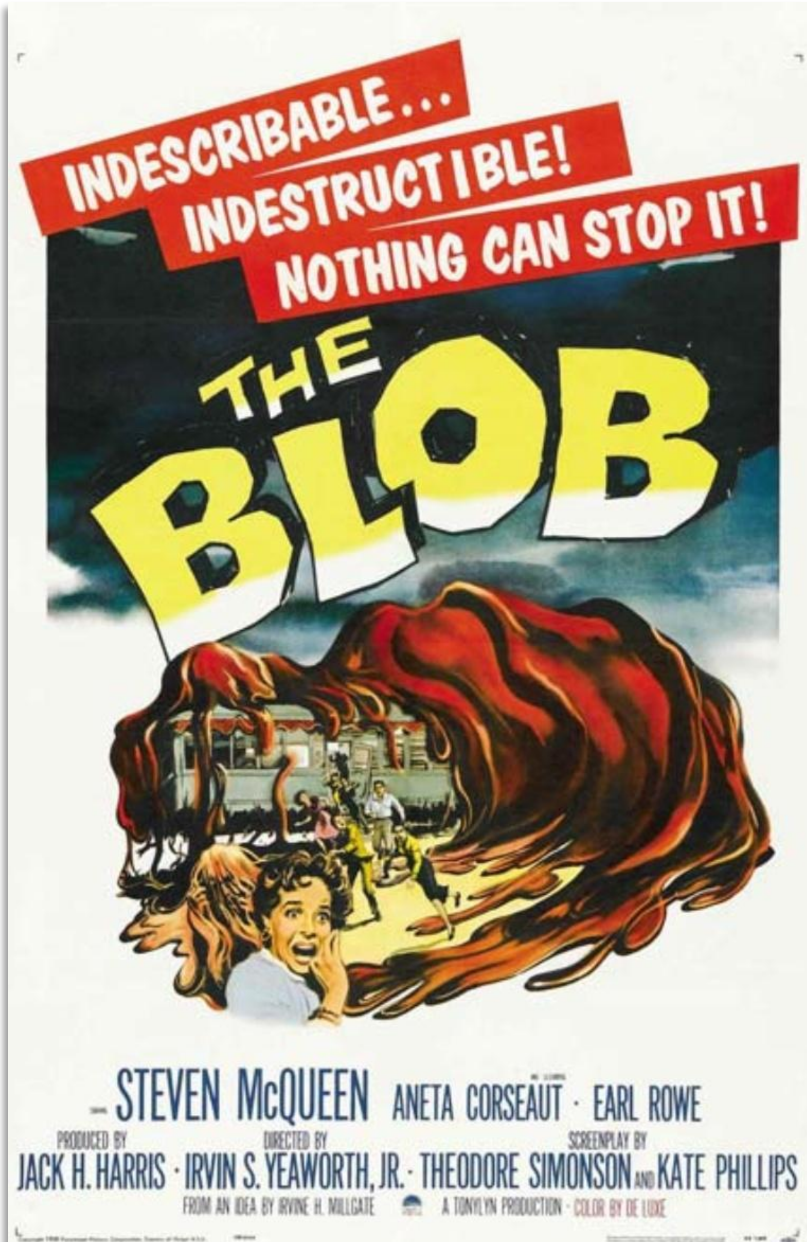
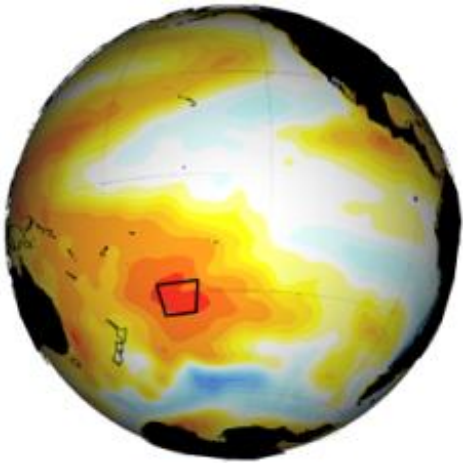


INDESCRIBABLE...
INDESTRUCTIBLE!
NOTHING CAN STOP IT!
THE BLOB
STEVEN McQUEEN ANETA CORSEAUT · EARL ROWE
PRODUCED BY
JACK H. HARRIS
DIRECTED BY
IRVIN S. YEAWORTH, JR.
SCREENPLAY BY
THEODORE SIMONSON AND KATE PHILLIPS
FROM AN IDEA BY IRVINE H. MILLGATE
A TONYLYN PRODUCTION · COLOR BY DE LUXE

BEWARE! Robert Walker
BEWARE! Godfrey Cambridge
BEWARE! Carol Lynley
BEWARE! Shelley Berman
BEWARE! Larry Hagman
BEWARE! THE BLOB
is back in a horrifying NEW adventure
ROBERT WALKER
GODFREY CAMBRIDGE • CAROL LYNLEY • LARRY HAGMAN • SHELLEY BERMAN
GP
Color by De Luxe

THE SOUTH PACIFIC BLOB AND THE PRESSURE TREND DIPOLE



EXPECT THE UNEXPECTED

WITH RENÉ GARREAUD[1], KYLE CLEM[2] AND JOSÉ VICENCIO[3]

THANKS ALSO TO ROBERTO "ROSSBY" RONDANELLI,
JUAN PABLO "TRENDY" BOISIER AND MARK "BELIEVER" FALVEY

NOW PLAYING AT UNIVERSIDAD DE CHILE (21-01-2020)
PG32

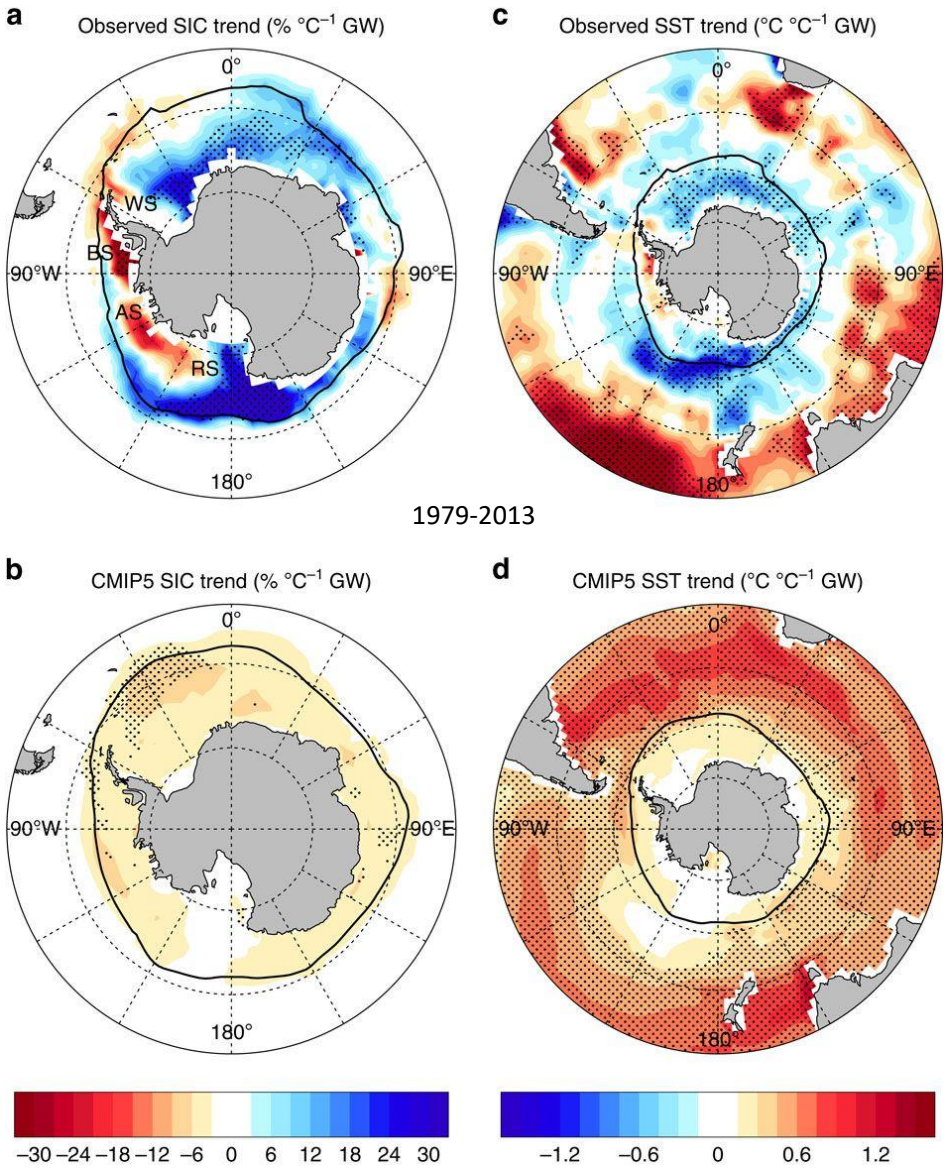
(1) DGF-UCH + CR2 (2) VUW NZ, (3) DMC

The South Pacific Blob and the Pressure Trend Dipole

- Background: Their motivation, our motivation
- Pressure Trend: Revisit and update
- The Southern Blob
- Attribution
- Conclusions

Huston….we have a problem!

CMIP5 trends oppose their observational counterparts around Antarctic



Evidence for link between modelled trends in Antarctic sea ice and underestimated westerly wind changes

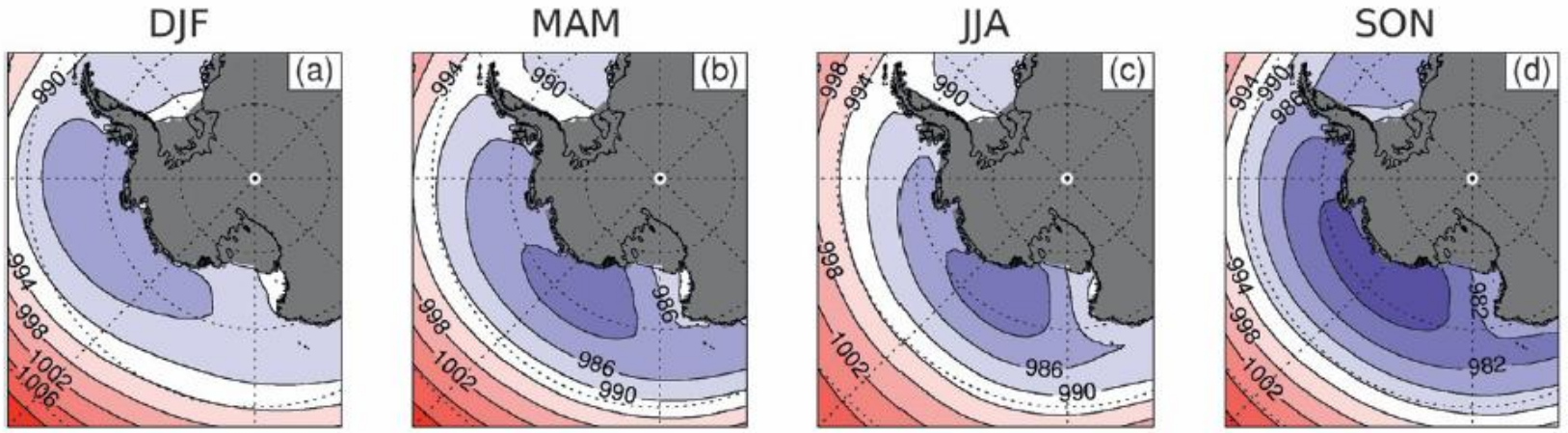
Ariaan Purich[1,2,3], Wenju Cai[1], Matthew H. England[2,3] & Tim Cowan[1,4]

THE AMUNDSEN SEA LOW

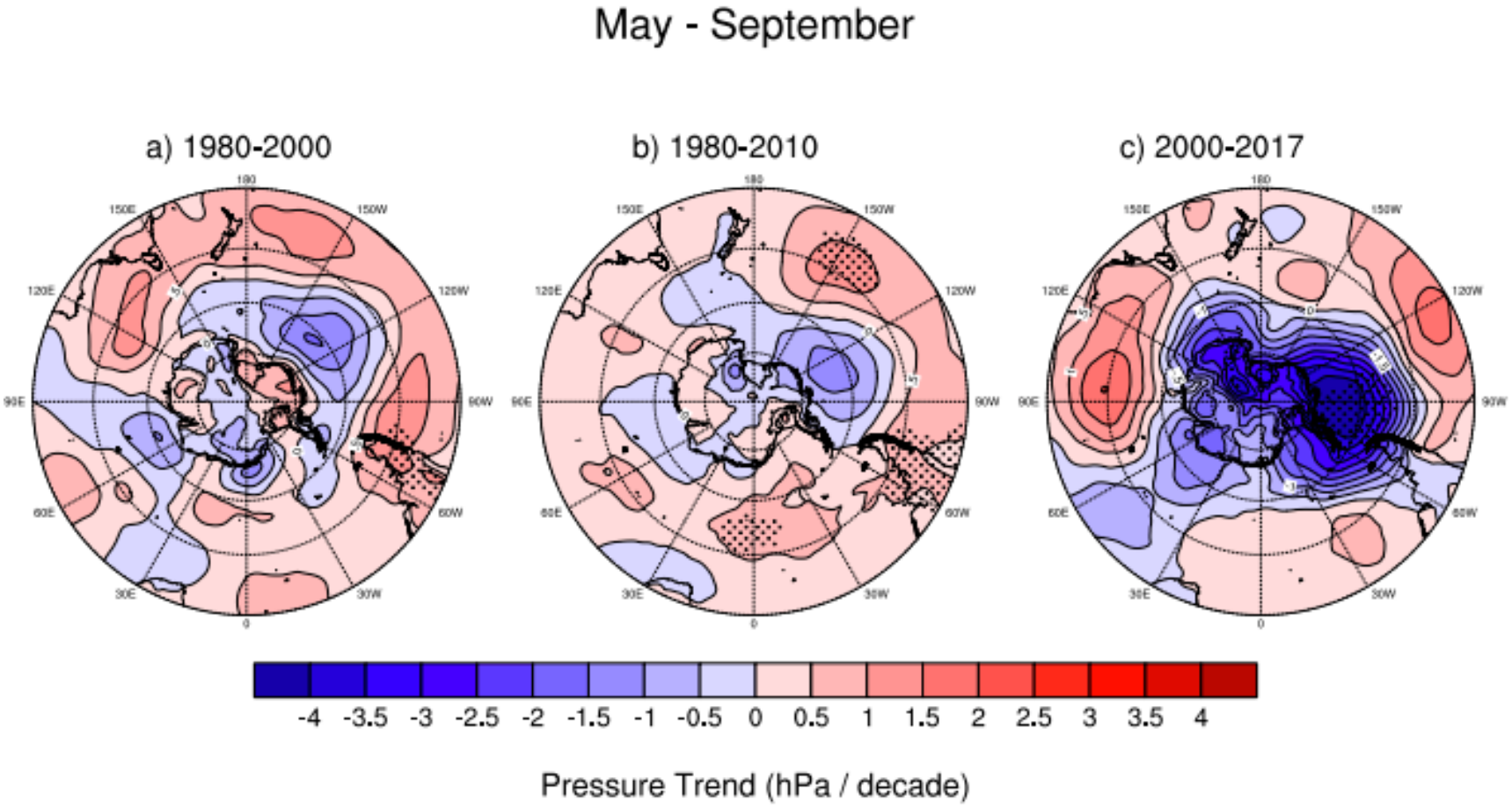
Variability, Change, and Impact on Antarctic Climate

BY M. N. RAPHAEL, G. J. MARSHALL, J. TURNER, R. L. FOGT, D. SCHNEIDER, D. A. DIXON, J. S. HOSKING, J. M. JONES, AND W. R. HOBBS

The Amundsen Sea low (ASL) has deepened in recent decades, influencing the West Antarctic climate.

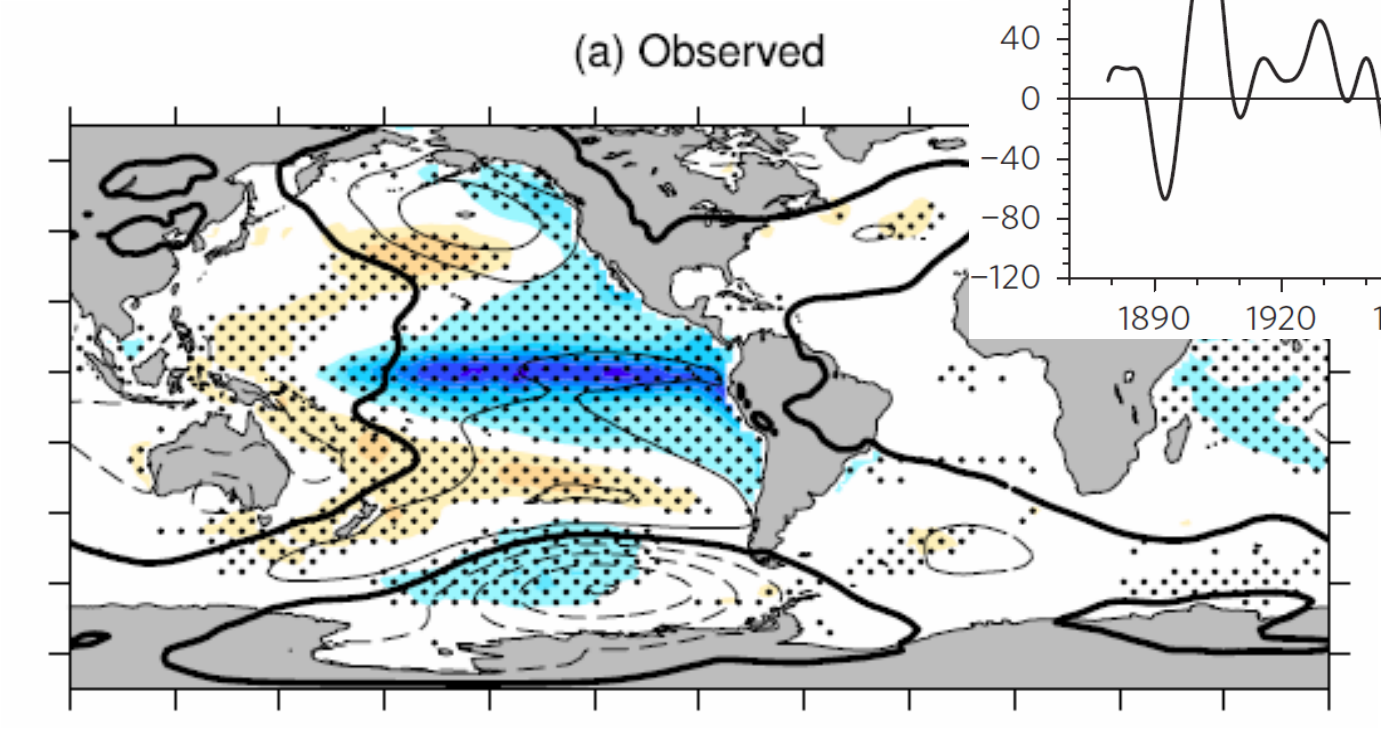


Long term mean SLP (ERA5)



R. Fogt, 2018. Based on ERA-SLP

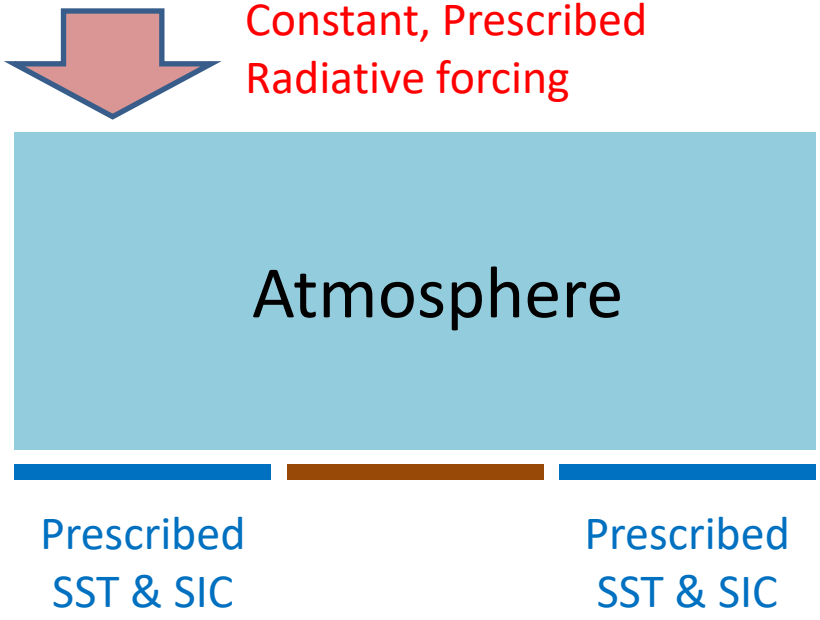
Causes of the ABS low deepening?

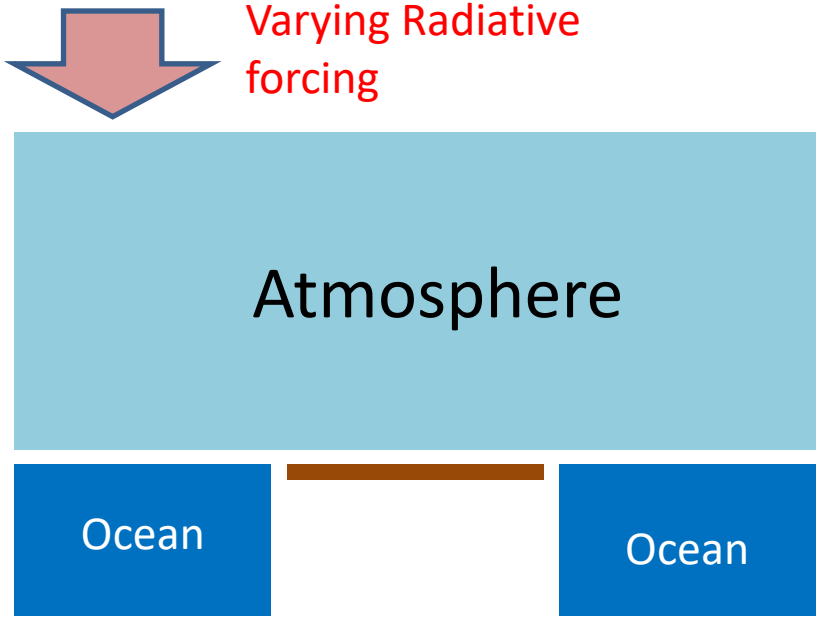


Tropical Pacific SST Drivers of Recent Antarctic Sea Ice Trends

ARIAAN PURICH,[a,b,c] MATTHEW H. ENGLAND,[b,c] WENJU CAI,[a] YOSHIMITSU CHIKAMOTO,[d] AXEL TIMMERMANN,[d,e] JOHN C. FYFE,[f] LEELA FRANKCOMBE,[b,c] GERALD A. MEEHL,[g] AND JULIE M. ARBLASTER[g,h]

Nature is complicated and observation-only analysis can be confused when multiple forcing are playing at the same time. A little help from models!





AMIP models

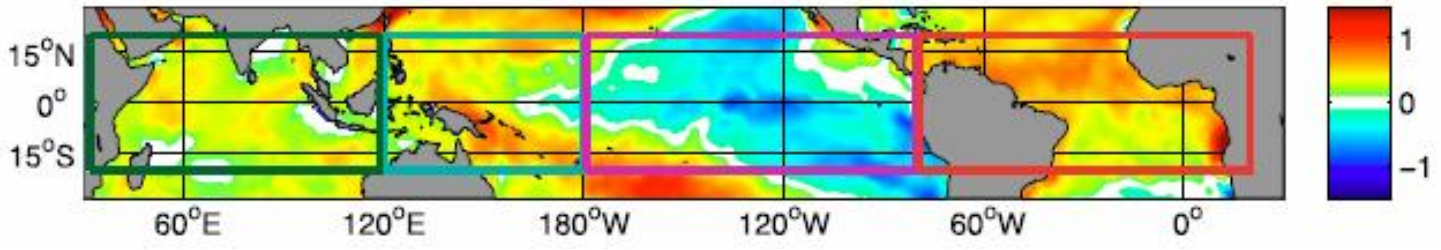
Ensemble mean reveals the atmospheric response forced by prescribed SST anomalies

Fully coupled models

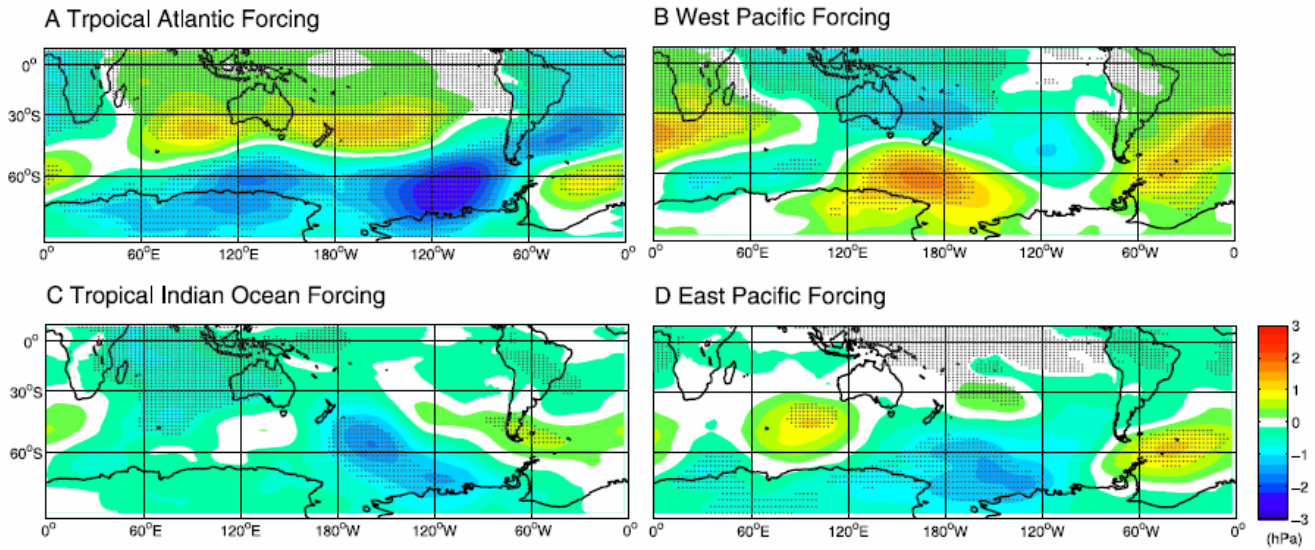
Ensemble mean reveals the ocean/atmos response forced by a prescribed change in RF

Tropical forcing of high latitude circulation

SST trend 1979-2012



CAM4 SLP Response

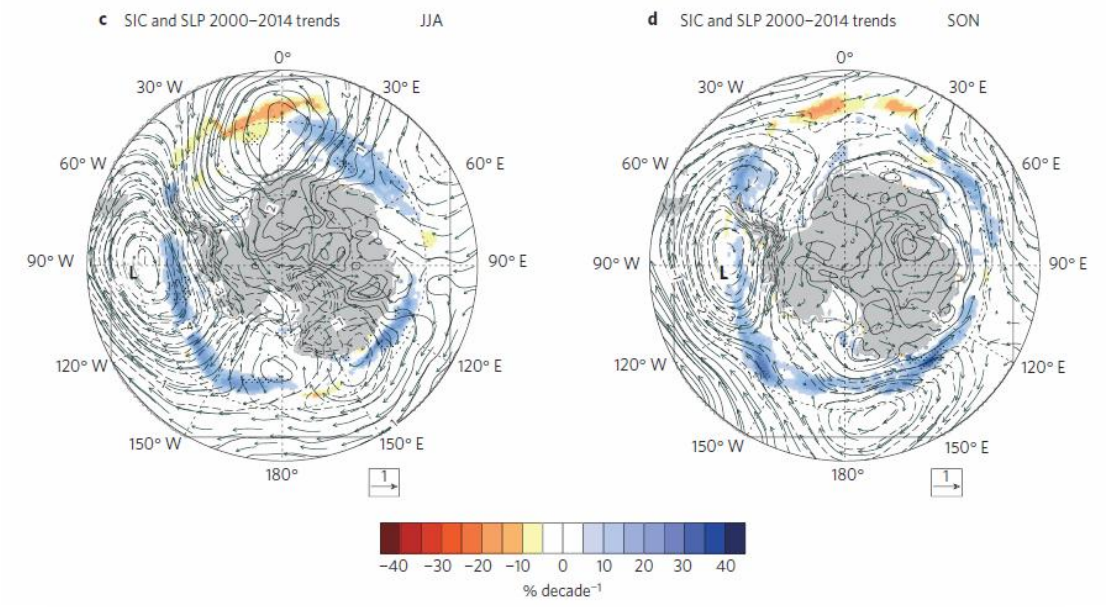


Rossby Waves Mediate Impacts of Tropical Oceans on West Antarctic Atmospheric Circulation in Austral Winter

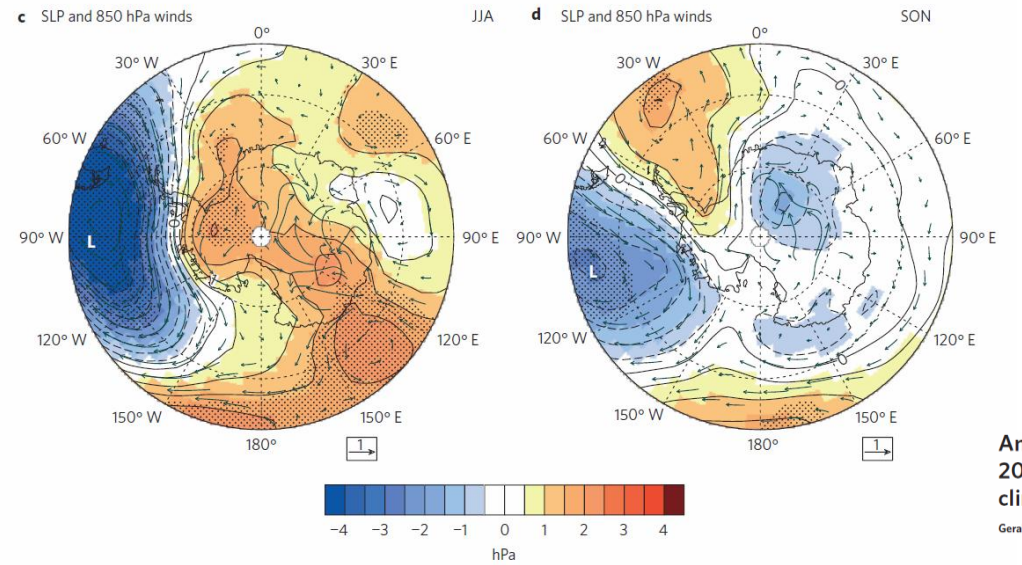
XICHEN LI

IPO transition from warm to cold → CPac drying → ABS low deepening → Changes in Antarctic SIC

Observed trends



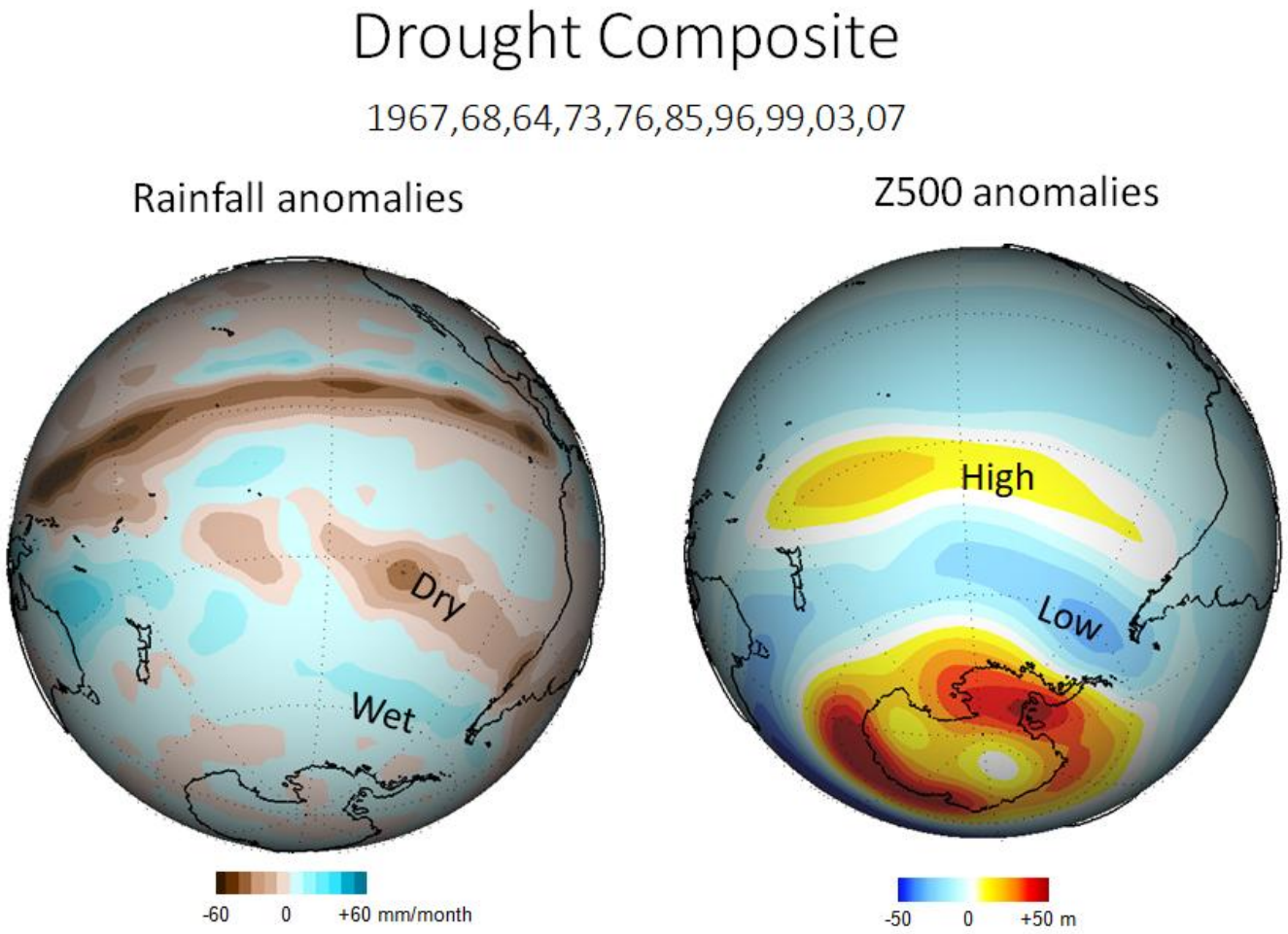
CAM3 Central Pacific drying forced response



Antarctic sea-ice expansion between 2000 and 2014 driven by tropical Pacific decadal climate variability

Gerald A. Meehl[1]*, Julie M. Arblaster[1,2], Cecilia M. Bitz[3], Christine T. Y. Chung[4] and Haiyan Teng[1]

Large-scale context for central Chile droughts

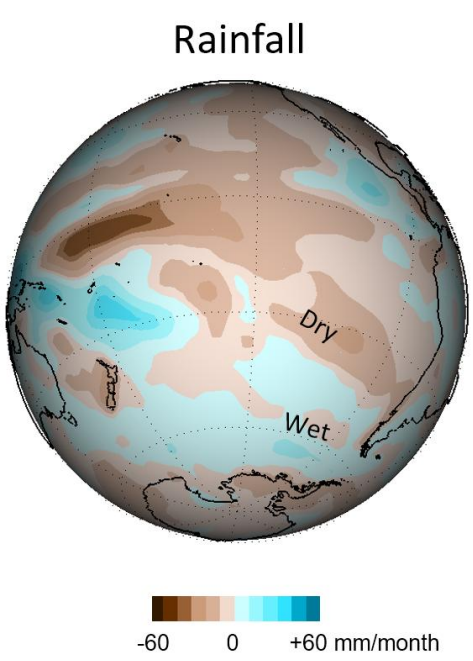


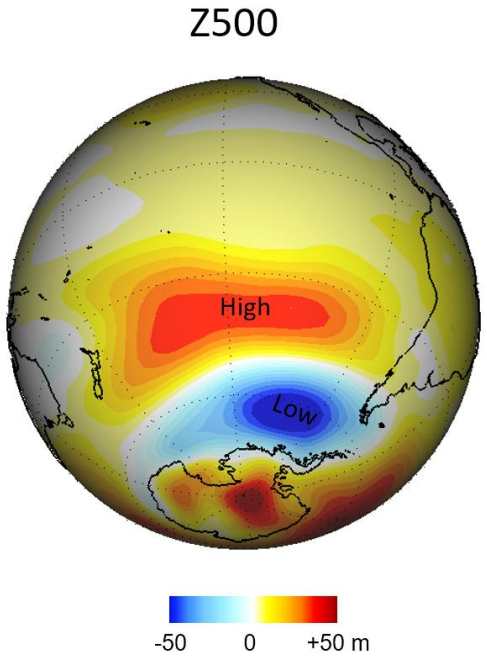
ABS low and SEP anticyclone play a key role

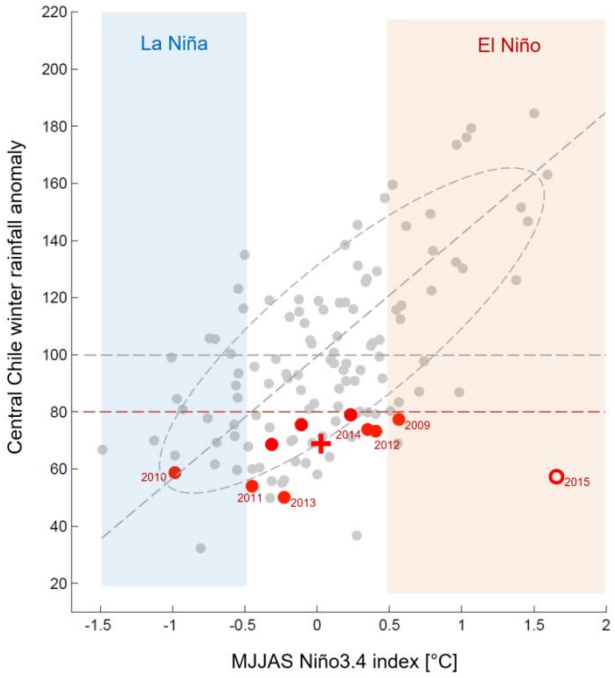
Both modulated by ENSO

The 2010-2018 mega drought in Central Chile

Mostly ENSO neutral!



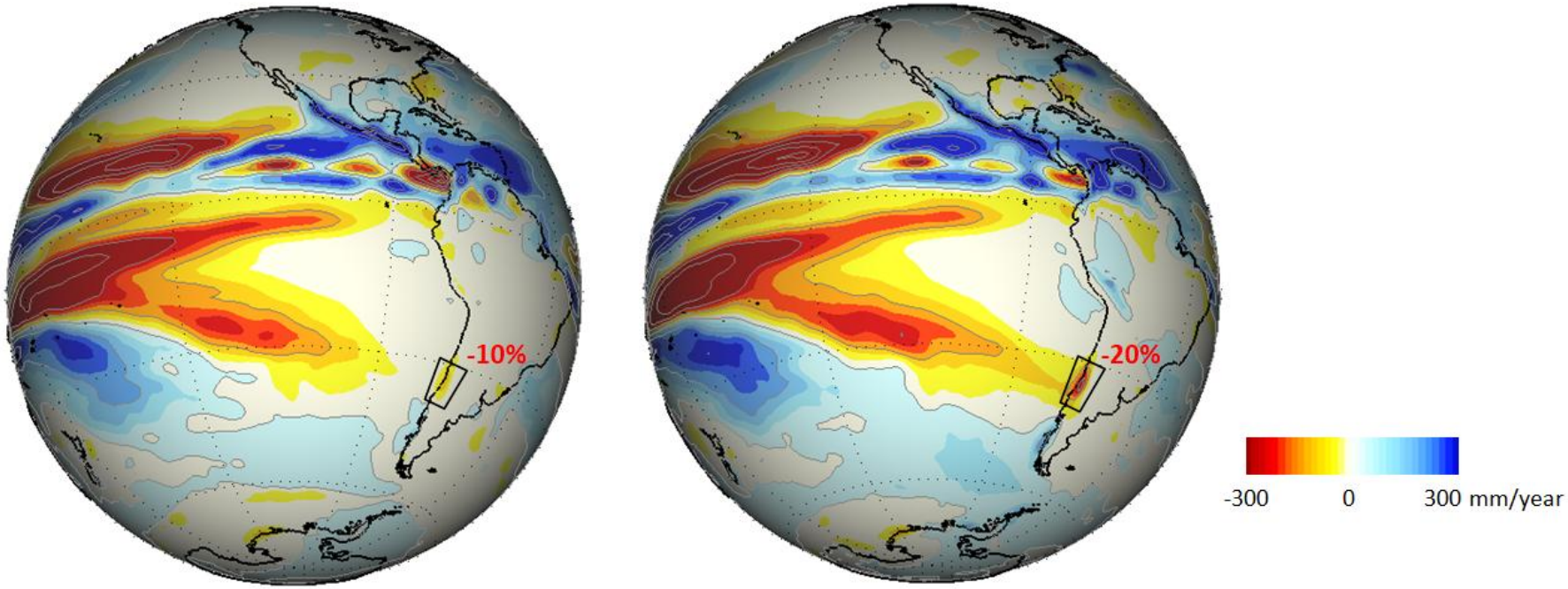




Winter (MJJAS) rainfall anomaly 2010-2017
LBNL CAM 5.1 AMIP simulations (50 runs)

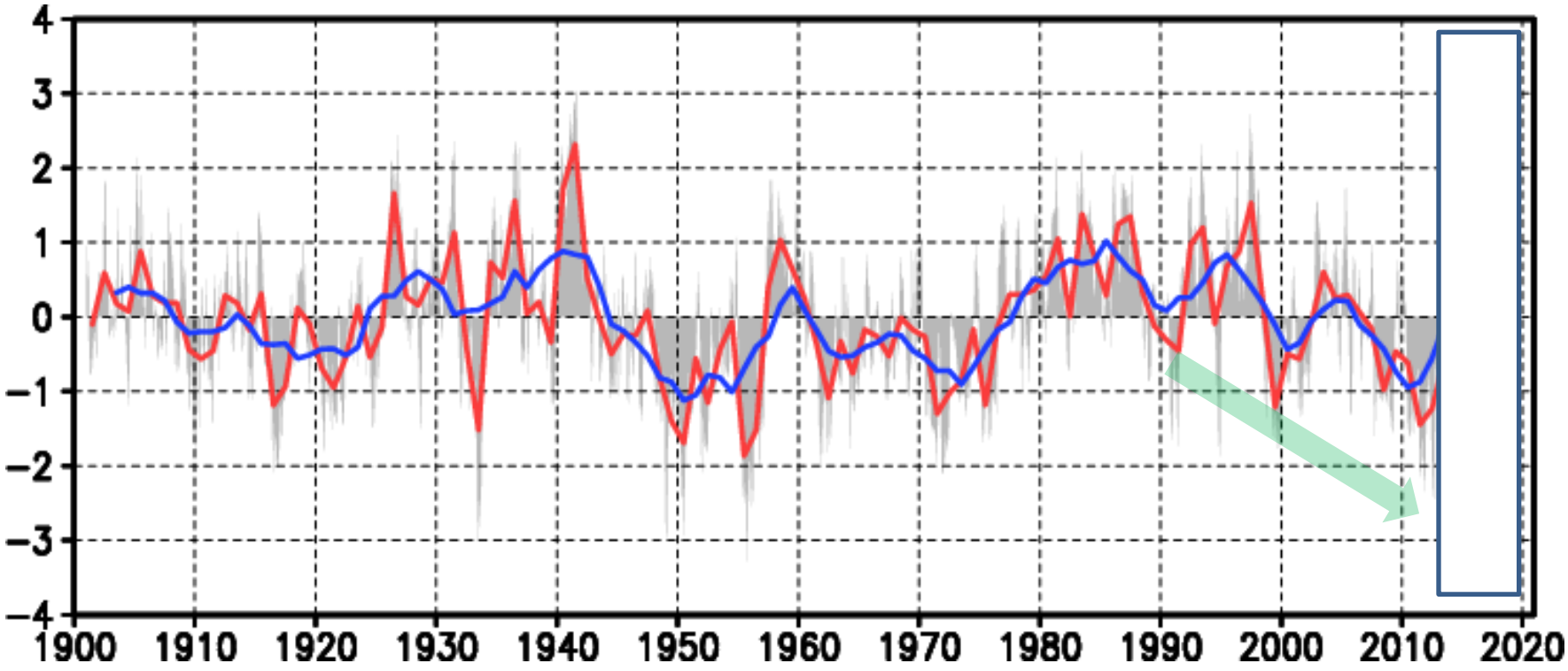
(a) Nat-Hist forcing / Obs SST

(b) Obs. Rad. Forcing / Obs. SST



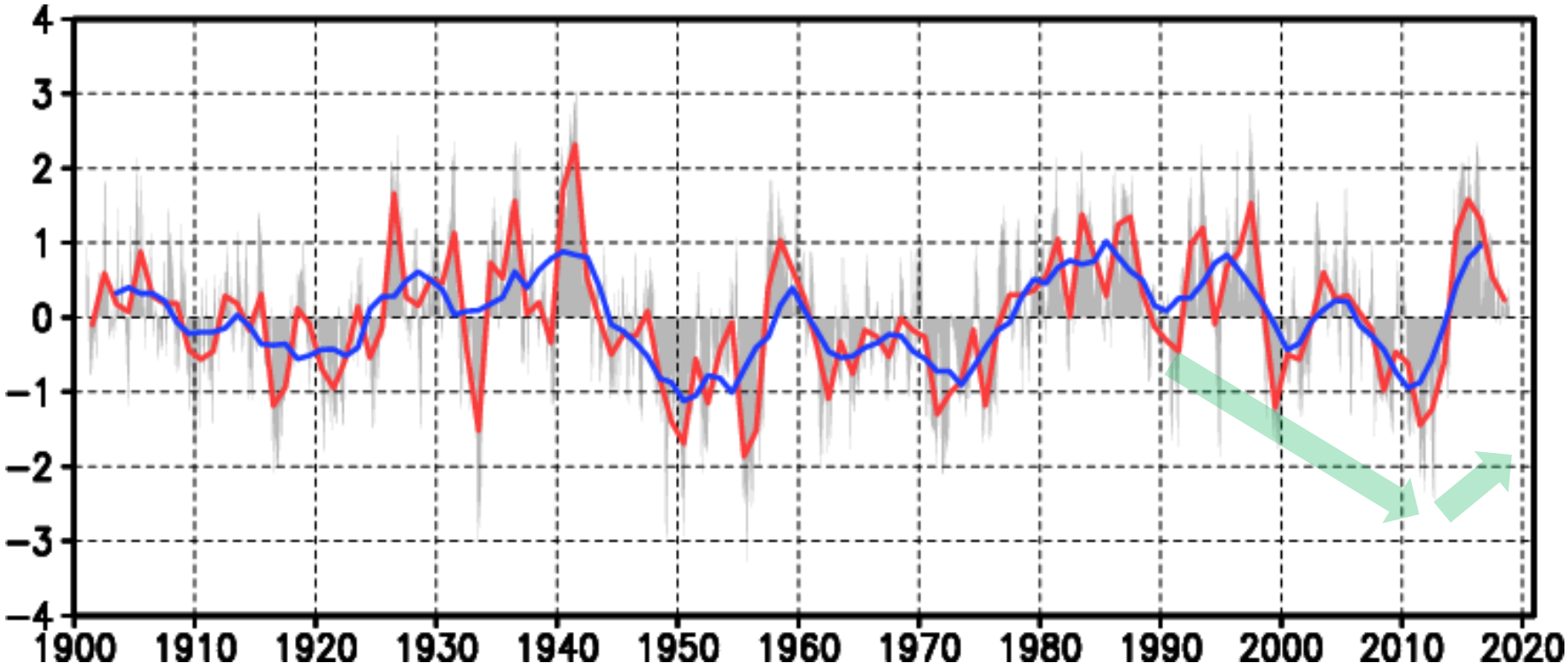
So…natural variability (ocean sourced) also plays a role

PDO (IPO) index until 2014 (Tokyo climate center)



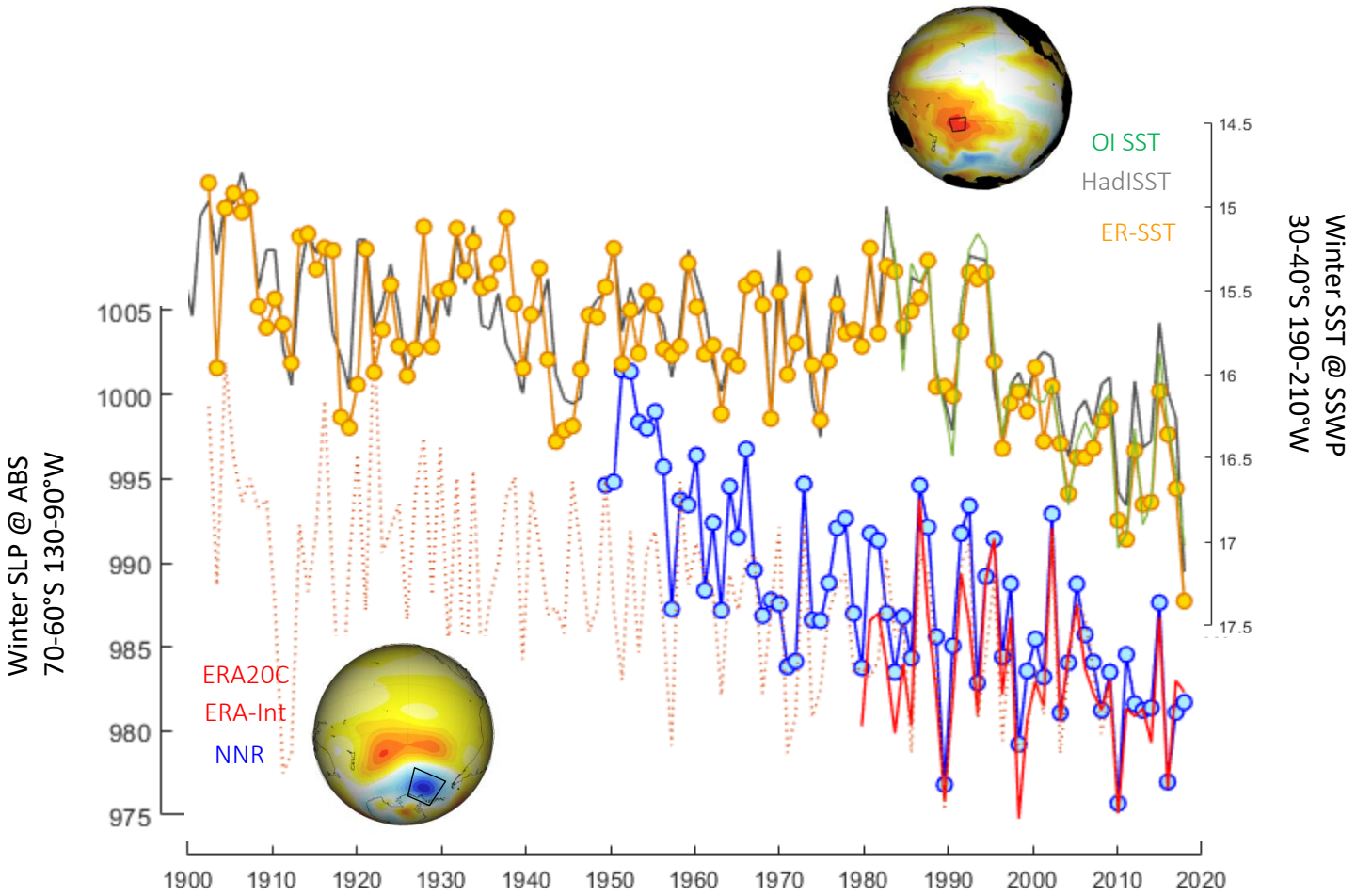
Ok for long-term drying and first half of mega drought, but….

PDO (IPO) index until now (Tokyo climate center)



….Not enough for 2015 onwards

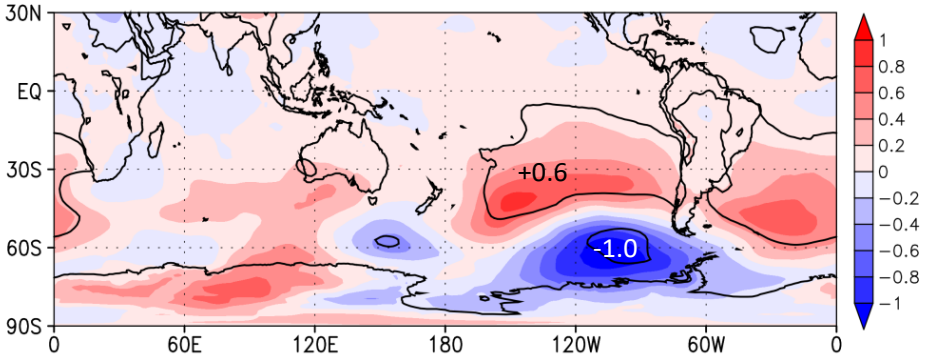
What (else) is sustaining the ABS low deepening / mega drought until now?



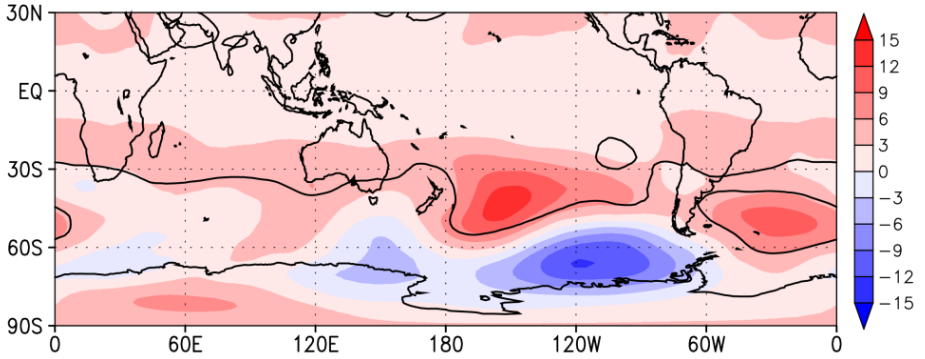
Wintertime (MJJAS) 40 year trends (1979-2018) from selected fields (ERA5)

(a) SLP

hPa/dec



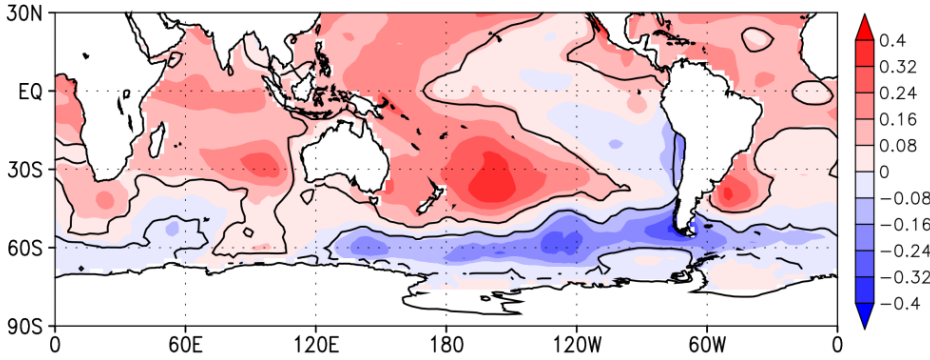
(b) Z500



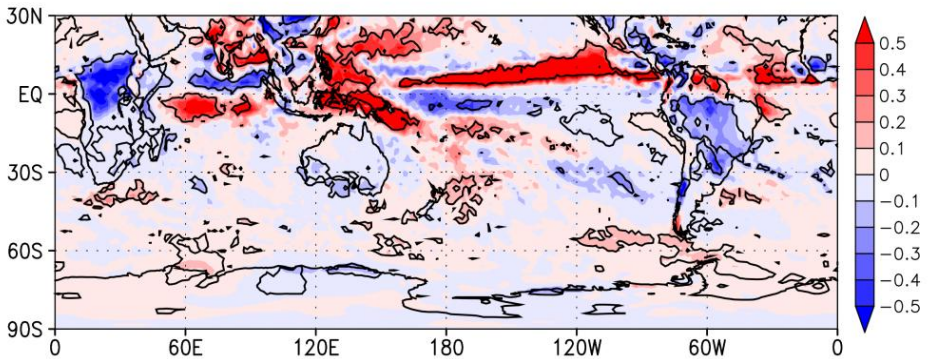
gpm/dec

(c) SST

°C/dec

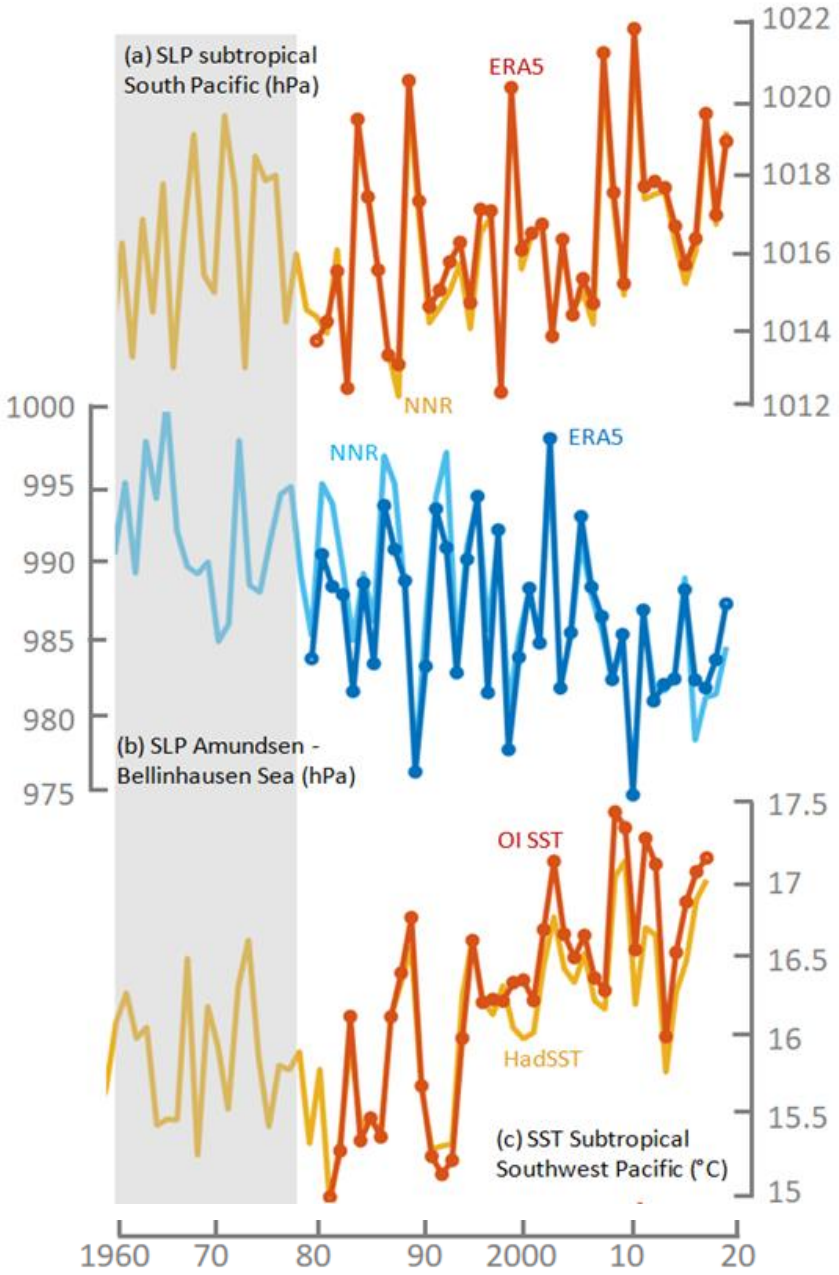


(d) Precip



mm/day/dec

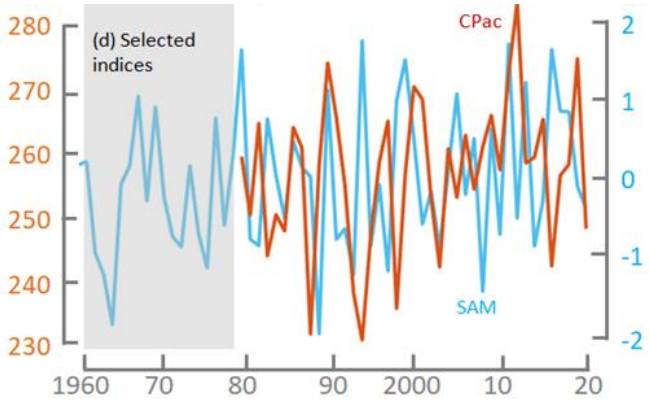
Wintertime (MJJAS) 40 year trends (1979-2018) from selected fields (ERA5)

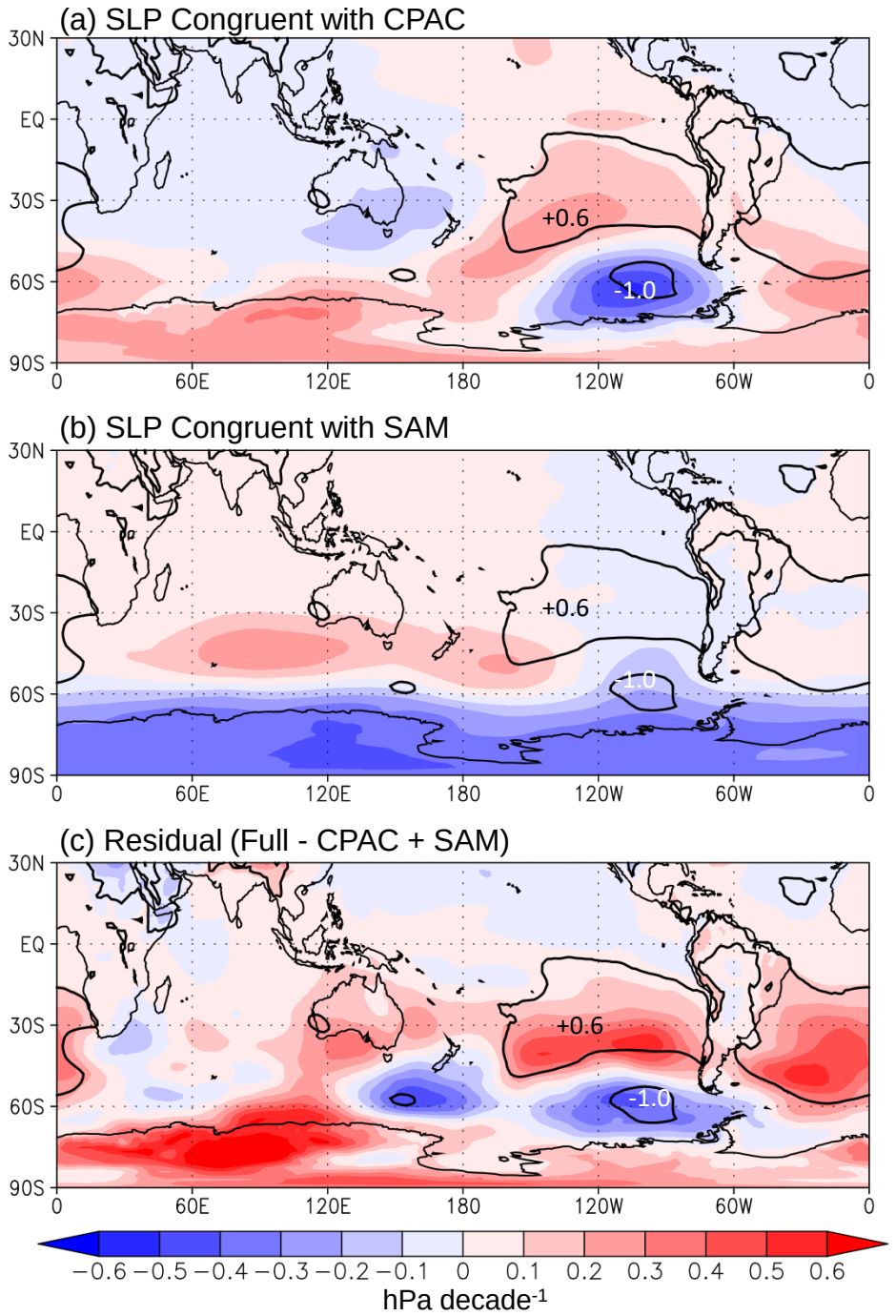


Linear congruency analysis:

$$Y = a \times F + b$$

$$dY = a \times F$$





Linear congruency analysis:

$$Y = a \times F + b$$

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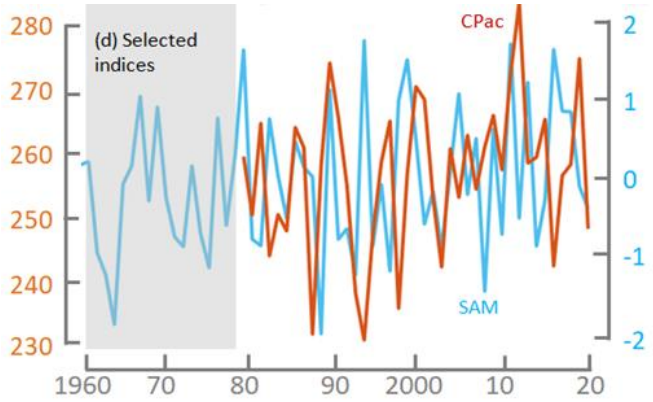
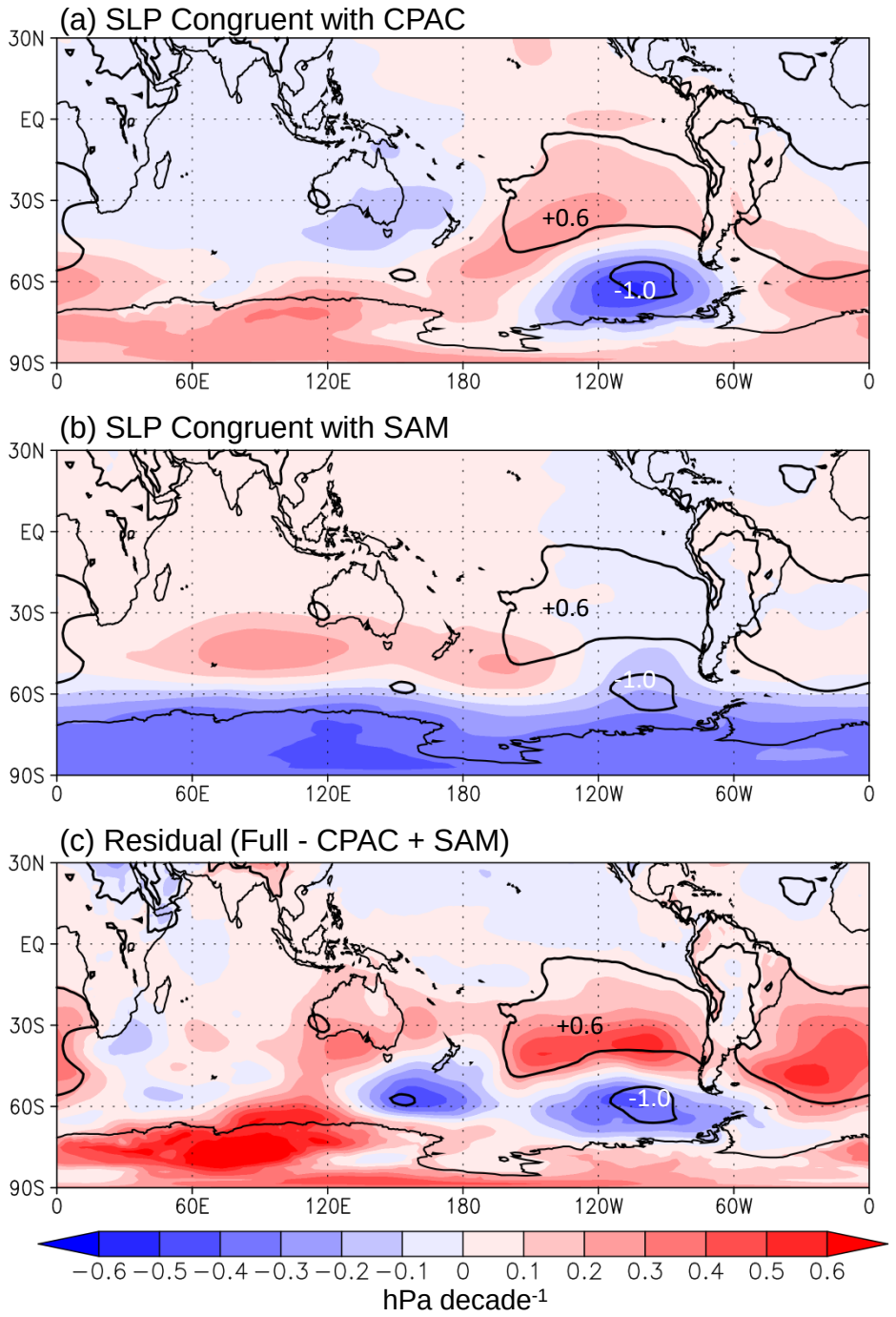
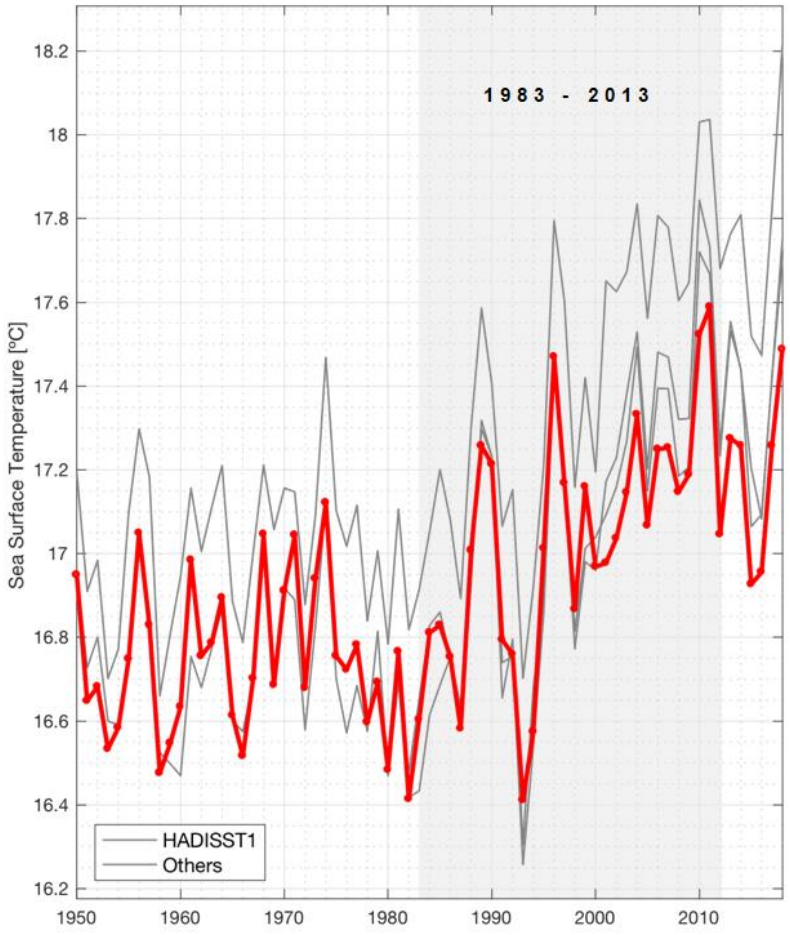


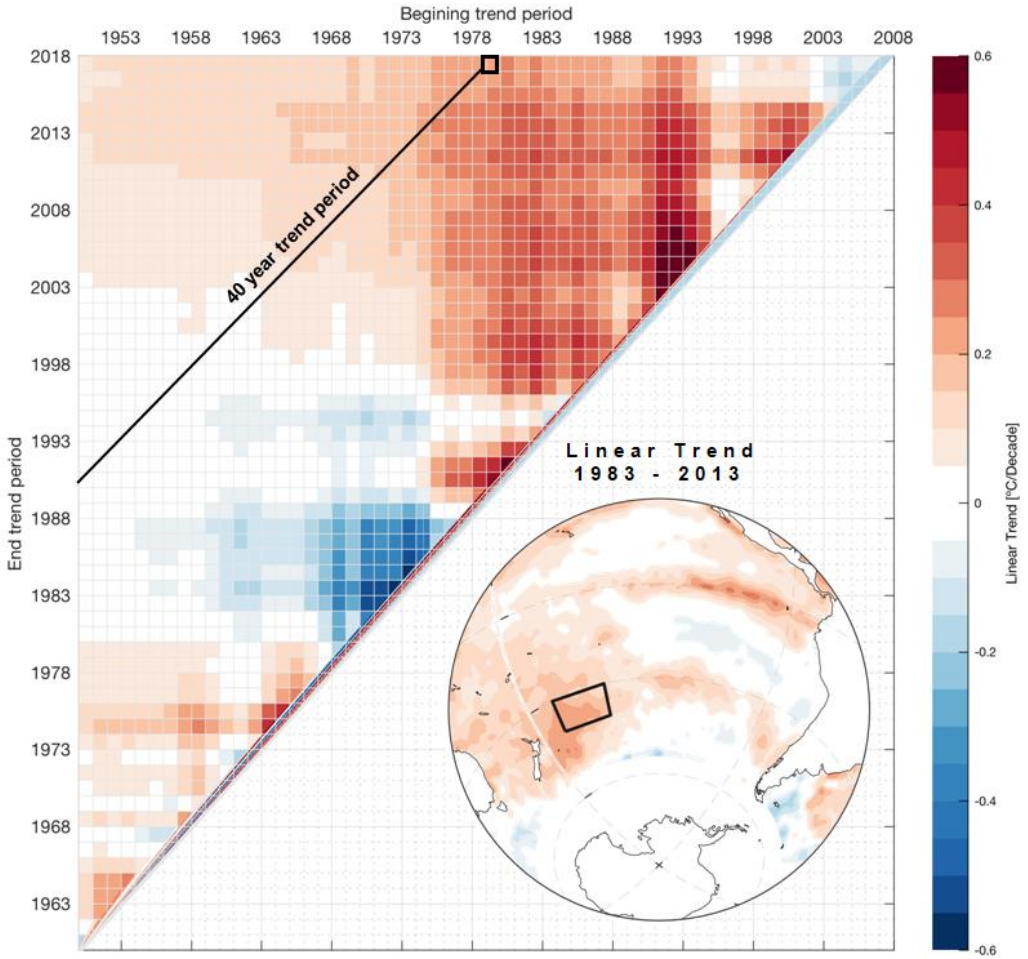
Both CPac (IPO) and SAM (CC) are part of the story but only accounts for about half of the observed trends



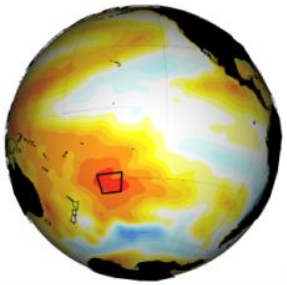
SUBTROPICAL SOUTH WEST PACIFIC

Sea Surface Temperature (SST) – AMJJAS – Data Source: HADISST1



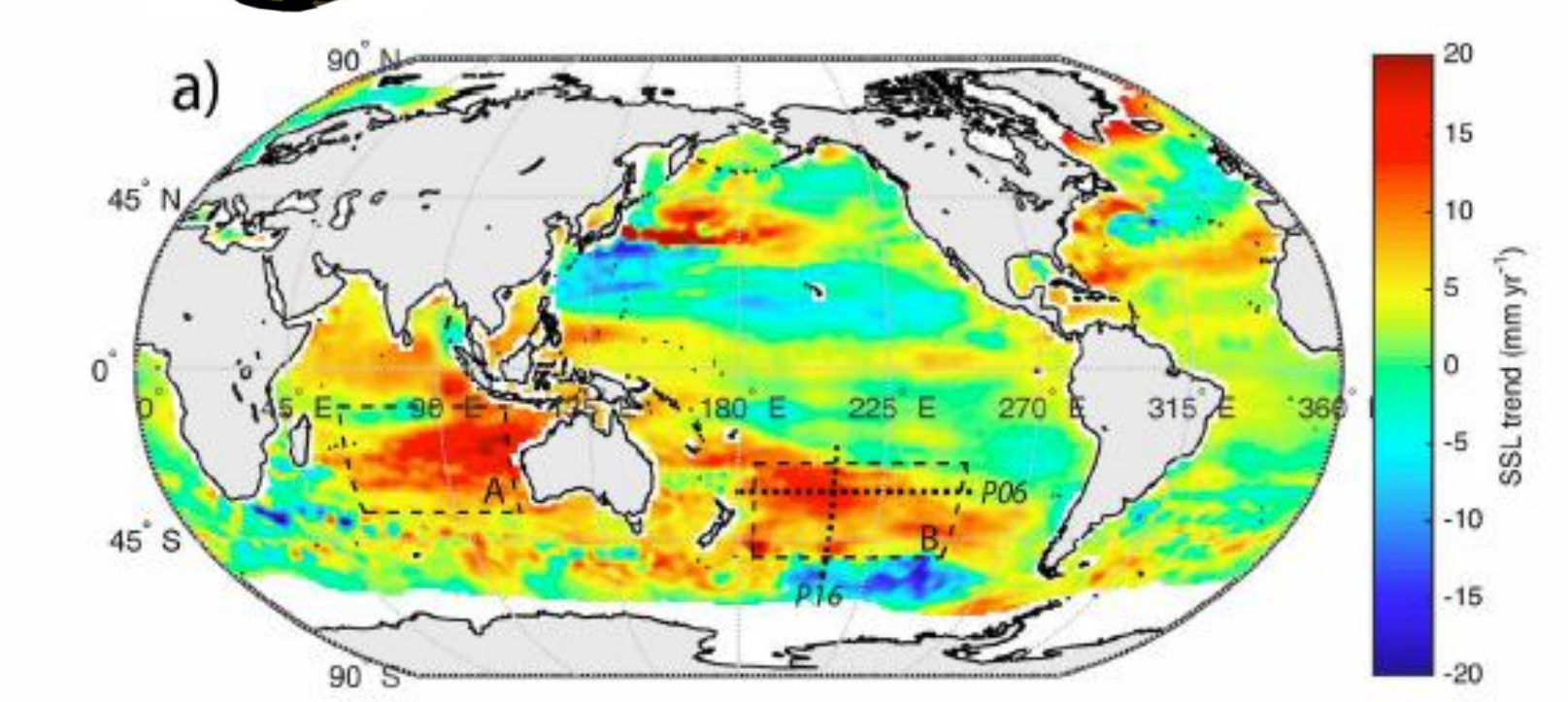


J. Vicencio 2020



The Southern Blob

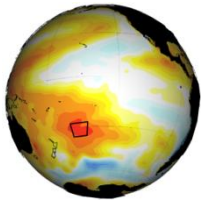
(30-40°S, 190-210°E)



Satellite-based (altimetry minus GRACE-CSR) steric sea level trend over 2005–2014.

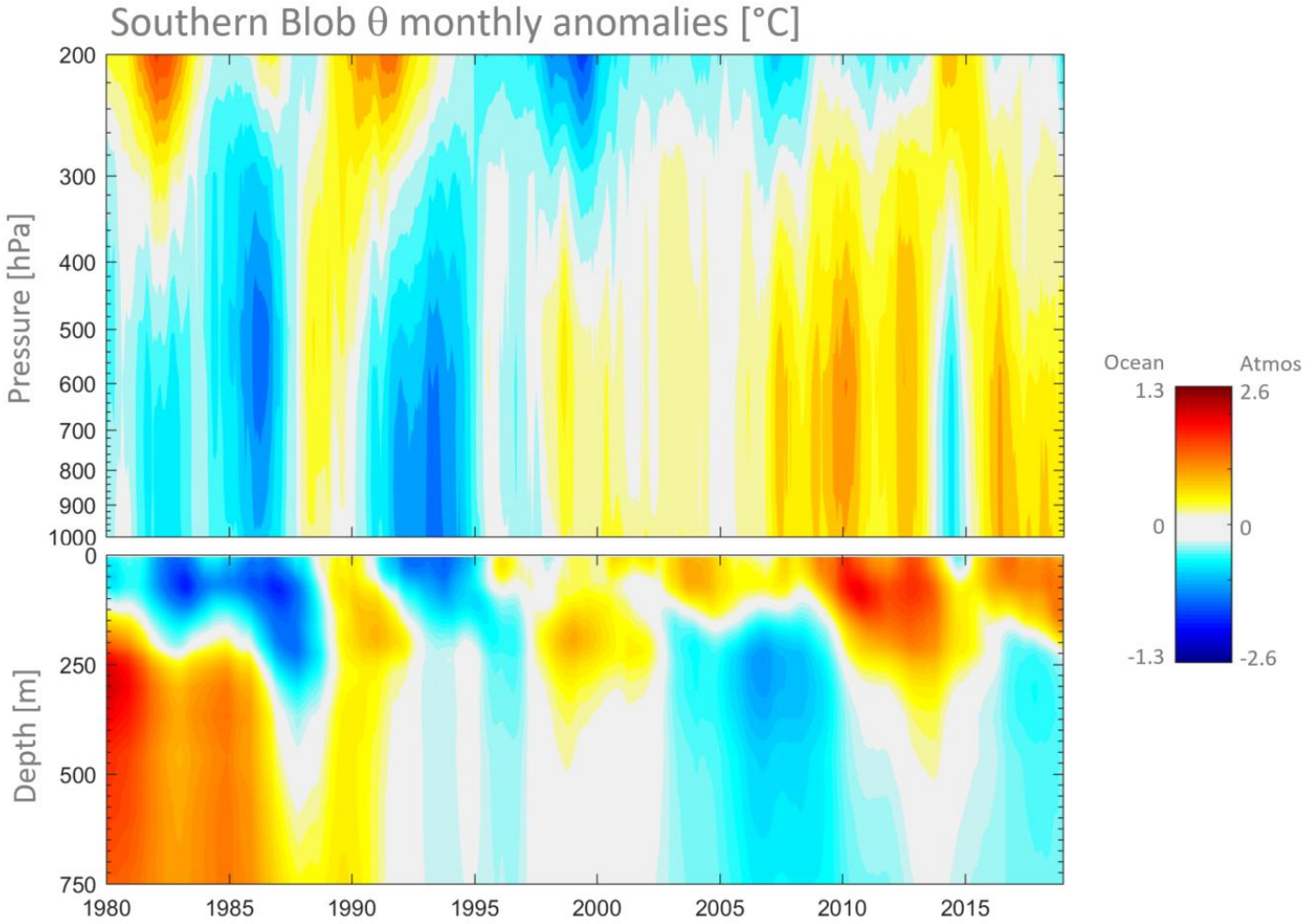
Decade-long deep-ocean warming detected in the subtropical South Pacific

Denis L. Volkov[1,2], Sang-Ki Lee[2], Felix W. Landerer[3], and Rick Lumpkin[2]

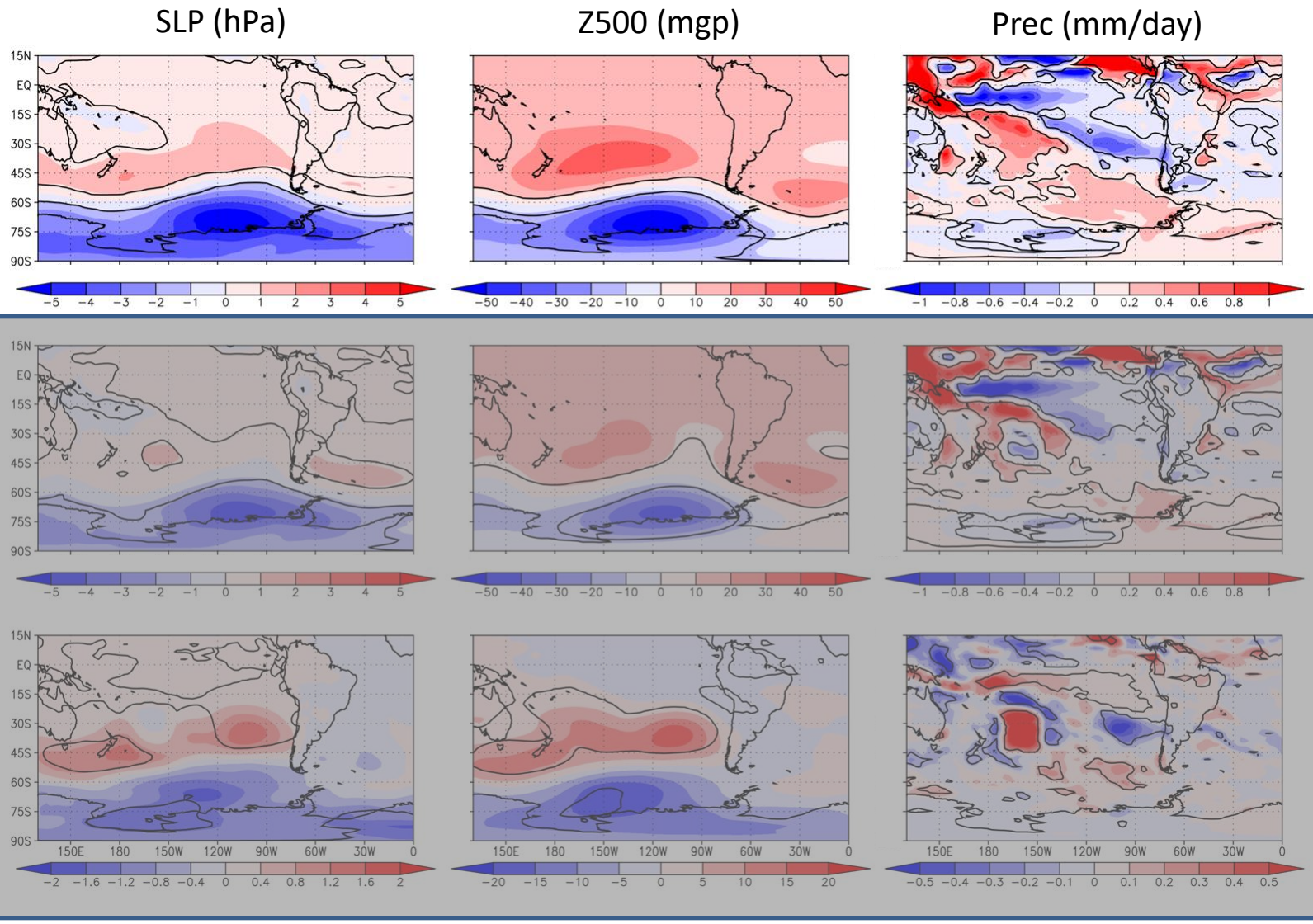


The Southern Blob

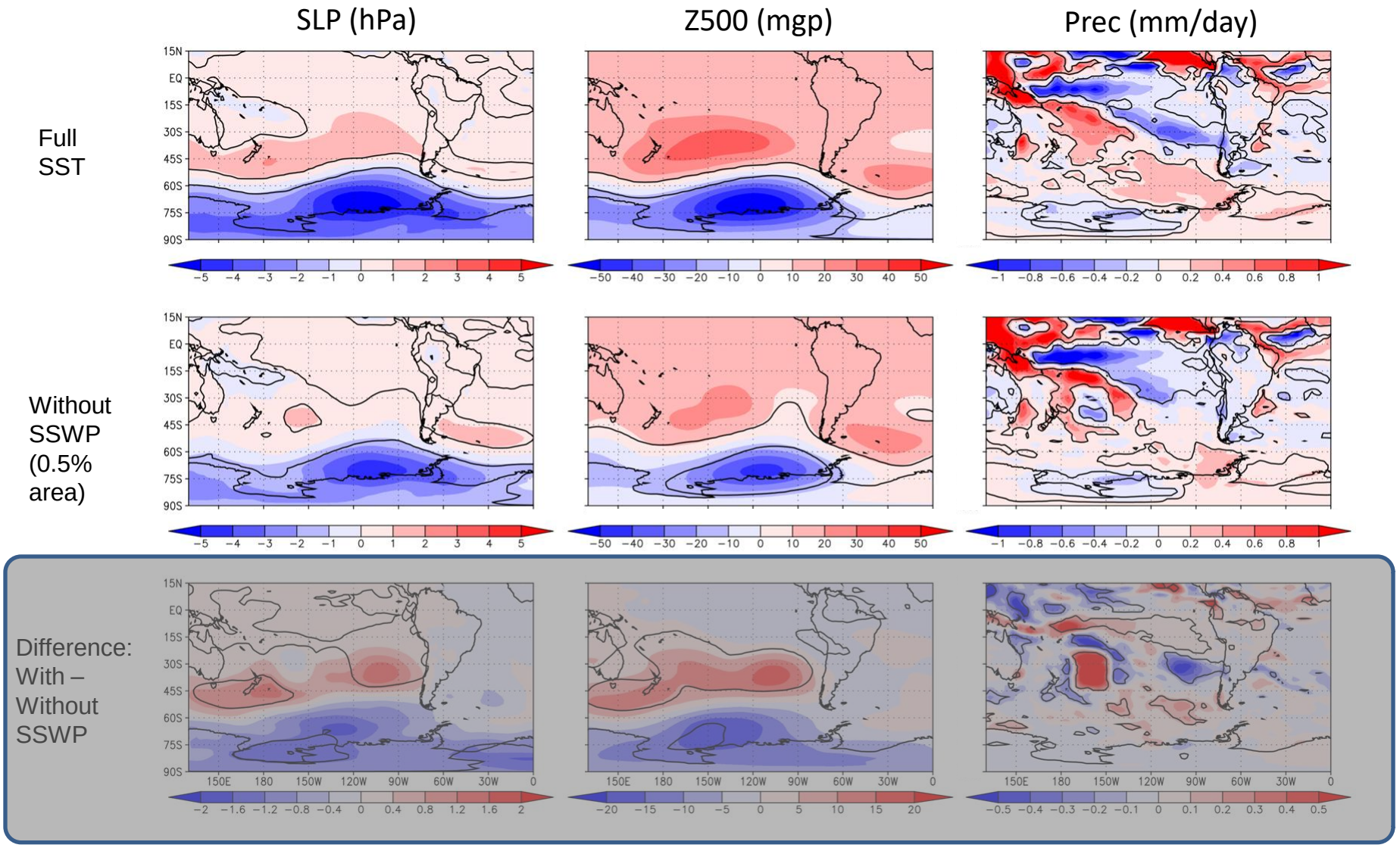
(30-40°S, 190-210°E)



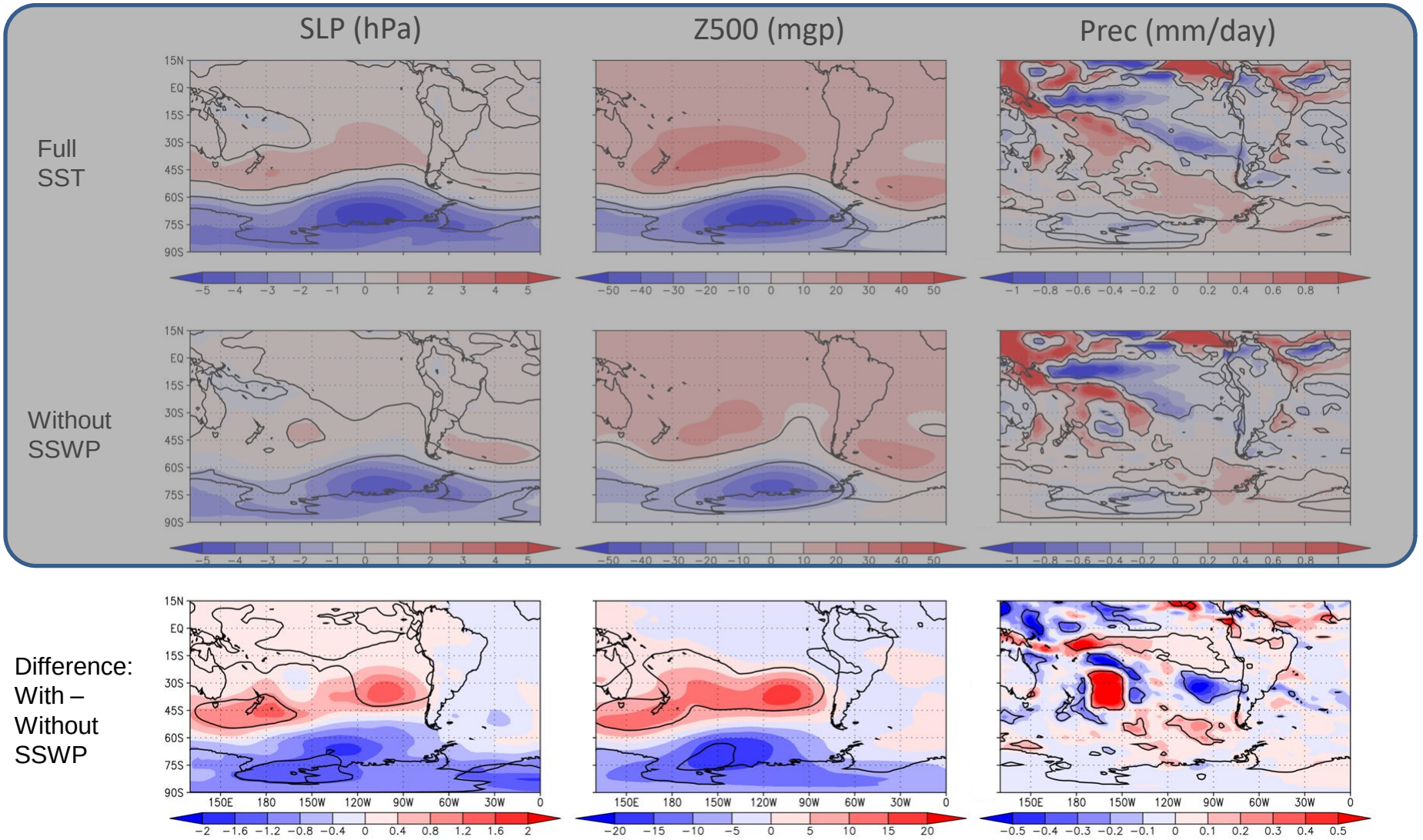
CESM results: CLIMO+dSST minus CLIMO



CESM results: CLIMO+dSST minus CLIMO



CESM results: CLIMO+dSST minus CLIMO

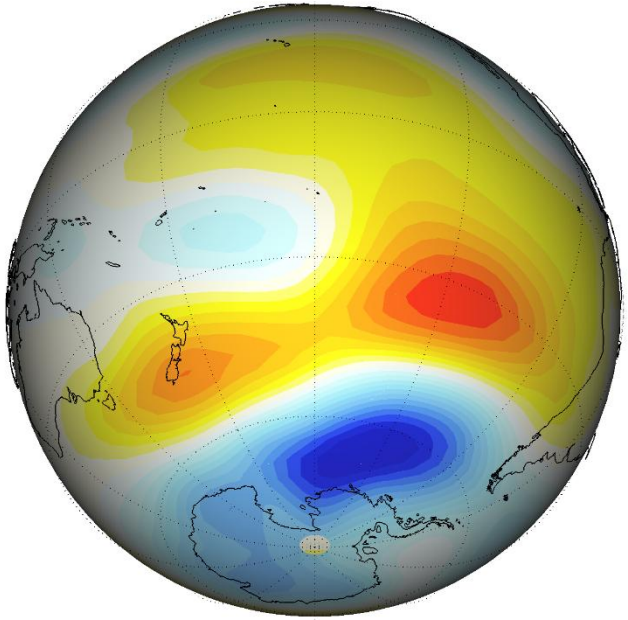


Southern Blob direct effect

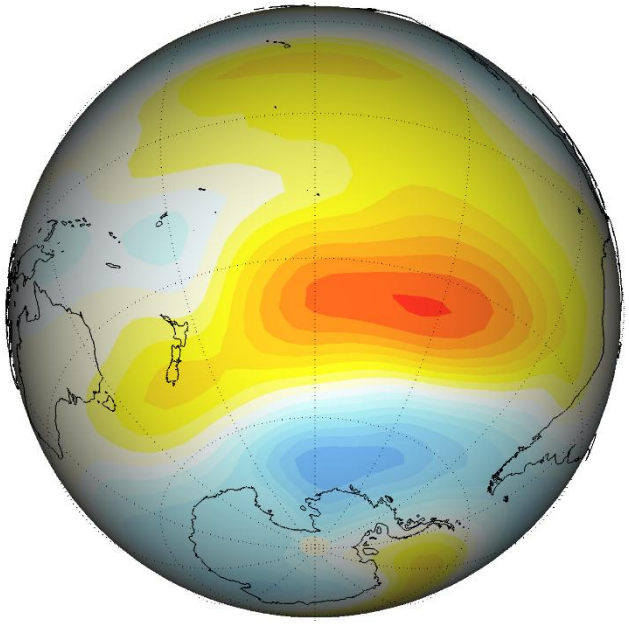
Is the southwest subtropical Pacific causing the pressure drop over the ABS?

SLP Trend 1980 – 2015 calculated with SPEEDY

Control (Full SST)



No SSWP SST

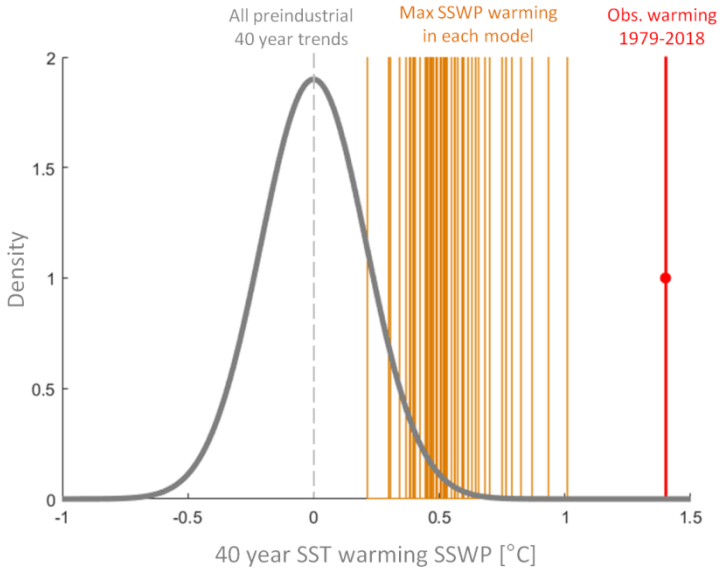


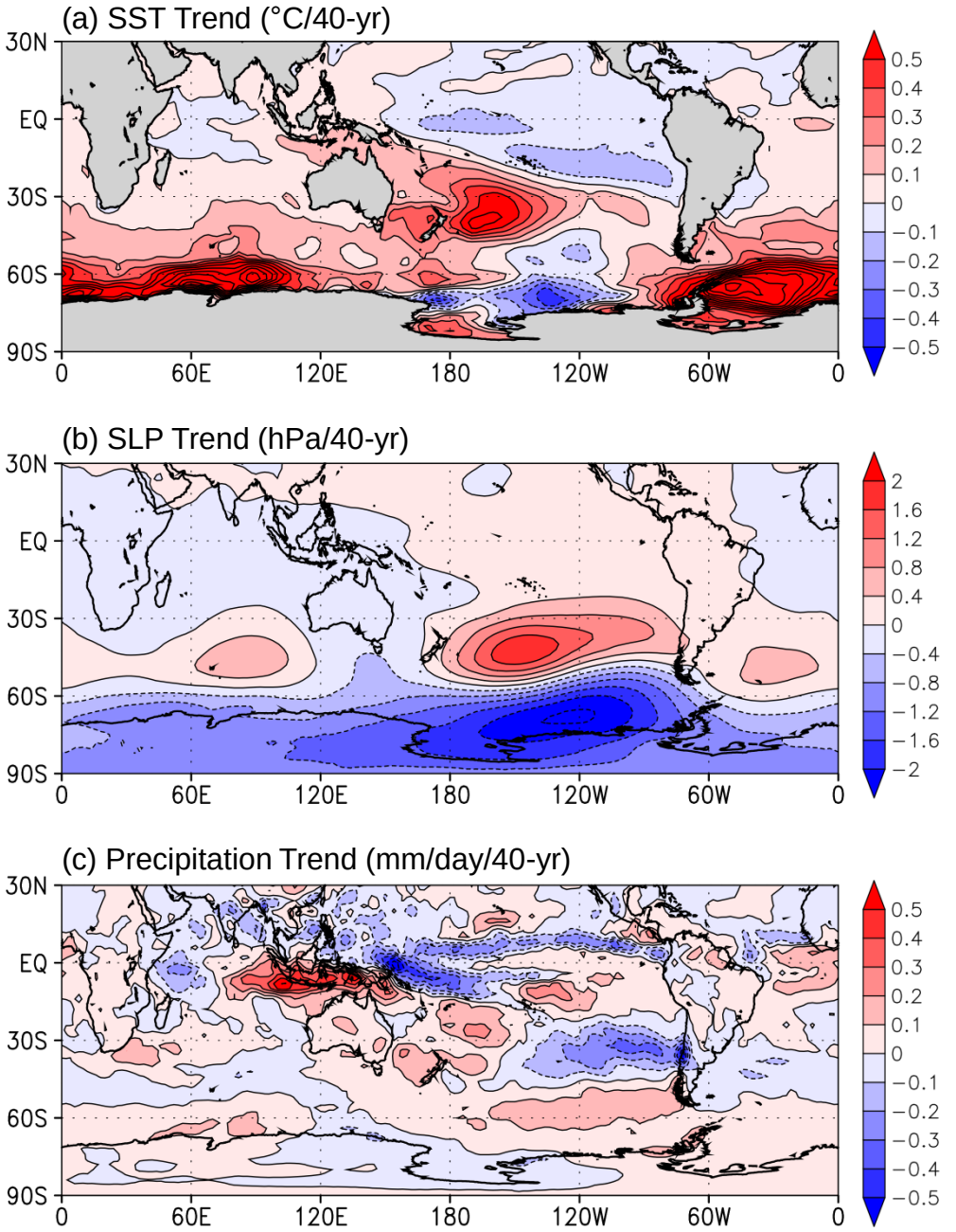
Vicencio 2020

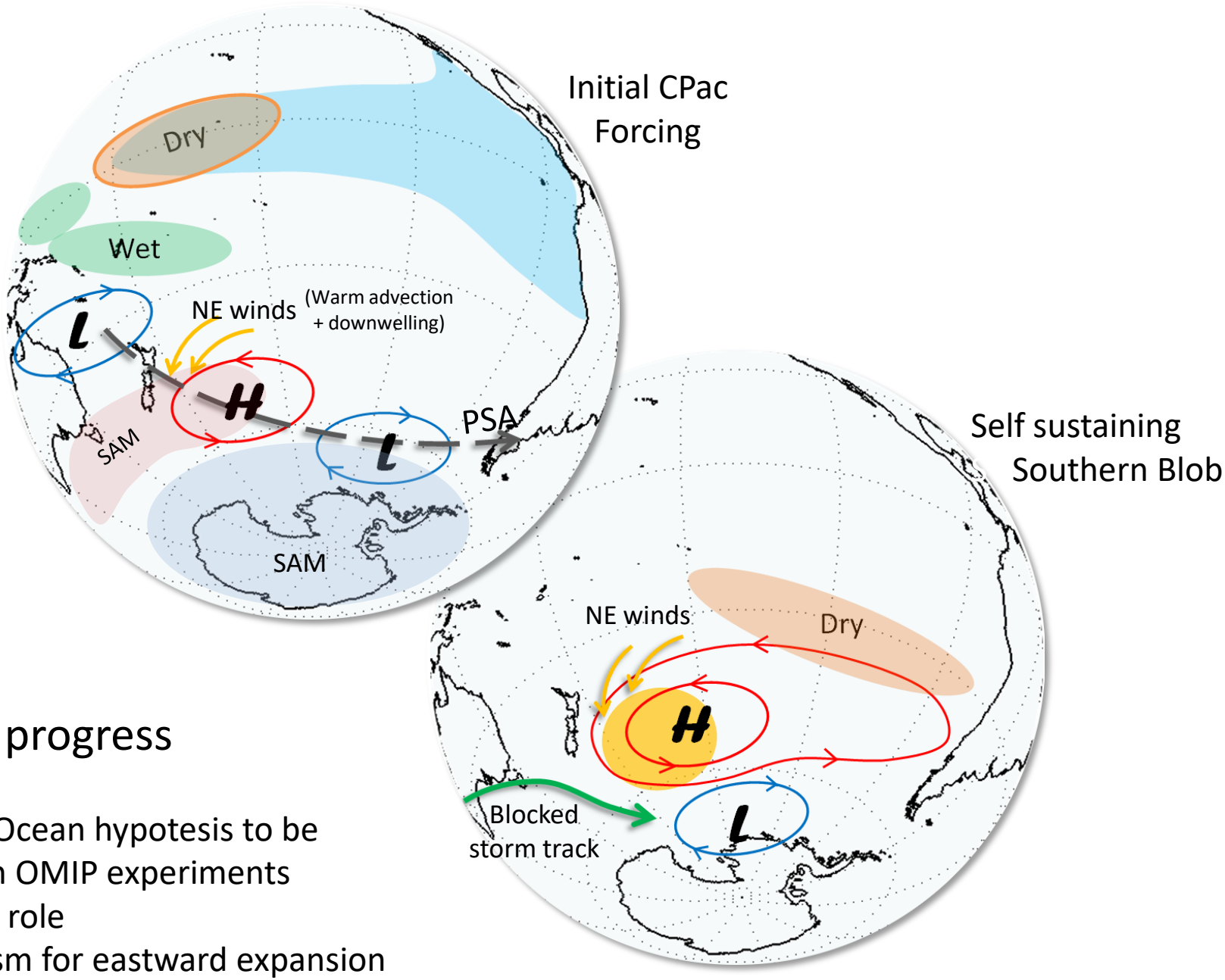
The Southern Blob in the past?

51 Pre-industrial fully coupled simulations. Composite of largest 40-year warming periods in the SSWP

- Similar to present climate trends but amplitude is unprecedented.
- Signature of CPac (and SAM) are also present….



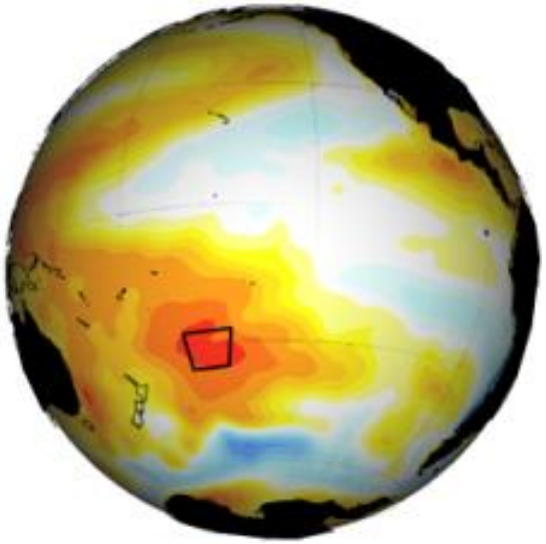




Work in progress

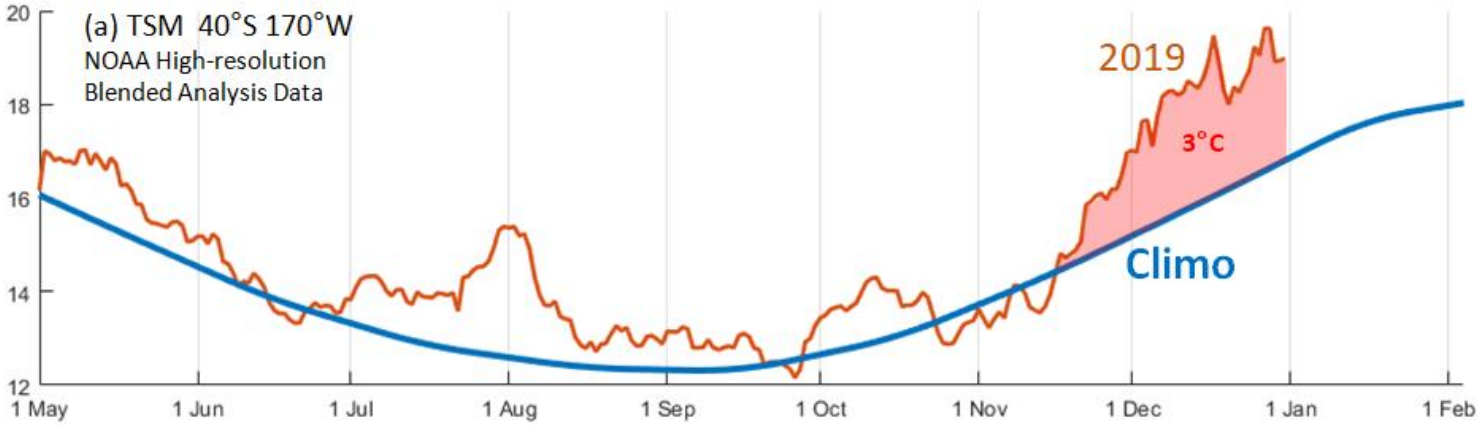
- Atmos→Ocean hypotesis to be tested with OMIP experiments
- SAM (CC) role
- Mechanism for eastward expansion

The South Pacific Blob and the Pressure Trend Dipole

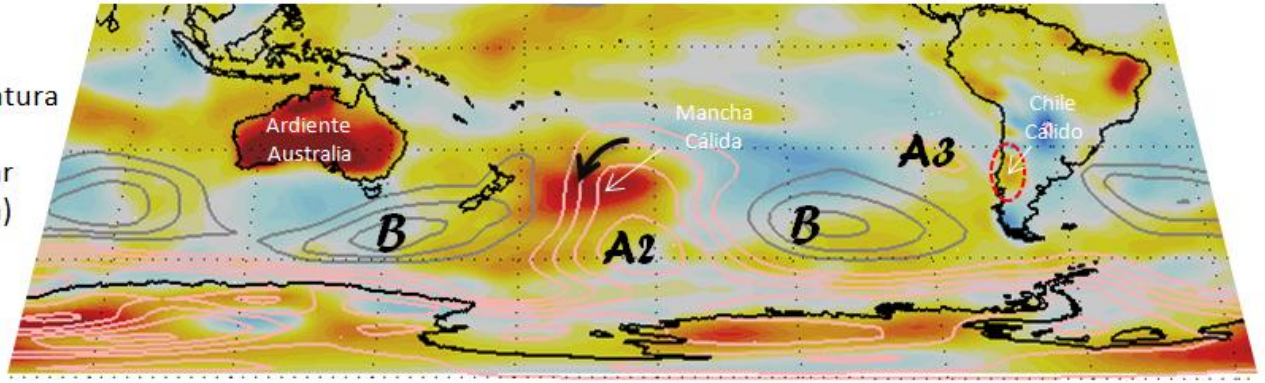


Expect the unexpected

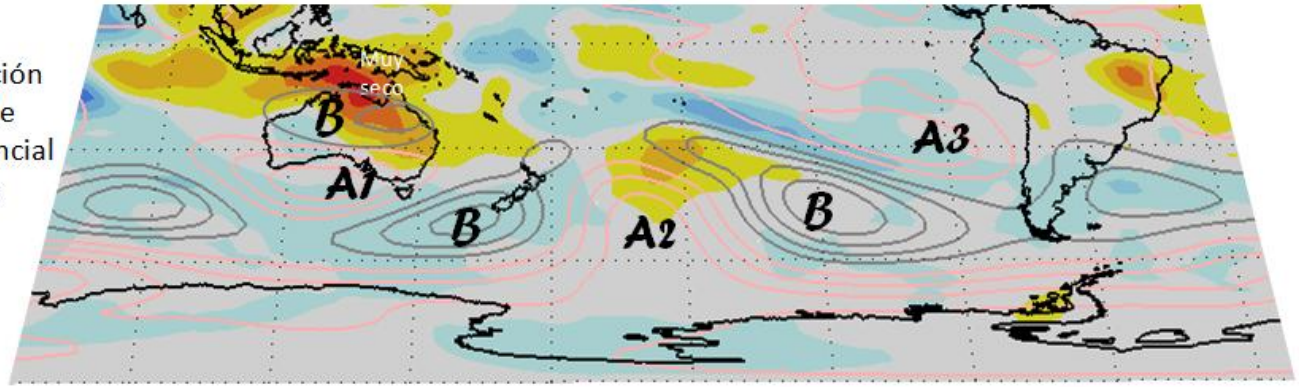
Extra Bonus



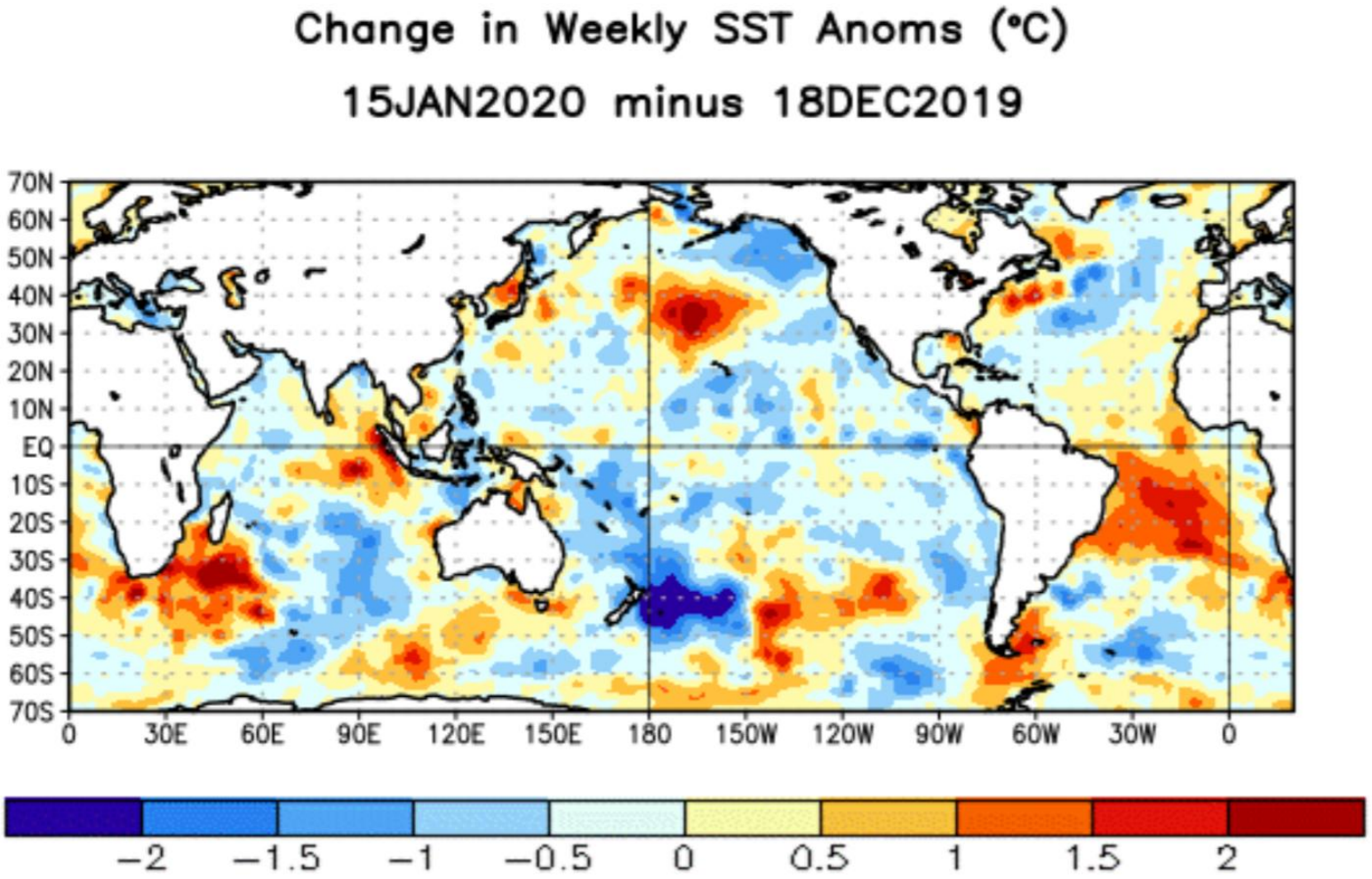
(b) Anomalía Temperatura Superficial (colores) y Presión a Nivel del Mar (contornos cada 2 hPa) Diciembre 2019
NCEP-NCAR Reanalysis



(c) Anomalía Radiación infrarroja emergente (colores) y geopotencial 200 hPa (contornos cada 20 mgp) para Dic. 2019
NCEP-NCAR Reanalysis



The widely publizised early summer 2020 blob grew under the same mechansism proposed here, but it was short lived because mother high was MJO-related and faded by the early January ….



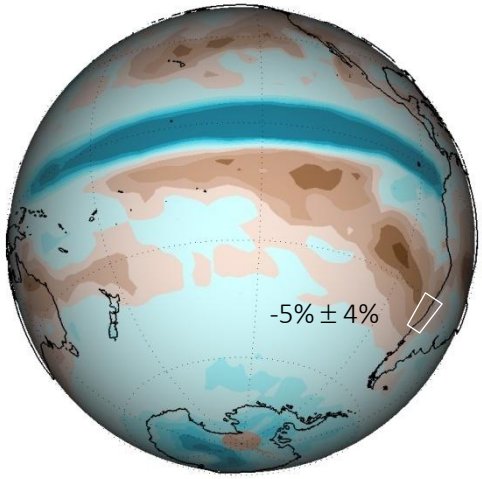
CMIP5 Models: Present (2010-2020, RCP8.5) minus recent past (1970-2000, HIST)

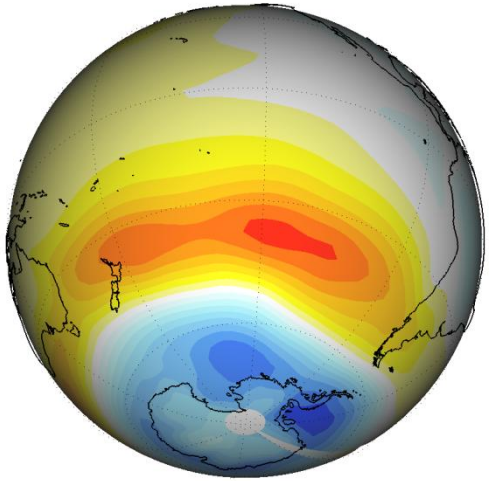
Precipitation Anomalies (%)

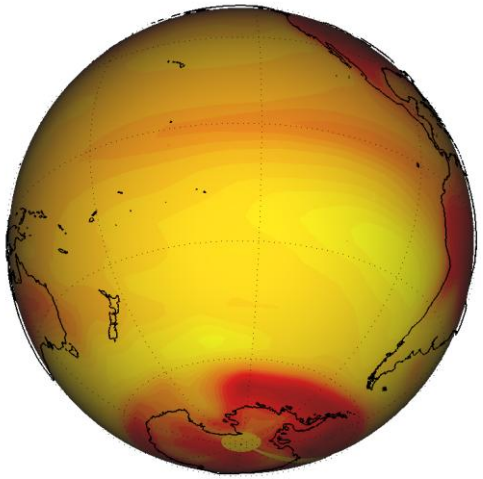
SLP Anomalies (hPa)

SAT Anomalies (°C)

Multi model mean
(43 models)







Dry – Wet CCH
(7 models each)