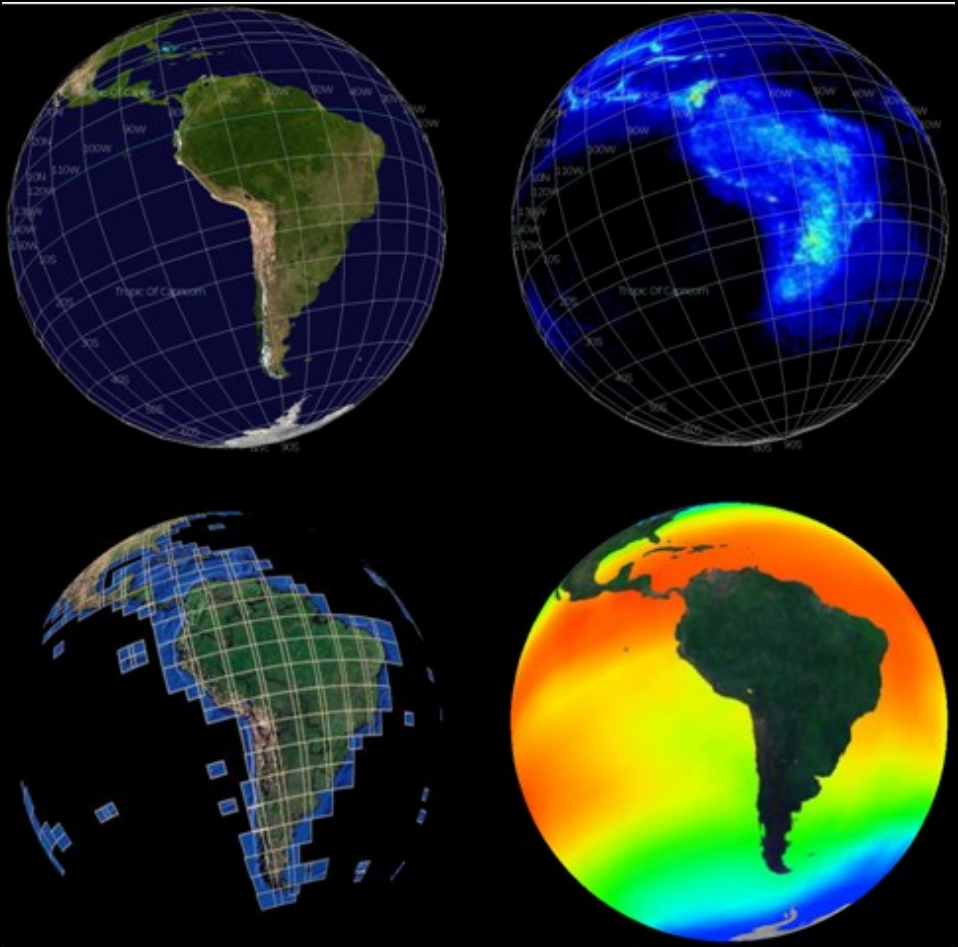
Cambio Climático en Sud América y el Caribe



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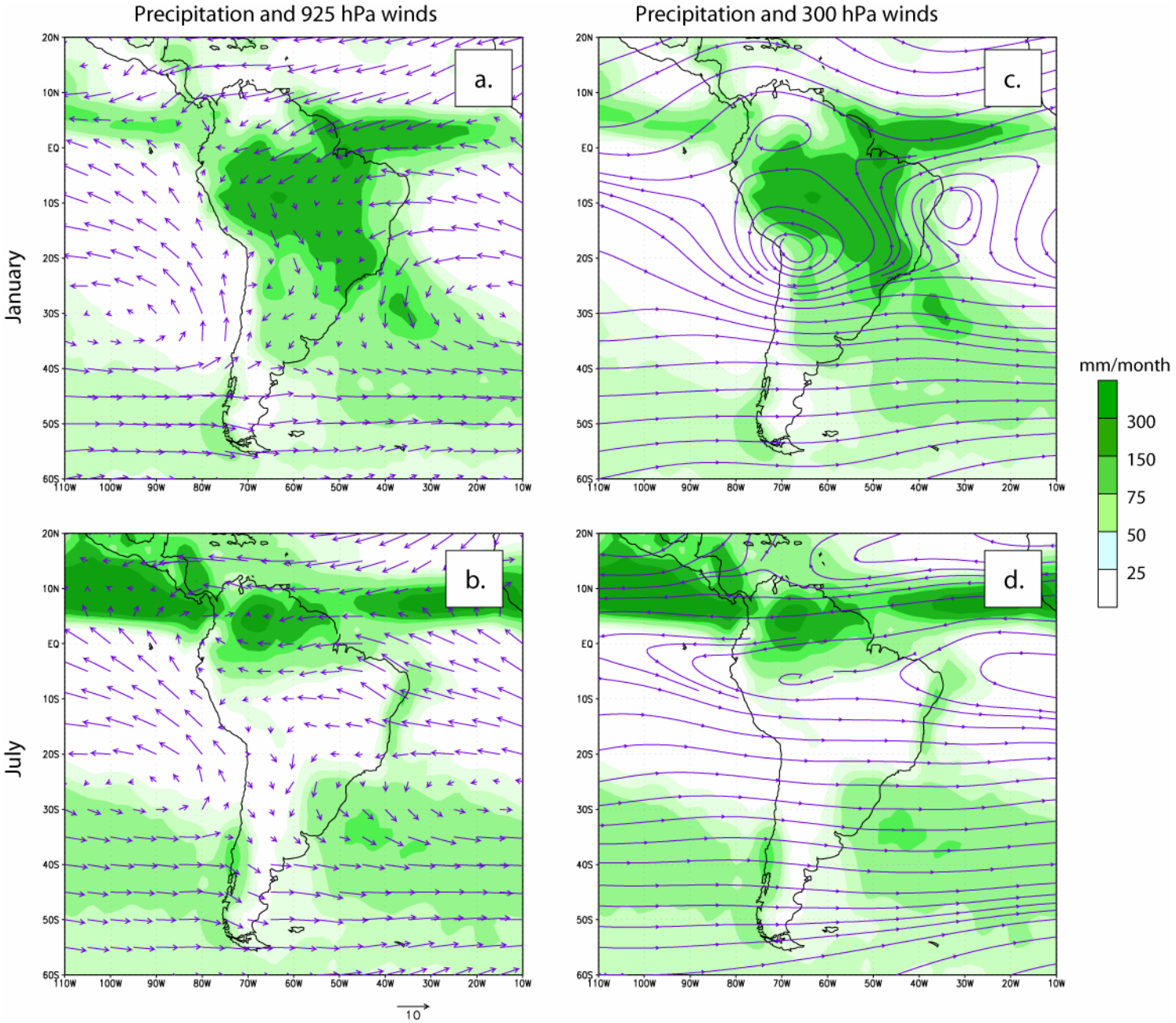
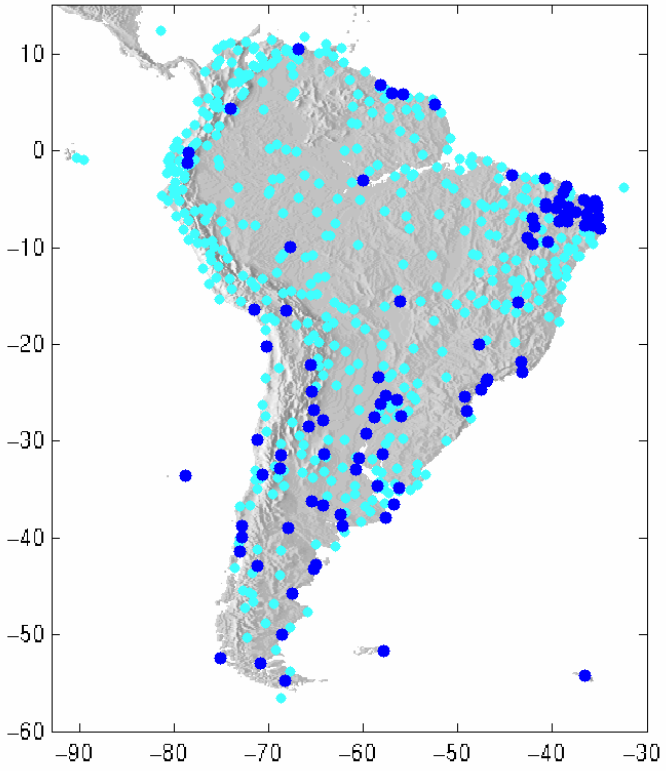
Universidad de Chile

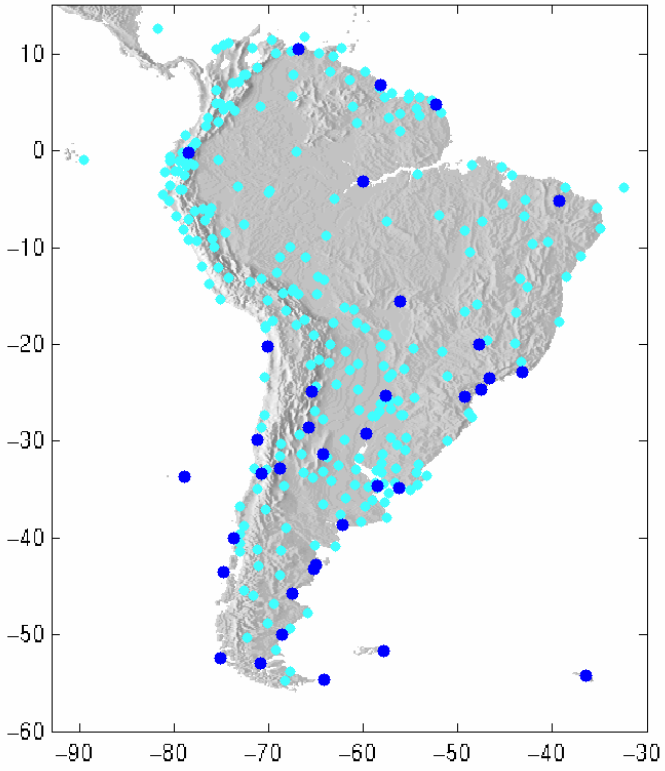

Precipitation and 925 hPa winds
Precipitation and 300 hPa winds
January
July
a.
b.
c.
d.
mm/month
300
150
75
50
25
10
20N
10N
EQ
10S
20S
30S
40S
50S
60S
110W
100W
90W
80W
70W
60W
50W
40W
30W
20W
10W

Global Historical Climate Network (GHCN)

Precipitation

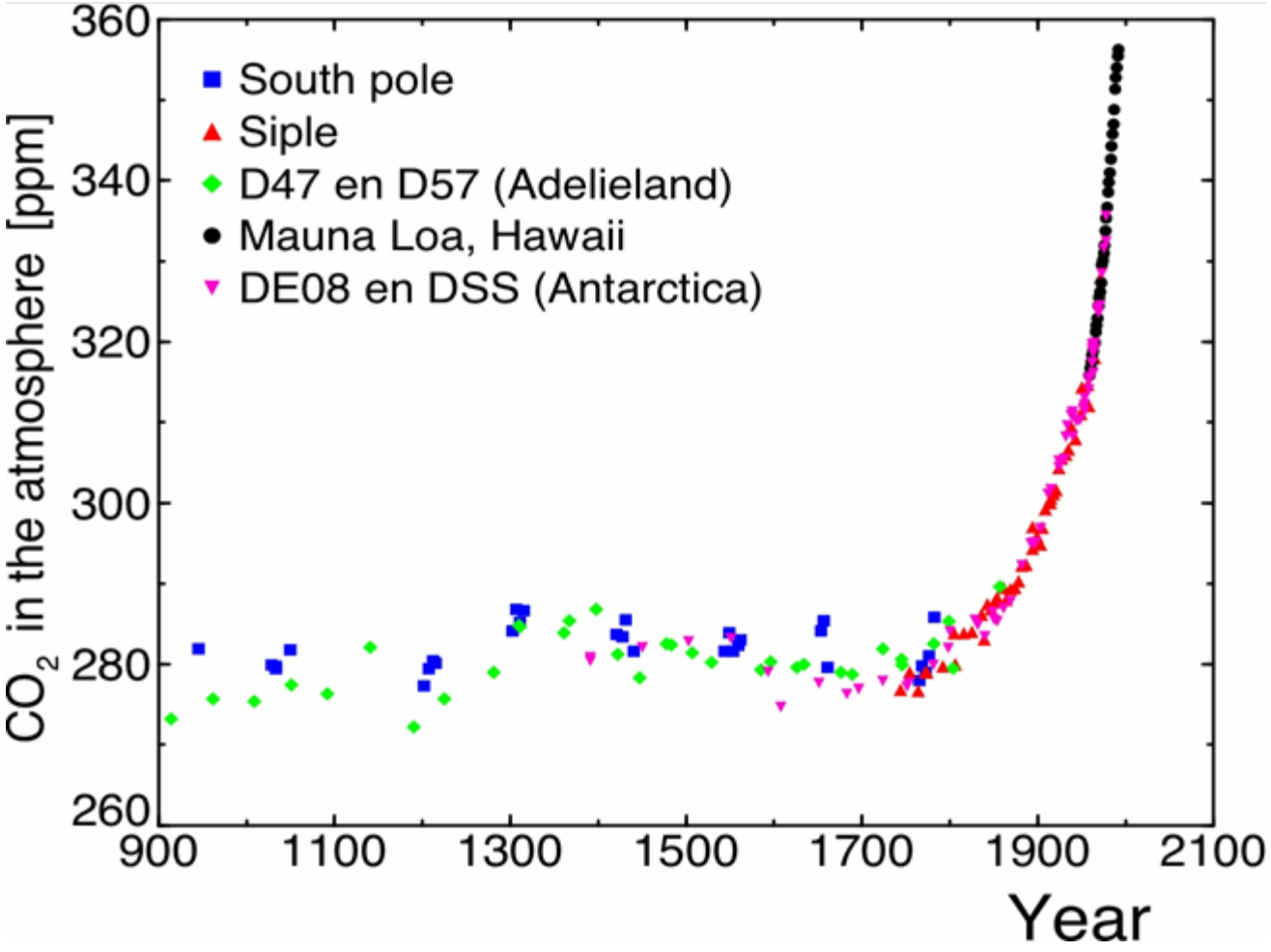


Mean Temperature

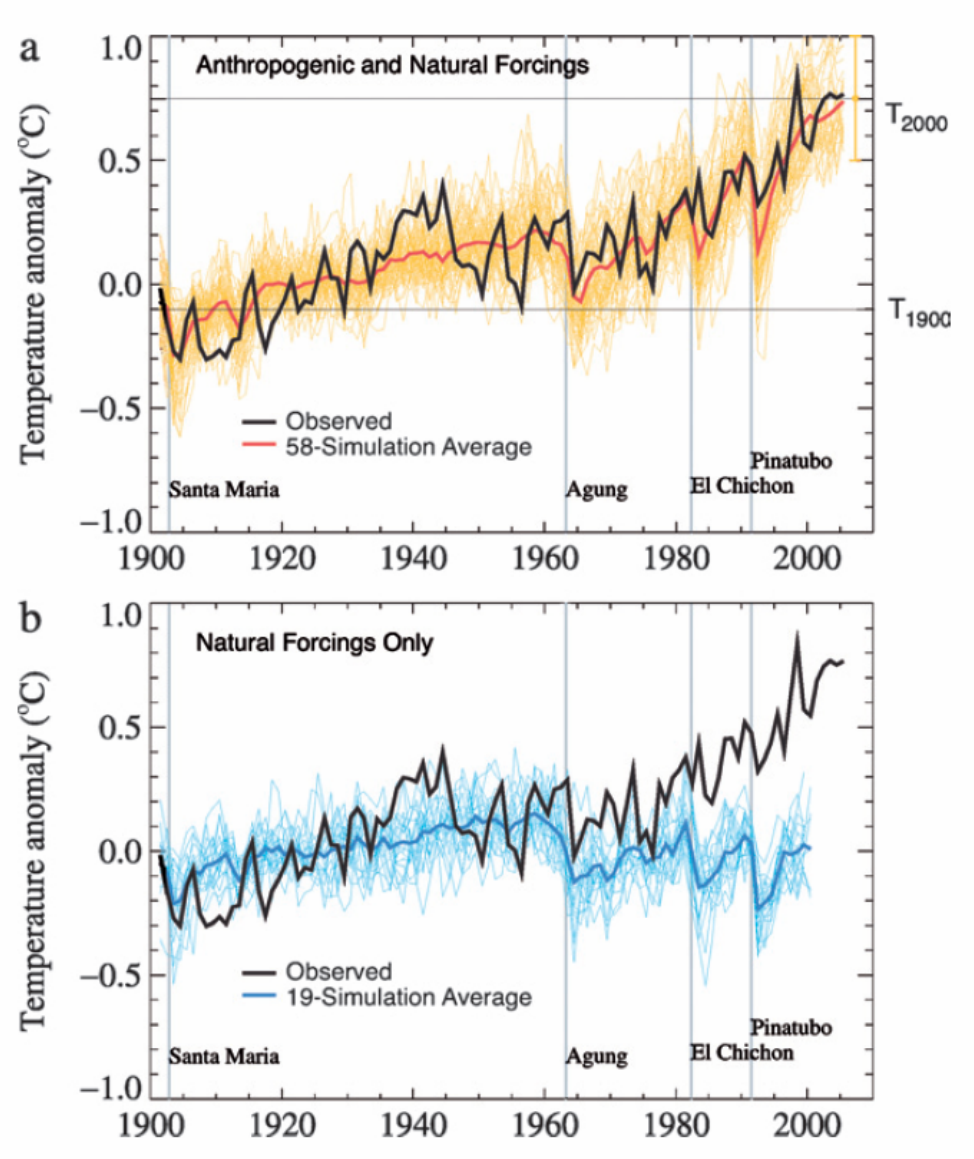


- All stations (anytime, any length)
- Century-long stations (Ti<1905, Tf>1995, missdata<20%)

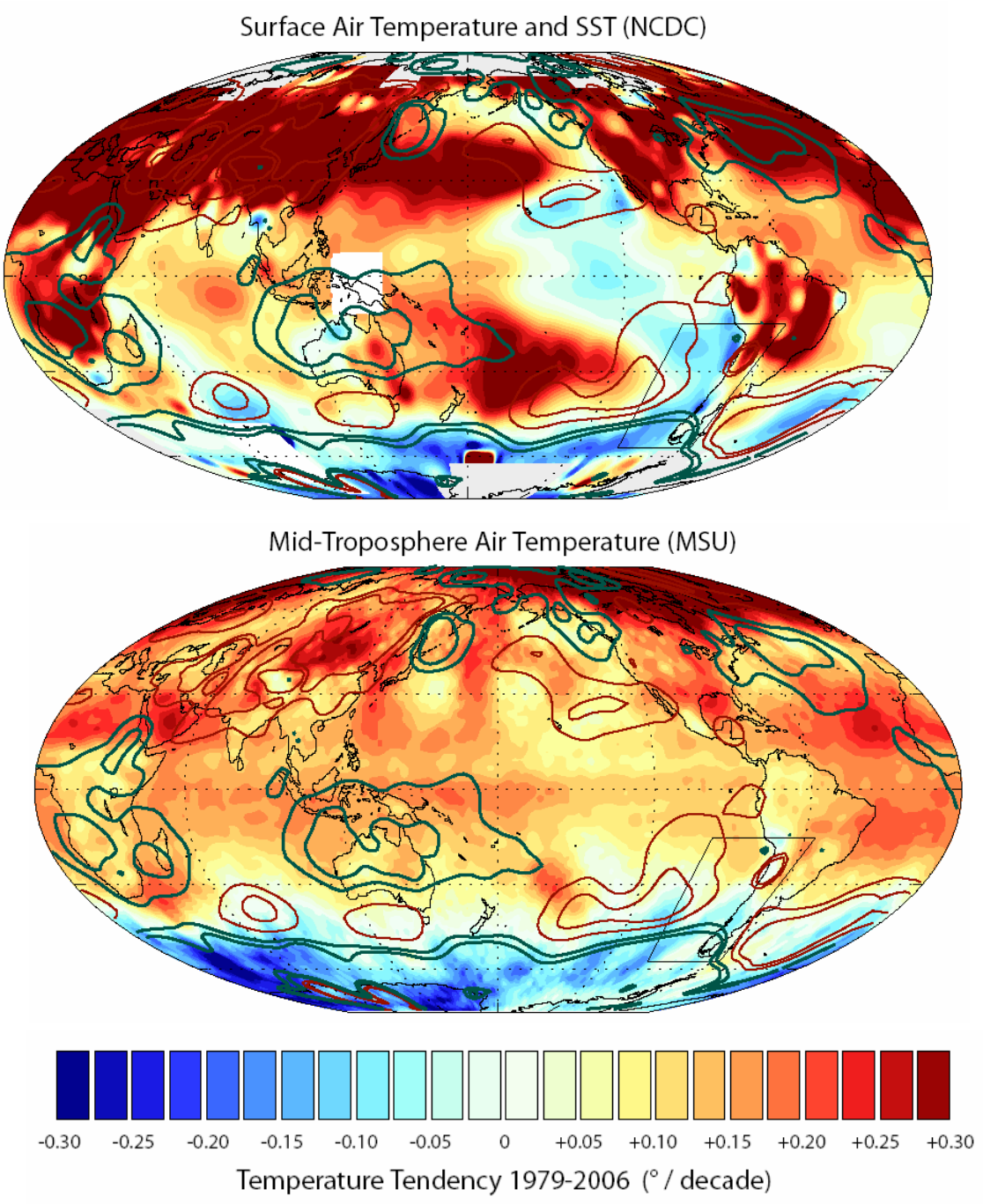
Cambios observados en CO_2 $\rightarrow$ Cambios observados en Tsfc



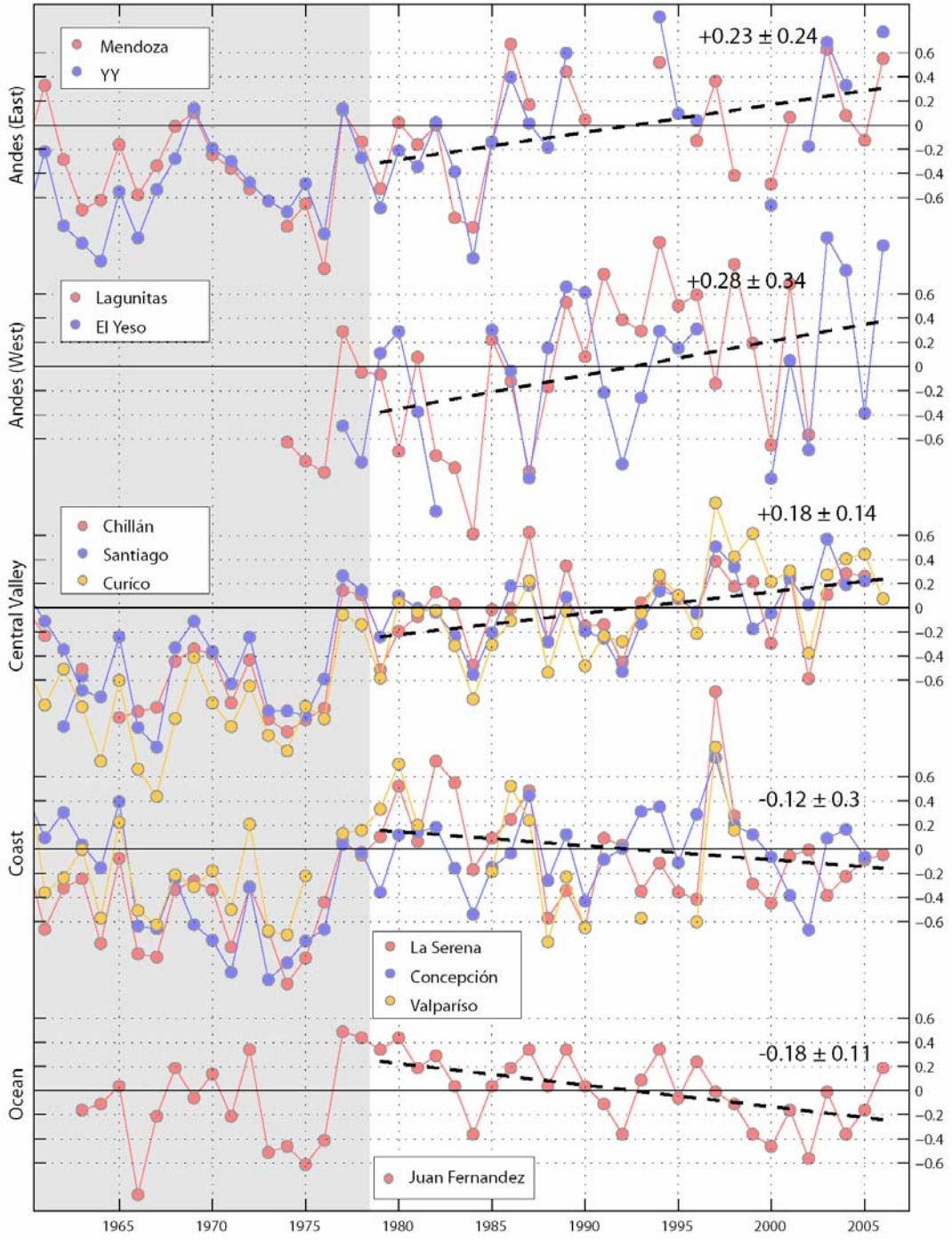
Cambios observados y simulados en Tsfc



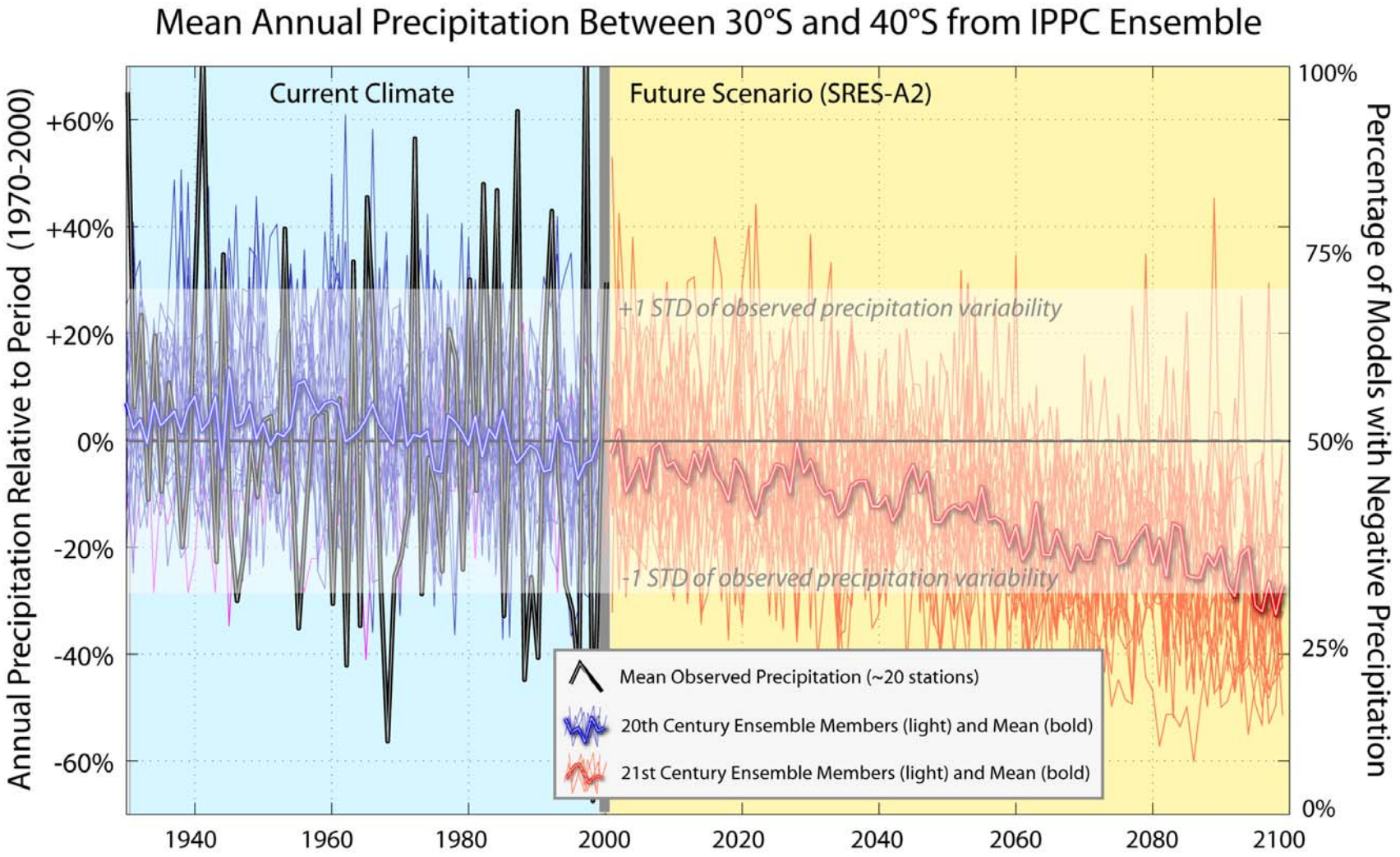
Global Temperature Change 1979-2006



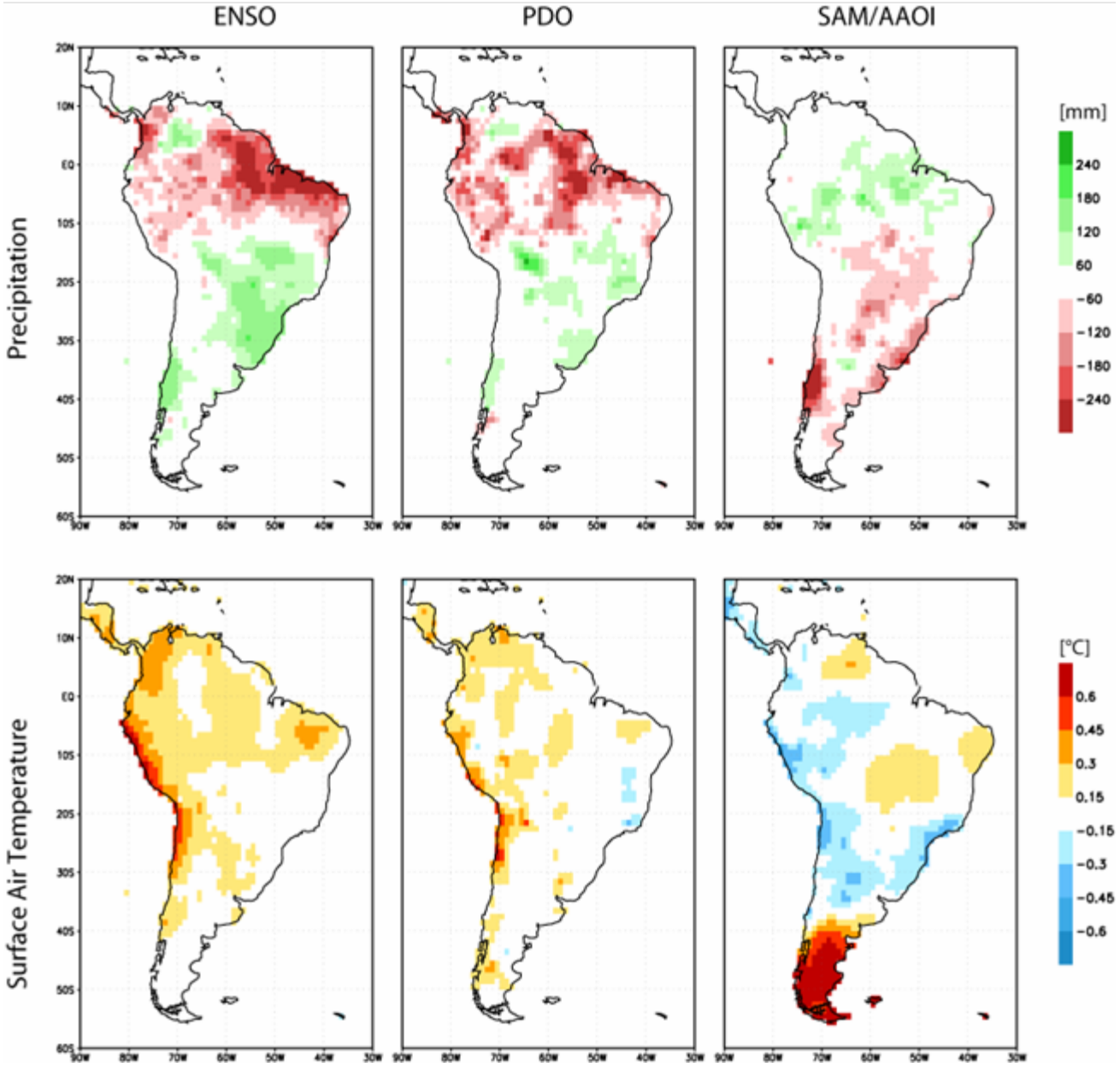
Temperature Changes in Central Chile



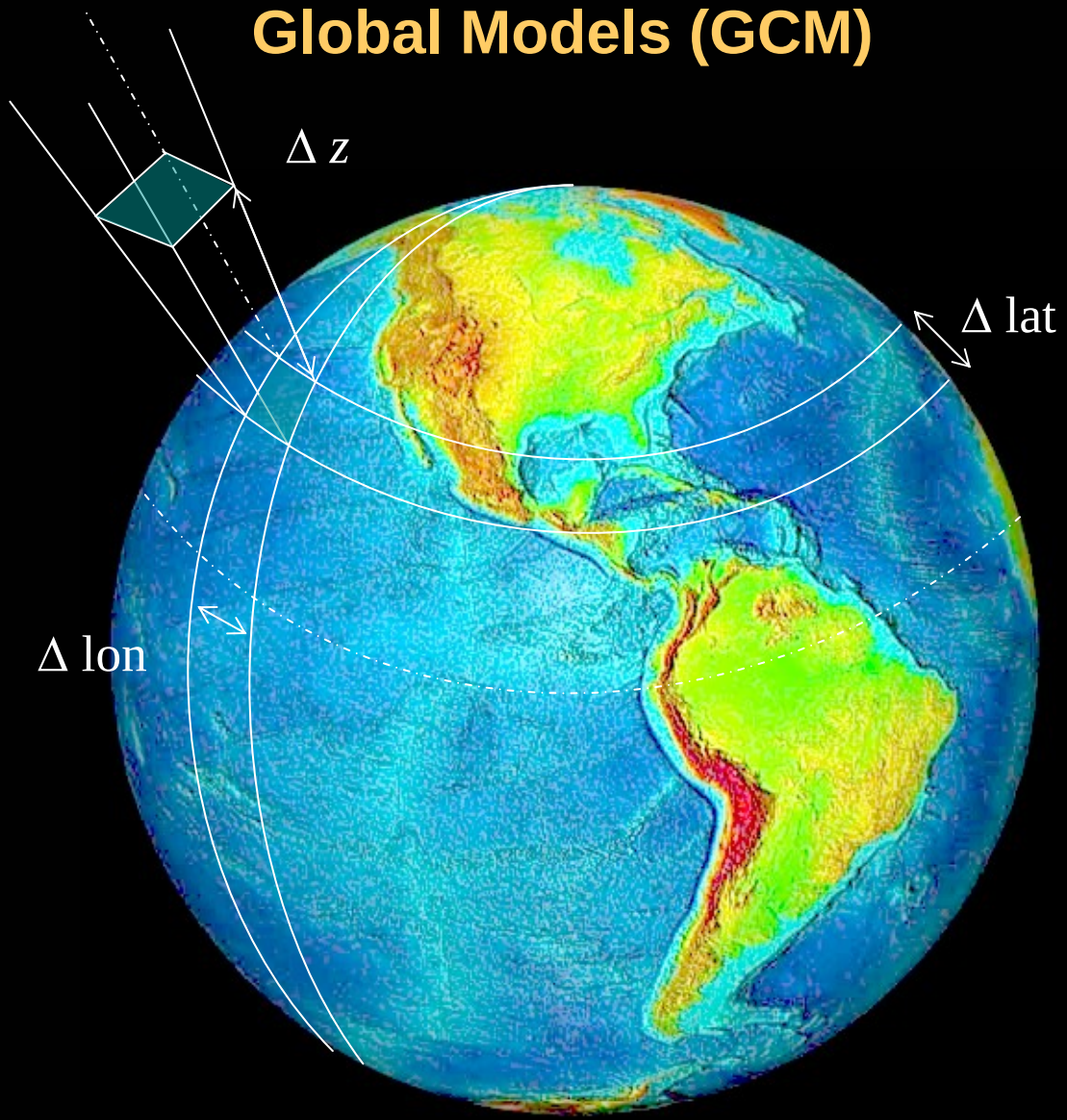
Alta variabilidad interanual debido a factores naturales



Impactos de ENSO / PDO / SAM



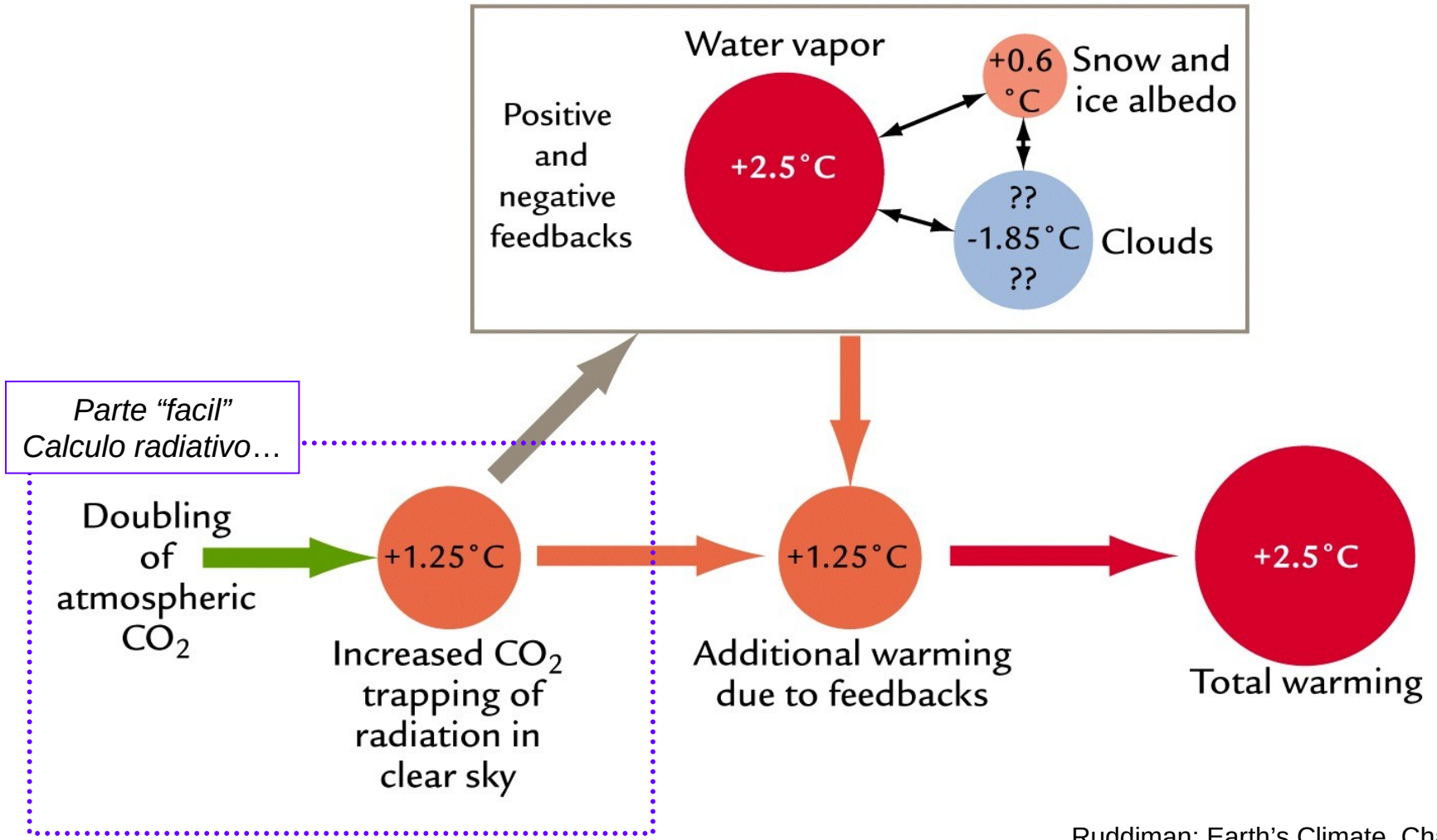
Global Models (GCM)



Δlat ~ Δ lon ~ 1° - 3° Δ*z* ~ 1 km Δ*t* ~ minutes-hours

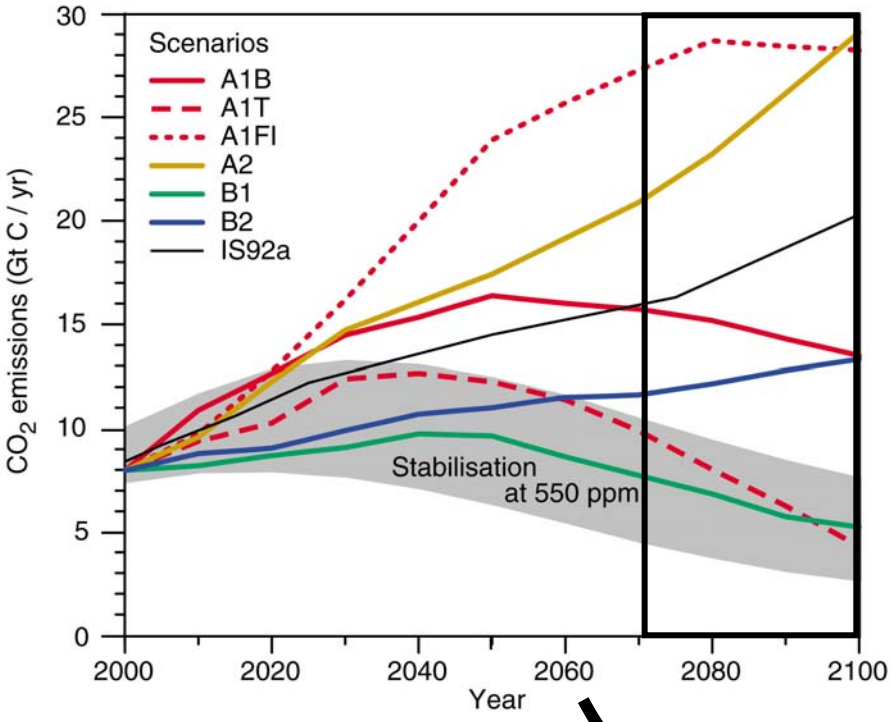
Top of atmosphere: 15-50 km

Retro-alimentación del sistema climático cambian la respuesta al incremento del CO_2

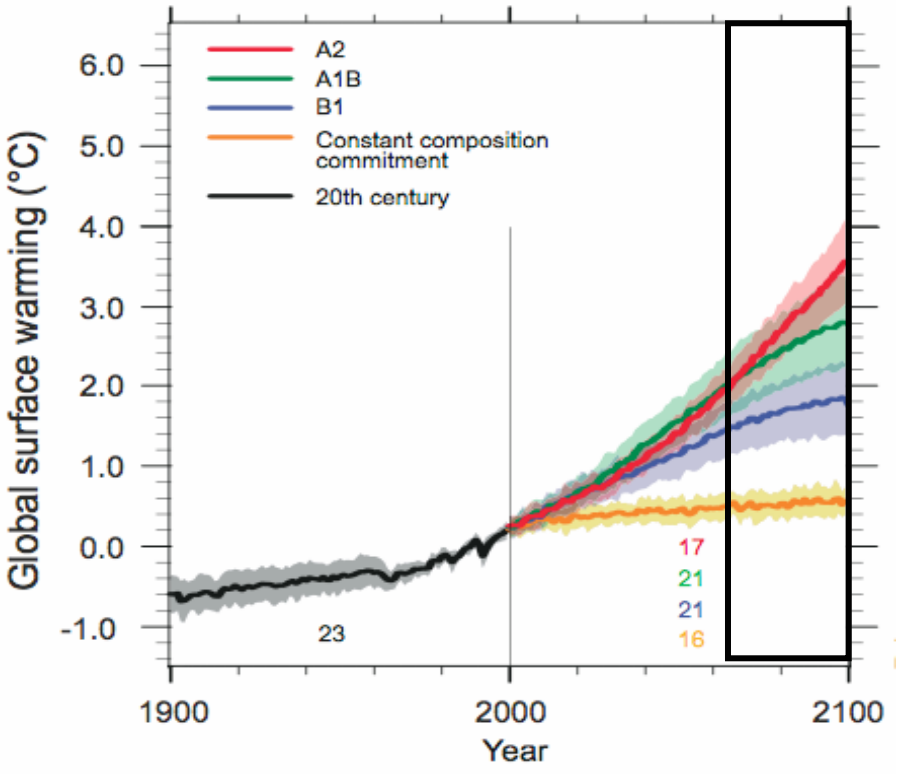


Ruddiman: Earth's Climate, Chapter 4

Future Climate Scenarios
GHG (CO2,…) emissions projections + GCMs



20+ GCMs
CMIP3/IPCC AR4



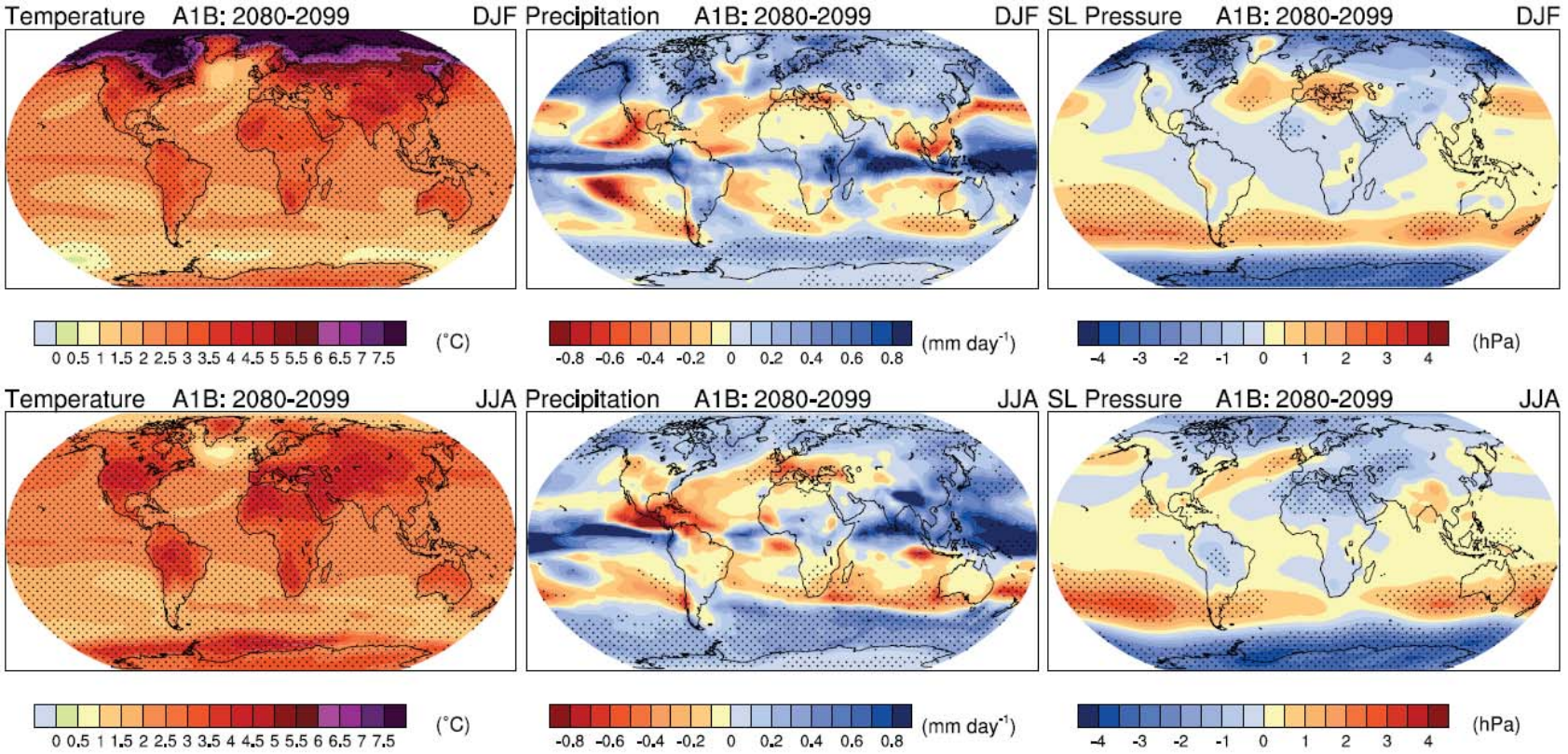
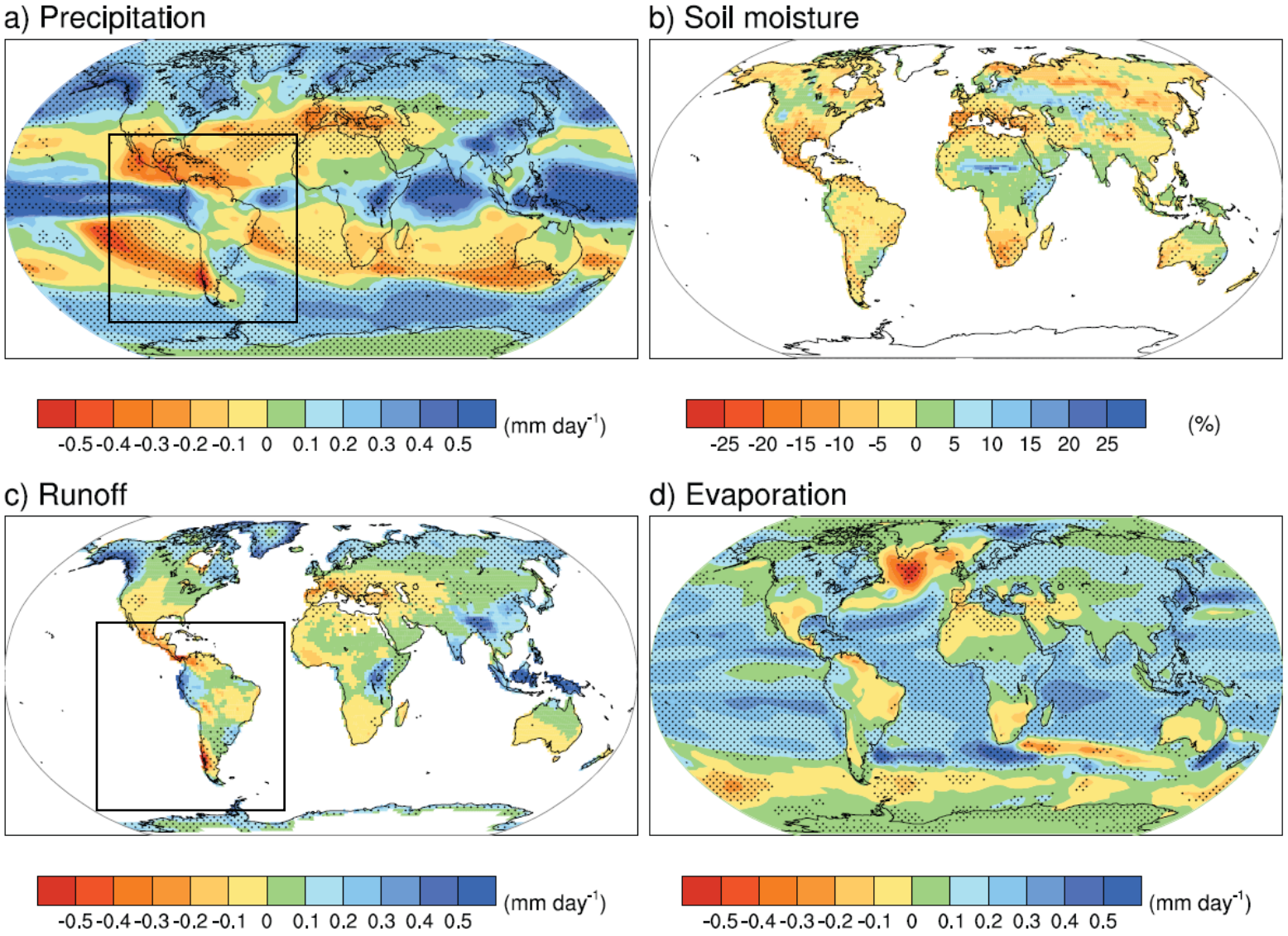


Figure 10.9. *Multi-model mean changes in surface air temperature (°C, left), precipitation (mm day^{-1}, middle) and sea level pressure (hPa, right) for boreal winter (DJF, top) and summer (JJA, bottom). Changes are given for the SRES A1B scenario, for the period 2080 to 2099 relative to 1980 to 1999. Stippling denotes areas where the magnitude of the multi-model ensemble mean exceeds the inter-model standard deviation. Results for individual models can be seen in the Supplementary Material for this chapter.*



ıre 10.12. *Multi-model mean changes in (a) precipitation (mm day⁻¹), (b) soil moisture content (%), (c) runoff (mm day⁻¹) and (d) evaporation (mm day⁻¹). To indicate con-ncy in the sign of change, regions are stippled where at least 80% of models agree on the sign of the mean change. Changes are annual means for the SRES A1B scenario ıe period 2080 to 2099 relative to 1980 to 1999. Soil moisture and runoff changes are shown at land points with valid data from at least 10 models. Details of the method 'esults for individual models can be found in the Supplementary Material for this chapter.*

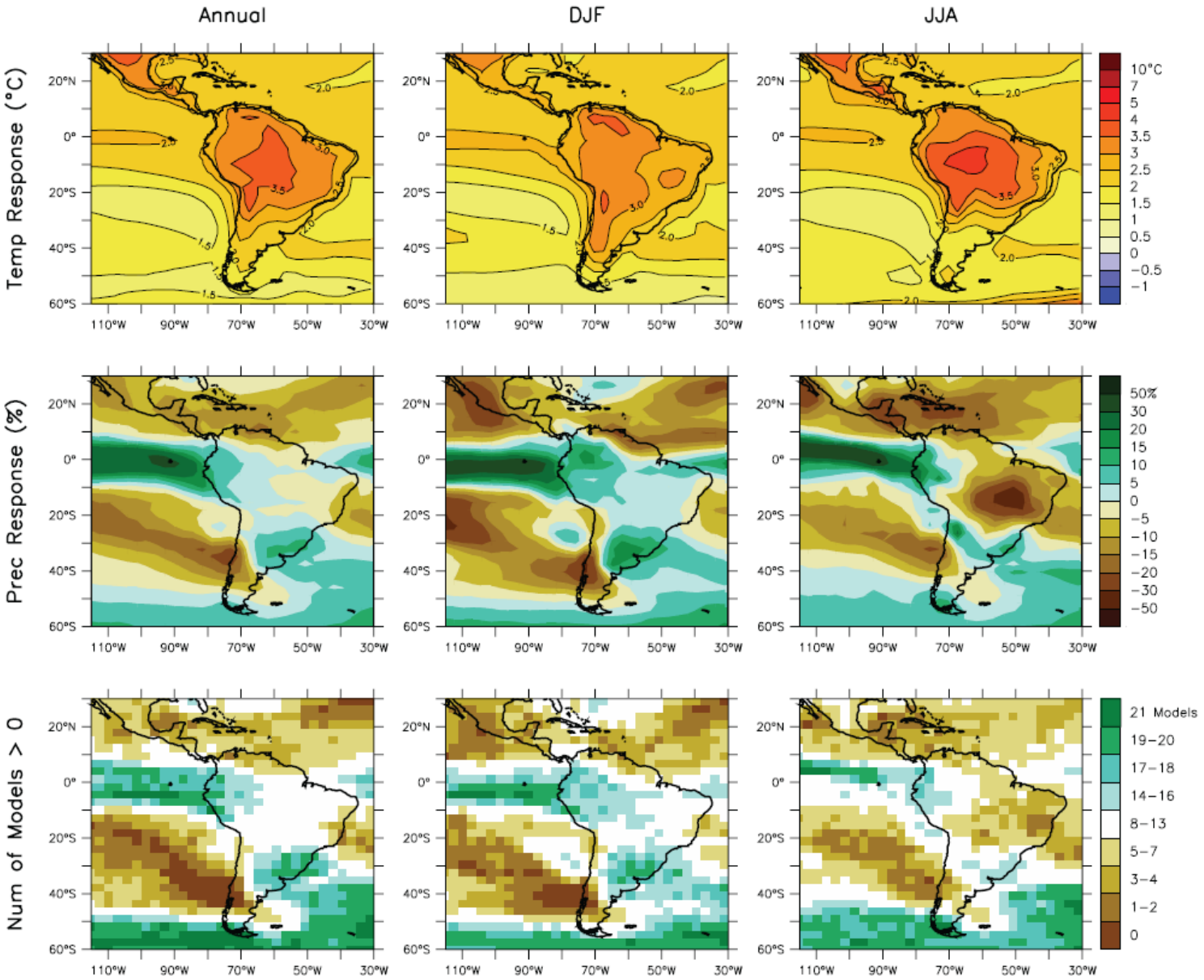
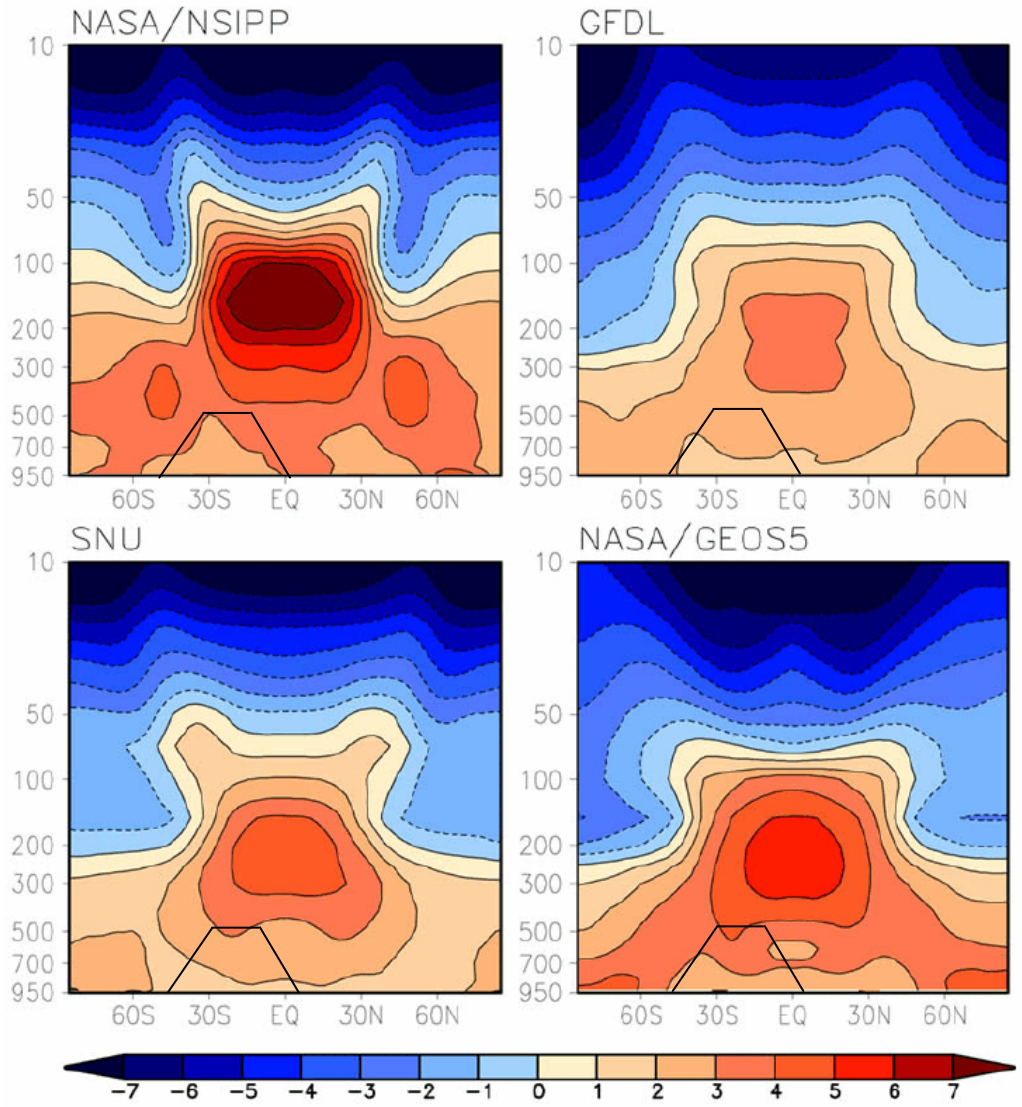


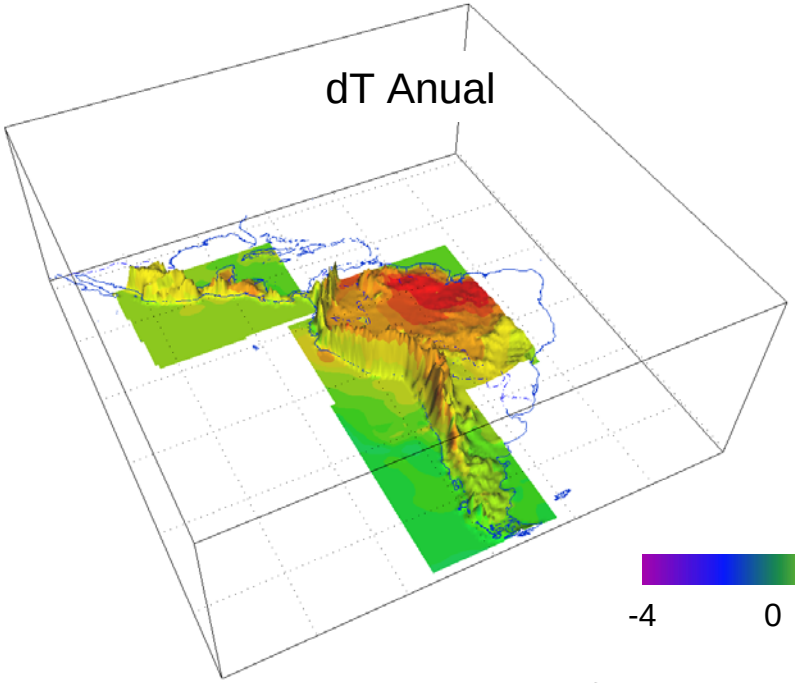
Figure 11.15. *Temperature and precipitation changes over Central and South America from the MMD-A1B simulations. Top row: Annual mean, DJF and JJA temperature change between 1980 to 1999 and 2080 to 2099, averaged over 21 models. Middle row: same as top, but for fractional change in precipitation. Bottom row: number of models out of 21 that project increases in precipitation.*

Zonal mean distribution of temperature change (2xC02-Ctr)

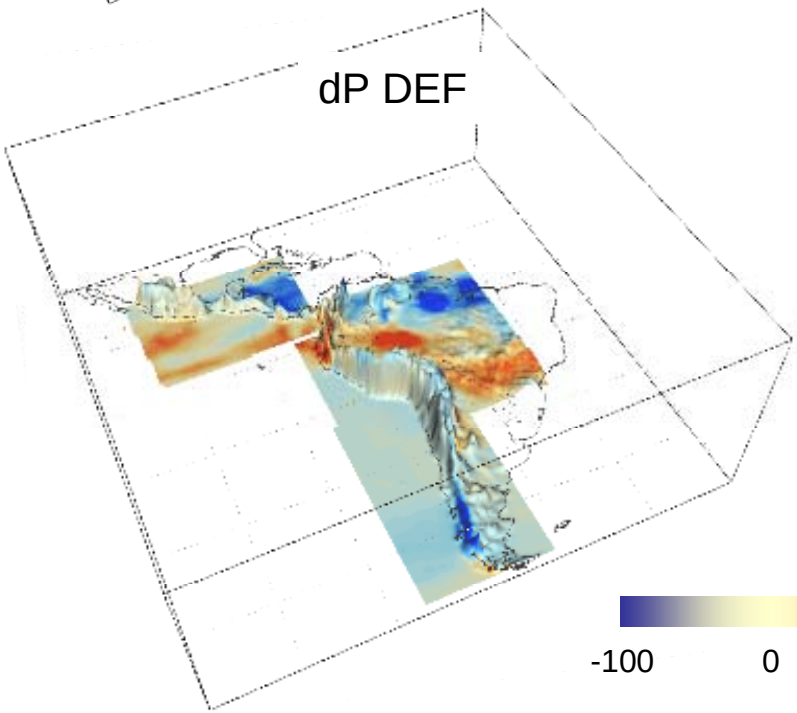


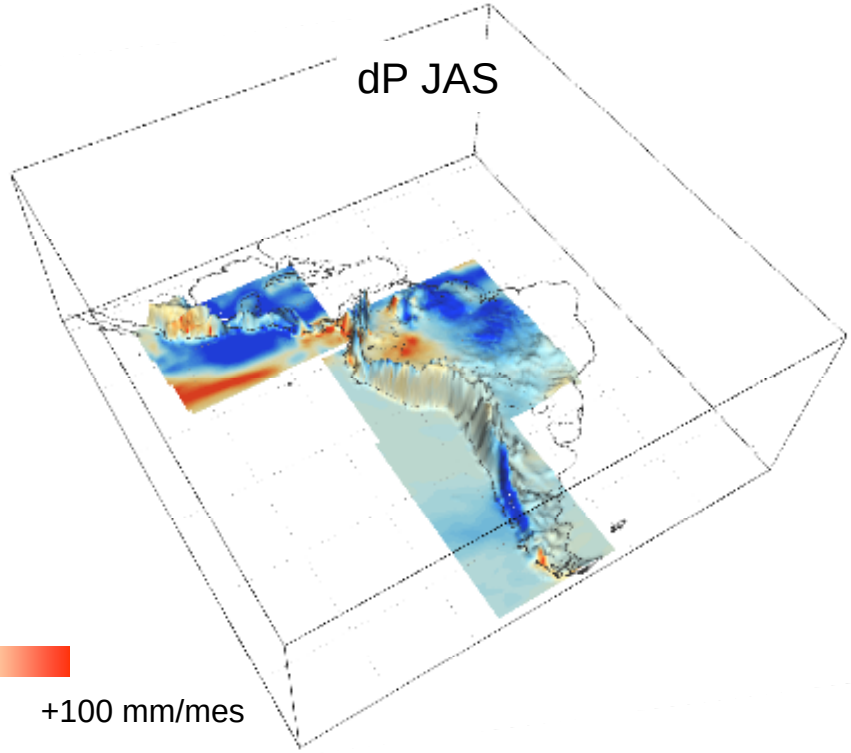
Zonal mean distributions of temperature change (2×CO2–Control). Units are Kelvin.

averaged, equilibrated temperature change associated with doubling of latitude and pressure for four different GCMs. From Lee et al, 2007.

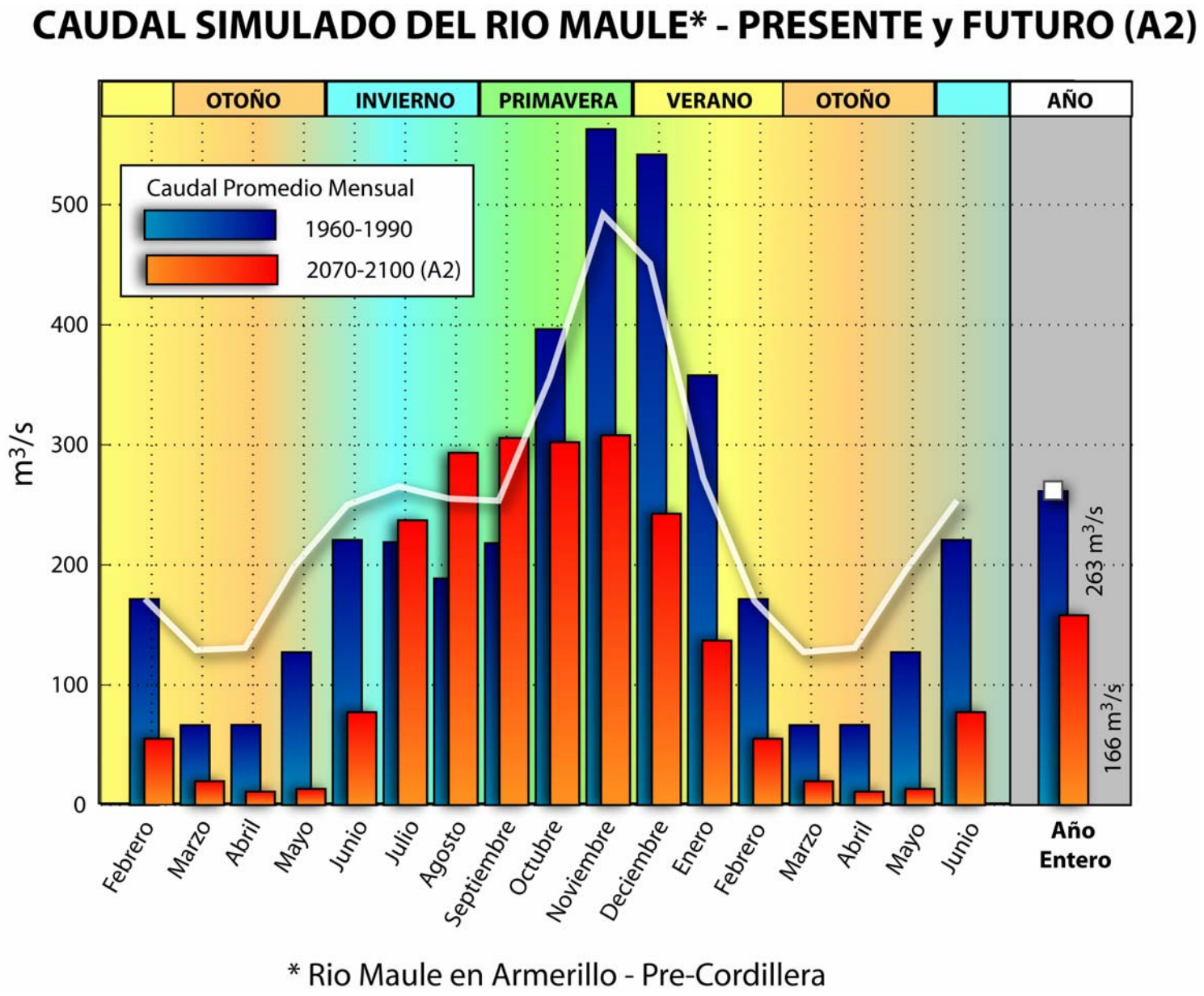


Cambios (A2-BL) proyectados empleando PRECIS con resolución espacial de 50 km Forzado por HadCM3



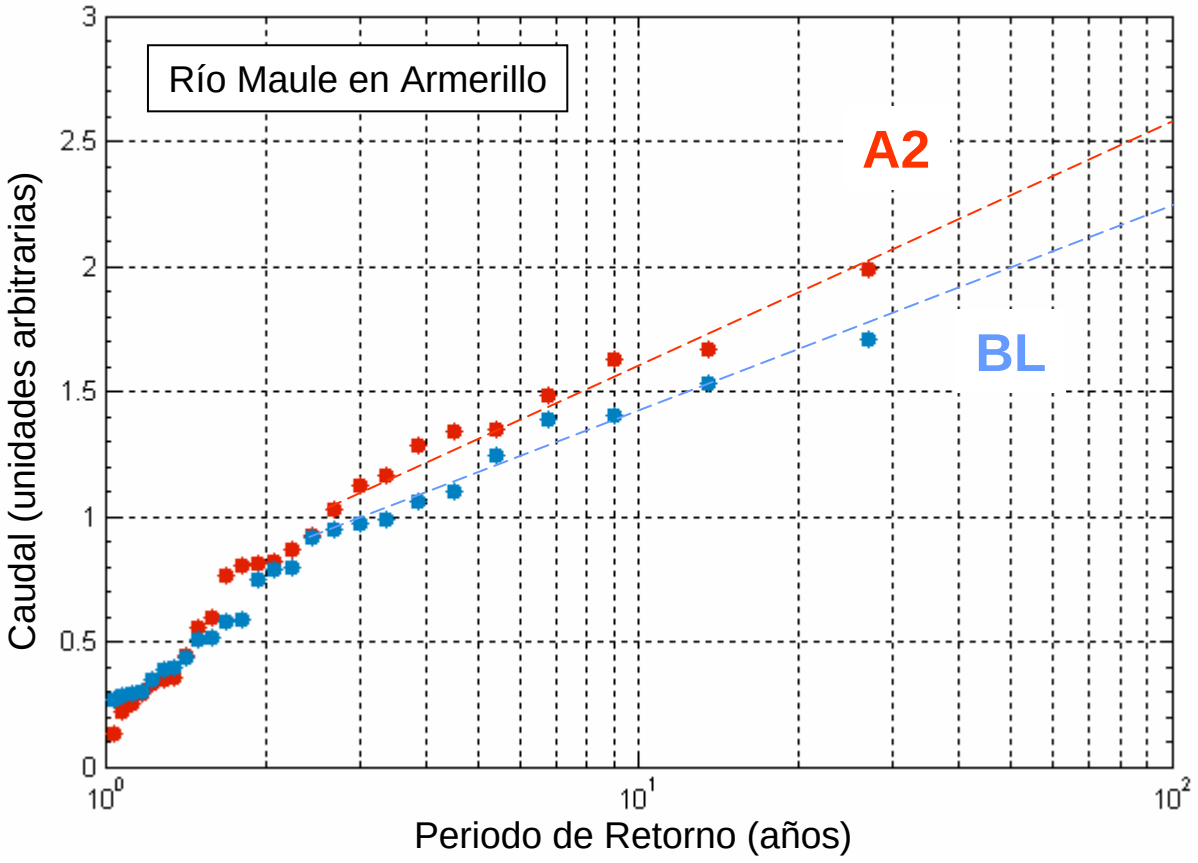


PRECIS-DGF Acomplamiento con modelos hidrológicos.



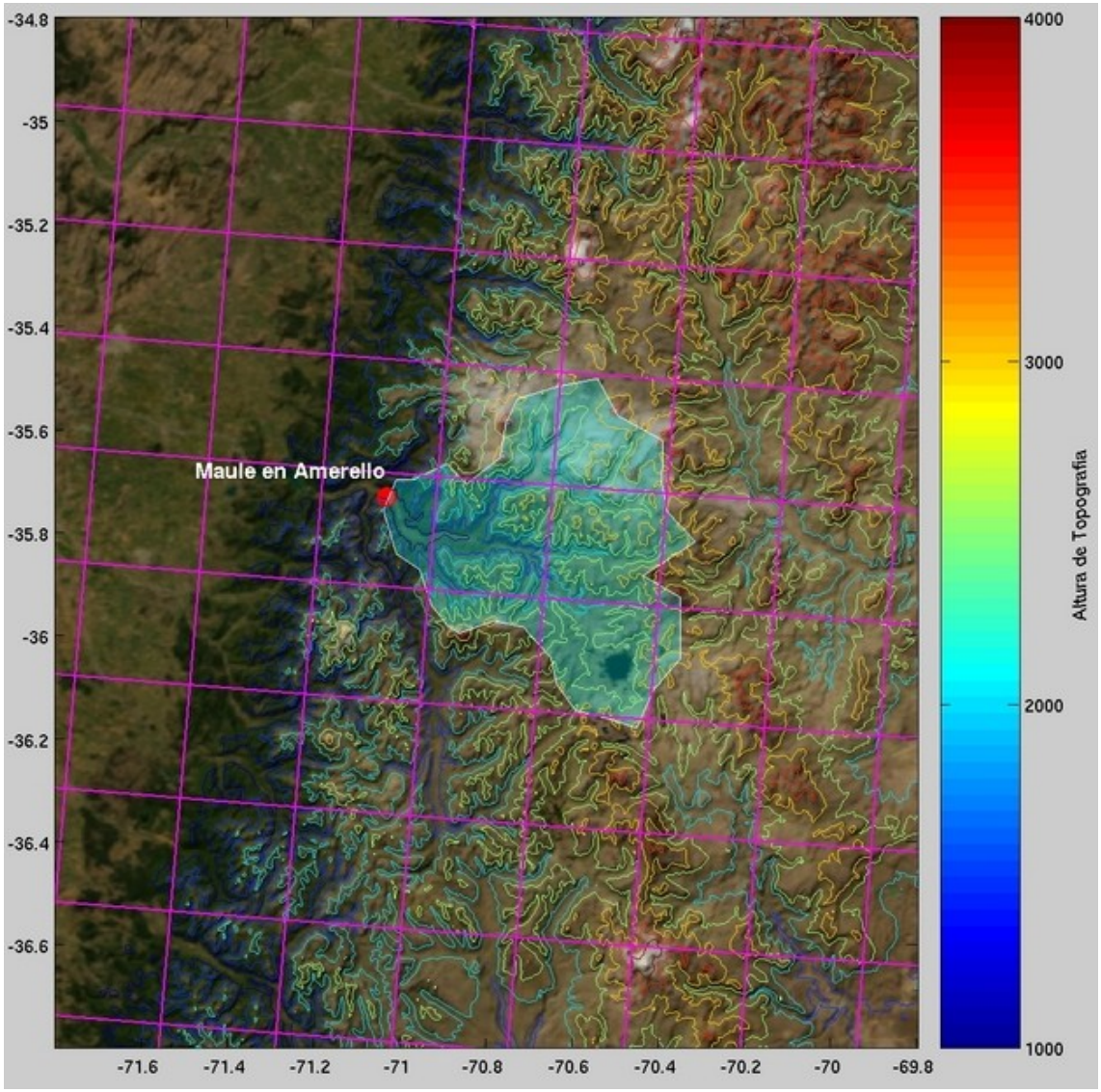
PRECIS-DGF - Eventos Extremos

Modelo hidrológico simple indica cierta disminución de **caudales extremos diarios** con bajo periodo de retorno pero un aumento de caudales extremos diarios con alto periodo de retorno

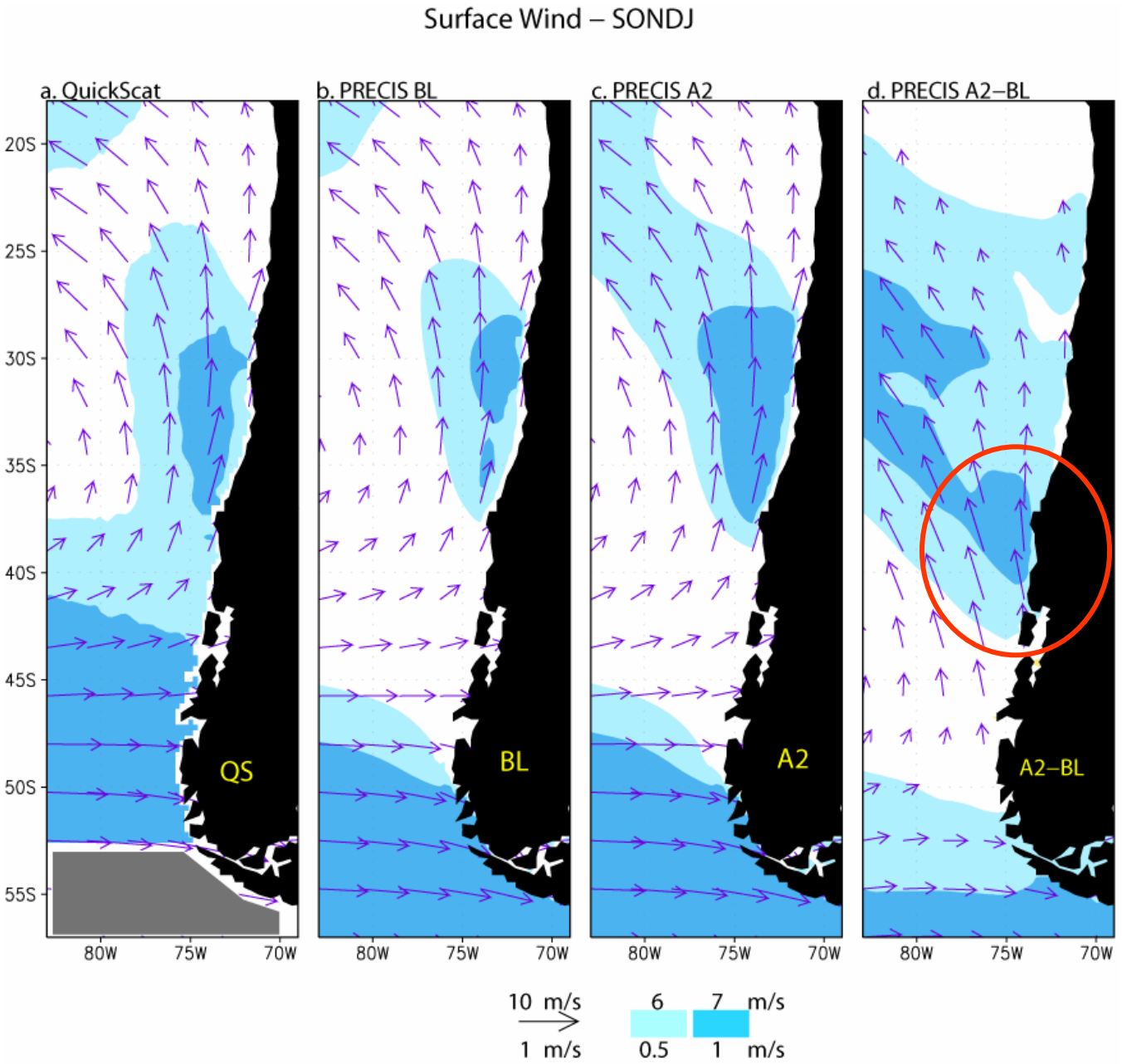


PRECIS-DGF

Acomplamiento con modelos hidrológicos.

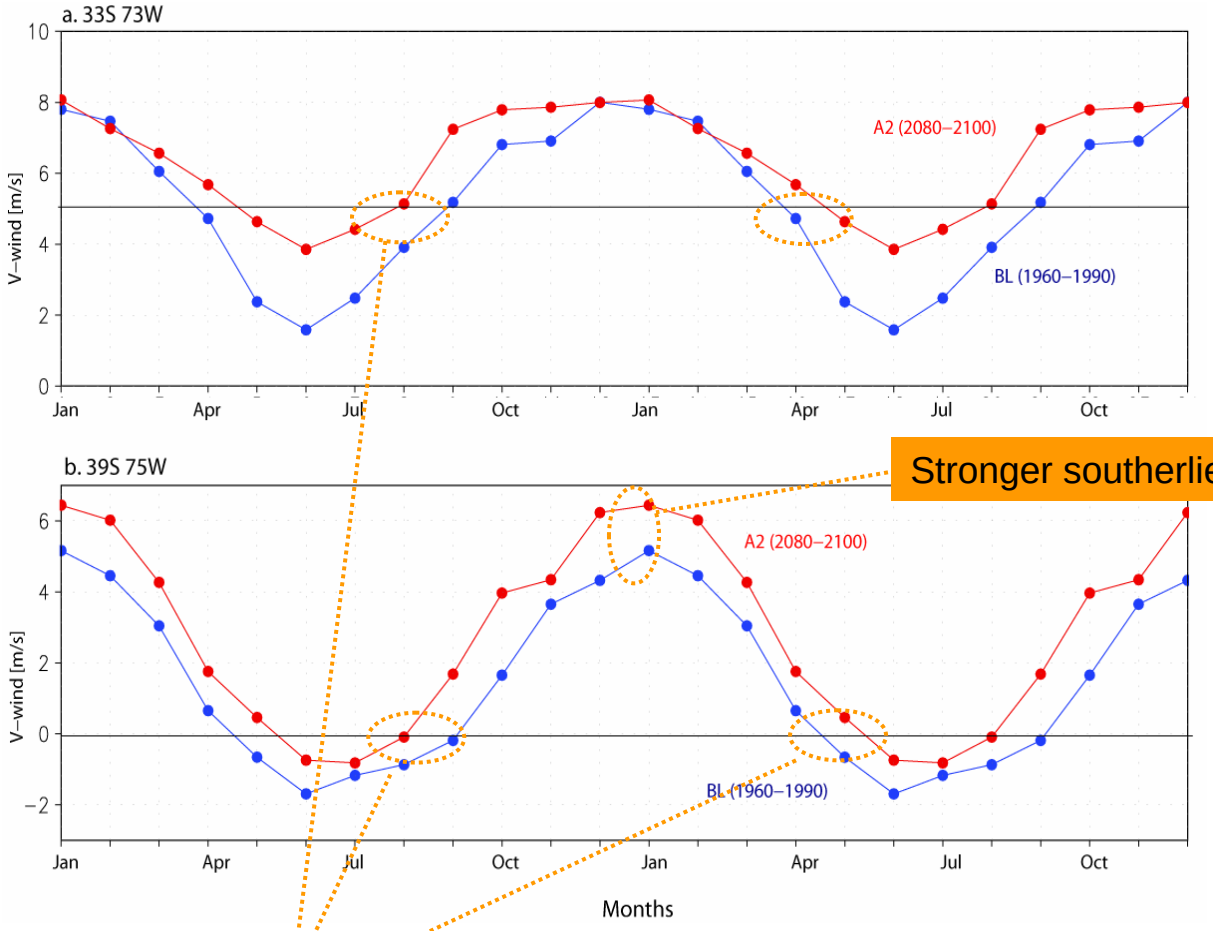


Resultados PRECIS: Viento Superficial



Consecuencias biológicas a través de cambio en la surgencia costera y turbulencia

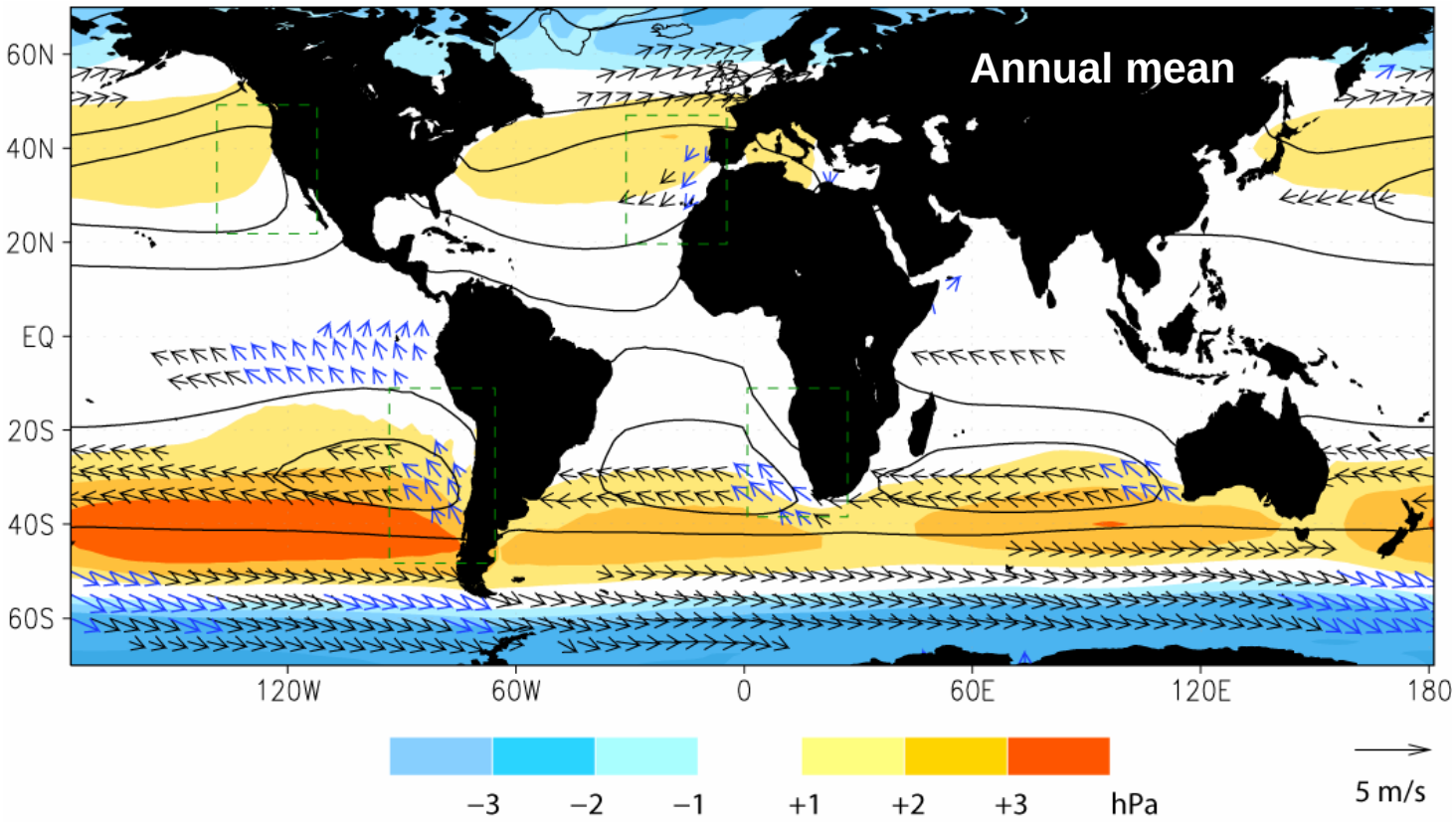
PRECIS Results



Stronger southerlies

2 month extended upwelling season
(earlier onset, later demise)

Multimodel average SLP and sfc wind difference betweenA2 (2070-2100) and BL (1970-2000)



Over open ocean Δv in geostrophic balance with ΔSLP.
Near the coast Δv more controlled by along-coast ΔSLP

Conclusiones

* Existen manifestaciones del cambio climático asociado a los GI en las últimas décadas a lo largo del país.

* Cambios proyectados son en algunos casos similares en magnitud y signo a los observados en las últimas décadas.

* Proyeccion de cambio de precipitación muy variable en el espacio y con alto grado de incertidumbre (magnitud y signo)

* Variabilidad natural (ENSO, PDO, SAM) es muy fuerte en SAyC, elemento dominante en los proximos 20-30 años.