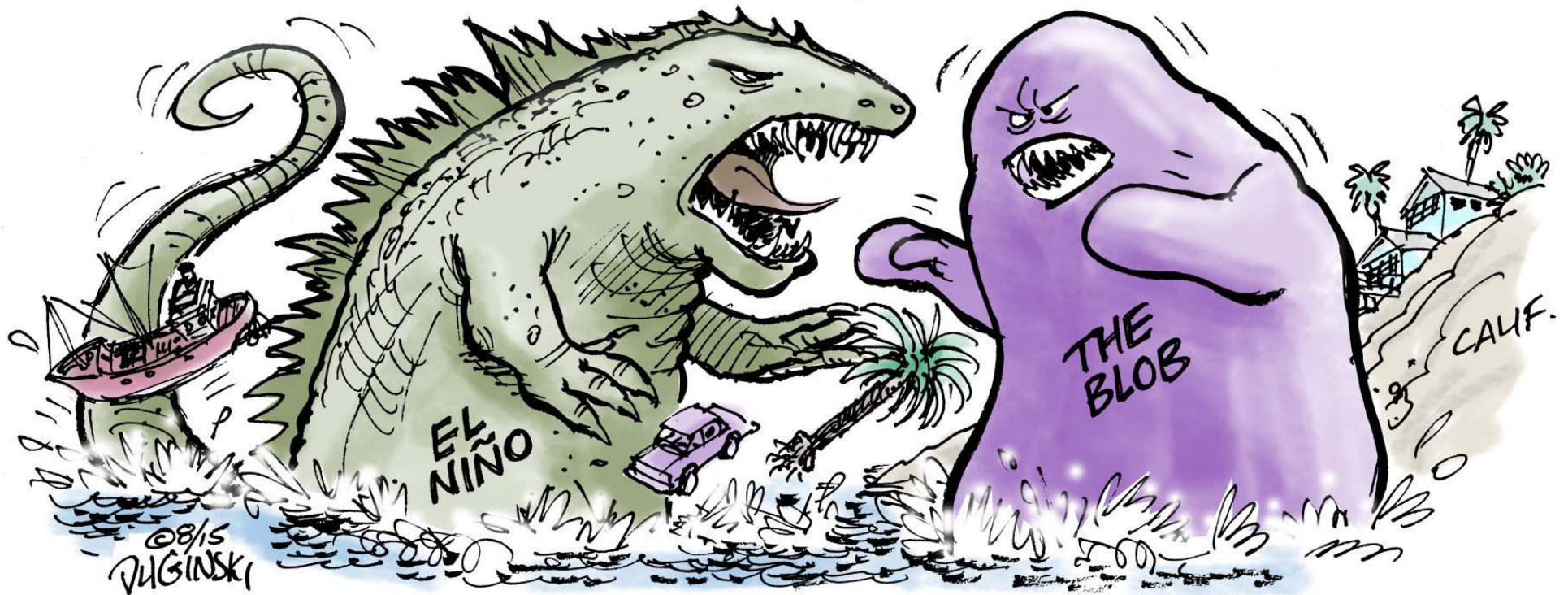


# The North Pacific Atmosphere-Ocean System in Recent Years According to the Media



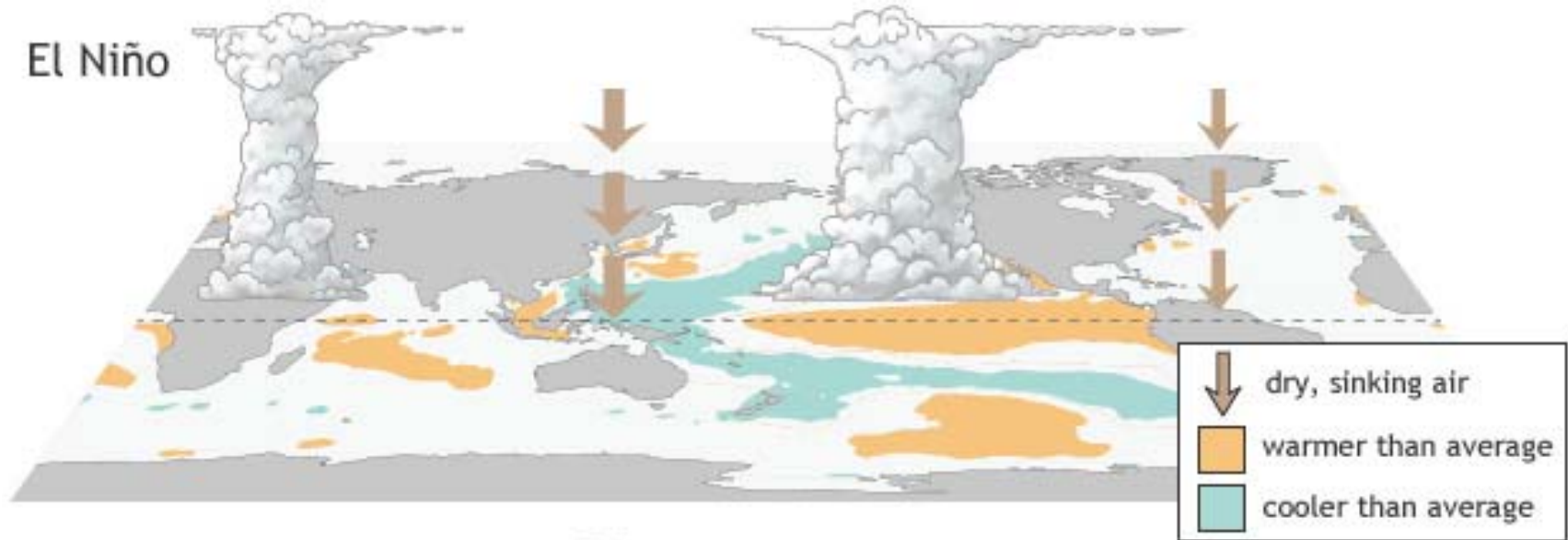
# **The Recent NE Pacific Marine Heat Wave from a Climate Perspective**



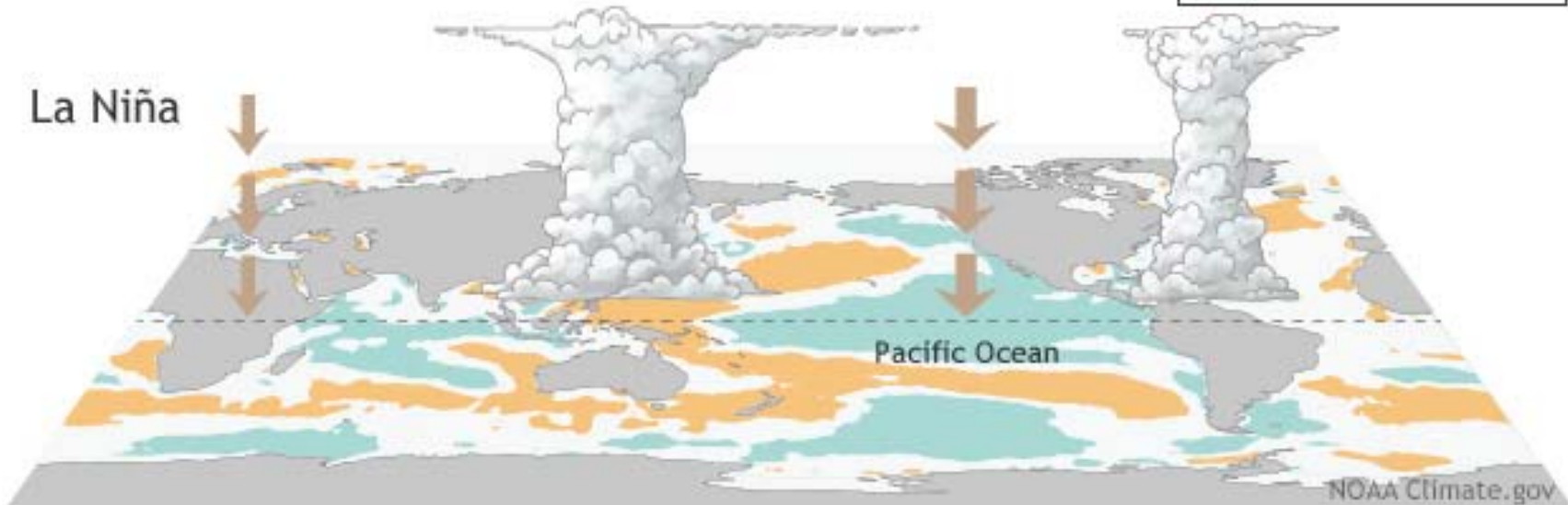
**El Nino, La Nina and the PDO**  
**The 2014-16 Event (aka the Blob)**  
**Climate Change Context**  
**Predictability of the NE Pacific**

## El Niño – Southern Oscillation (ENSO)

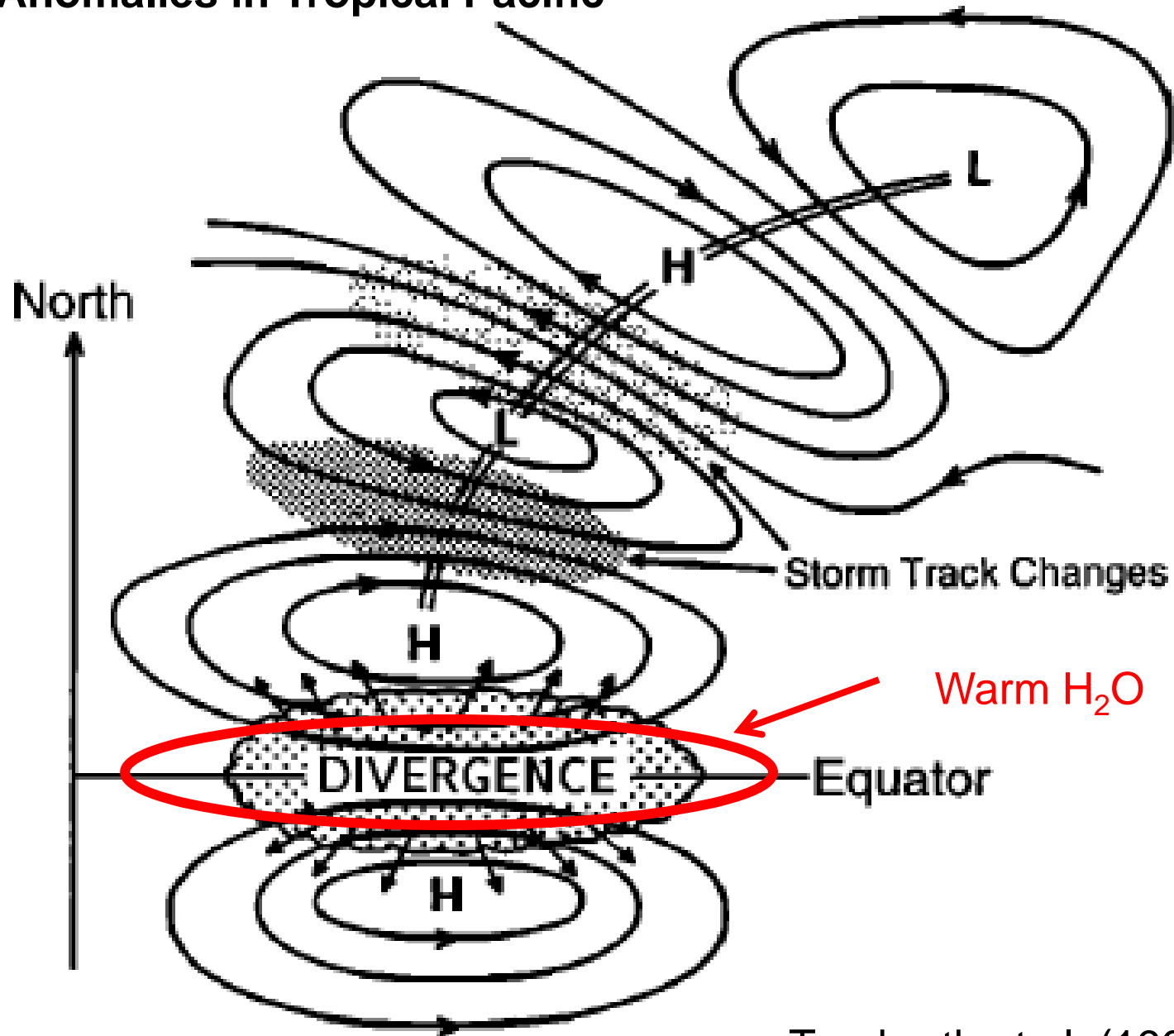
El Niño



La Niña



## Pressure Pattern in Upper Atmosphere with SST Anomalies in Tropical Pacific

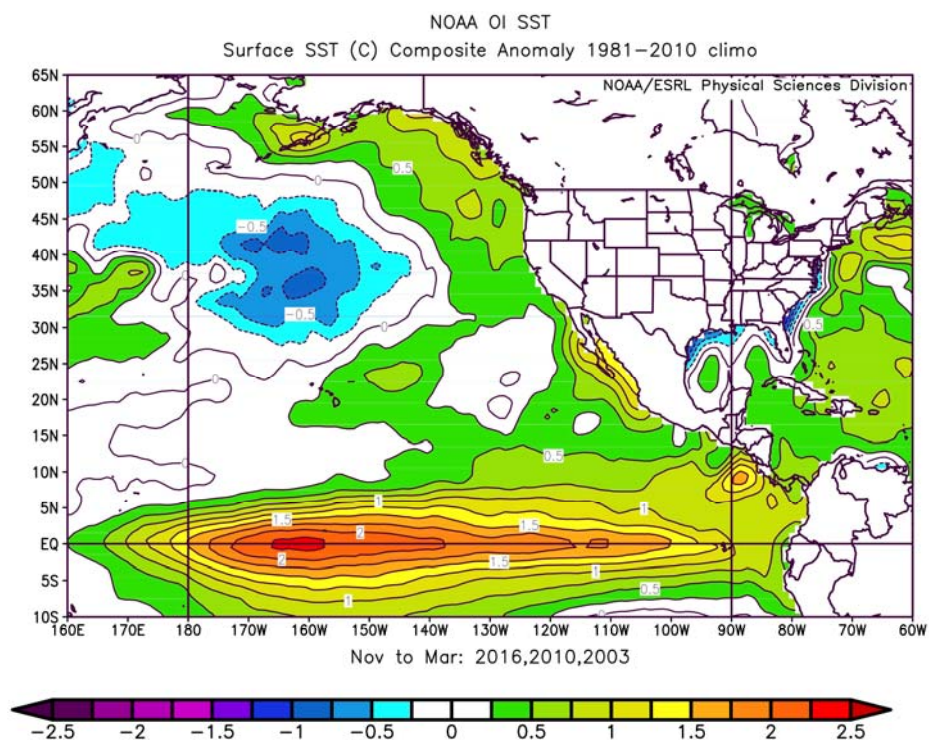


Trenberth et al. (1998)

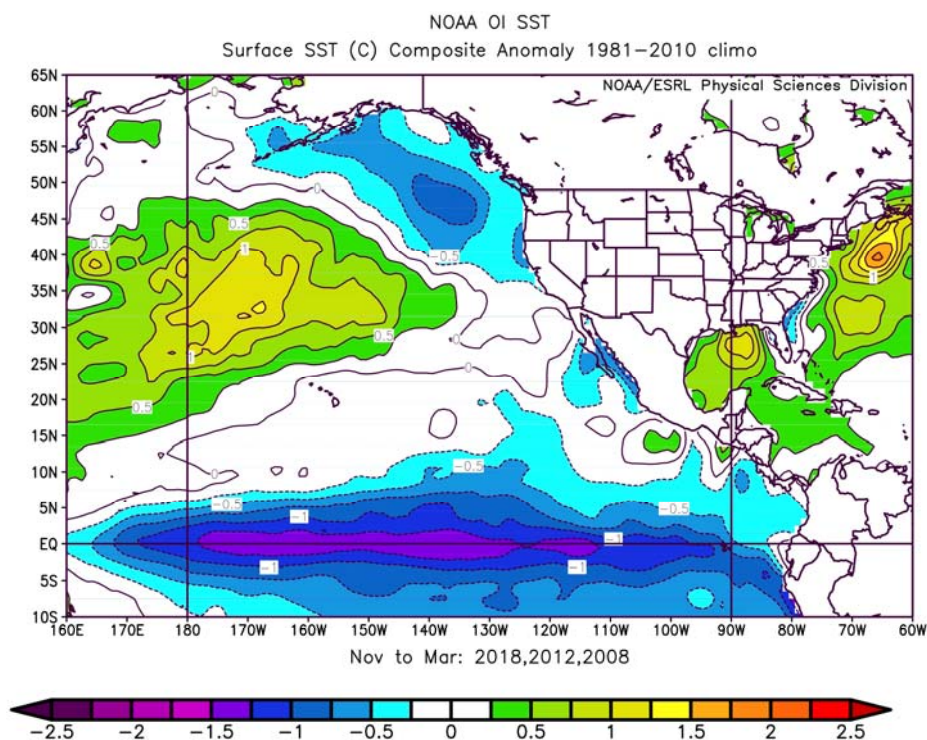


# Composite Sea Surface Temperature Anomalies

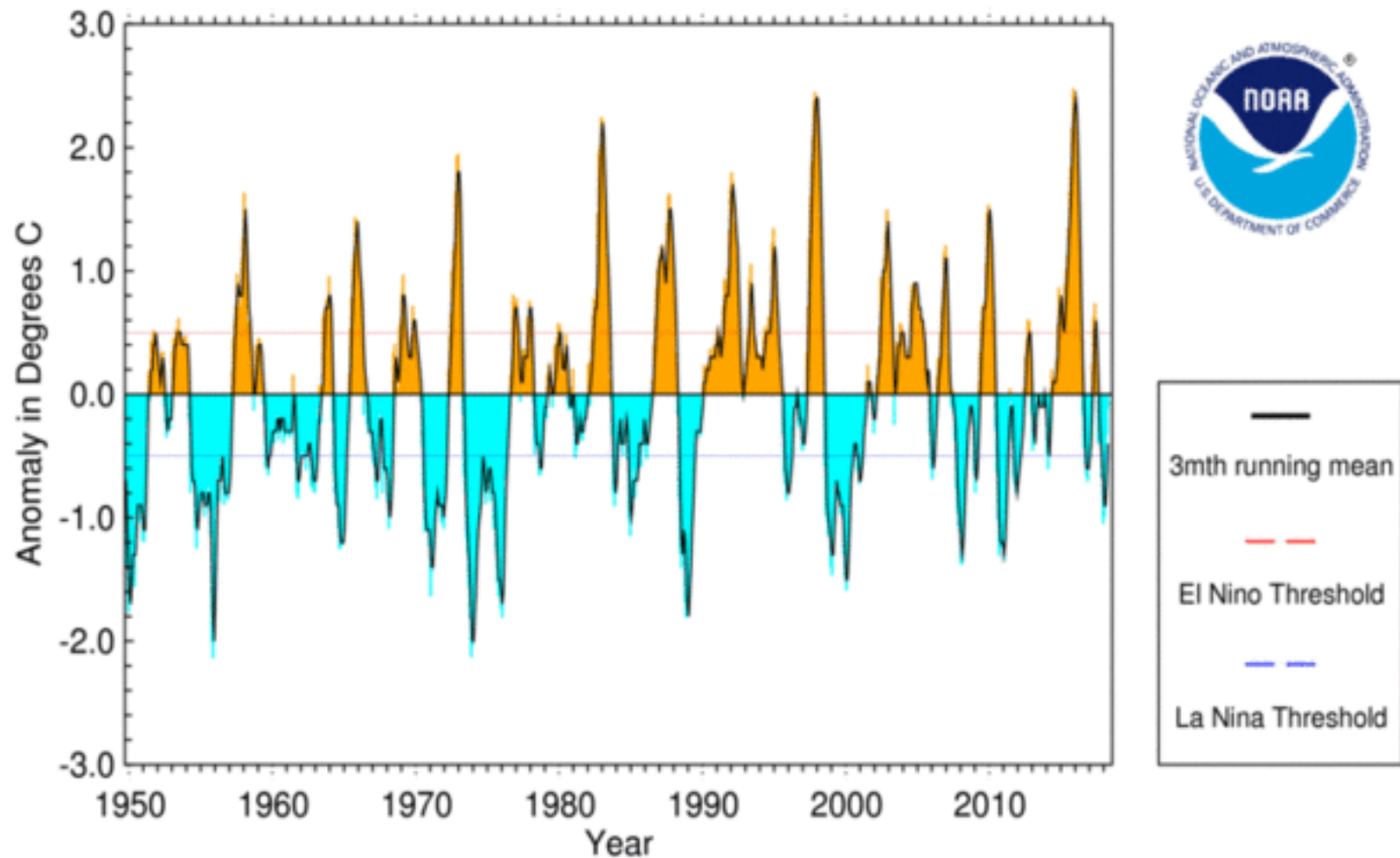
## El Nino (last 3)



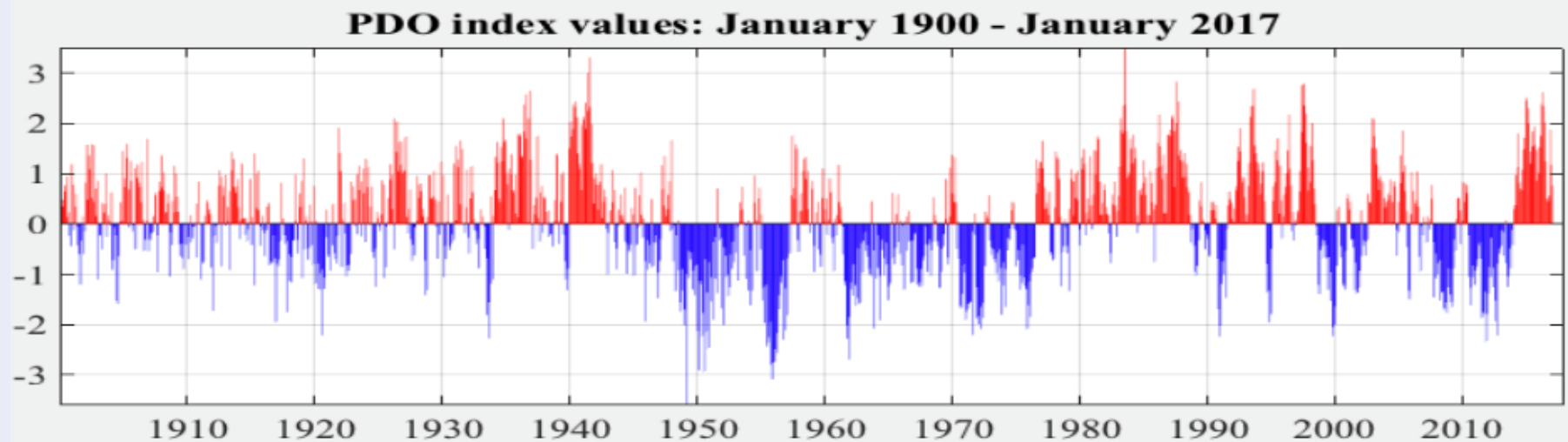
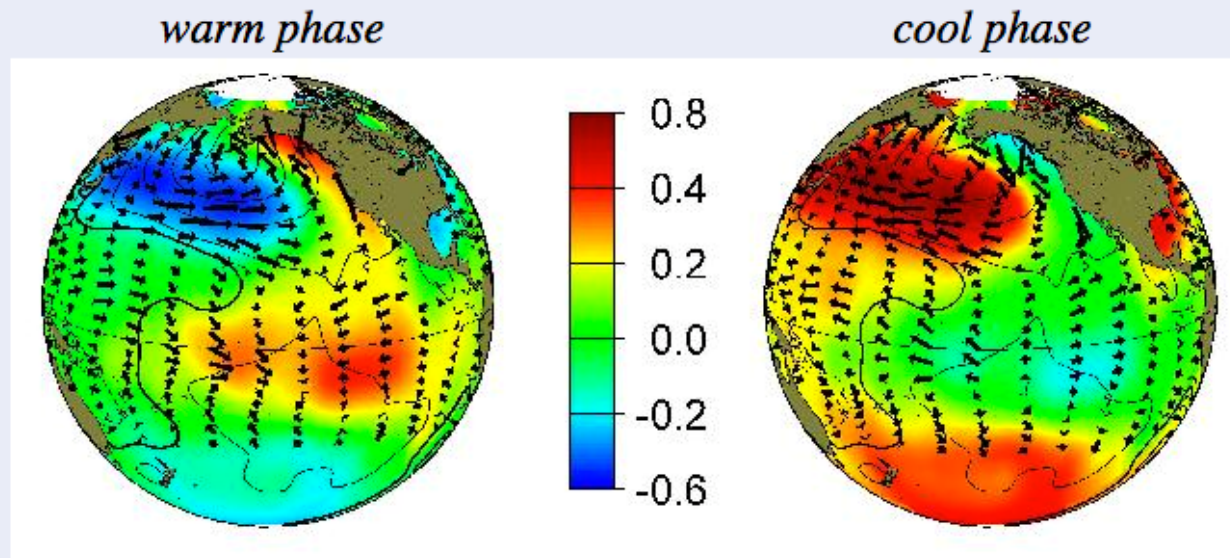
## La Nina (last 3)



## SST Anomaly in Nino 3.4 Region (5N-5S,120-170W)

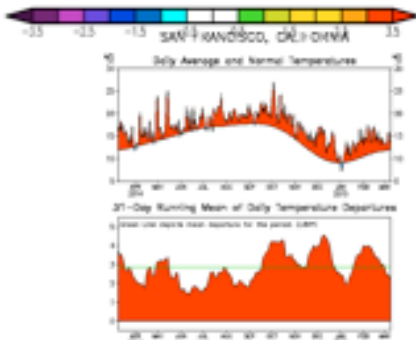
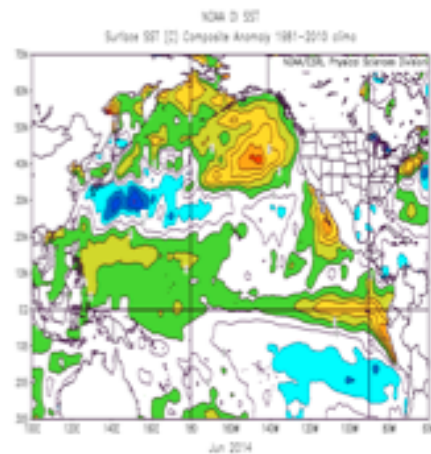


# Pacific Decadal Oscillation (PDO)

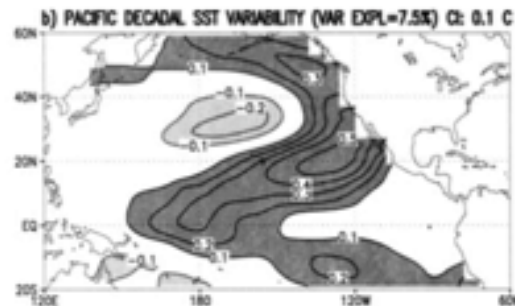
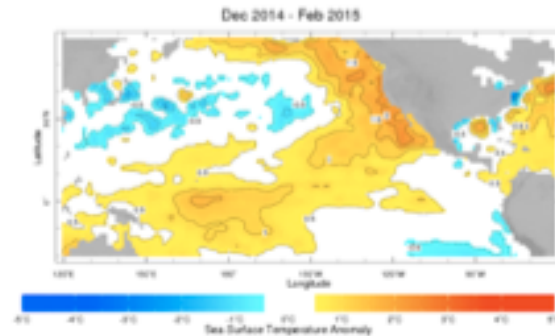




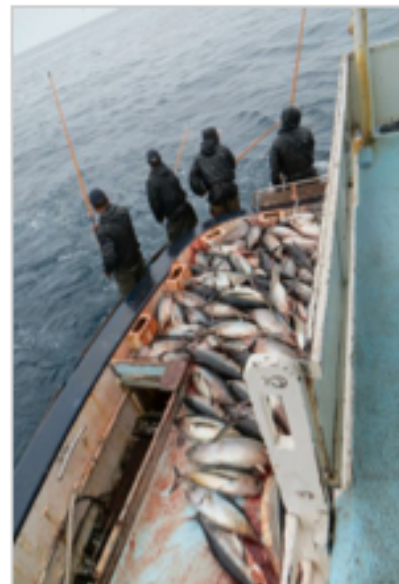
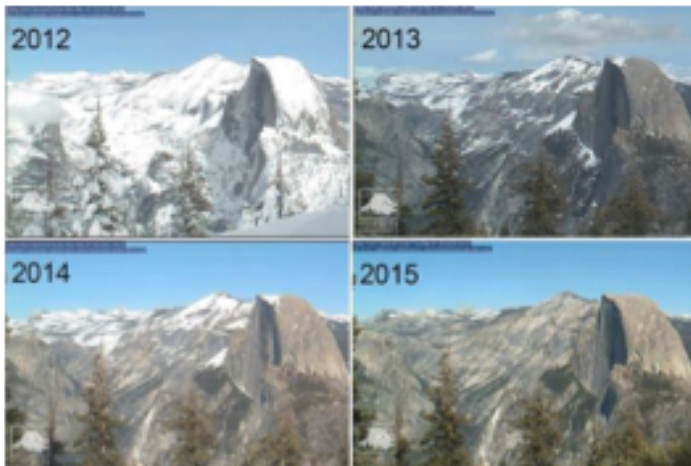
## Historic “warm blob”



What the hell is going on?!  
- Toby Garfield SWFSC

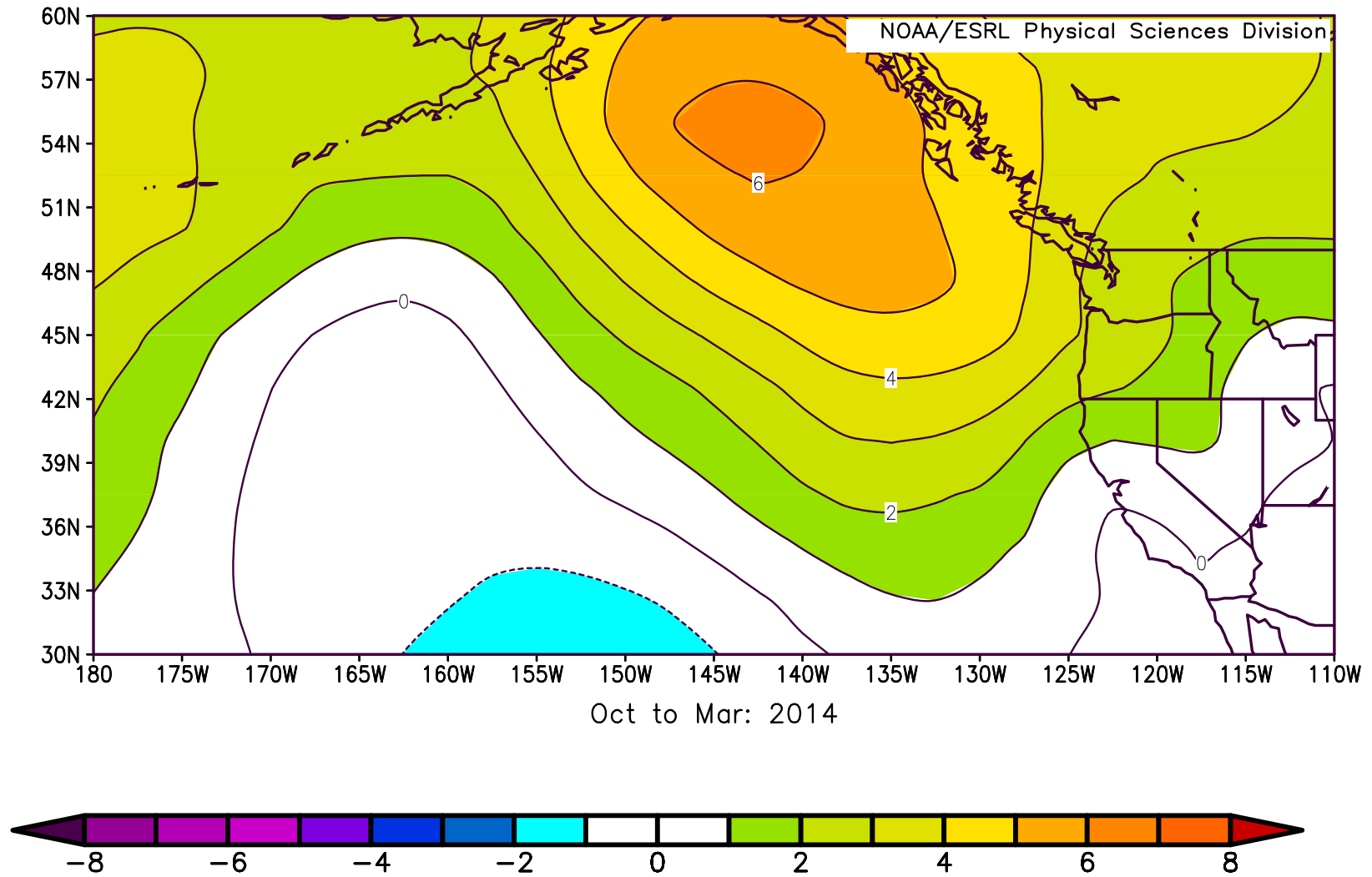


## Historic warmth and low snowpack

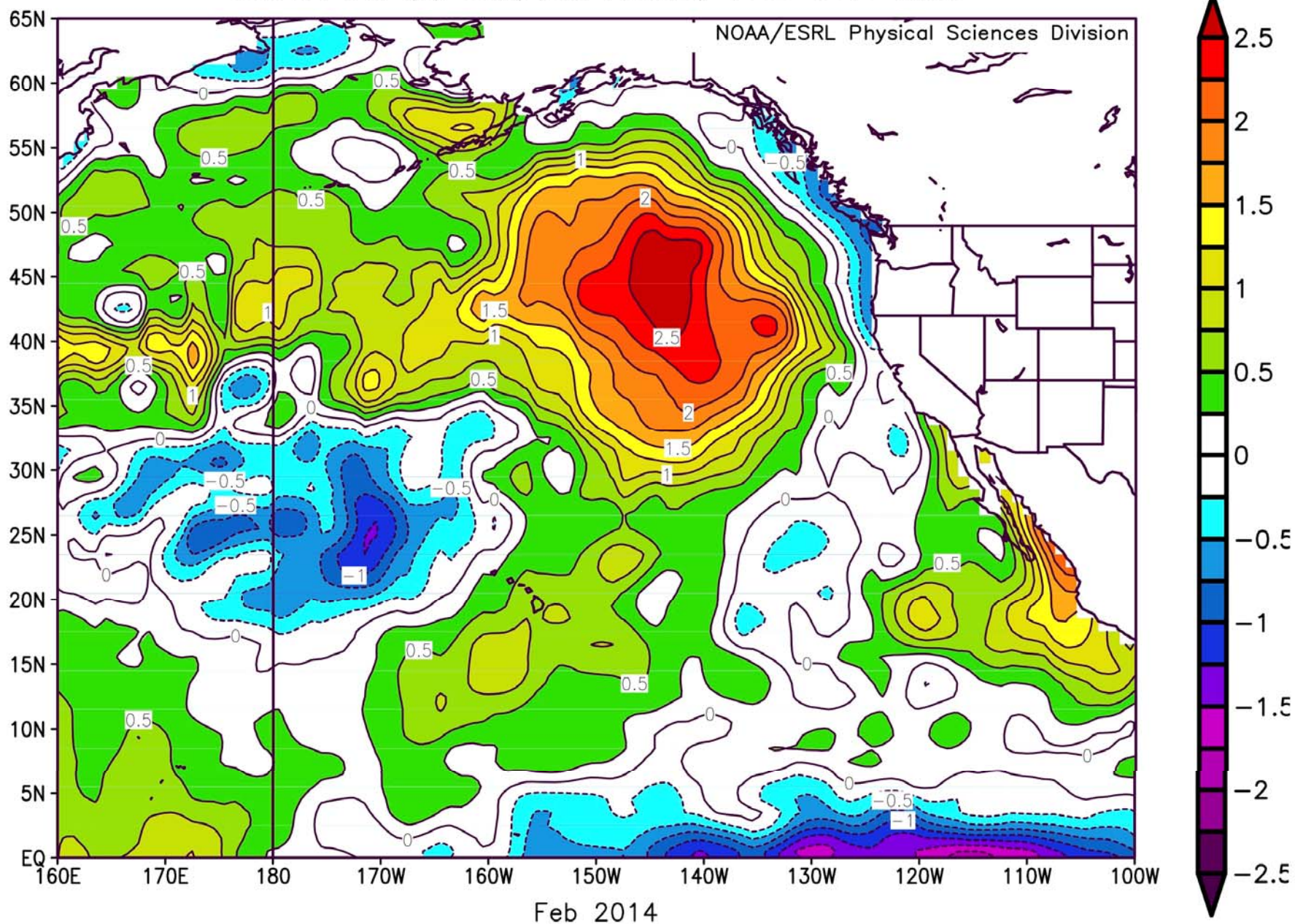




NCEP/NCAR Reanalysis  
Sea Level Pressure (mb) Composite Anomaly 1981–2010 climo

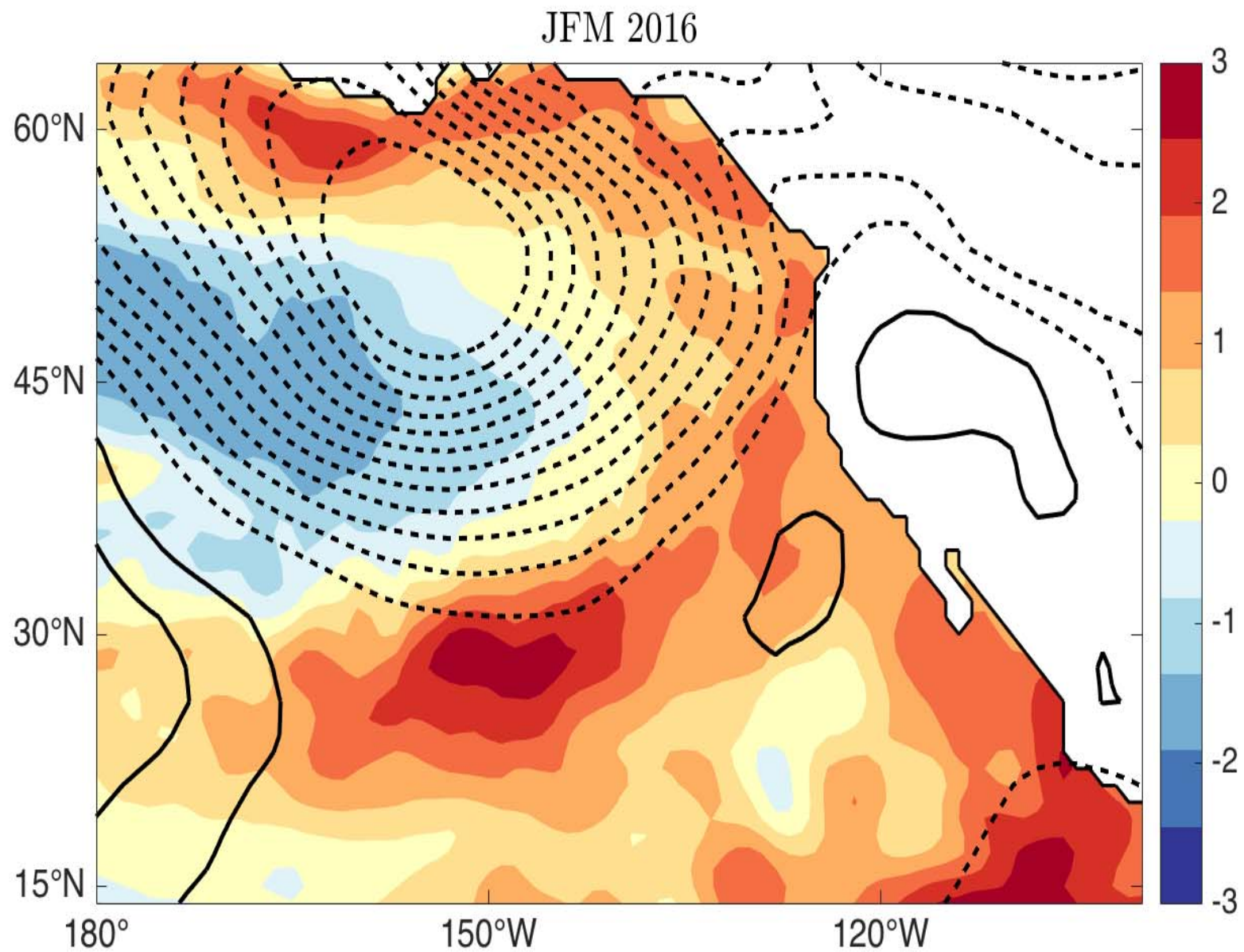


NOAA OI SST  
Surface SST (C) Composite Anomaly 1981–2010 climo





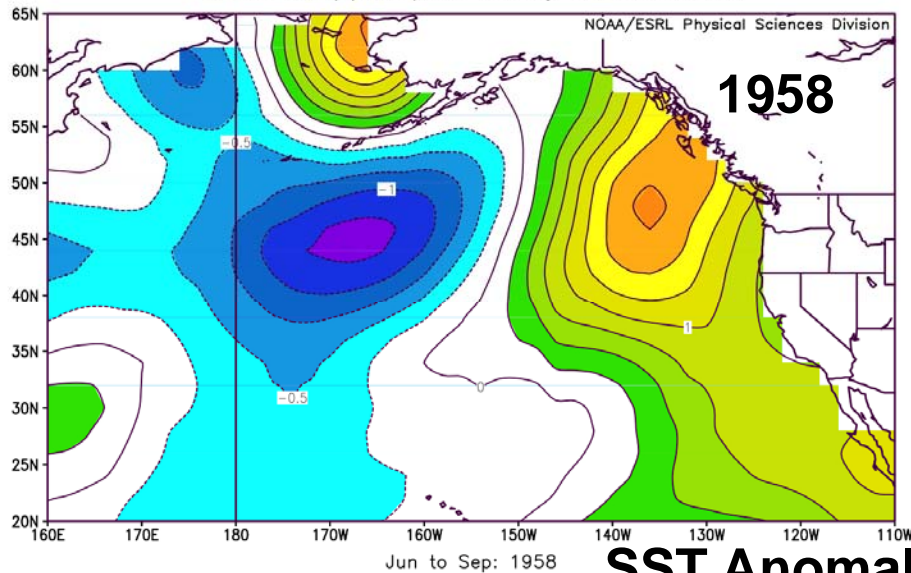
## Early 2016 SLP (contours) and SST (color fill) Anomalies



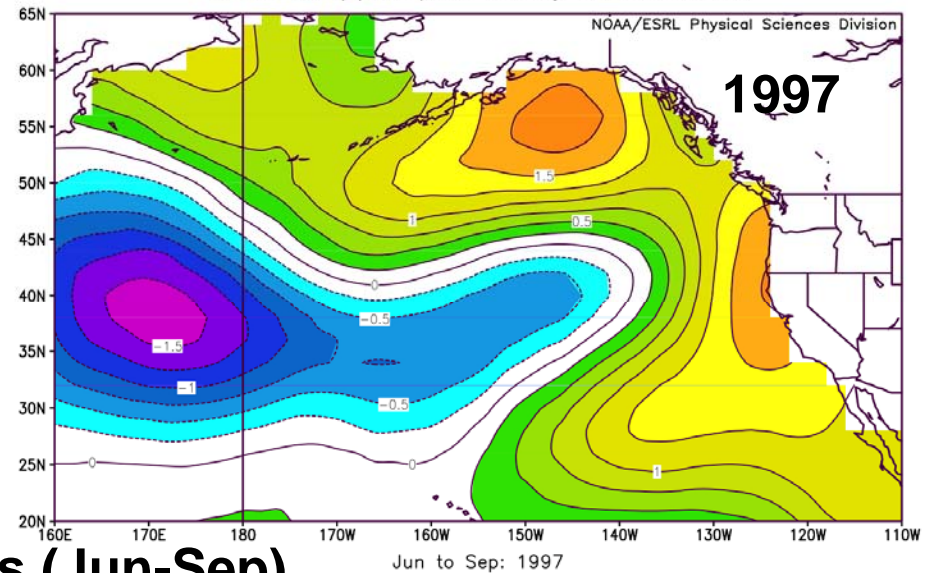


# Is there precedent for the recent warmth in the NEP?

NOAA Extended SST V4 (ERSST)  
Surface SST (C) Composite Anomaly 1981–2010 climo

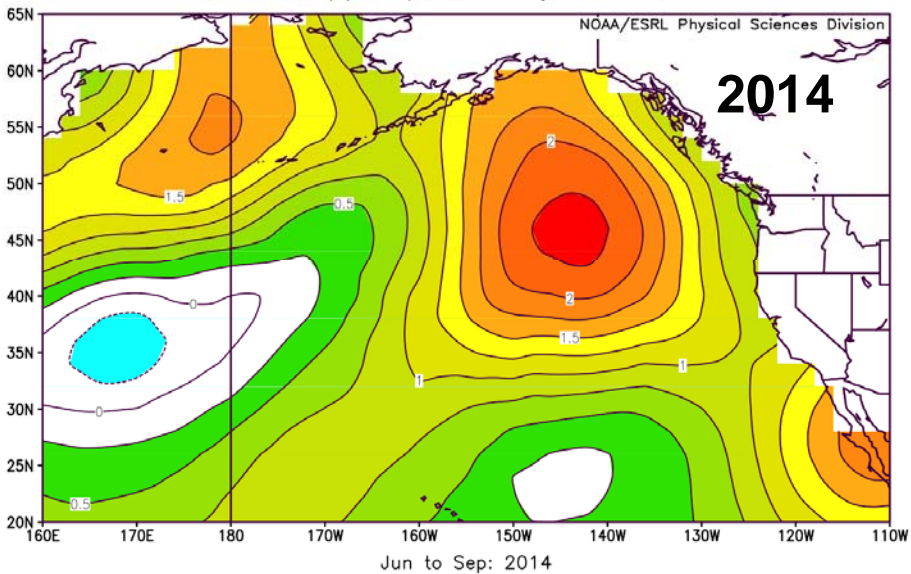


NOAA Extended SST V4 (ERSST)  
Surface SST (C) Composite Anomaly 1981–2010 climo

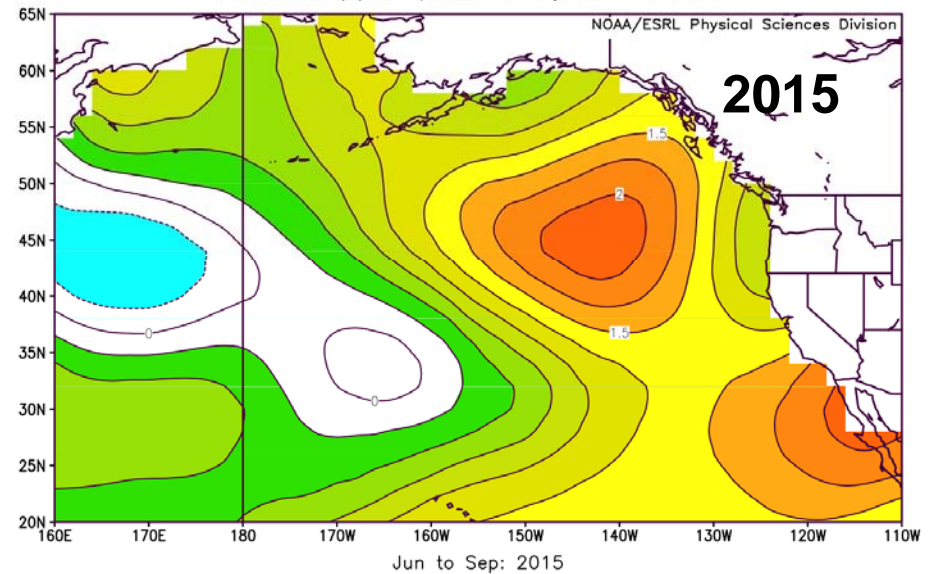


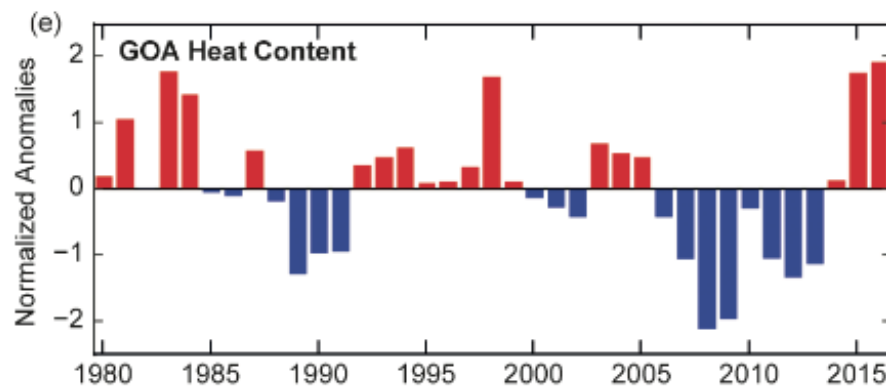
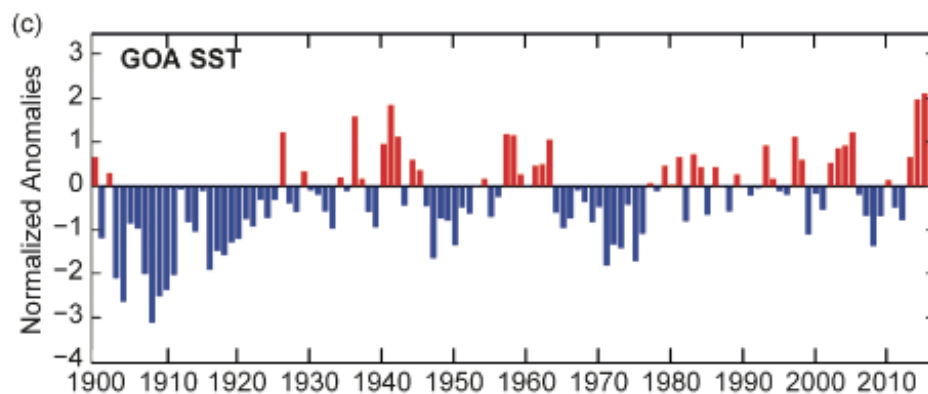
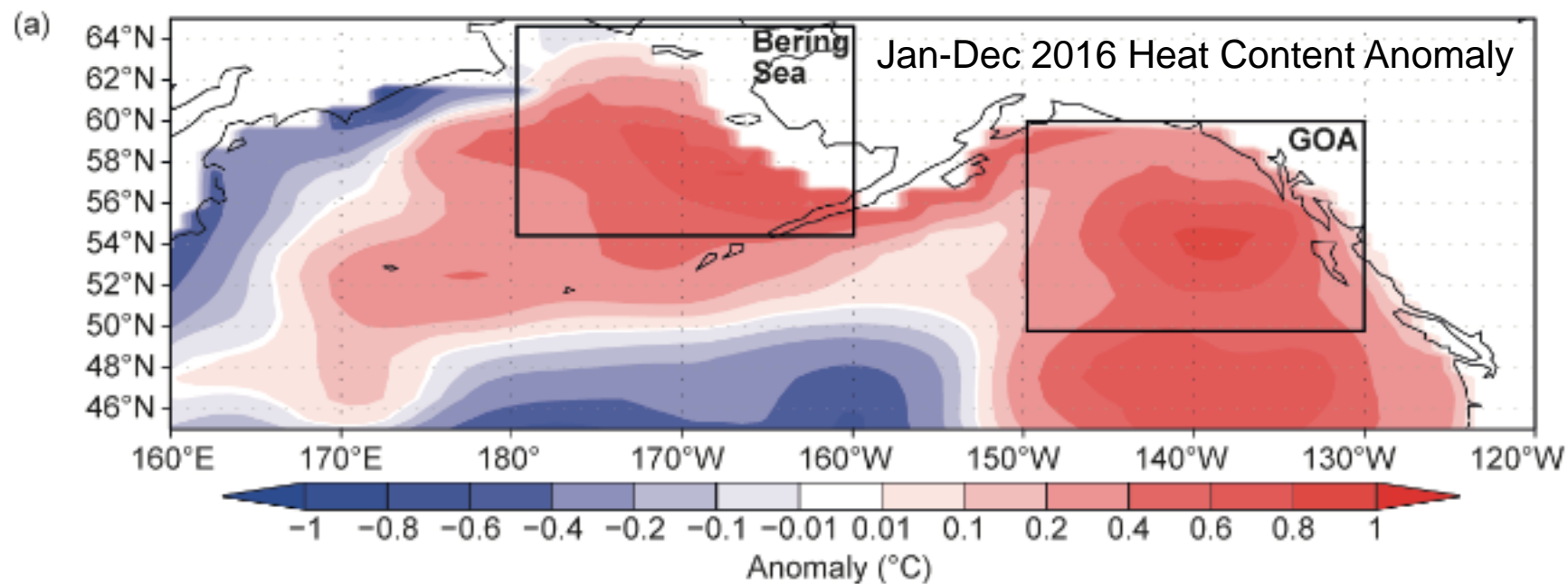
## SST Anomalies (Jun-Sep)

NOAA Extended SST V4 (ERSST)  
Surface SST (C) Composite Anomaly 1981–2010 climo



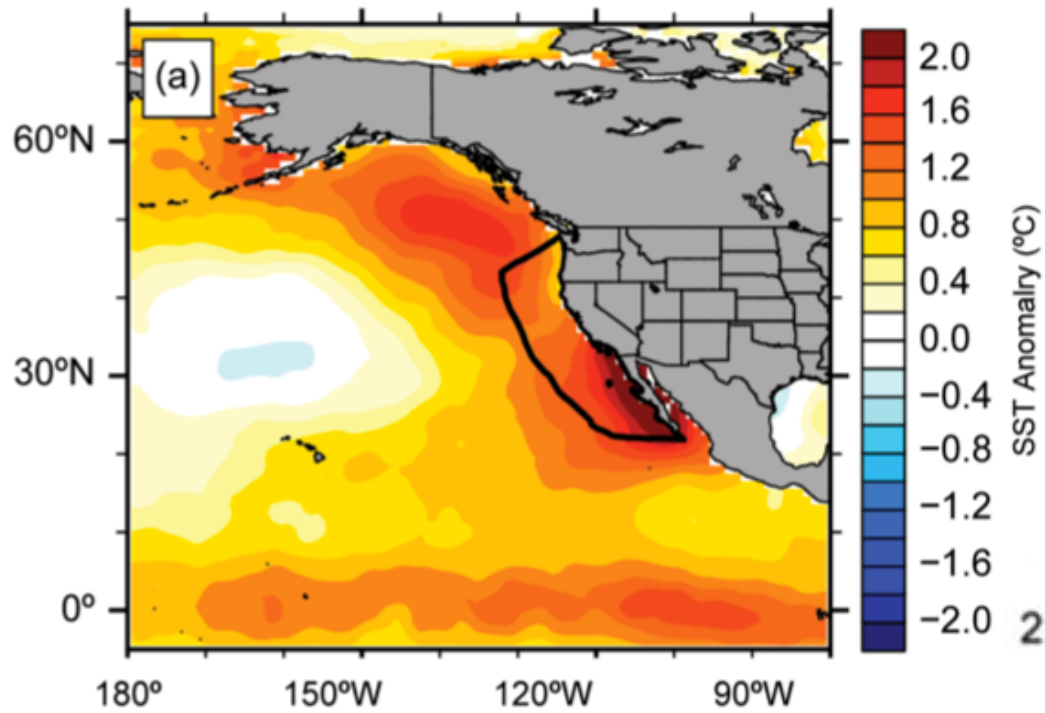
NOAA Extended SST V4 (ERSST)  
Surface SST (C) Composite Anomaly 1981–2010 climo



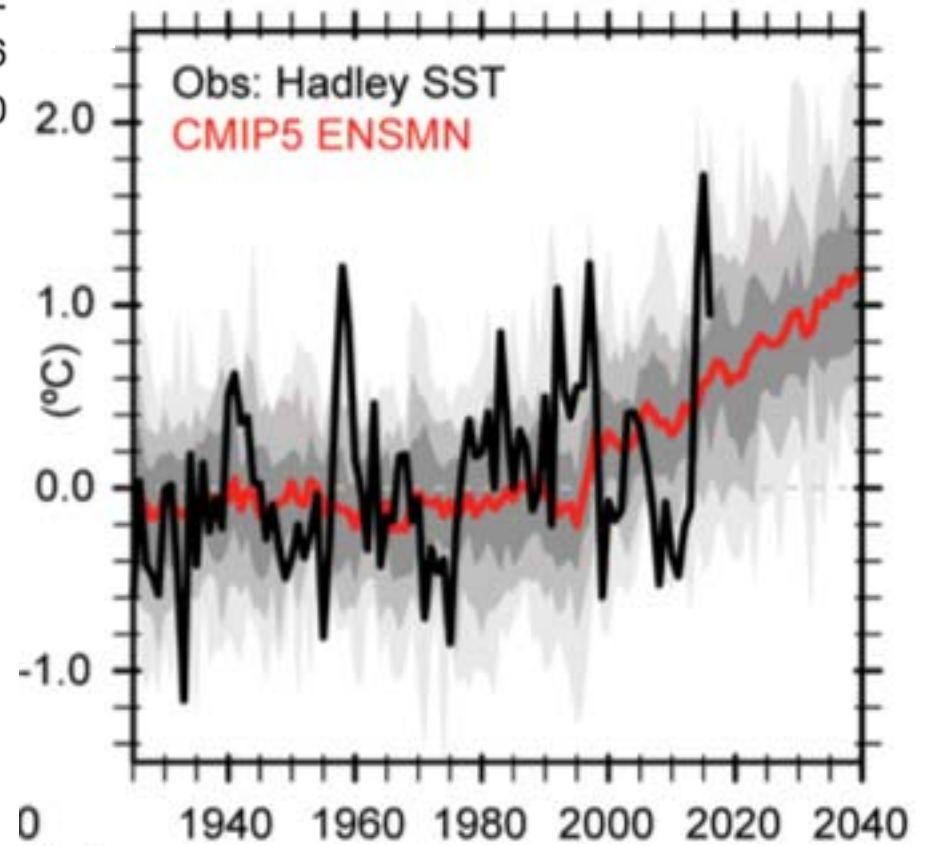


Walsh et al. (2018)

Jacox et al. (2018)

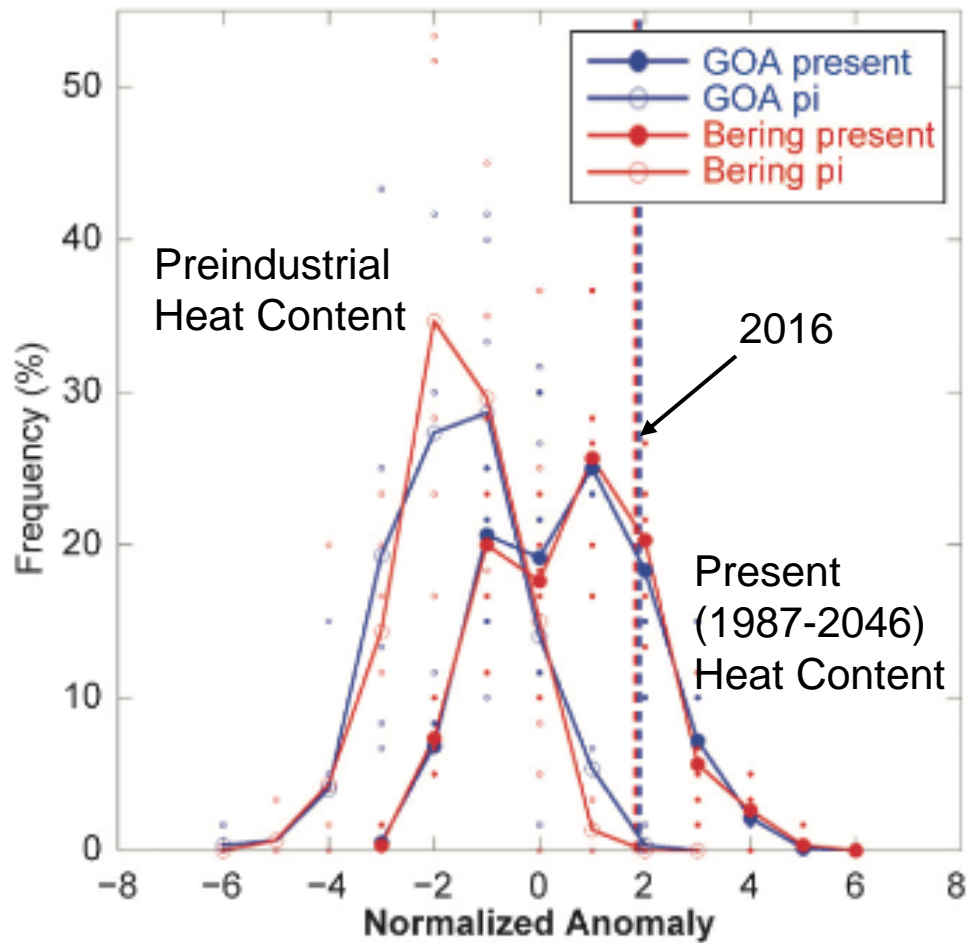


2014-16 SST Anomaly

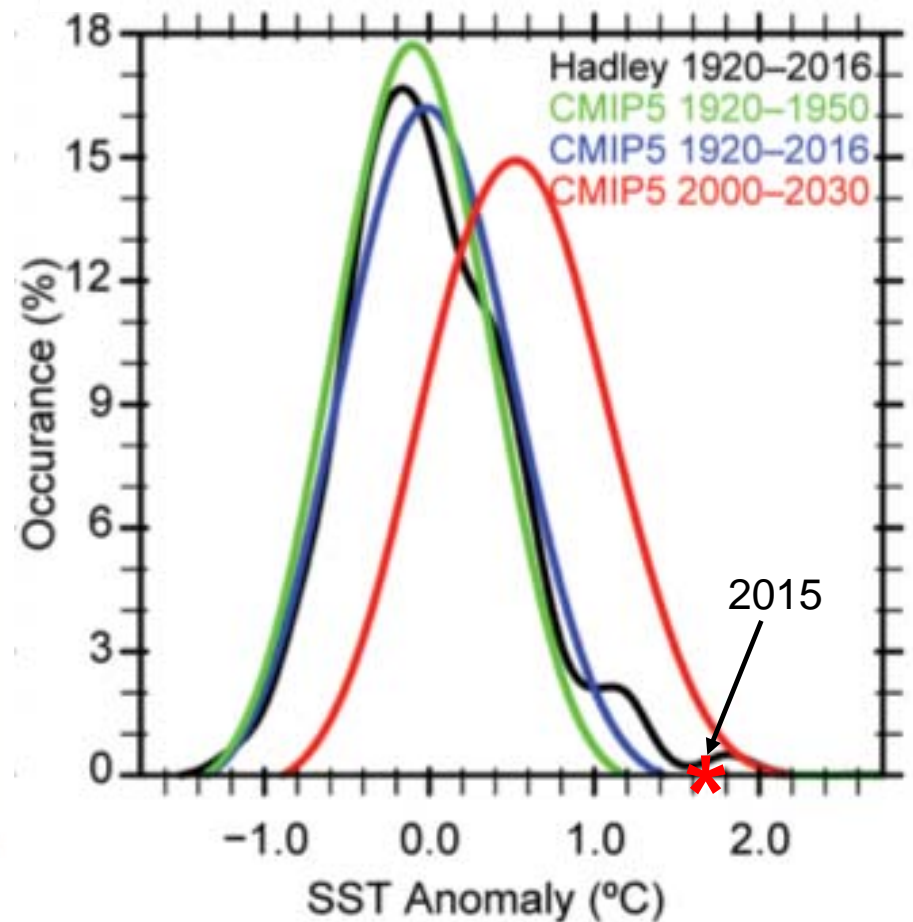




## Modeled Changes in the Frequency Distribution of Mean Annual Thermal Anomalies

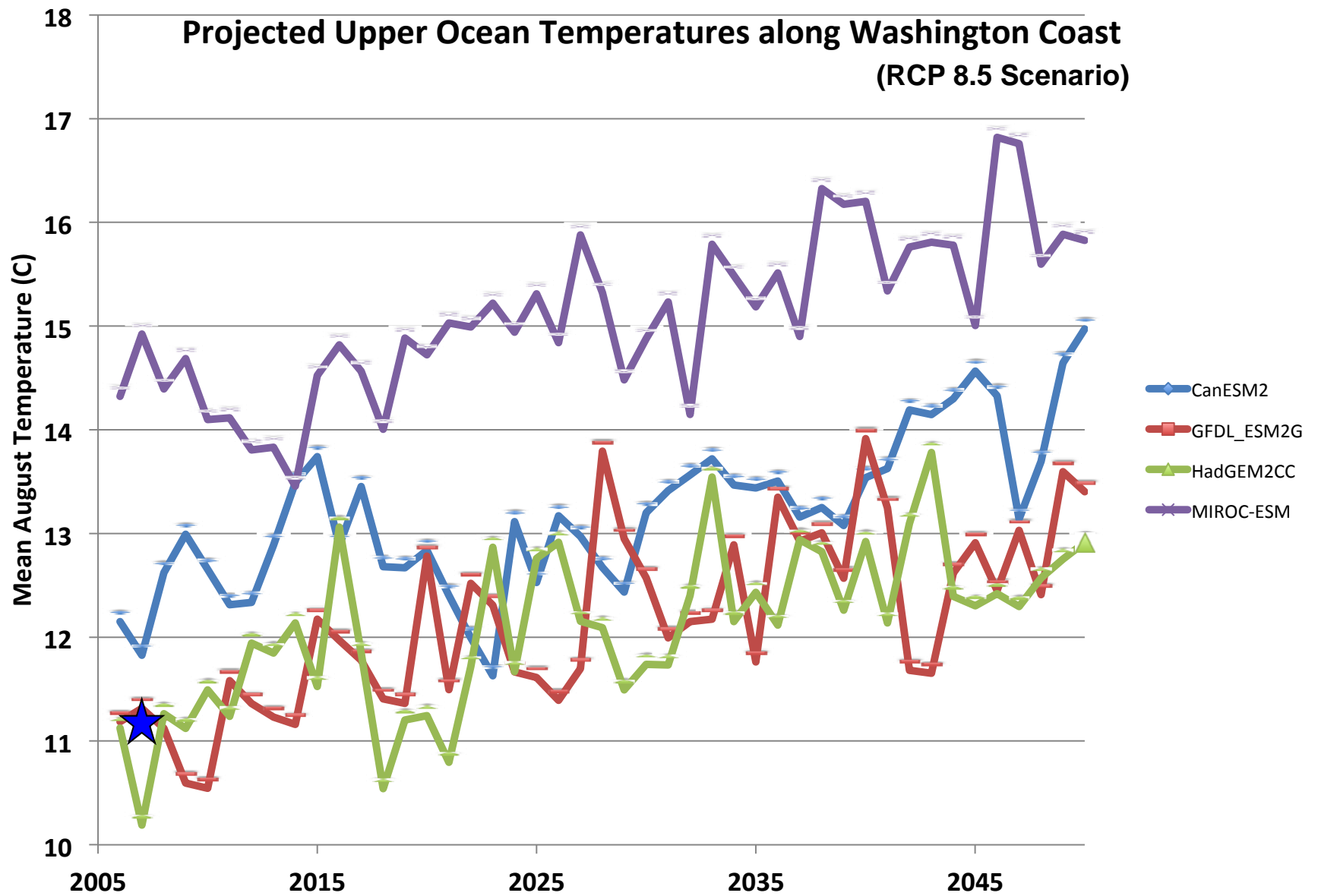


Walsh et al. (2018)



Jacox et al. (2018)

# Projected Upper Ocean Temperatures along Washington Coast (RCP 8.5 Scenario)

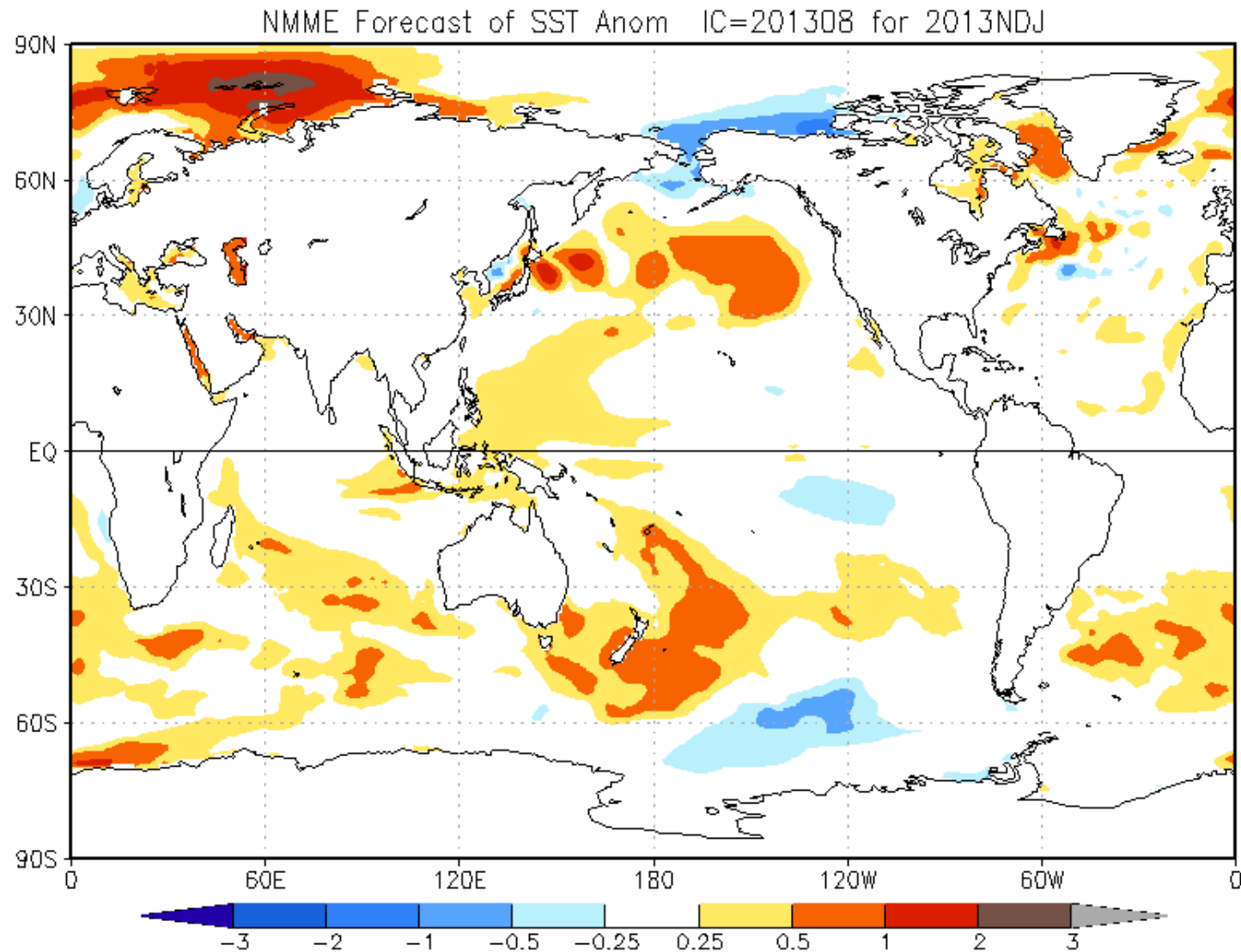


Could the Blob have been  
predicted?

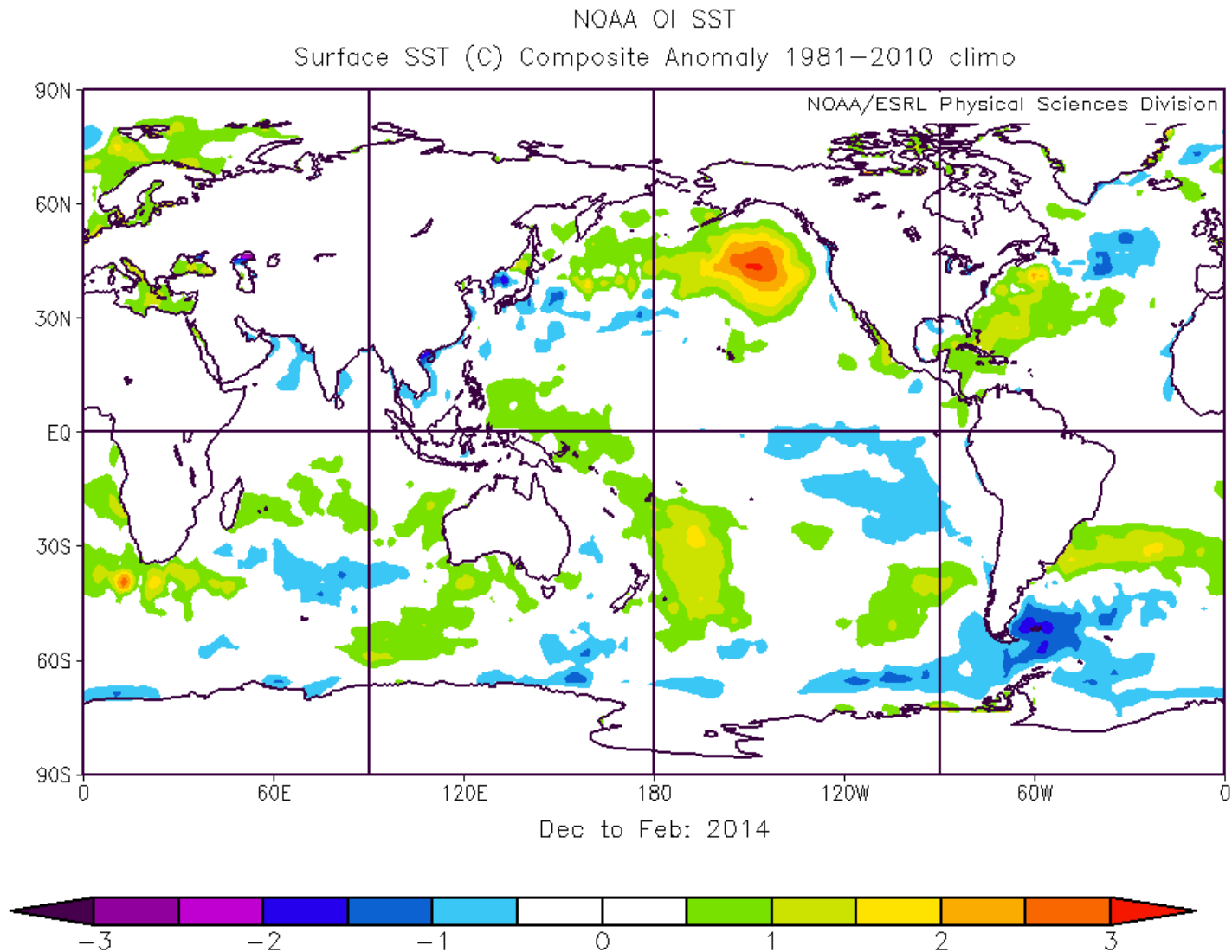


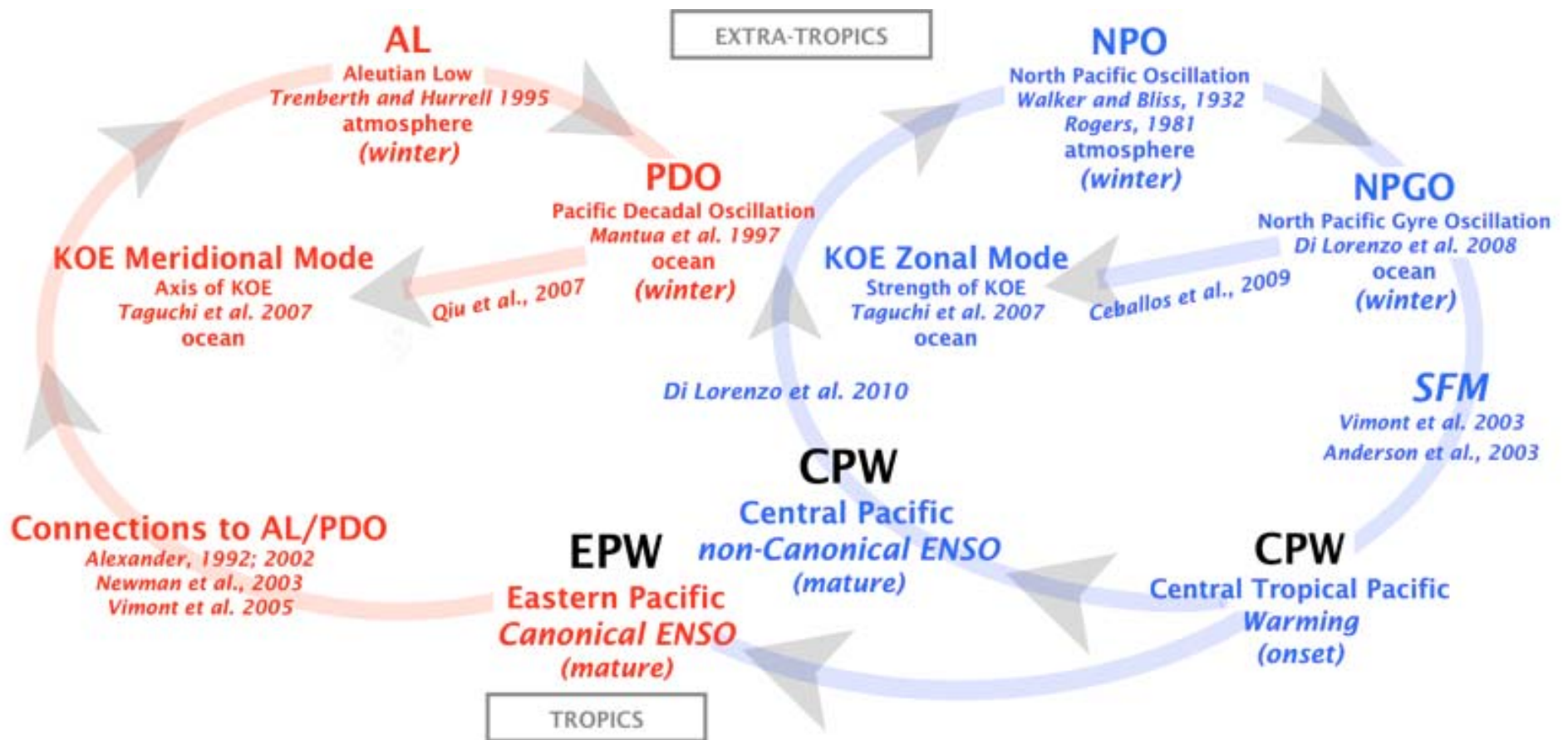
# NMME SST Anomalies

## August 2013 for DJF 2013-14



# DJF 2013-14 observed SST Anomalies





M. DiLorenzo and Collaborators



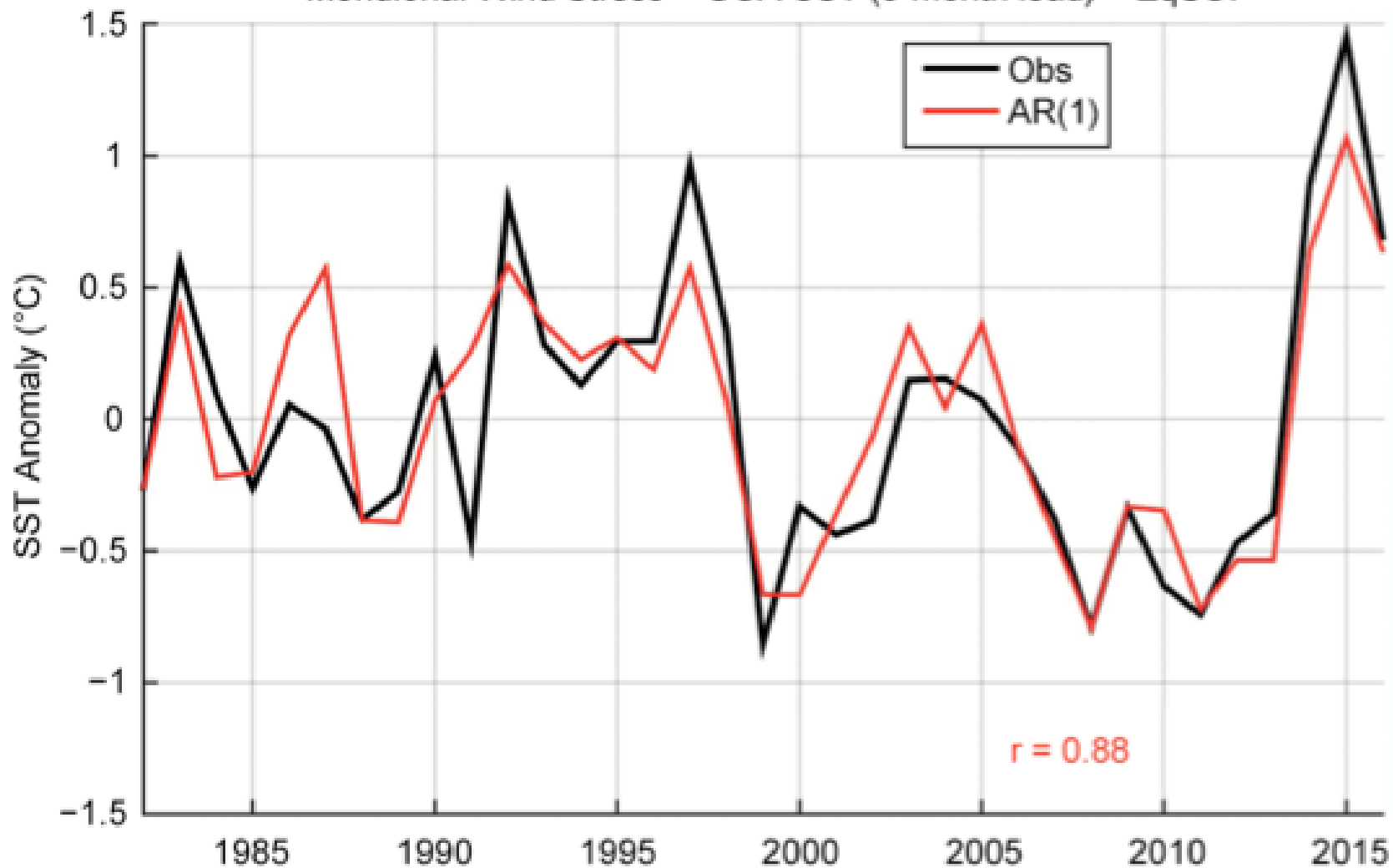
# Final Remarks

- A marine heat wave (MHW) of unprecedented intensity and duration occurred in the NE Pacific during 2014-16.
- It was especially severe because of the baseline warming that has occurred; comparable events are apt to become increasingly frequent in future decades.
- There appears to be **some** predictability in the NE Pacific on time horizons of 6-12 months.

# Back-Up Slides

(f)

Meridional Wind Stress + GOA SST (6-month lead) + EqSOI



# Observed 200 hPa Z, SST & Precipitation Anomalies (c) 2013-2014

Seager et al. (2015)

