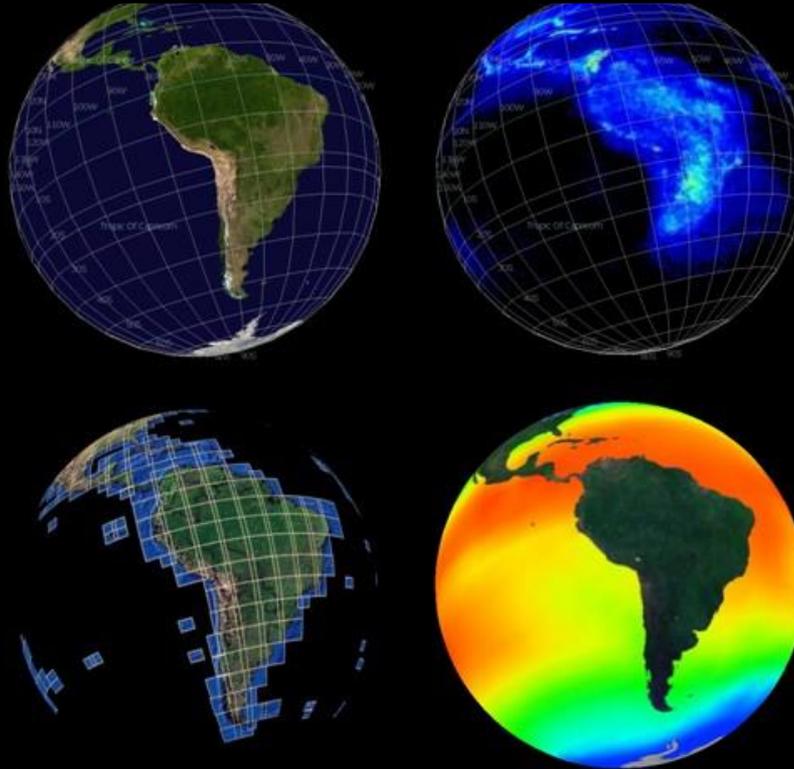


El Fenómeno El Niño y su impacto socio-ecológico en la Región
The Niño Phenomenon and its Socio-Ecological Impact in the Region
16-17 NOVIEMBRE 2020
PERÚ – EVENTO ONLINE



Impactos Climáticos del fenómeno ENOS en Sudamérica

Dr. René D. Garreaud

www.dgf.uchile.cl/rene

Departamento de Geofísica

Universidad de Chile

Desde cuando conocemos El Niño?

Hidrografía oceánica

DISERTACIÓN SOBRE LAS CORRIENTES OCEÁNICAS Y ESTUDIOS DE LA CORRIENTE PERUANA Ó DE HUMBOLDT, POR EL CAPITÁN DE NAVÍO D. CAMILO N. CARRILLO, VICE-PRESIDENTE DE LA SOCIEDAD GEOGRÁFICA; LEÍDA EN LA NOCHE DEL 27 DE MAYO EN EL SALÓN DE LA SOCIEDAD, Y PUBLICADA EN ESTA SECCIÓN POR ACUERDO DEL CONSEJO DIRECTIVO, PREVIA REVISIÓN DE SU AUTOR.

Carrillo, 1893

Bol. Soc. Geogr. Lima

Está, pues, fuera de toda duda, que hay una contra-corriente que se dirige del Norte al Sur, en la costa del Perú, en oposición á la corriente de Humboldt.

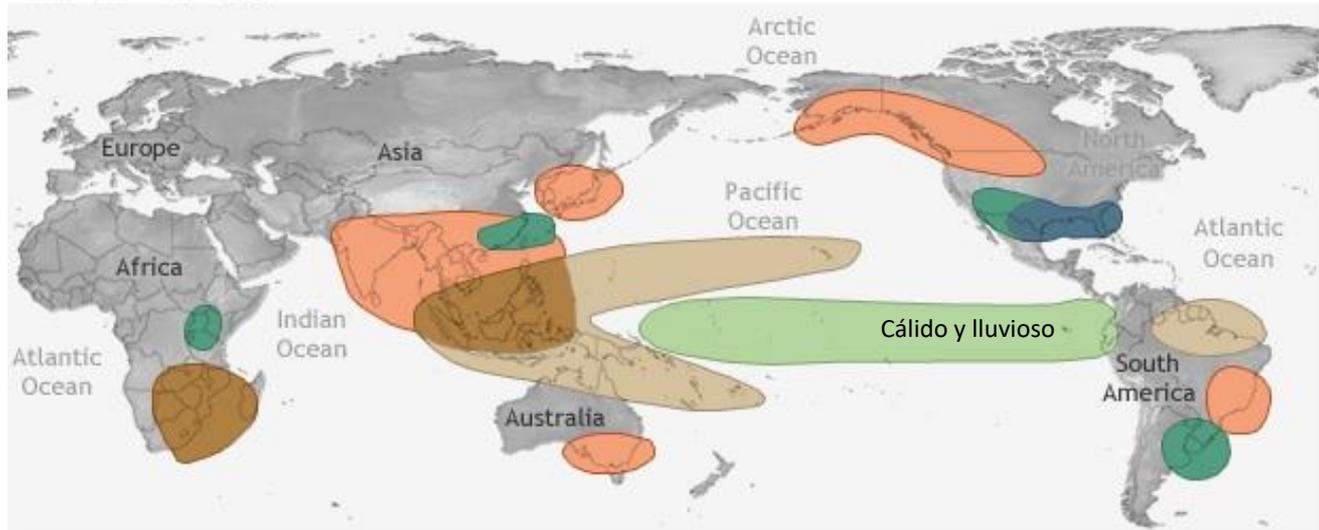
✓ Pero debo hacer notar que ellas son completamente independientes: la primera corre de norte á sur, siguiendo la dirección de la costa, y pegada á ella; mientras que la de Humboldt, tiene una dirección opuesta, según la descripción que de ella se ha hecho.

★ Los marinos paitesios que navegan frecuentemente cerca de la costa y en embarcaciones pequeñas, ya al norte ó al sur de Paita, conocen esta corriente y la denominan corriente del *Niño*, sin duda porque ella se hace mas visible y palpable después de la Pascua de Navidad. Esta contra-corriente me parece que tiene su origen cerca ó en el mismo golfo de Guayaquil; de manera que en ciertas épocas, particularmente en verano, se encuentran en las inmediaciones de la costa norte del Perú, hojas de palmeras, de platanos, naranjas y muchos otros objetos que las aguas del río Guayaquil y de Tumbes conducen al mar, y que la corriente del *Niño*, suelen arrastrar hasta la latitud de Sechura y Pacasmayo.

EL NIÑO CLIMATE IMPACTS

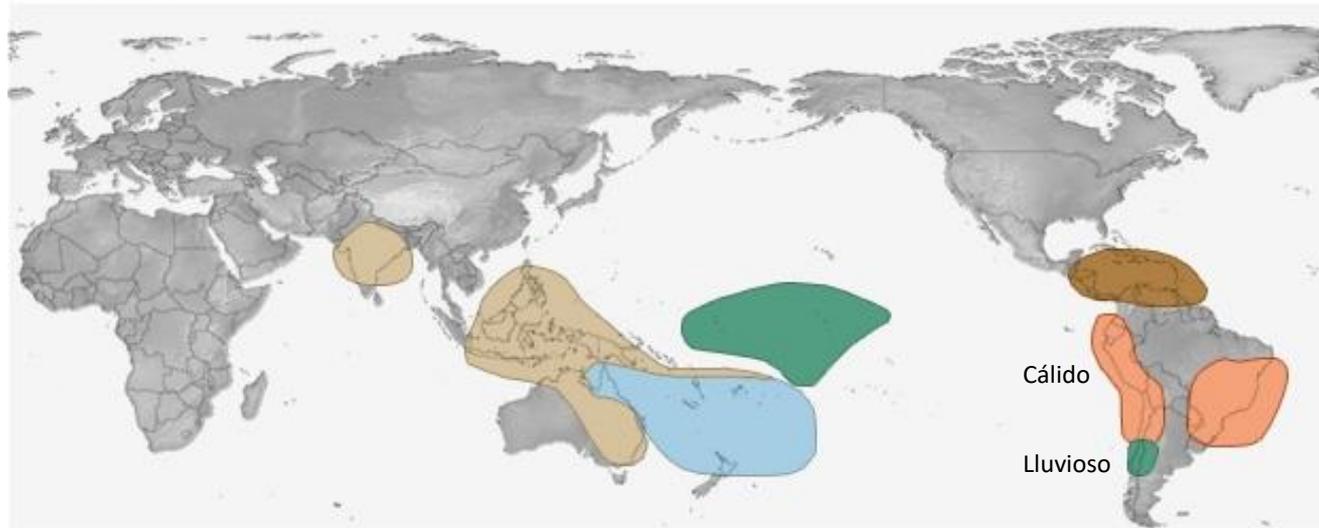
December-February

Verano

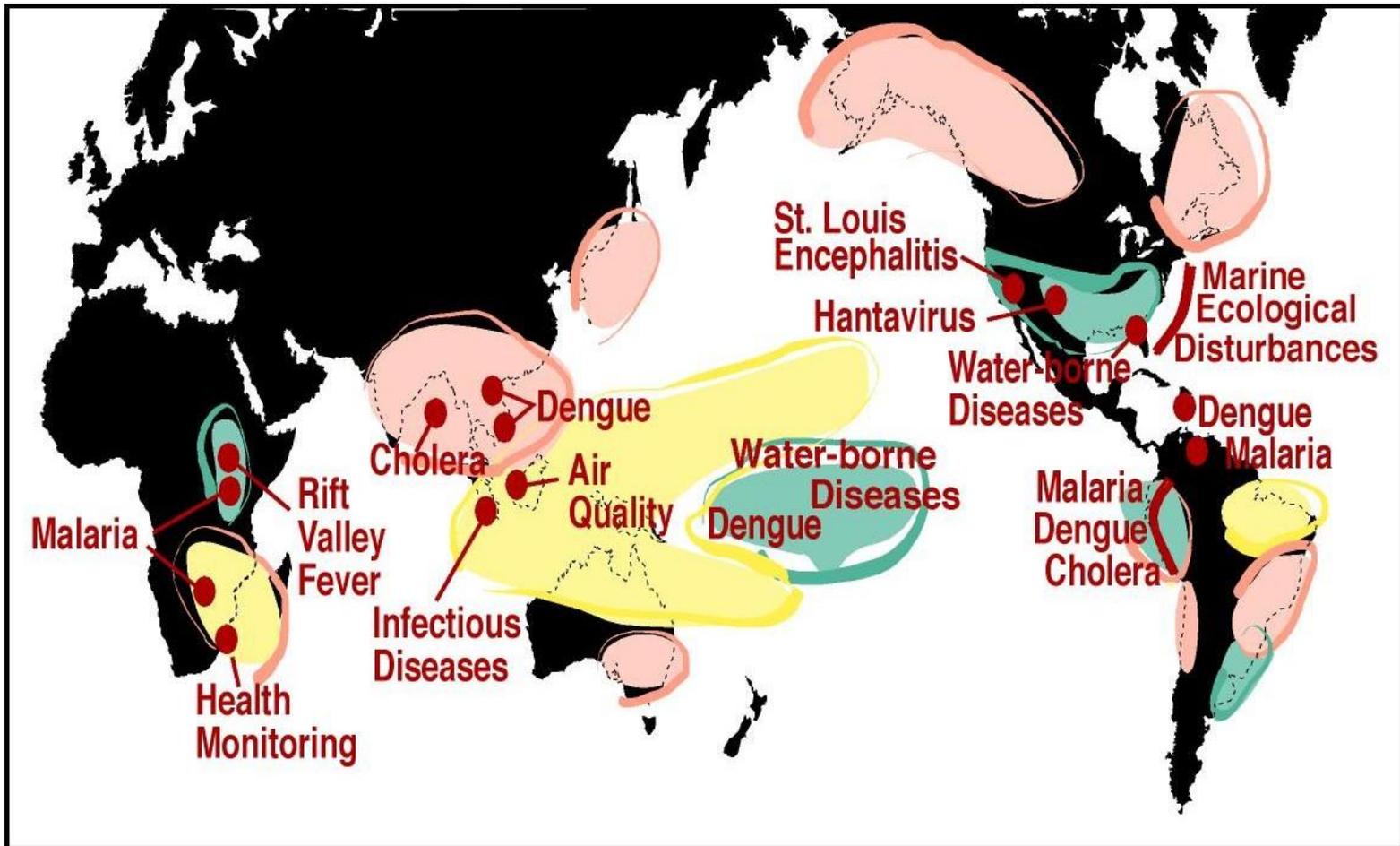


June-August

Invierno



Exploring the Linkages between the El Niño-Southern Oscillation (ENSO) and Human Health

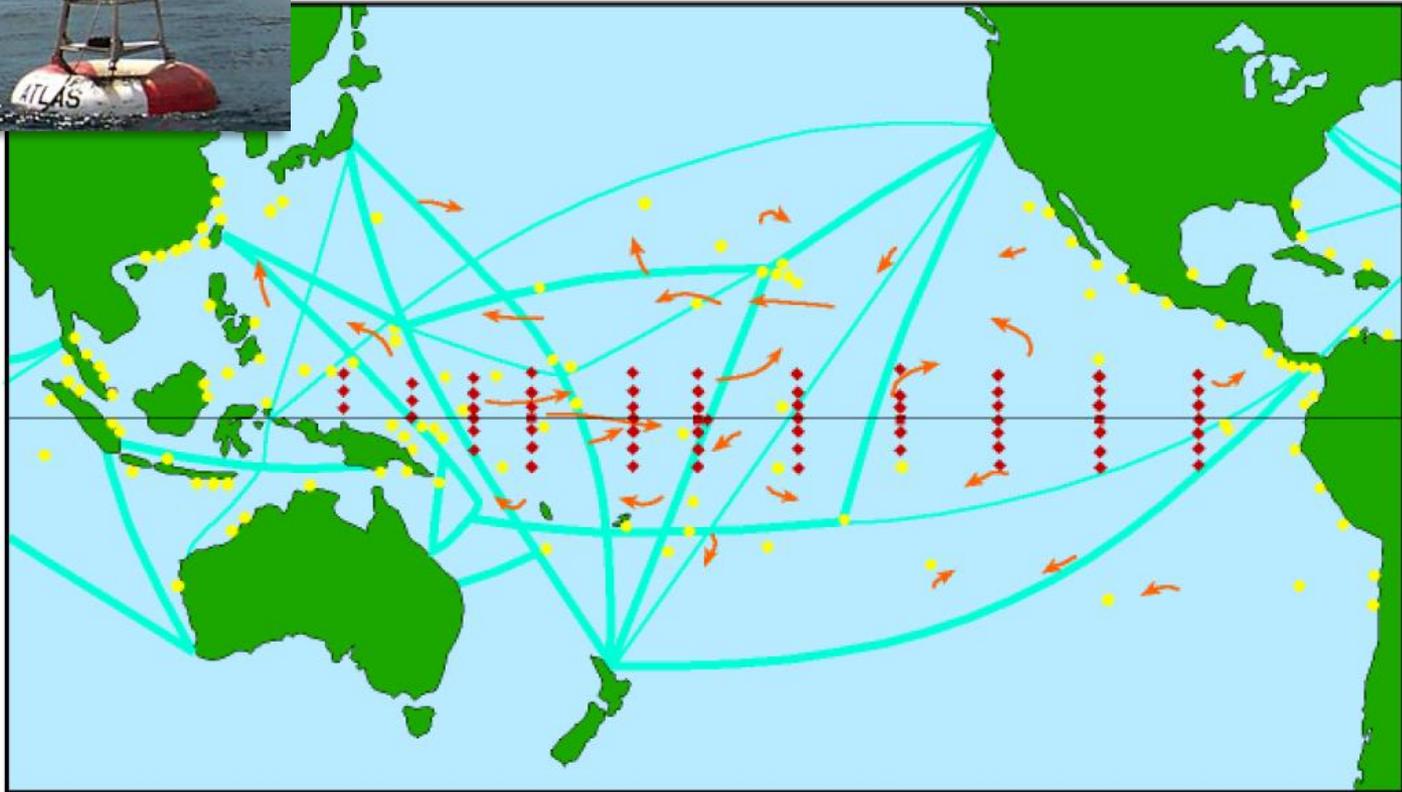


Generalized El Niño-Southern Oscillation (ENSO) Impacts

- | | |
|---|---|
| = DRY | = DRY & WARM |
| = WET | = WET & WARM |
| = WARM | = WET & COOL |



ENSO Observing System

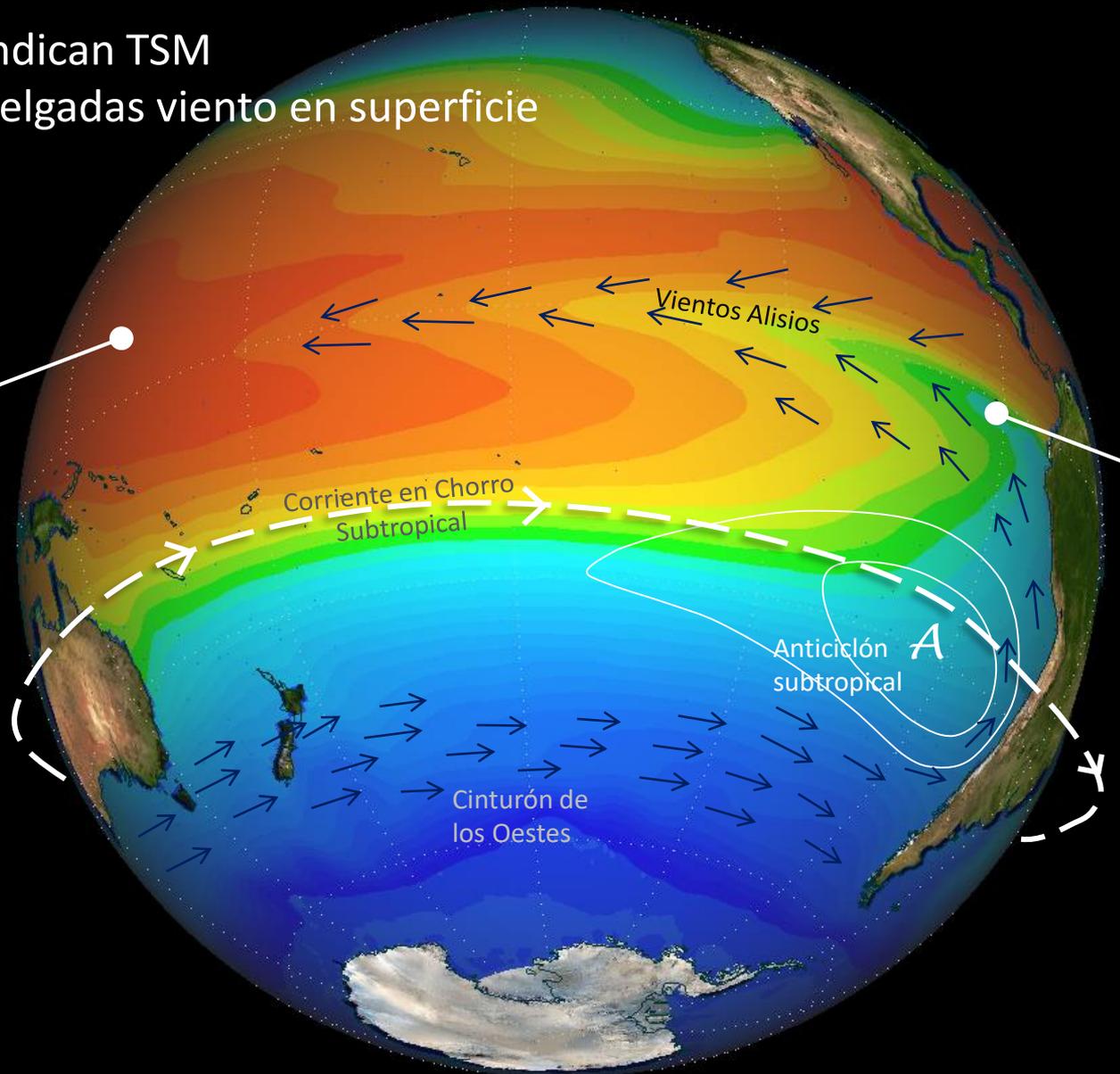


Condición media: Asimetría zonal y acoplamiento OA

Colores indican TSM

Flechas delgadas viento en superficie

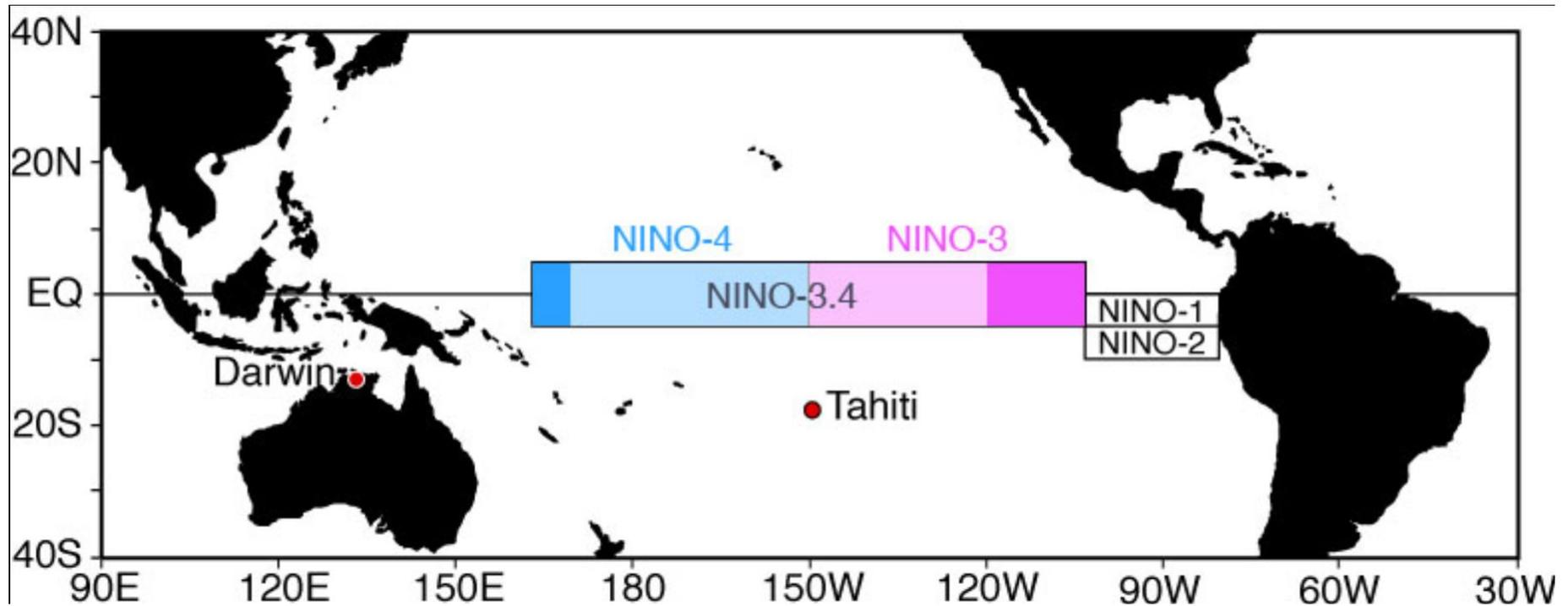
Continente Marítimo
Posa cálida
Baja presión
Termoclina profunda
Convección Profunda



Pacífico Oriental
Lengua fría
Altas presiones
Termoclina somera
Subsidencia

Regiones El Niño

Cada día se obtiene la temperatura superficial del mar y se le resta su promedio de largo plazo (anomalía de TSM)

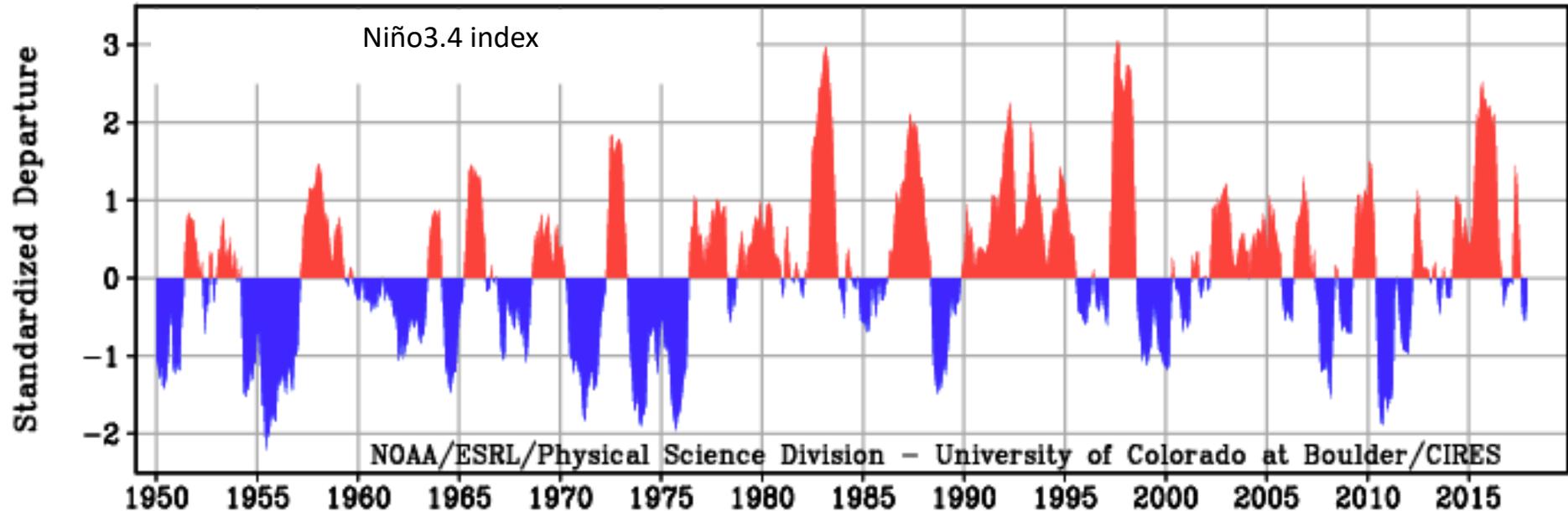


Variabilidad interanual en el Pacifico tropical

El Niño Global (aTSM >0.5°C por 3 meses en Nino3.4)

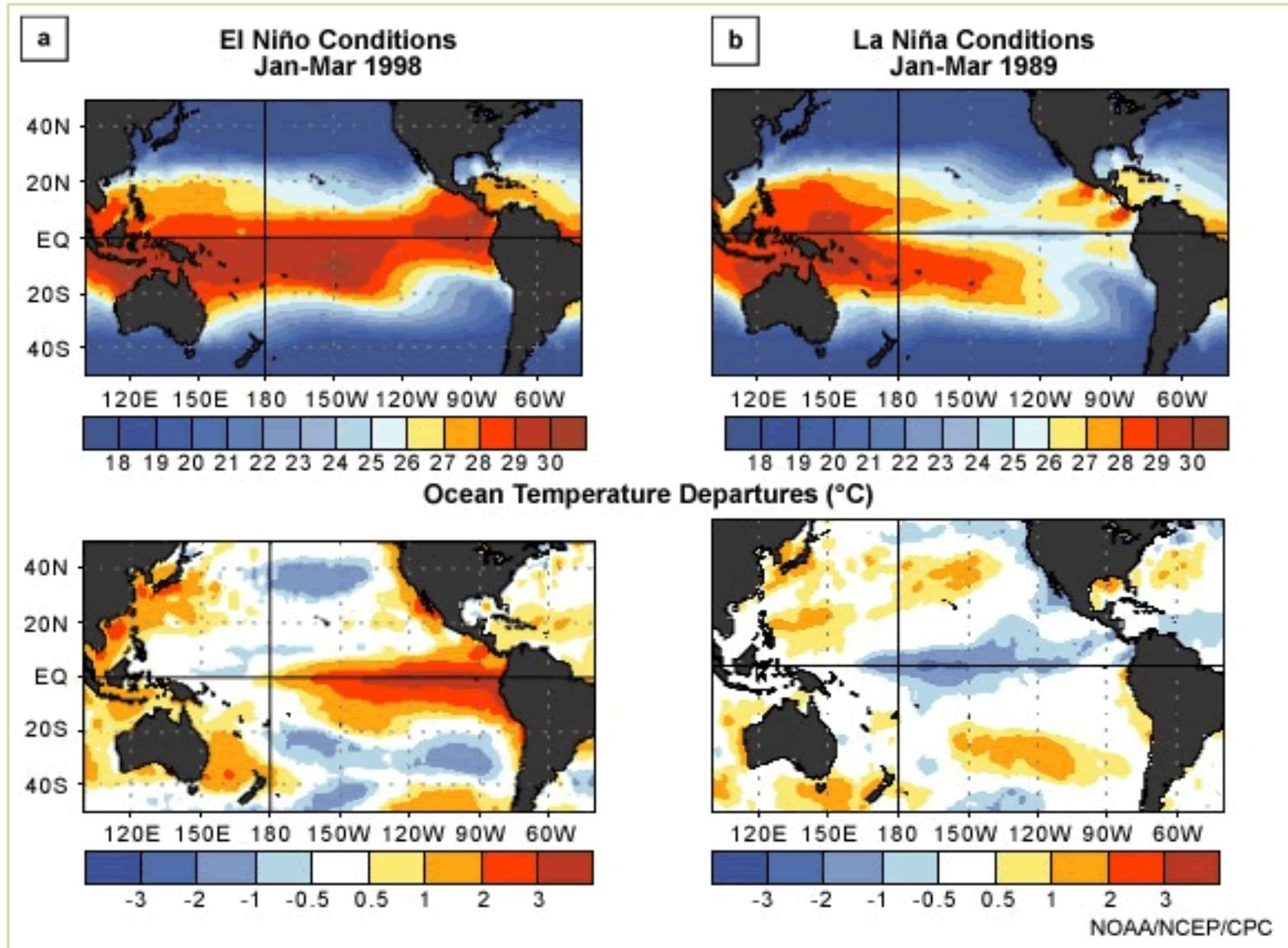
App 1 años de duración

Cada 3-7 años



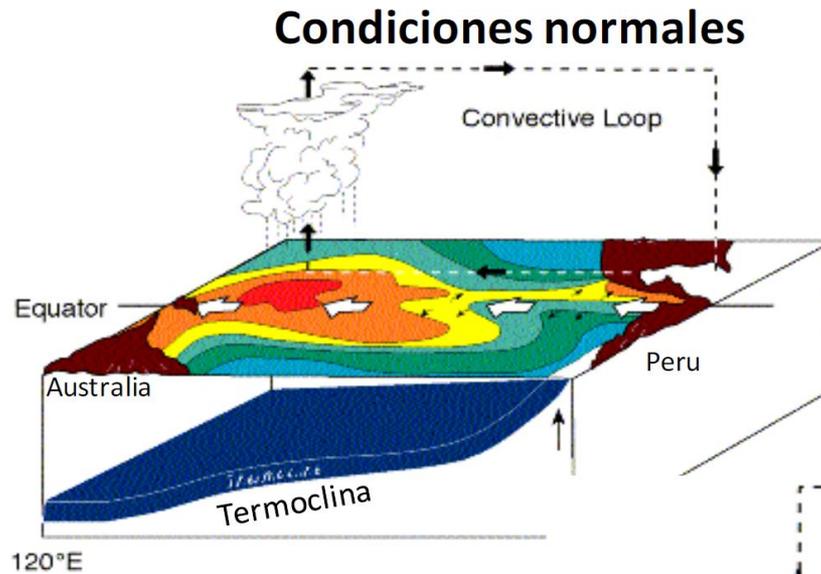
Variabilidad interanual en el Pacifico tropical

EN, LN (aT>0.5°C por 3 meses) : 1-2 años de duración, cada 3-7 años



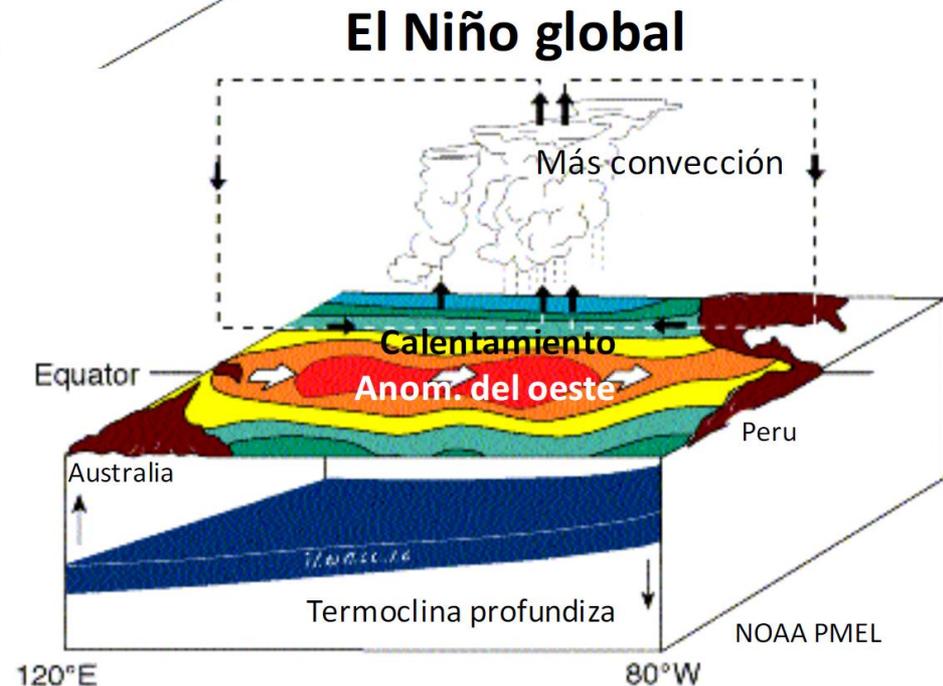
Mantenimiento de El Niño: Mecanismo de Bjerknes

(También refleja acoplamiento O-A: SST, SLP, Viento)



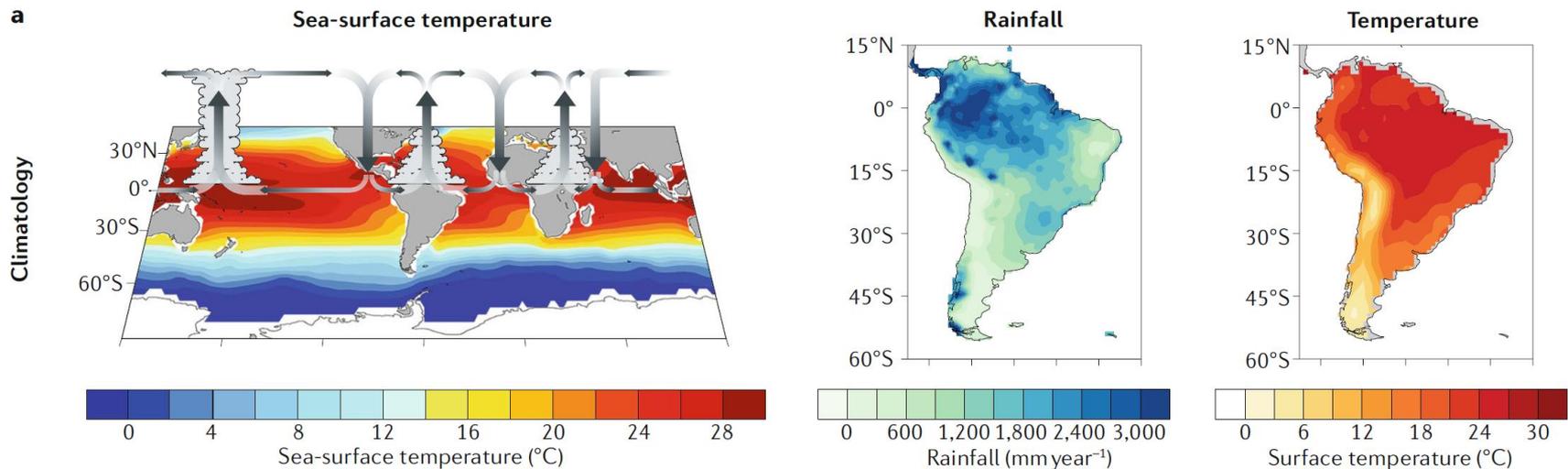
El Niño-Oscilación Sur (ENOS) GLOBAL

Interacción océano-atmósfera en todo el Pacífico ecuatorial de **oeste a este**



Climate impacts of the El Niño–Southern Oscillation on South America

Wenju Cai^{1,2}✉, Michael J. McPhaden³, Alice M. Grimm⁴, Regina R. Rodrigues⁵,
Andréa S. Taschetto⁶, René D. Garreaud^{7,8}, Boris Dewitte^{9,10,11,12}, Germán Poveda¹³,
Yoo-Geun Ham¹⁴, Agus Santoso^{15,16}, Benjamin Ng¹⁷, Weston Anderson¹⁵,
Guojian Wang^{18,19}, Tao Geng^{18,19}, Hyun-Su Jo², José A. Marengo¹⁶, Lincoln M. Alves¹⁷,
Marisol Osman^{18,19}, Shujun Li^{1,2}, Lixin Wu¹, Christina Karamperidou²⁰, Ken Takahashi²¹
and Carolina Vera^{18,19}



El Niño – related precipitation variability in Perú

P. Lagos¹, Y. Silva¹, E. Nickl², and K. Mosquera¹

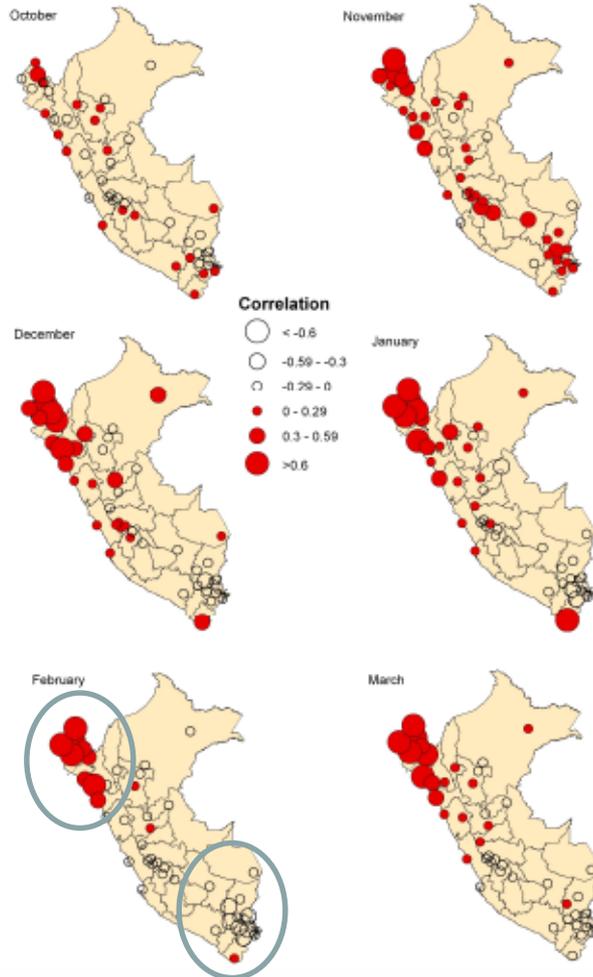
¹Instituto Geofísico del Perú, Lima, Perú

²Department of Geography, University of Delaware, Delaware, USA

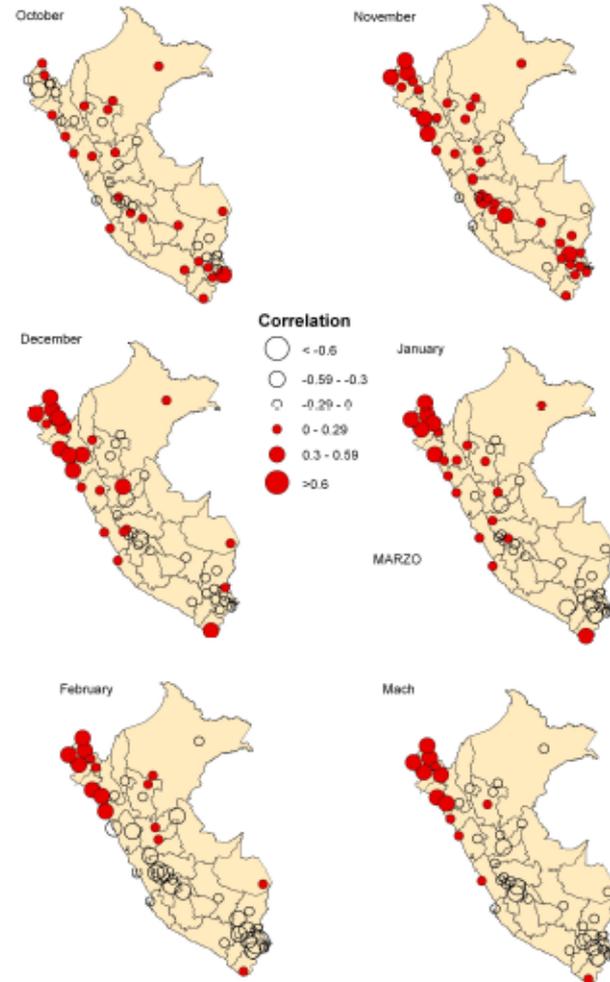
Adv. Geosci., 14, 231–237, 2008
www.adv-geosci.net/14/231/2008/
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Received: 15 July 2007 – Revised: 19 November 2007 – Accepted: 19 November 2007 – Published: 10 April 2008

Correlation between Precipitation and SST in el Niño 1+2 Region

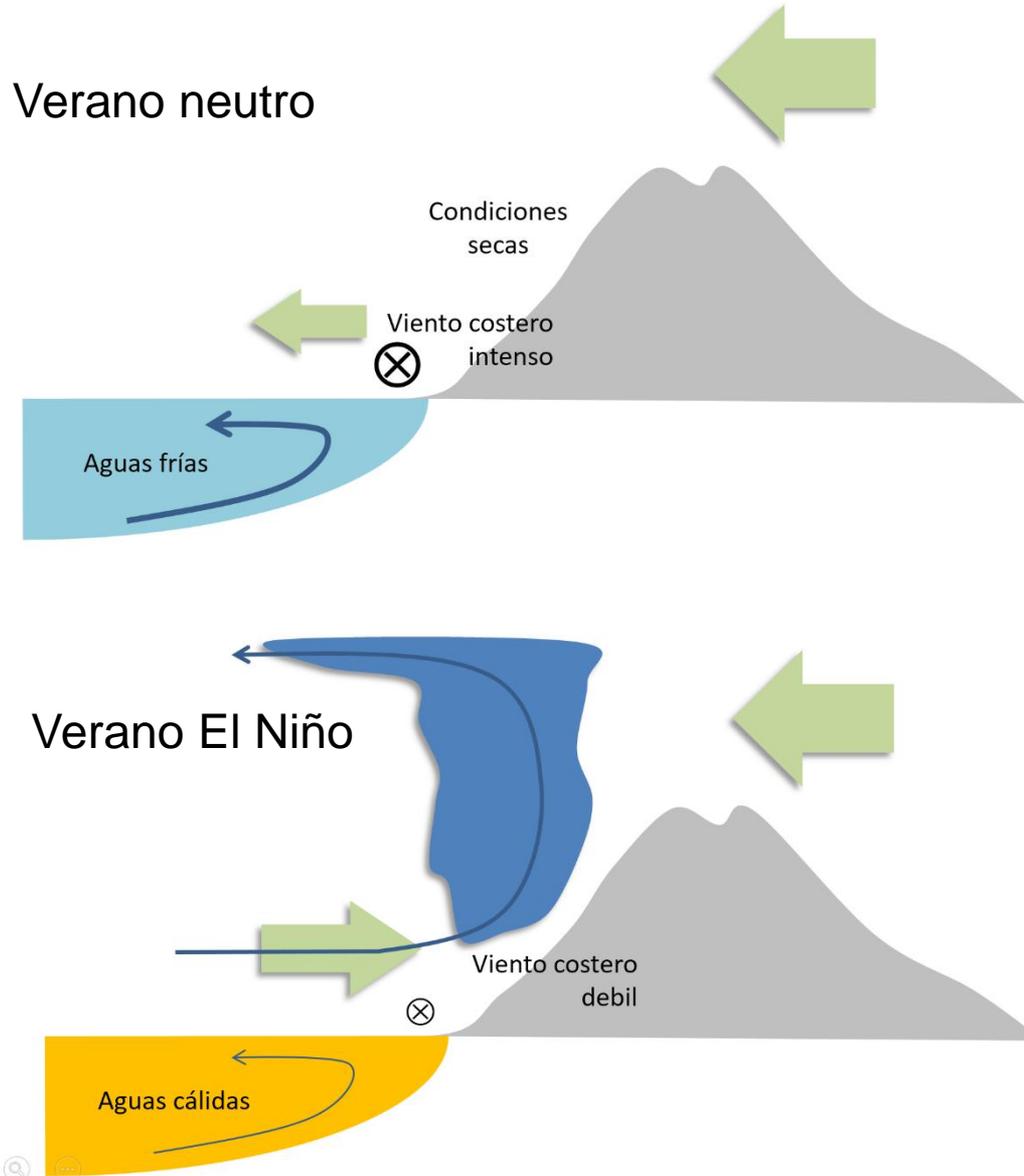


Correlation between Precipitation and SST in el Niño 3.4 Region

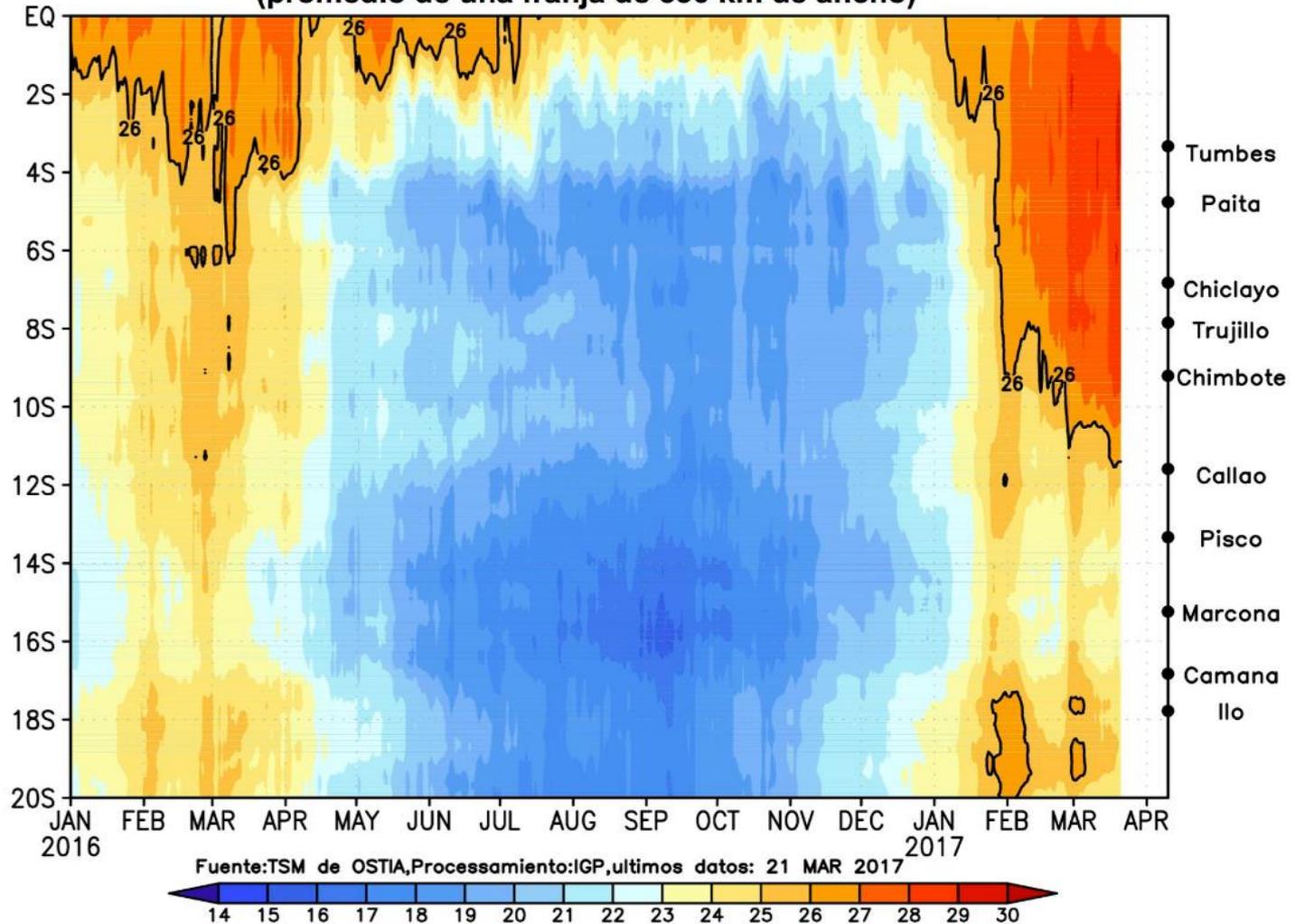


Condiciones en la zona norte del Perú y Ecuador

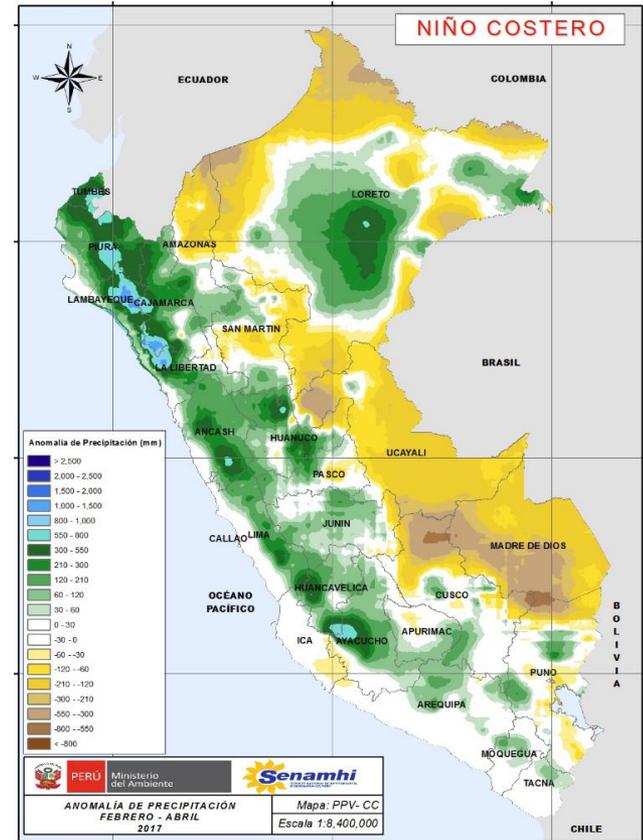
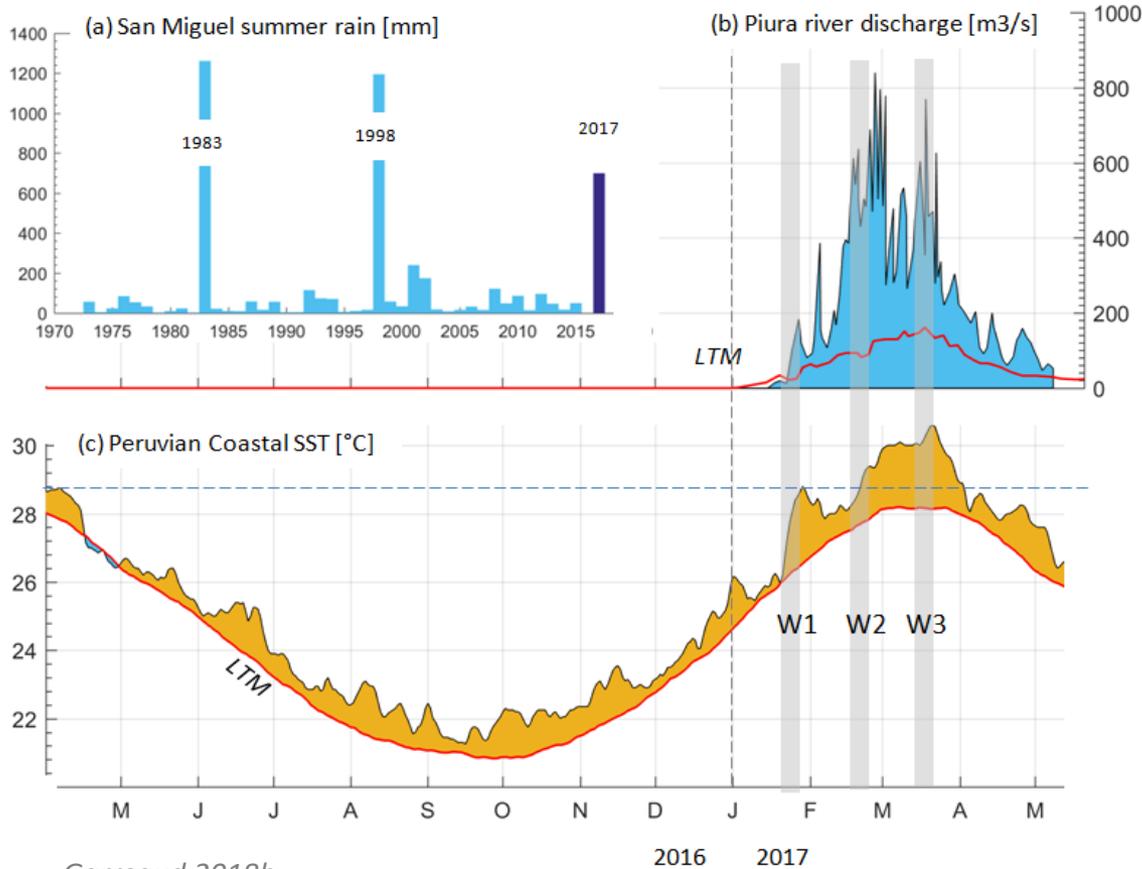
Efecto directo de la TSM costera



Temperatura superficial del mar (°C) frente a la costa (promedio de una franja de 330 km de ancho)

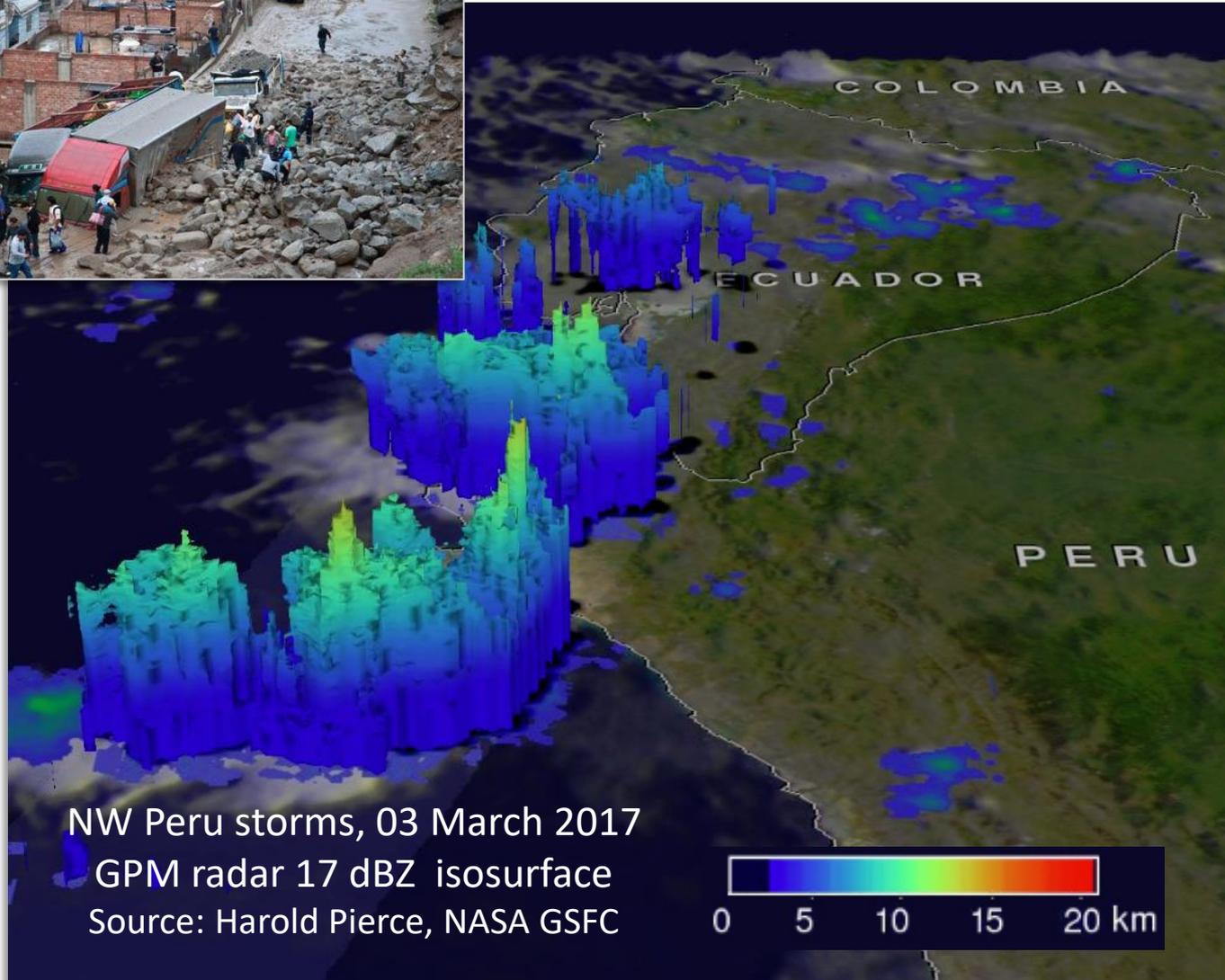
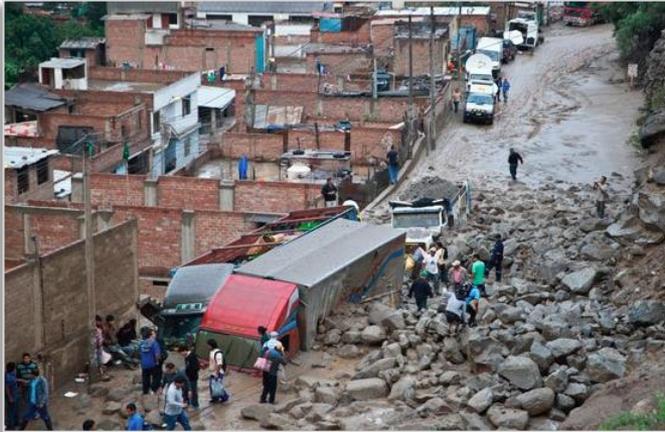


Calentamiento costero y precipitación



Calentamiento costero y precipitación

>200 fallecidos, 3.1 Bill US\$



NW Peru storms, 03 March 2017

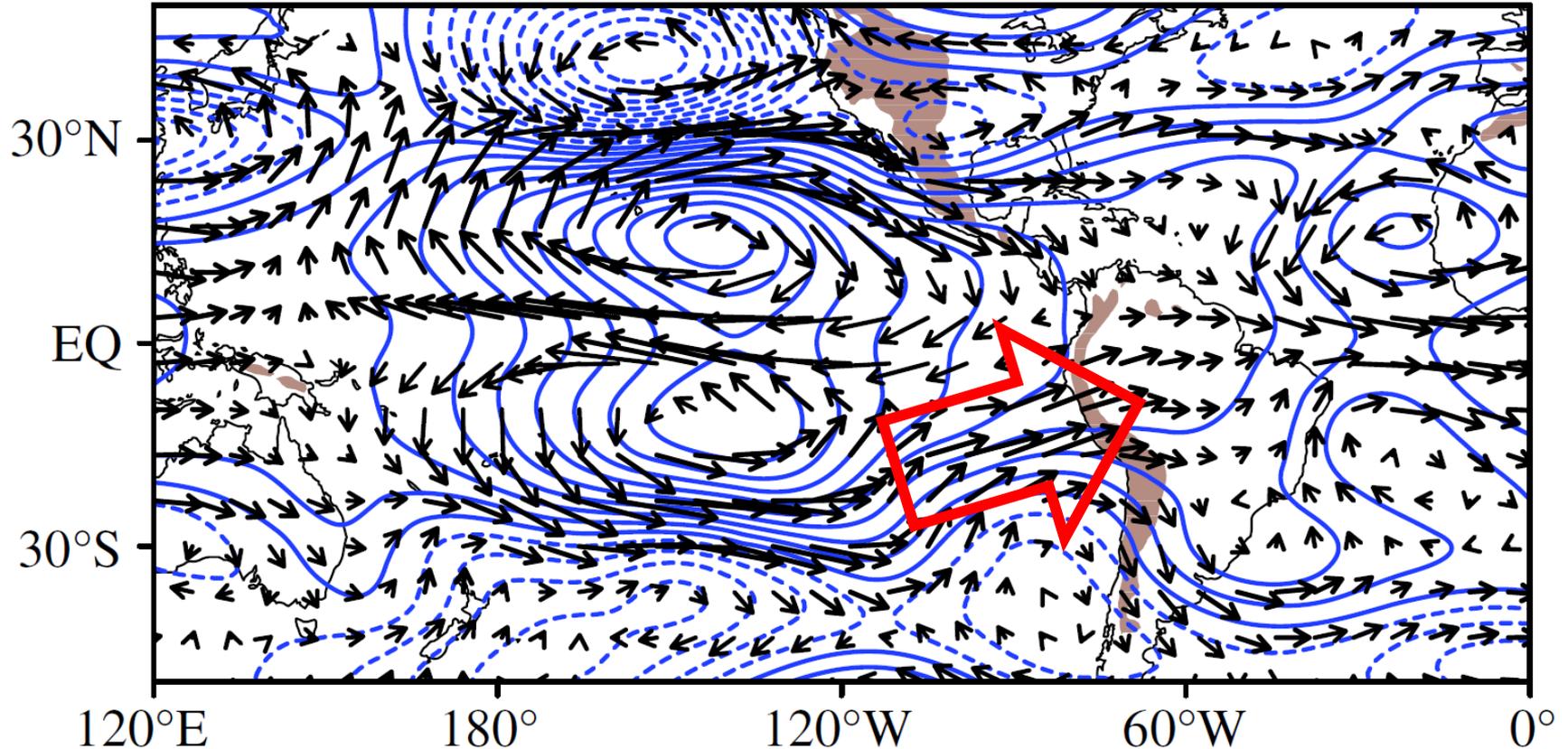
GPM radar 17 dBZ isosurface

Source: Harold Pierce, NASA GSFC



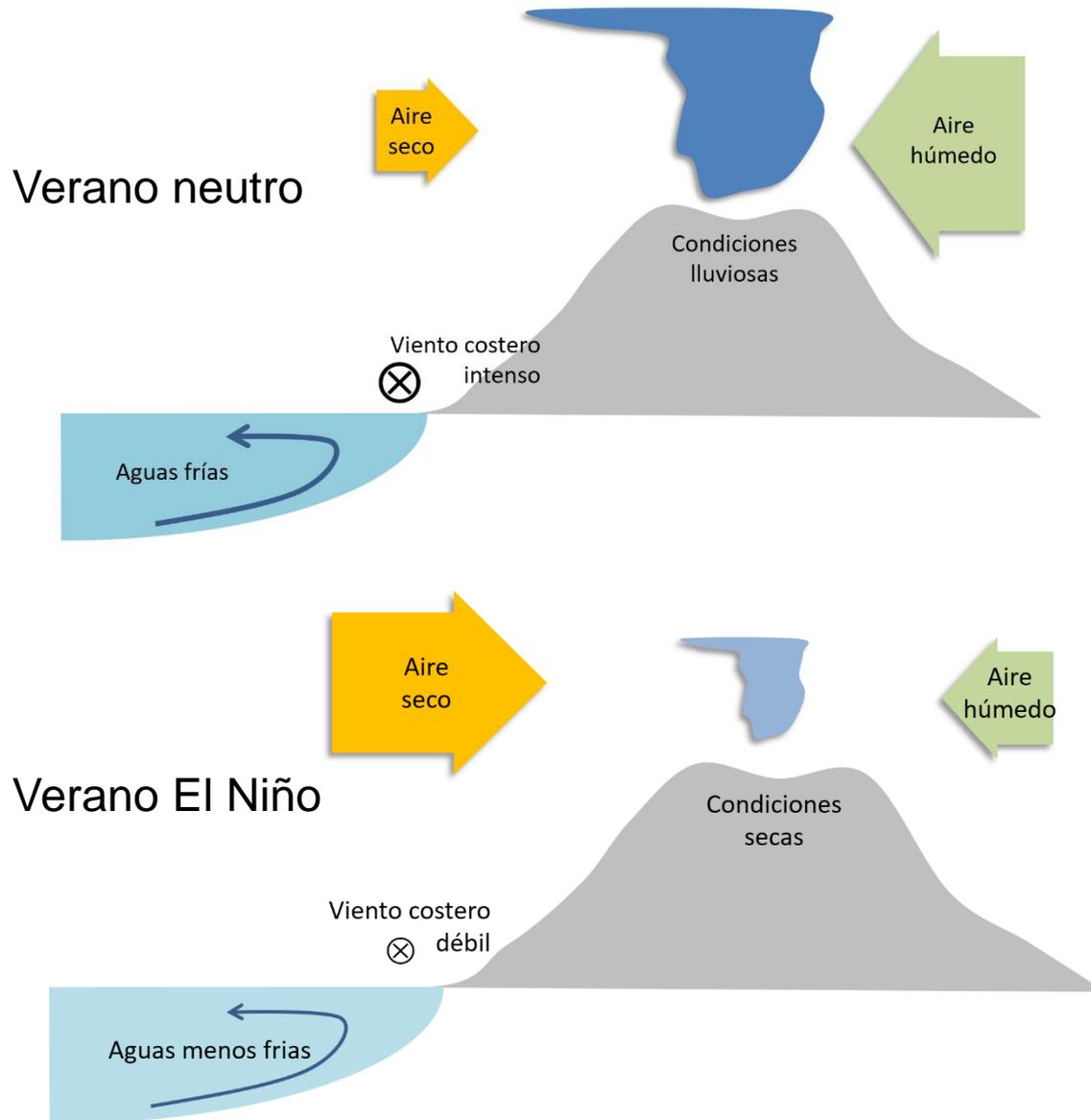
Anomalías de viento en altura durante años EN

(a) 200 hPa Wind (m s^{-1}) and geopotential height (m) anomaly



Condiciones en la zona centro y sur del Perú

Cambio en los vientos de altura (tele conexión)



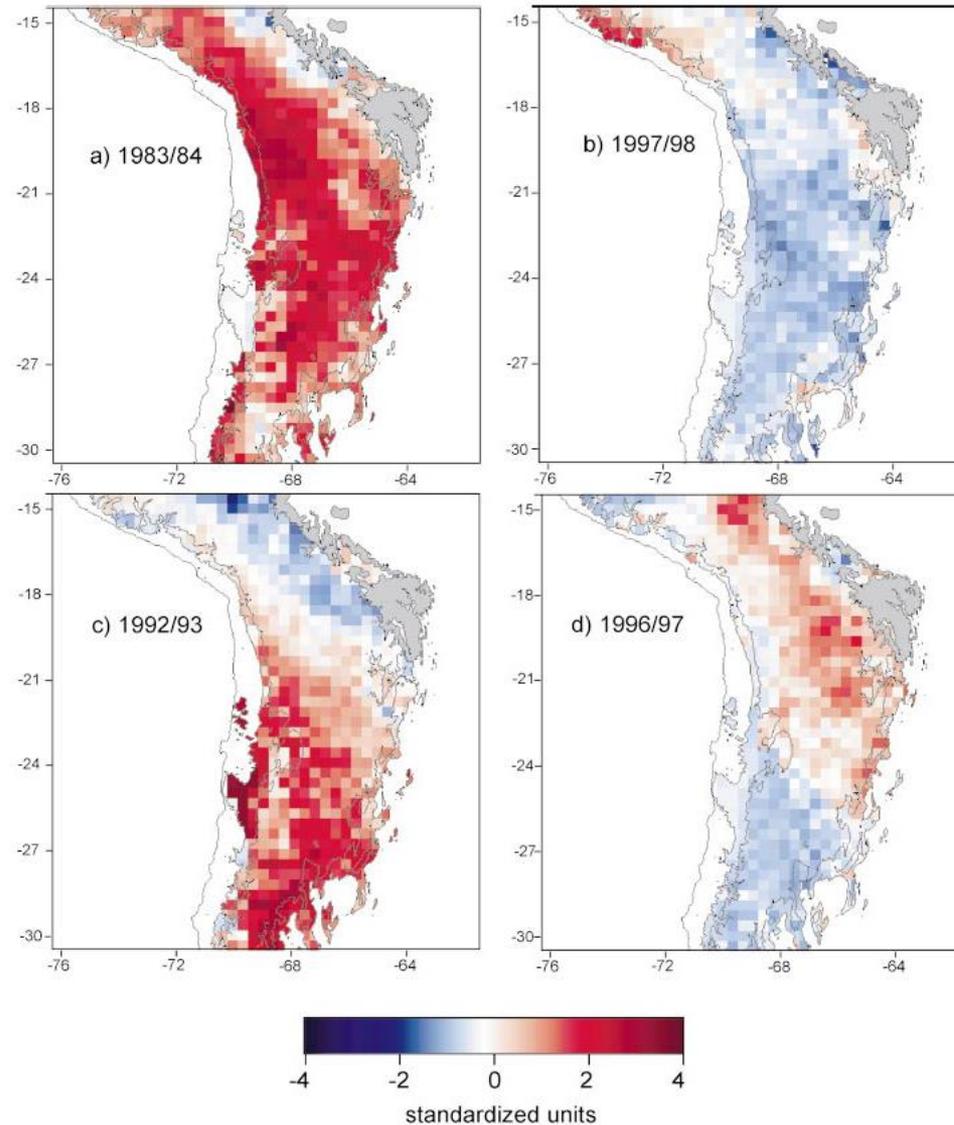
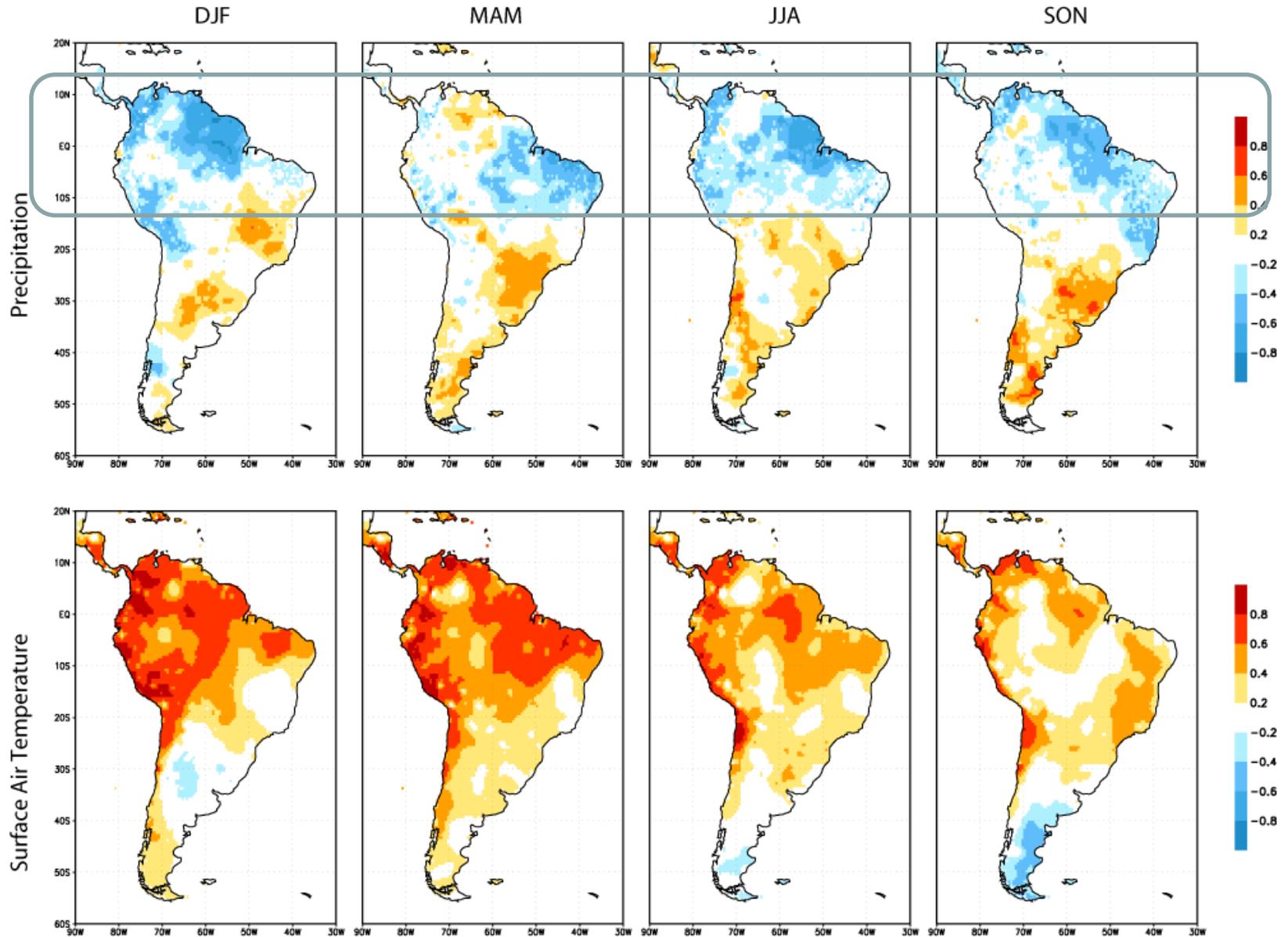
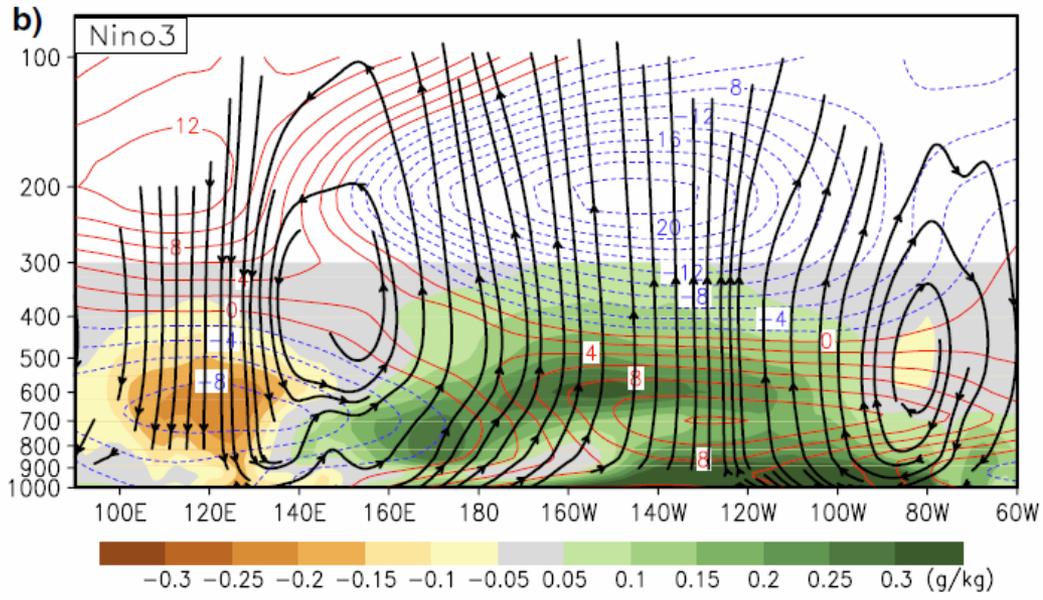
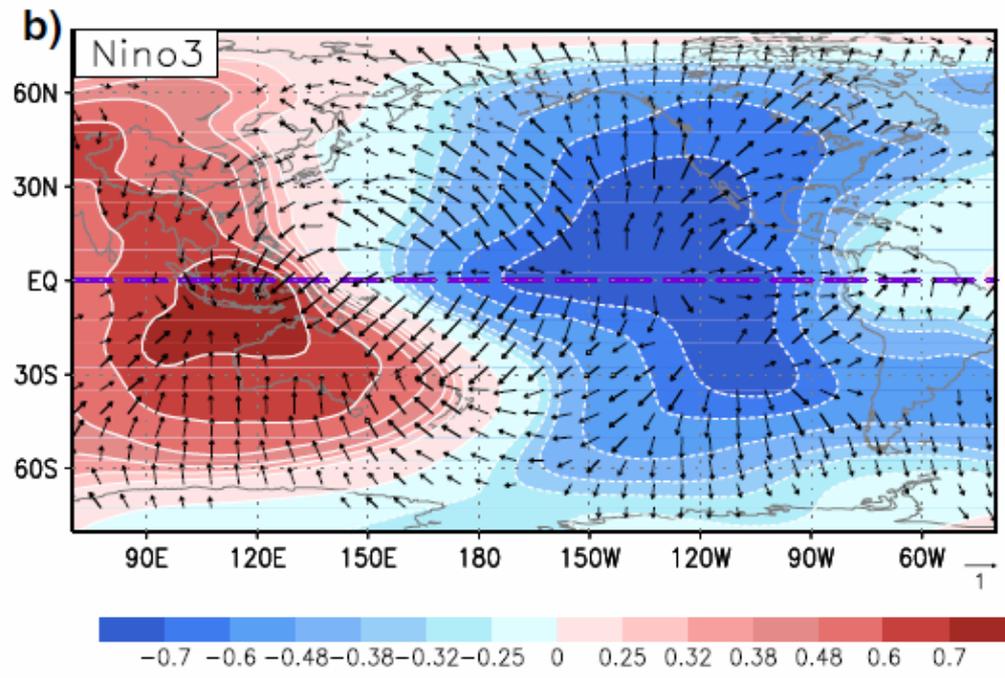


FIG. 7. Departure (standardized anomalies) of DJFM fractional cold ($T_g^* = 240$ K) cloud coverage F^* from long-term mean (1983–99) in (a) 1983/84, (b) 1997/98, (c) 1992/93, and (d) 1996/97. Only results for regions >1500 m are shown and northeast slope between 1500 and 3000 m is masked in gray. Black lines indicate 0-, 1500-, and 3000-m contour line.

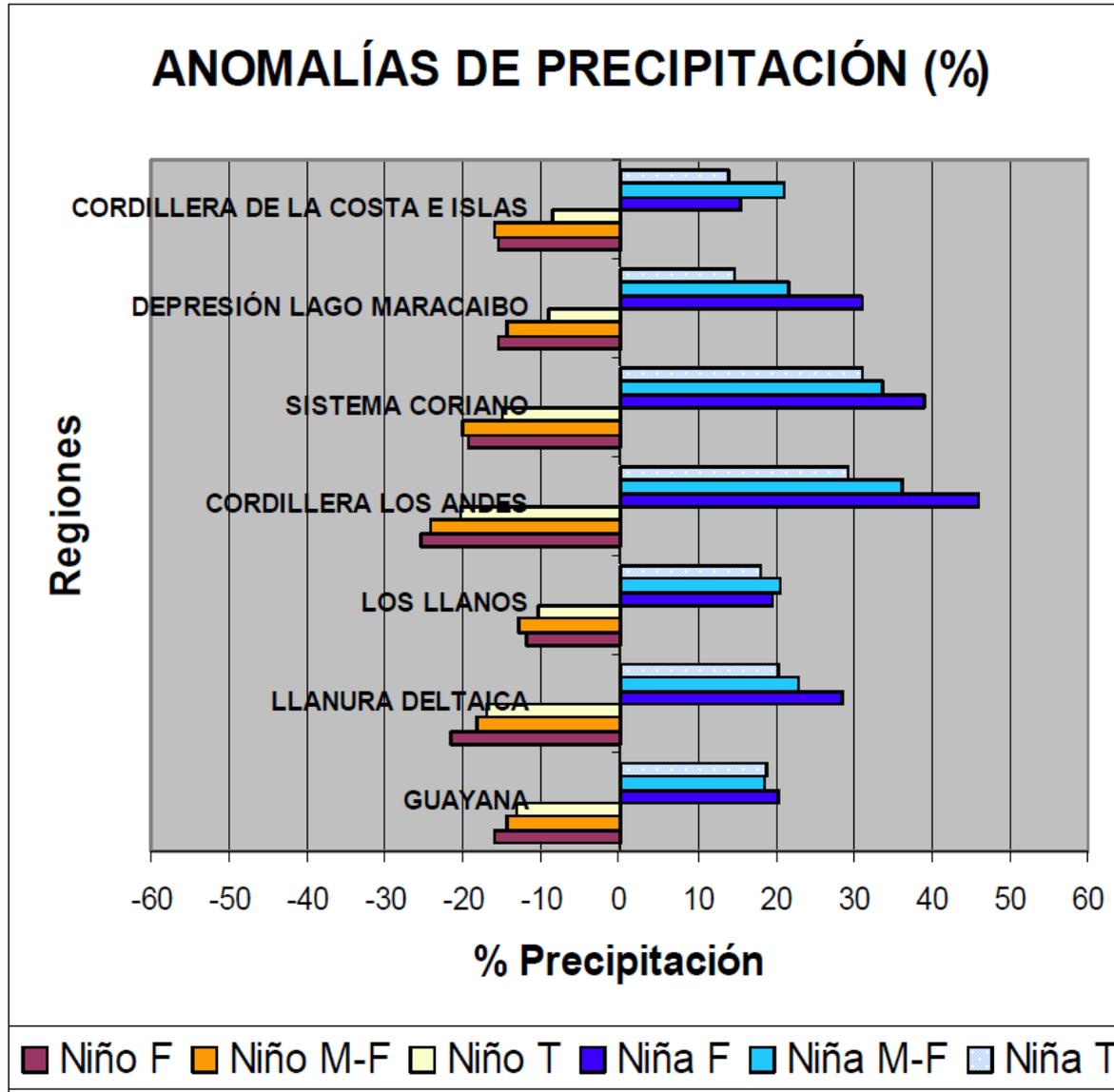
Seasonal correlation between Precip/SAT and Multivariate ENSO Index (50 years of data)





The Influence of El Niño Phenomenon on the Climate of Venezuela

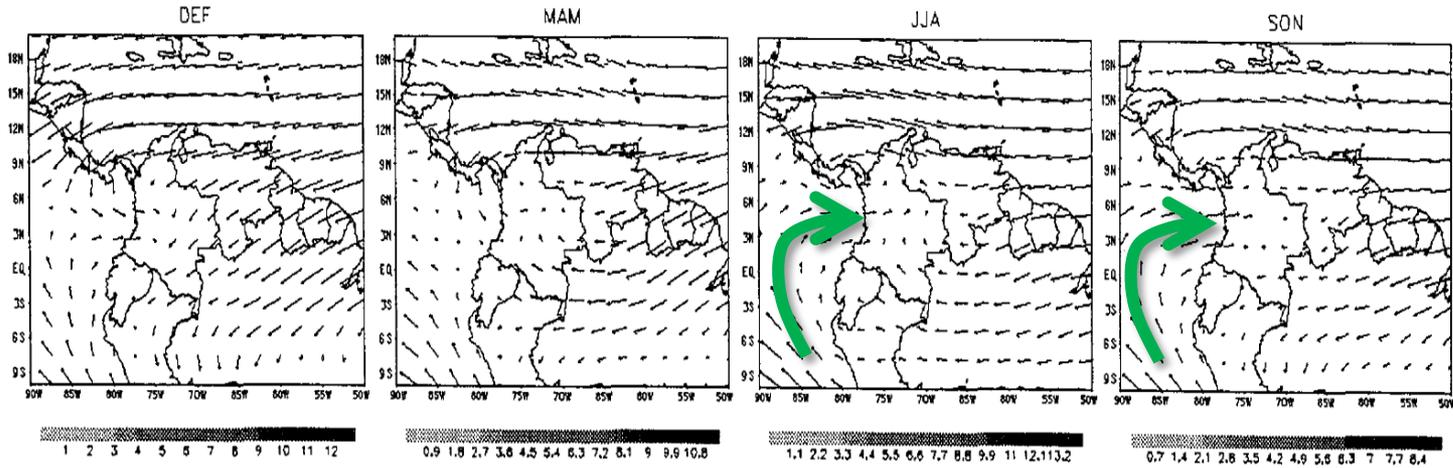
Edilberto Guevara
Profesor of Civil and Environmental Engineering.
Carabobo University
Bárbula, Valencia 2001.
Venezuela



EL CICLO ANUAL DE LA HIDROLOGÍA DE COLOMBIA EN RELACIÓN CON EL ENSO Y LA NAO

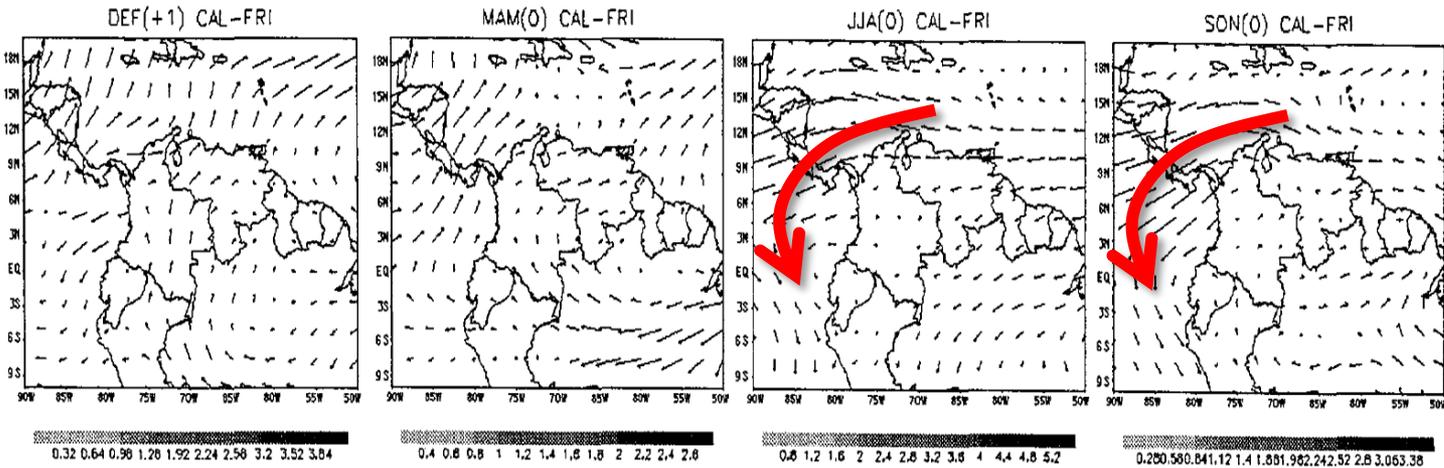
Germán POVEDA *, Marta María GIL *, Natalia QUICENO *

Climo



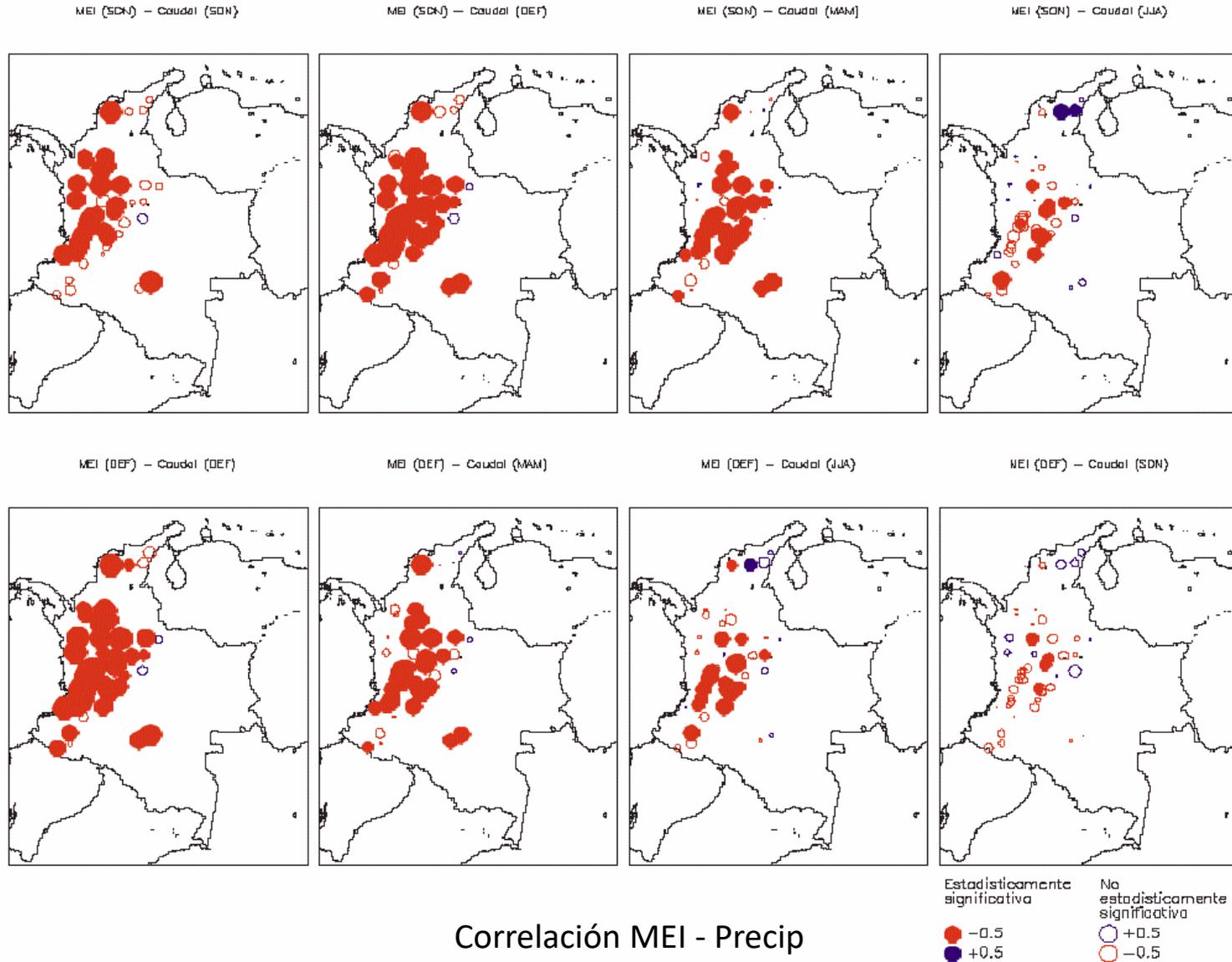
Choco Jet

EN-LN



Impacto en Sector de Colombia

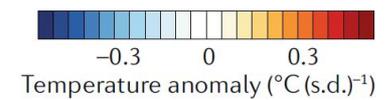
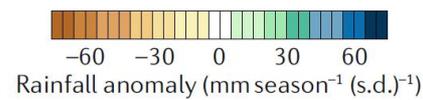
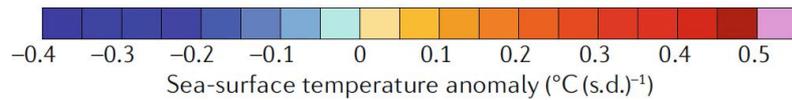
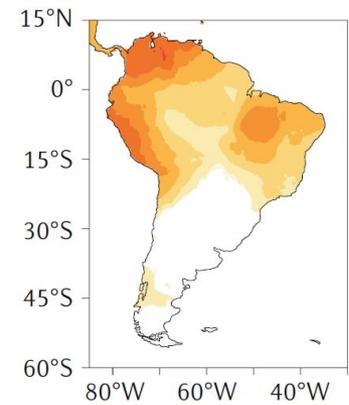
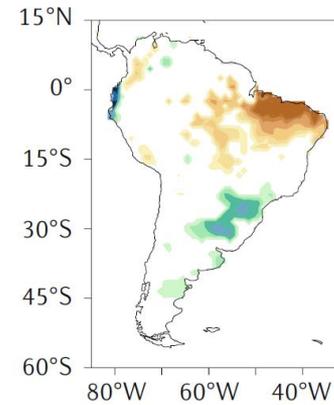
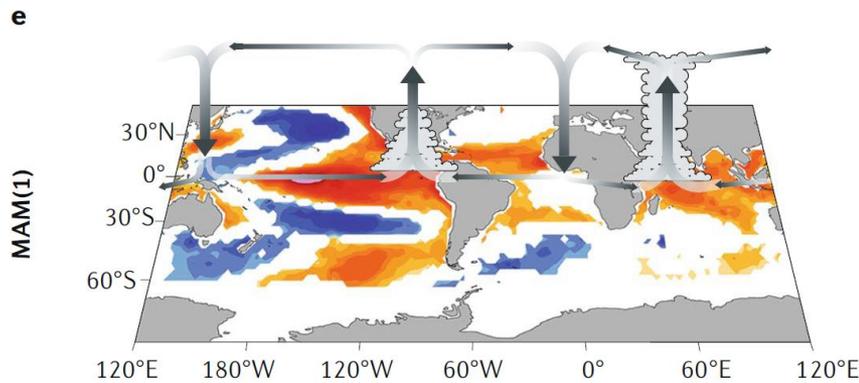
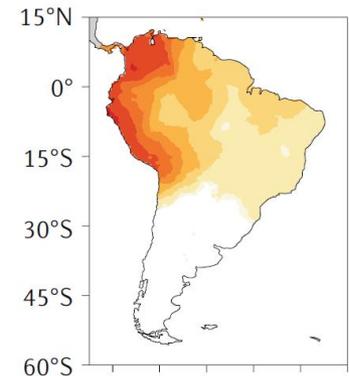
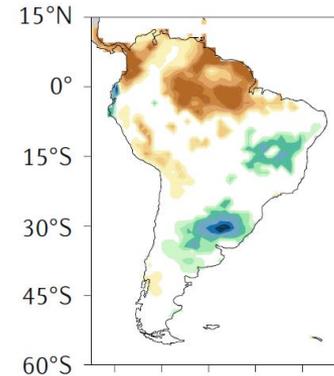
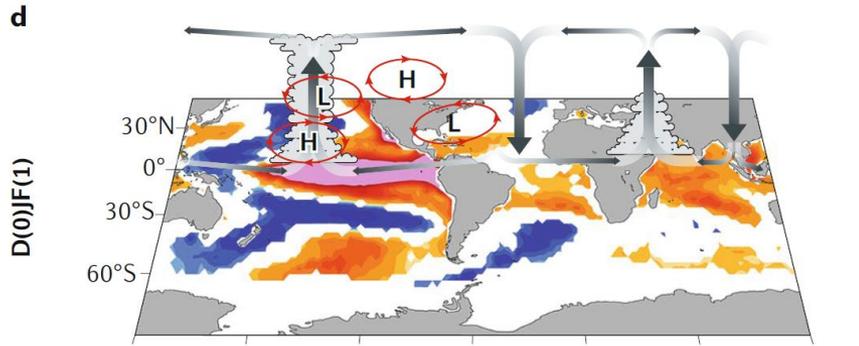
El Niño – Seco / La Niña - Lluviosa



Correlación MEI - Precip

Amazonia y NE Brasil

El Niño – Seco / La Niña - Lluviosa



The El Niño Impact on the Summer Monsoon in Brazil: Regional Processes versus Remote Influences

ALICE M. GRIMM

Department of Physics, Federal University of Paraná, Curitiba, Brazil

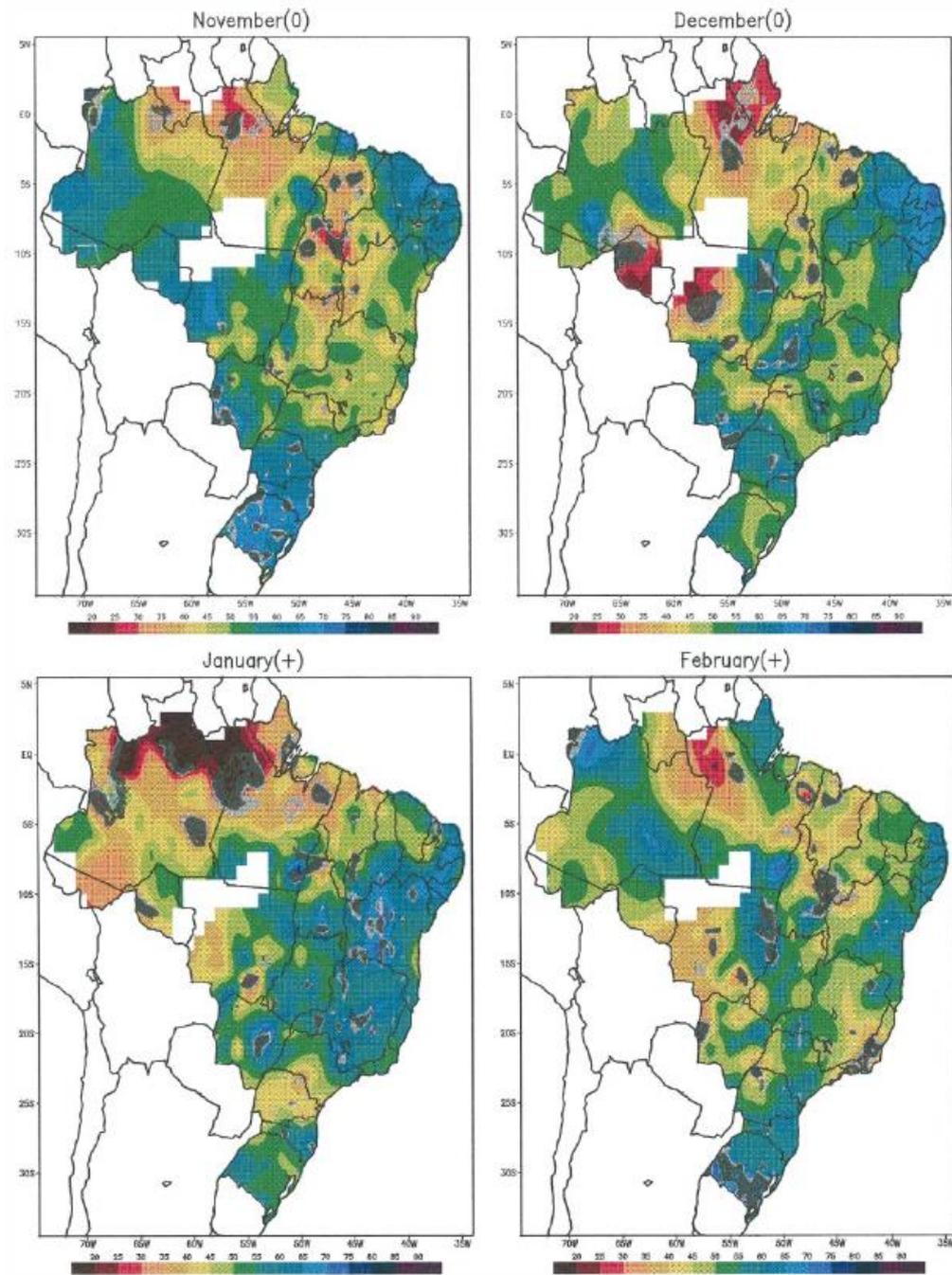
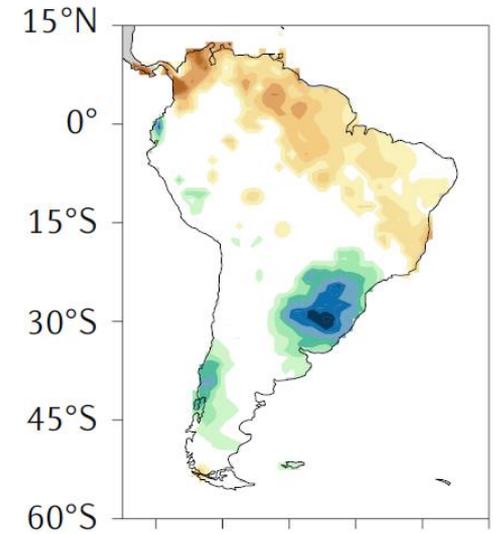
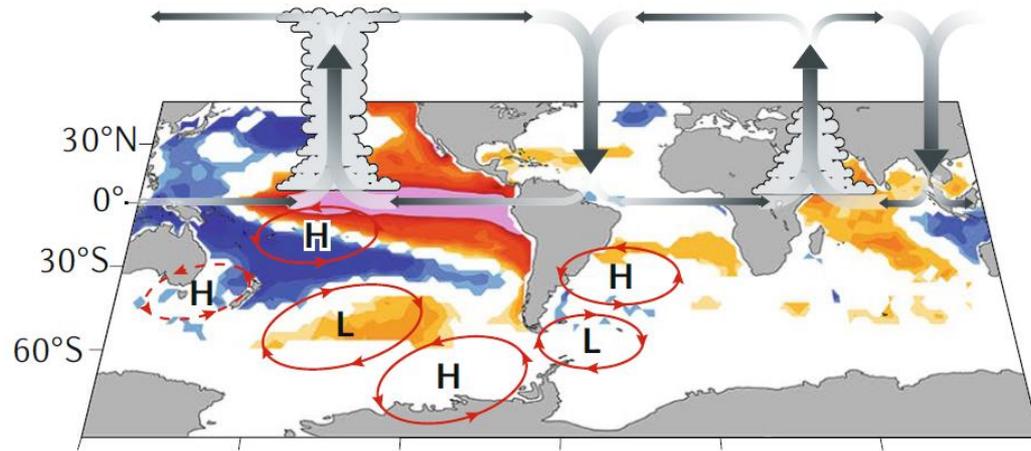


FIG. 6. Monthly mean precipitation percentiles expected for the indicated month of EN events. Dark (clear) shadowed areas have precipitation anomalies consistent over the 90% (85%) confidence level.

Impacto en Sector Extratropical (Chile, Argentina, Uruguay, Sur de Brasil)

El Niño – Lluvioso / La Niña - Seca

c



Rutllant and Fuenzalida 1991: Synoptic explanation of increased CCh precipitation during EN years: blocking anticyclone shifts northward storm track and embedded frontal systems

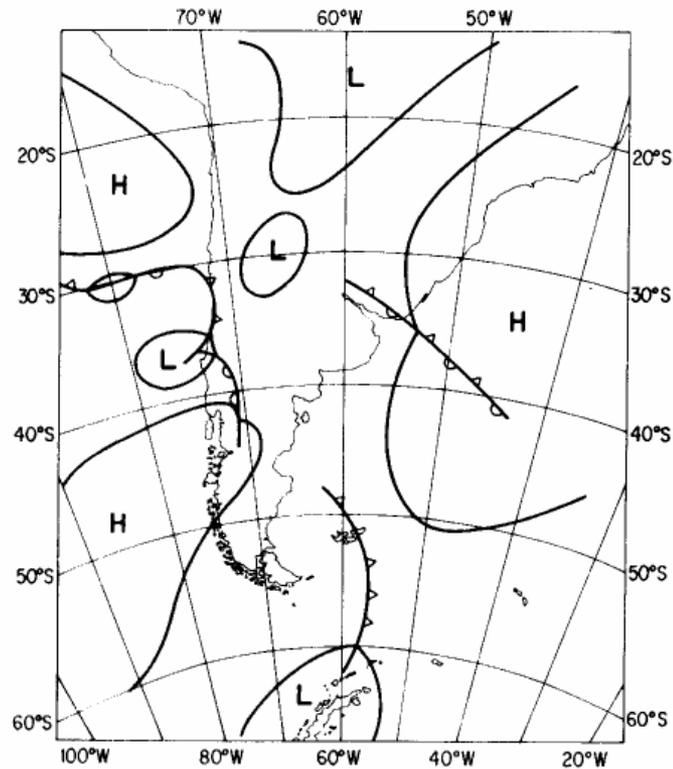
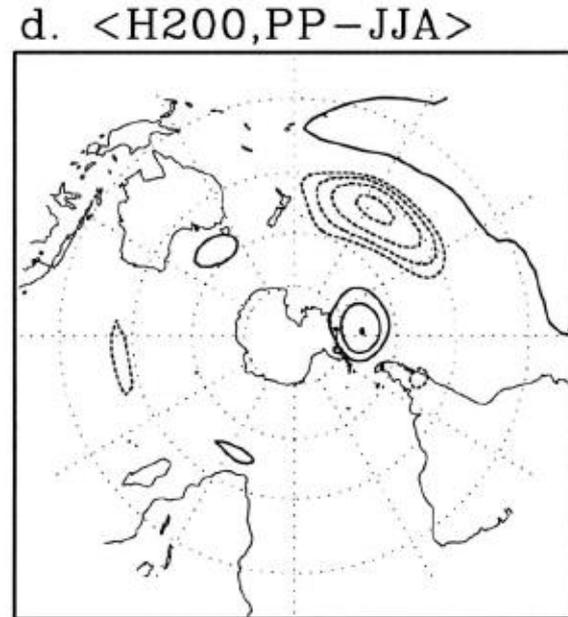
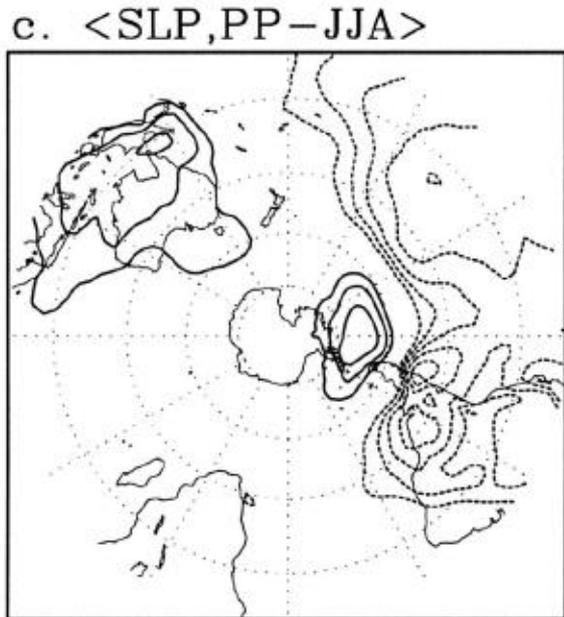
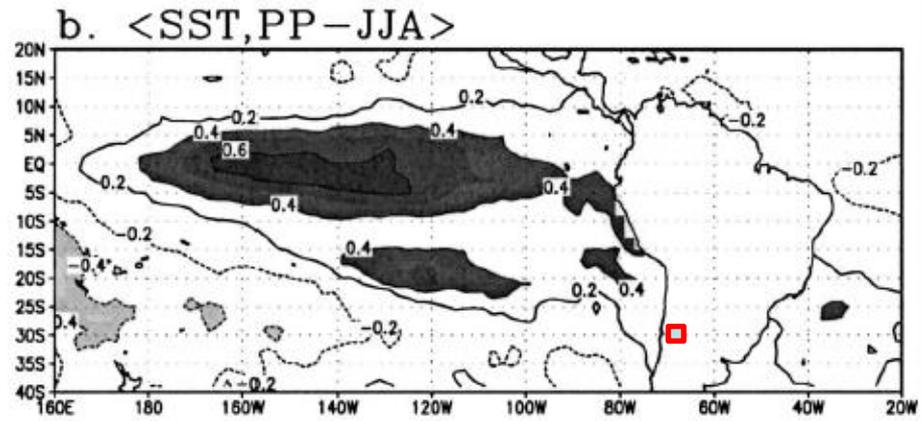
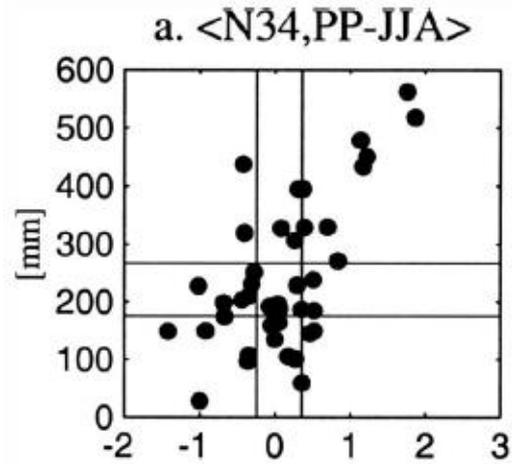


Figure 3. Composite SLP chart with the most frequent features associated with rainfall events in 1972 and 1982 (from Rutllant, 1987)



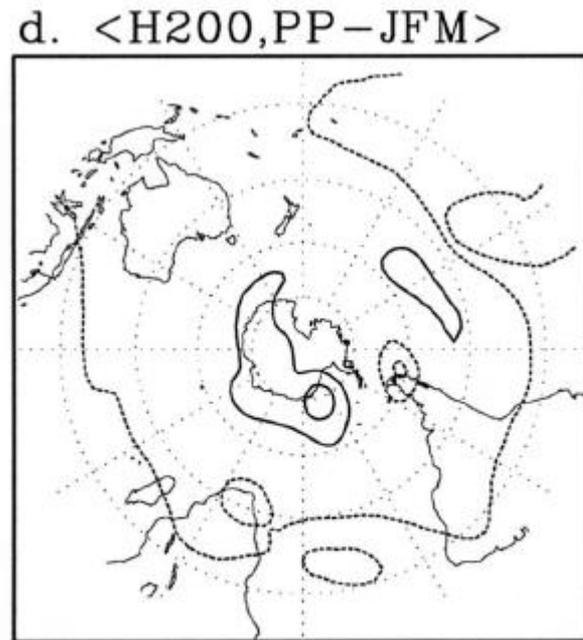
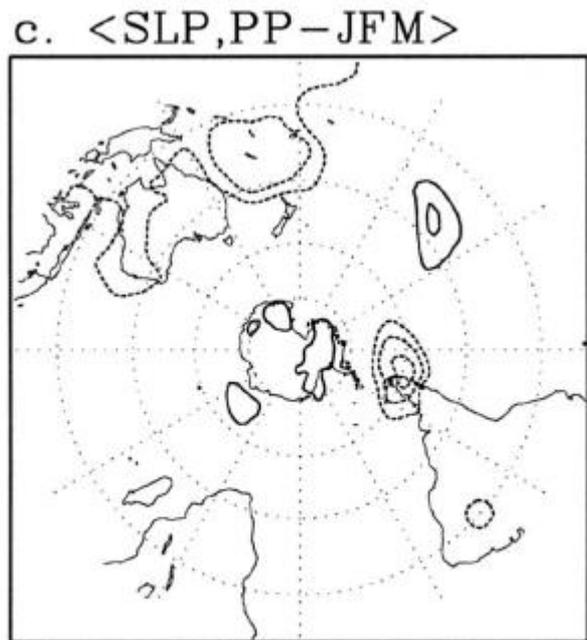
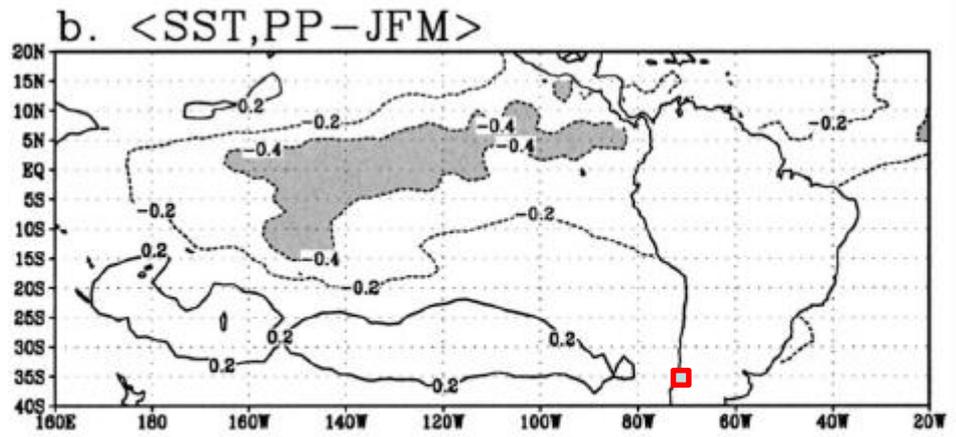
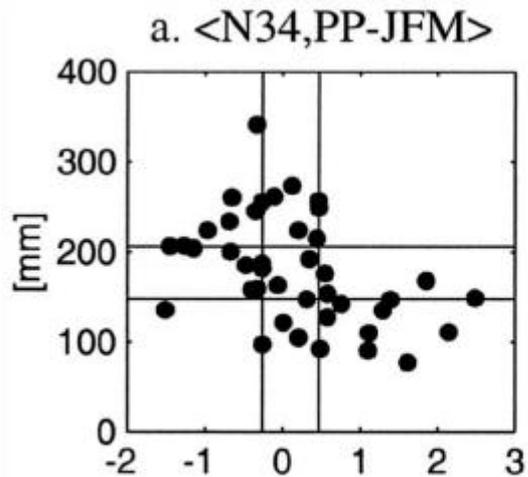
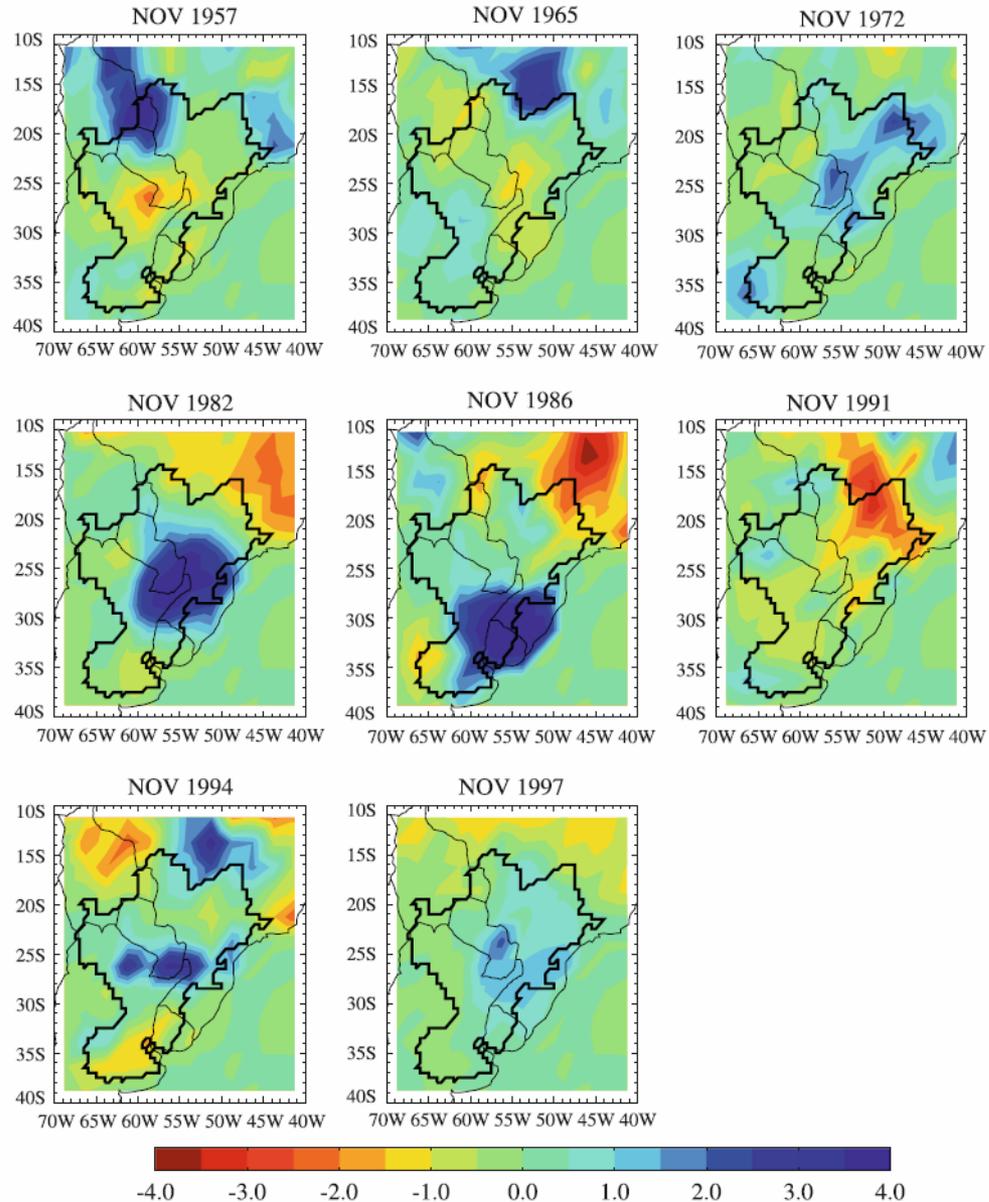


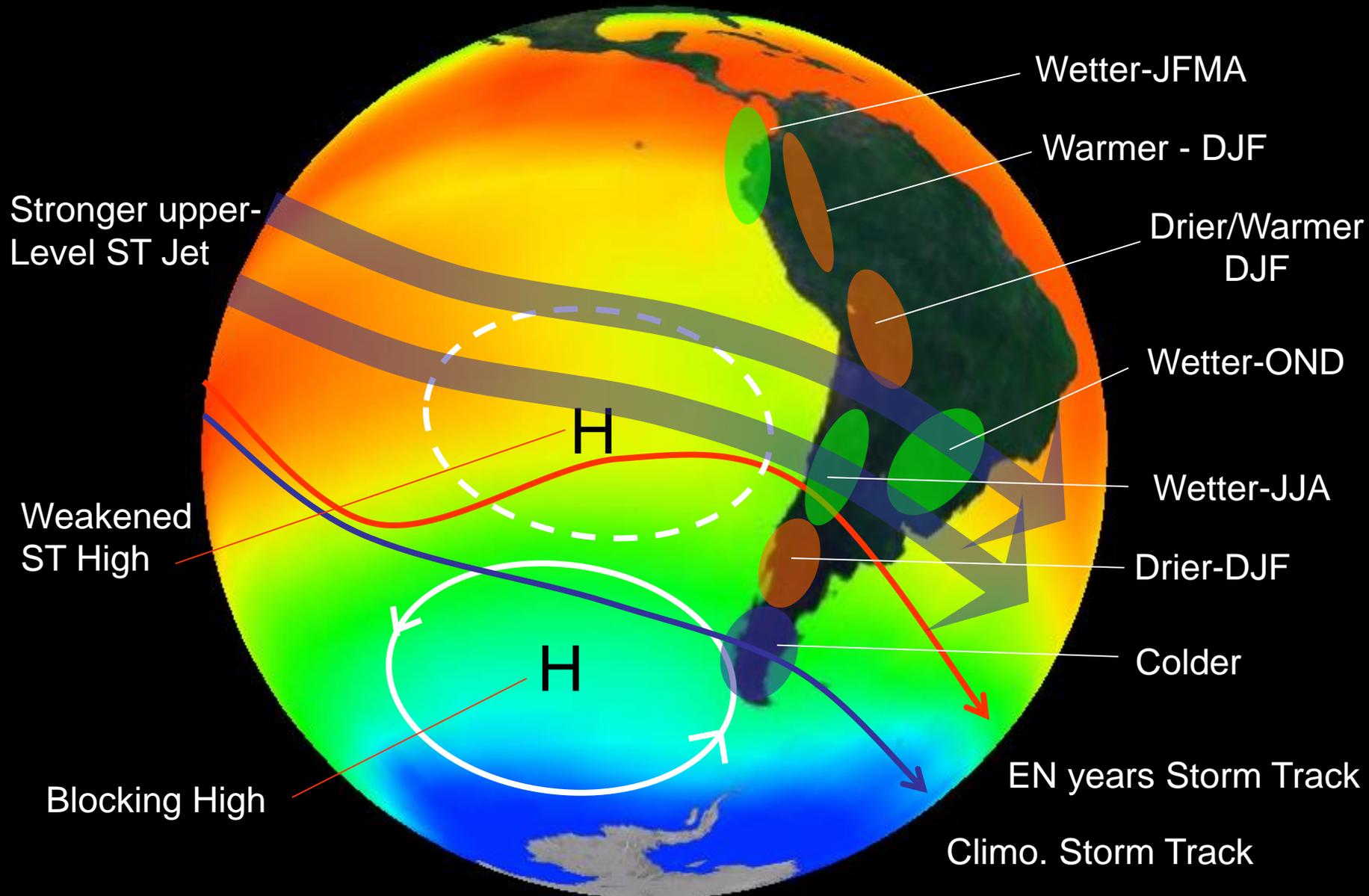
Fig. 16 Precipitation anomalies observed in November of the year of the warm peak of the eight strongest El Niño event observed over the 1955–2001 period. Anomalies are divided by the Niño3.4 anomaly at the same time. Contours are every 0.5 mm/day/°C. *Blue contours* represent stronger precipitation

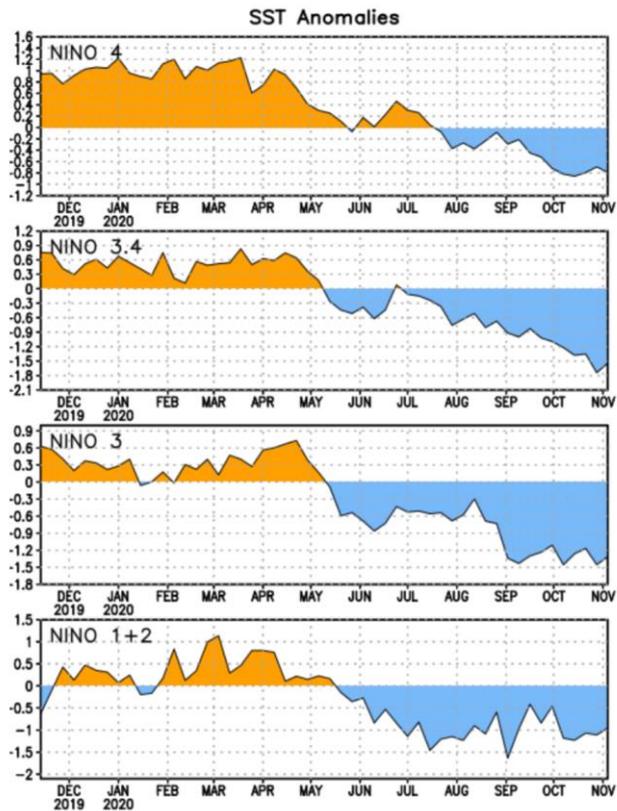


Interannual variability

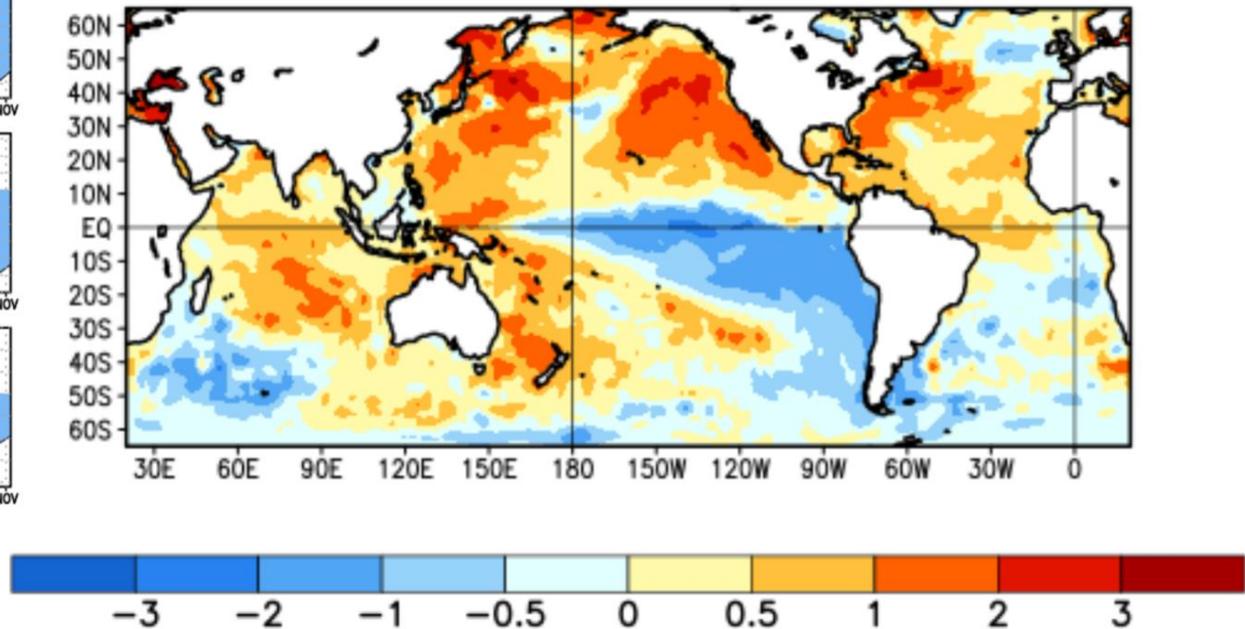
-

Major ENSO impacts





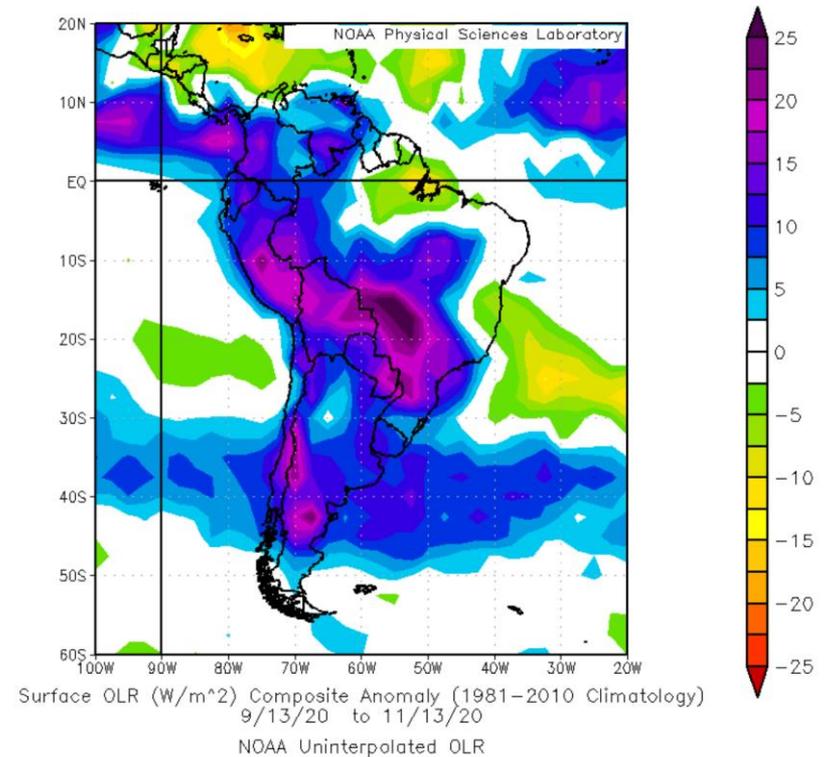
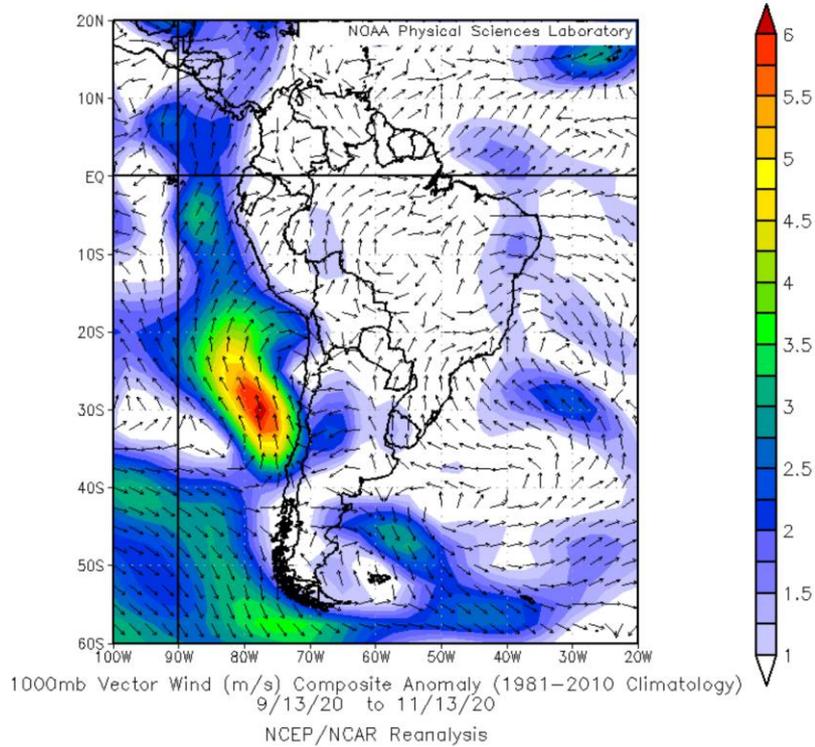
Average SST Anomalies
11 OCT 2020 – 7 NOV 2020



Condición Actual

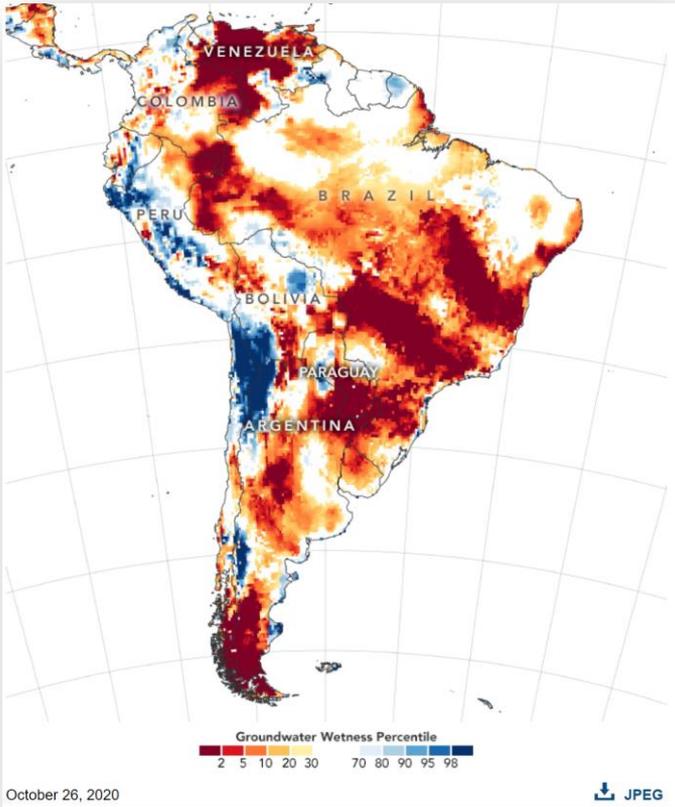
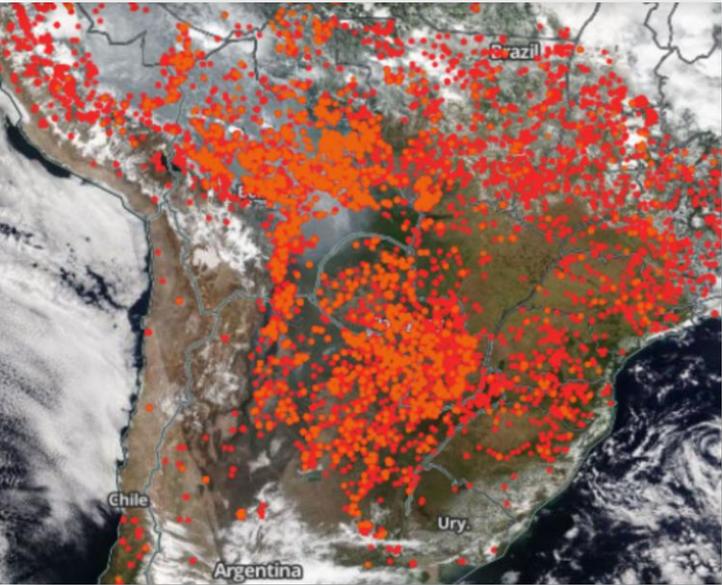
La Niña esta presente!

Muy seco!



Condición Actual

La Niña esta presente!



Condición Actual

La Niña esta presente!

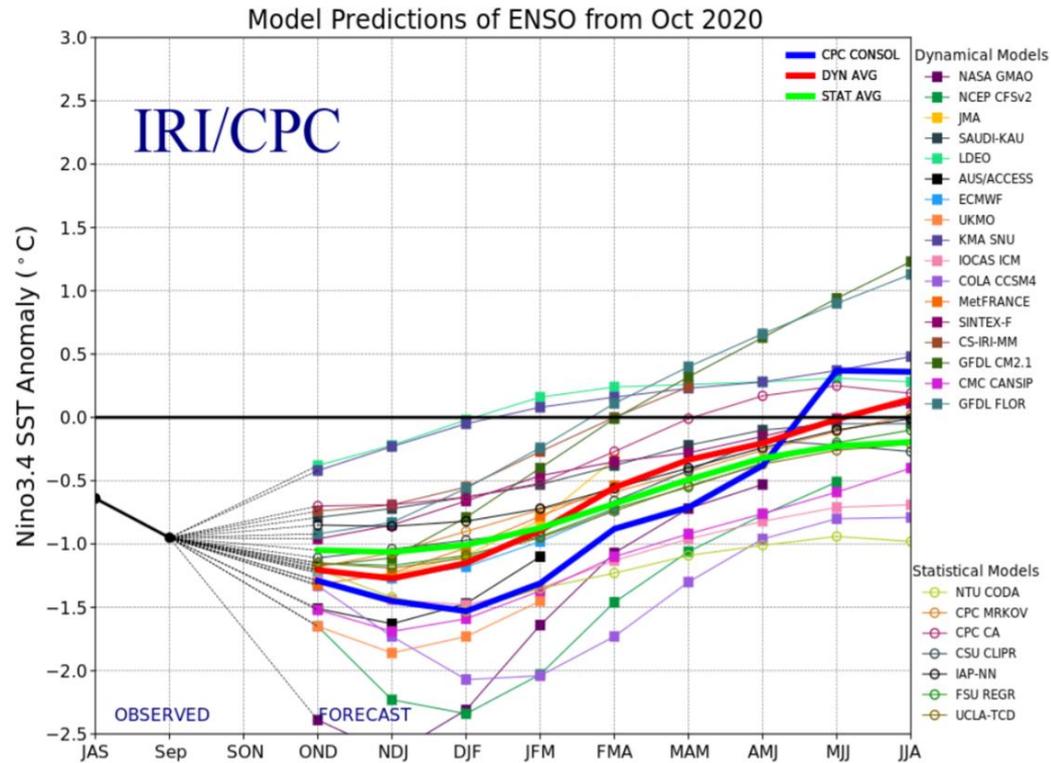


Figure provided by the International Research Institute (IRI) for Climate and Society (updated 19 October 2020).