NOAA Science & Education Symposium

July 30, 2024

Investigating the Impact of Climate Variability and Change on the California Current System

Jacqueline Kiszka

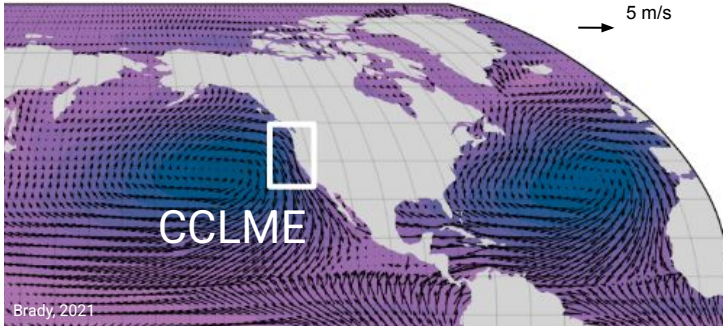
Pennsylvania State University

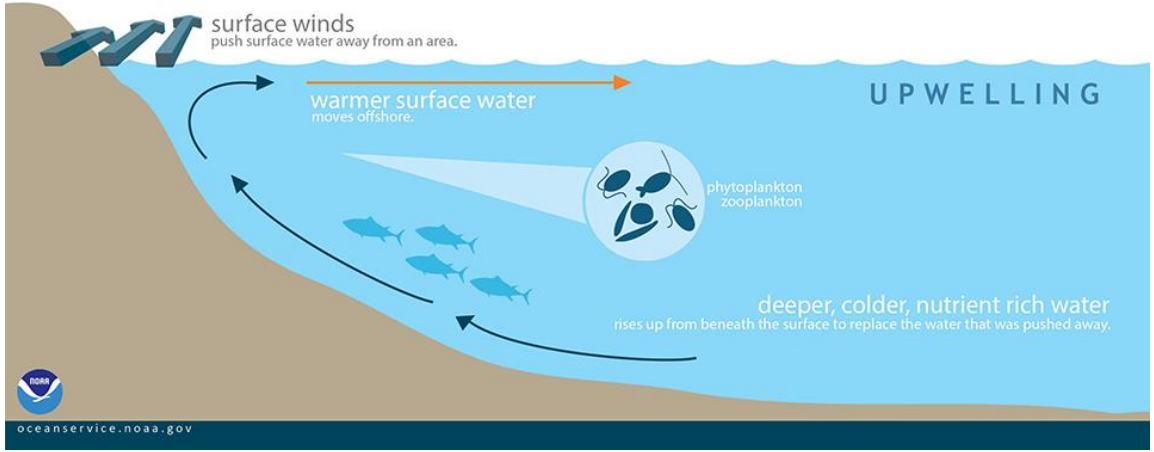
NOAA Physical Sciences Laboratory

Natalie Freeman and Dillon Amaya

The California Current Large Marine Ecosystem (CCLME)

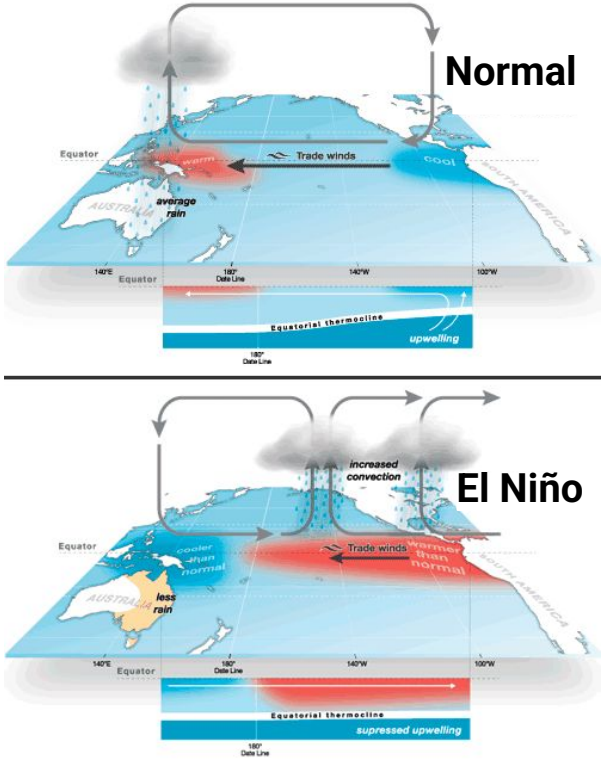
Upwelling Supports High Productivity in the CCLME



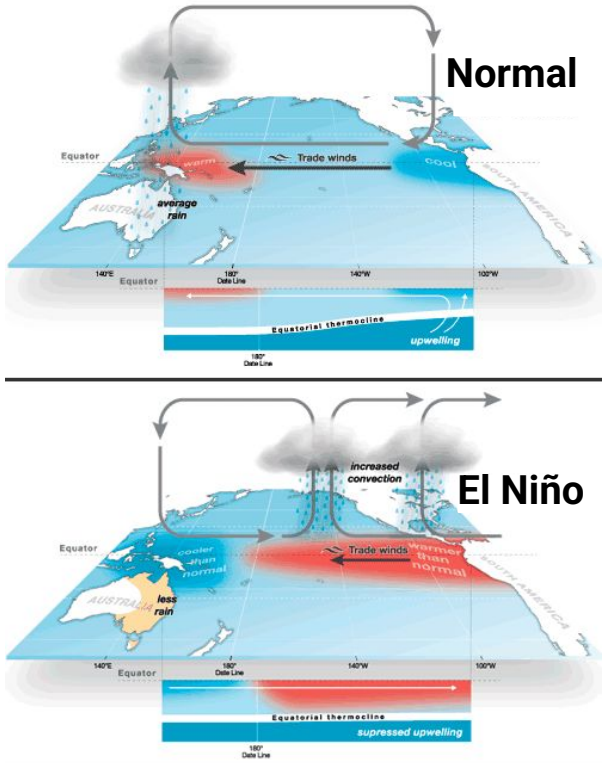


High Productivity Supports Valuable Living Marine Resources

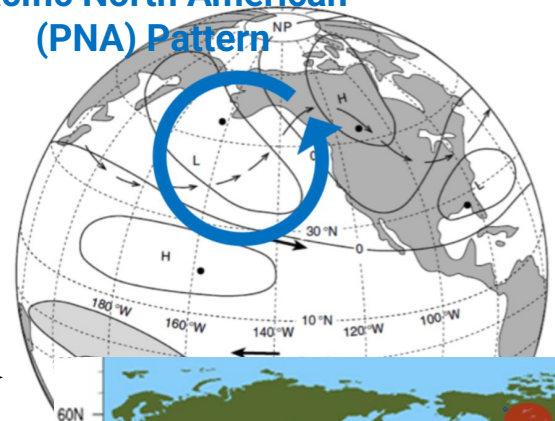
El Niño-Southern Oscillation (ENSO)

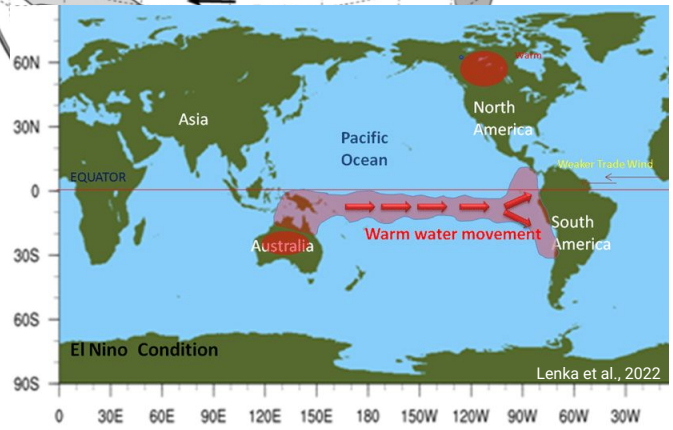


El Niño-Southern Oscillation (ENSO)

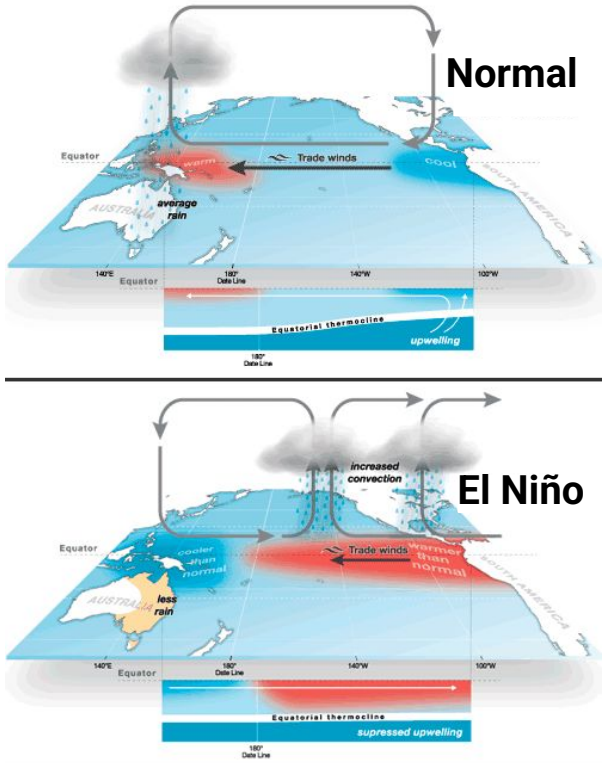


Pacific North American (PNA) Pattern

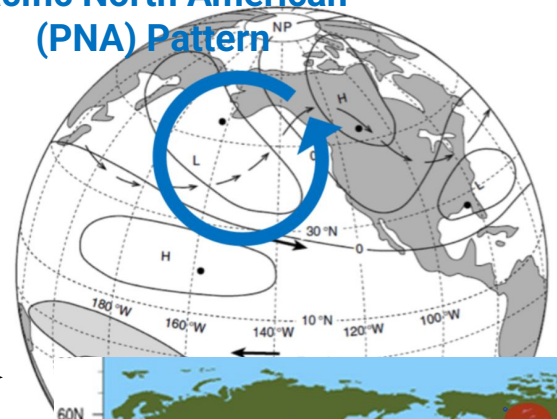


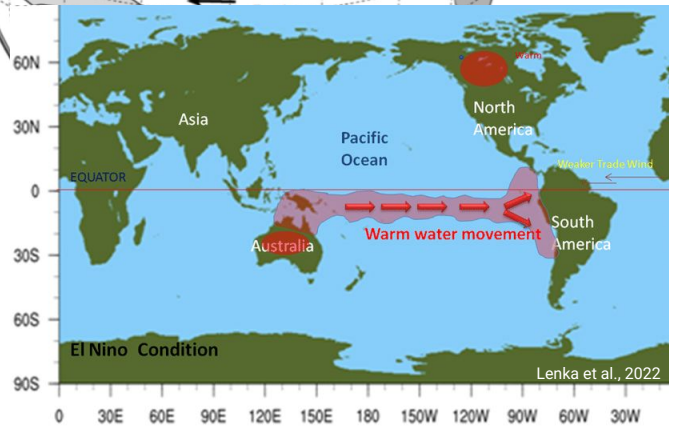


El Niño-Southern Oscillation (ENSO)



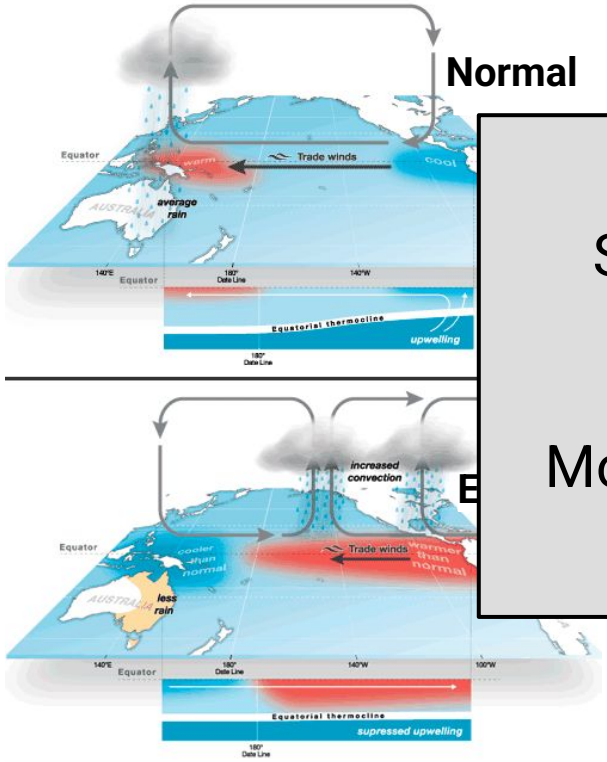
Pacific North American (PNA) Pattern





Dampened upwelling in the CCLME

El Niño-Southern Oscillation (ENSO)



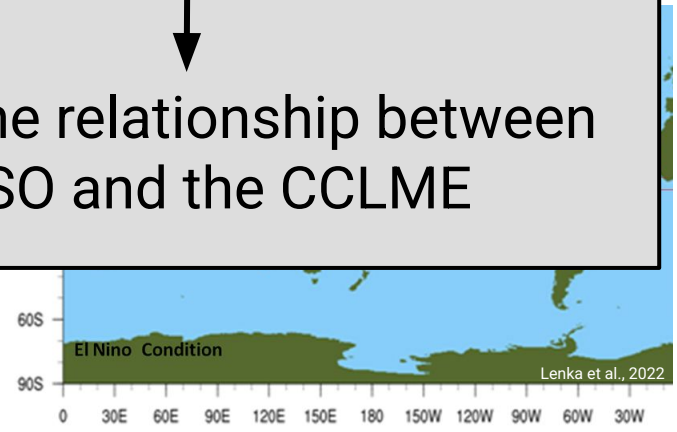
Pacific North American (PNA) Pattern

Motivation:

Short observational records

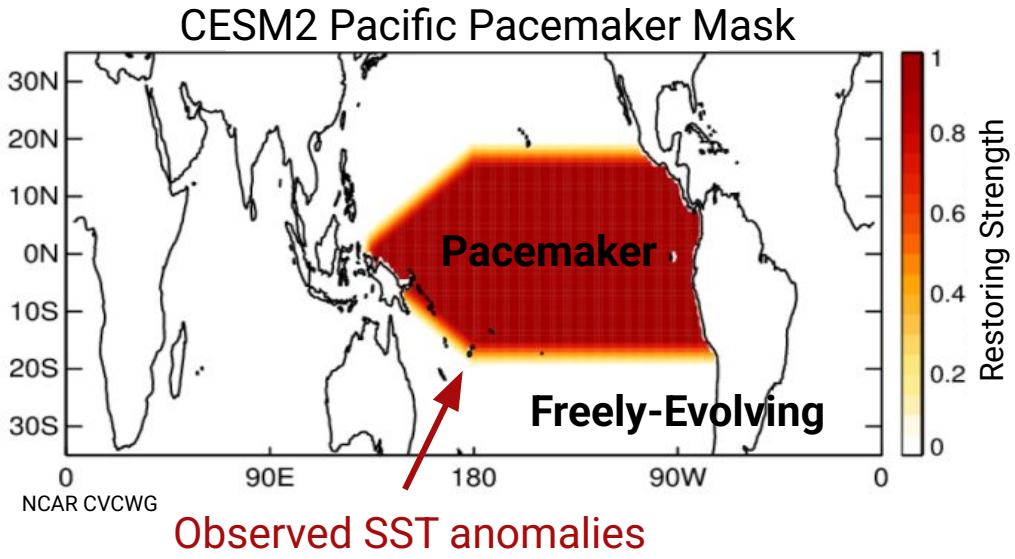
↓

Model the relationship between ENSO and the CCLME



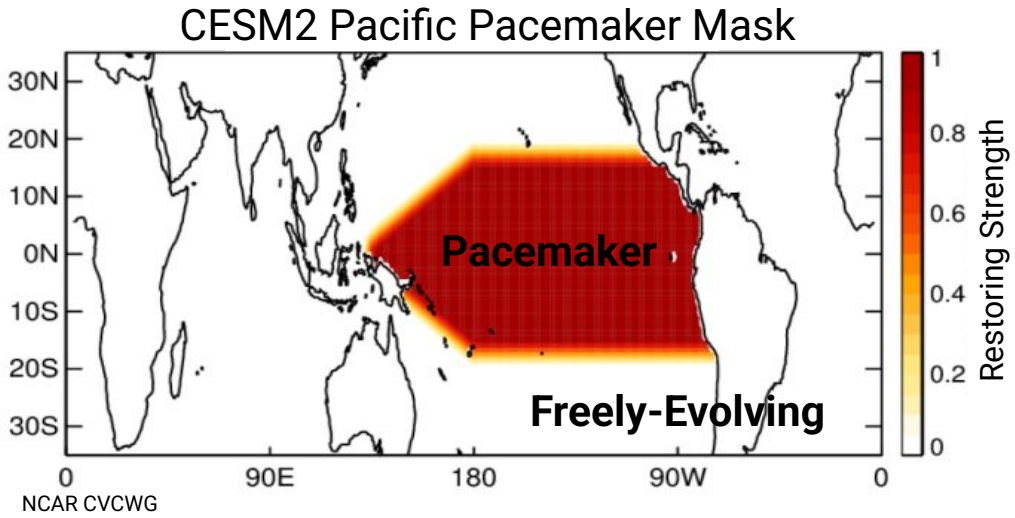
→ Dampened upwelling in the CCLME

CESM2 Pacific Pacemaker Ensemble



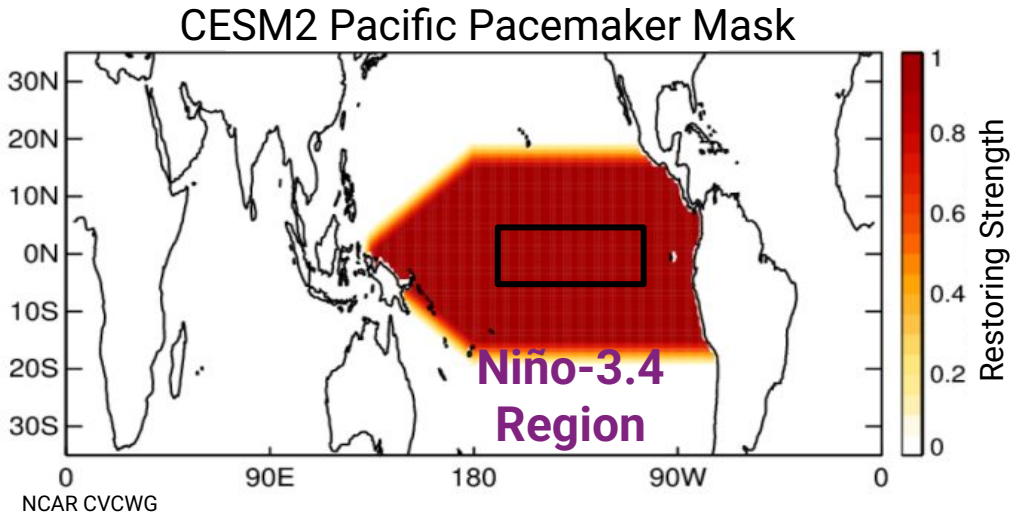
- Fully-coupled model, 1º resolution
- 10 ensemble members
- 1880-2019, monthly output
- ERSSTv5 SST anomalies

CESM2 Pacific Pacemaker Ensemble

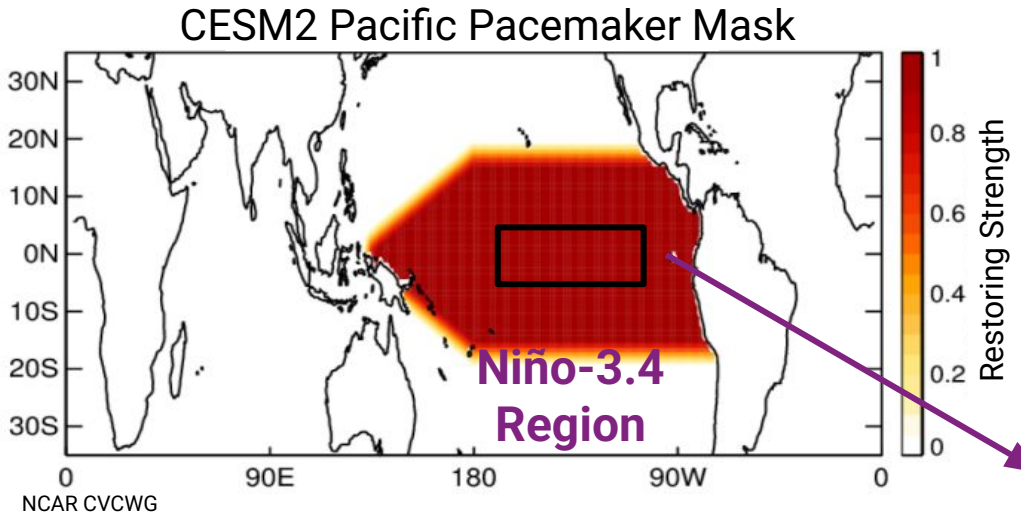


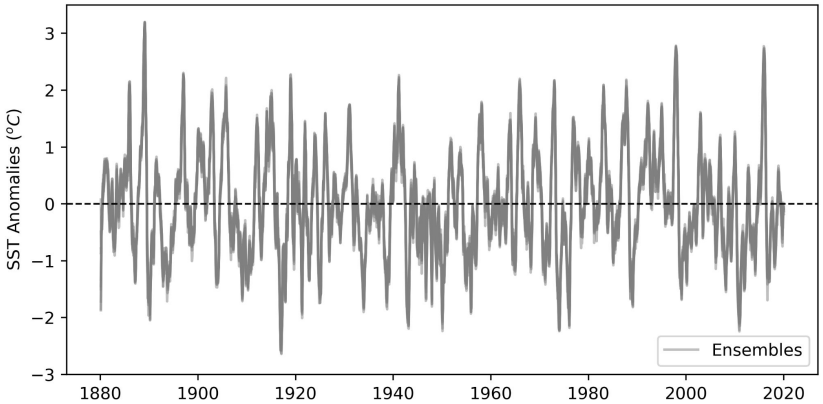
- Physical variables:
  - Sea Surface Temperature (SST), Vertical Velocity (40-meter depth), and Mixed Layer Depth
- Biogeochemical (BGC) variables:
  - 100-meter depth
  - Nitrate, Oxygen, and Carbon

ENSO Region is the Pacemaker

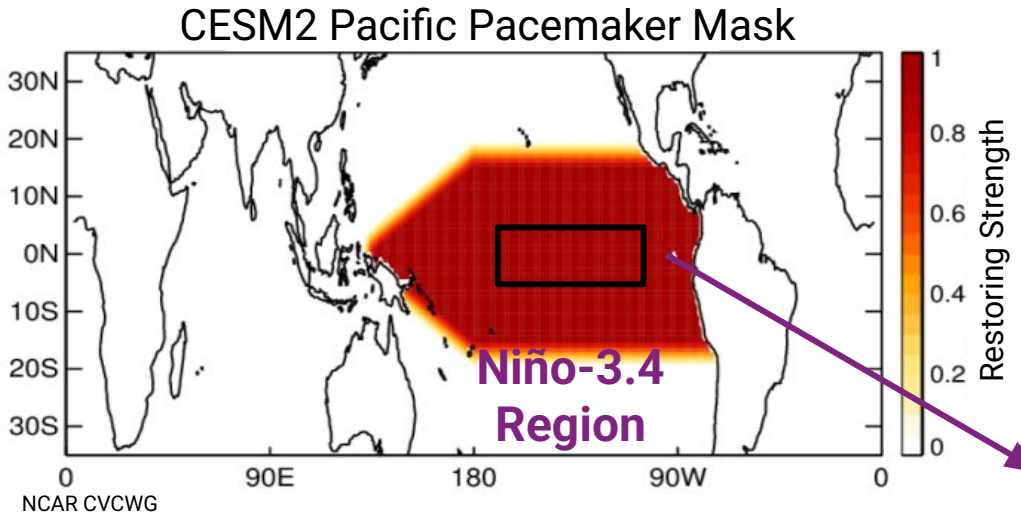


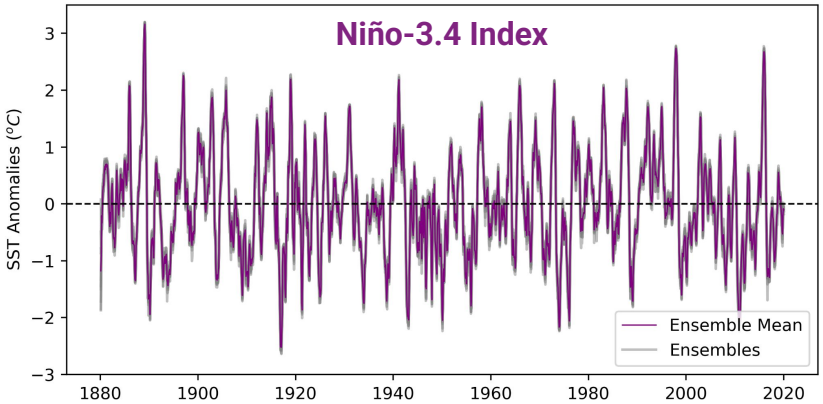
ENSO Region is the Pacemaker



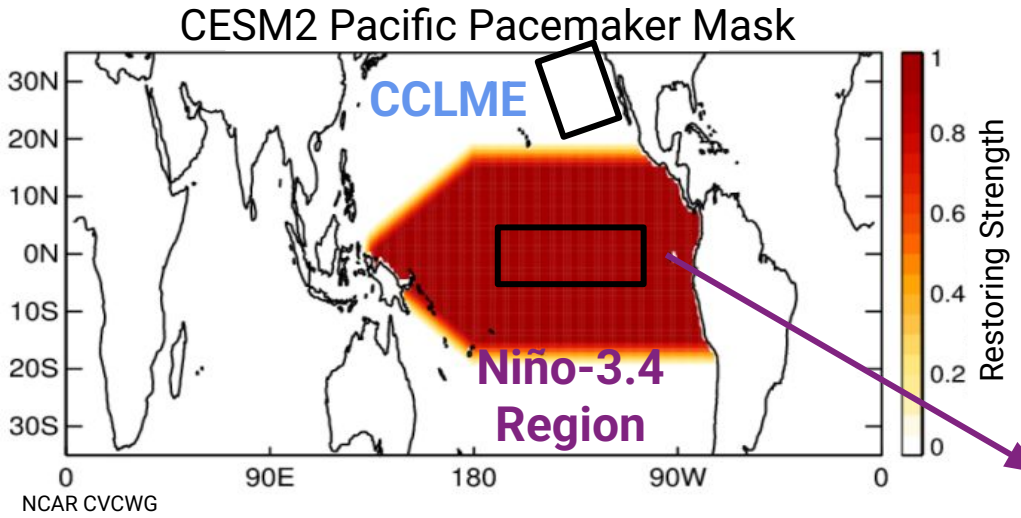


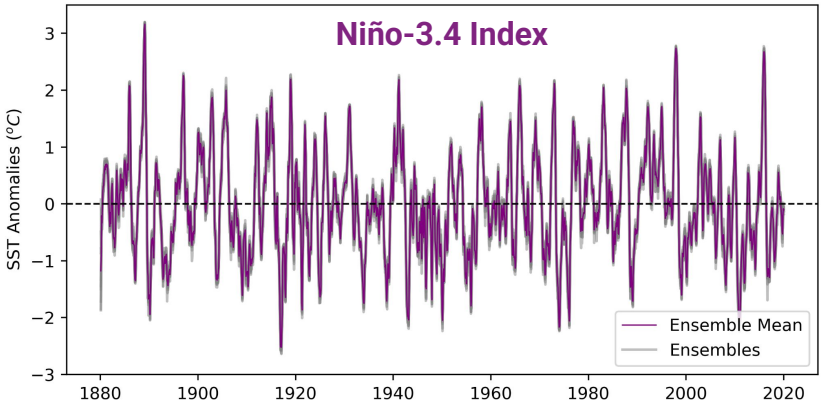
ENSO Region is the Pacemaker



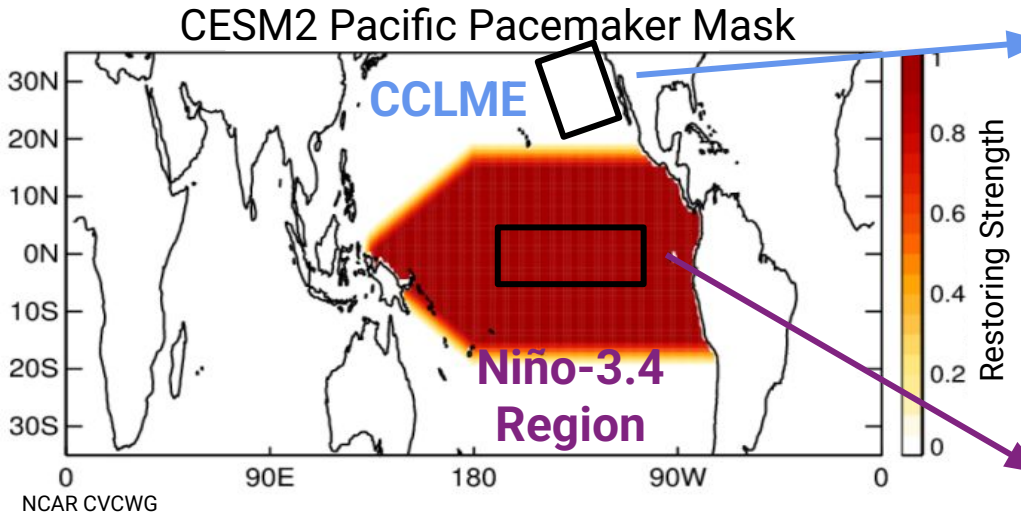


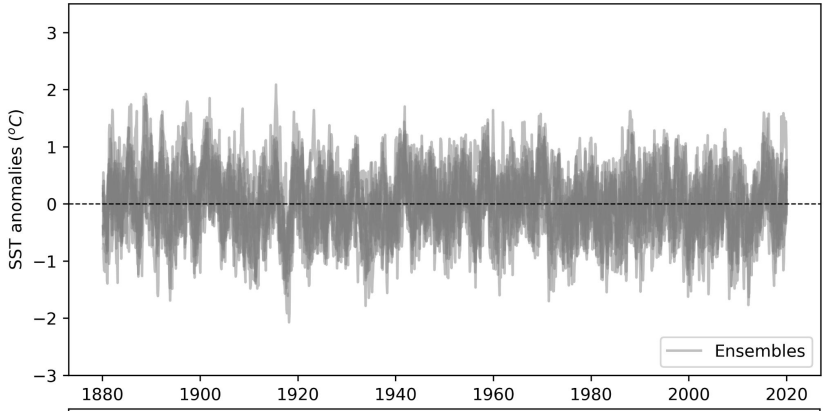
ENSO Region is the Pacemaker

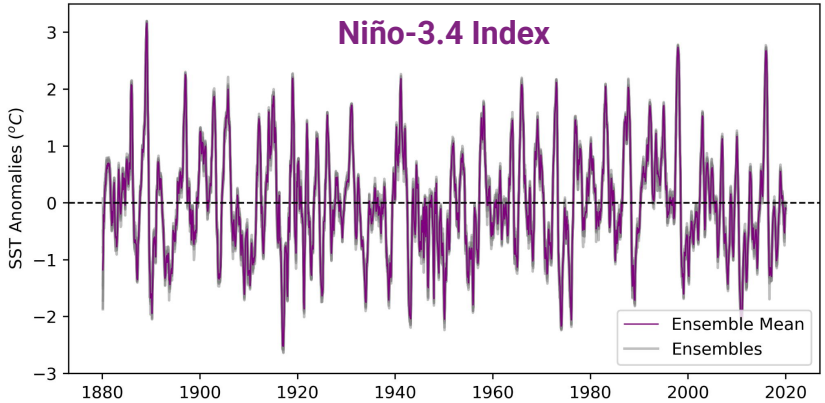




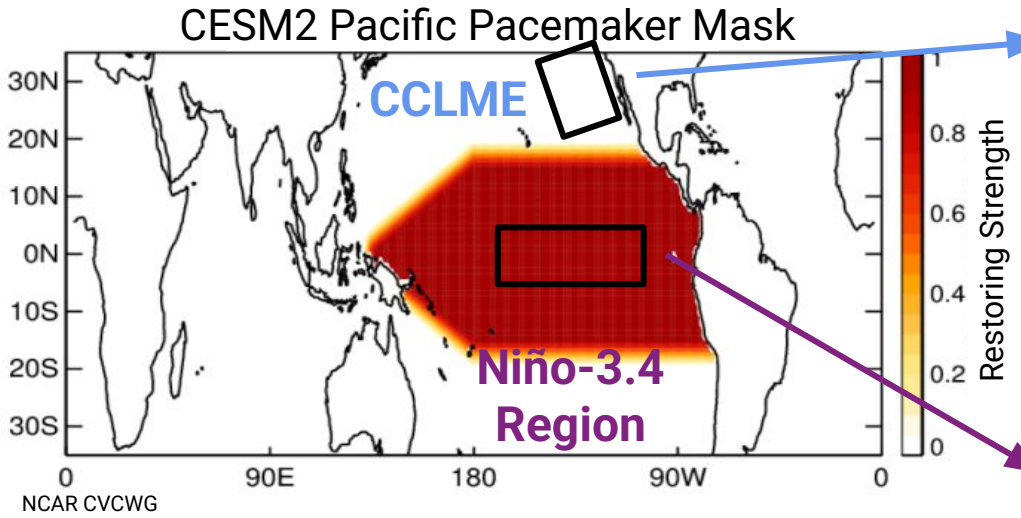
ENSO Region is the Pacemaker

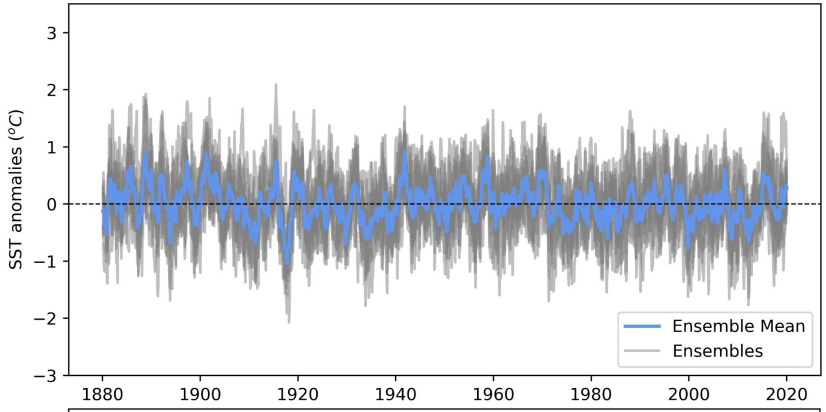


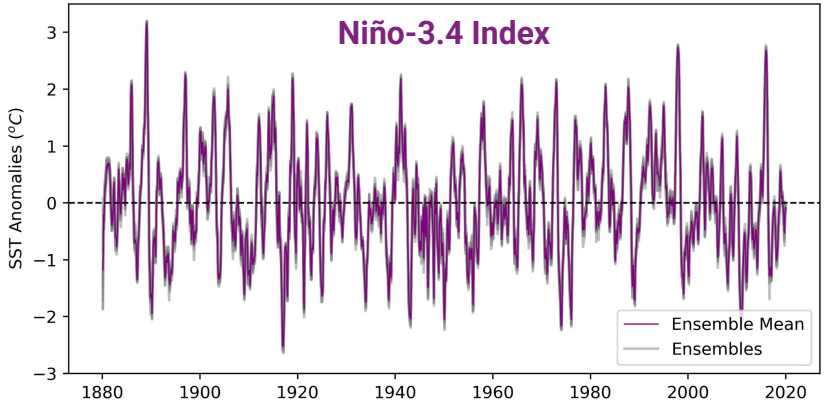




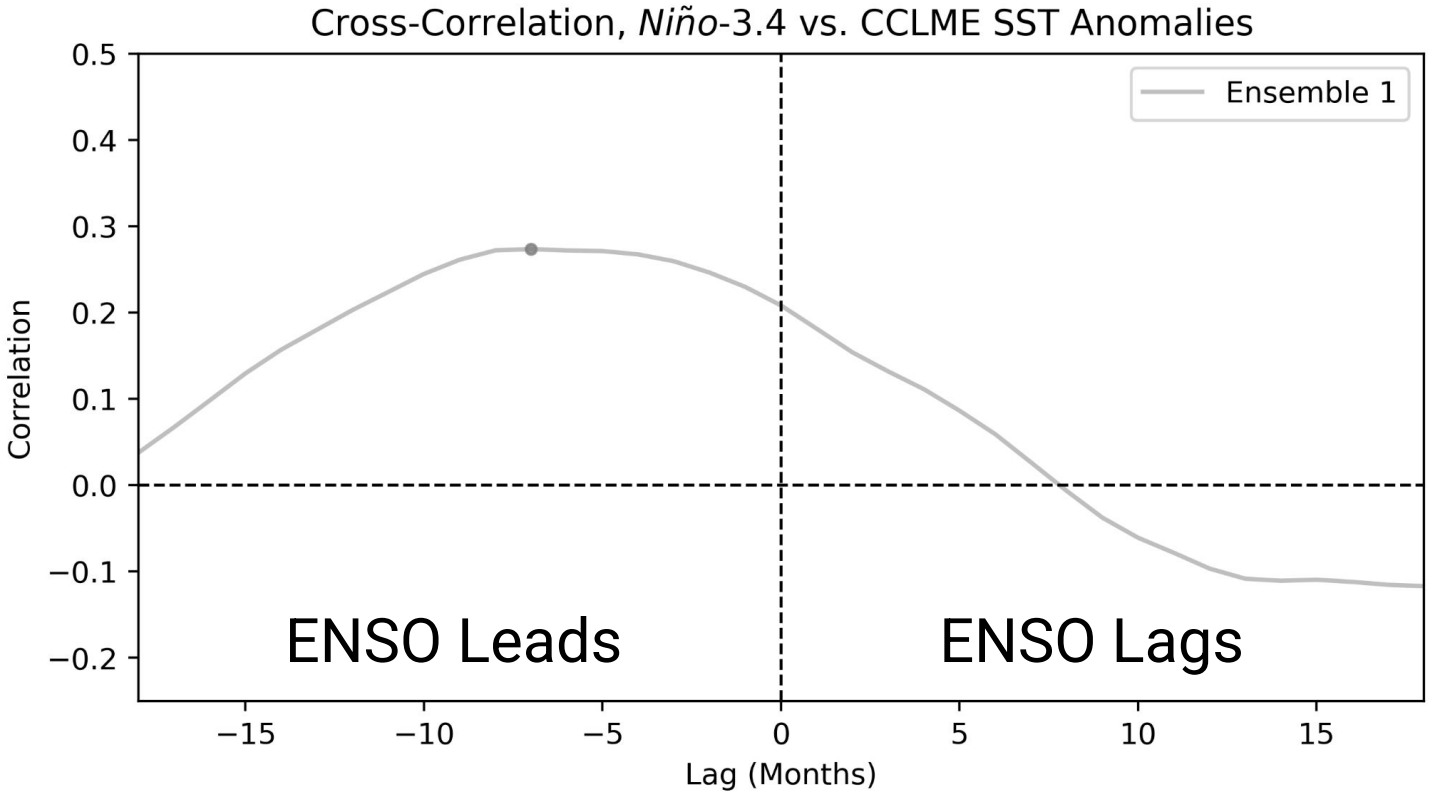
ENSO Region is the Pacemaker



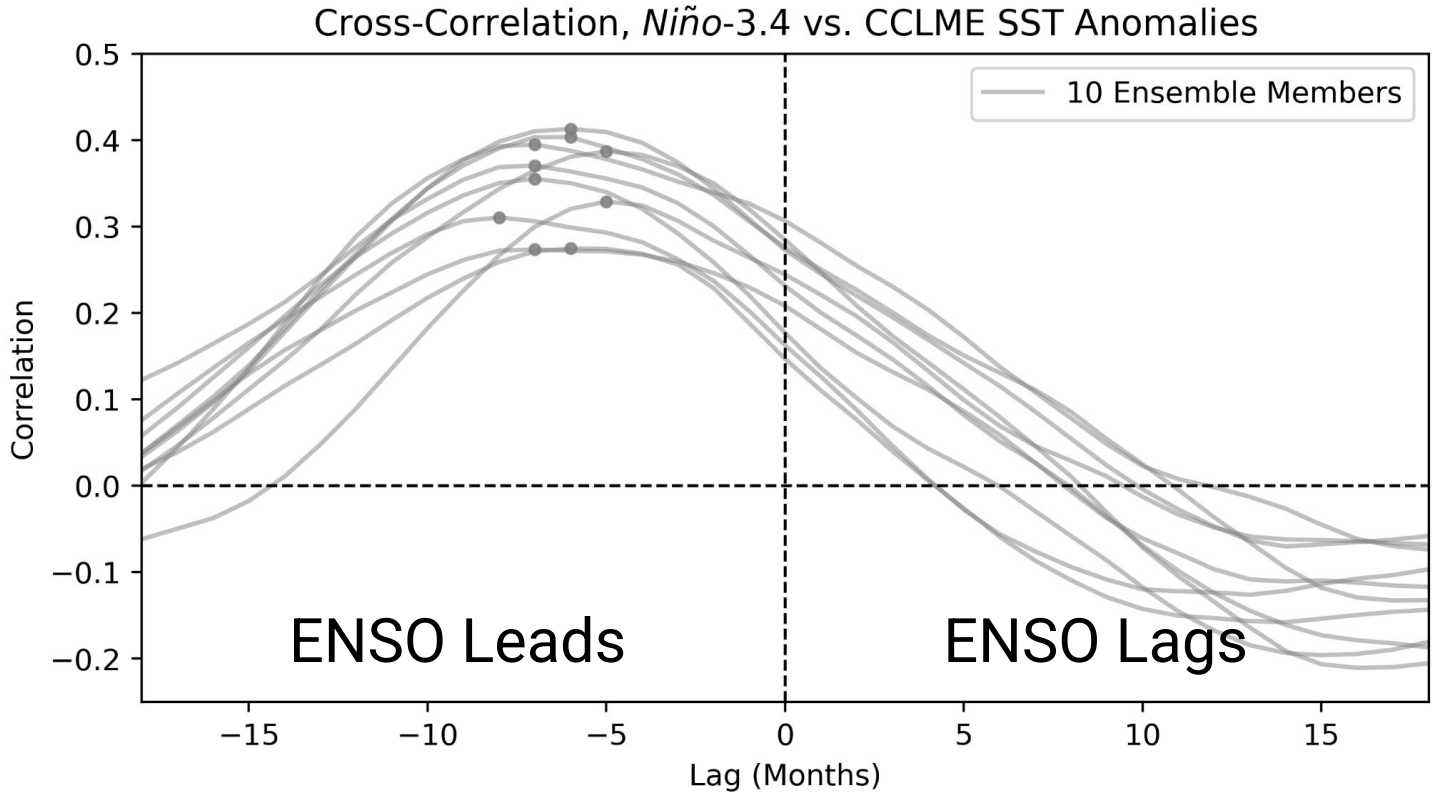




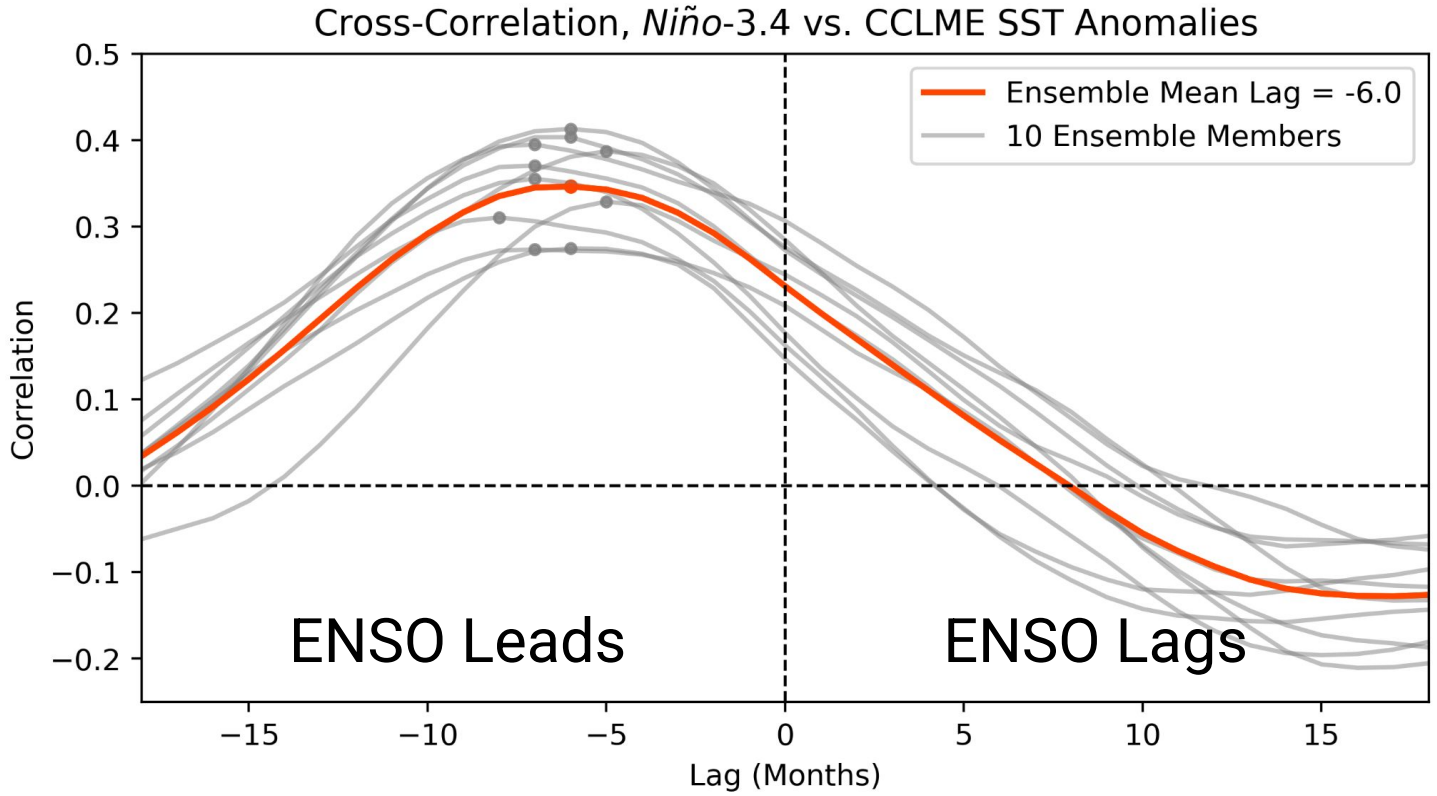
Spread in Lagged Correlation



Spread in Lagged Correlation

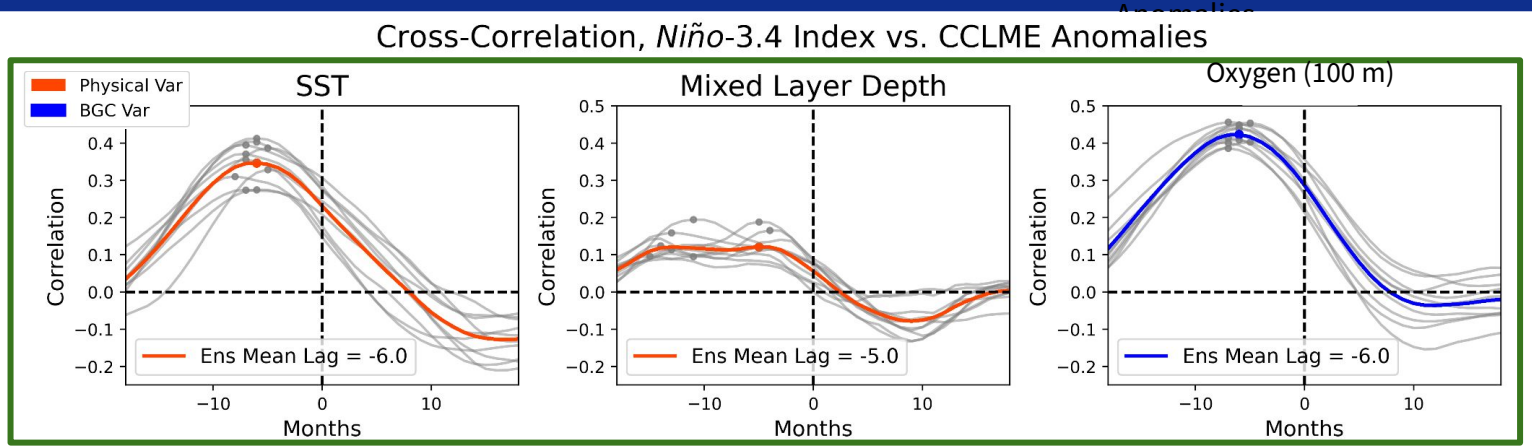


Spread in Lagged Correlation



Spread in Lagged Correlation

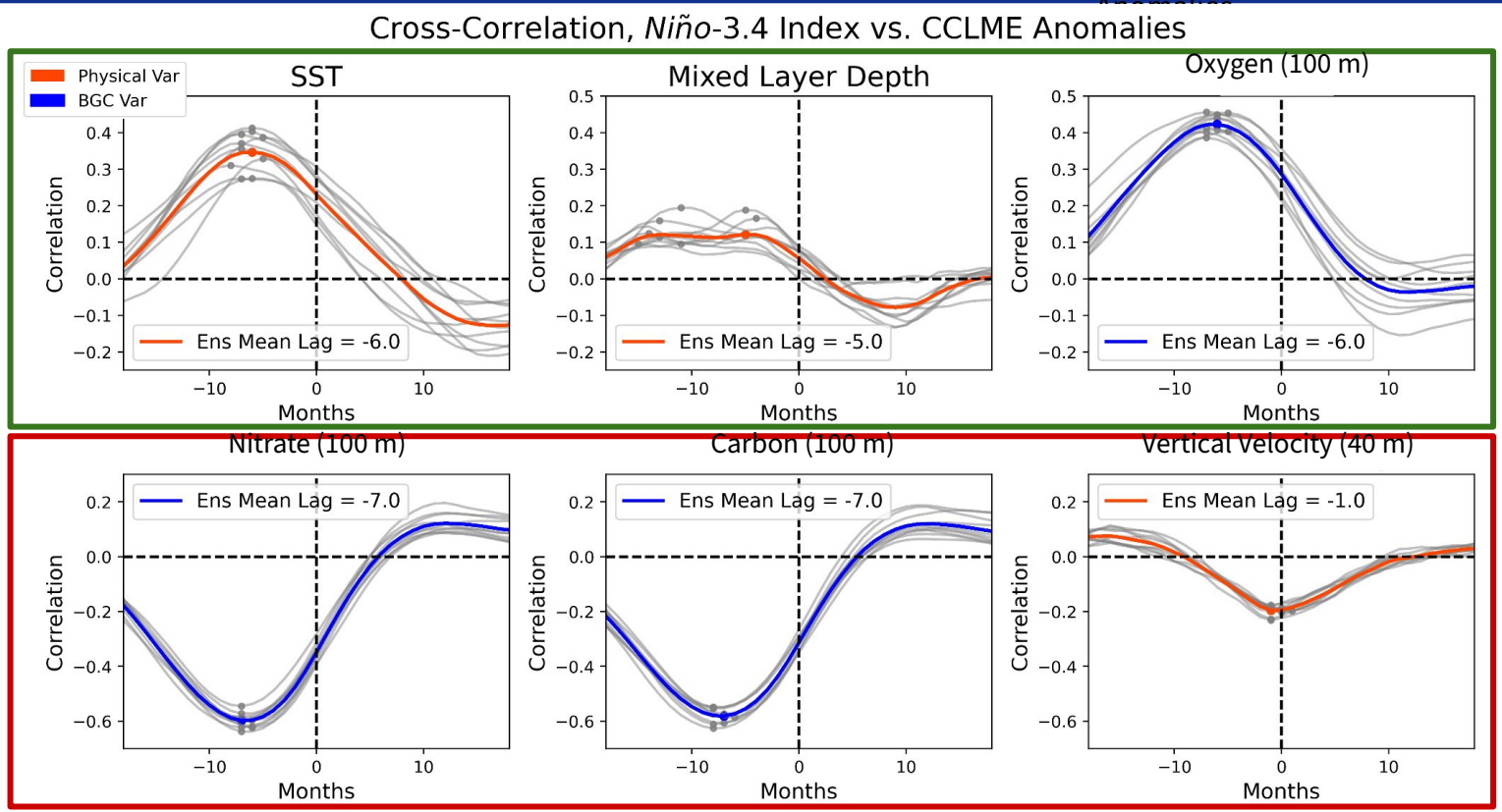
Positive ENSO Correlation



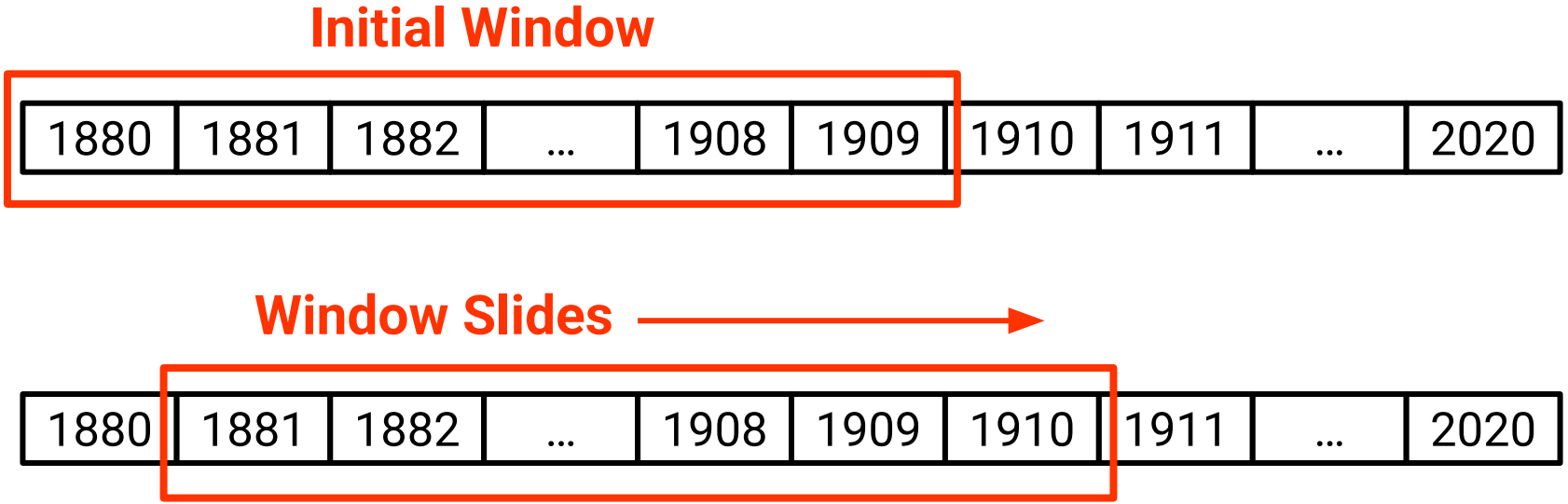
Spread in Lagged Correlation

Positive ENSO Correlation

Negative ENSO Correlation

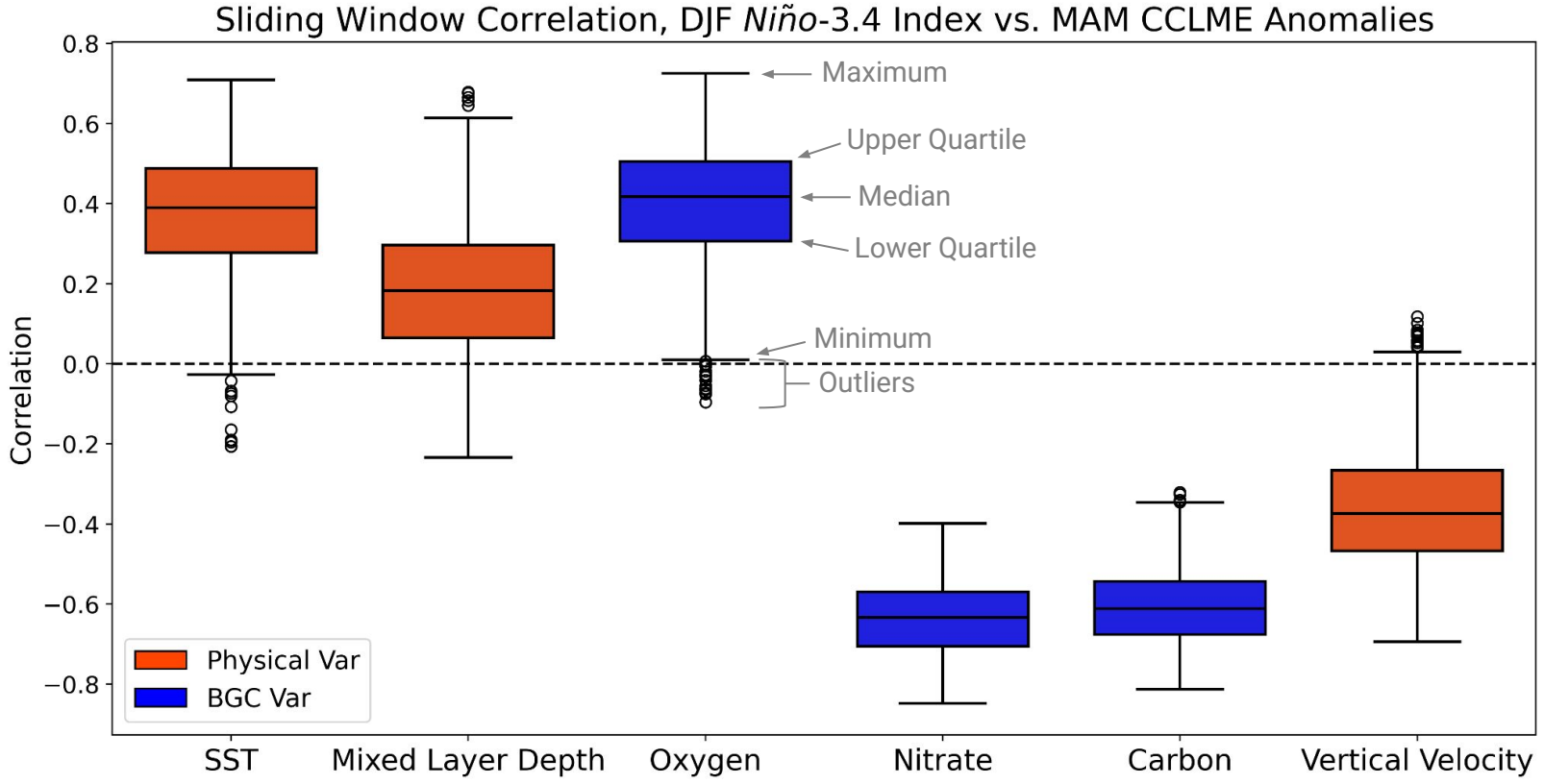


30-Year Sliding Window Resampling

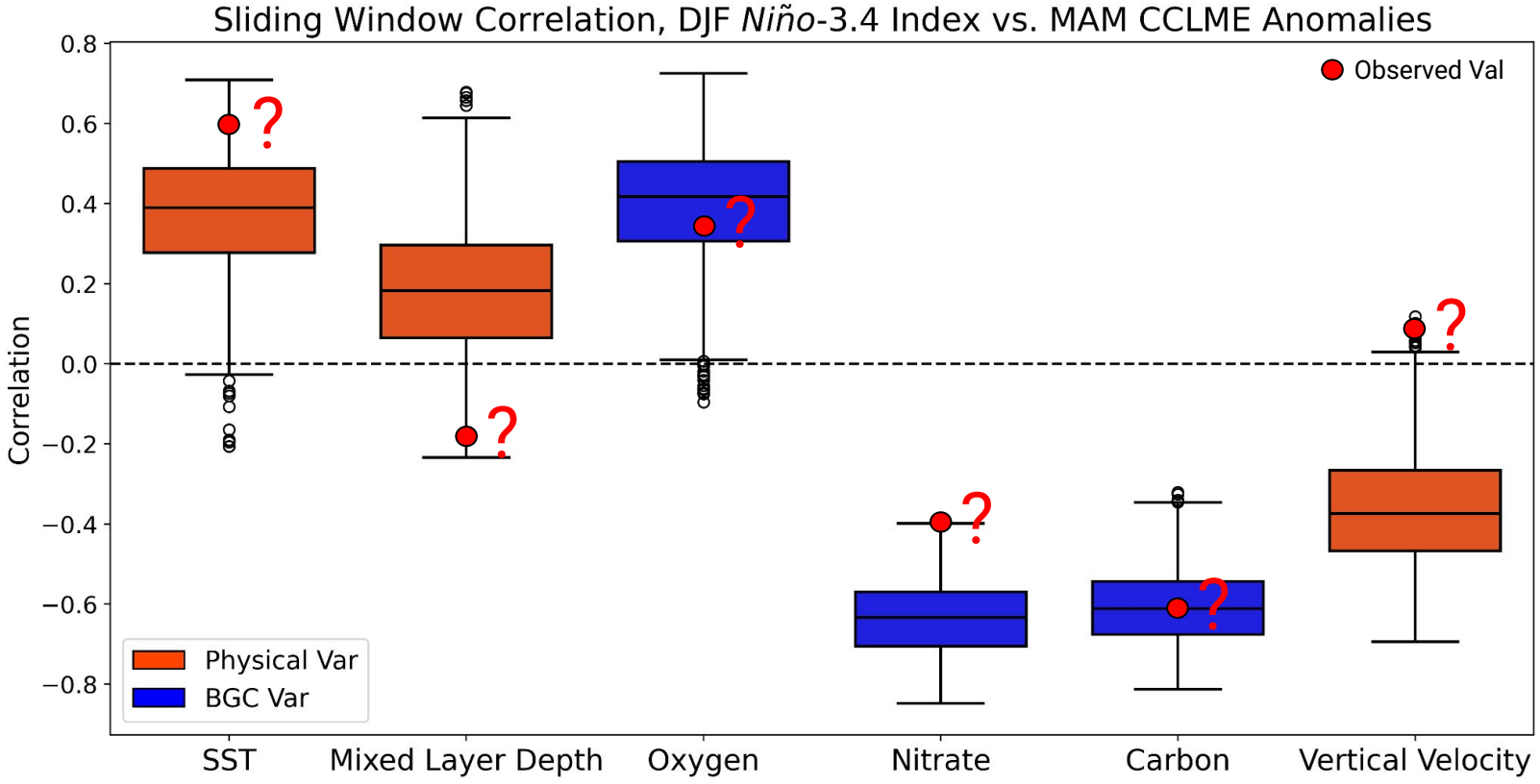


10 correlation values → 1090 correlation values

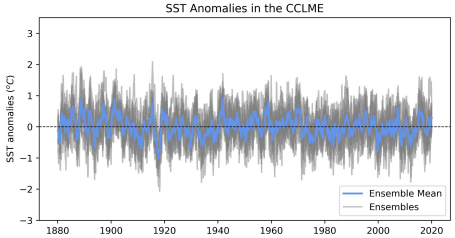
Spread in Possible Correlation Values

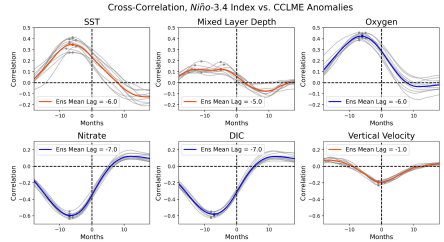


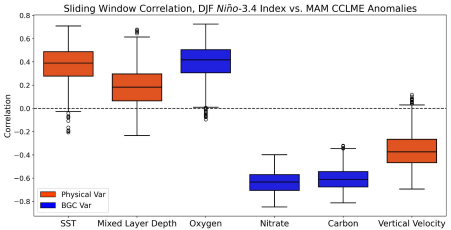
Future Work: Observed Correlation



Summary





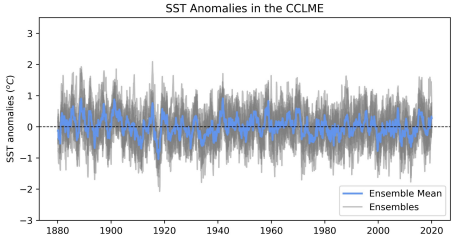


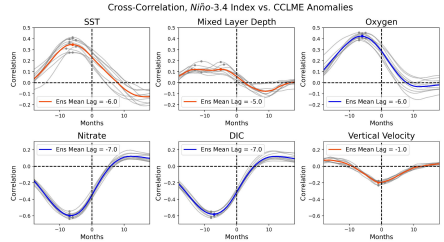
- Pacemaker ensemble members show 10 realizations of the relationship between ENSO and the CCLME
- We quantify the spread in the lag time of ENSO's effect on CCLME variables
- We quantify the spread in the possible correlation between the Niño-3.4 Index and CCLME variables

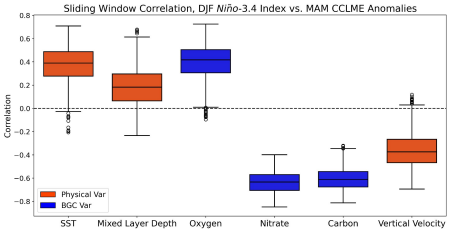
Acknowledgements

- The CESM2 Tropical Pacific Pacemaker Ensemble was created by the NCAR Climate Variability & Change Working Group (CVCWG)
- Funding for this project was provided by the NOAA Ernest F. Hollings Scholarship Program

Summary







- Pacemaker ensemble members show 10 realizations of the relationship between ENSO and the CCLME
- We quantify the spread in the lag time of ENSO's effect on CCLME variables
- We quantify the spread in the possible correlation between the Niño-3.4 Index and CCLME variables