

Climate trends in the Southeast Pacific Natural and anthropogenic contributions

René D. Garreaud

Professor, Geophysics Department, Universidad de Chile
Deputy Director, Center for Climate and Resilience Research

Victoria University Wellington. New Zealand – November 1, 2016

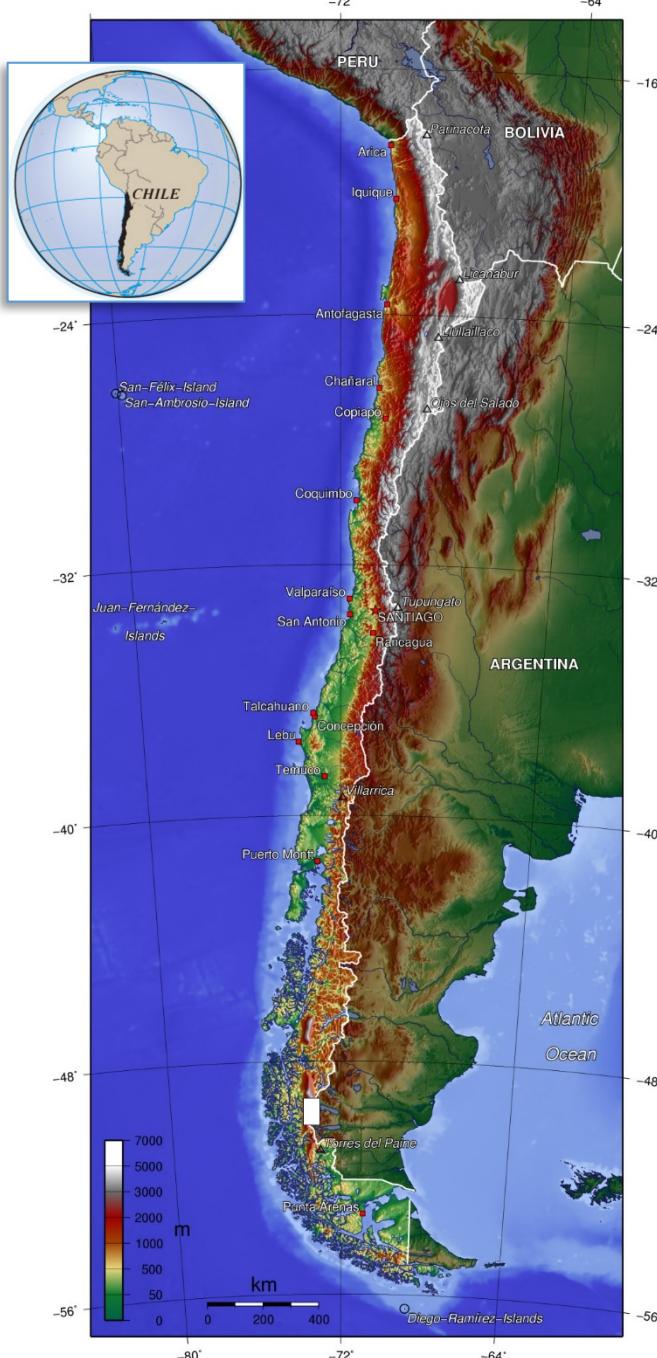
Chile

Climate trends in the ~~Southeast Pacific~~ Natural and anthropogenic contributions

René D. Garreaud

Professor, Geophysics Department, Universidad de Chile
Deputy Director, Center for Climate and Resilience Research

Victoria University Wellington. New Zealand – November 1, 2016



Chile's Fast Facts

A long, narrow, mountainous country with a nice ocean view and....

16 Mill inhabitants / 6 Mill in Santiago (Capital)

GDP per capita: US\$ 13.000 (near world average)

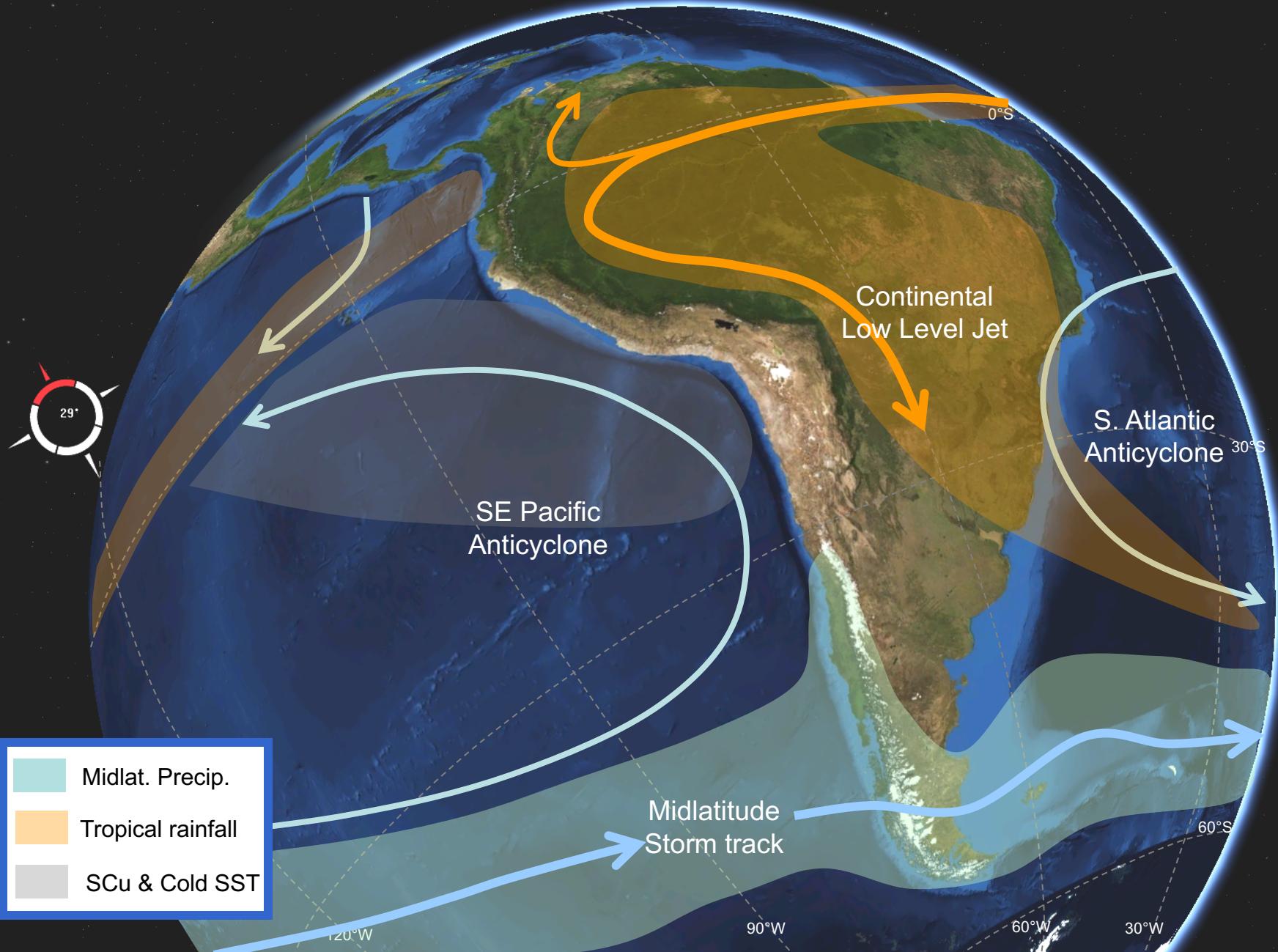
GINI Index: 51 (World: 38, NZ: 33)

Life expectation: 76 / Literacy: 88%

Open economy based on mining (copper), services, fisheries (2nd world salmon producer), agriculture (fruits, wine).

Climate: From Atacama, the driest place on earth, in the north to a Mediterranean central Chile (Santiago rainfall: 300 mm/yr) to hyper-humid western Patagonia.

The big picture



Impacts of ENOS, PDO and SAM (AAO)

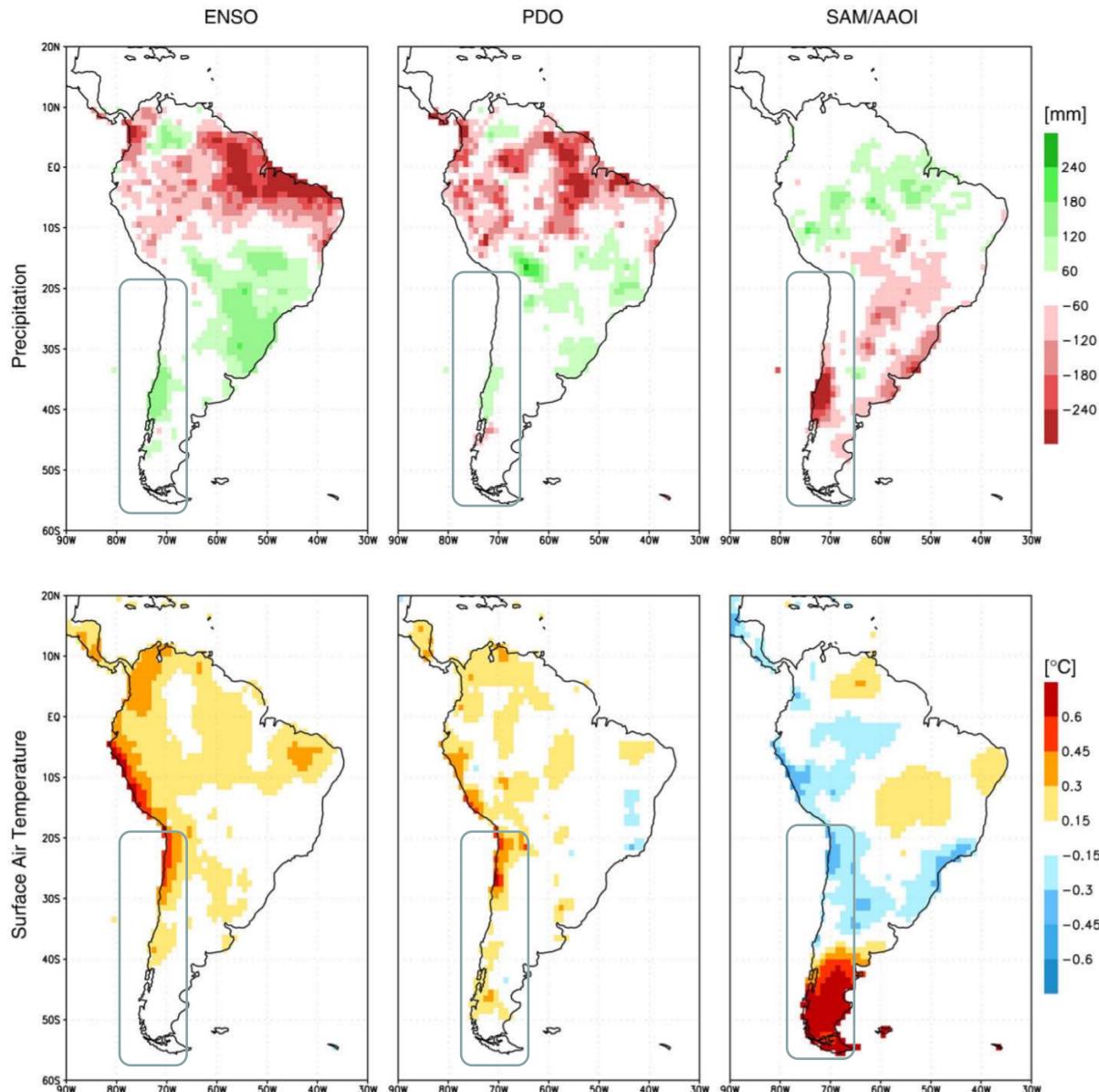


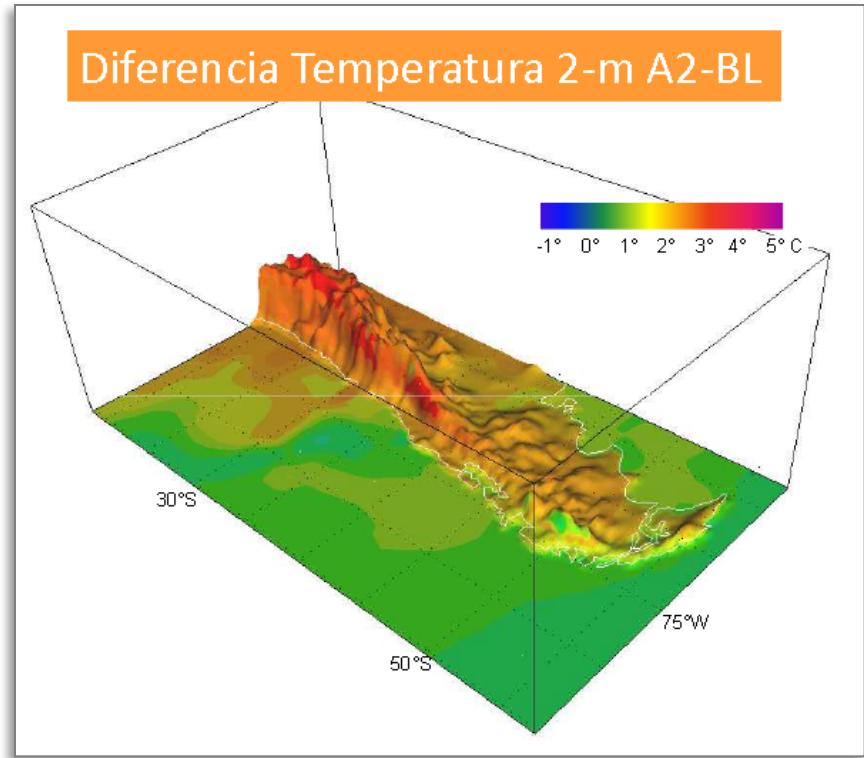
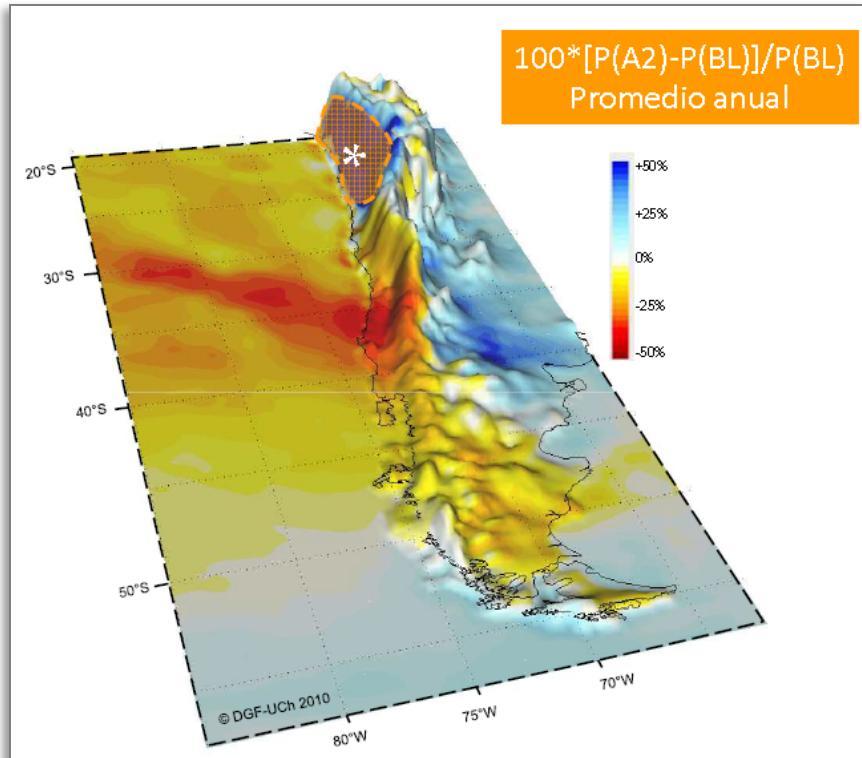
Fig. 10. Annual mean precipitation (upper row) and surface air temperature (lower row) regressed upon MEI (left column), PDO index (center column) and AAOI (right column). Precipitation and surface air temperature from University of Delaware gridded dataset.

Garreaud et al. 2009

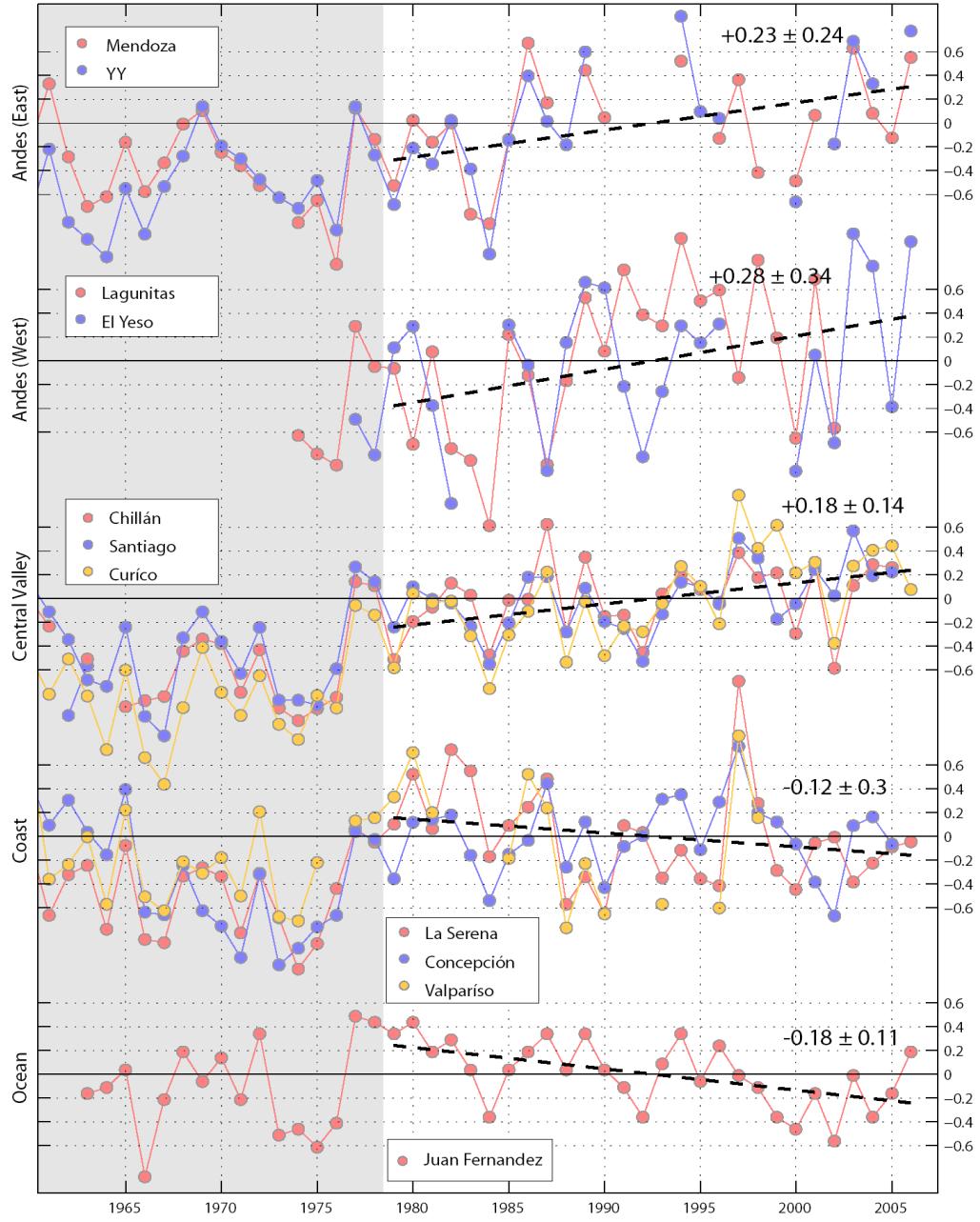
Central Chile Climate Change Projections

Towards the end of century under A2 (RCP8.5)

- Temperature increase 2.5-3.5°C, most marked in the mnts.
- Rainfall decline 25-35% in central, southern Chile



Surface Temperature Change



East Pacific Cooling

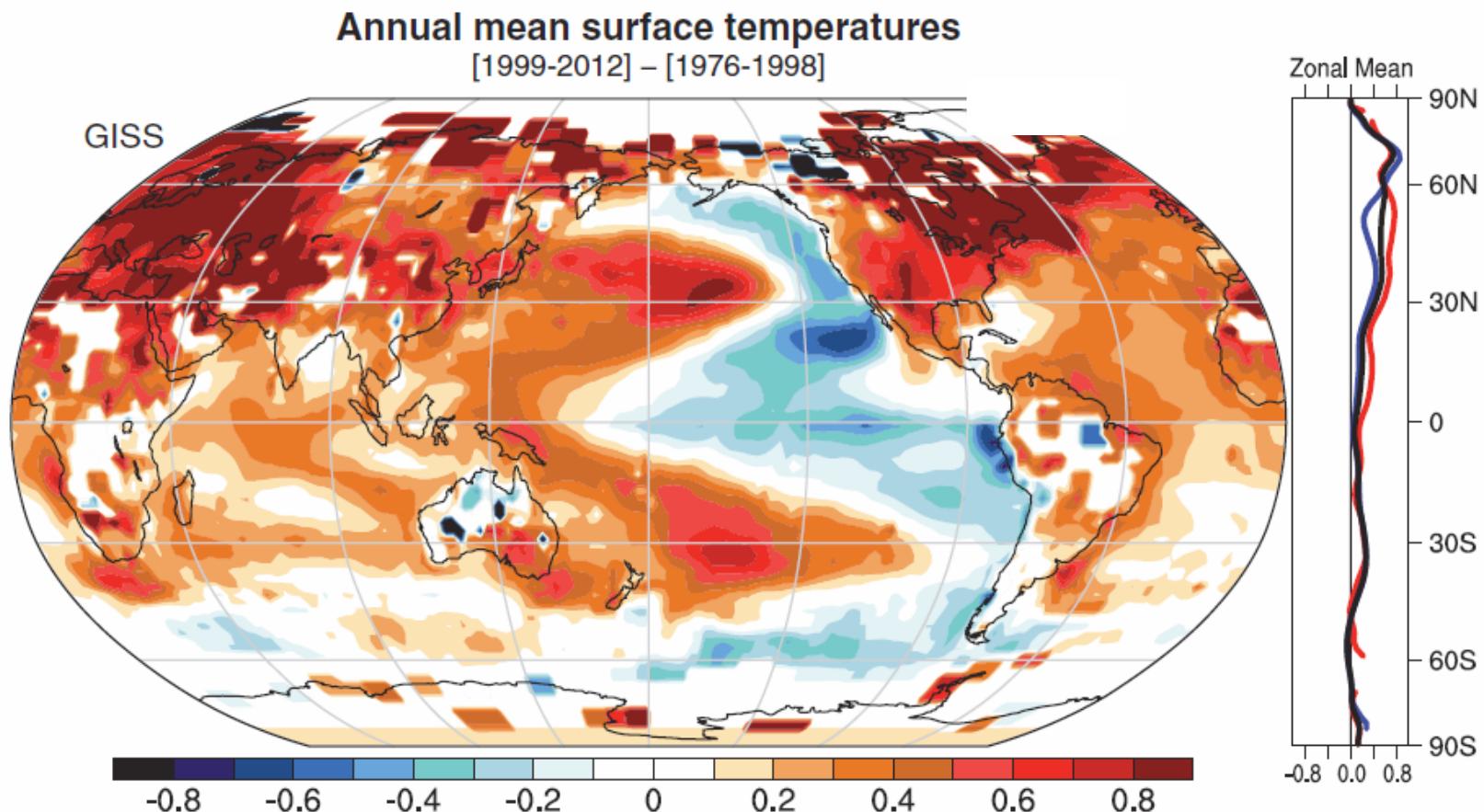
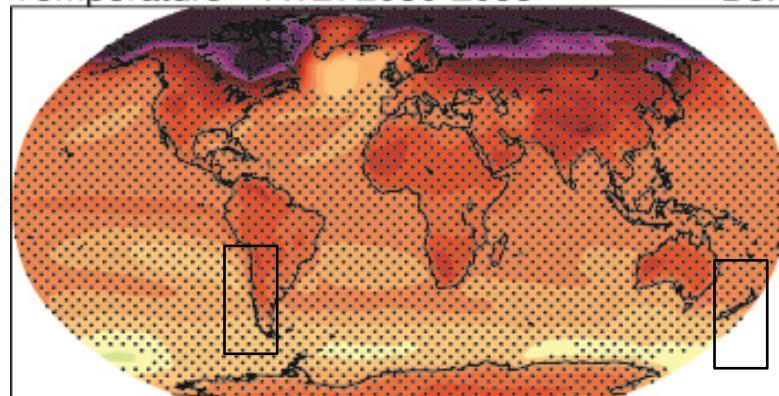


Figure 9. Mean annual surface temperature differences from GISS for 1999–2012 and 1976–1998 in °C, with zonal means at right for ocean (blue), land (red), and zonal mean (black).

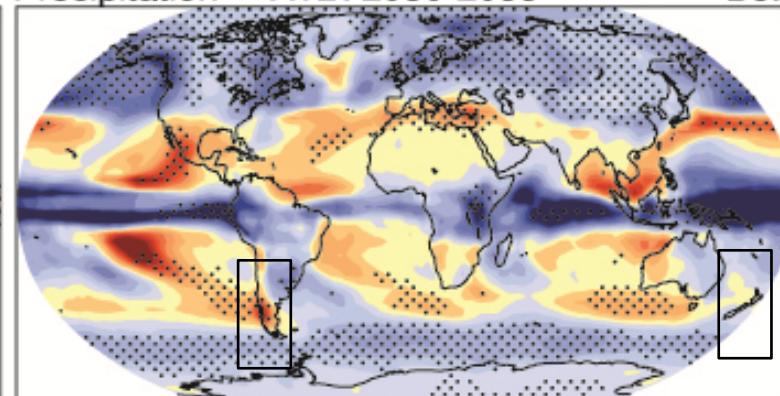
We are your closest neighbors...to the east!

Temperature A1B: 2080-2099



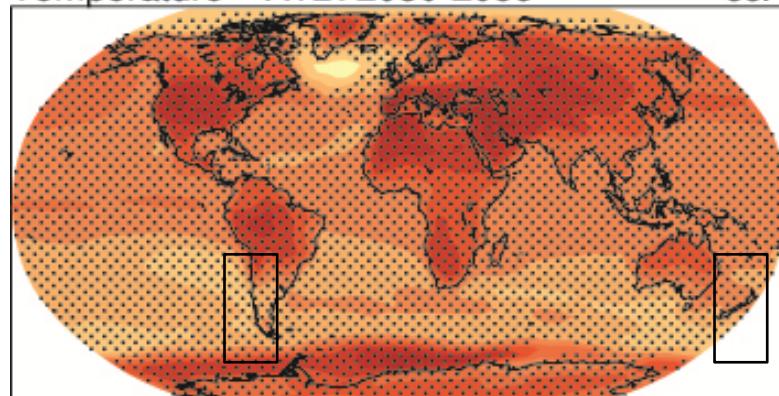
DJF Precipitation

A1B: 2080-2099



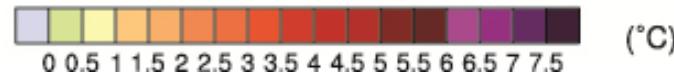
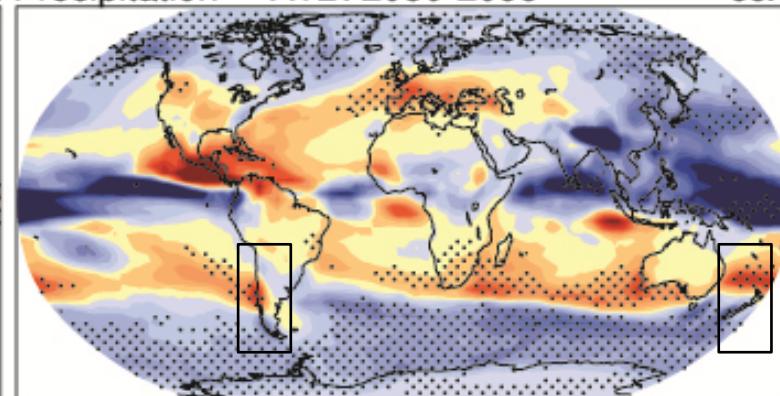
(°C)

Temperature A1B: 2080-2099

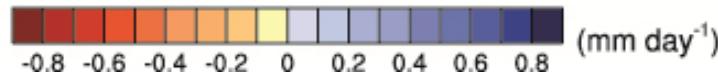


JJA Precipitation

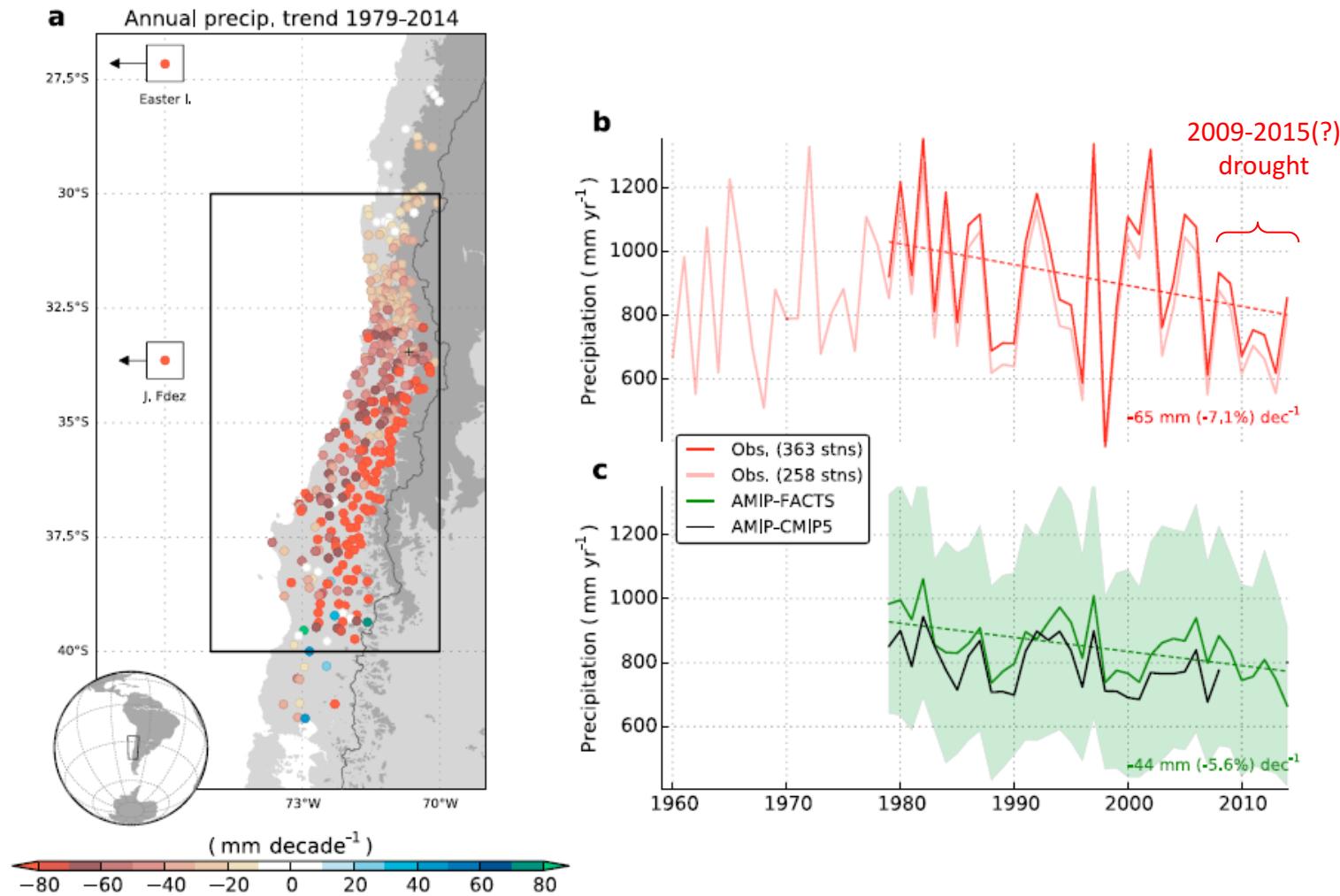
A1B: 2080-2099



(°C)

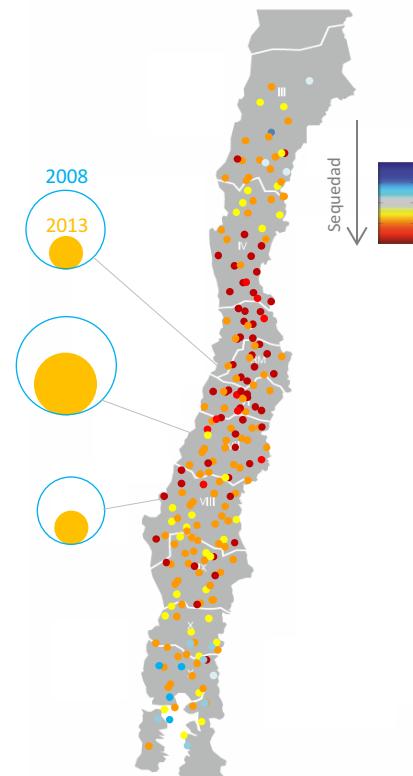


Contemporaneous rainfall trends in central Chile (Updated)



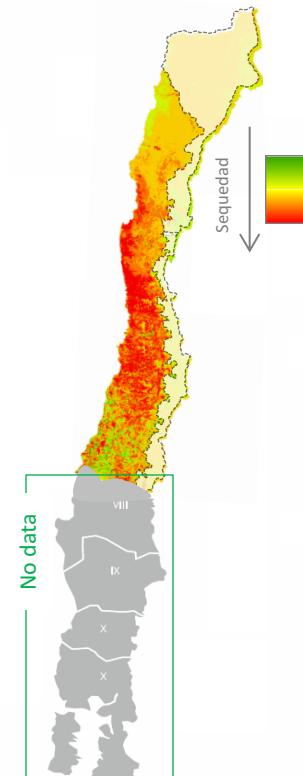
The Mega drought 2010-2015

Transporte de sedimentos en invierno

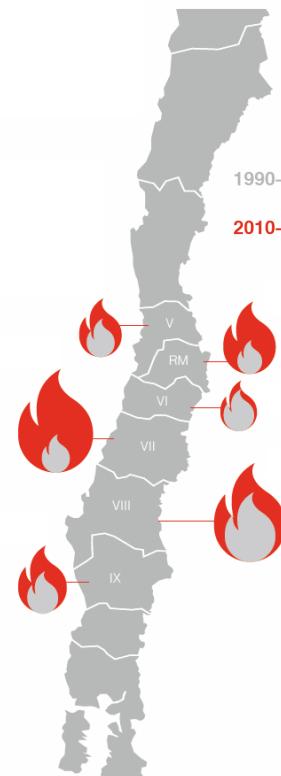


Déficit Pluviométrico (2010-2014)

Deterioro vegetación Agosto 2010-2015



Incendios forestales de magnitud



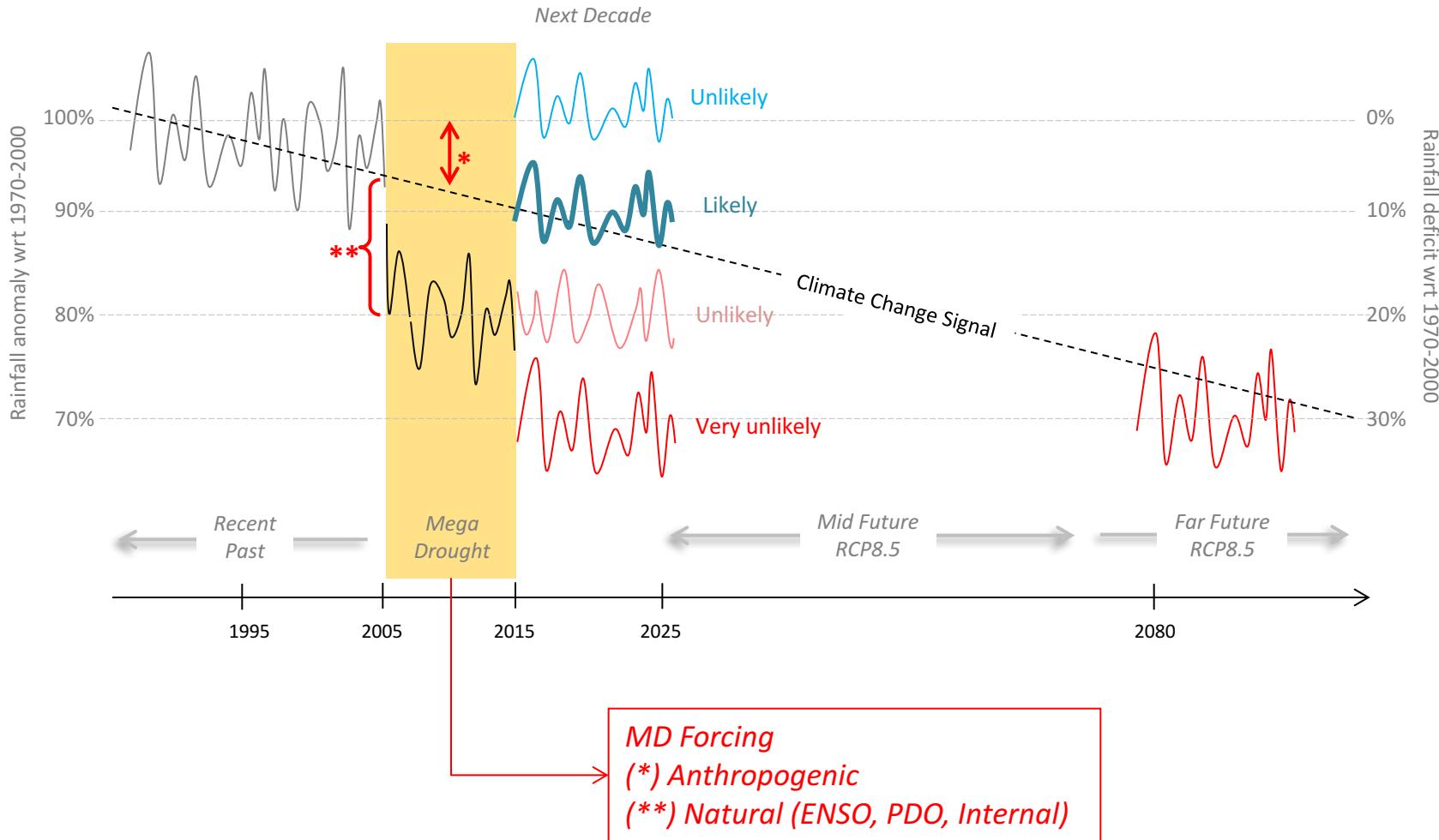
Apariciones en prensa escrita (2014)



Gastos en Camiones Aljibes (Mill\$)



The Next Decade Challenge



La Megasequía 2010-2015

Una lección para el futuro

<http://www.cr2.cl/megasequia/>



Center for Climate
and Resilience Research
www.CR2.cl



The Mega drought 2010-2015

- Very bad for the country
- Doesn't rule out storms
- A synopsis of our future (adaptation)
- Foster climate change awareness
- Good for our research center
 - ✓ Integrative research topic
 - ✓ Interesting science ($6 \neq 6 \times 1$)
 - ✓ Lot of visibility





We are your closest neighbors...
to the east!