

Prediction of El Niño events using warm SST anomalies formed in the eastern North Pacific subduction zone

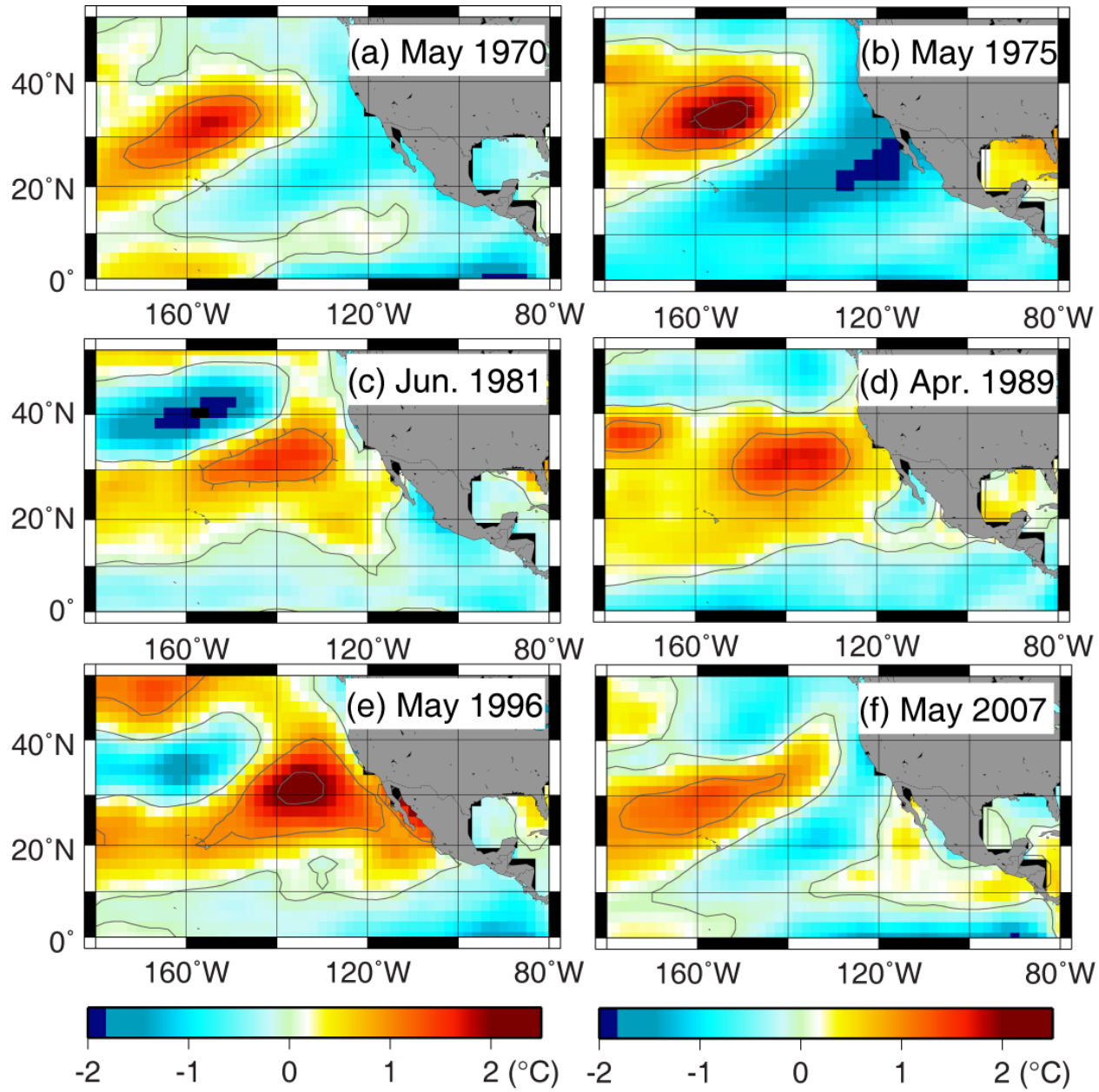
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Why does El Niño occur?

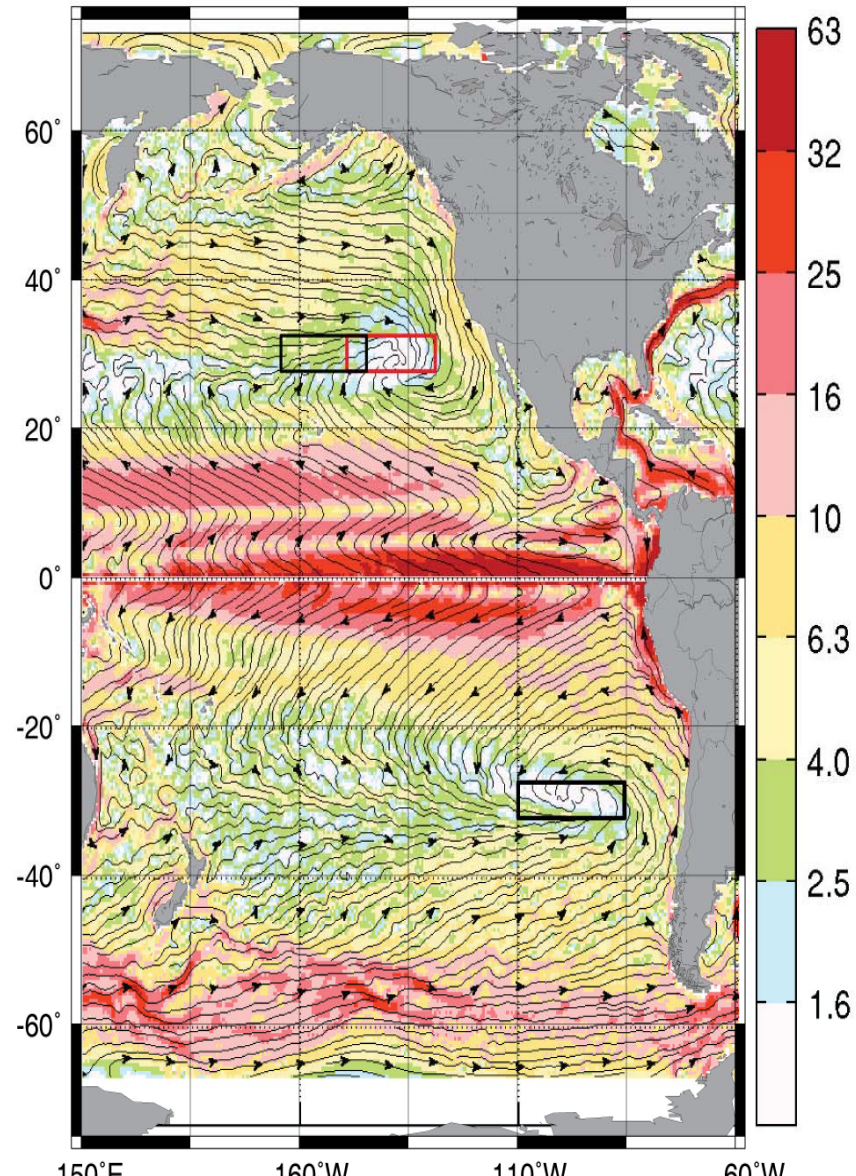
- The coupled ocean-atmosphere system determines the ***onset*** and ***termination*** of El Niño events.
- The complicated physical processes involve unstable ***air-sea interaction*** and planetary scale oceanic ***waves***.
- The system oscillates between warm (El Niño) to neutral (or cold) conditions with a ***natural periodicity*** of roughly 3-4 years.

Source: NOAA/PMEL Website

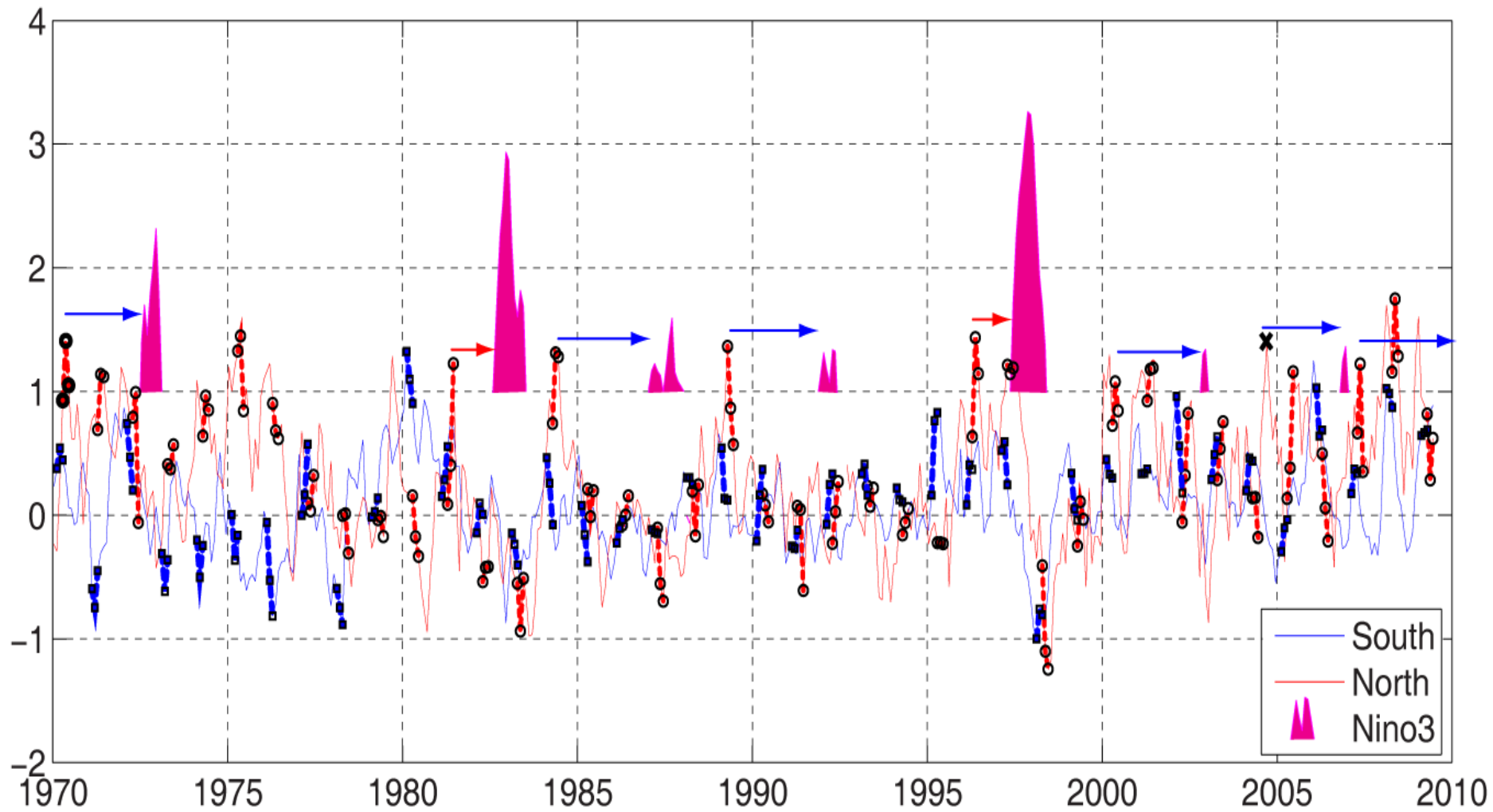
Monthly Mean SST Anomaly



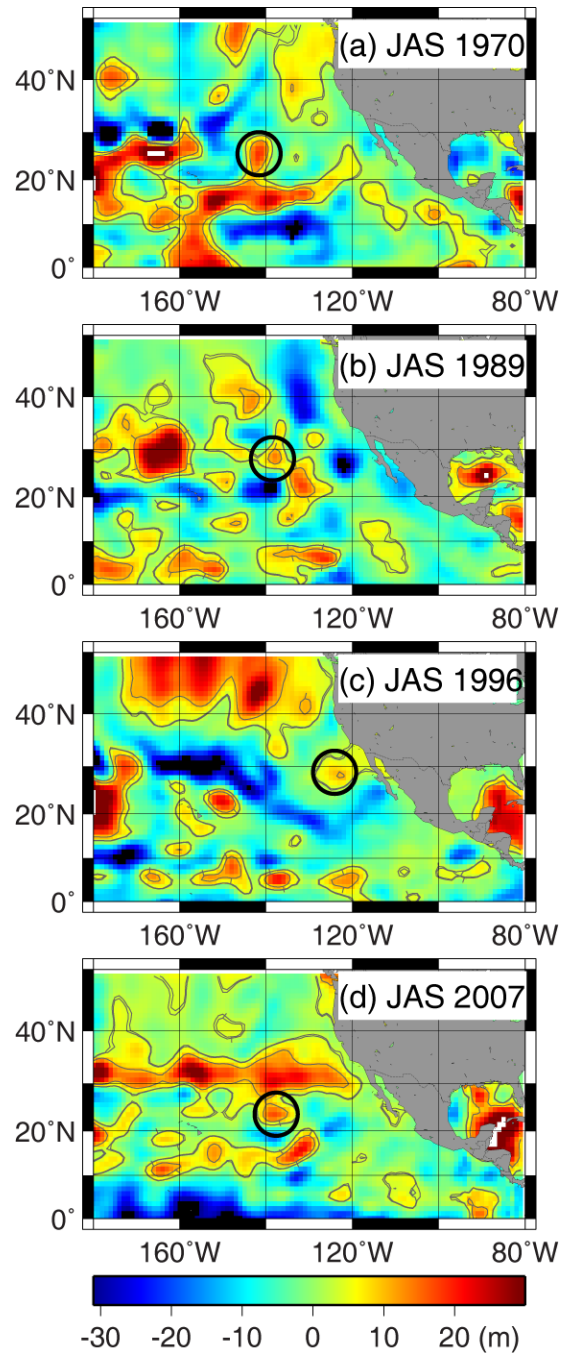
Northern Pacific Subduction Zone (aka Great North Pacific Garbage Patch)



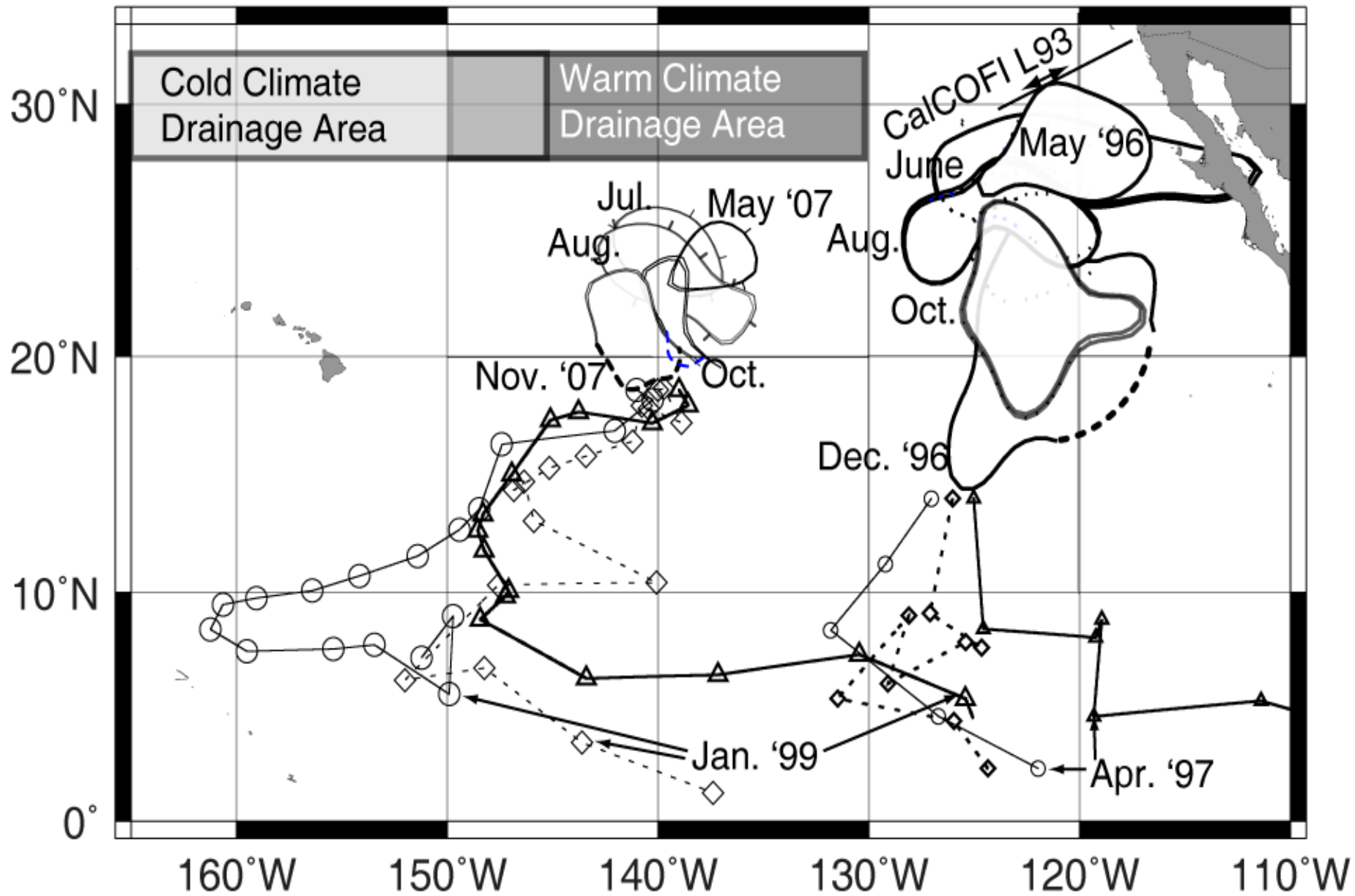
Monthly Mean SST Anomaly



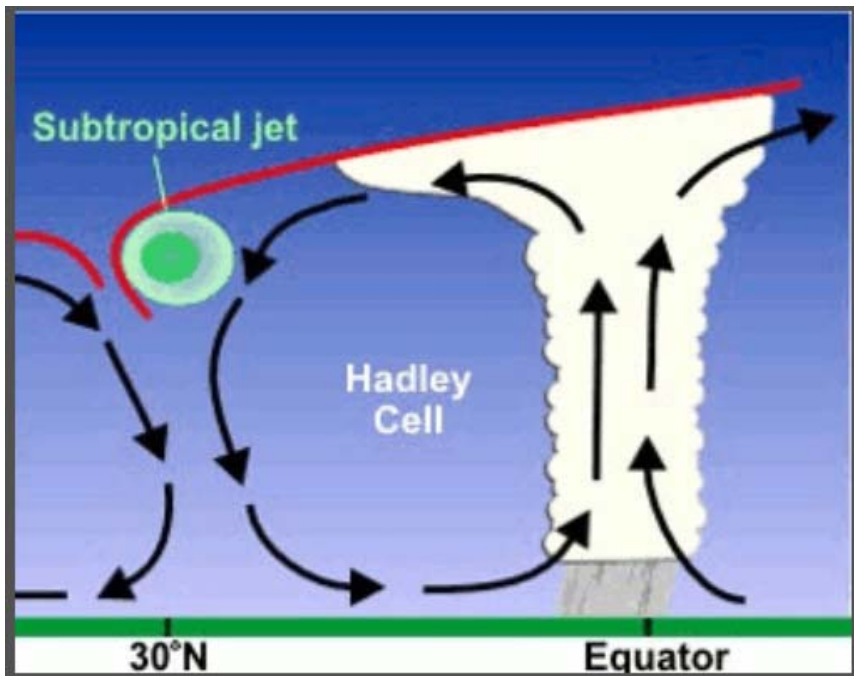
Seasonal Mixed Layer Depth Anomaly



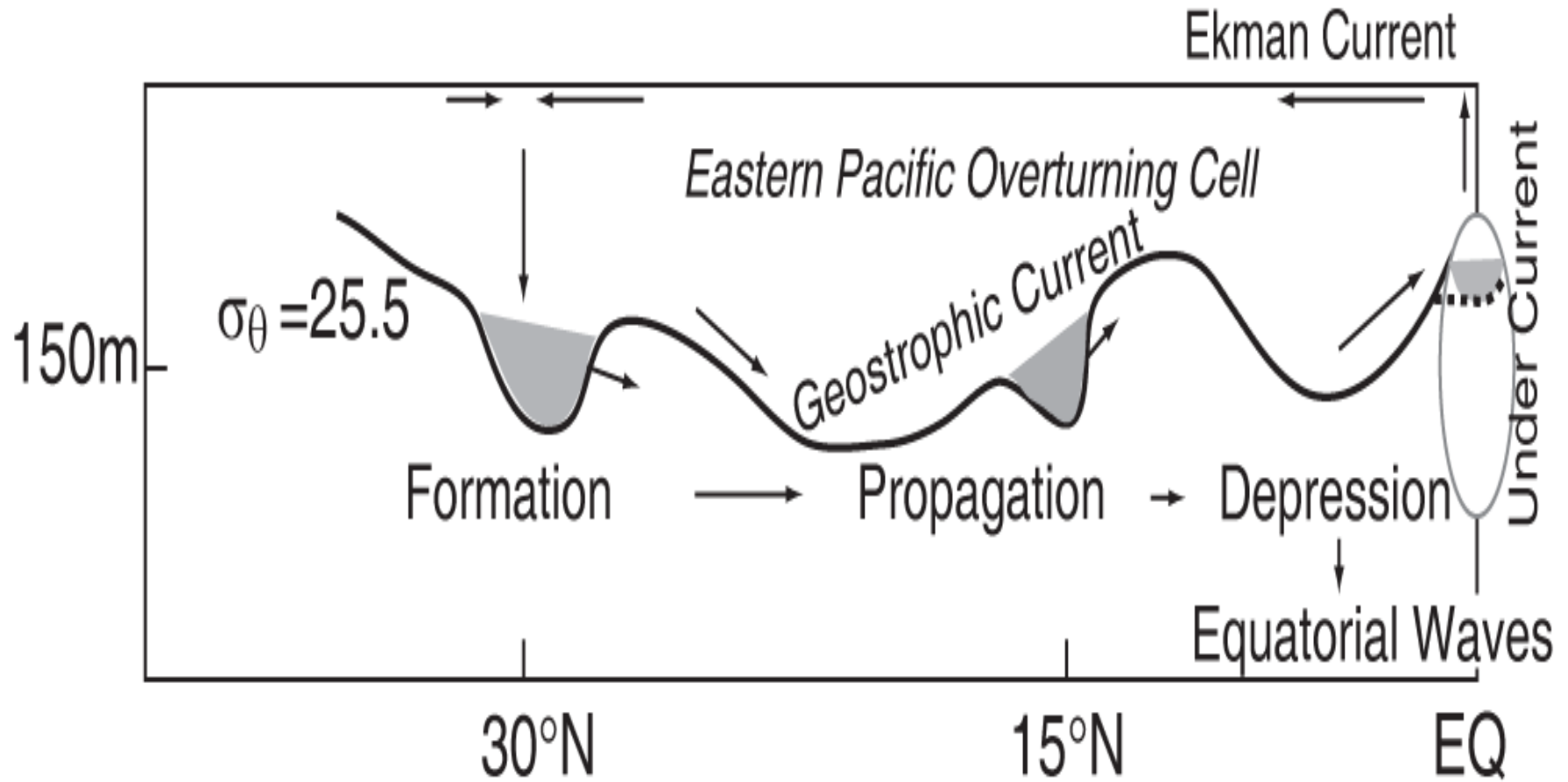
Monthly Mean SST Anomaly



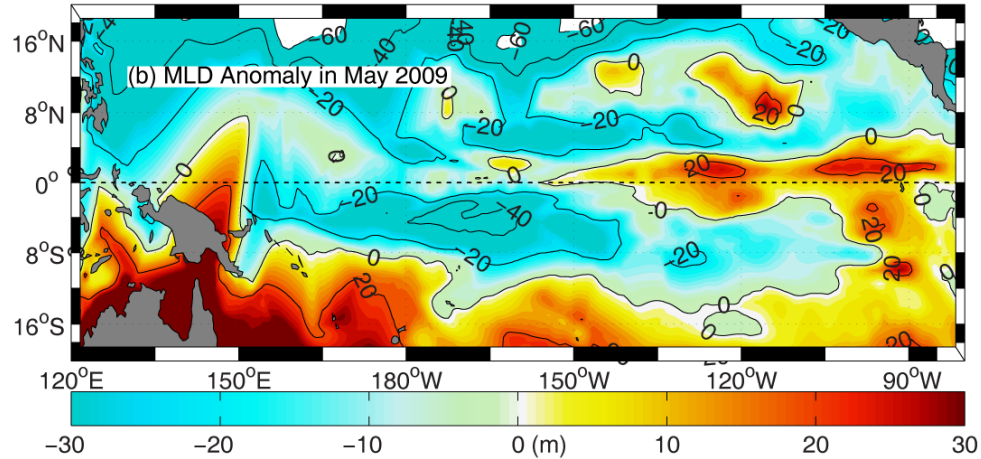
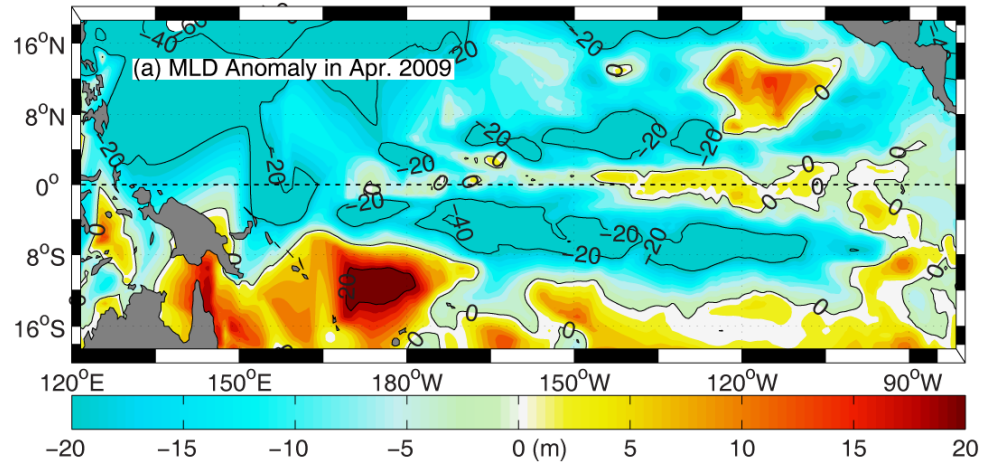
Subtropical Cell



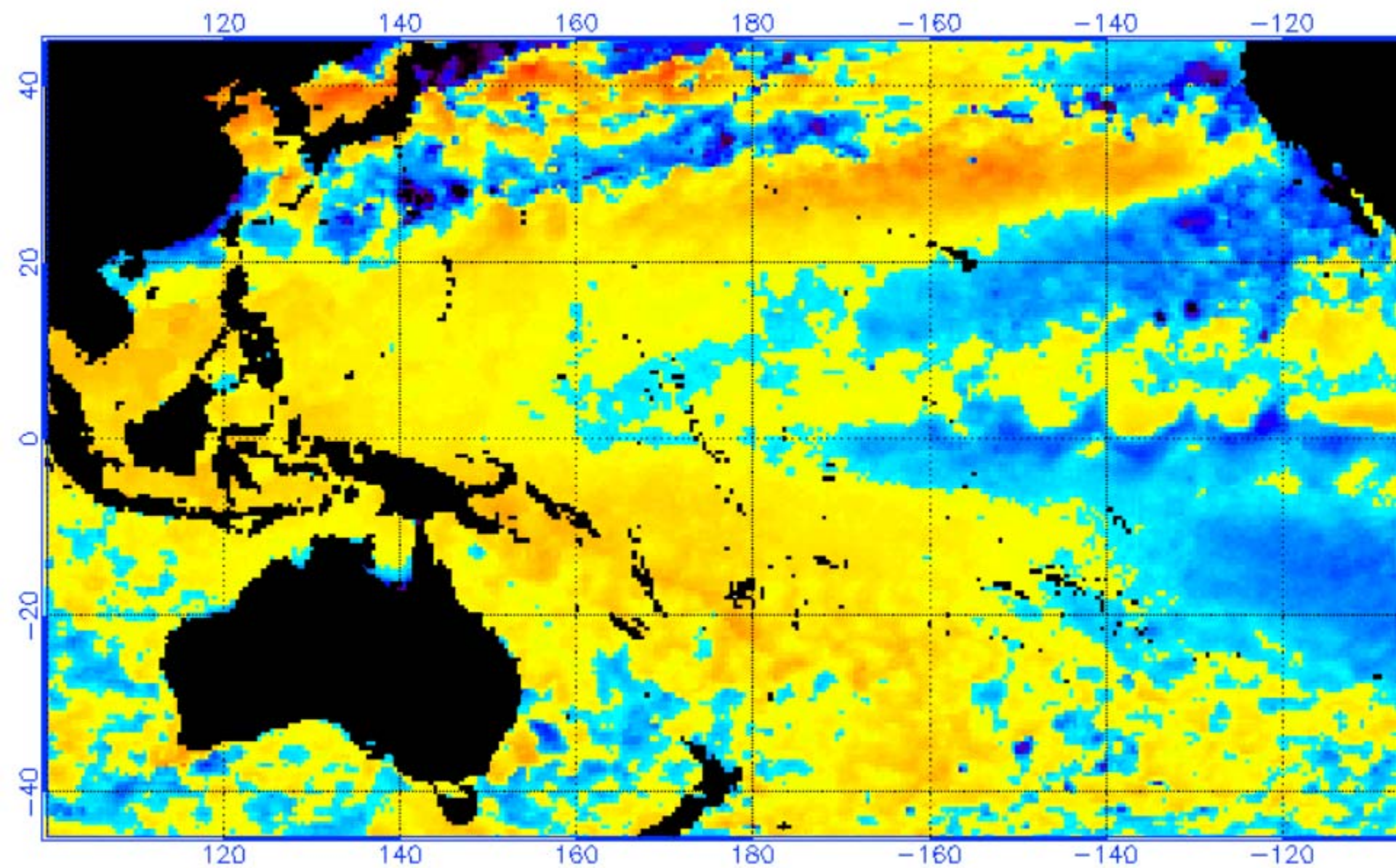
Mechanism – Subtropical Circulation Cell



Mixed Layer Depth Anomaly in 2009 El Niño



NOAA/NESDIS SST Anomaly (degrees C), 6/10/2010



-5.0 -4.5 -4.0 -3.5 -3.0 -2.5 -2.0 -1.5 -1.0 -0.5 0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50

Pacific Niño 3.4 SST Outlook

- Nearly all of the dynamical models predict a transition from ENSO-neutral conditions (Niño-3.4 SST anomalies between -0.5°C and $+0.5^{\circ}\text{C}$) to El Niño during the Northern Hemisphere summer/fall, with El Niño continuing through the remainder of the year.
- The average dynamical model forecast is warmer than the statistical models during the second half of 2012/early 2013.

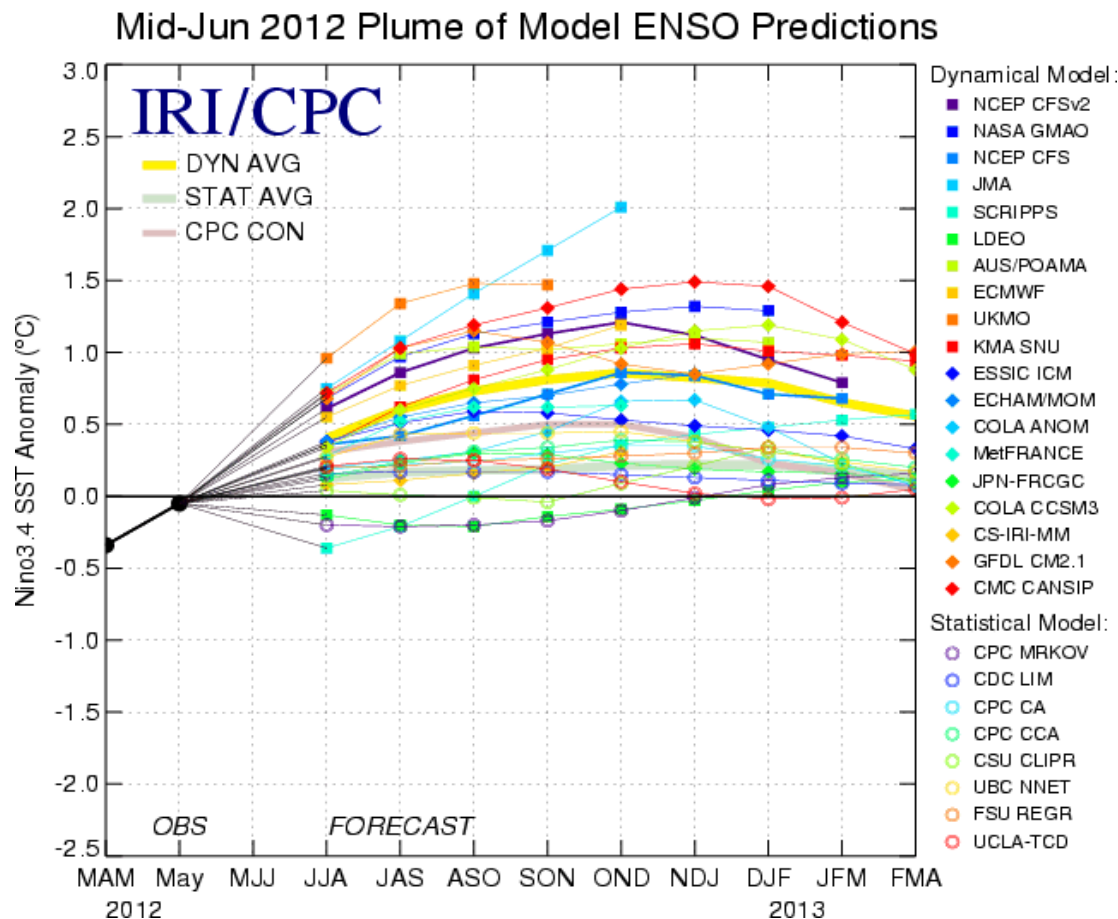
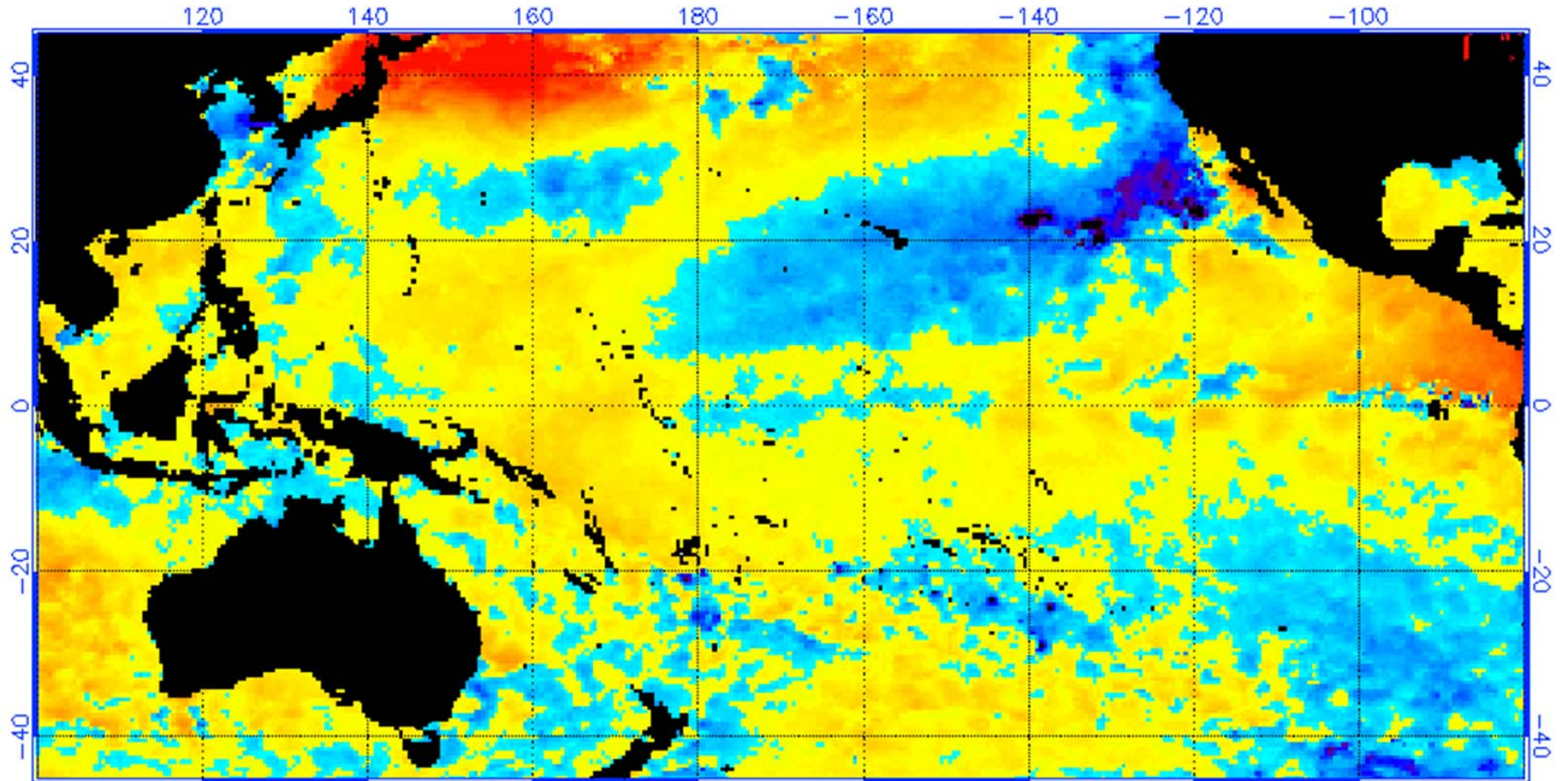


Figure provided by the International Research Institute (IRI) for Climate and Society (updated 15 June 2012).

Sep. 24, 2012



Summary

- All El Nino from 1970 can be explained by new theory.
- Our theory can predict El Nino 1.5 years (Strong; 1983, 1998) and 2.5 years (Normal).
 - Present dynamic model (6 months)
- Delayed action oscillation theory [atmospheric] vs. Subtropical Cell theory [oceanic]
 - Need observational proof
 - e.g. ctd with underwater winch wave glider