Evidencias Atmosféricas del Cambio Climático en el Pacifico Sur Oriental

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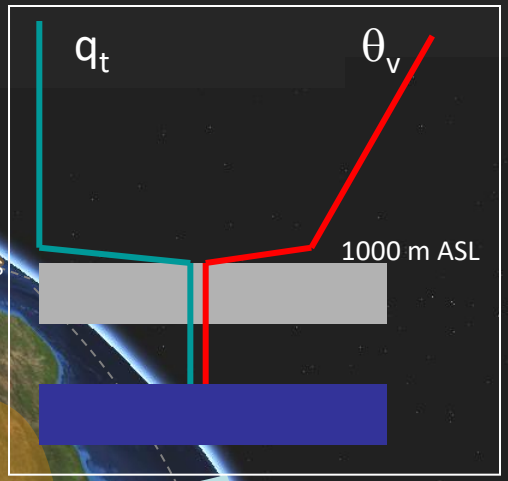
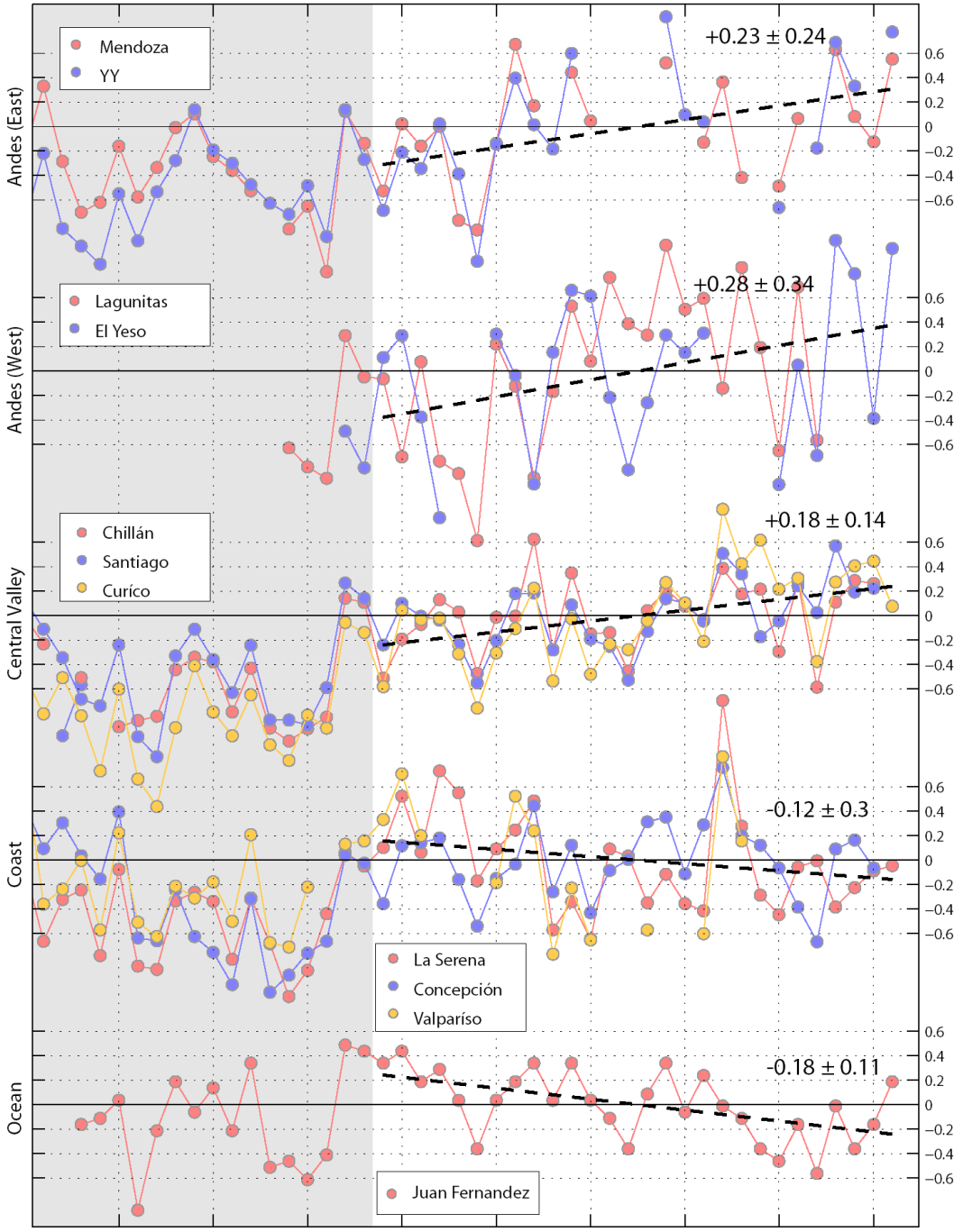
Reunión conformación grupo expertos nacionales
en Cambio Climático del Sistema Marino
Valparaiso, 21-Dic-2018

The big picture



Is the regional cooling of the Humboldt EBUS already taking place?



East Andes

West Andes

Inland

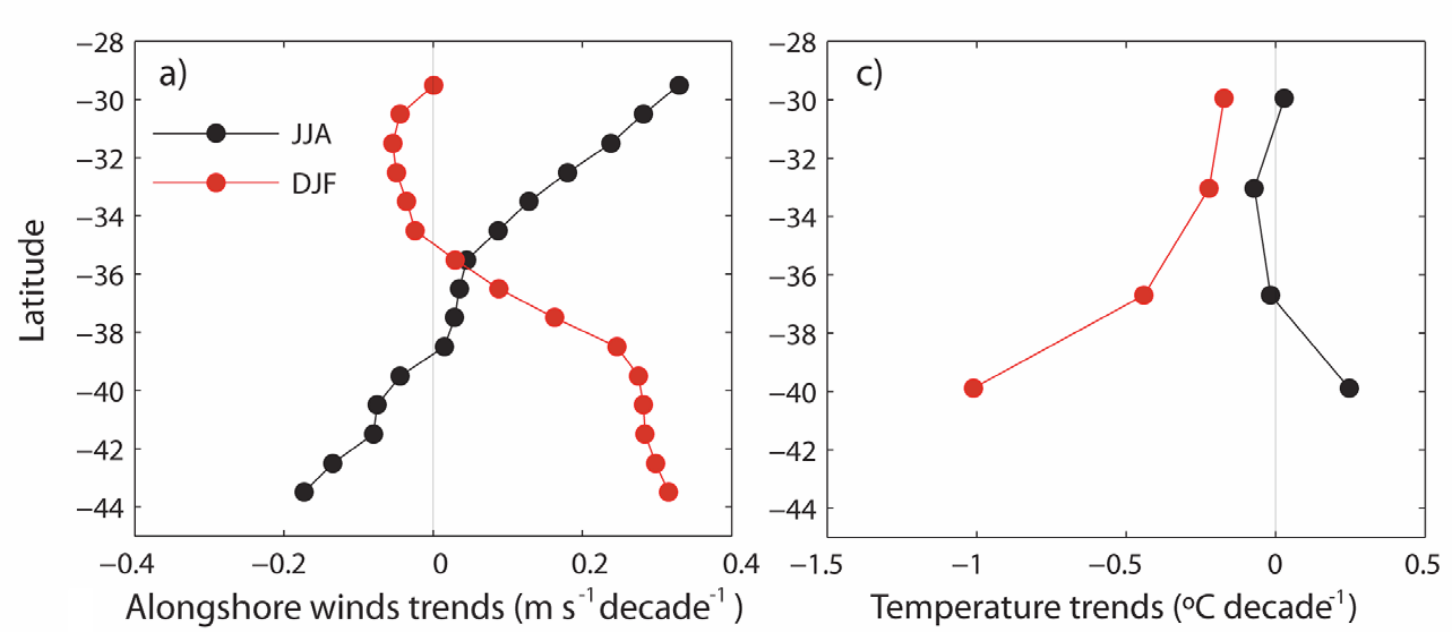
Coast

Offshore

Falvey & Garreaud 2009

Is the regional cooling of the Humboldt EBUS already taking place?

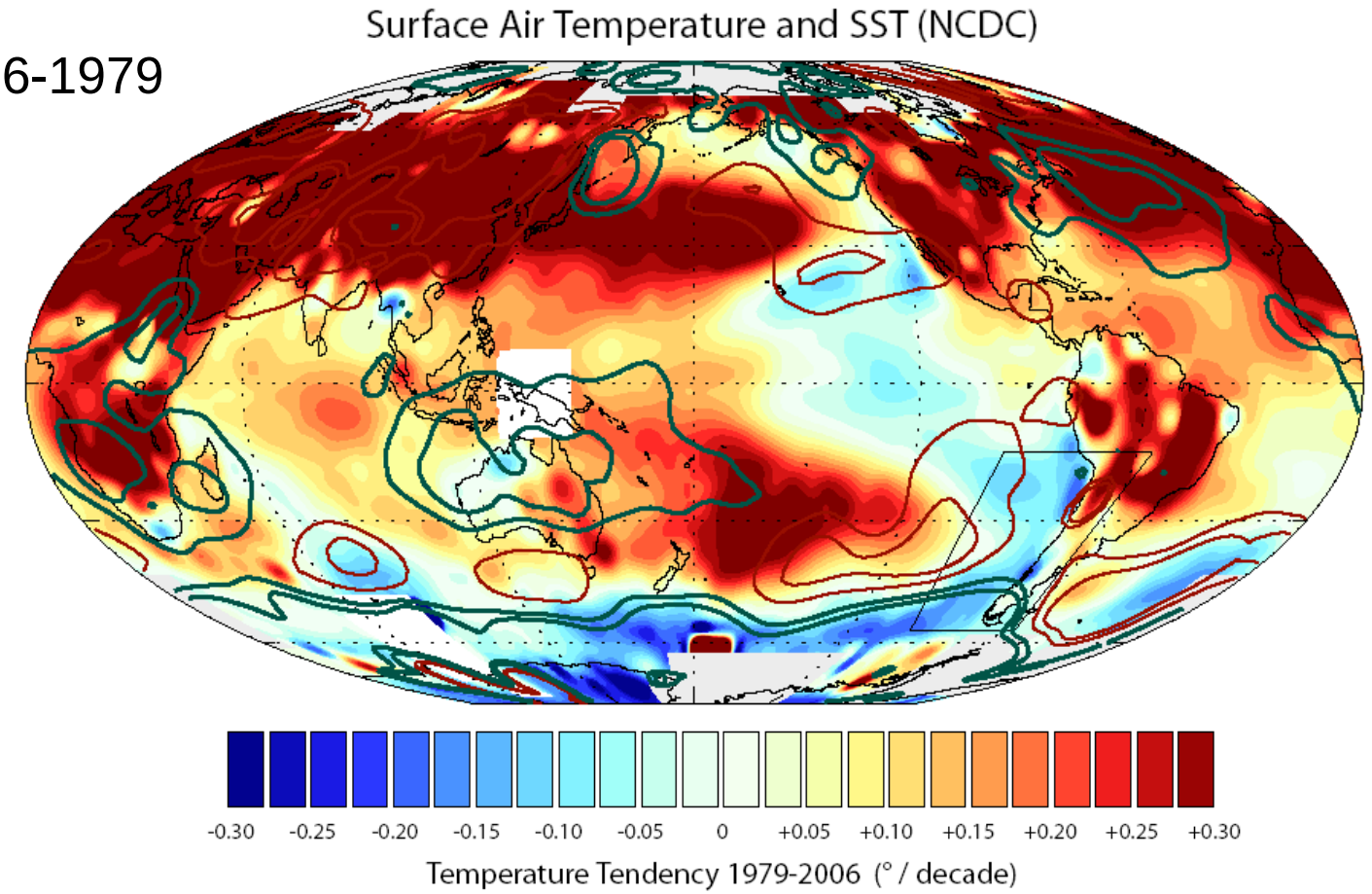
Vwind & SST trends (1979-2015)



Aguirre et al. 2009

Is the regional cooling of the Humboldt EBUS already taking place?

2006-1979

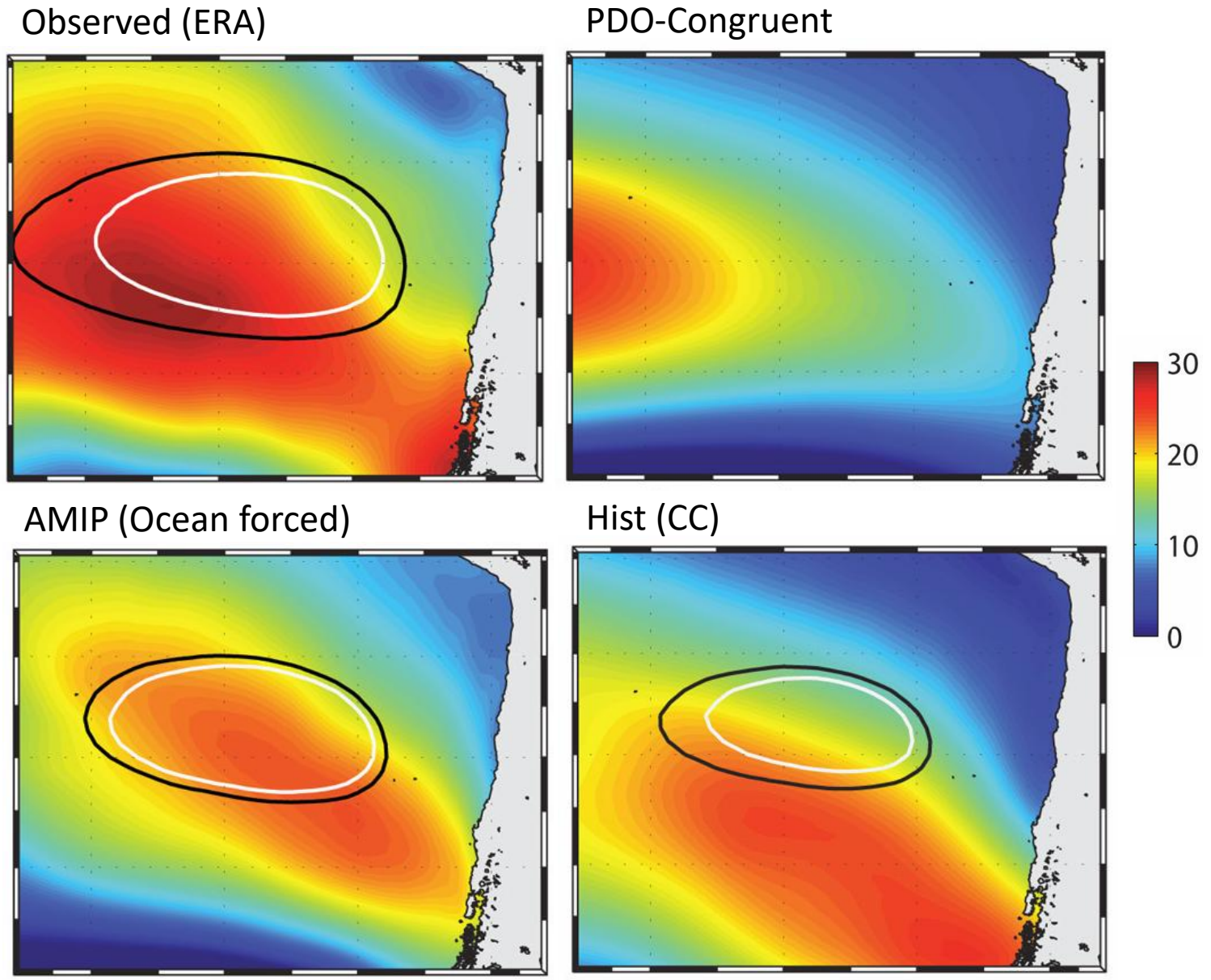


Over the Pacifc SST trend looks very similar to the PDV patter

Falvey & Garreaud 2009

Is the regional cooling of the Humboldt EBUS already taking place?

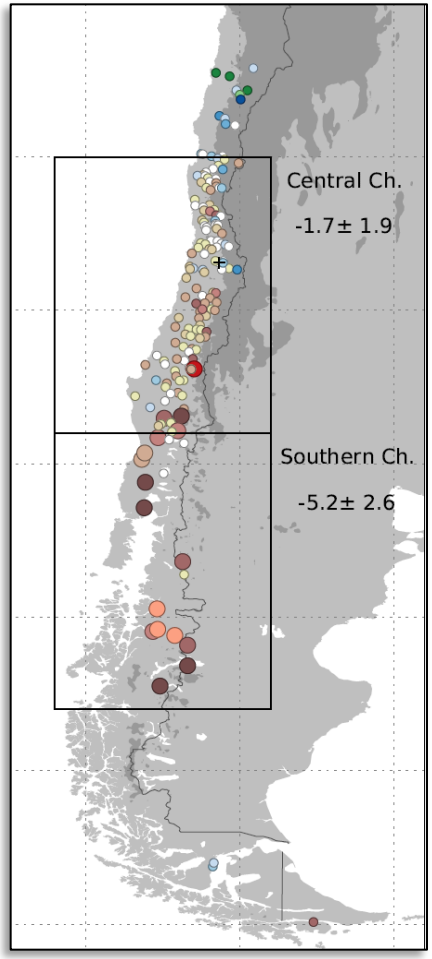
SLP trends (1979-2015)



Aguirre et al. 2009

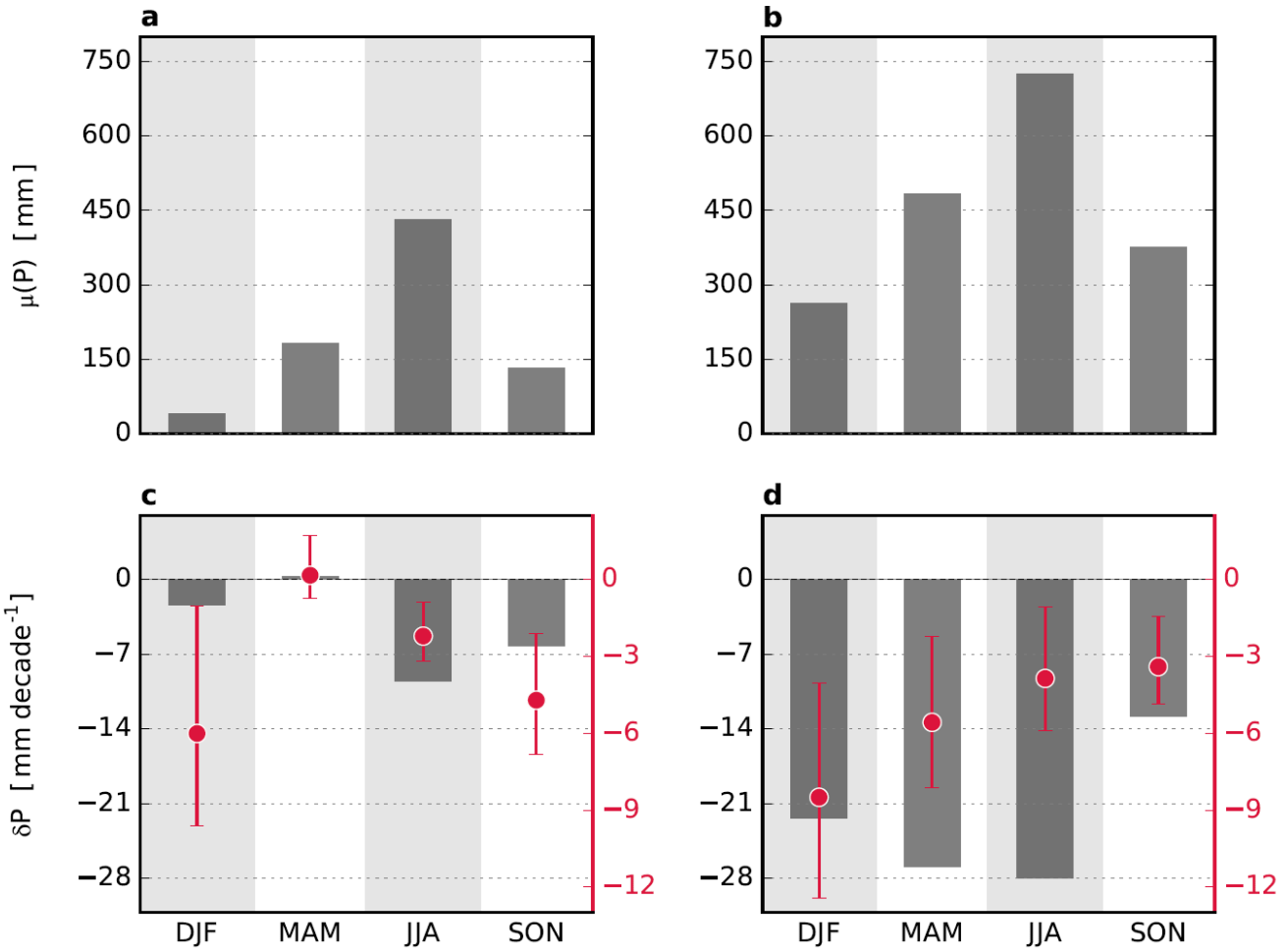
Precipitation trends over land

Annual rainfall trends
(1960-2016)



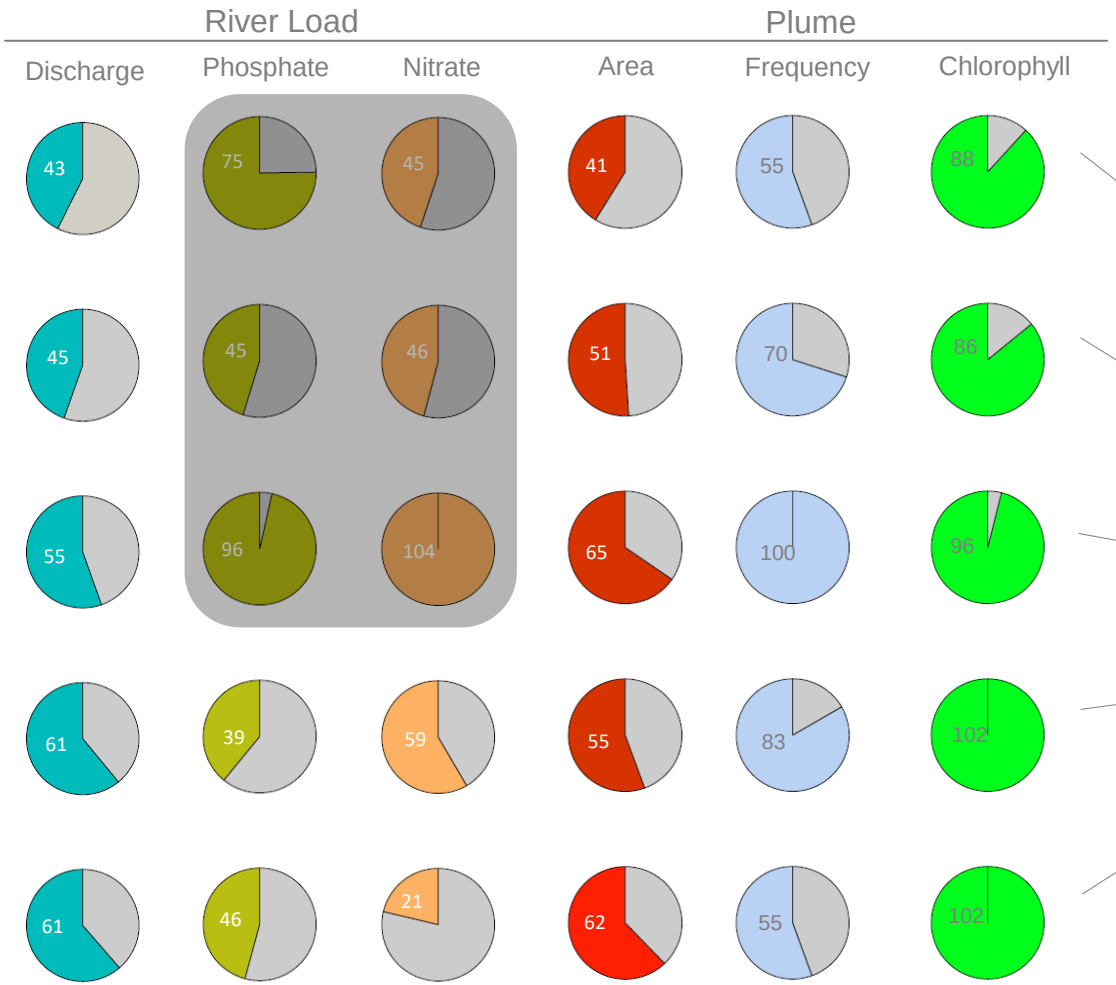
Central Chile

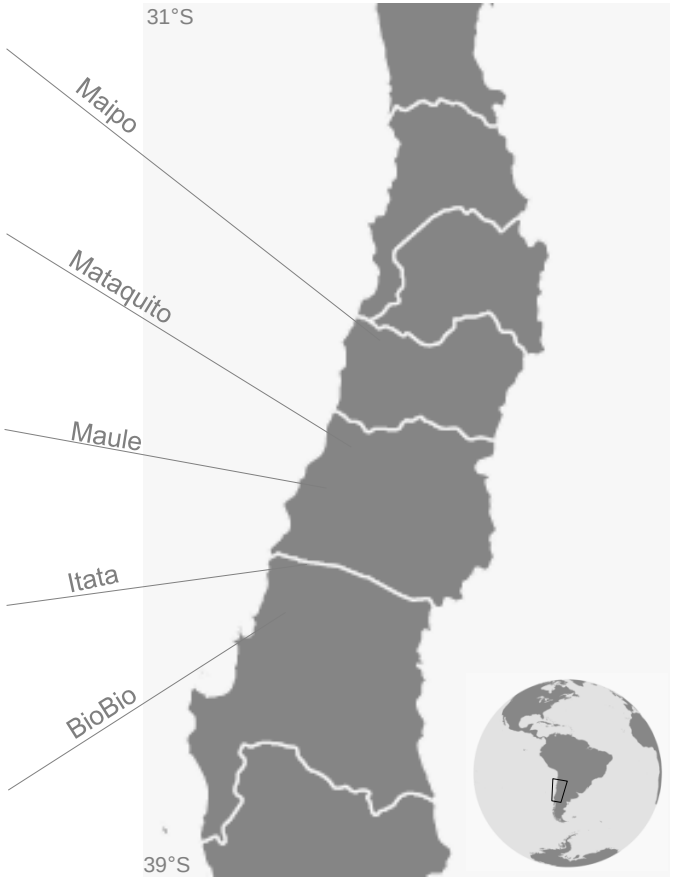
Southern Chile



Boisier et al. 2018, *Elementa*

Impact of Mega drought in coastal zone



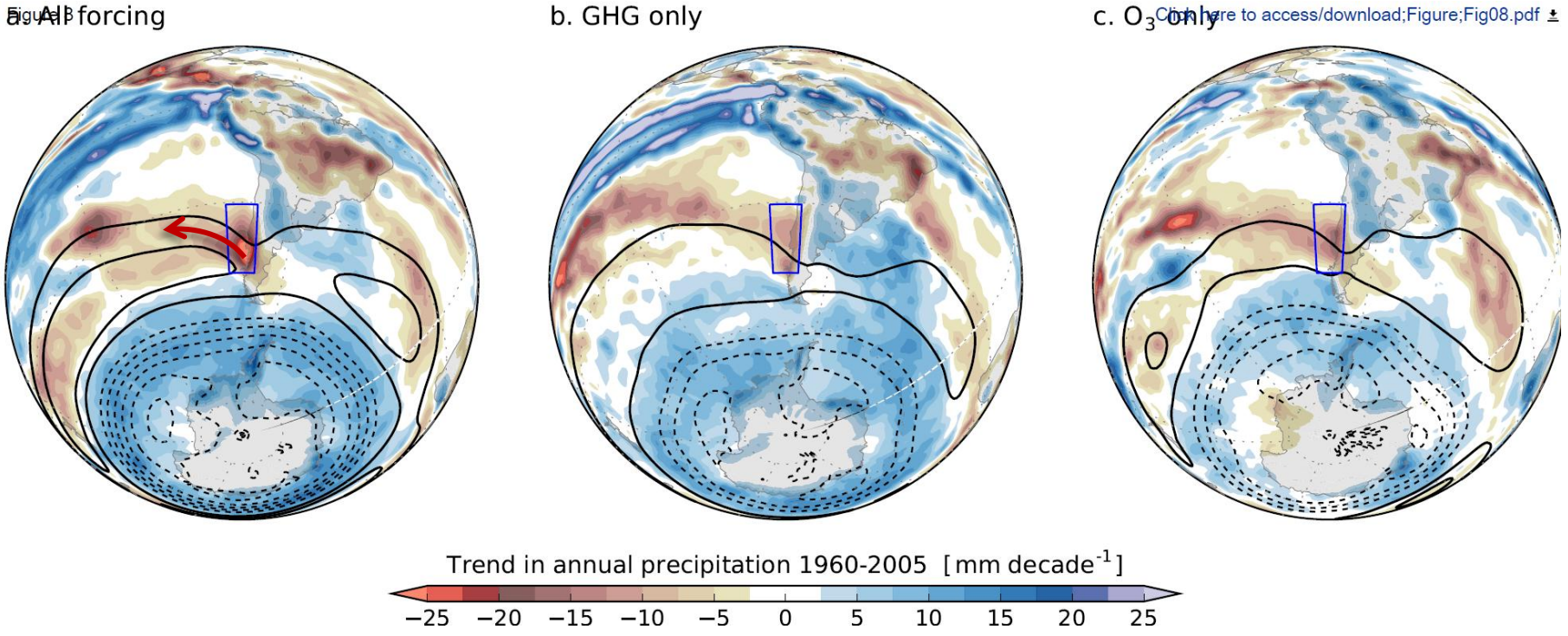


Numbers and colored areas indicate the mega drought (2010-2014) mean values of selected variables as a percentage of the past decade (2000-2009) averages for five rivers in central Chile. Maipo, Mataquito and Maule river have P and Ni data until 2011 only.

Massoti et al. 2018, *Frontiers*

Precipitation trends 1960-2005: Attribution

Both O3 depletion and GHG increase, but O3 effect dominates in summer

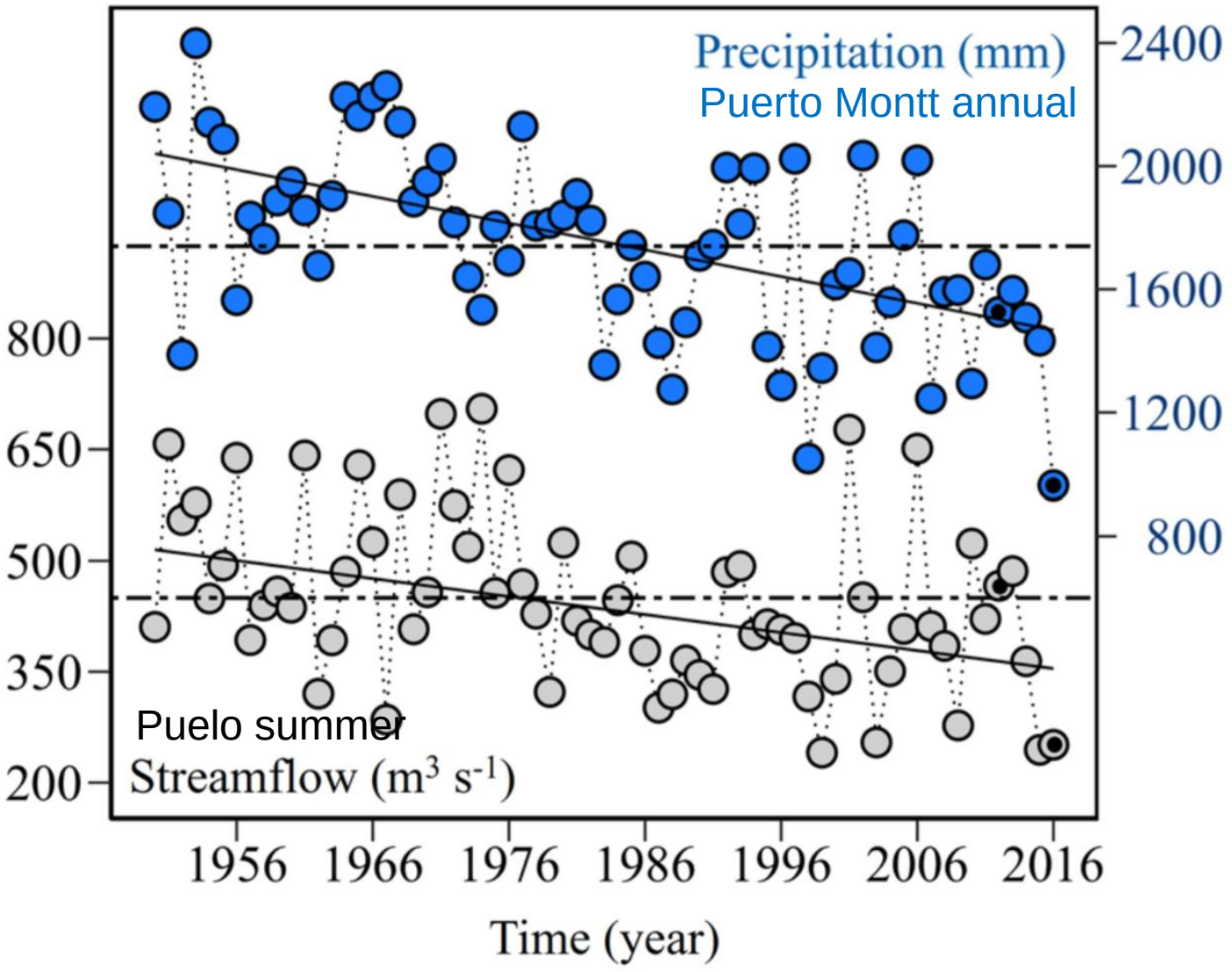


Boisier et al. 2018, *Elementa*

What about

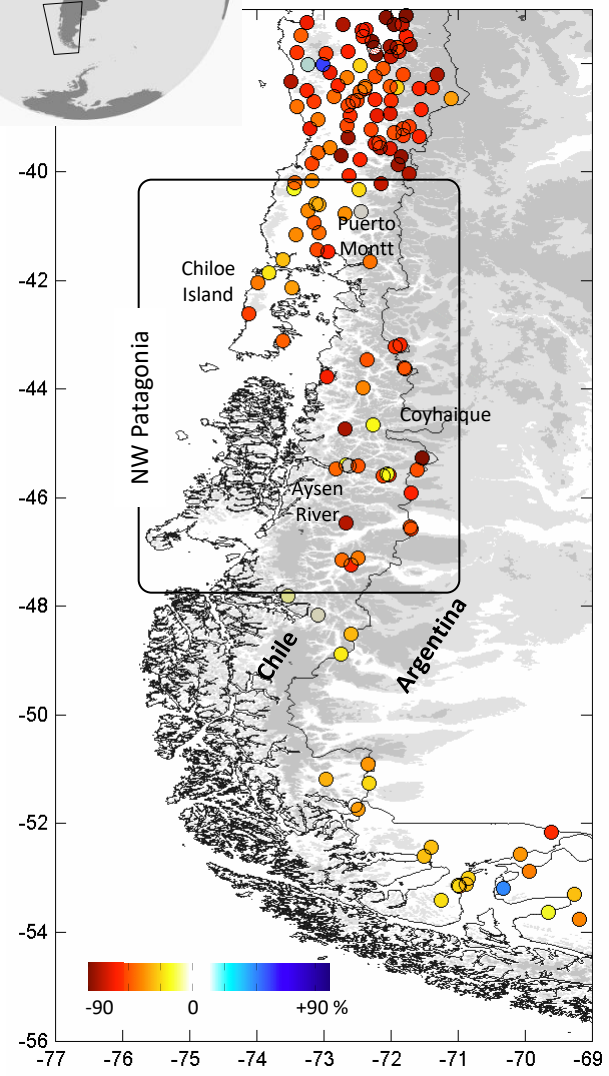
Extreme Events?

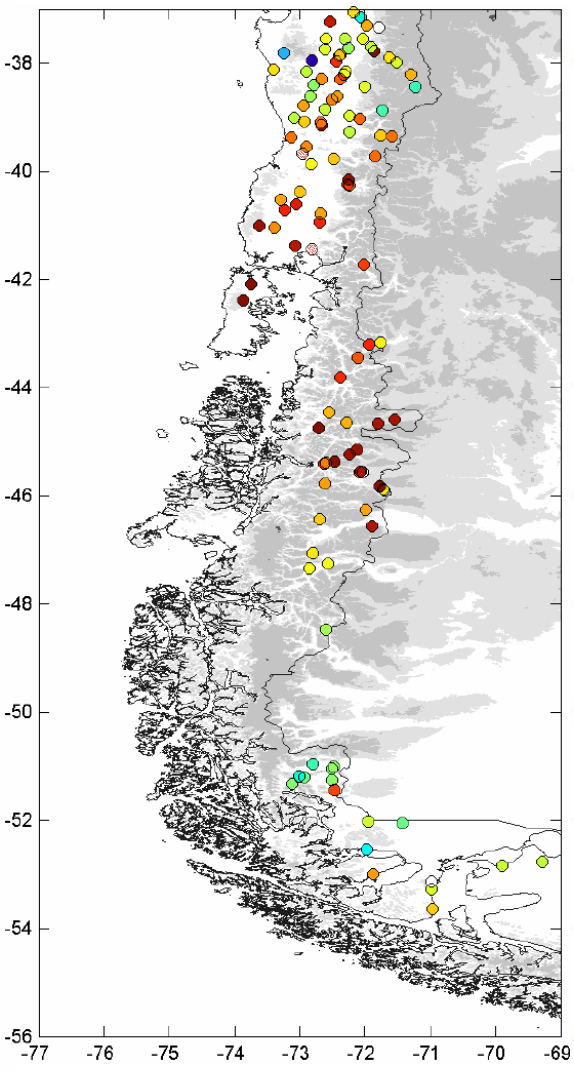
Trend and Variability

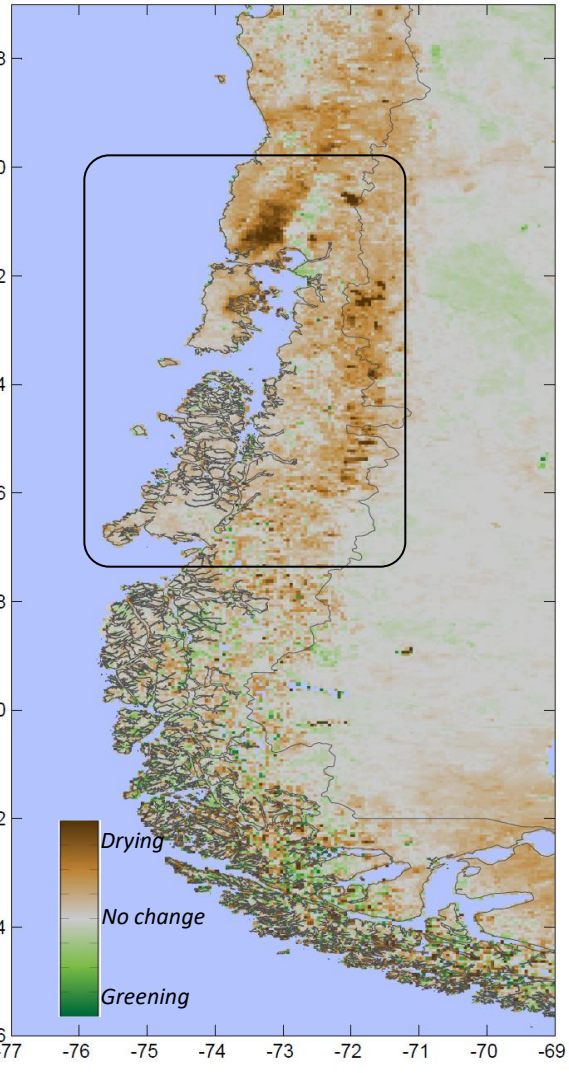


Leon-Muñoz et al. 2018, *Sci. Reports*

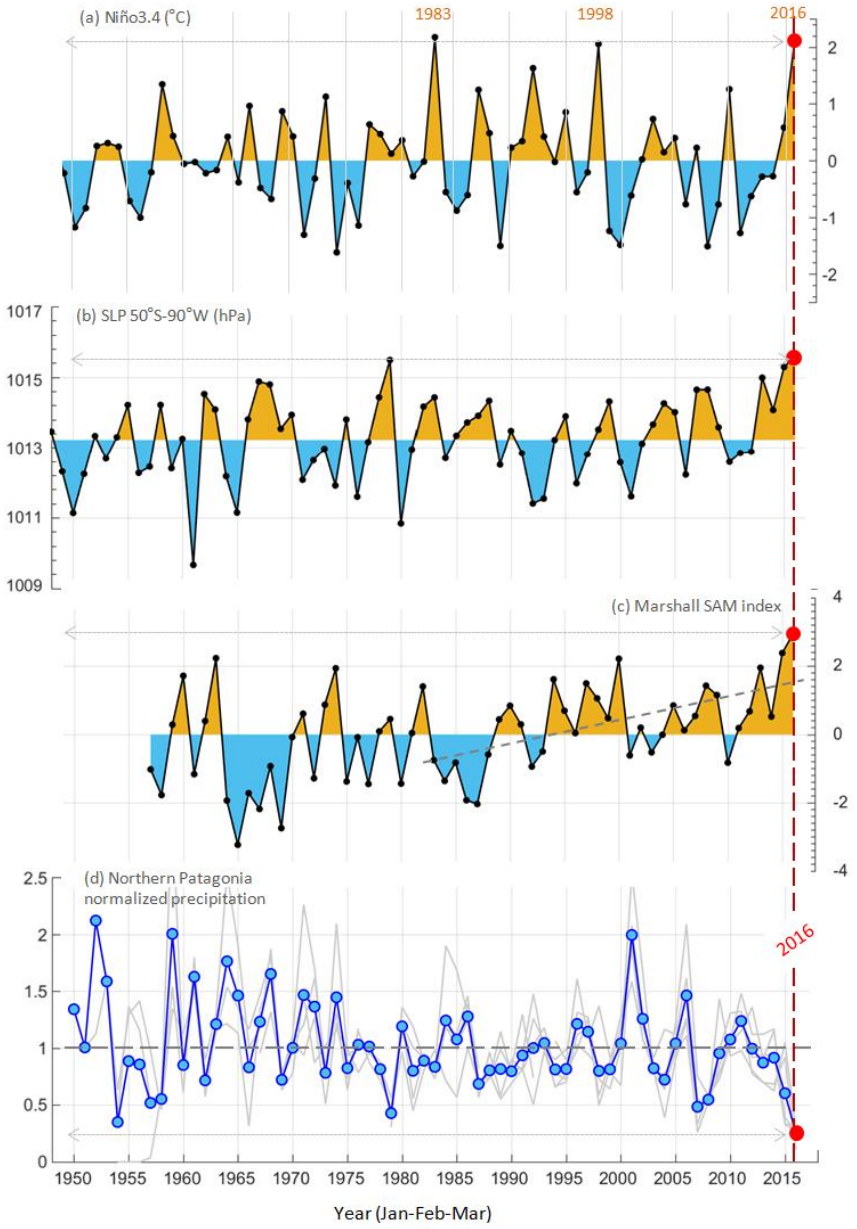
The awful 2016







Large scale conditions JFMA 2016

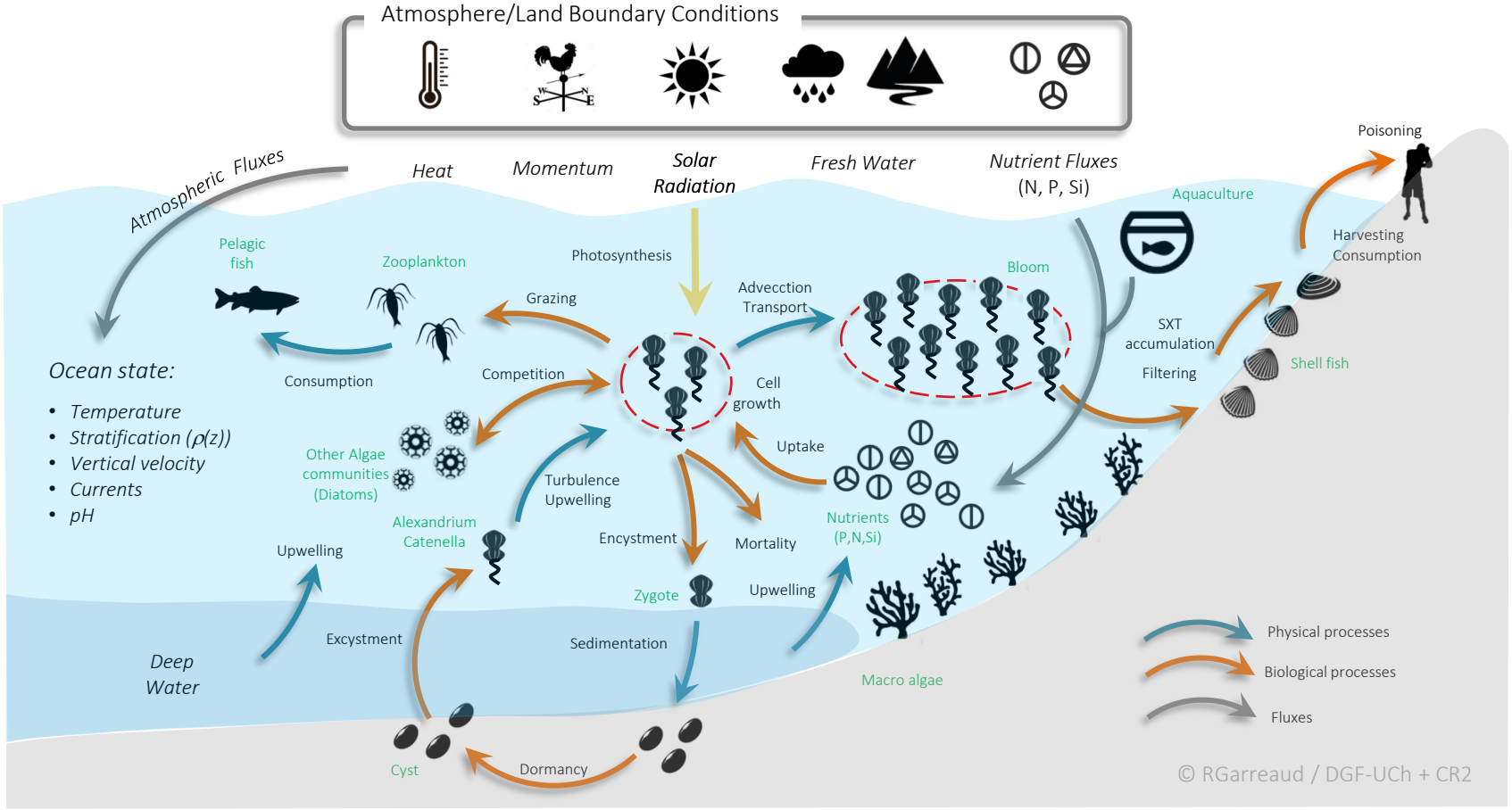


El Niño!
Natural….

r = -0.2

SAM!
Antrophogenic

Garreaud 2018, *Sci. Res.*



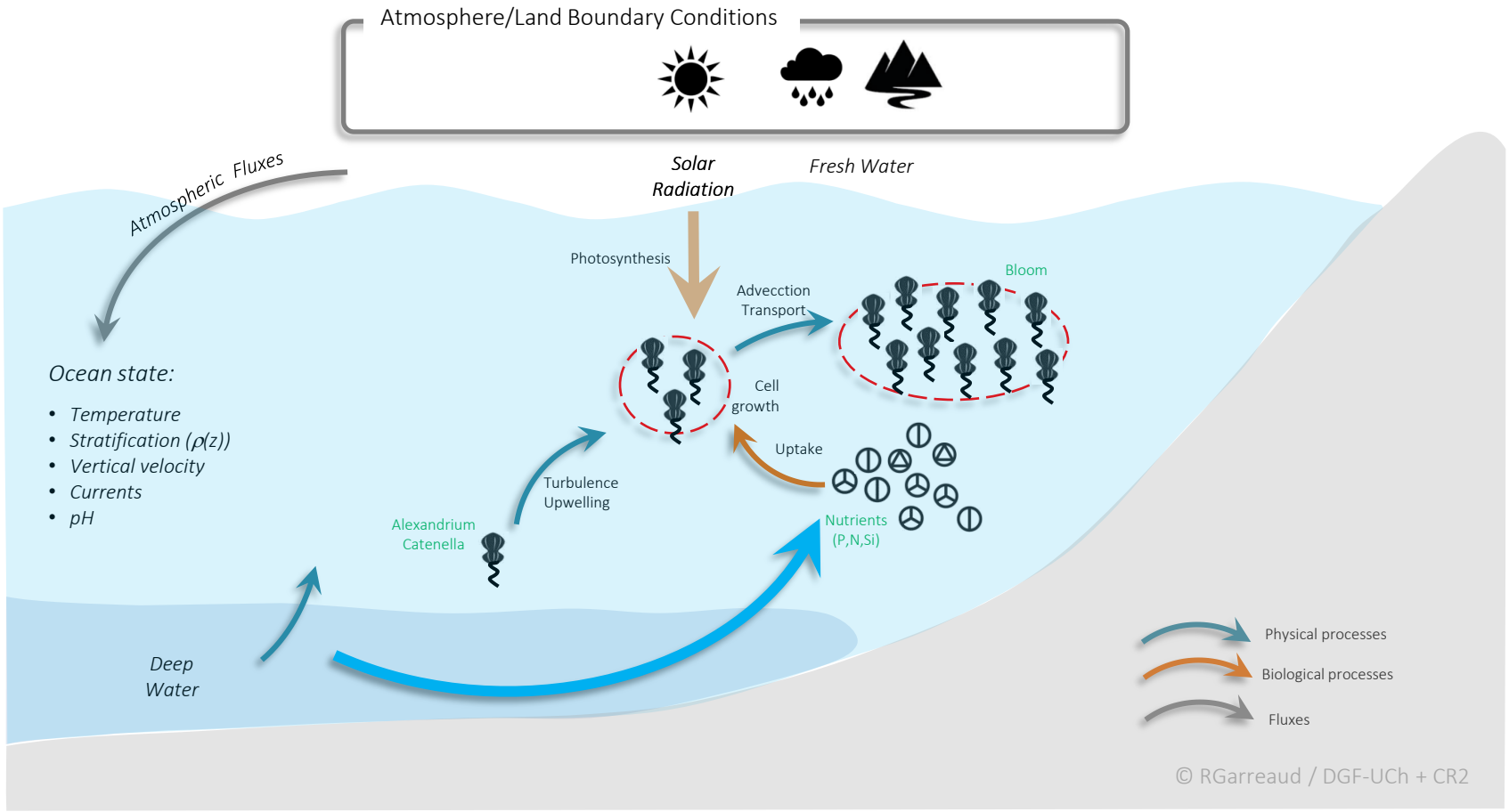
SCIENTIFIC REPORTS

OPEN

Hydroclimatic conditions trigger record harmful algal bloom in western Patagonia (summer 2016)

d: 26 April 2017

Jorge León-Muñoz[1], Mauricio A. Urbina[2], René Garreaud[3,4] & José Luis Iriarte[5,6,7]

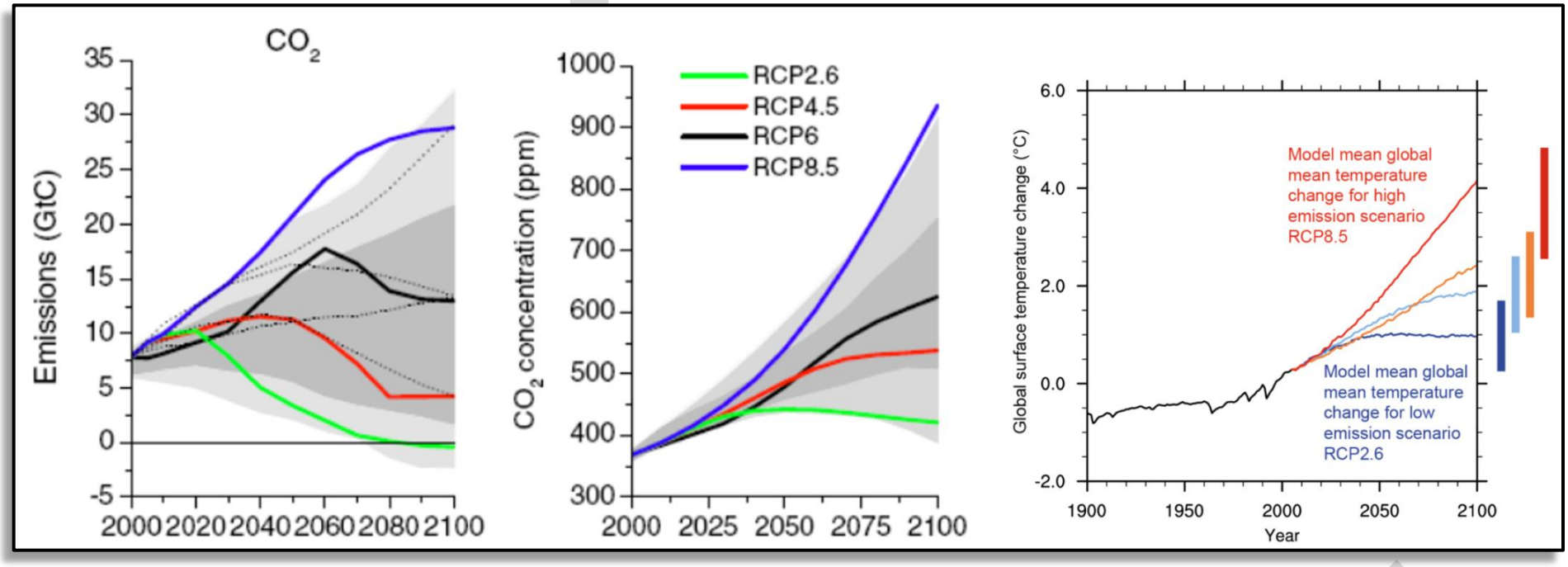

Atmosphere/Land Boundary Conditions
Atmospheric Fluxes
Solar Radiation
Fresh Water
Photosynthesis
Advecction Transport
Bloom
Cell growth
Uptake
Turbulence Upwelling
Alexandrium Catenella
Nutrients (P,N,Si)
Ocean state:
Temperature
Stratification (ρ(z))
Vertical velocity
Currents
pH
Deep Water
Physical processes
Biological processes
Fluxes
© RGarreaud / DGF-UCh + CR2

The awful 2016

How much CO2 will be emitted in the future ?

Socio-economic development pathways

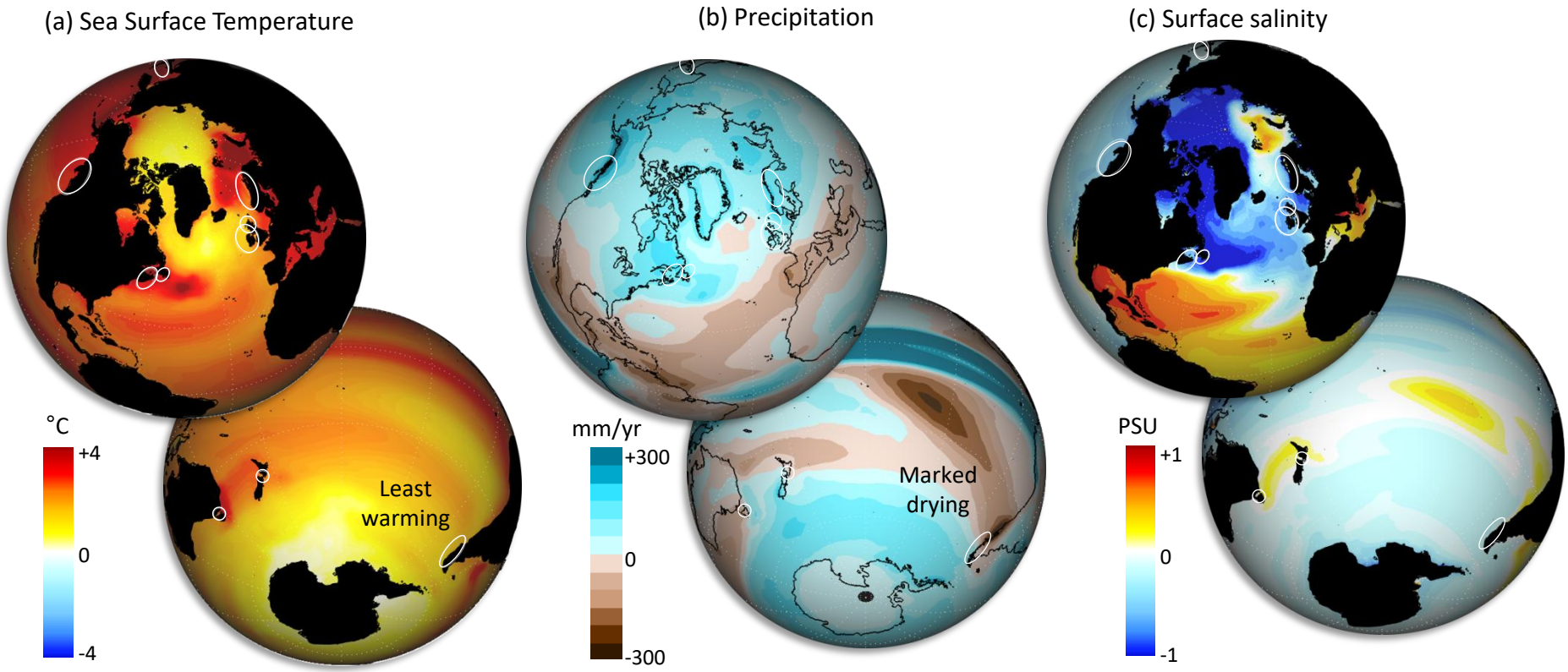
Climate Scenarios



Balance
De Masa

GCMs (more than 40)

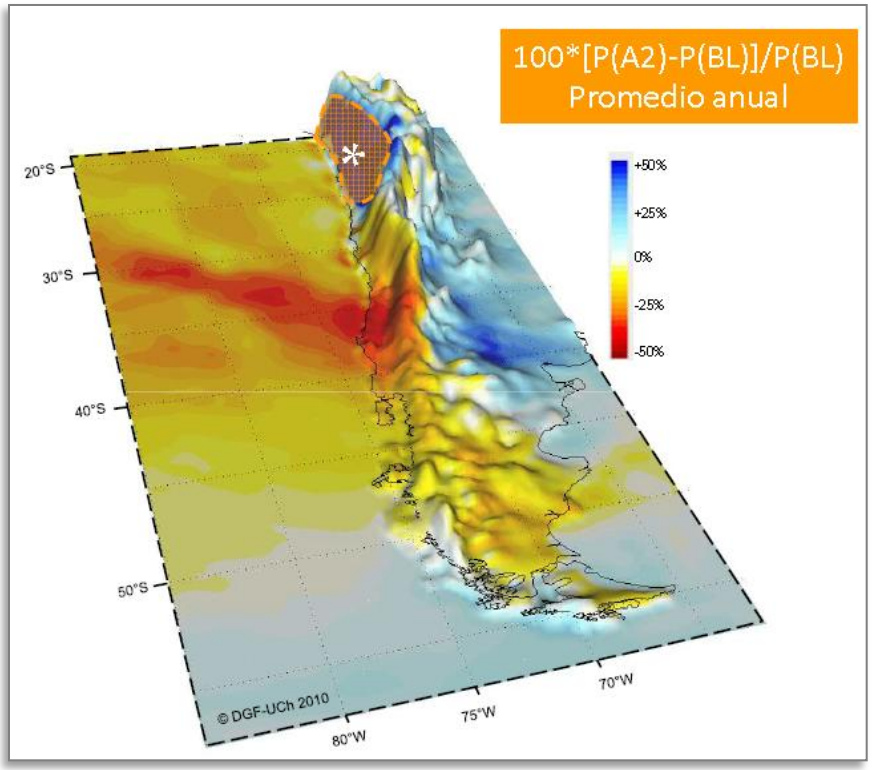
Projected changes
End of century under heavy emission scenarios

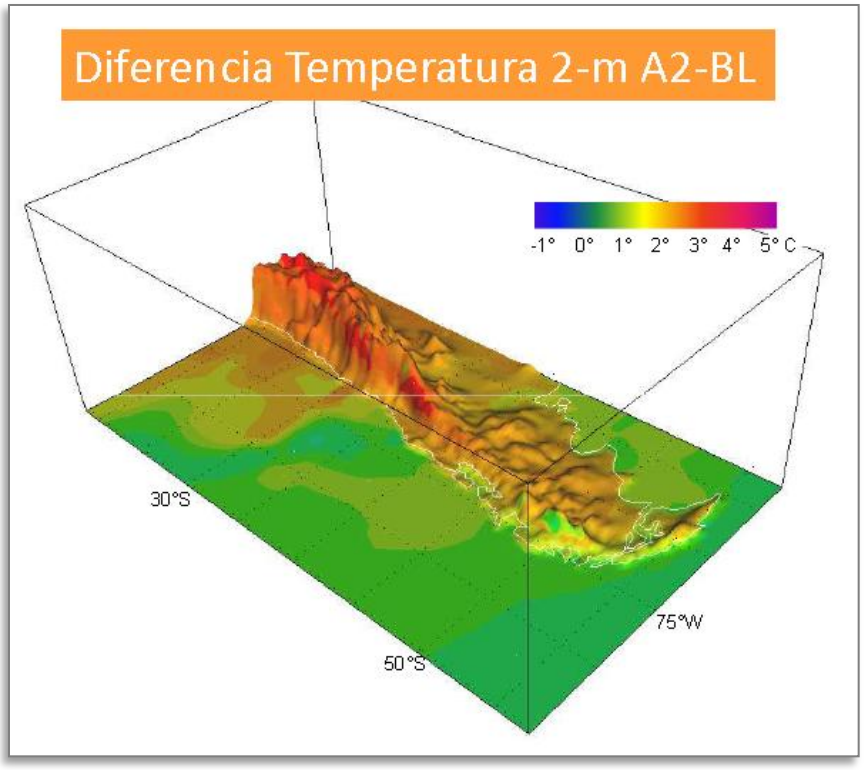


Garreaud 2019, submitted to *JFD*

Southern SA Climate Change Projections

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

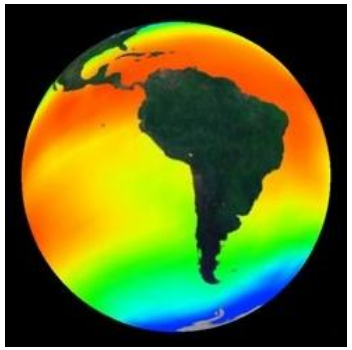


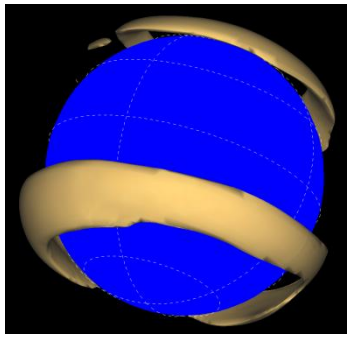


Estudio DGF/UCh-CONAMA 2007 empleando PRECIS

Environmental extremes and change
→ Social tensions

Local activities





Climate variability
Climate change

Medir, medir, medir…

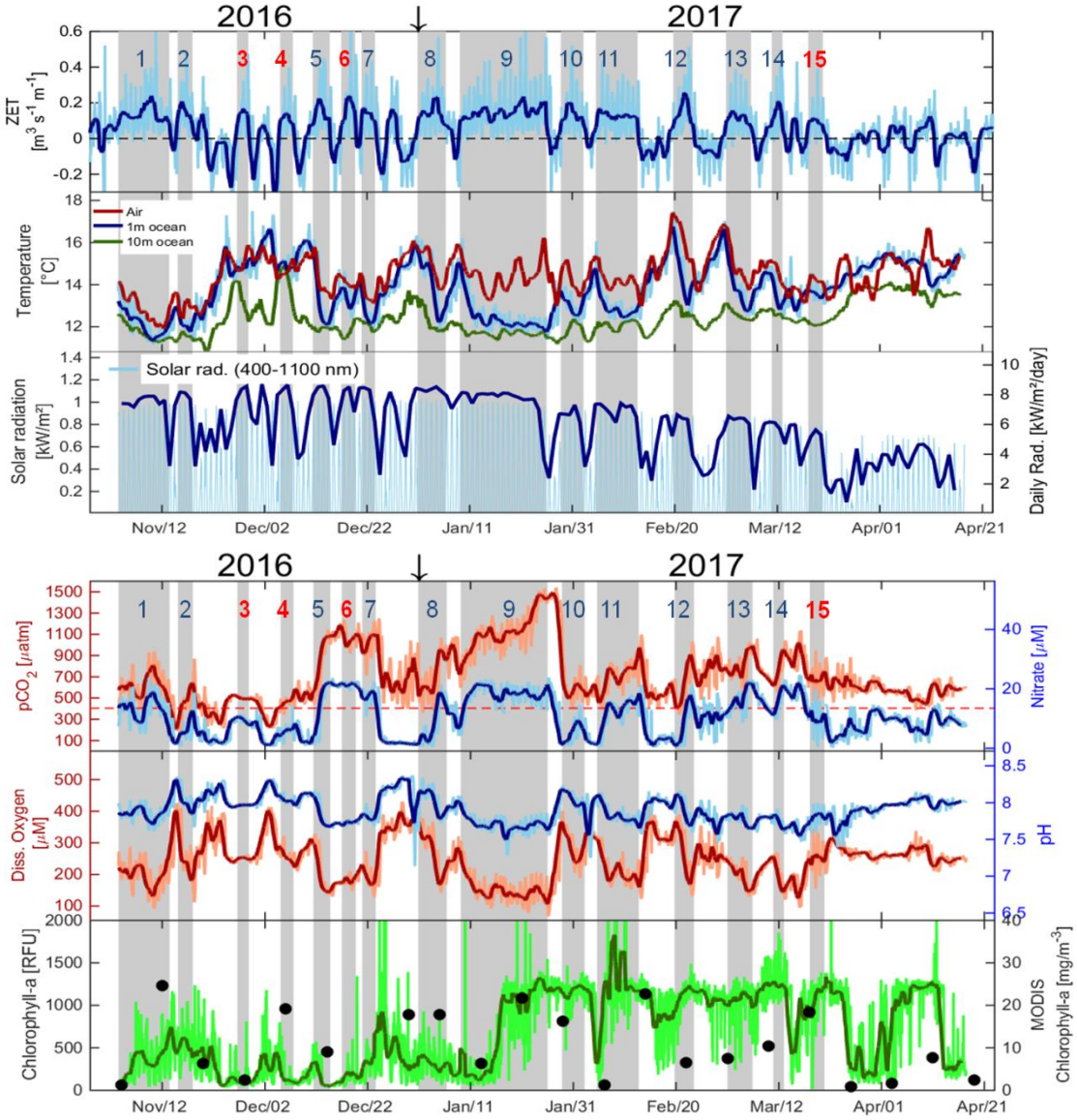
POSAR
Plataforma de Observación del Sistema Acoplado Océano AtmósfeRa

9 de Junio 2016 - Posición: 36.4°S 72.9°W
5 millas náuticas frente a la desembocadura del río Itata - Región del Bio Bio

(CR)²

CONICYT
Ministerio de Educación
Gobierno de Chile

SeaHorse



Belmar et al. 2019???