

Response of O₂ and pH to ENSO in the California Current System in a high resolution global climate model

Giuliana Turi, Mike Alexander, Nikki Lovenduski,
Antonietta Capotondi, Jamie Scott, Charlie Stock,
John Dunne, Jasmin John, and Mike Jacox

Response of O_2 and pH to ENSO in the California Current System in a high resolution global climate model

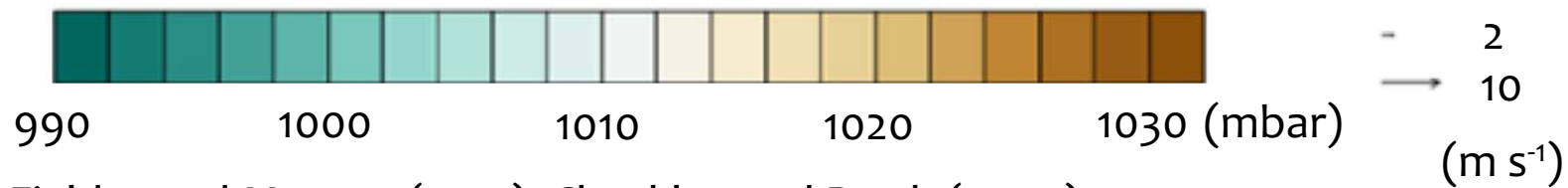
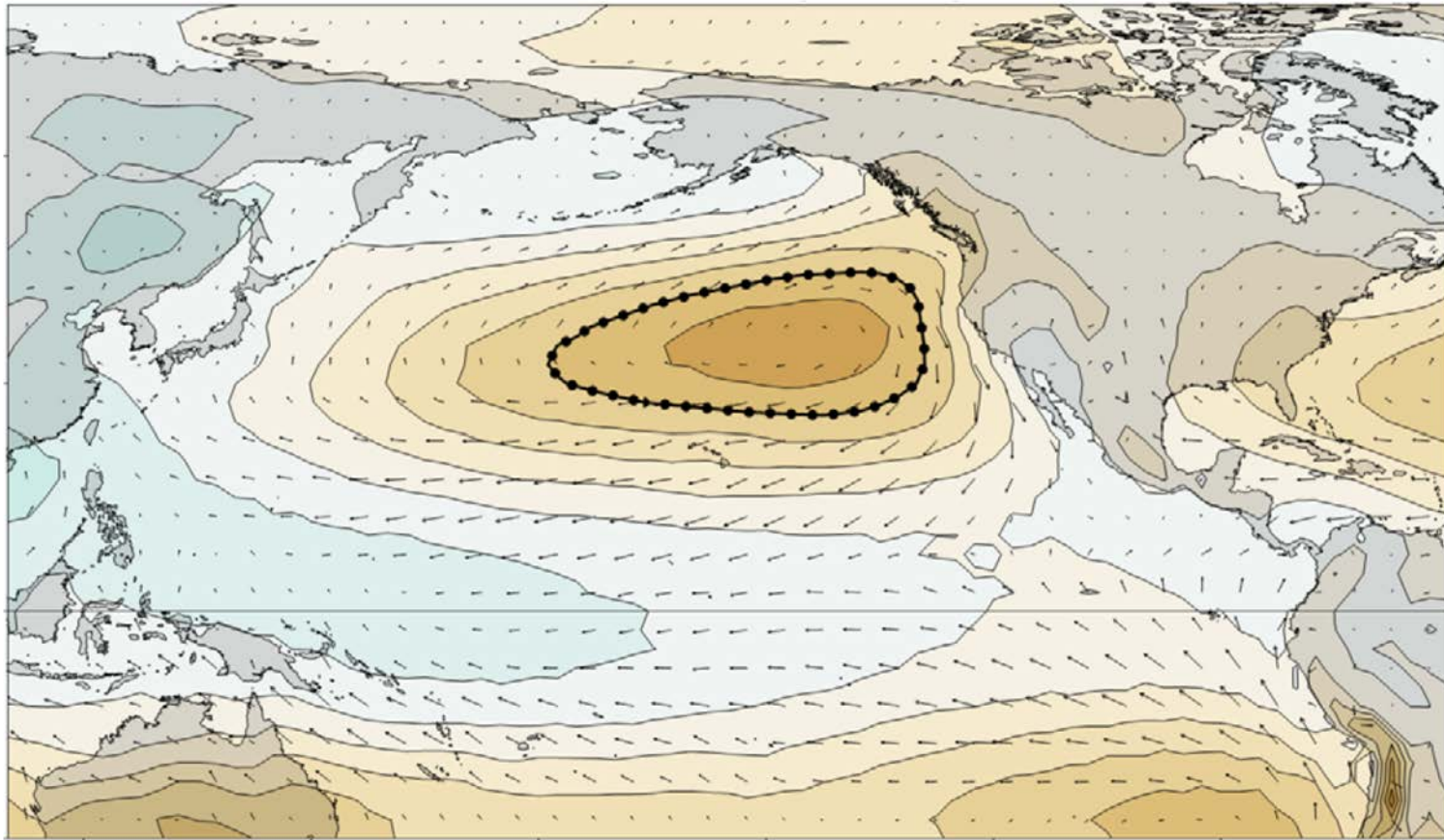
Did all the work
but has a new job

Is attending a wedding

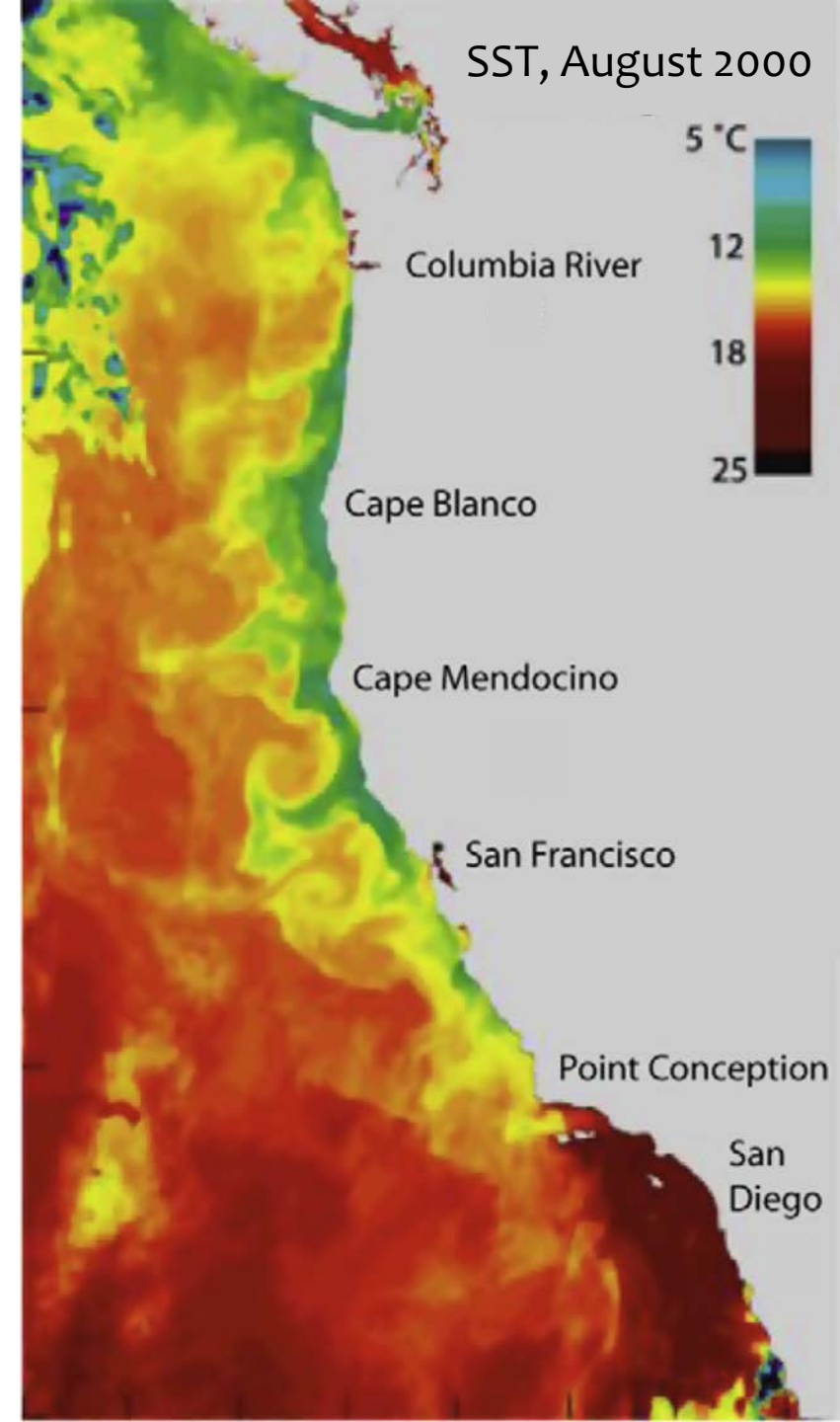
Got stuck giving the talk

Giuliana Turi, Mike Alexander, Nikki Lovenduski,
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The California Current System

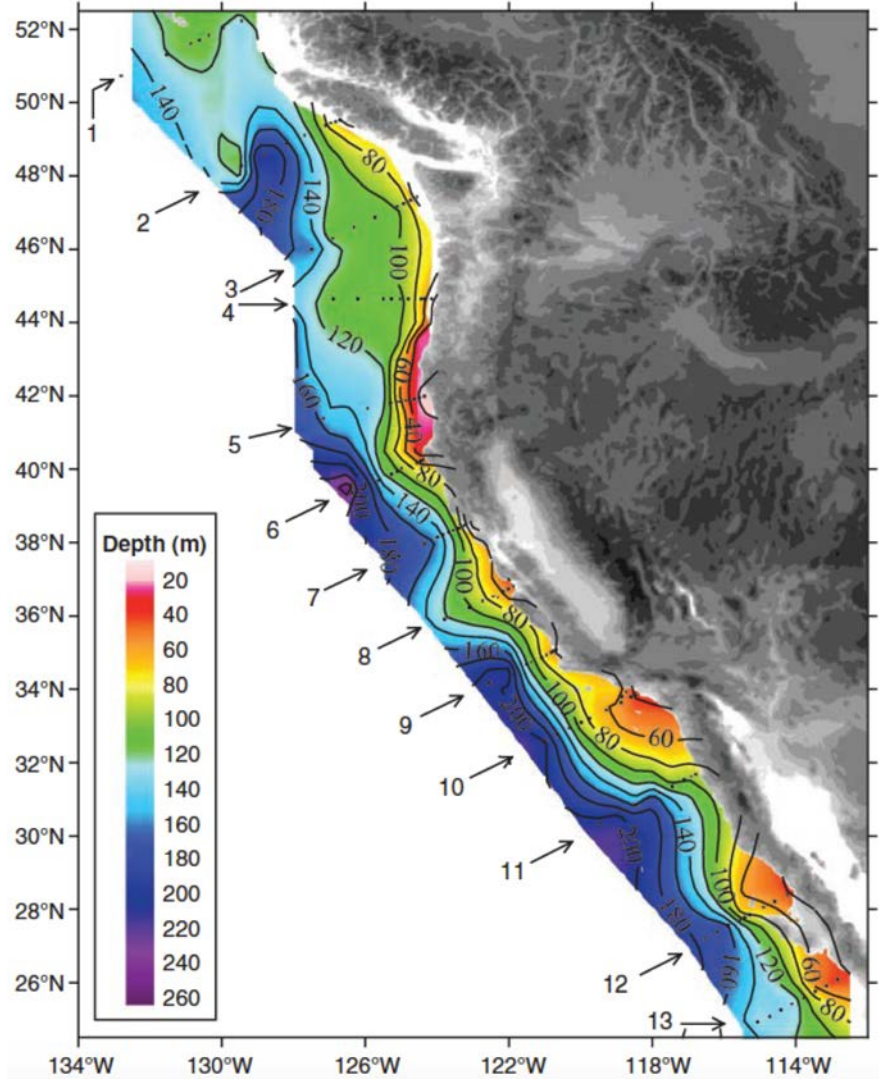


Fielder and Mantua (2017); Checkley and Barth (2009)



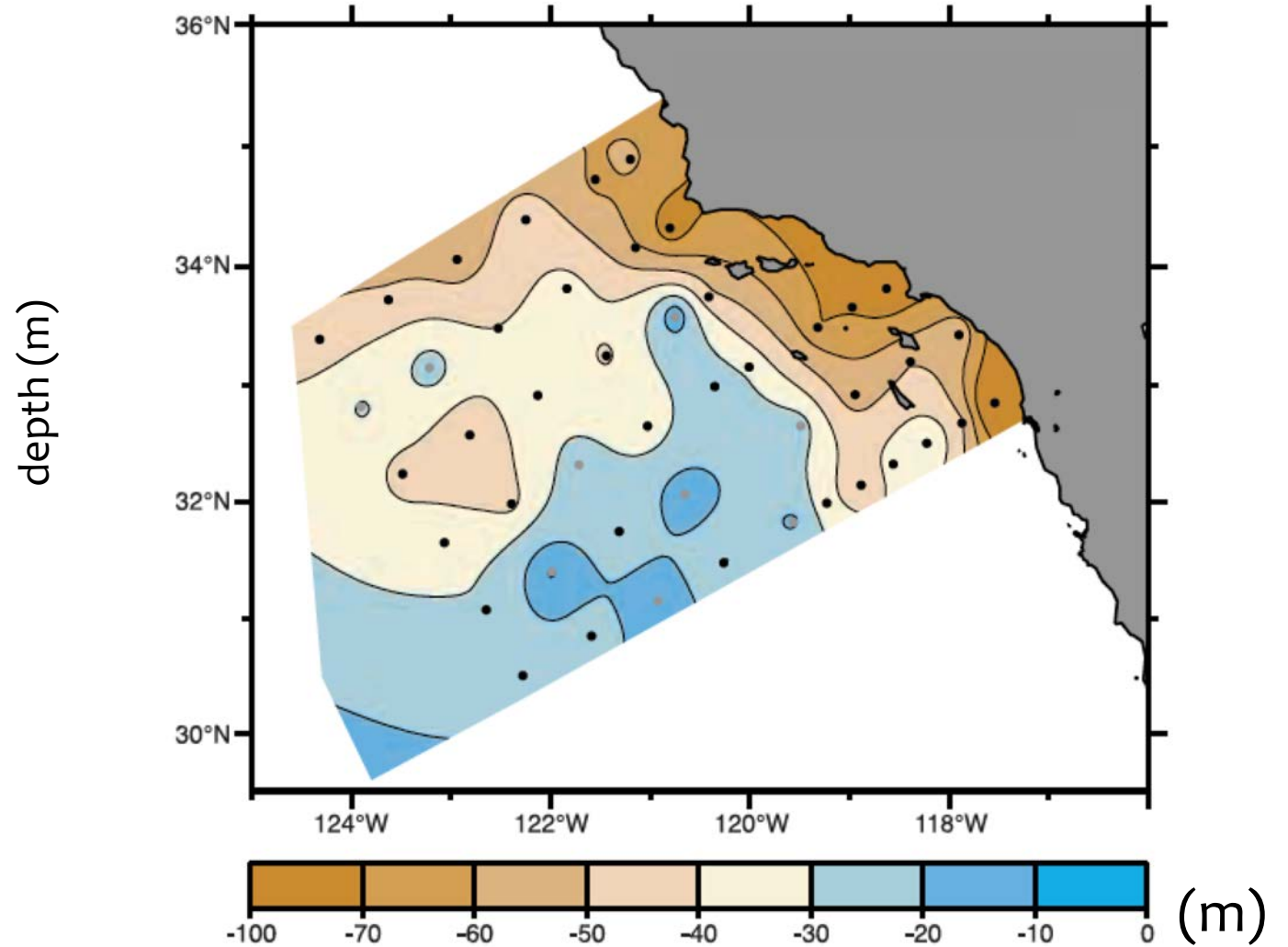
Why pH and O₂?

Shallowest depth with pH < 7.75



Feely et al. (2008)

Shoaling of the hypoxic boundary
1984-2006



Bograd et al. (2008)

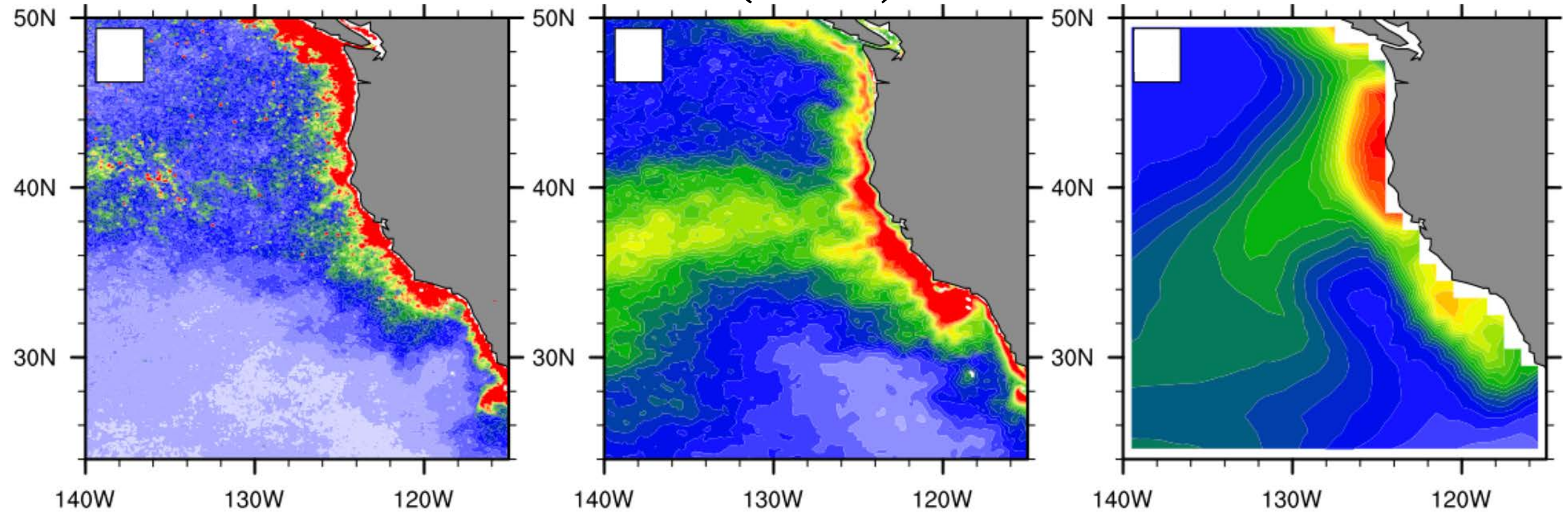
Why a high-resolution model?

Chlorophyll standard deviation

SeaWiFS

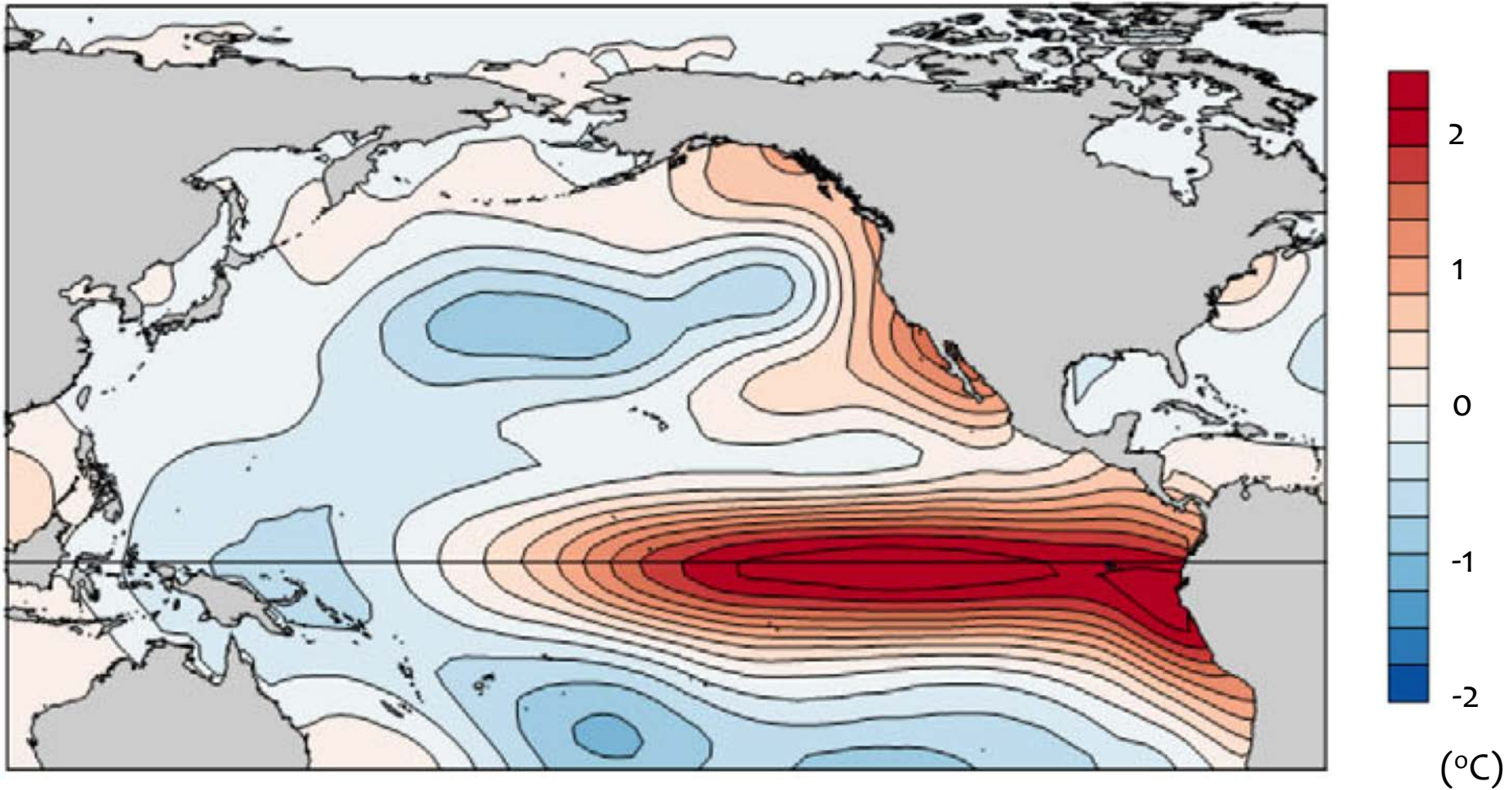
High-resolution model
(ESM2.6)

Low-resolution model
(ESM2M)



Why a global model?

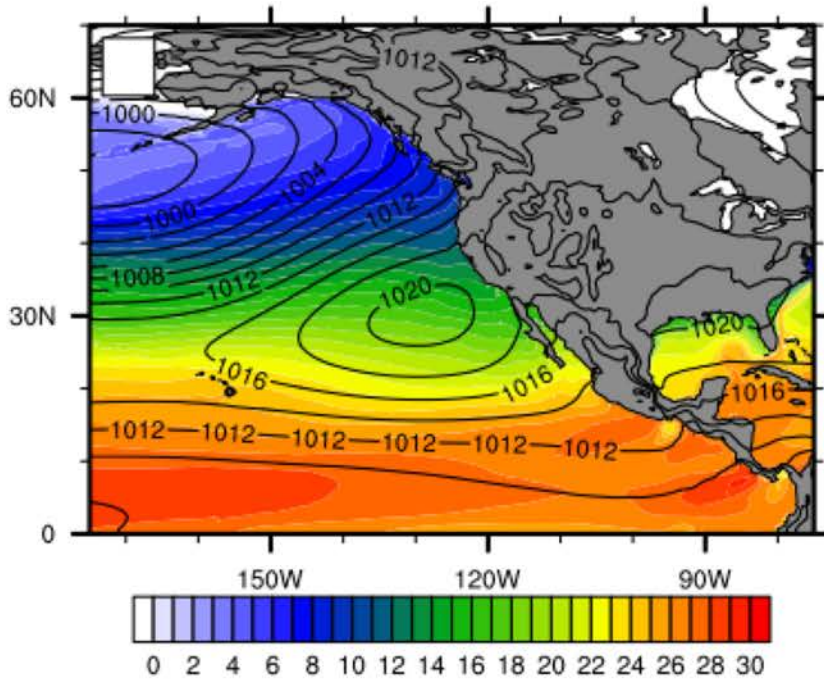
SST anomaly during “typical” El Nino



GFDL ESM2.6

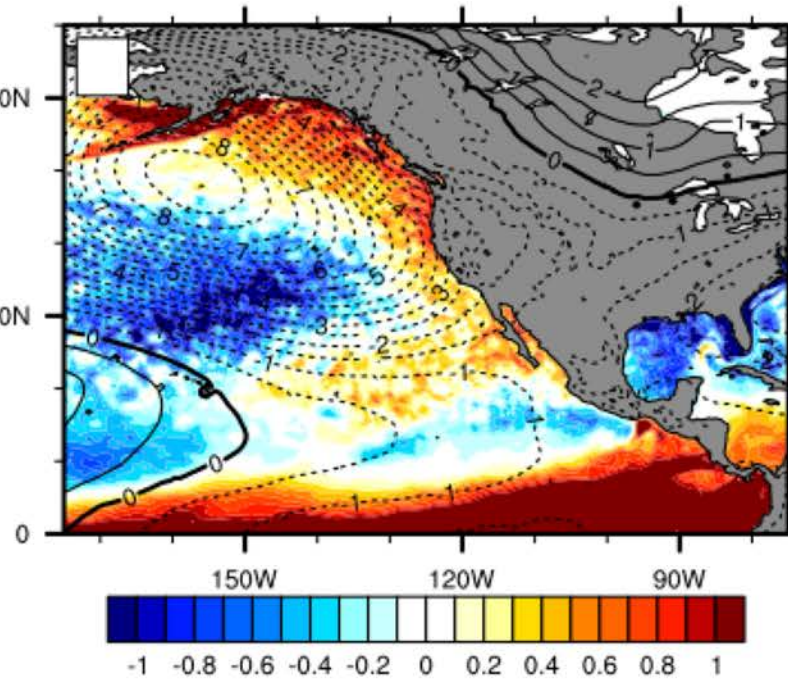
Composite analysis: GFDL ESM2.6

climatology



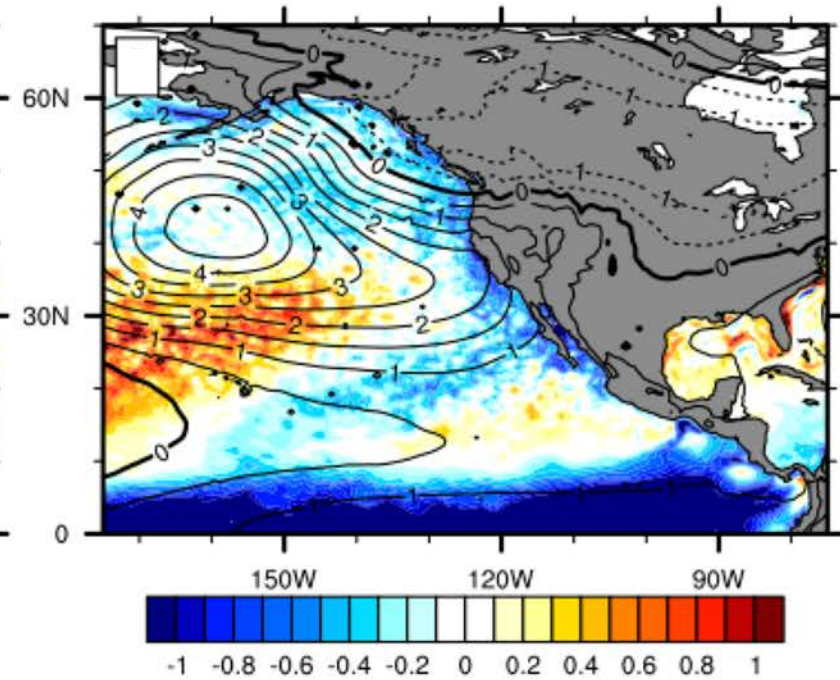
SST (°C)

El Nino/warm composite



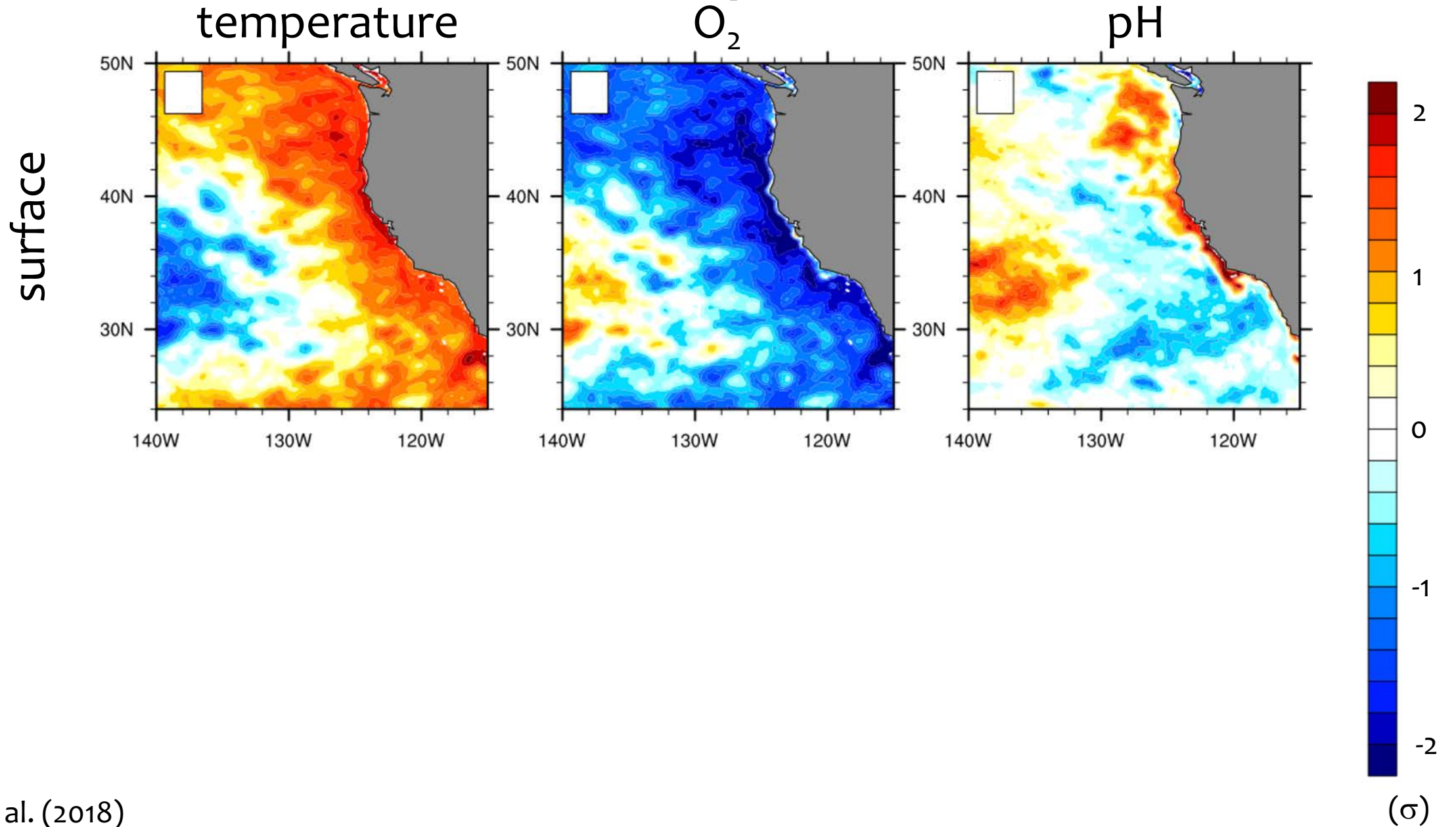
SST anomaly (°C)

La Nina/cold composite



SST anomaly (°C)

Warm minus cold composite



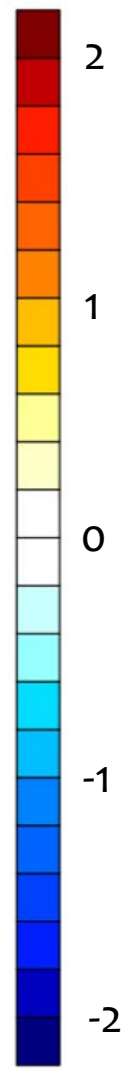
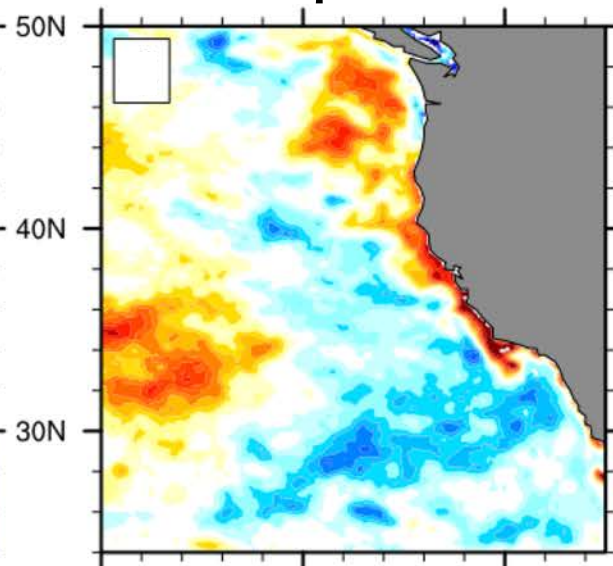
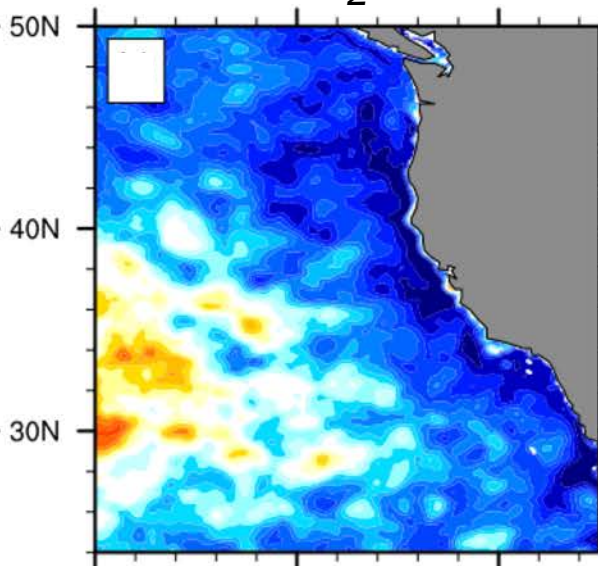
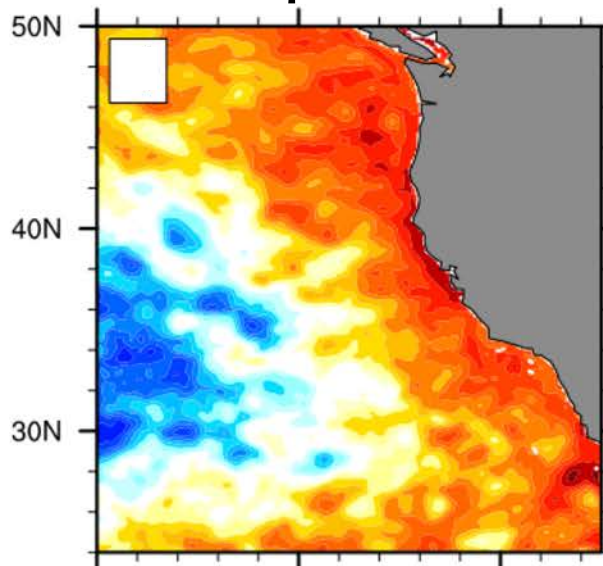
Warm minus cold composite

temperature

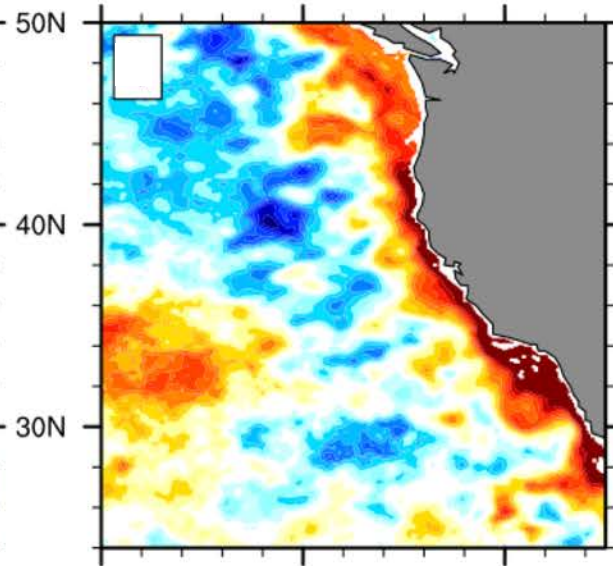
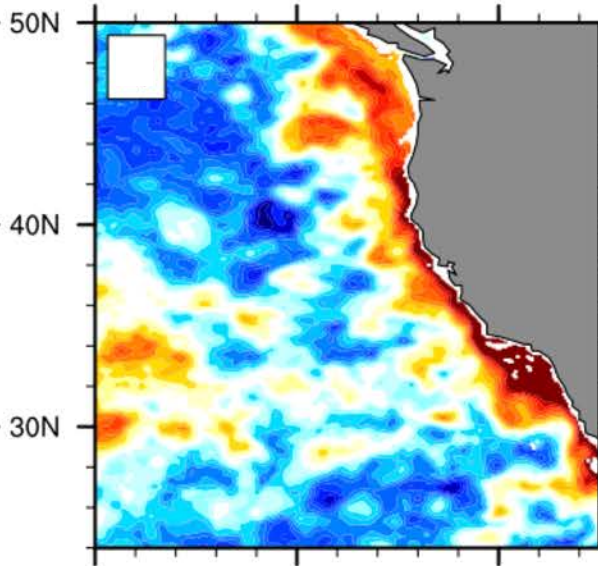
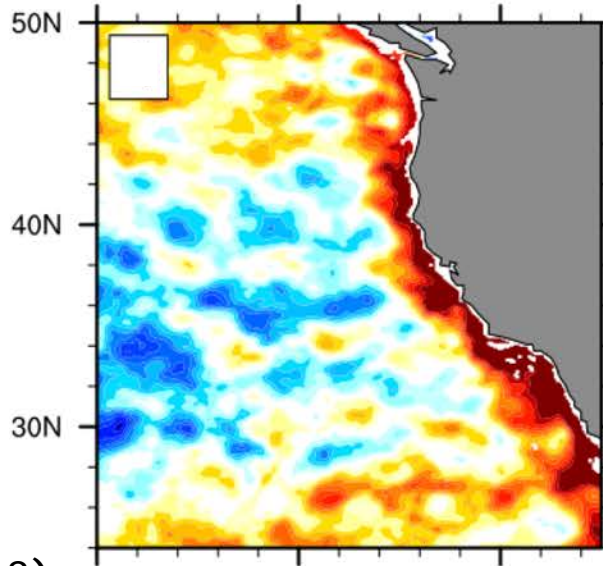
O₂

pH

surface

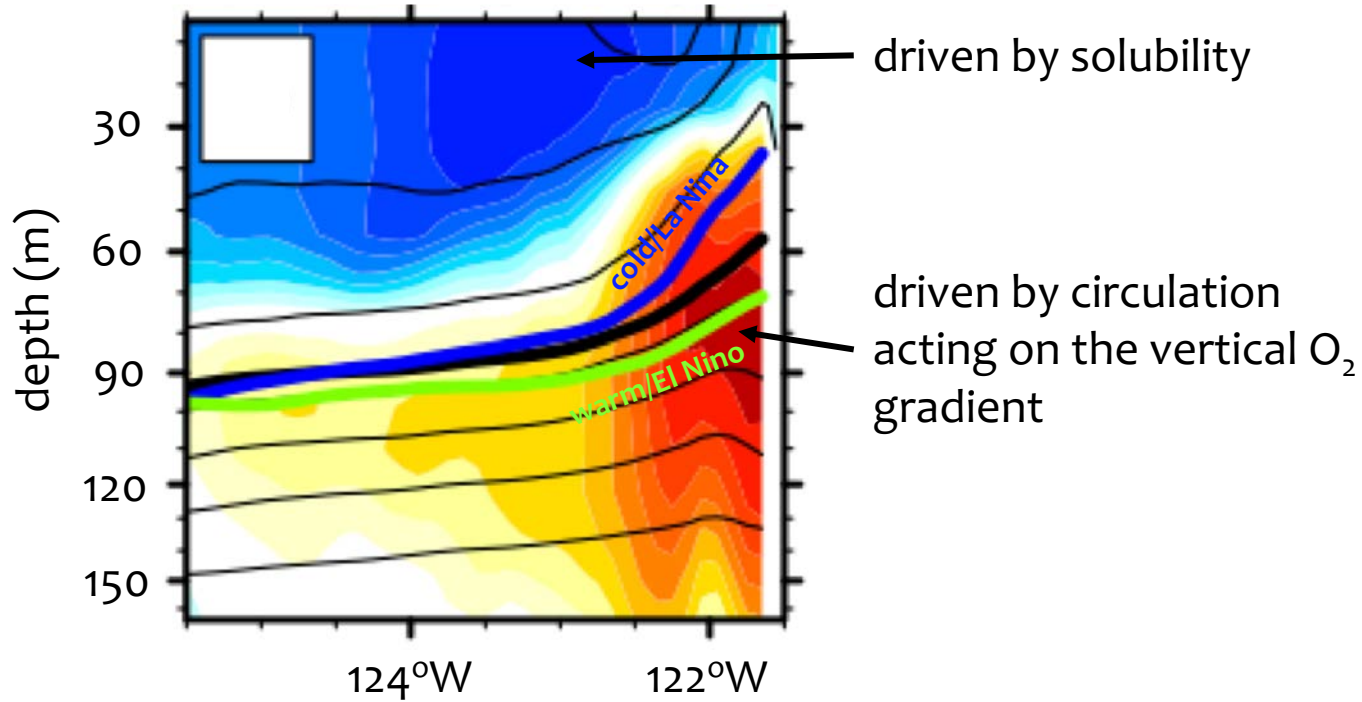


100 m

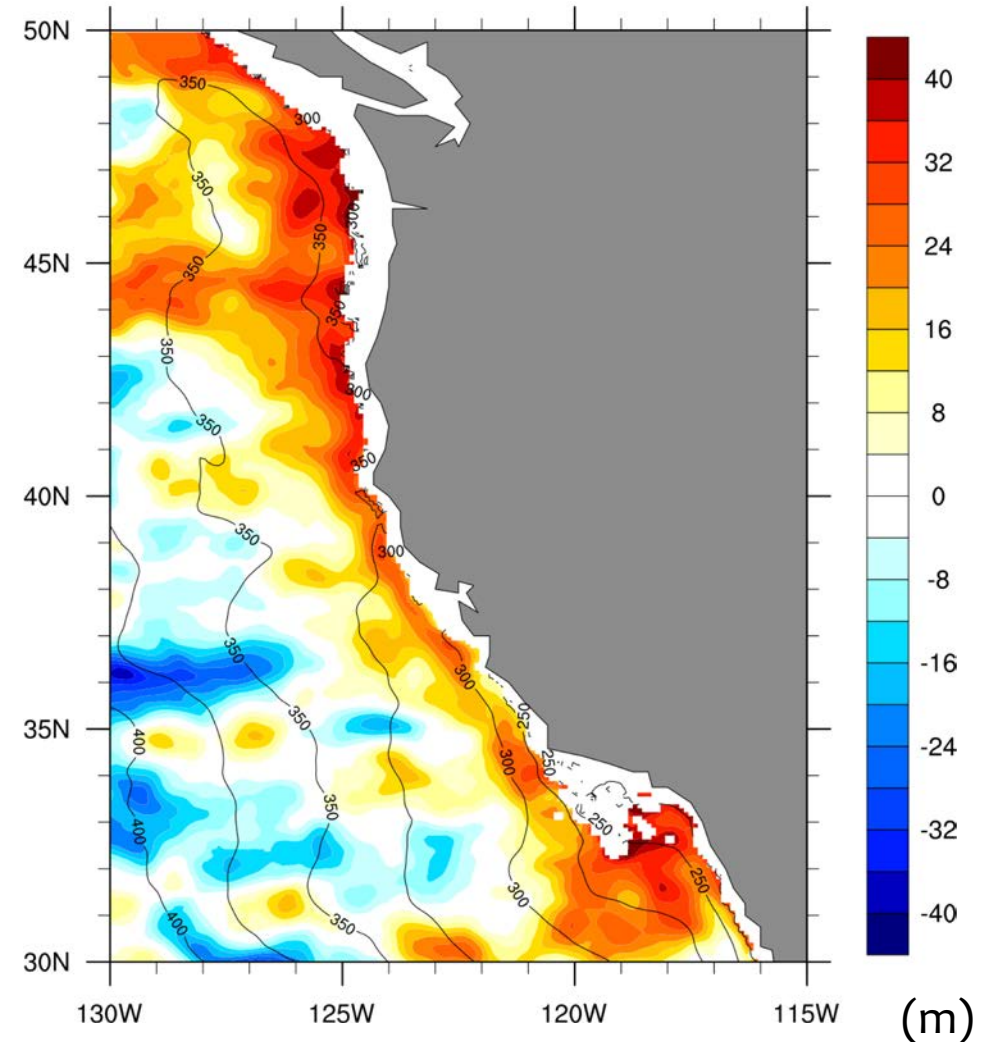


What drives the O₂ changes?

warm minus cold
O₂ anomalies at 36°N

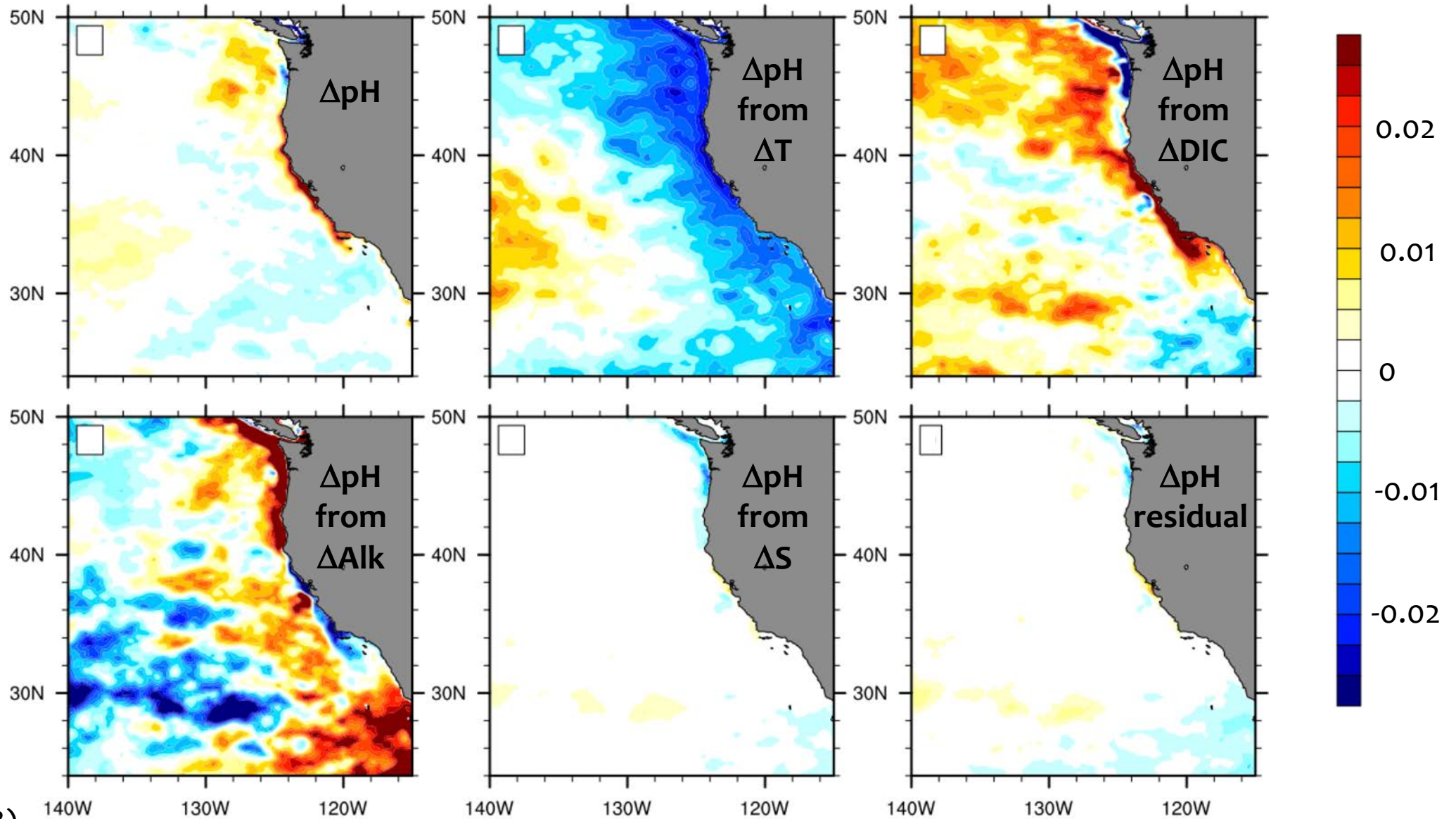


warm minus cold hypoxic depth



What drives the pH changes?

warm minus cold composite anomalies



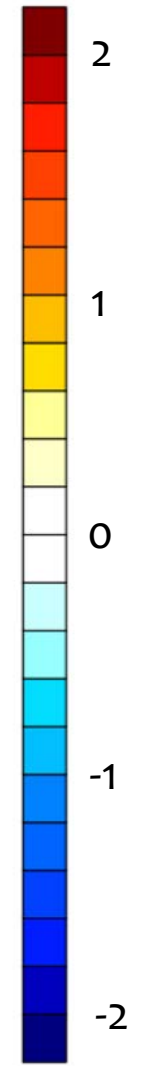
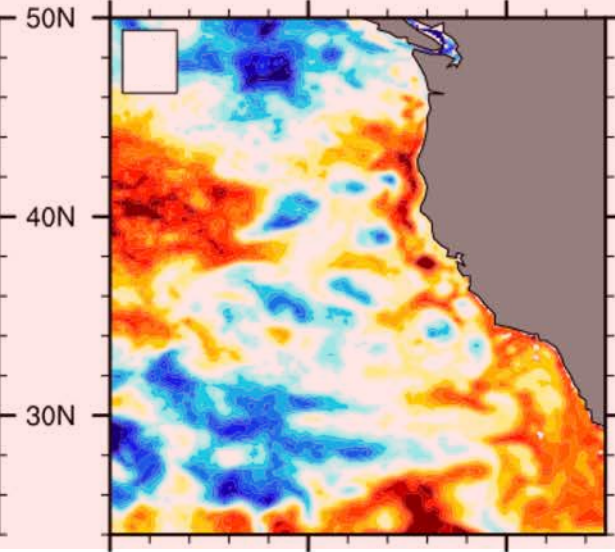
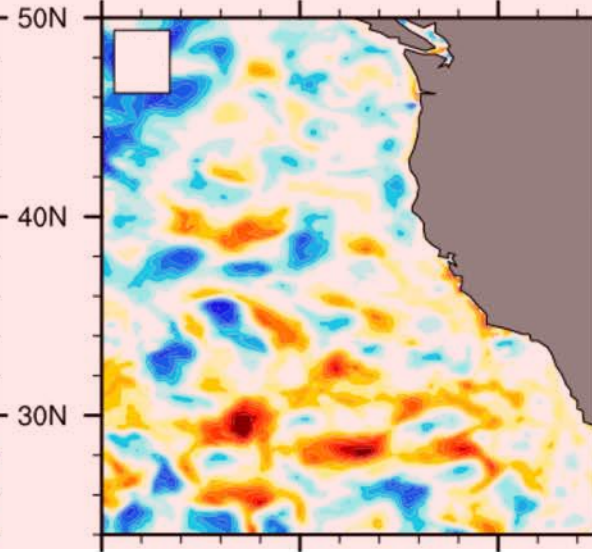
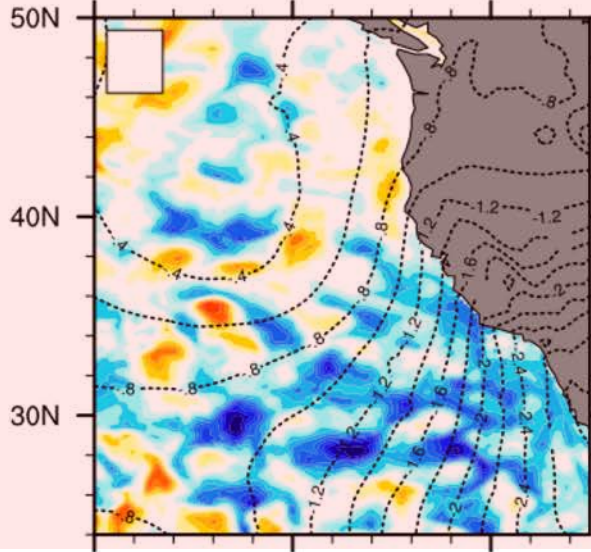
Not all El Nino's are the same!

SST, SLP anomalies

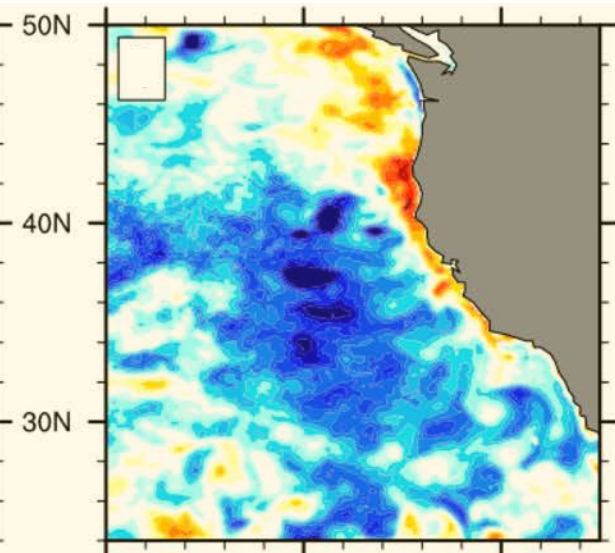
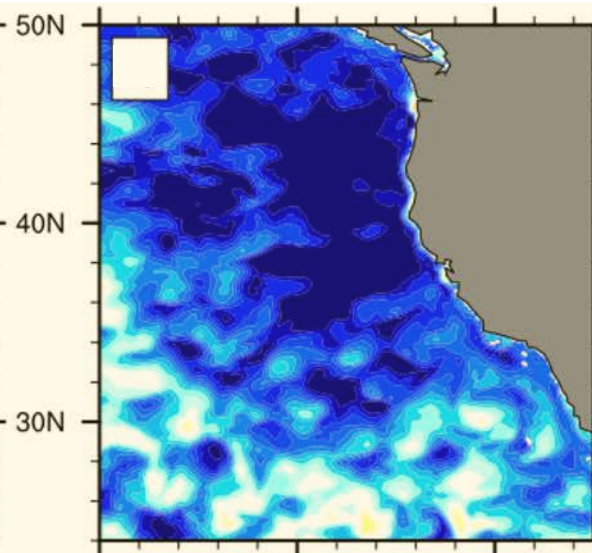
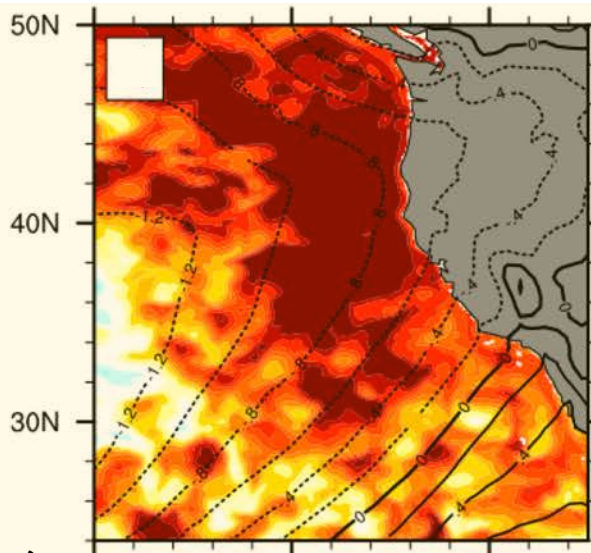
O₂ anomalies

pH anomalies

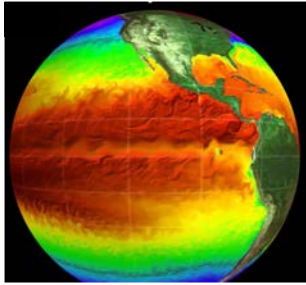
warm event #2



warm event #6

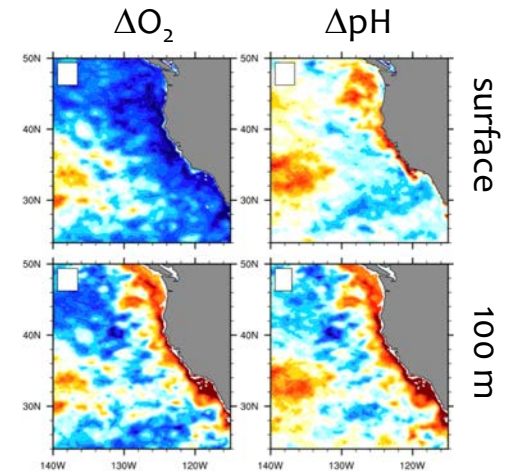


Conclusions

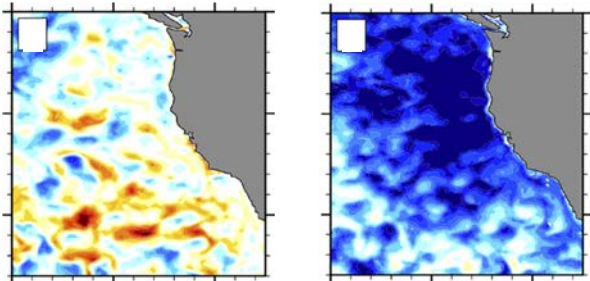


ESM2.6 is a novel, high resolution coupled model that represents ocean biogeochemistry and ecosystem dynamics

ENSO induces large changes in O_2 and pH in the California Current; the surface and subsurface expressions of these changes can differ



ΔO_2 , warm event #2 ΔO_2 , warm event #6



There are large differences in the response of California Current O_2 and pH to ENSO events; not all events are the same

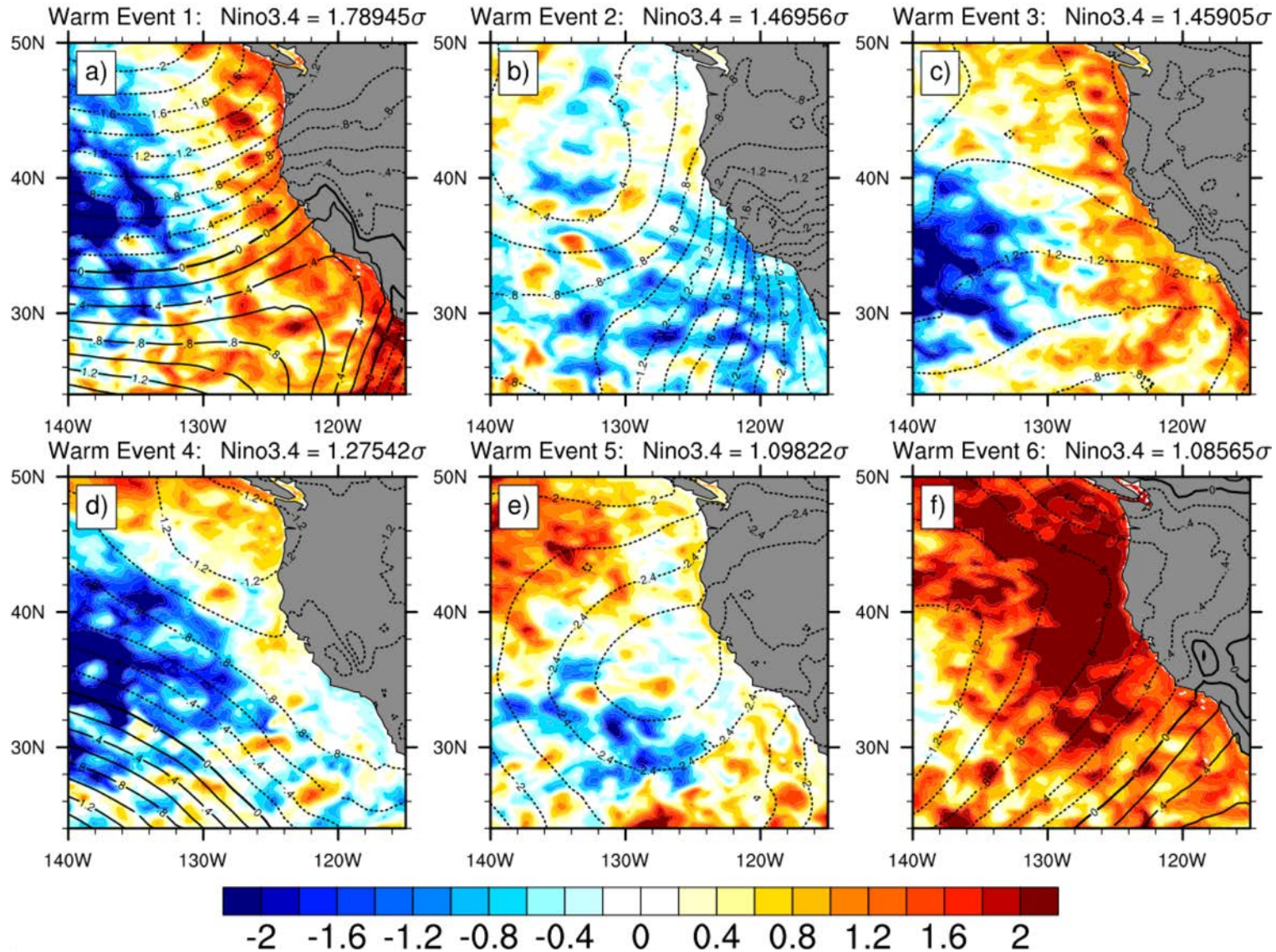
Want to learn more?

Turi, G., et al., 2018: *Ocean Science*, doi:10.5194/os-14-69-2018.

The End!

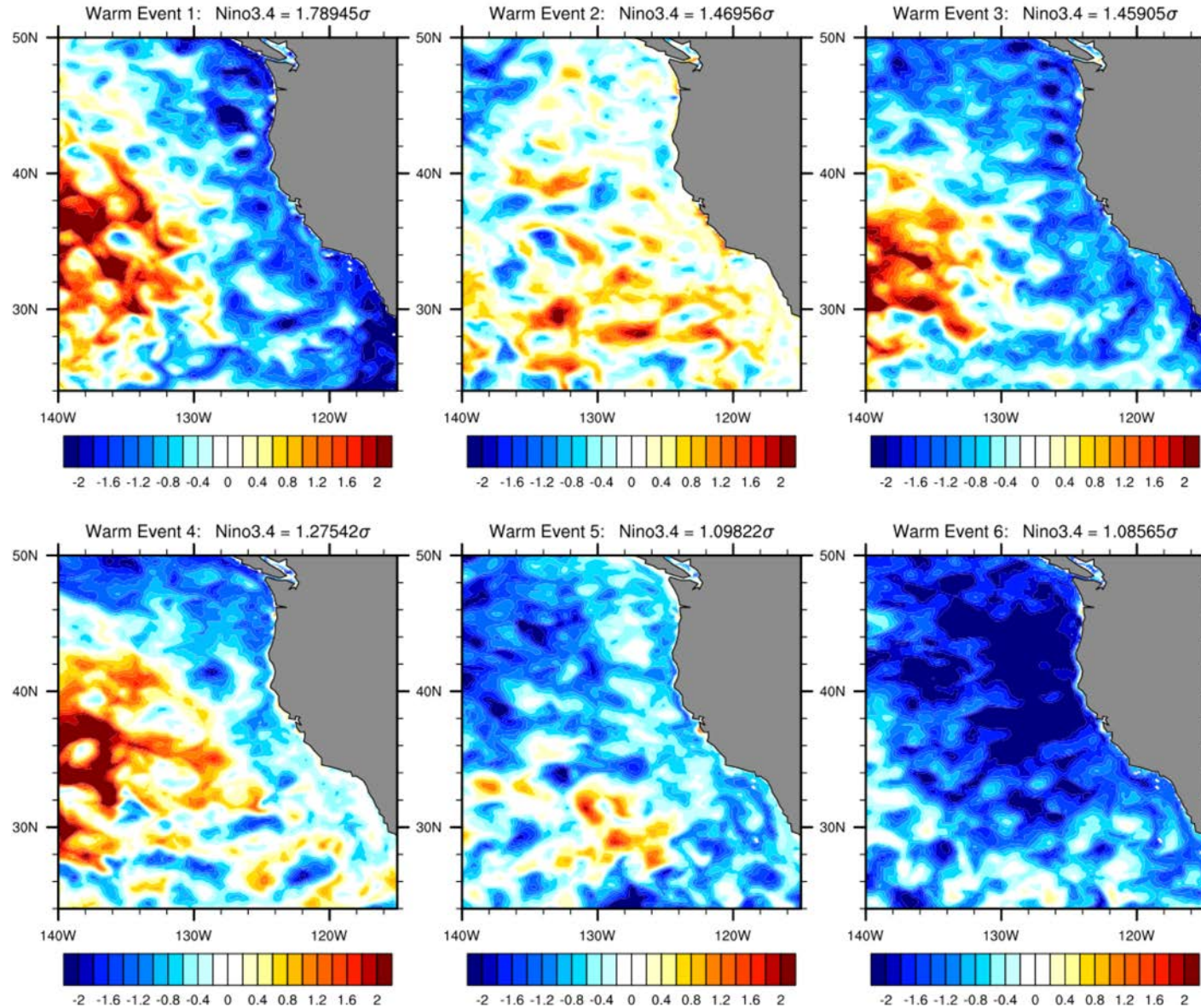
Not all El Nino's are the same !

GFDL ESM2.6 FMA SST(shaded) SLP(contour)



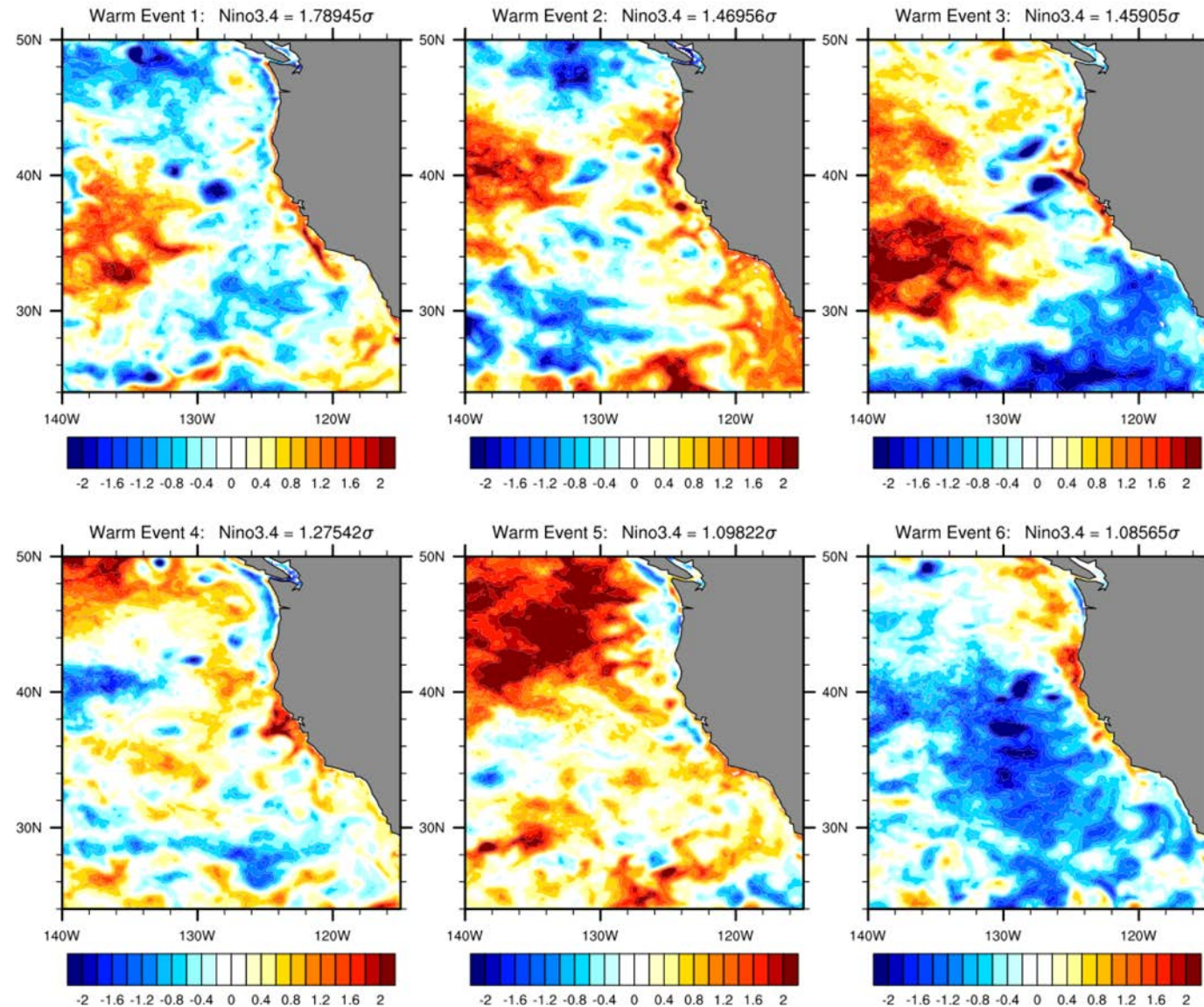
Not all El Nino's are the same !

GFDL ESM2.6 FMA O₂



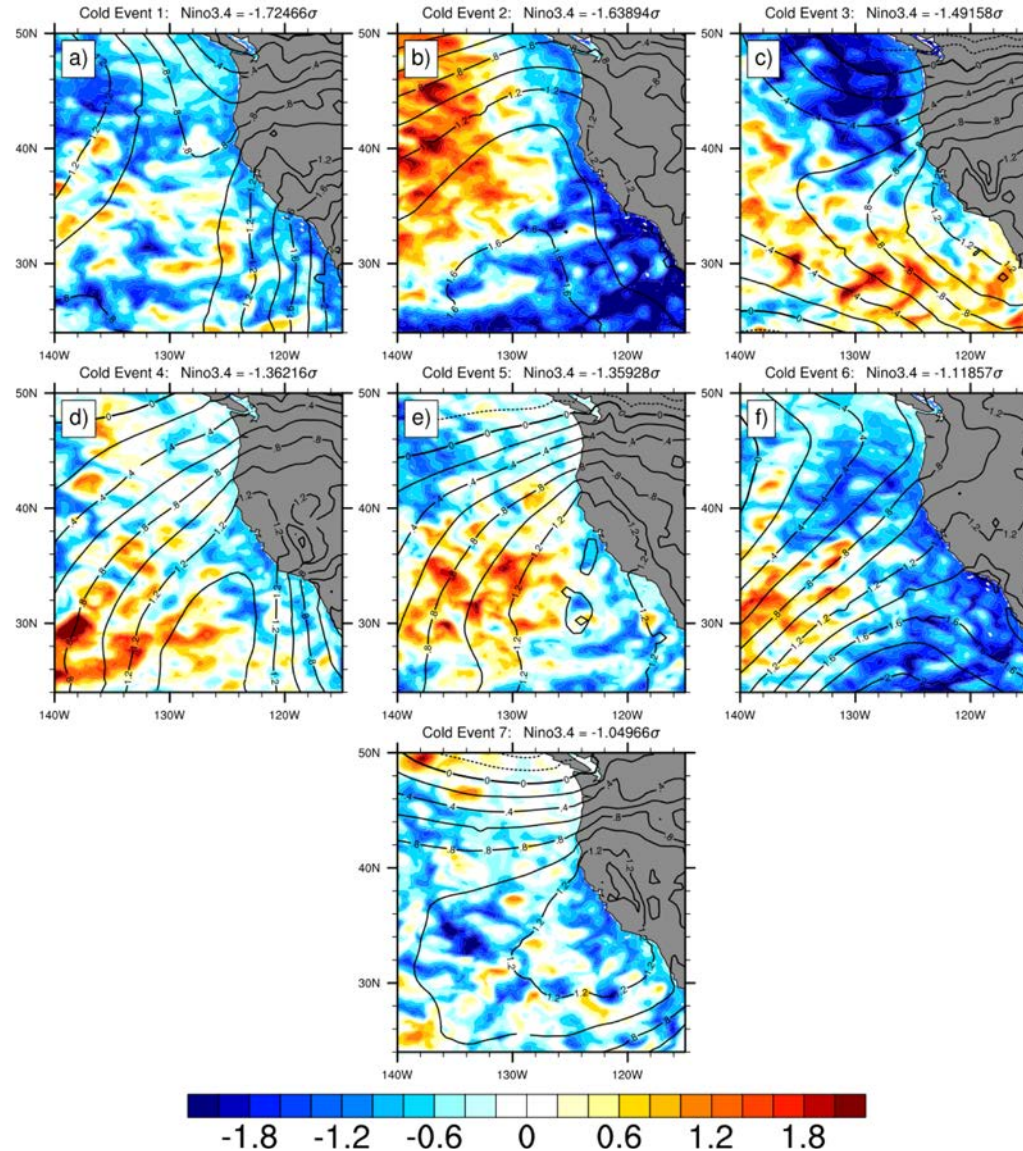
Not all El Nino's are the same !

GFDL ESM2.6 FMA pH

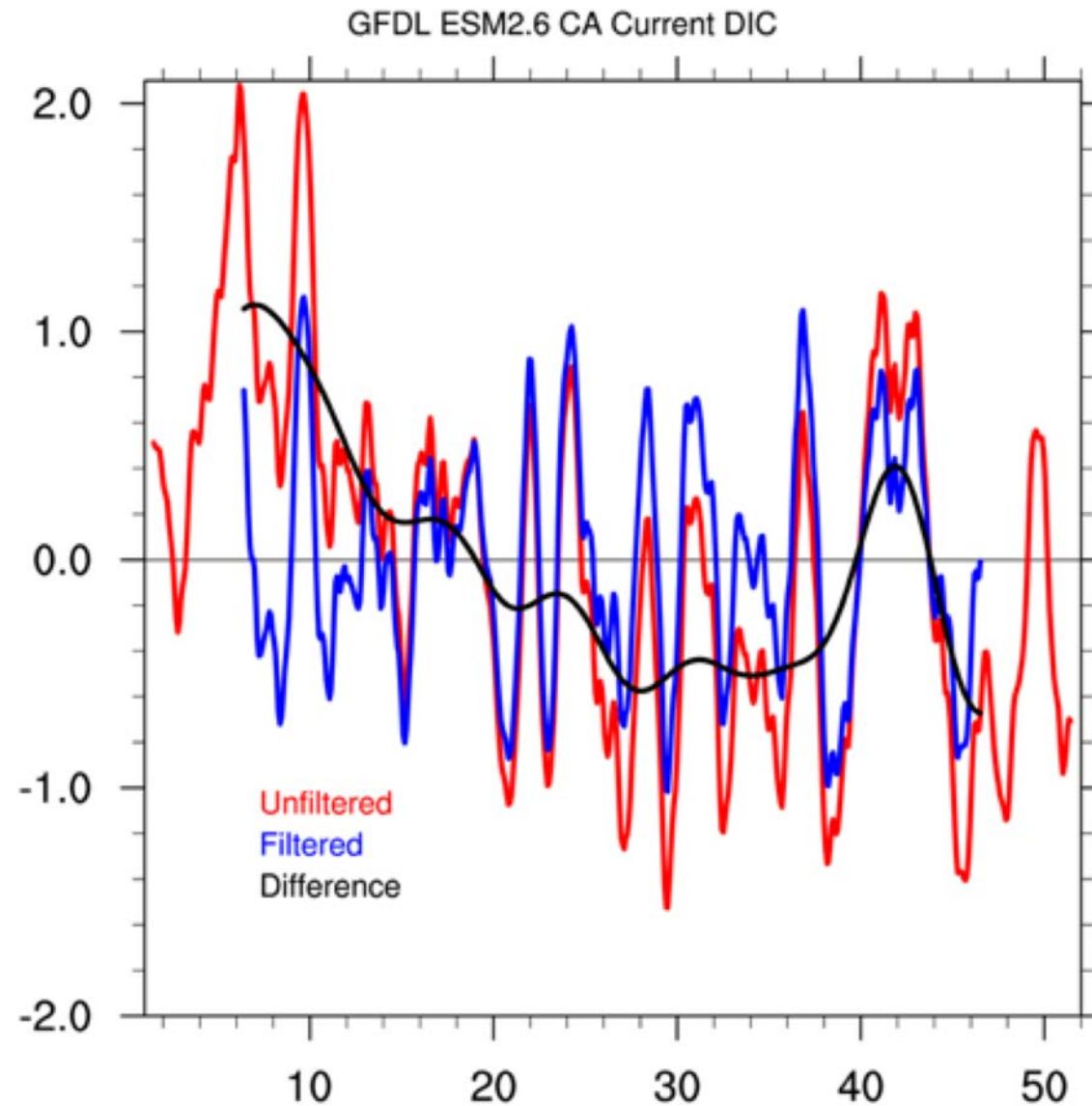


Not all La Nina's are the same !

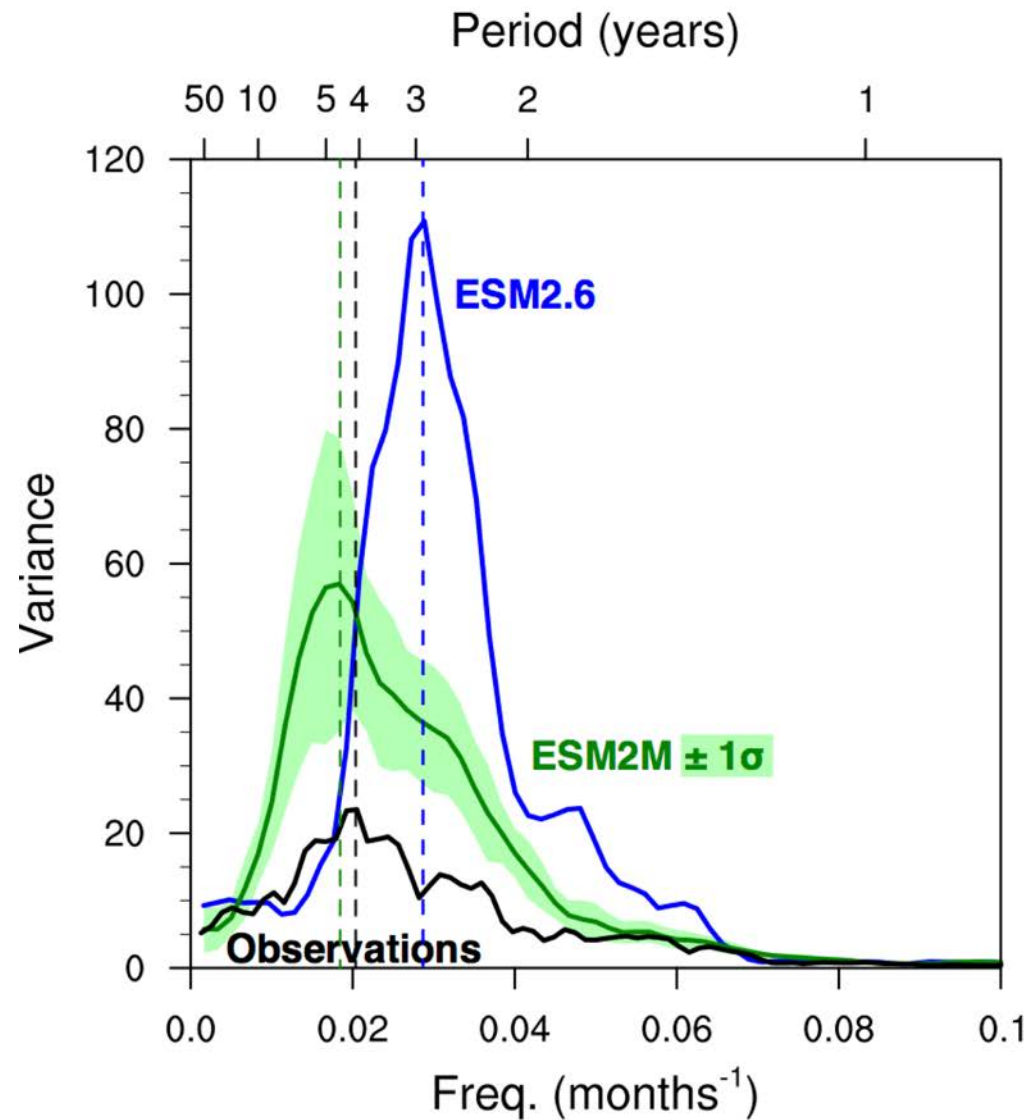
GFDL ESM2.6 FMA SST(shaded) SLP(contour)



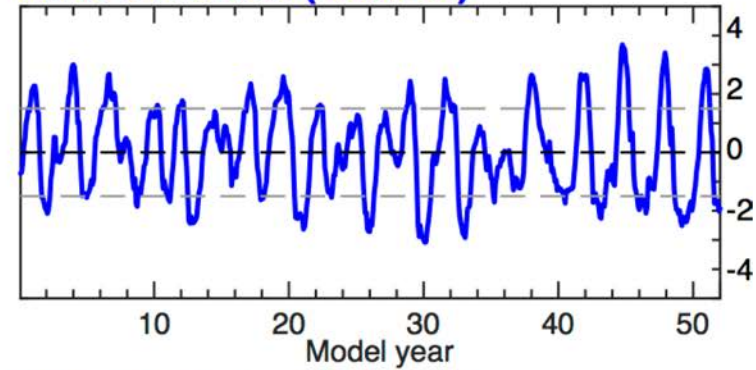
Lanczos high-pass (10-year cutoff) filter



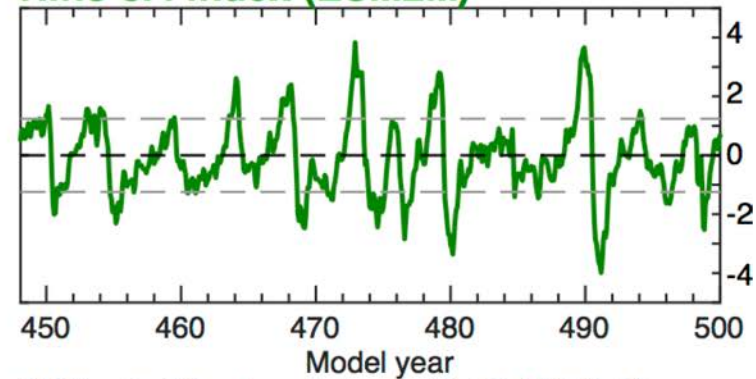
GFDL Ninios



Niño 3.4 index (ESM2.6)



Niño 3.4 index (ESM2M)



Niño 3.4 index (obs.: CPC NOAA)

