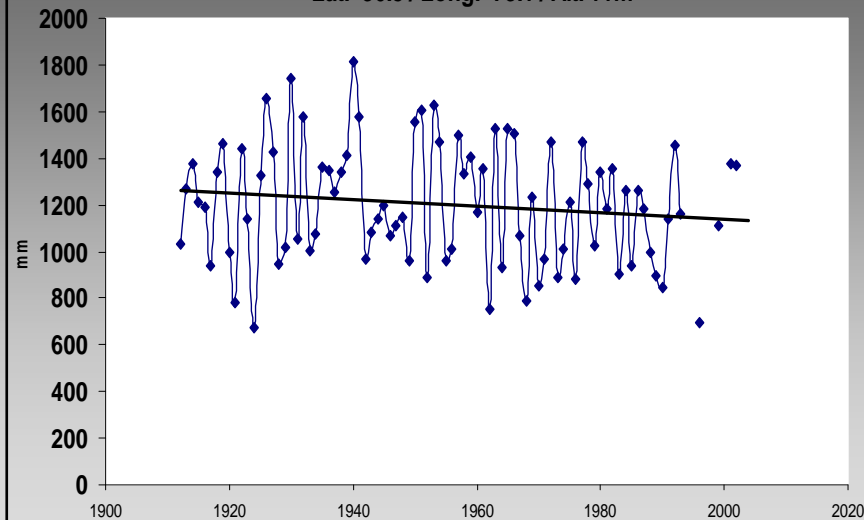
### PRECIPITACIÓN ANUAL en LA SERENA

Lat. -29.9 / Long. -71.2 / Alt. 172m



### PRECIPITACIÓN ANUAL en CONCEPCIÓN

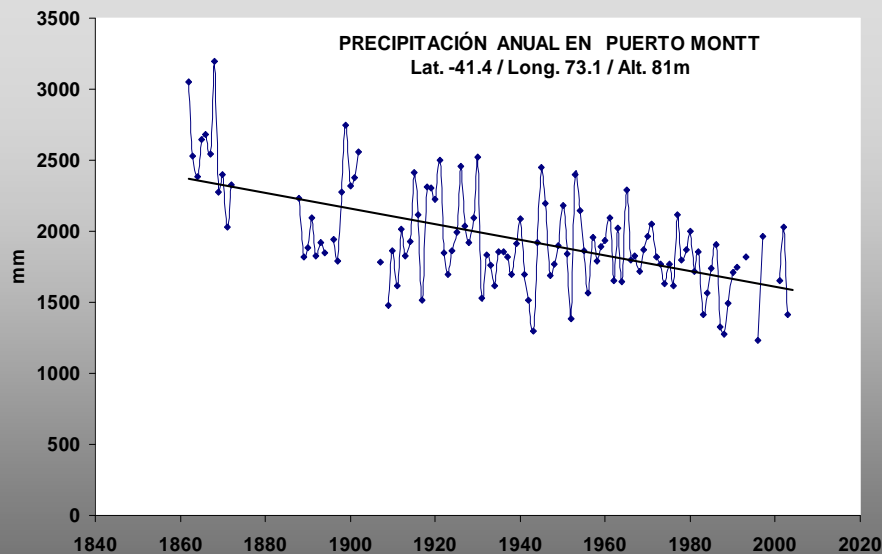
Lat. -36.8 / Long. -73.1 / Alt. 11m



# CENTRAL CHILE

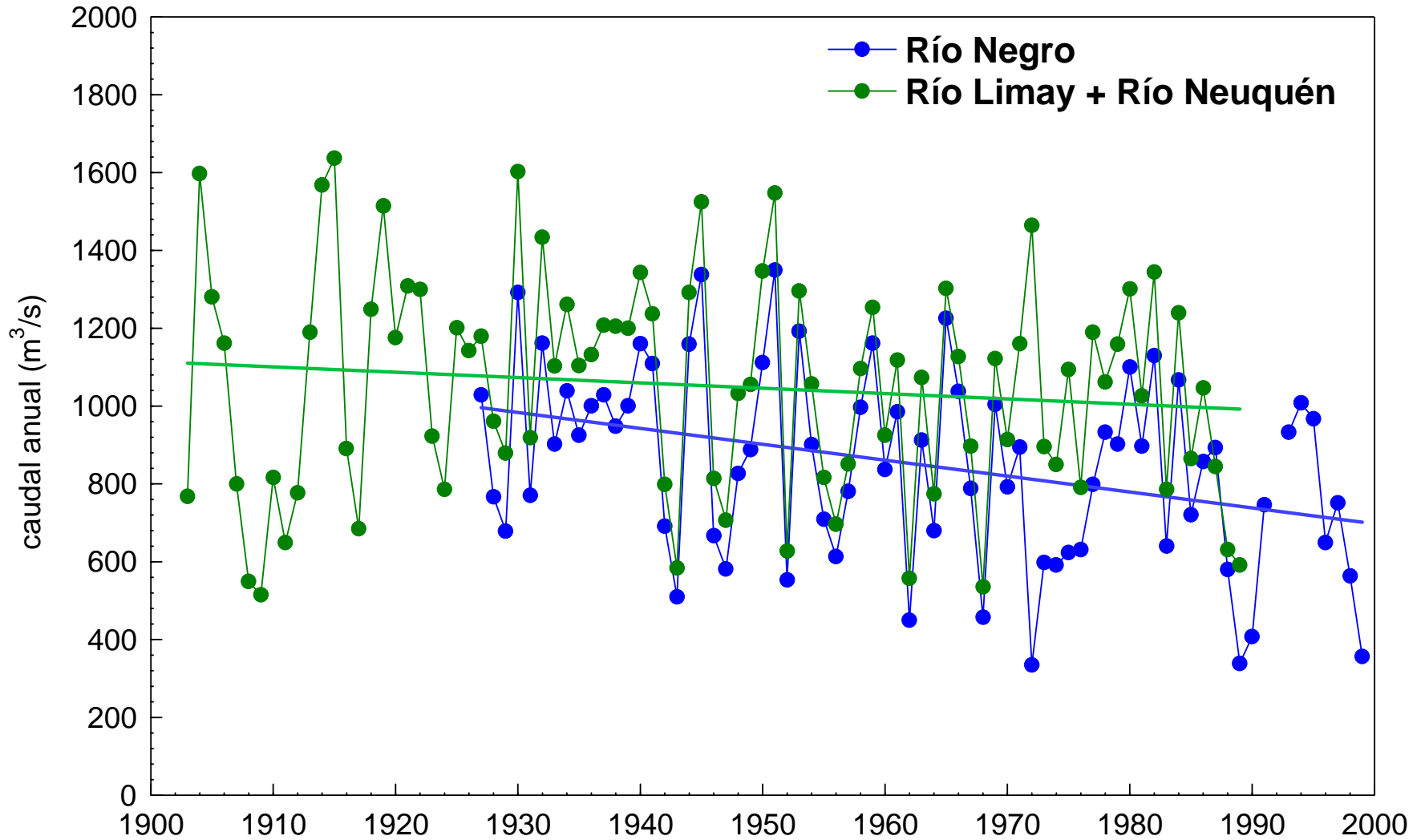
### PRECIPITACIÓN ANUAL EN PUERTO MONTT

Lat. -41.4 / Long. 73.1 / Alt. 81m



# COMAHUE RIVERS

## Río Negro vs. (Río Limay + Río Neuquén)

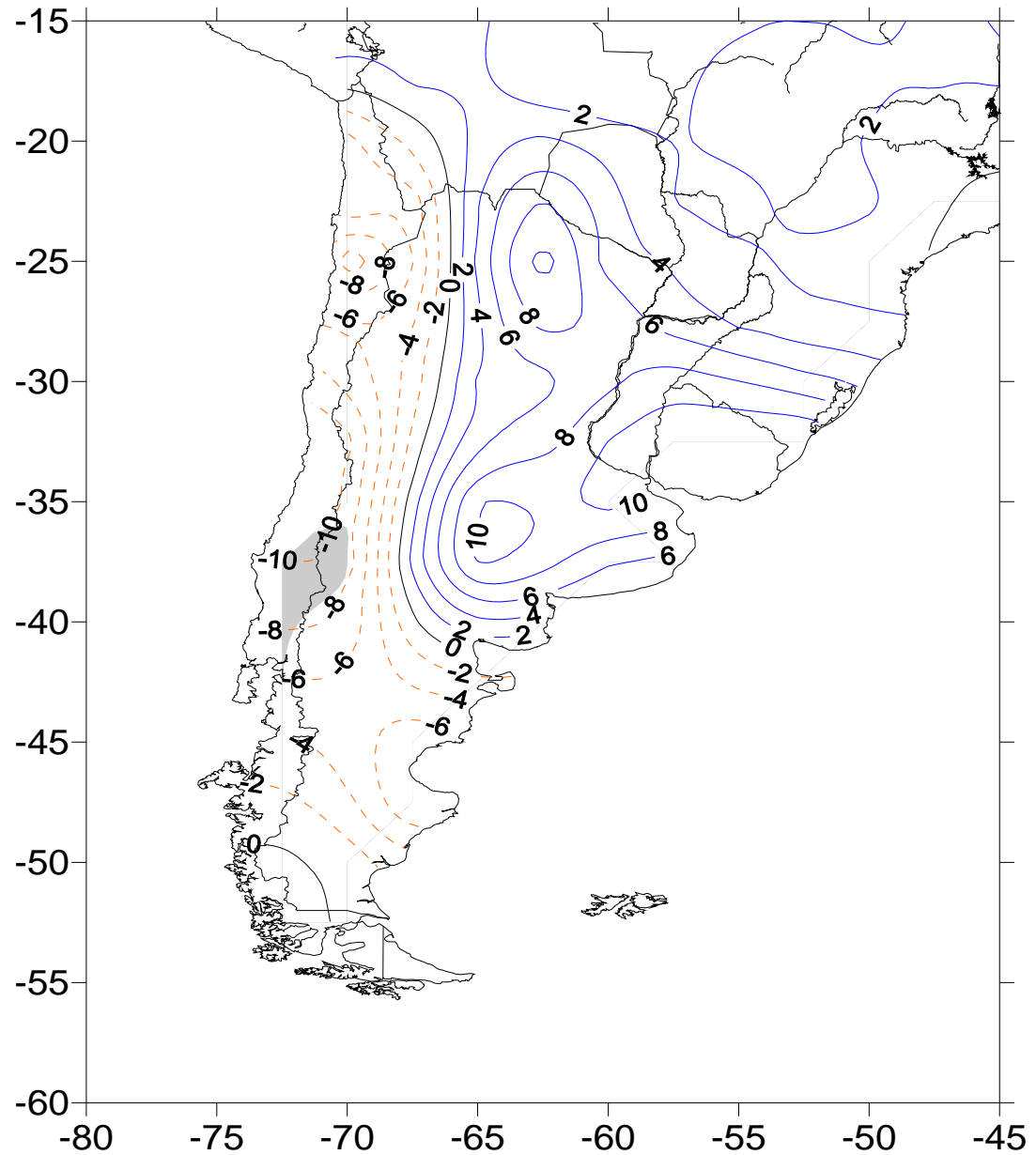


# COMAHUE POWER SUPPLY

**26 % of present power generation  
of the country**

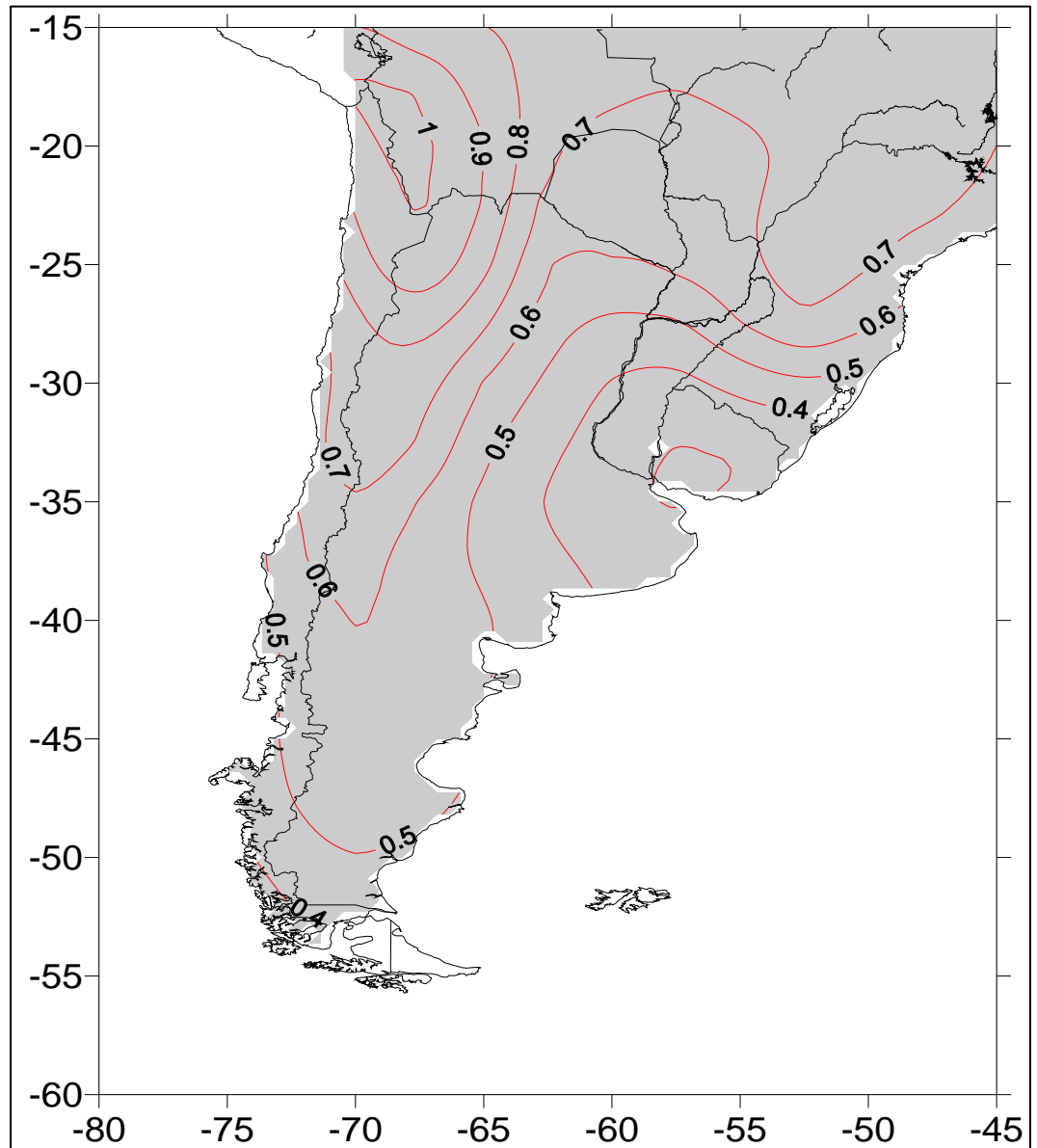
*It was already reduced 30 % with  
respect to the 1940 decade*

*Scenario of precipitation change (%) for 2020-40 respect to 1961-90 (Emission scenario Ab1). Ensemble of 14 MCGs In grey the areas with significant agreement between the 14 models*



From Barros and Camilloni 2007

*Scenario of  
Temperature  
change (°C) for  
2020-40 respect to  
1961-90  
(Emission  
scenario Ab1).  
Ensemble of 9  
MCGs In grey the  
areas with  
significant  
agreement  
between the 9  
models*

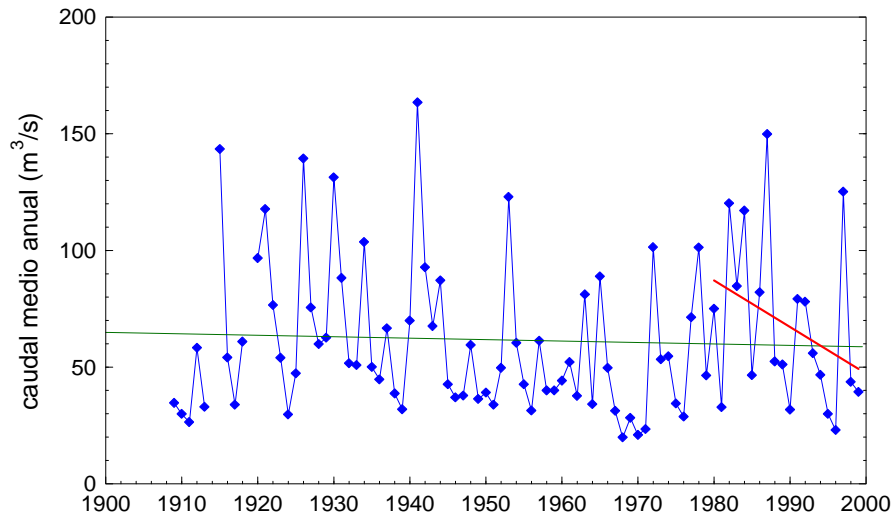


From Barros and Camilloni 2007

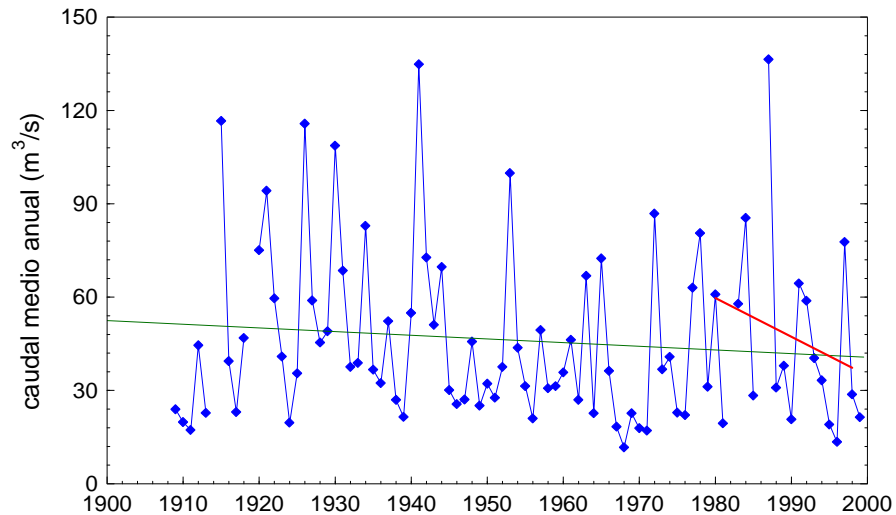
# The Central Andean Mountain foot Oasis

- *Less water offer*
- *Growing demand because of population and temperature increase*
- >>> losses of economic activity*

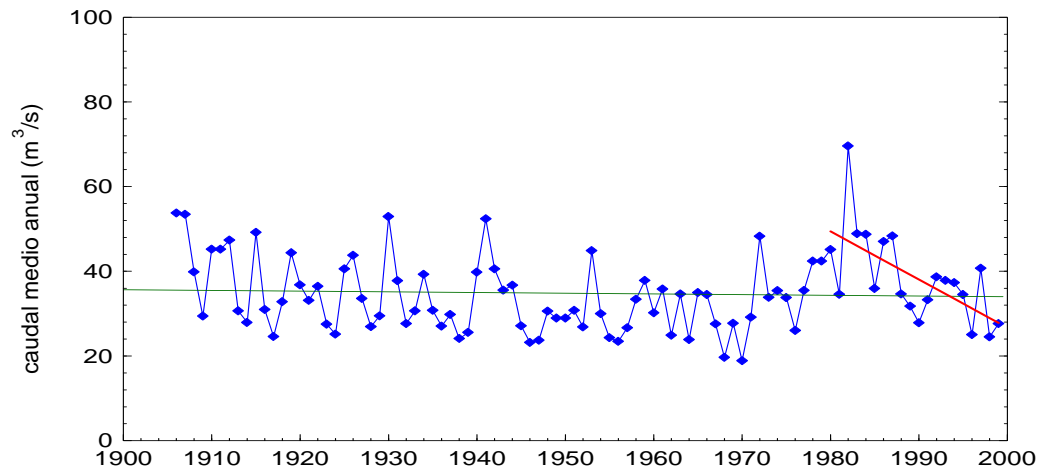
**Río San Juan - Km 47.3**



**Río de los Patos - La Plateada**

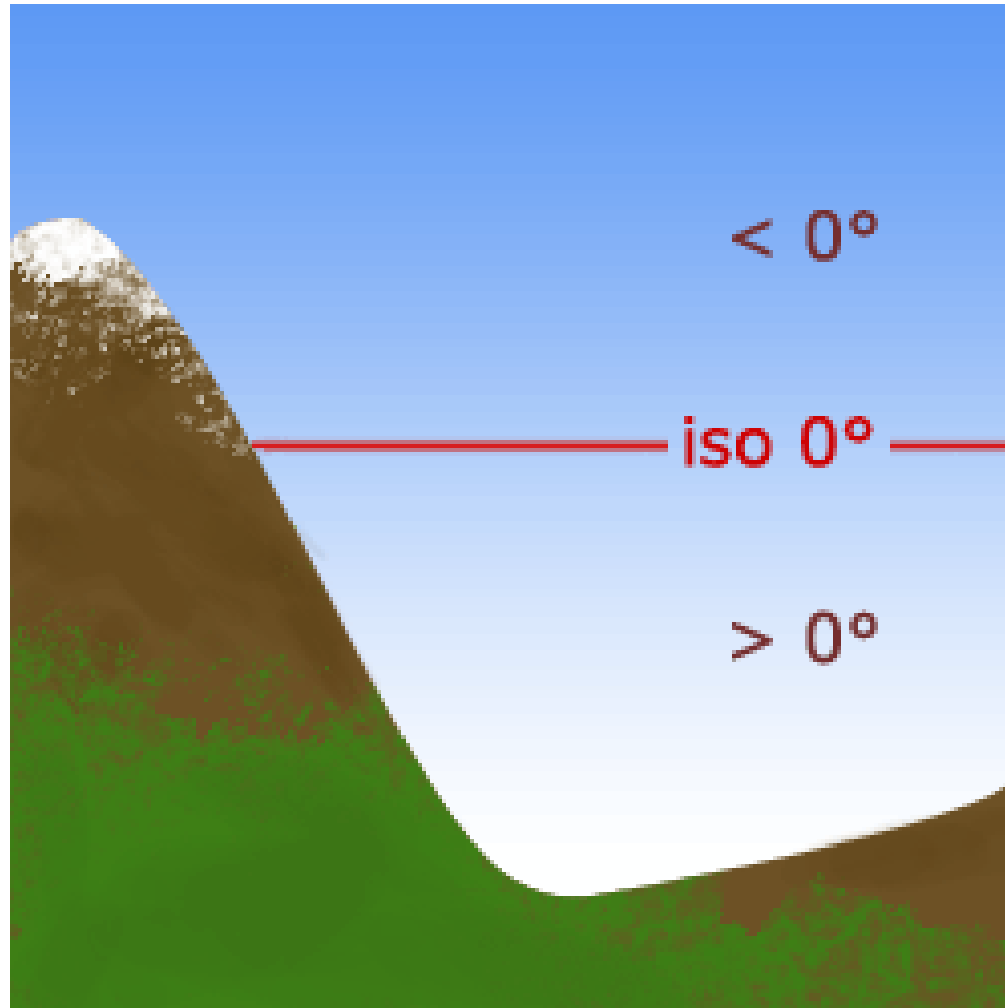


**Río Atuel - La Angostura**



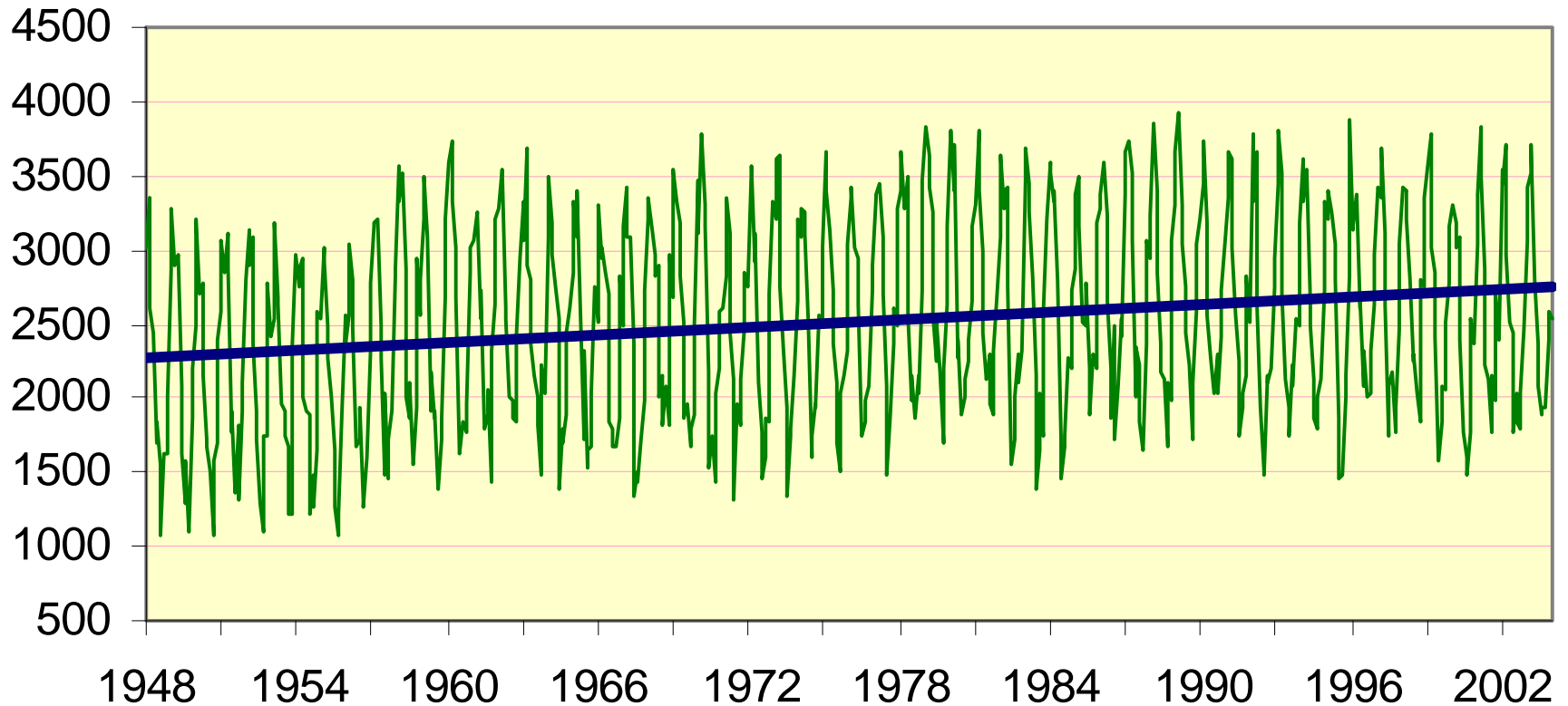
**CUYO  
RIVERS**

# The zero isotherm in the lower atmosphere

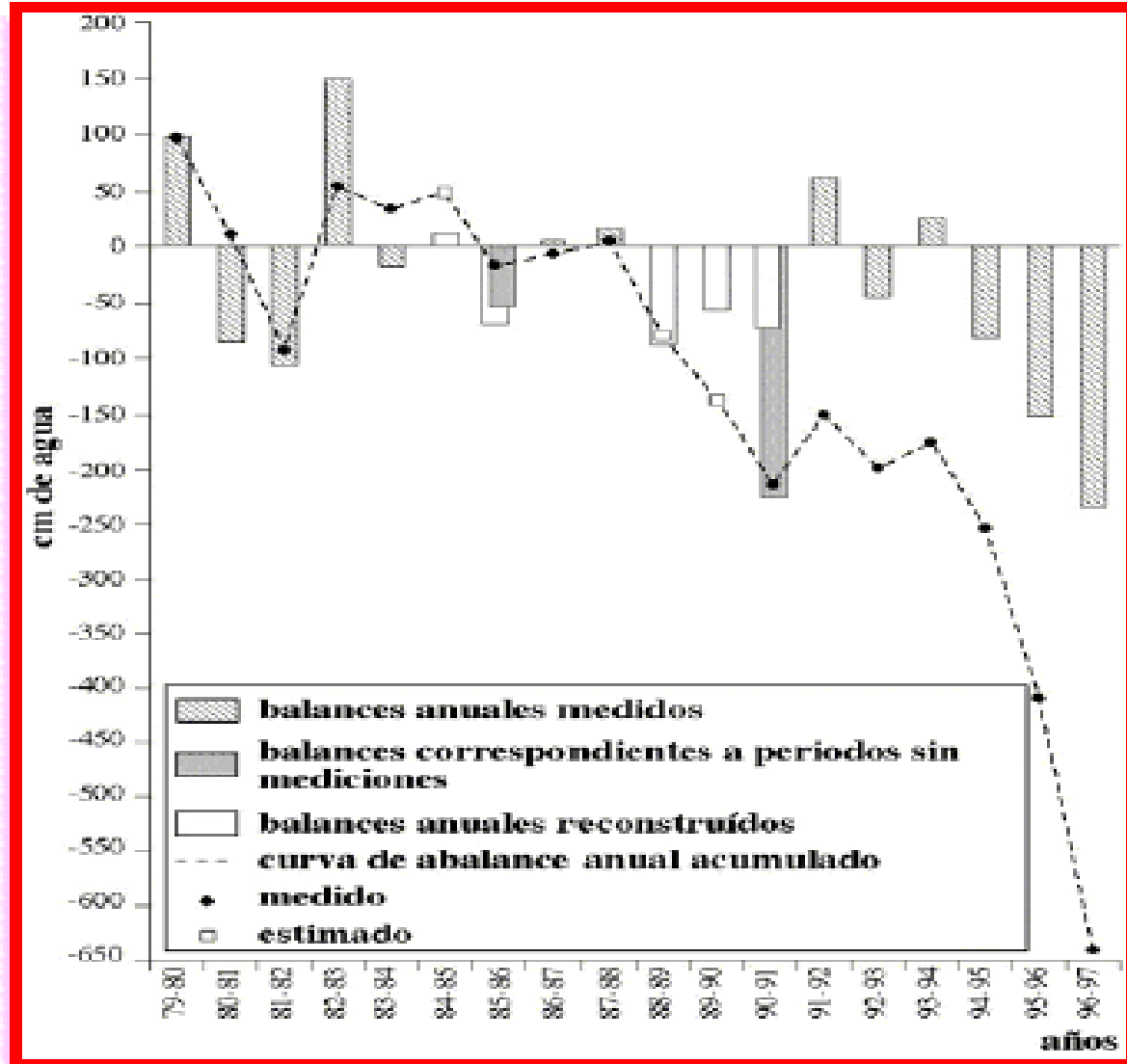


**Lat 40.0; Long 70.0**

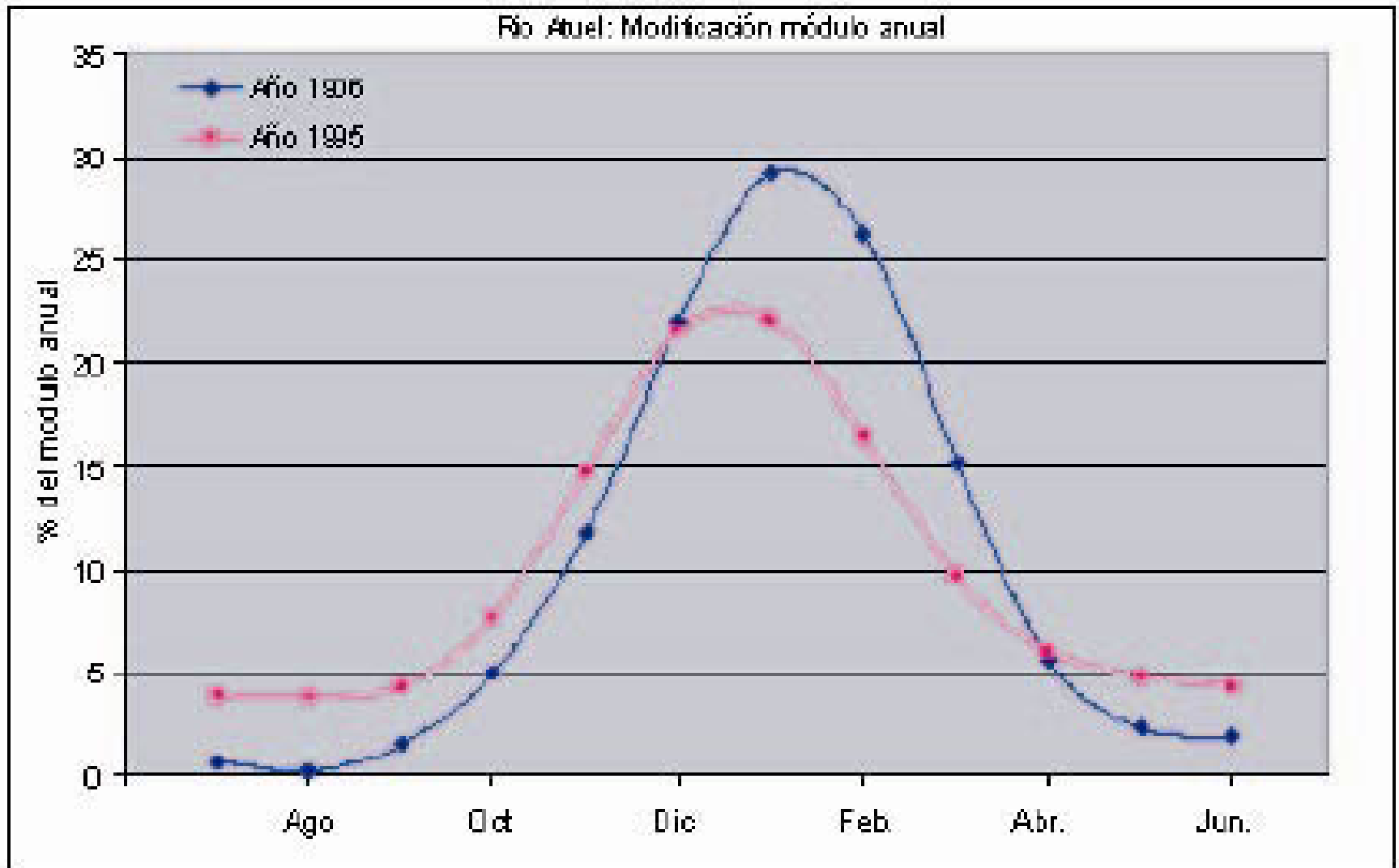
$$y = 0,7012x + 2276,6$$
$$R^2 = 0,0408$$



Trends in the height of the °C Isotherm  
in 40° South, 70° West. 1948 - 2002  
From Nuñez 2006

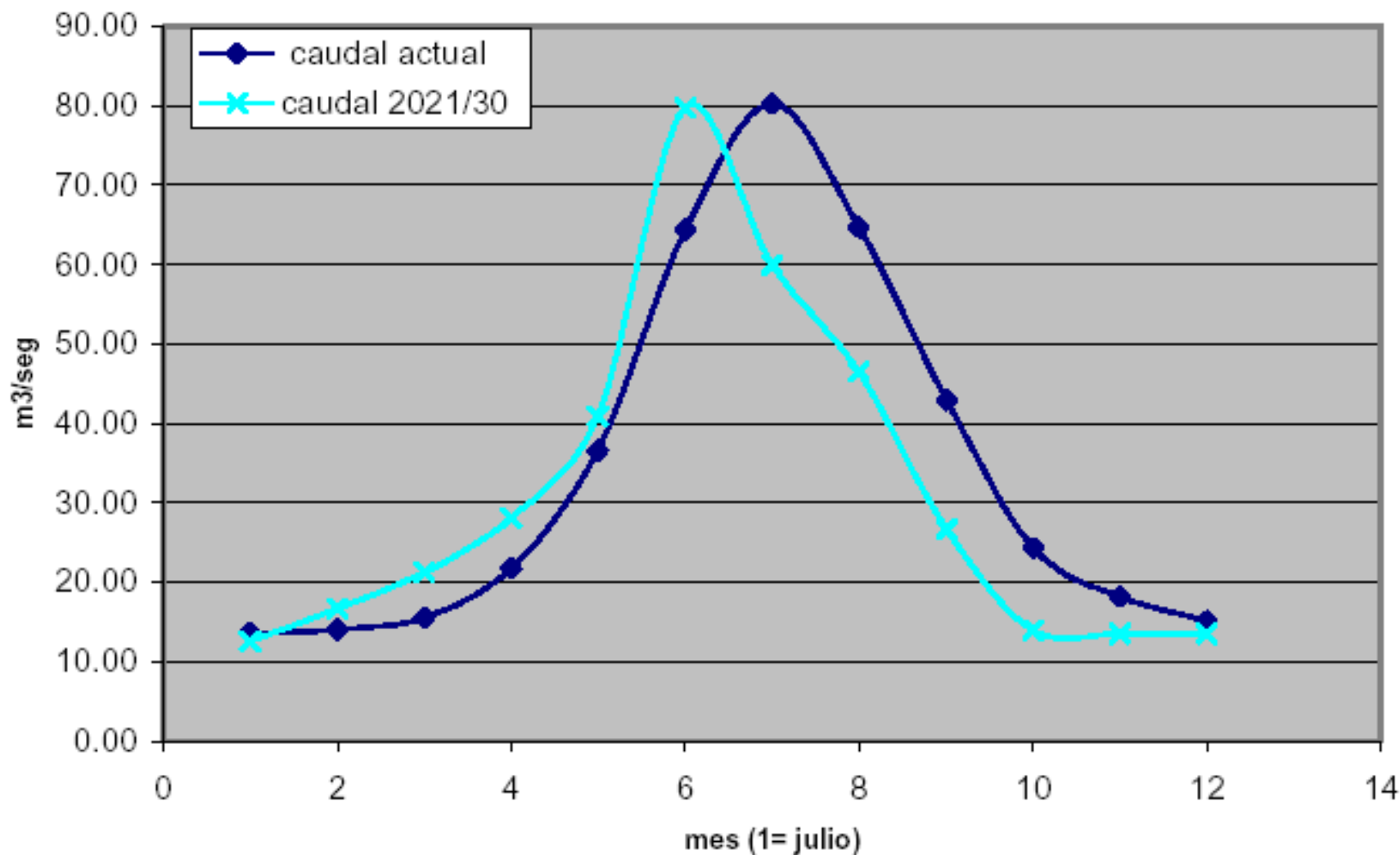


Mass balance of the Piloto Glacier since 1979 (Leiva 1999)



**Hydrogram of the Atuel River in 1906 (blue) and in 1995 (red) (percentage of the annual discharge)**  
**From Boninsegna and Villalba 2006**

## Hidrograma actual y proyectado

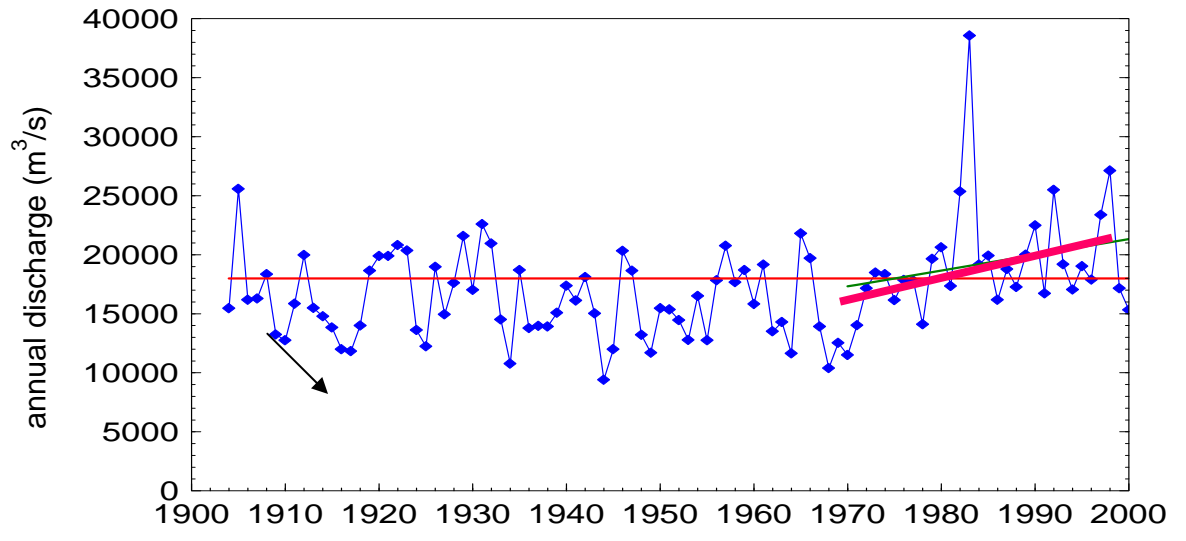


**Hydrogram of the Atuel River in m<sup>3</sup>/s**

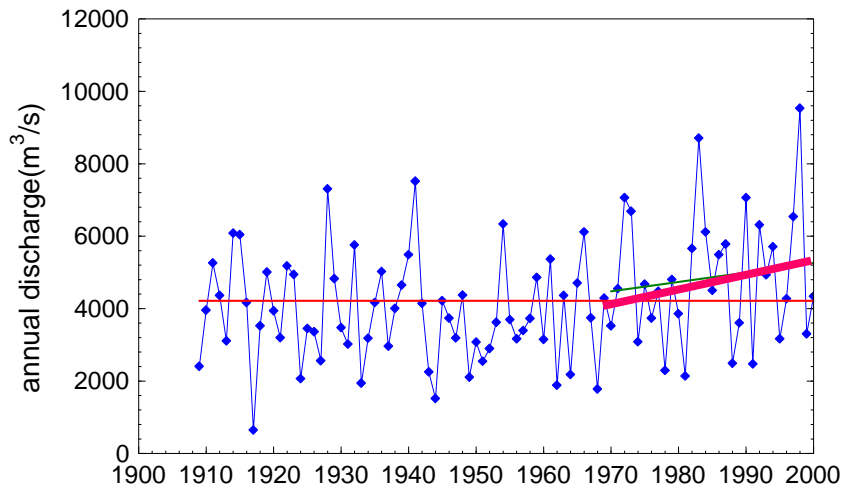
**From Boninsegna and Villalba 2006**



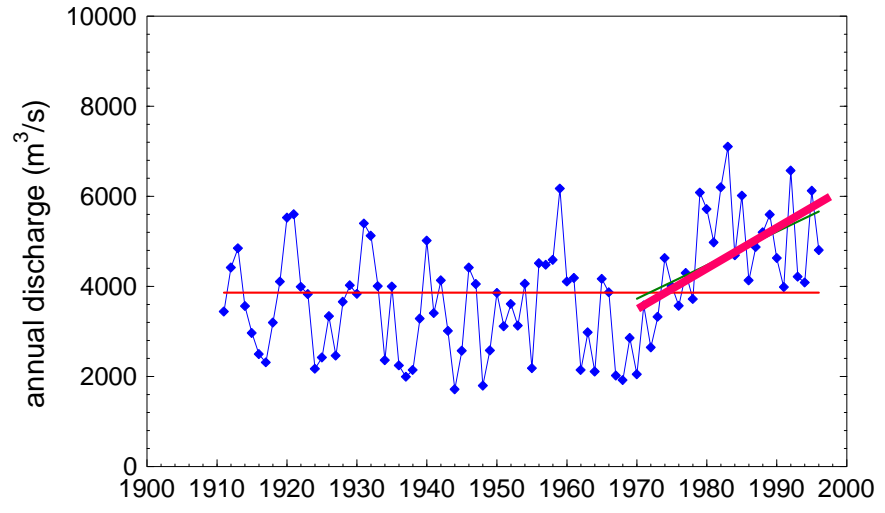
# Paraná River - Corrientes



# Uruguay River- Paso de los Libres



# Paraguay River - Puerto Bermejo



**IN THE PLATA BASIN  
70 % OF THE PRECIPITACION  
EVAPORATES  
ONLY 30 % REACH THE RIVERS**

**Moderated changes in precipitation  
or temperature**

**>>**

**Larger percent changes in river  
discharges**

**A 1° C WARMING COULD RISE EVAPORATION TO  
75 %**

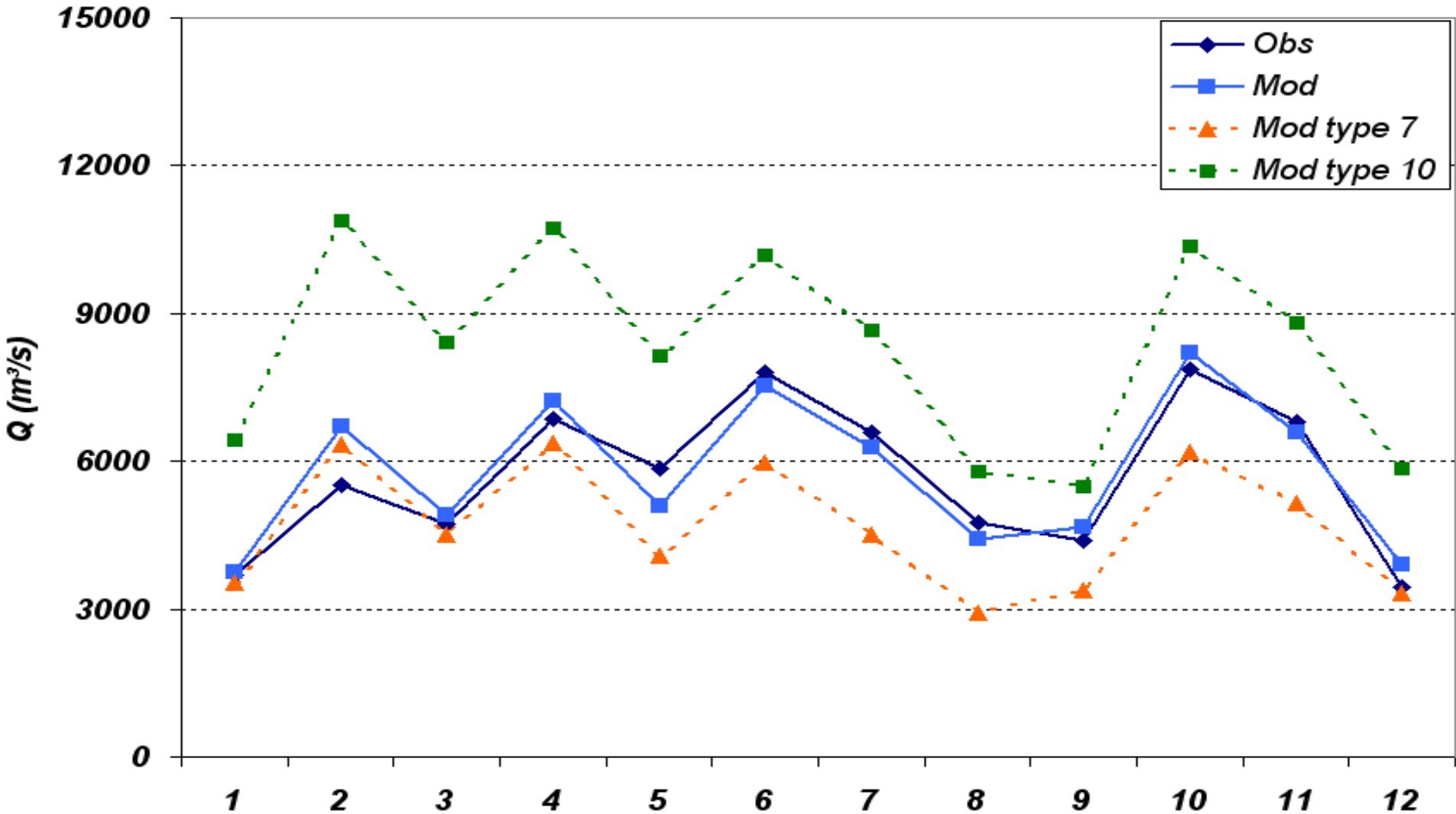
**AND COULD ROUGHLY REDUCE STREAMFLOWS  
BY 10/15 %**

***POWER (BRASIL 90 %, PARAGUAY 100 %)***

***NAVEGATION***

***WATER SUPPLY***

# ¿LAND USE CHANGE ?



**DEFORESTATION IS STILL POSSIBLE IN THE URUGUAY BASIN AND  
MAY OVERCOMPENSATE CLIMATE CHANGE EFFECTS**

# MANY UNCERTAINTIES

- *CLIMATE SCENARIOS*
- *LAND USE CHANGES*
- *HOW CO<sub>2</sub> CONCENTRATION TRENDS  
WOULD INFLUENCE  
EVAPOTRANSPIRATION ?*

**CIMA**

**OBRIGADO**