North Pacific Warm Anomalies: Update on "The Blob"

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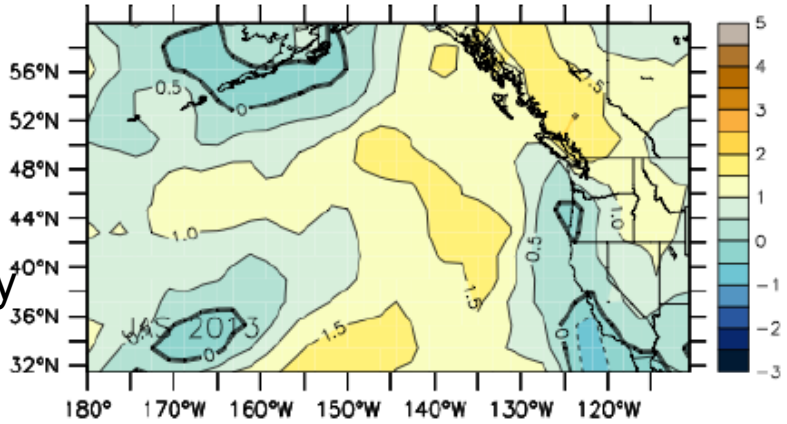
U.S. CLIVAR Summit
Tucson, AZ
August 3-6, 2015

Meetings and Sessions

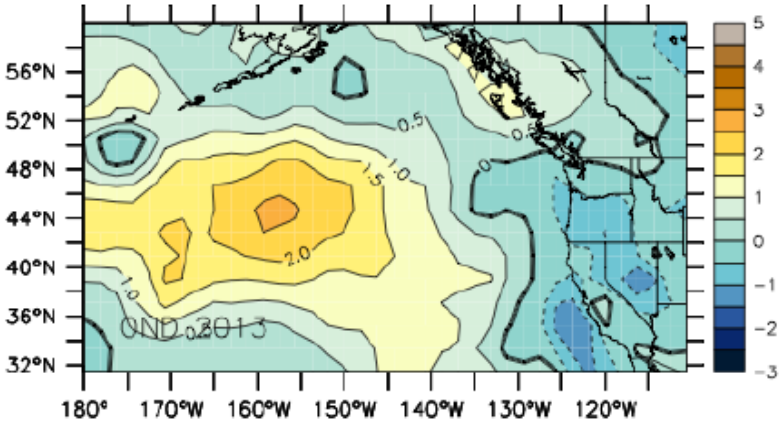
- May 5-6: SIO “Pacific Anomalies Workshop 1”
- Sept 21-22: Eastern Pacific Ocean Conference (EPOC)
- November 17-19: UW “Pacific Anomalies Workshop 2”
- Dec 14-18: AGU Fall Meeting
- Feb 21-26, 2016: Ocean Sciences Meeting

Development of the Blob SST pattern (NPGO) and transition to PDO pattern

JAS 2013

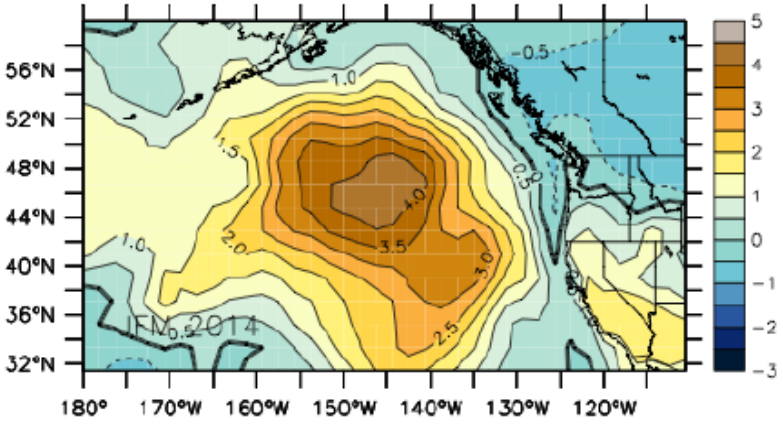


OND 2013

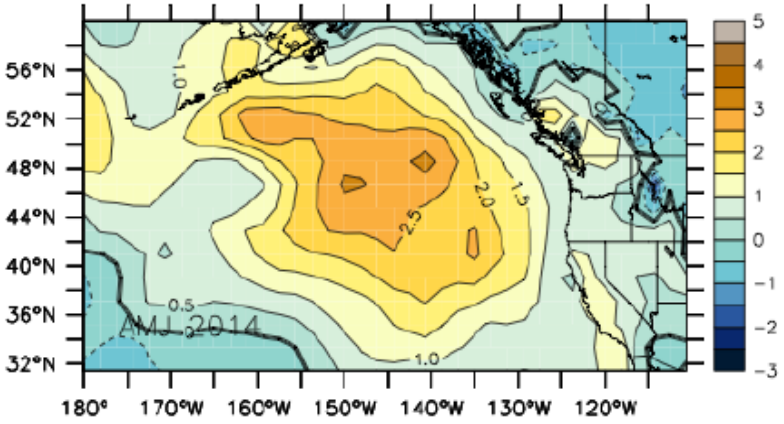


Courtesy **Nick Bond**

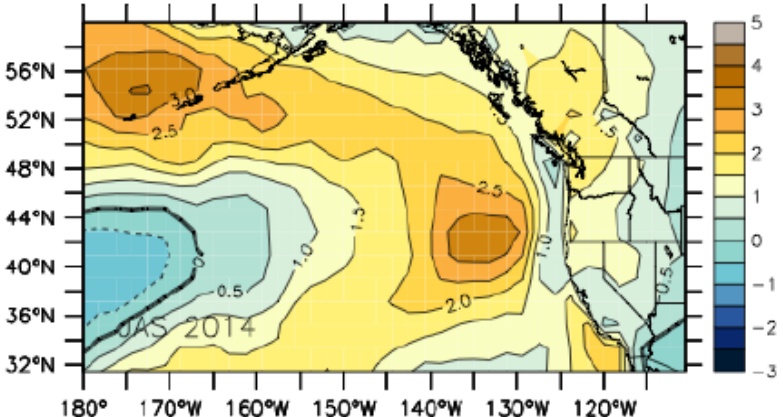
JFM 2014



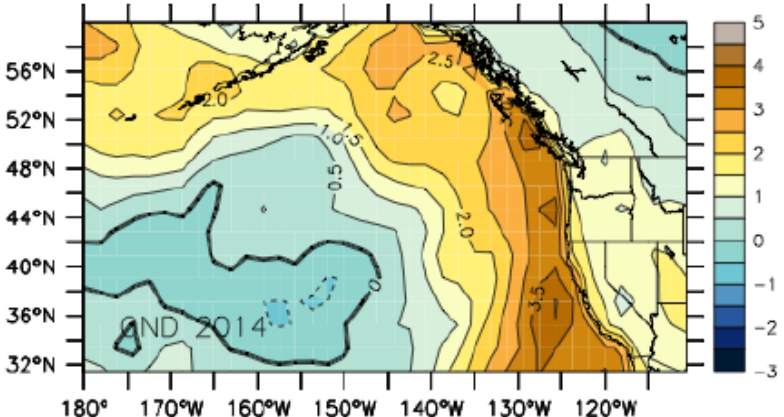
AMJ 2014



JAS 2014



OND 2014

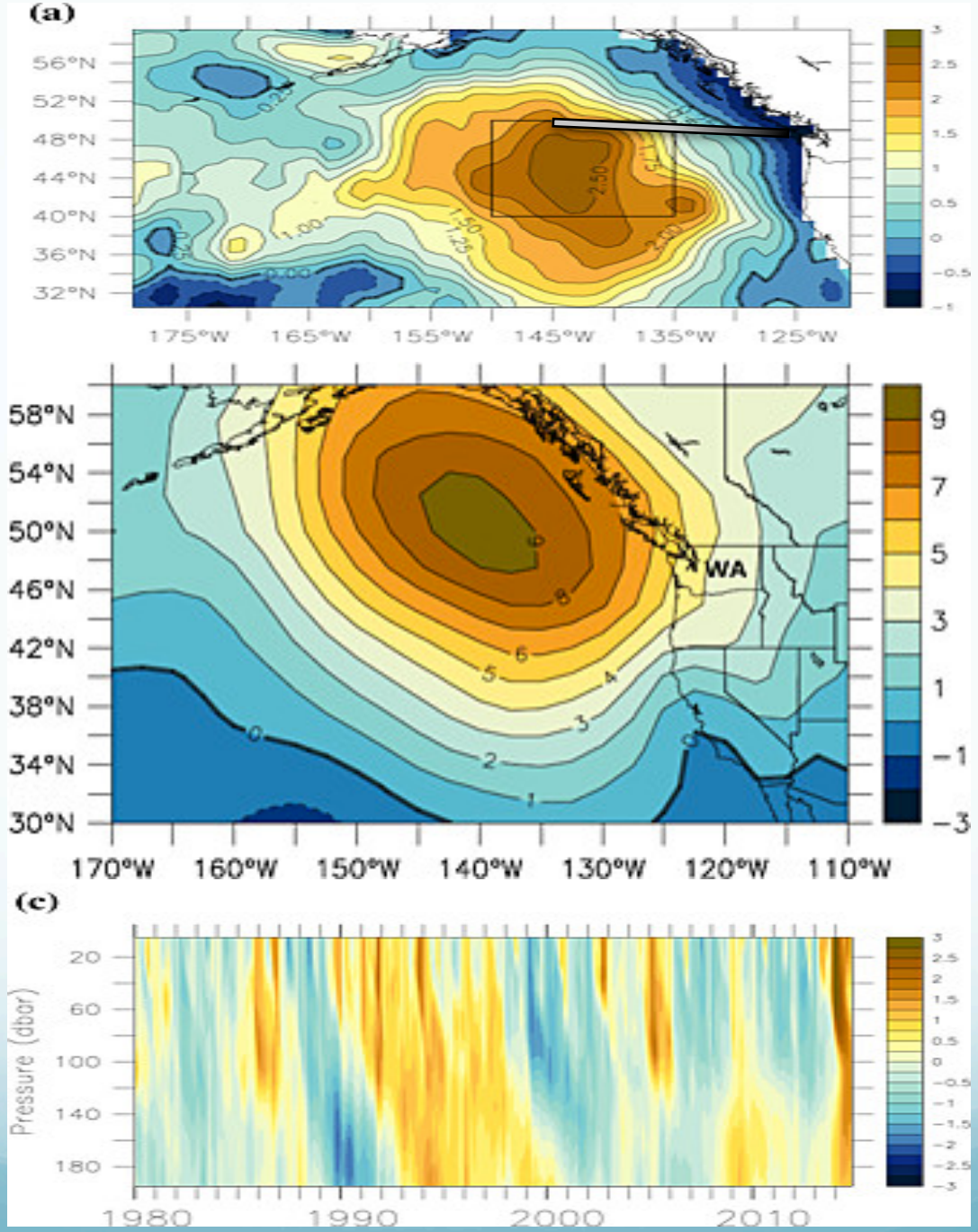


SSTA,
February 2014

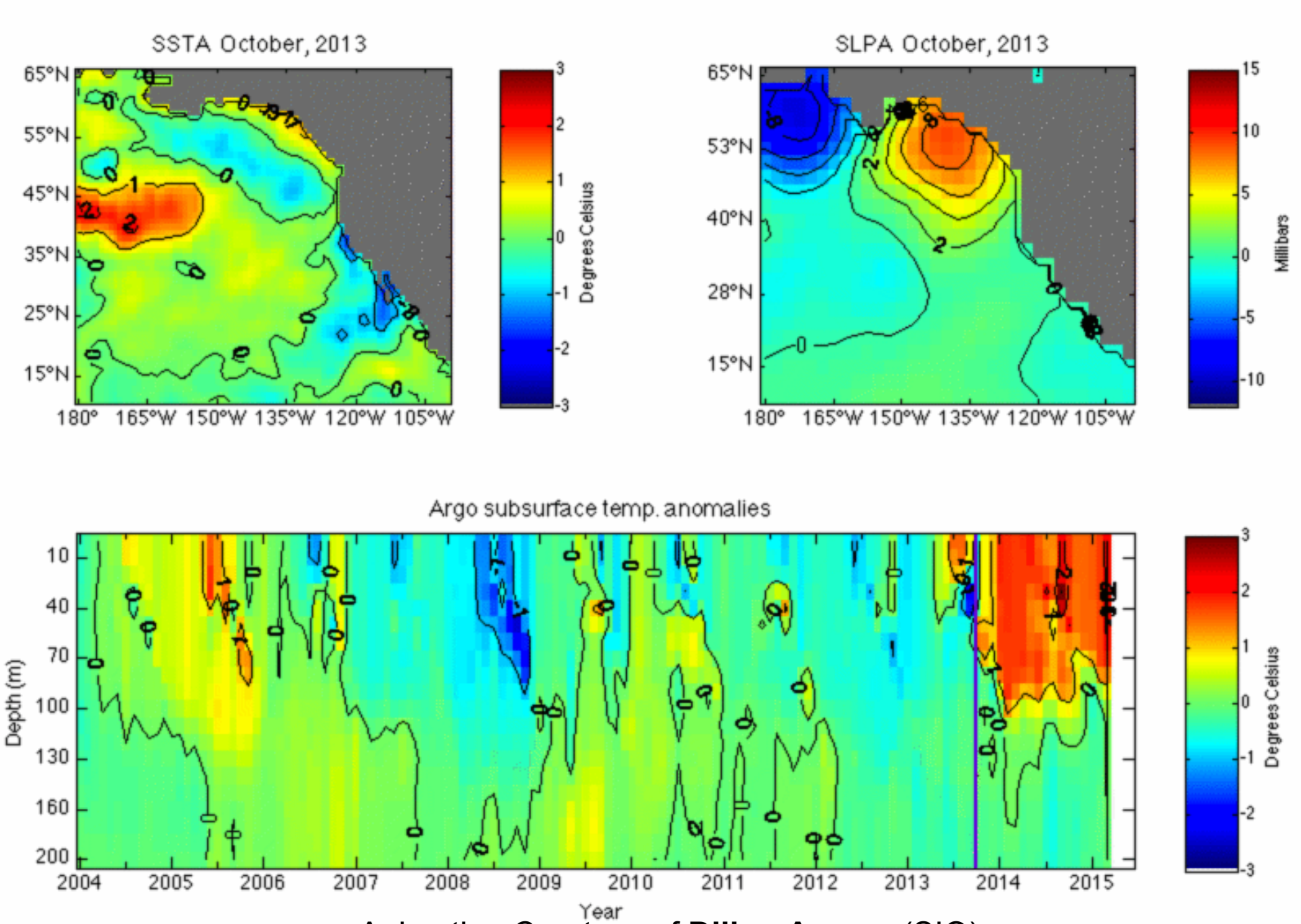
SLP anom
Oct 2013 – Jan 2014

(Antecedent months)

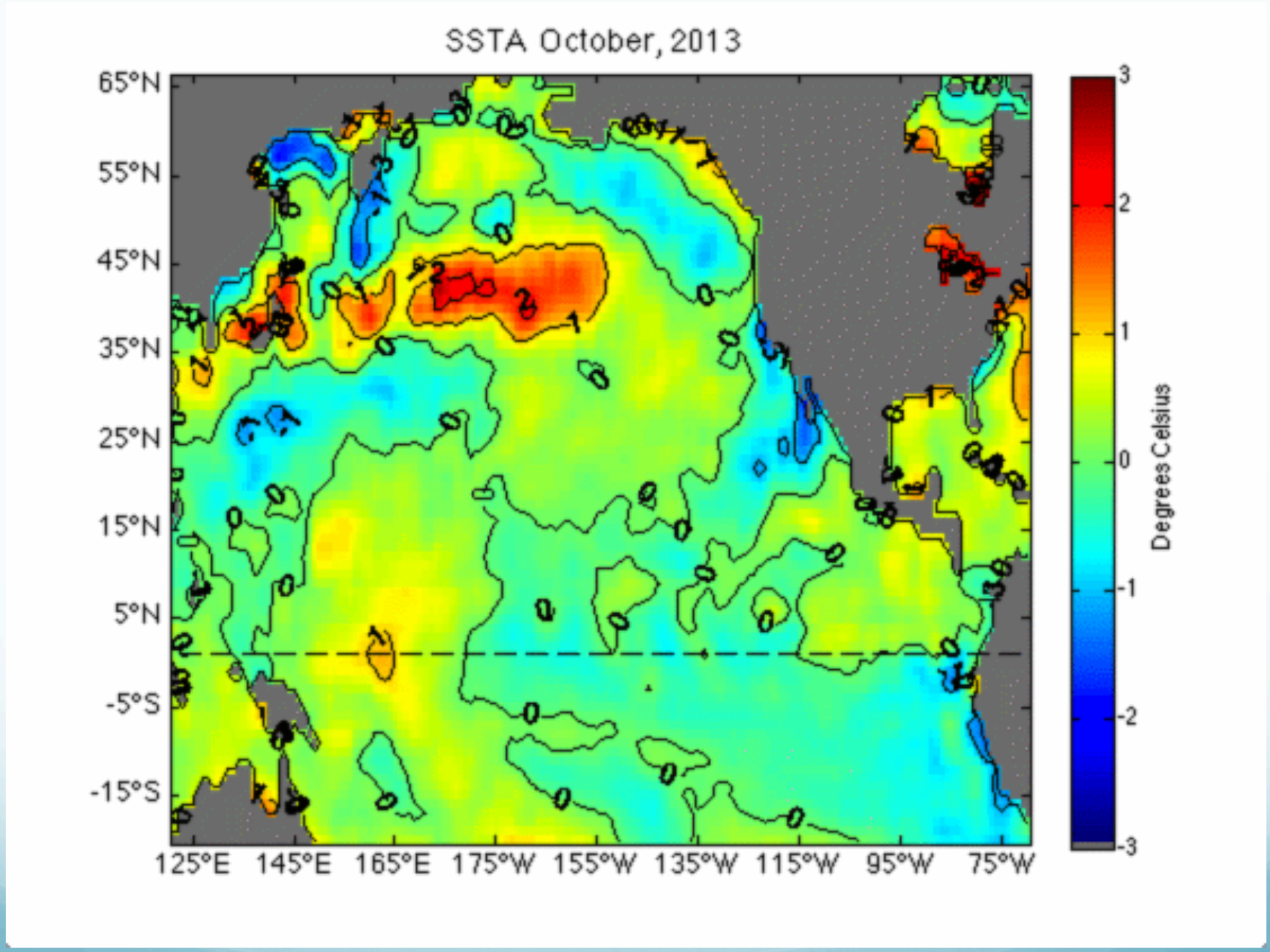
Temperature Averaged in Box



Bond et al.
GRL
2014

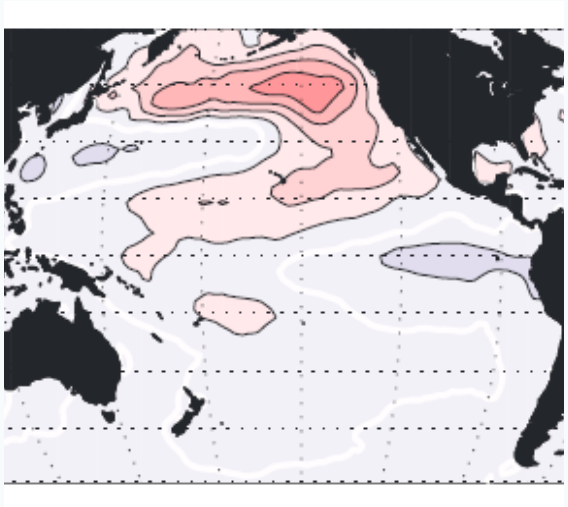


Animation Courtesy of **Dillon Amaya** (SIO)

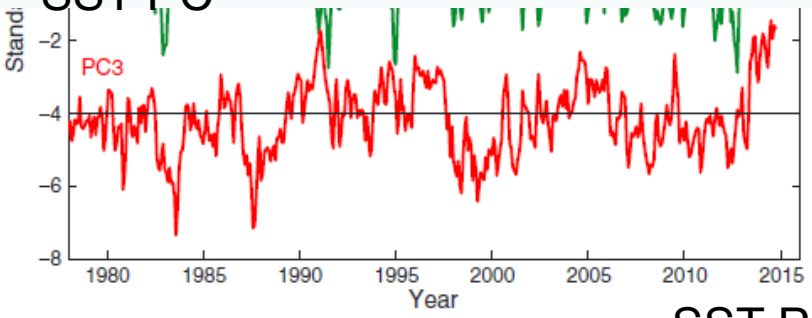


Animation Courtesy of **Dillon Amaya** (SIO)

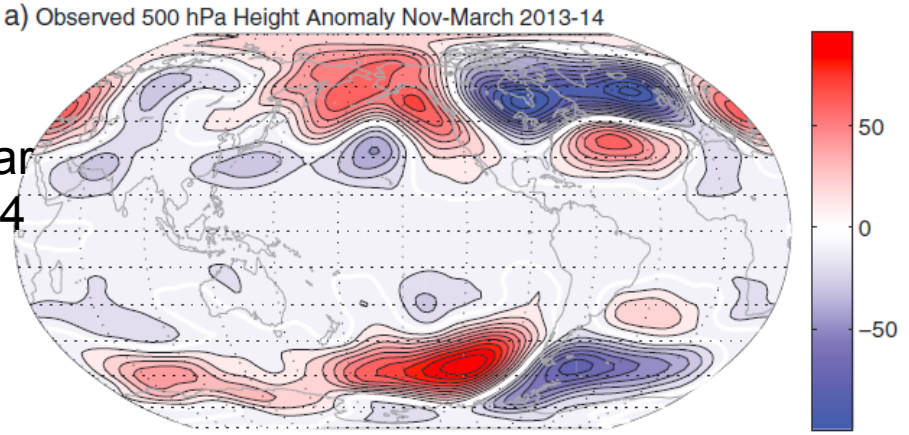
SST EOF



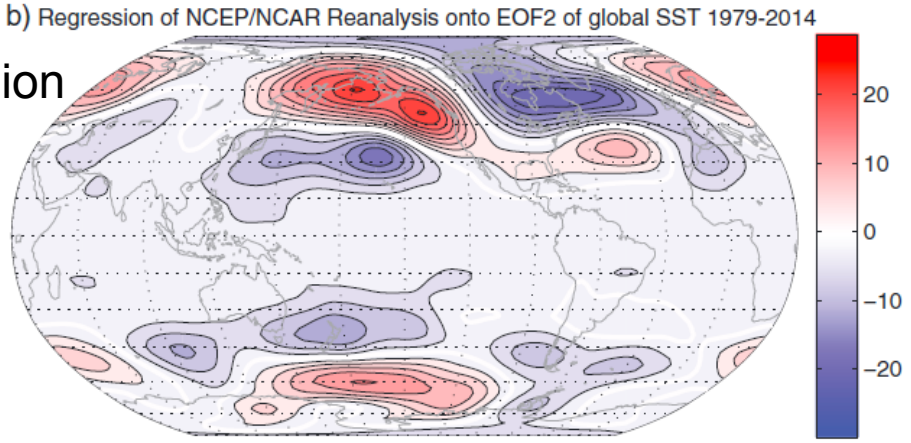
SST PC



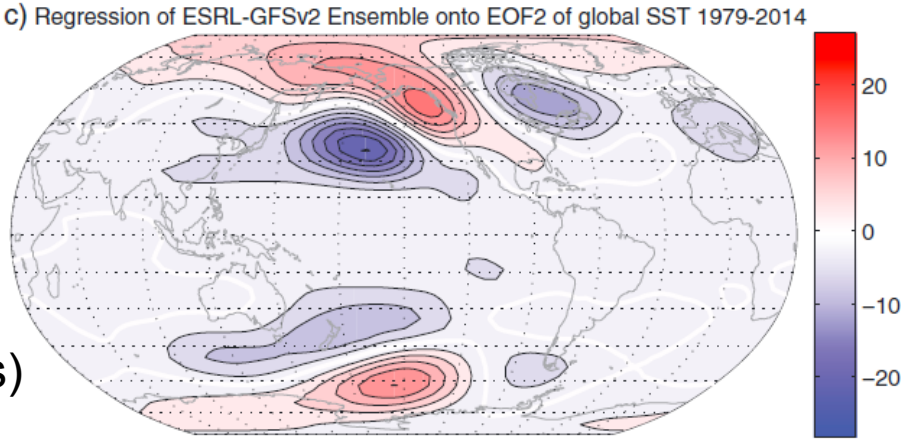
OBS 500mb Nov-Mar 2013-14



SST PC Regression on RA2



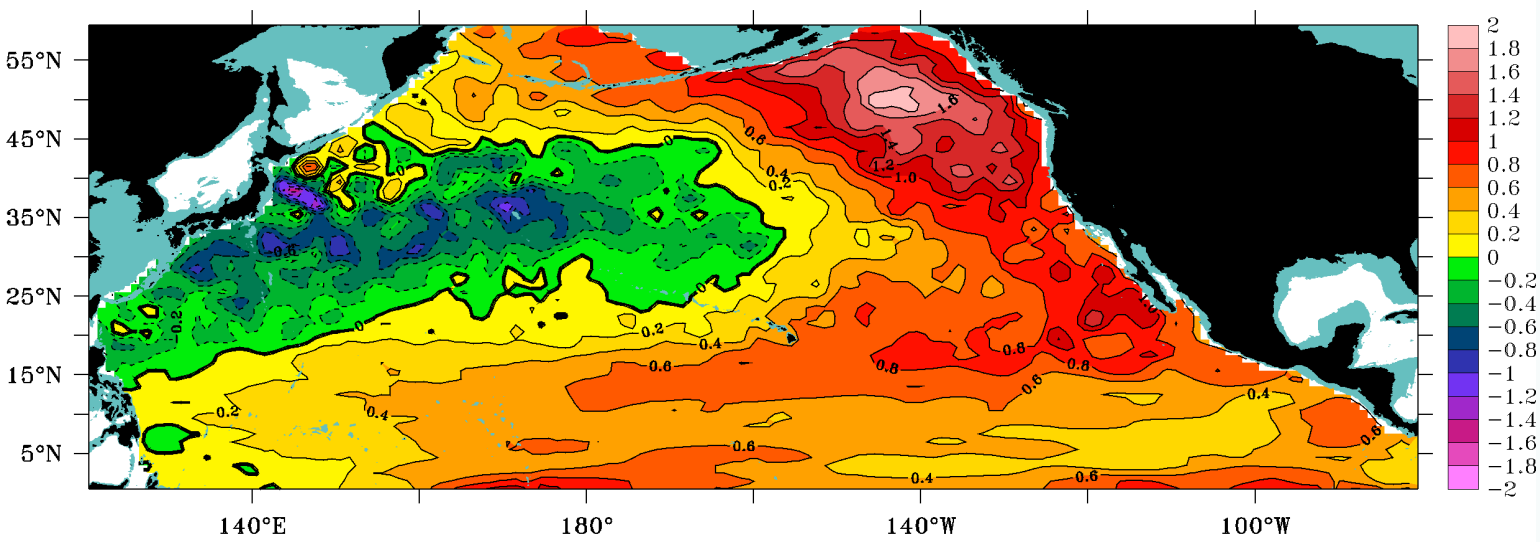
SST PC Regression on AMIP



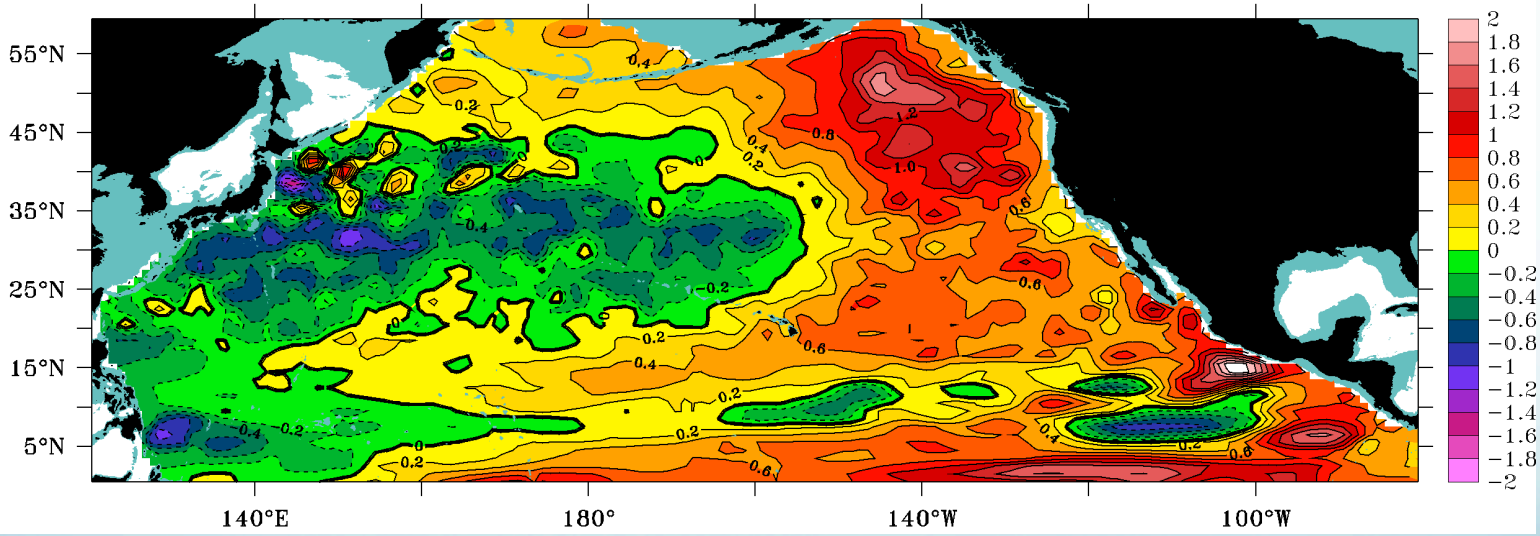
(Tropical Symmetries)

Hartman, GRL, 2014

Z=0



Mean of Z=0 to 100 decibars



Both plots show the temperature difference between 2014 and the 10-year mean (2004-2013)

Figure credit: **Dean Roemmich**

Line P Temperature Anomalies

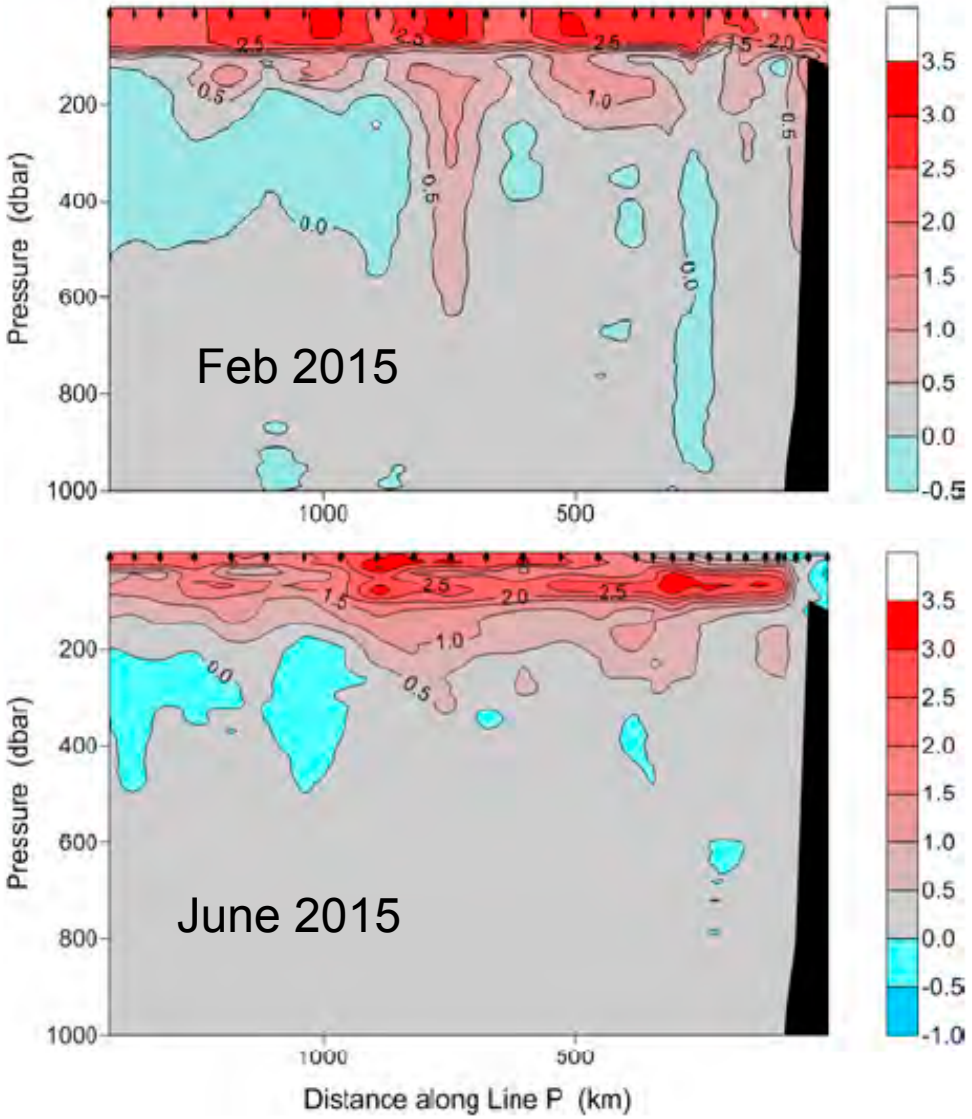
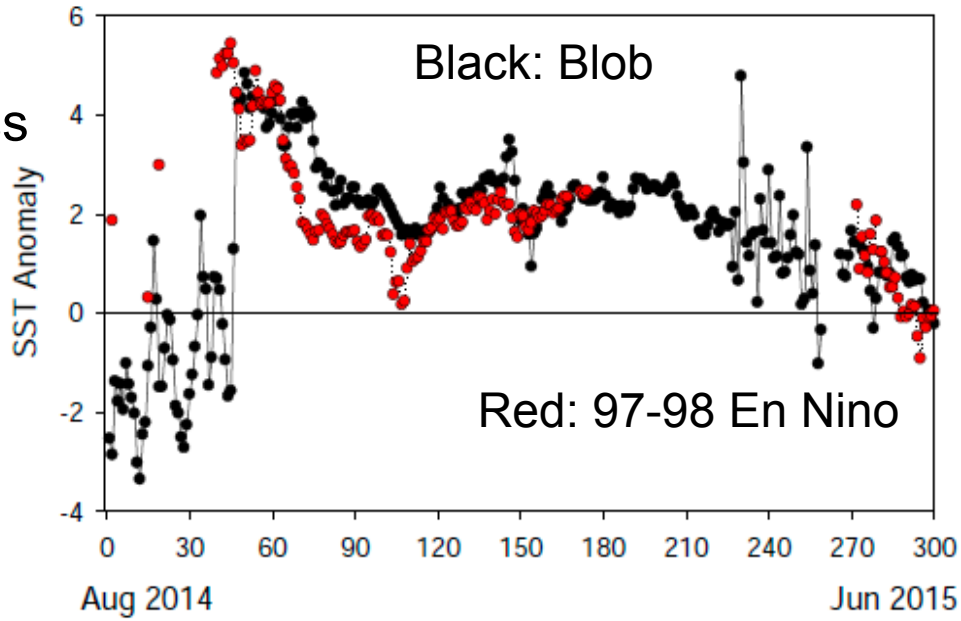


Fig. 3 Temperature anomaly along Line P in (top) February and (bottom) June 2015 with respect to the 1956–1991 averages.

Peterson et al. 2015

SST and Copepod Species Richness Along Oregon Coast



. 2 *SST at Buoy 46050 (20 miles (32 km) off Newport, Oregon) showing that the surface expression of the Blob arrived on September 16, 2014; the magnitude of the SST anomalies resembled the 1997–98 El Niño. Black = 2014–15, Red = 1997–98 El Niño.*

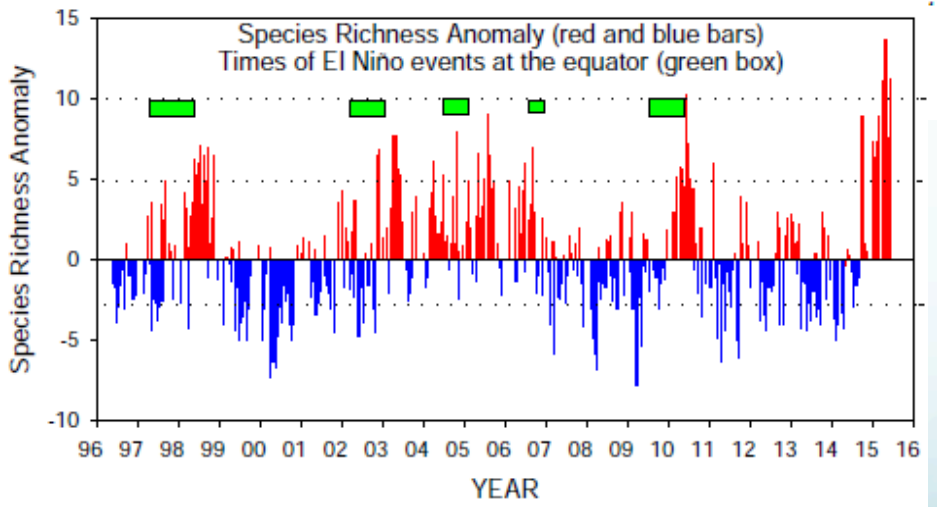


Fig. 4 Copepod species richness at station NH 05, 5 miles (9 km) off the Oregon coast. This station has been sampled biweekly since May 1996 for a total of 508 sampling dates. Note that the very high species richness observed in 2015 is unrelated to any past El Niño event.

Peterson et al. 2015

Interesting Issues

- What set up the persistent atmospheric forcing?

  - Western tropical Pacific => El Nino teleconnections, random events (+relation to West Coast drought)

- Importance and impacts of advection?

  - geostrophic advection of Blob and Ekman advection during upwelling events

- Few patterns (NPGO, PDO, Baja) or many patterns?
- Ocean influence on atmospheric flows (moisture, temperature, ABL)
- Ecosystem impacts: bottom-up and habitat changes

- **Fish**: Sardines and anchovies eggs off Newport in Feb-March 2015, a "first" for the Oregon coast: they usually spawn off southern California at this time of year. Low sardine biomass in Southern California

- Anecdotal observations of the presence of **tropical seabirds** in the Northern California Current.

- **Seabird mortality**: thousands of the Cassin's Auklet off the Farallon Islands on November 2014 and off Oregon coast on December 2014.

- **Coastal upwelling** in the NCC at 45°N began on April 12, 2015, close to the long-term average of April 9. However, the wind was insufficient to vertically mix the buoyant warm surface layer, and the weak wind speeds only transported surface waters ~9 km offshore, resulting in upwelling only within a narrow band very near the coast.

- Massive **blooms of phytoplankton** developed: 3 HAB species with domoic acid paralytic shellfish poisoning) and saxitoxins (amnesic shellfish poisoning) which led Oregon and Washington states to close the harvest of razor clams and mussels, and Dungeness crabs in Washington.

- **Steller sea lion pup** stranding along southern California coast far above normal