

ENSO impacts on the US West Coast

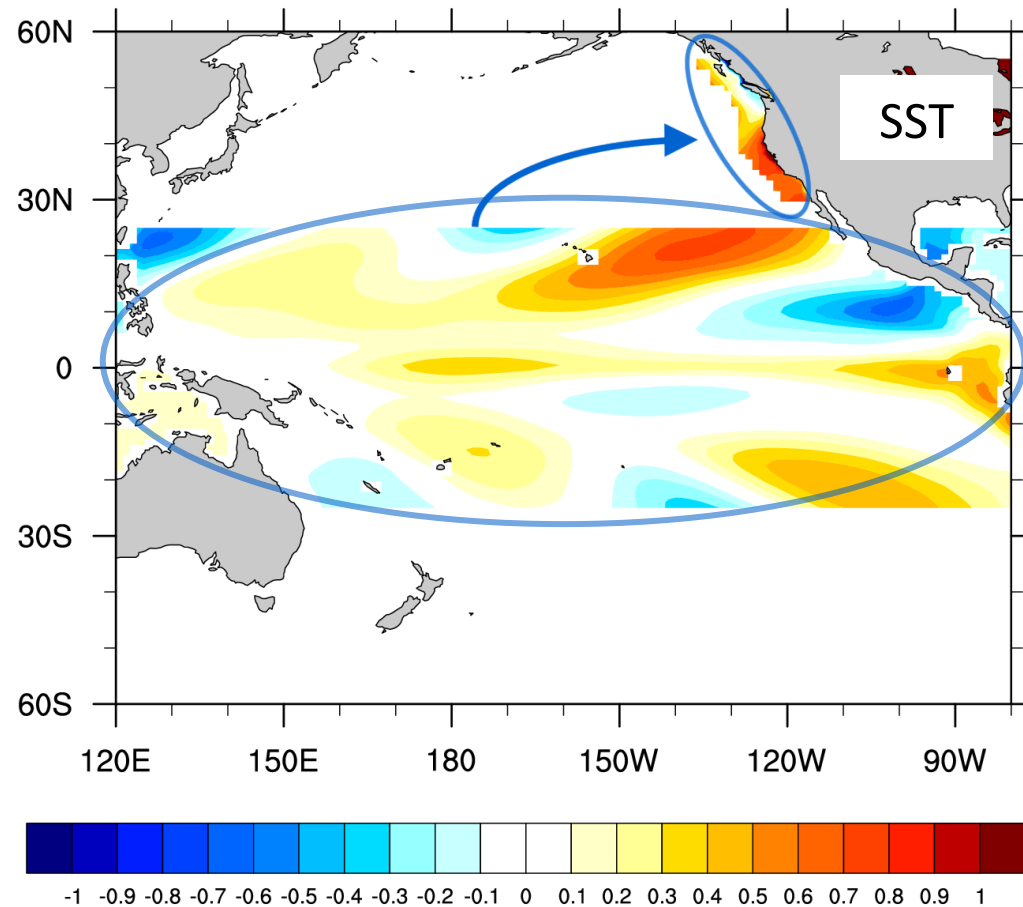
The important role of the Meridional Modes

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- Meridional modes and Pacific Decadal Variability
- Representation of MMs in climate models

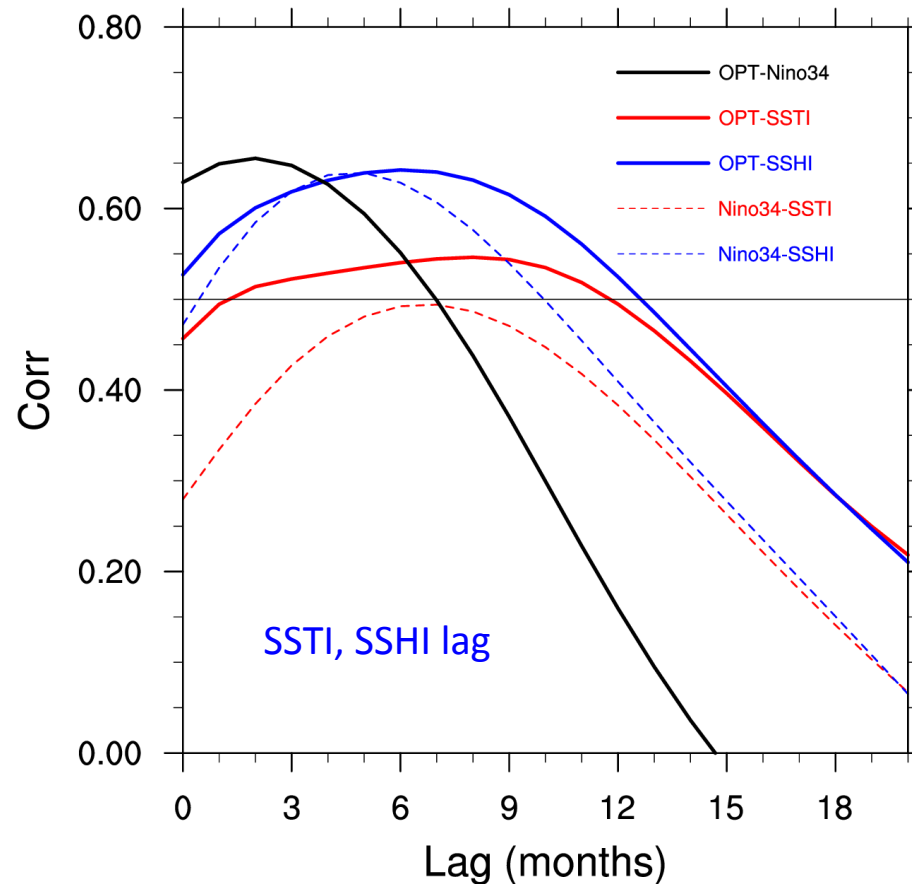
What is the tropical SST pattern that maximizes the SST coastal index at lag $\tau = 10$ months?



The optimal SST pattern does not look like a mature ENSO pattern

It includes structures similar to some of the ENSO precursors

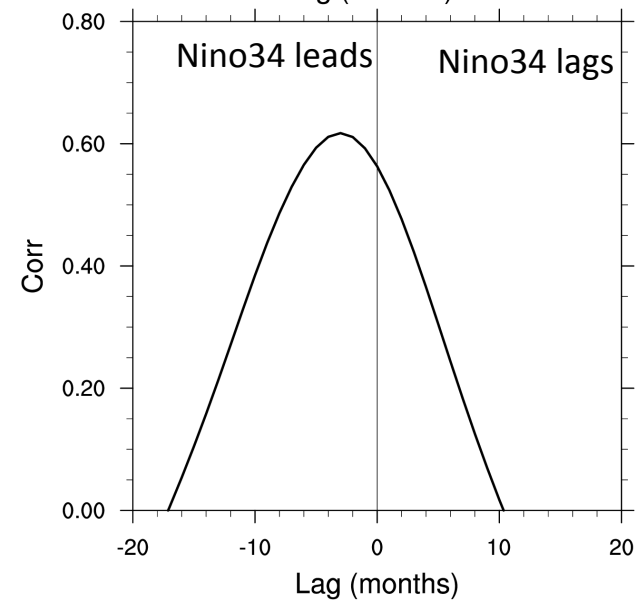
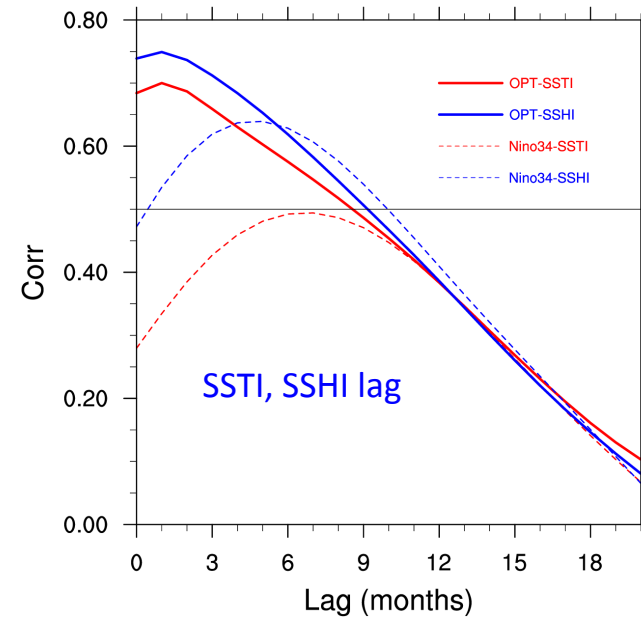
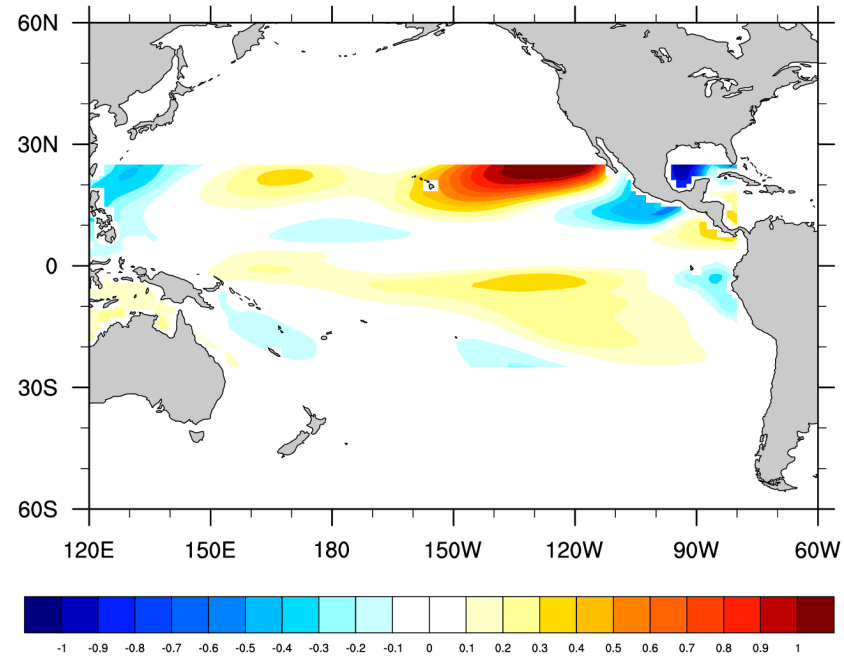
What is the correlation of the Optimal Precursor Index with the coastal indices?



The index OPT associated with the optimal SST pattern has a larger correlation with SSTI and SSHI than the Nino indices at larger lags

OPT leads the Nino34 index by a few months

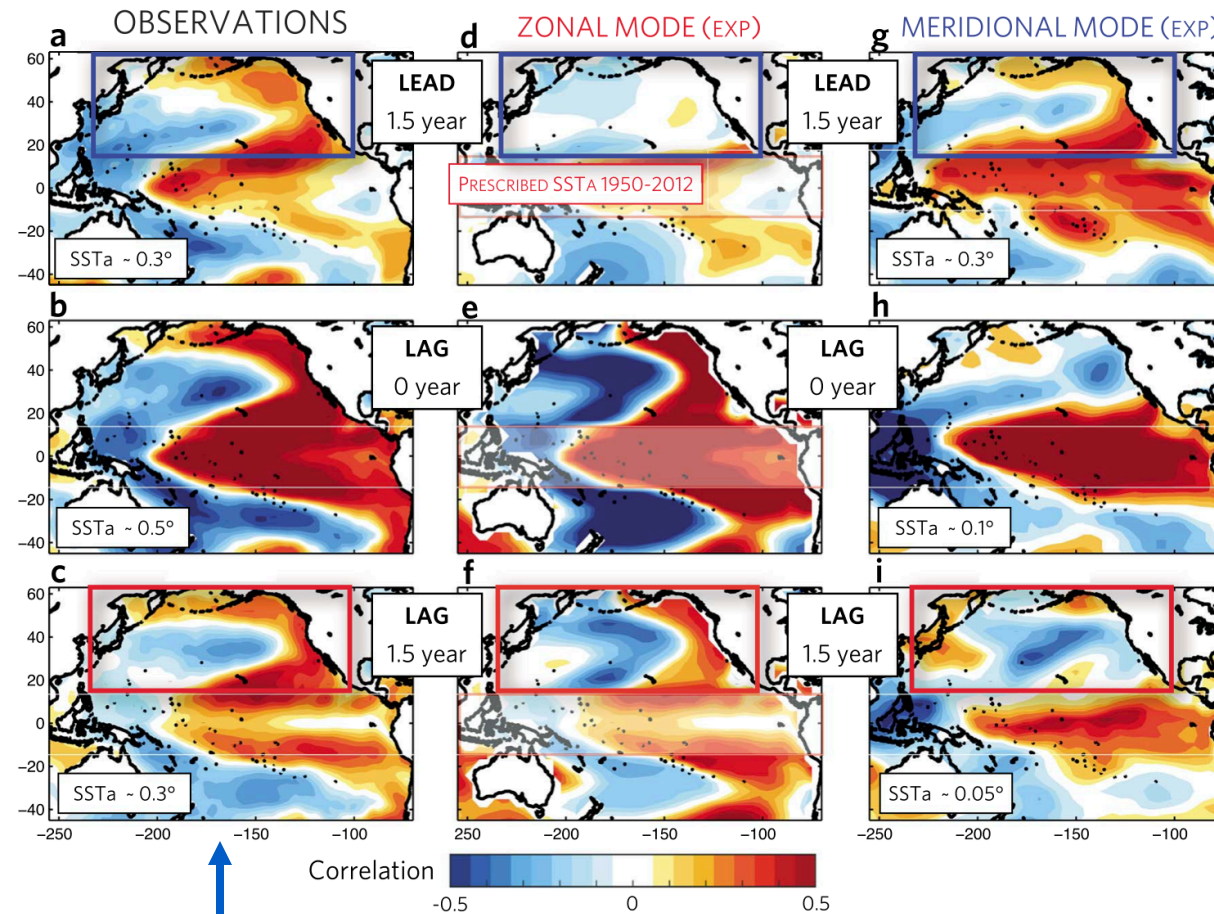
Optimal SST pattern for $\tau = 5$ months



OPT– Nino34
correlation

Meridional Modes play a key role in Pacific decadal variability

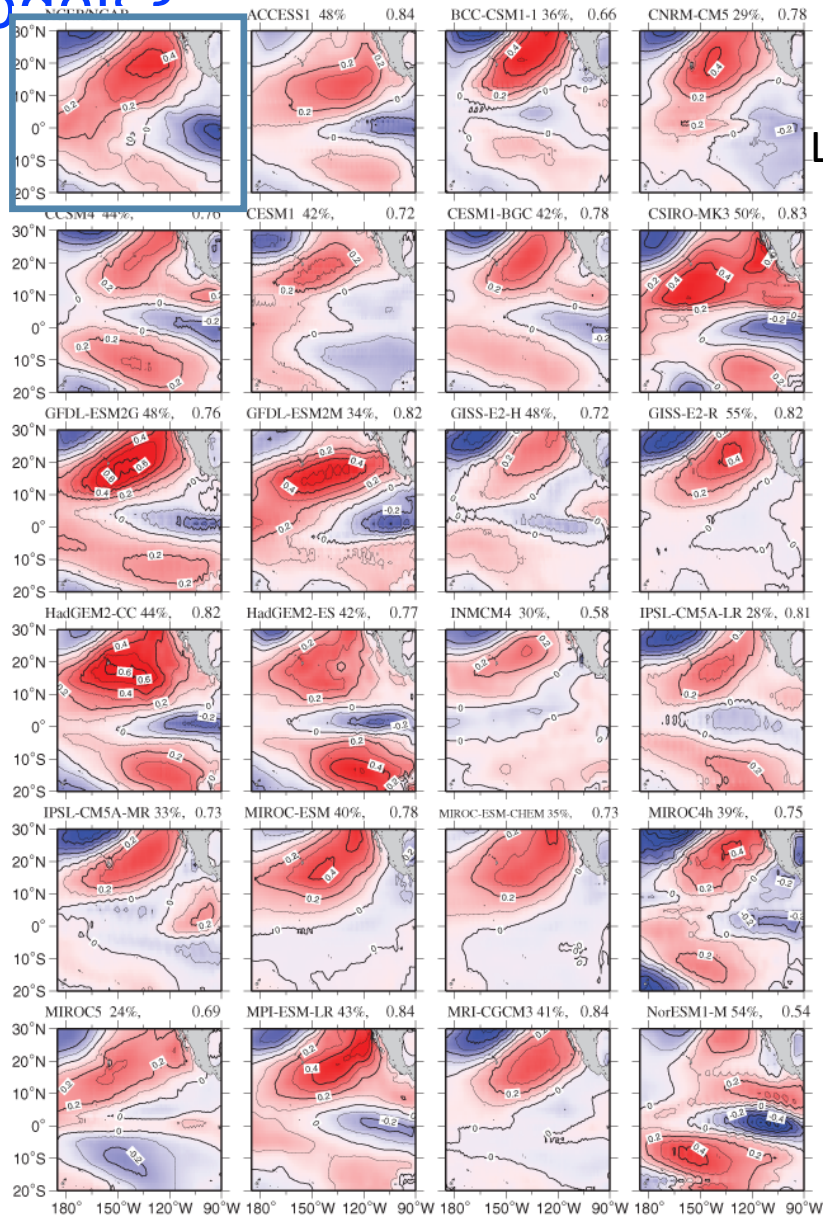
(Di Lorenzo et al. 2015)



Correlation between leading PC of low-pass filter SSTAs (timescales > 8 years) and SSTAs over the entire basin

How are the Meridional Modes represented in climate models?

NCEP/NCAR



Lin et al. 2015

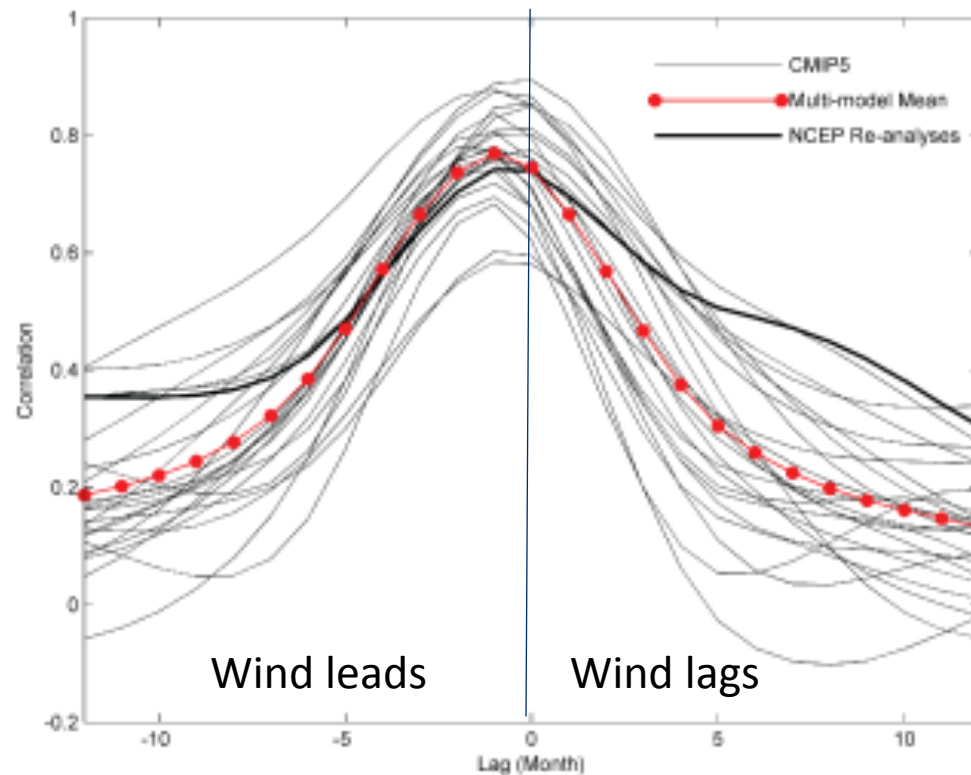
Spatial pattern

Meridional modes are calculated through SVD analysis of the cross-covariance matrix of SST and wind anomalies in 175E-90W and 20S-30N after removing the regression of SST and wind anomalies upon the cold tongue index (Chiang and Vimont 2004).

How are the Meridional Modes represented in climate models?

Coupling strength and persistence

Coupling: Correlation between the wind and SST PCs



Recommendation

To use climate models to look at ENSO impacts along the US west coast and for Pacific decadal variability studies it is very important to understand model biases in the representation of the MMs, and improve that representation.

Different types of El Niño events may have different impacts on the zooplankton communities in the northern California Current System during 1968-2014 (Fisher et al. 2014)

El Niño events are characterized by positive temperature anomalies, decreased upwelling, and zooplankton composition dominated by southern species.

1. Zooplankton communities responded relatively rapidly (lag 0-2 months, peak in Winter) to EP events, but the response was delayed (lag 2-8months, peak in Spring) during CP events
2. The magnitude and duration of the response was proportional to the amplitude and duration of the El Niño event, and phase of the PDO