La Nina condition persists in the tropical Pacific, steering winter storms away from California and driving the state back to drought. The Godzilla El Nino two winters ago failed to bring highly anticipated storms and rains to California. In the following winter with the tropical Pacific in a weak La Nina state, rain storms battered California staging a spectacular decadal bloom. The 2015-16 El Nino was successfully forecast but the same models sounded a false alarm and predicted a strong warm event to take place in late 2014. What about the Big Blob? Did it affect California climate?

The Pacific is home to El Nino/the Southern Oscillation (ENSO) and Pacific Decadal Oscillation (PDO). What triggers ENSO, what makes each El Nino different from the others, and what is the role of atmospheric noise such as the Madden-Julian Oscillation and North Pacific Oscillation? What determines ocean-atmospheric teleconnections from the tropical Pacific to remote regions in North America and Asia? What causes the seasonal phase-locking of the variability? What are the new advances and outstanding issues in ENSO prediction? What drives extratropical ocean variability, and how is it fundamentally different from that in the tropics?

The seminar takes a deep look into these questions by discussing key papers in the literature. At the first meeting on April 2, the instructor will give a lecture overviewing the broad theme of the seminar. A list of possible topics is provided below. Each registered student is expected to present a main paper for discussion. Everyone in the group will read the main paper before the seminar. The presenter or the instructor may follow with a mini-review to discuss related aspects of the research. The choices by the registered students and other volunteer participants will shape up the final lineup of topics (diagnostic vs. theoretical, atmosphere vs. ocean).

Learning objectives: to gain an understanding of ocean-atmospheric dynamics giving rise to rich variability in the Pacific Ocean, including the role of tropical-extratropical interactions and possible changes in such variability under greenhouse warming.

Topics. The following list includes 20 topics, each with one or more suggested papers. Please choose a main paper and email the instructor your choice by April 4 (W). Suggestions for other topics/papers are welcome.

Equatorial ocean heat budget and coupled instability

Observations of recharge

ENSO phase lock

ENSO diversity


Wind burst effect

Pacific meridional mode

ENSO variance cycle

ENSO asymmetry

ENSO effect on tropical cyclones

ENSO effect on extratropical storms and atmospheric rivers

ENSO effect on California beaches and fisheries

ENSO teleconnection

Seasonal prediction
Coupled modeling of ENSO

Internal vs. forced atmospheric variability


Large-scale extratropical ocean-atmosphere interaction


SST front-wind interaction
Ma, X. et al., 2016: Western boundary currents regulated by interaction between ocean eddies and the atmosphere. Nature 535, 533-537.


Pacific decadal oscillation


Kuroshio Extension variability

ENSO in warming climate