

# Air-sea interaction: Pacific Decadal Oscillation

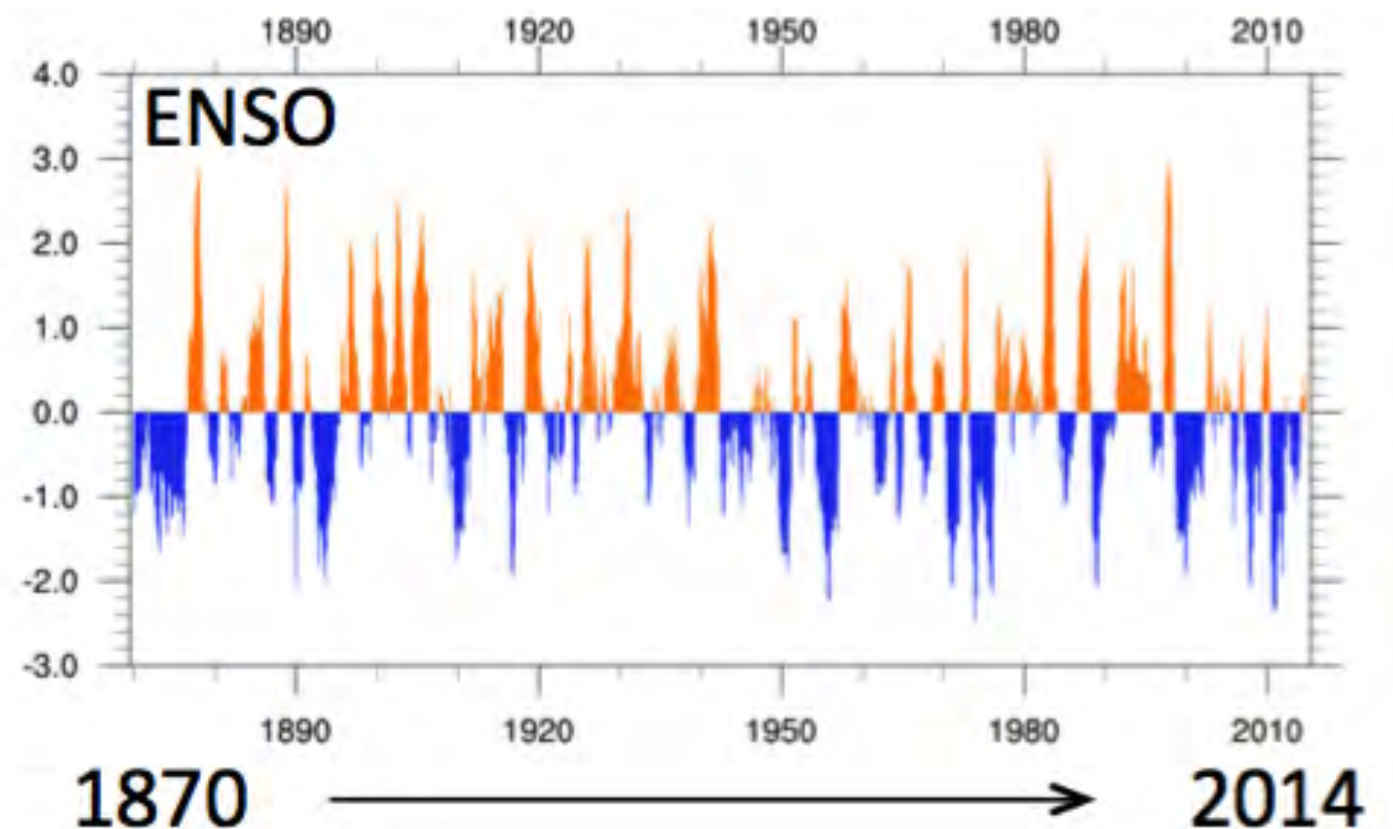
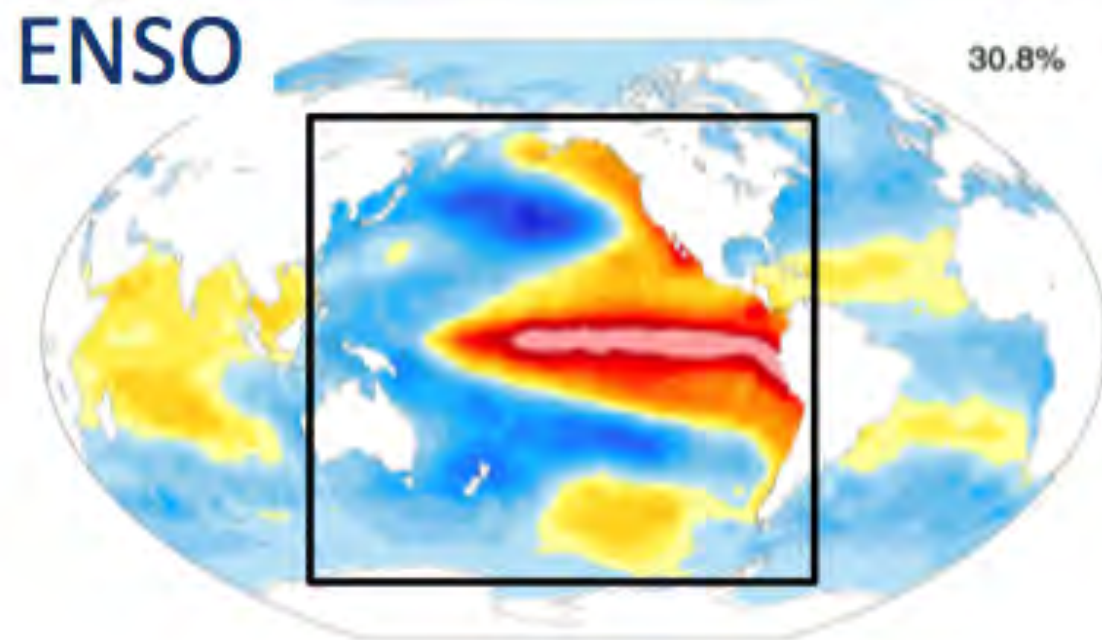
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ATM2106

# Last week

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- El Nino / La Nina
- The first independent mode captured from the sea surface temperature anomalies in the Pacific



# Today

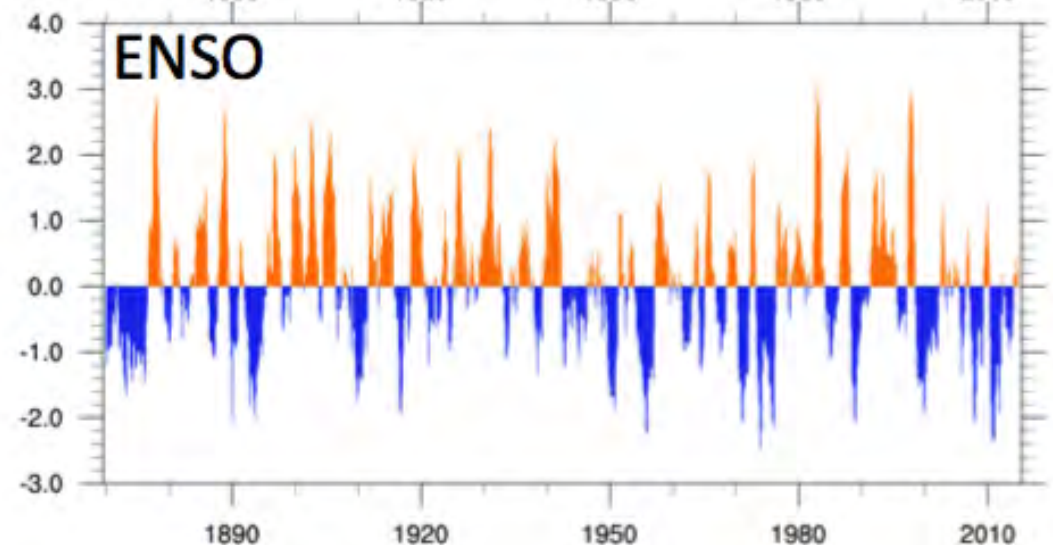
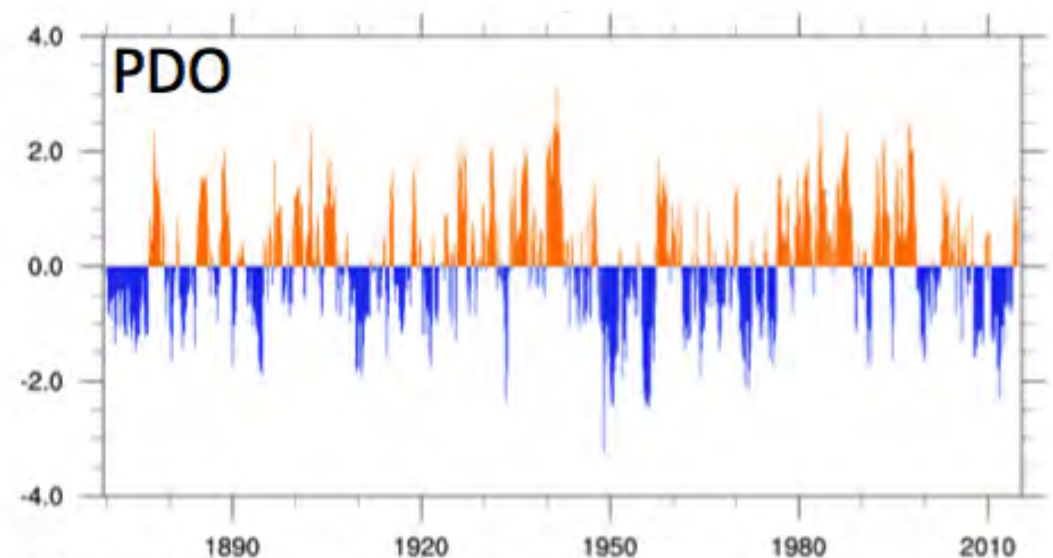
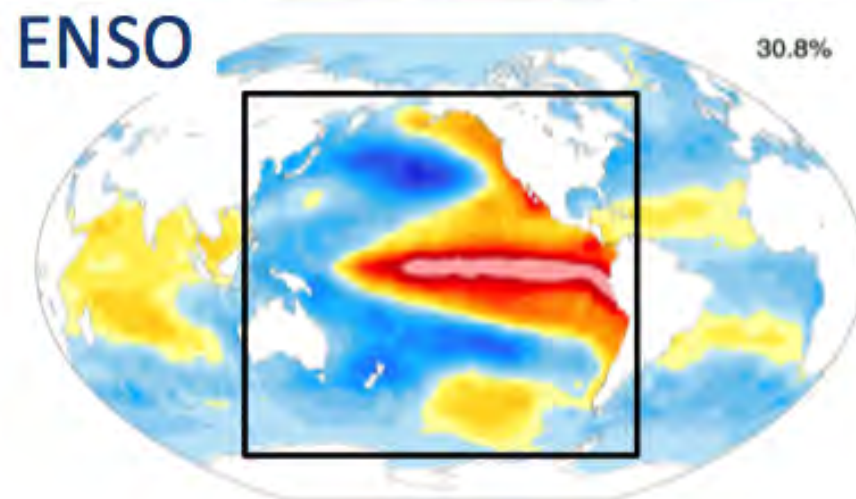
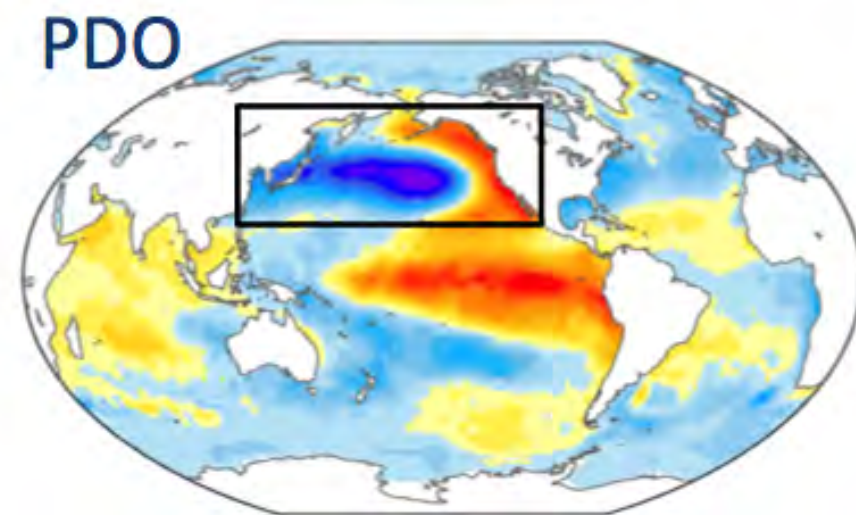
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- Pacific Decadal Oscillation
- Other climate events in the world

# Pacific Decadal Oscillation

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- A variability with a period of about 20 years in the North Pacific



1870 → 2014

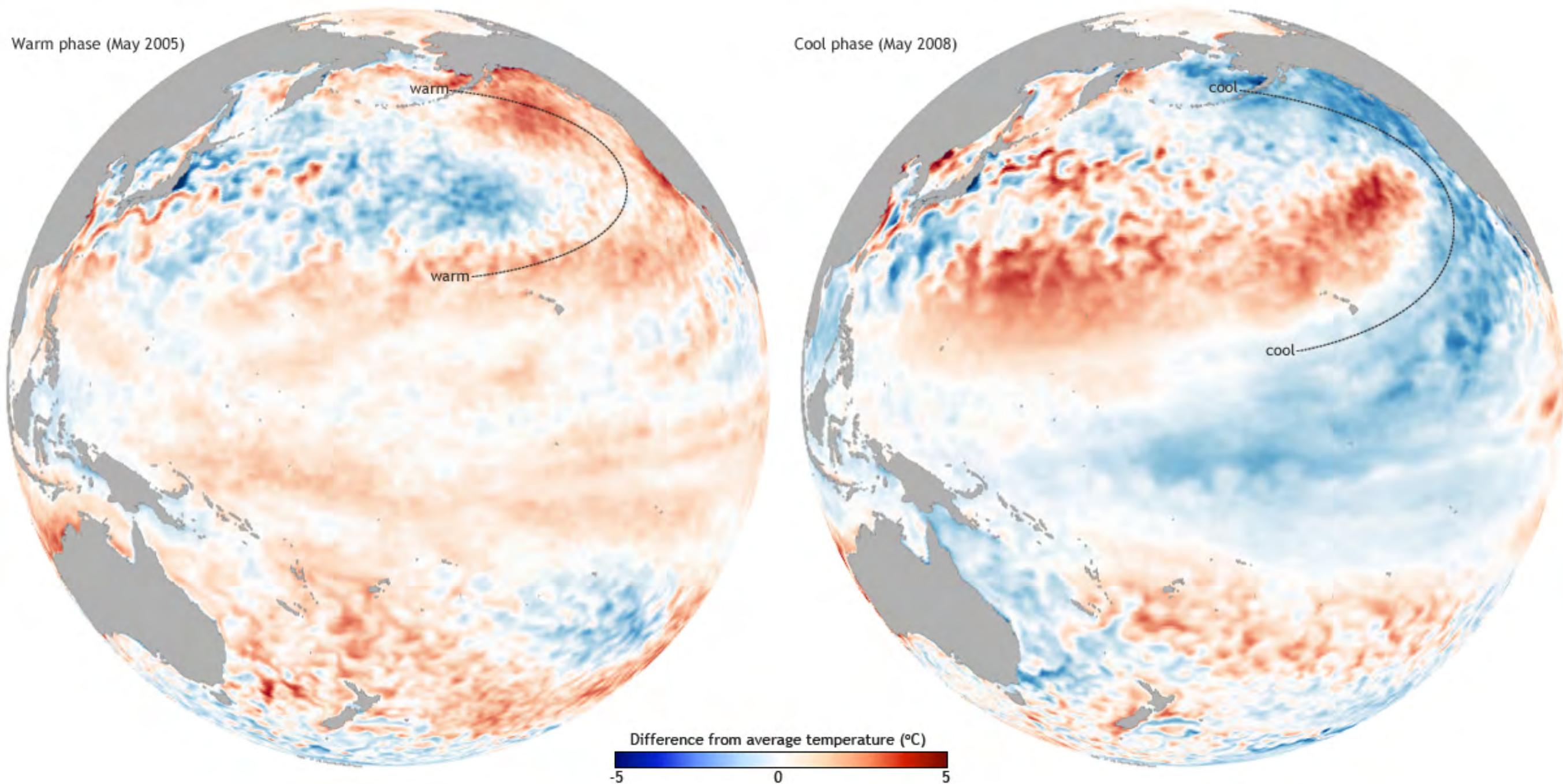


# Pacific Decadal Oscillation

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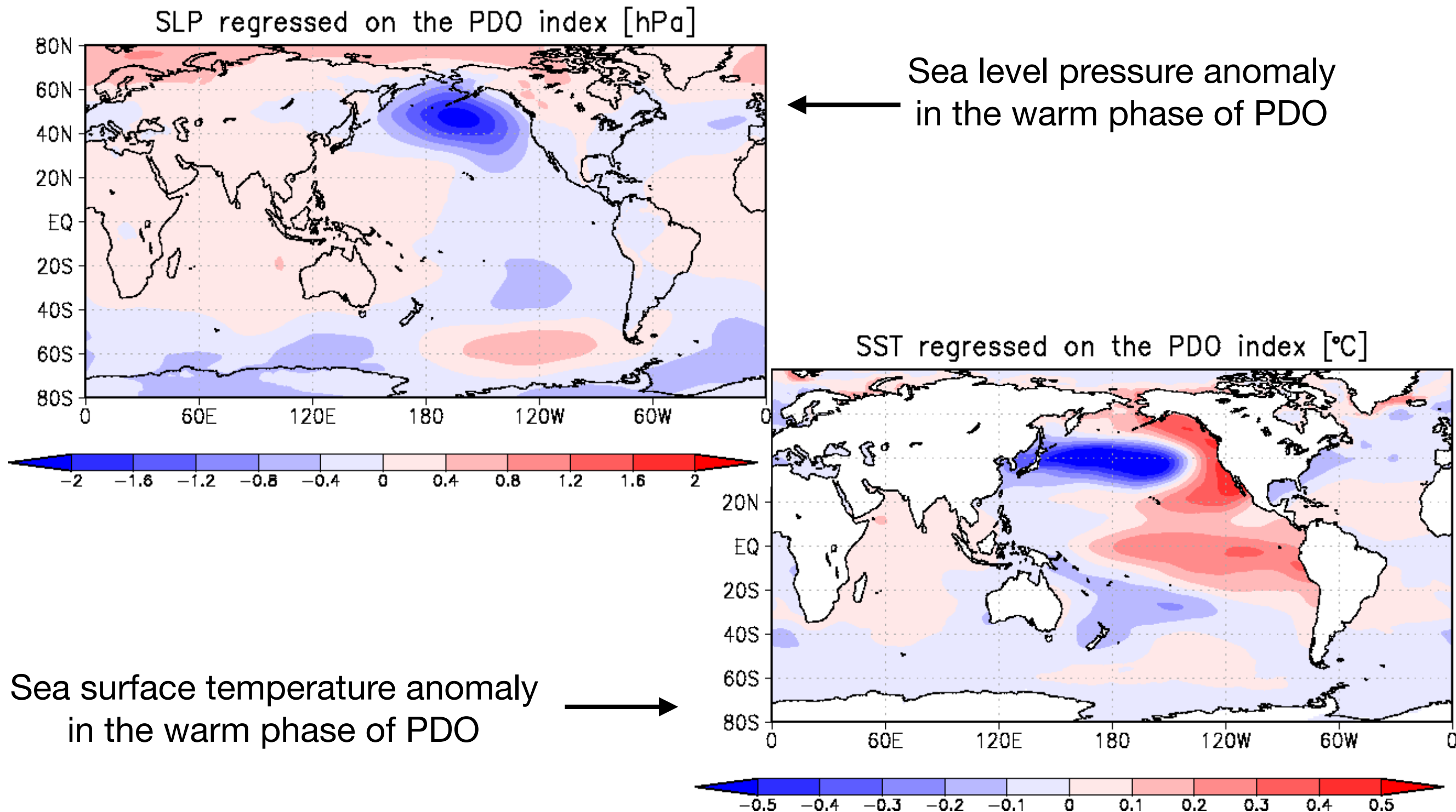
Warm phase

Cold phase

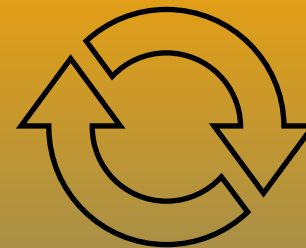
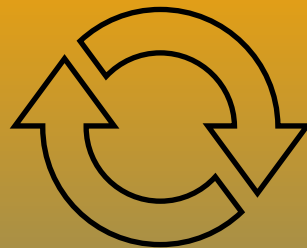
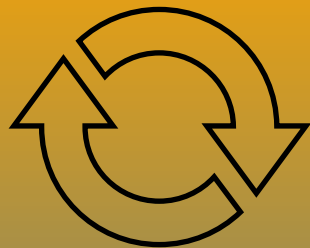


From [https://www.climate.gov/sites/default/files/HR\\_PDO2005-2008.jpg](https://www.climate.gov/sites/default/files/HR_PDO2005-2008.jpg)

# PDO and air-sea interaction

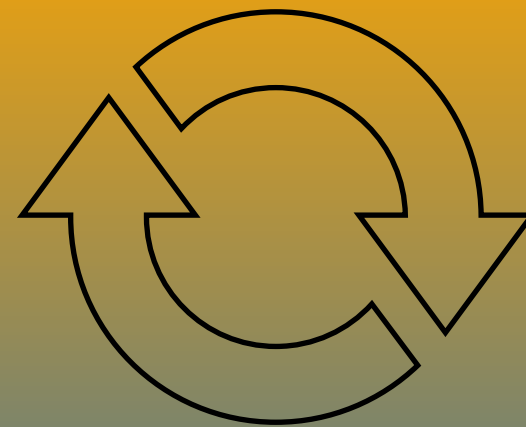
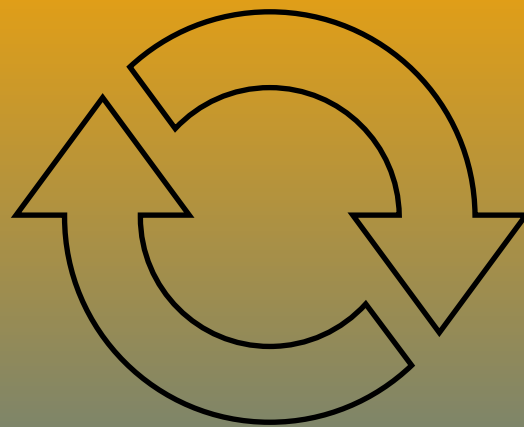
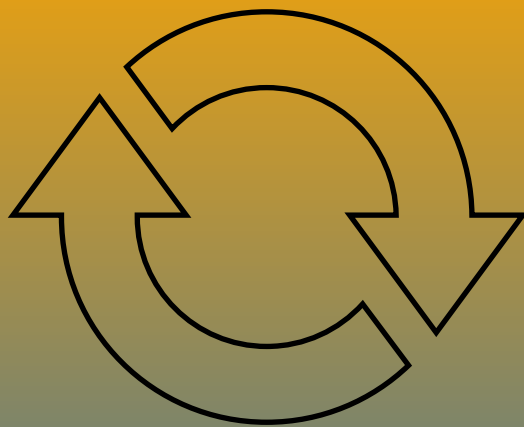
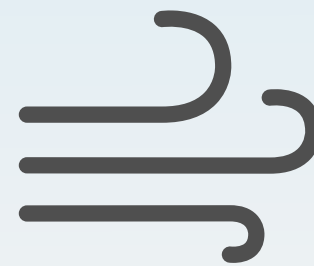


# WIND-SST IN LARGE SCALE



MIXING

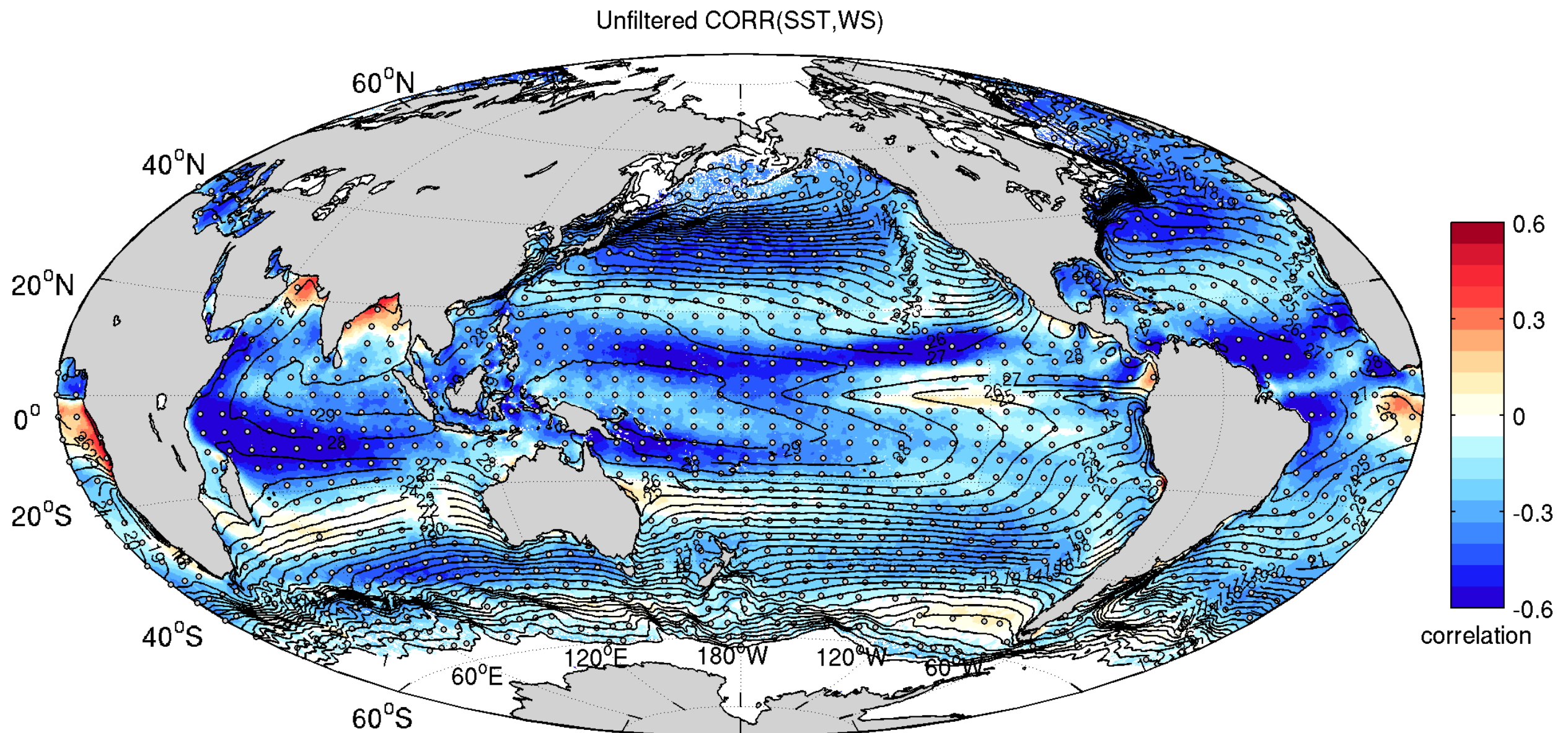
# WIND-SST IN LARGE SCALE



**MORE MIXING**



# Correlation between wind speed and SST

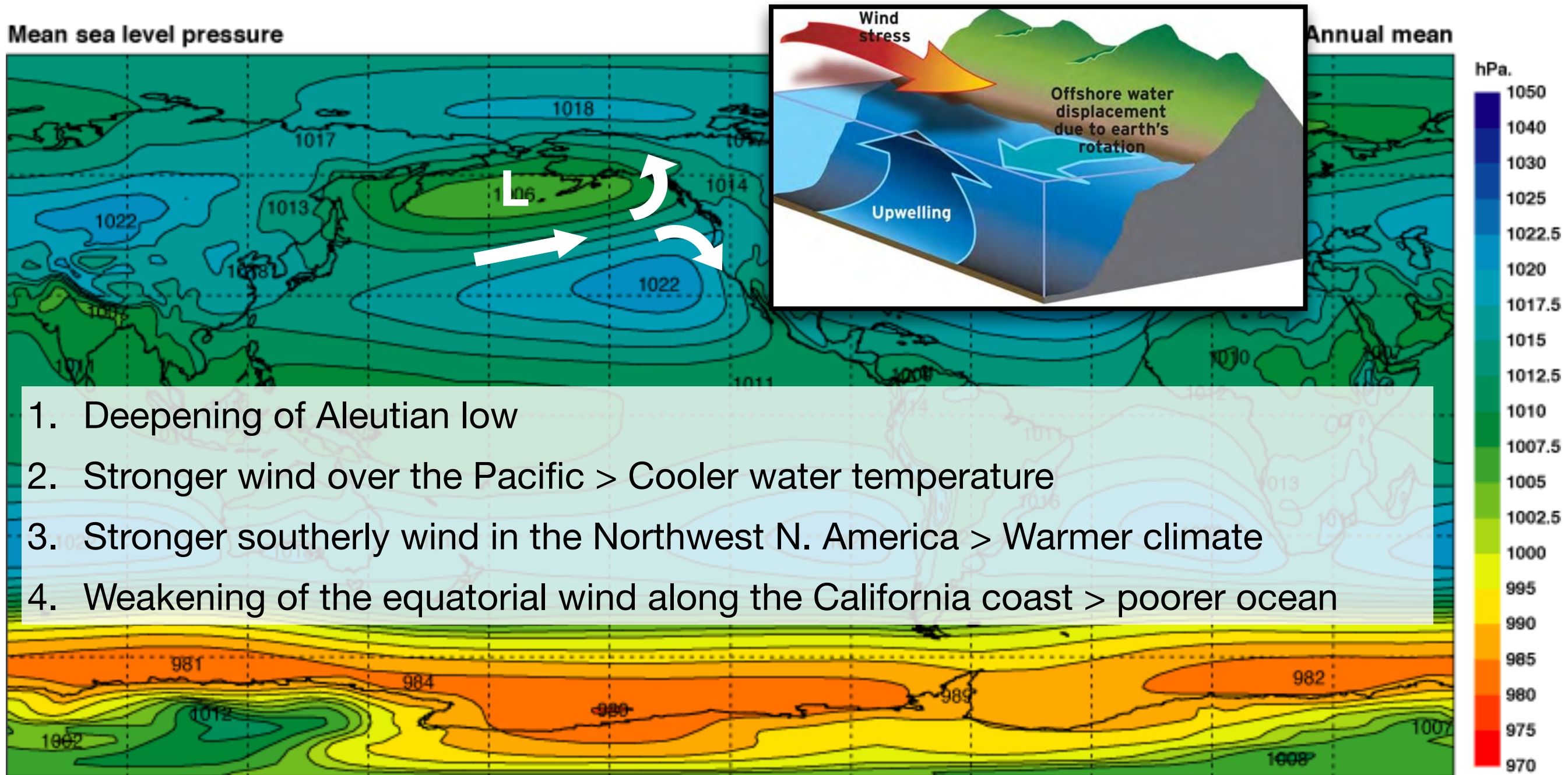


**Oceanic response to the atmosphere**

2000-2009 satellite wind and SST data

**A credit to Dr. Hyodae Seo (WHOI)**

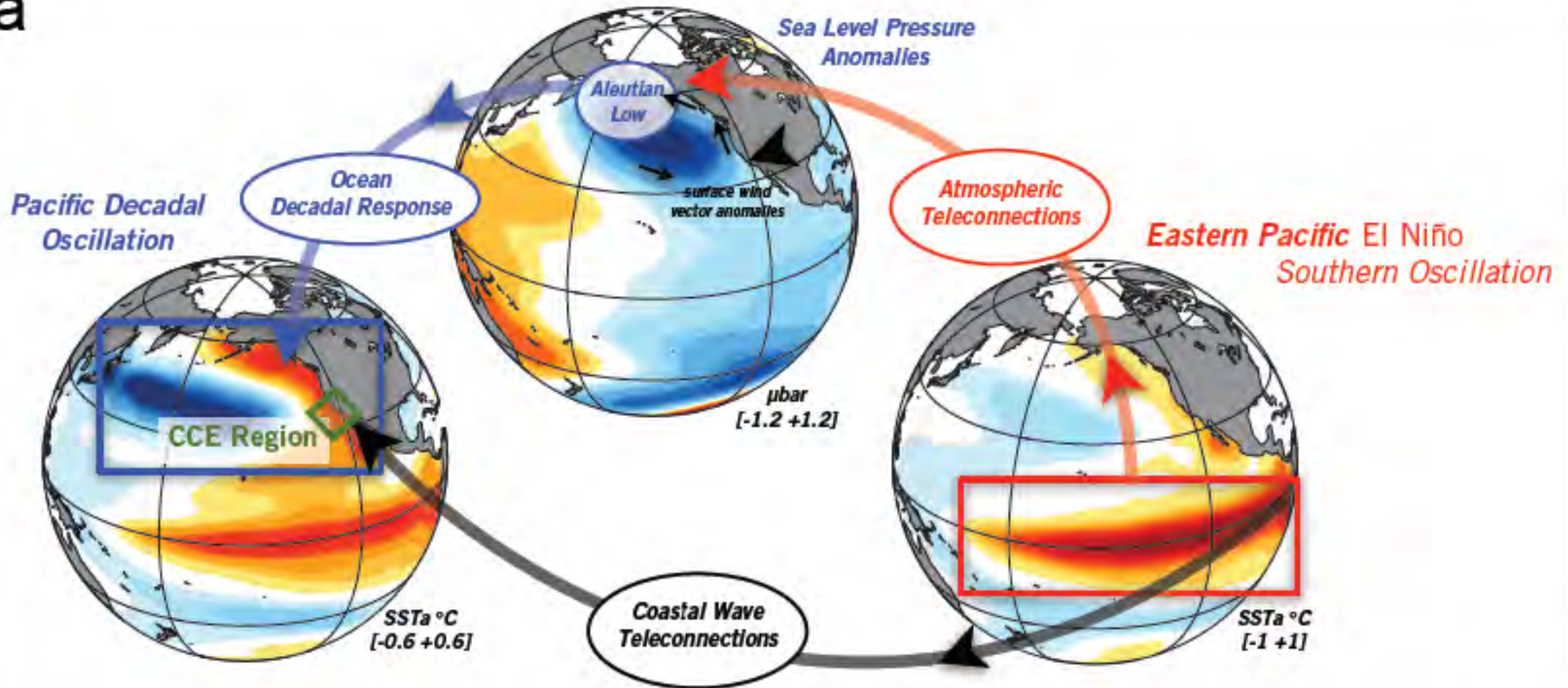
# Impact of a warm phase of PDO on climate





# Teleconnection

a

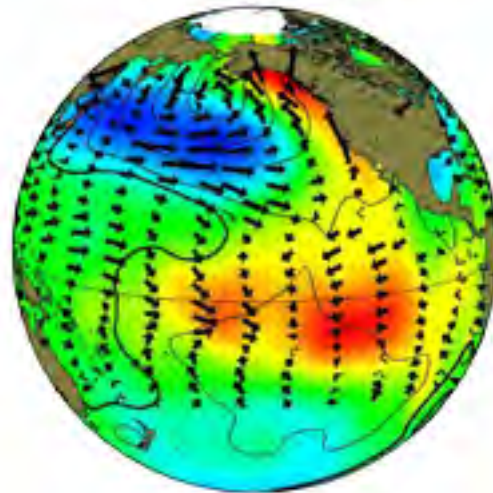


# PDO v.s. ENSO

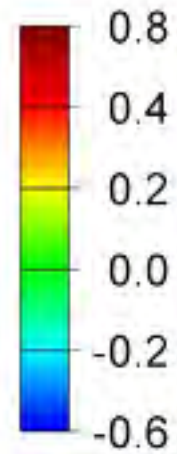
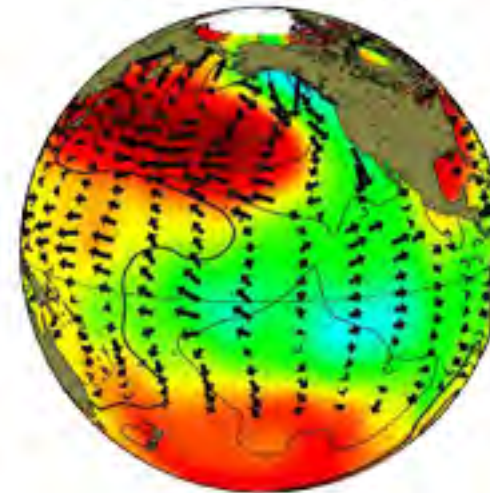
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## Pacific Decadal Oscillation

positive phase

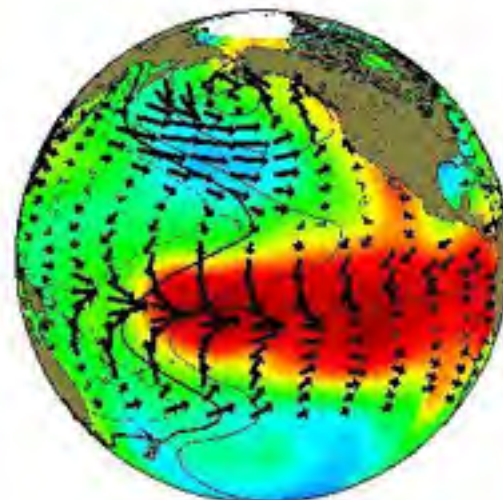


negative phase

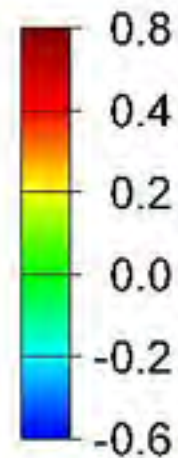
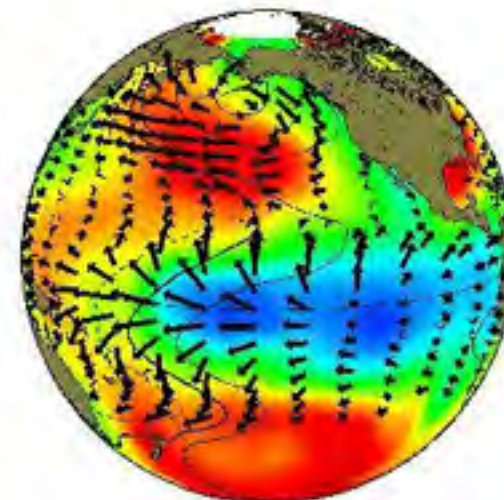


## El Nino Southern Oscillation

El Nino



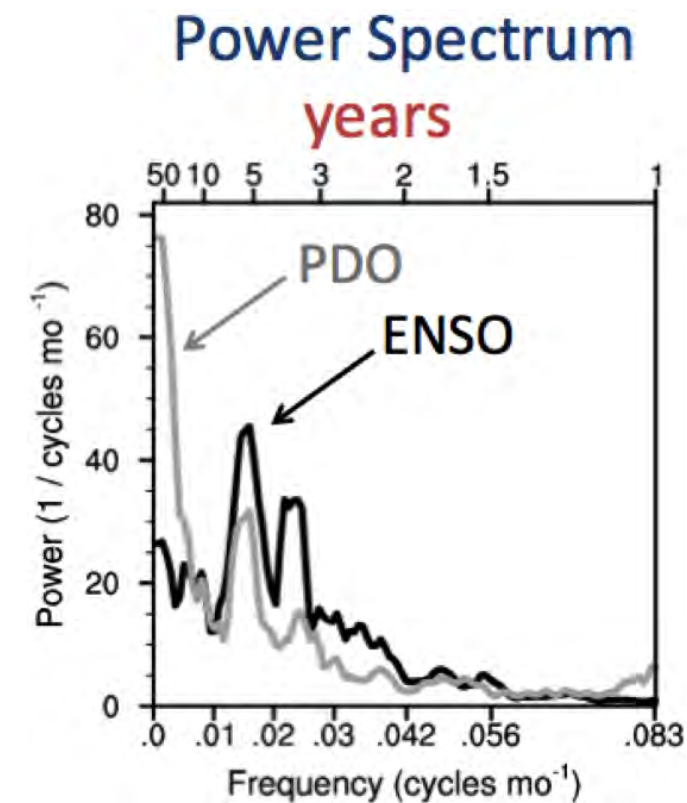
La Nina





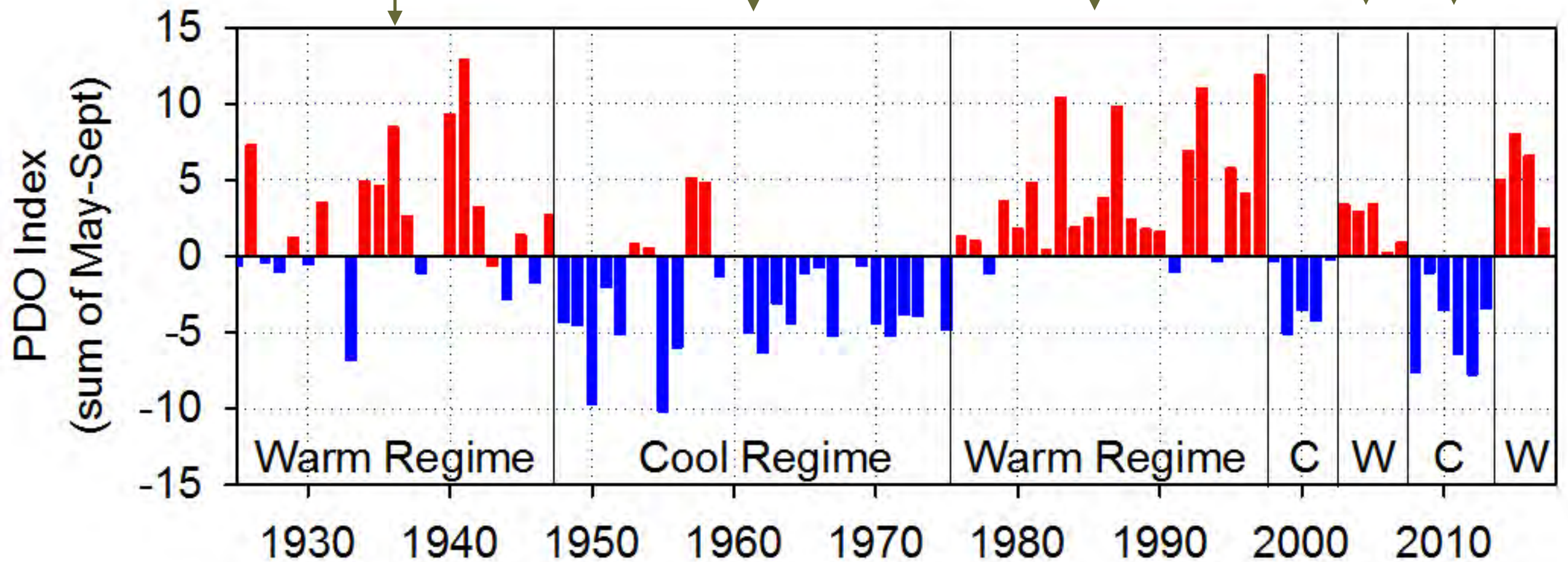
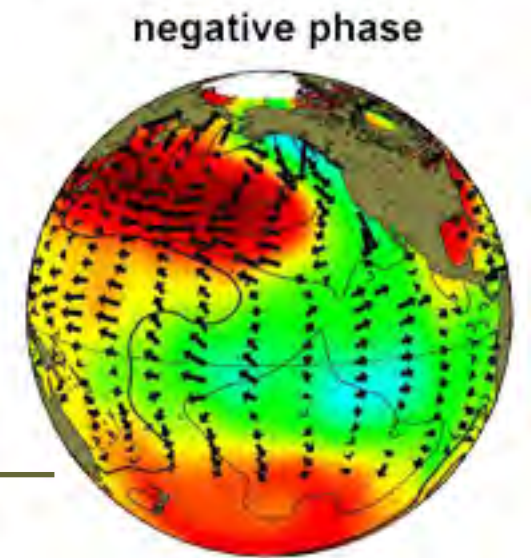
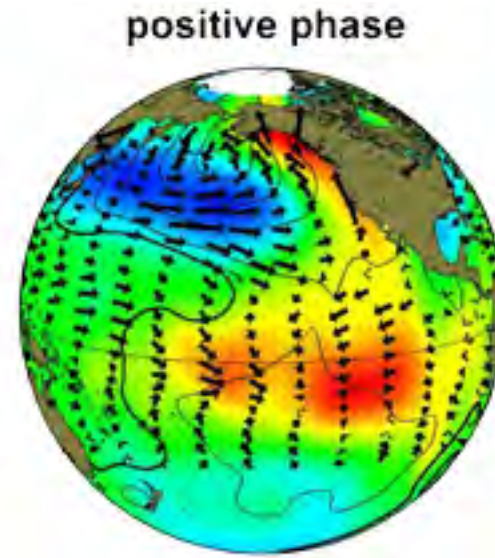
# PDO v.s. ENSO

- Time scale
  - PDO events persist for 20 to 30 years
  - ENSO events persist for 6 to 18 months
- The climate fingerprints
  - PDO in the North Pacific / North American sector
  - ENSO in the tropics





# PDO index





# Impact of PDO on climate

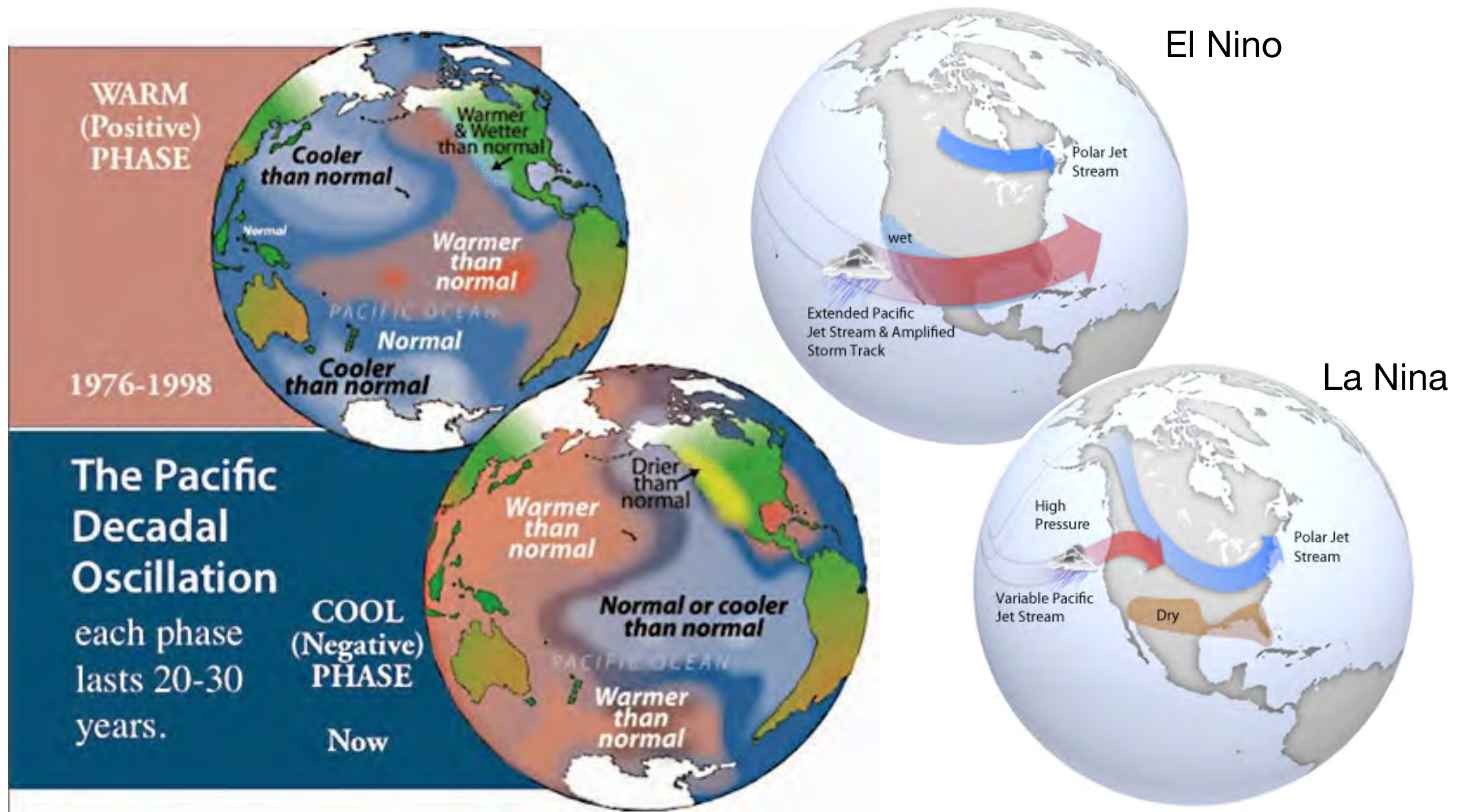
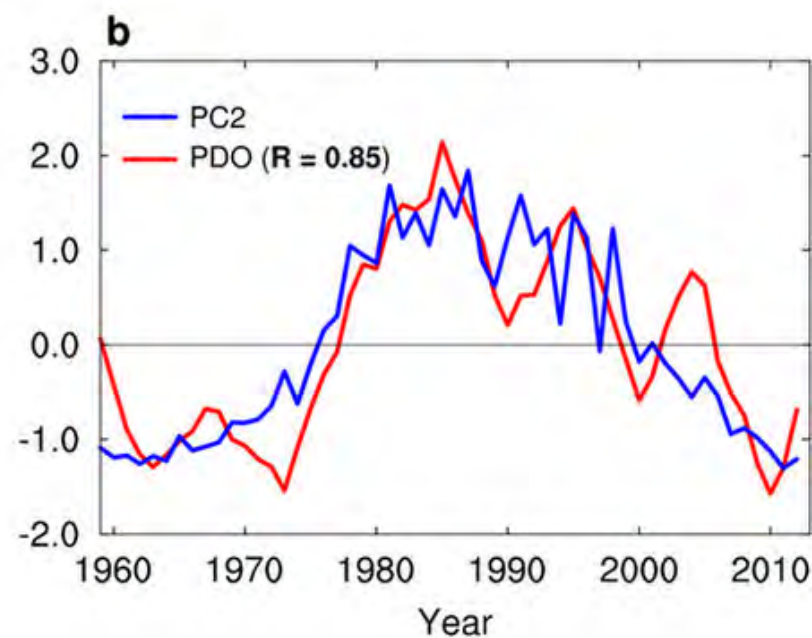
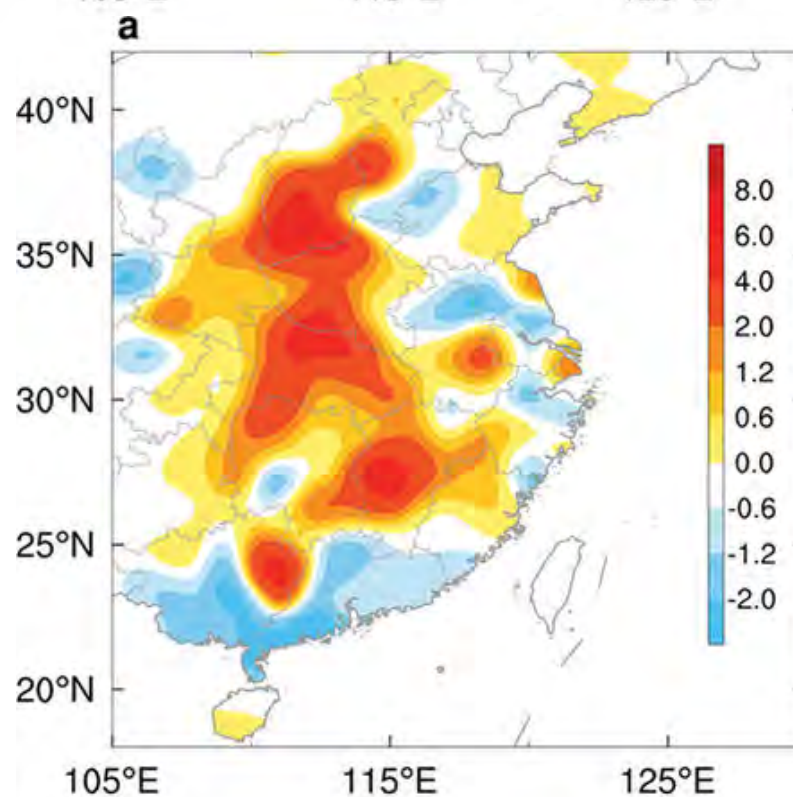
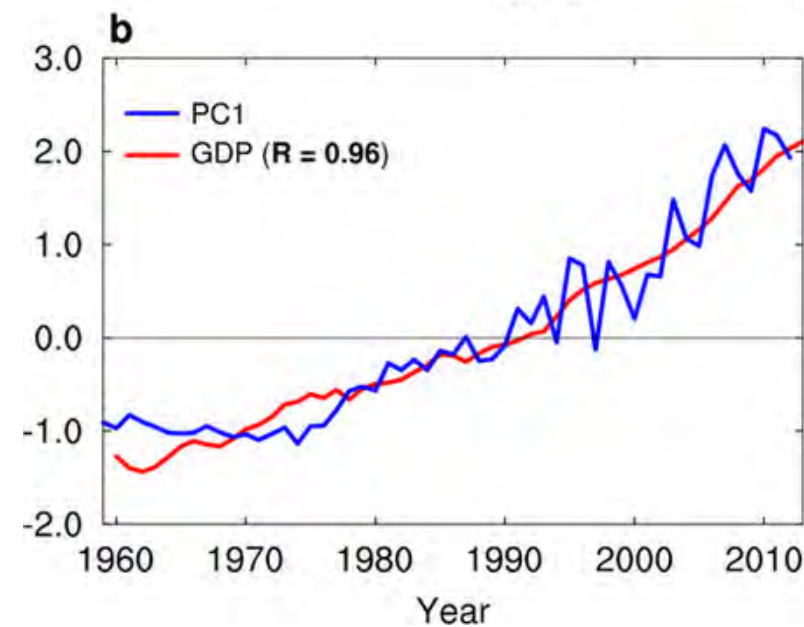
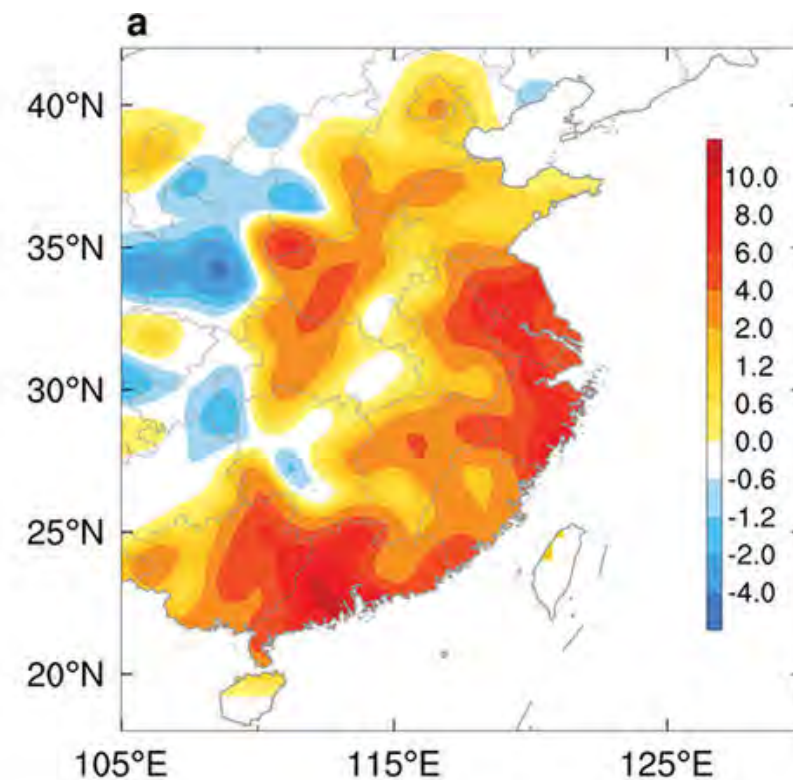


Figure from <http://the-mound-of-sound.blogspot.kr/2015/03/coming-soon-great-warming-spurt.html>  
And [https://www.climate.gov/sites/default/files/LosNinoshighpressure\\_0.jpg](https://www.climate.gov/sites/default/files/LosNinoshighpressure_0.jpg)

# Impact of PDO on the climate of east Asia

Haze day

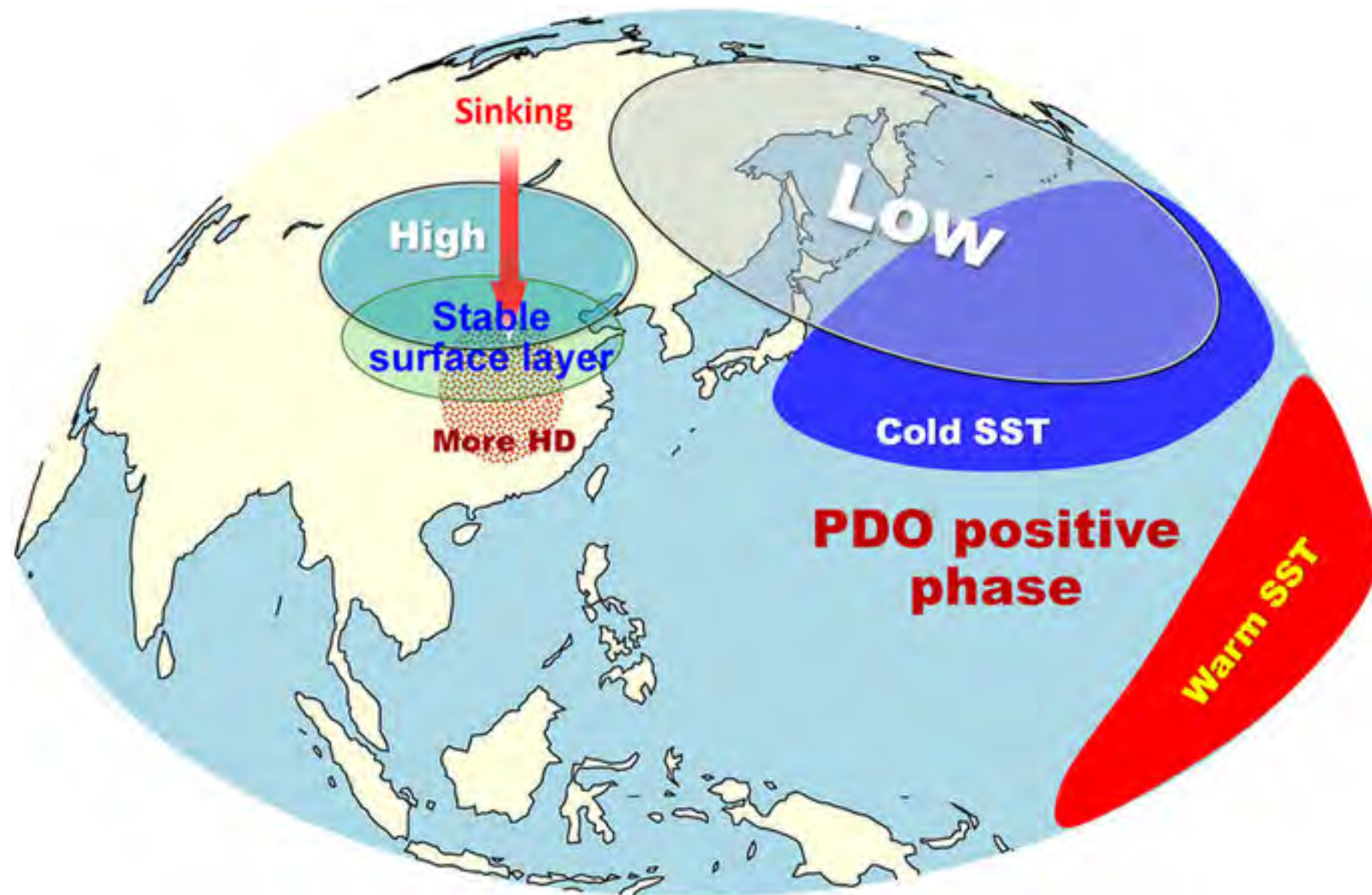


From Zhao et al., 2016

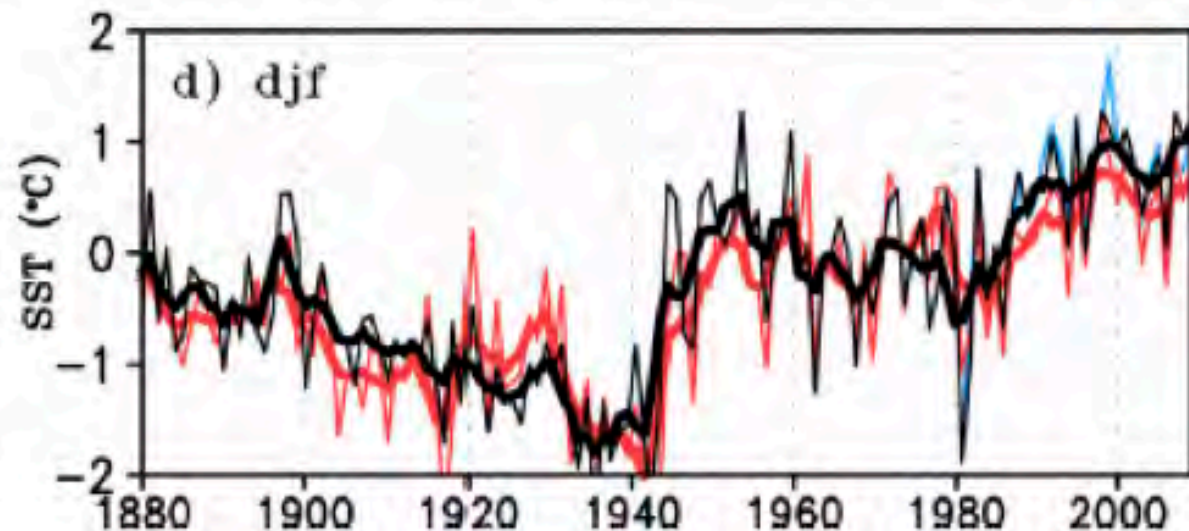


# Impact of PDO on the climate of east Asia

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# Impact of PDO on the climate of east Asia



Sea surface temperature near the Korean Peninsula

- Black : SST anomaly
- Blue :  $-1 \times$  (PDO index)
- Red : ENSO index

