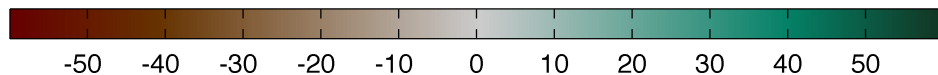
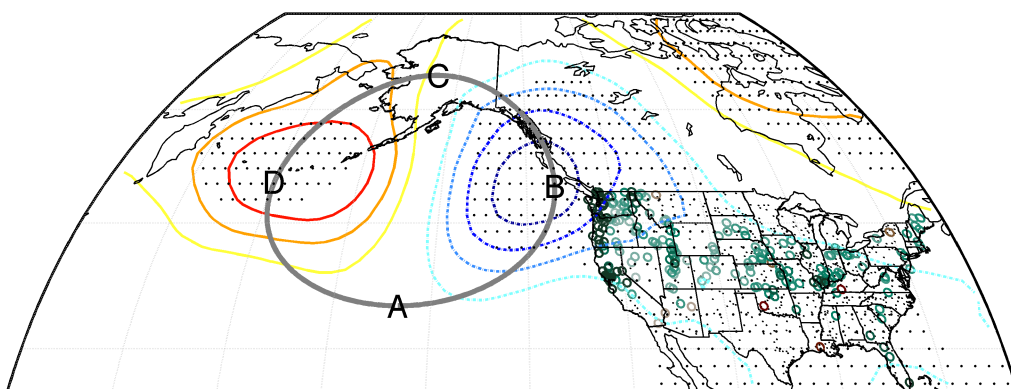
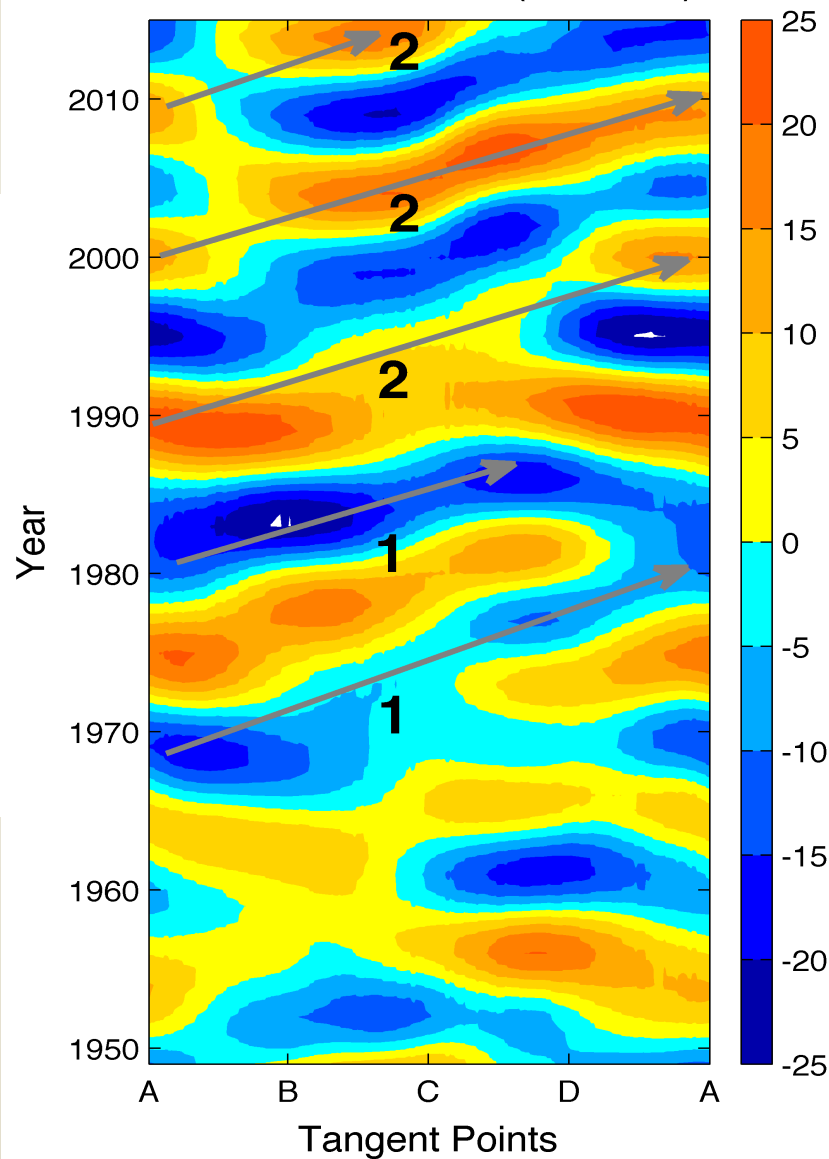


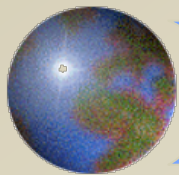
# *PDP Captured by Hovmöller Diagram*

Year 0

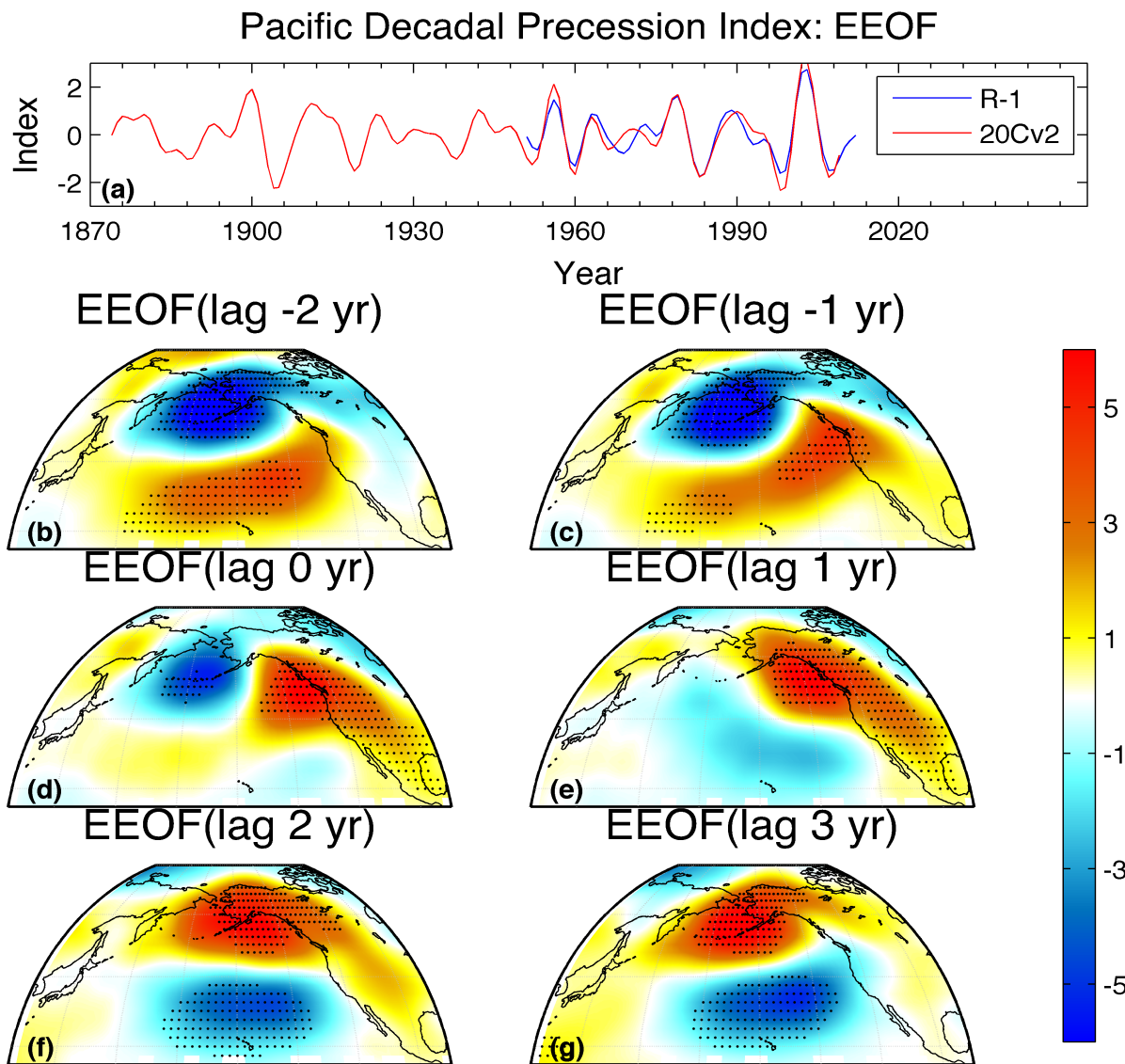


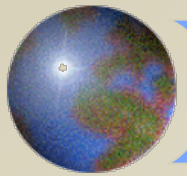
Time Evolution: Z(850hPa)



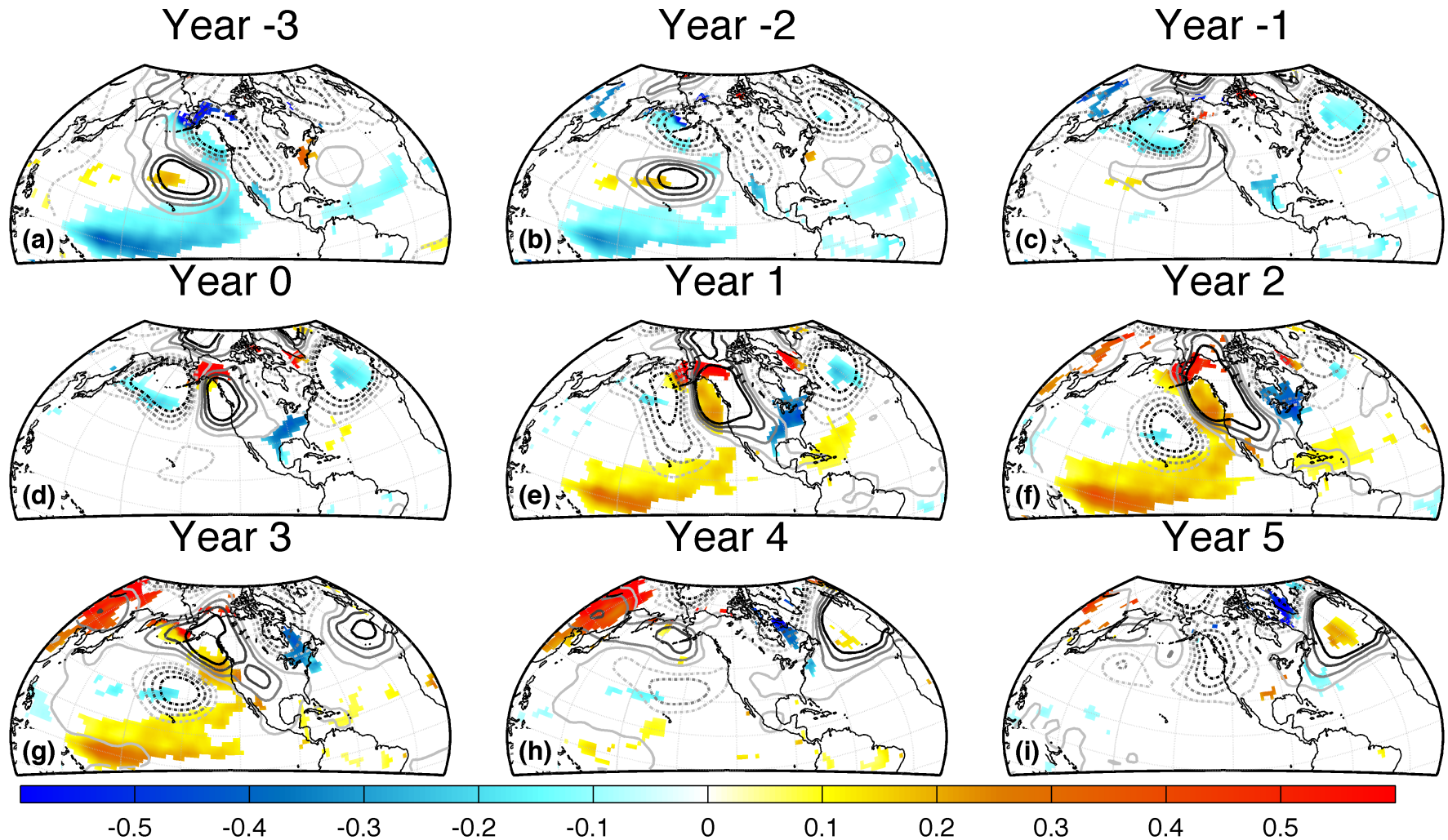


# *PDP Captured by Extended EOFs (EEOFs)*

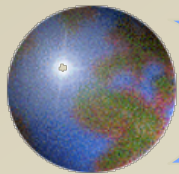




# *PDP and Surface Temperatures*





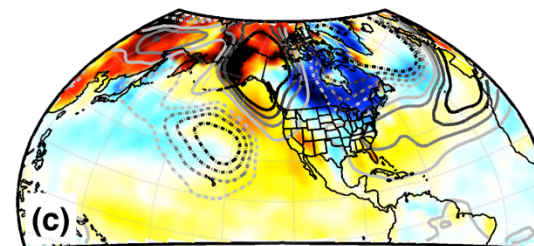
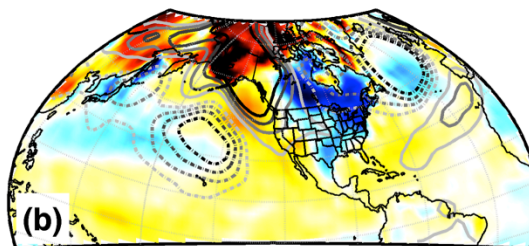
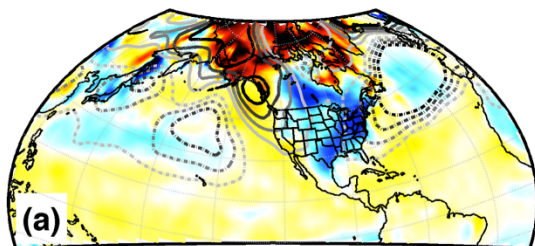


# *PDP and Recent Climate Extremes*

2013 (BP)

2014 (BP)

2015 (BP)

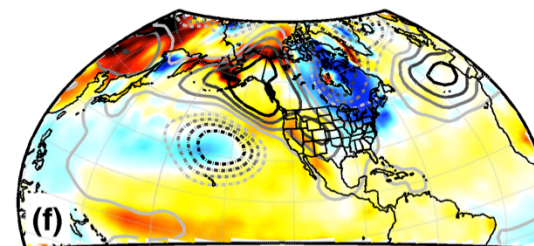
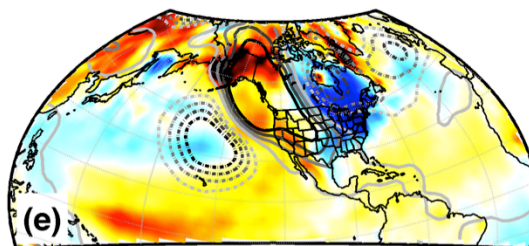
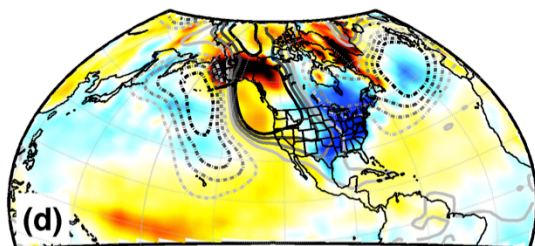


-1.5 -1.2 -0.9 -0.6 -0.3 0 0.3 0.6 0.9 1.2 1.5

Year 1

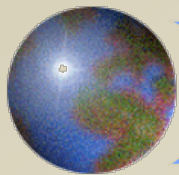
Year 2

Year 3



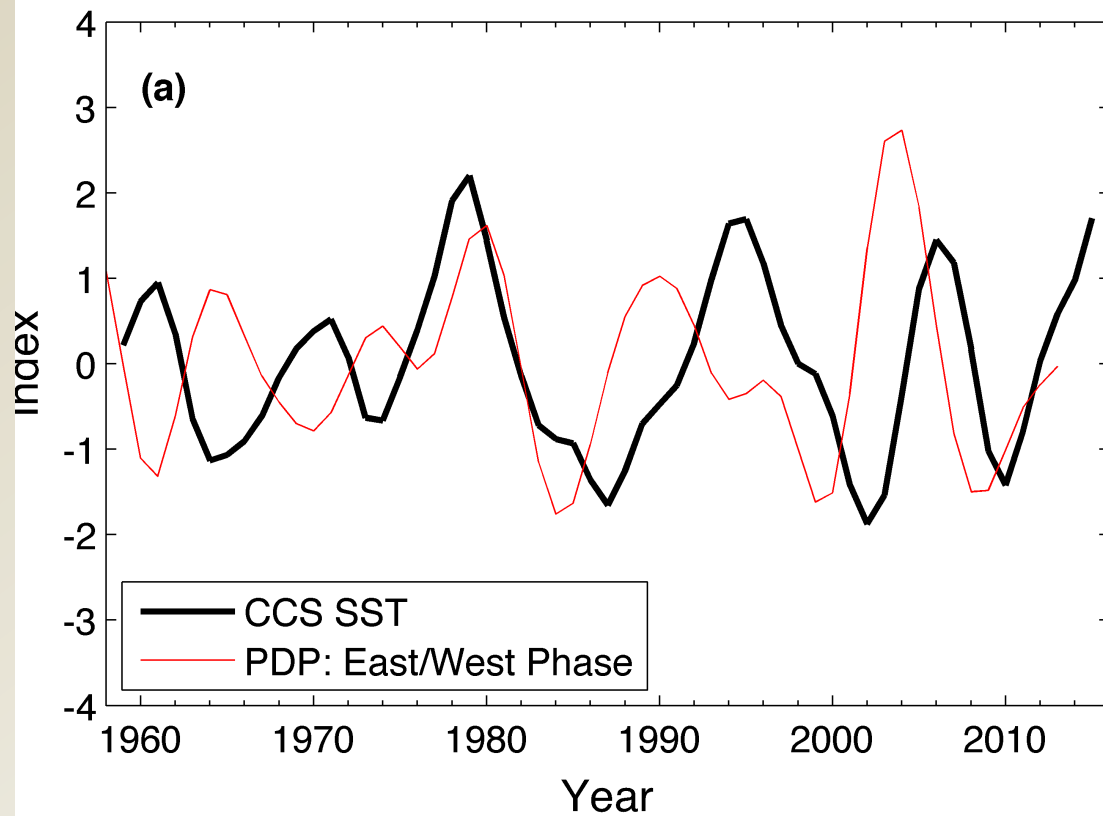
-0.5 -0.4 -0.3 -0.2 -0.1 0 0.1 0.2 0.3 0.4 0.5



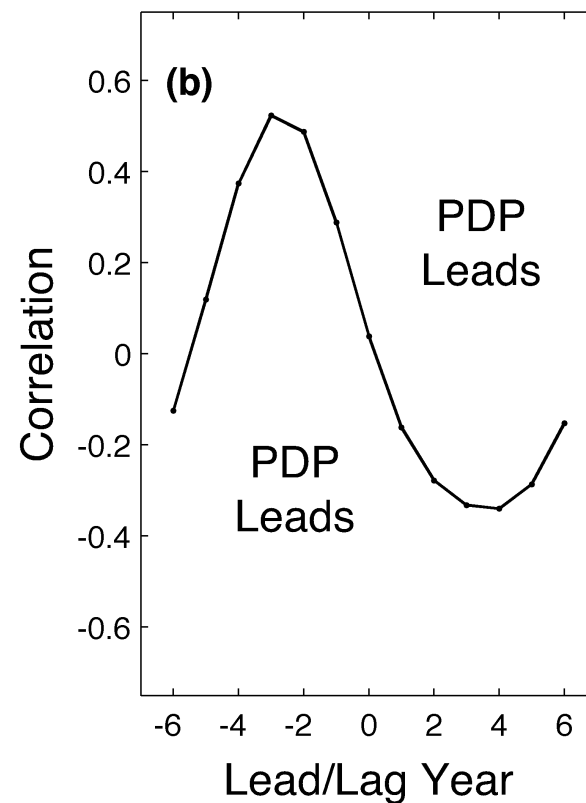


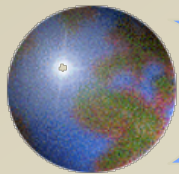
# *PDP as a Leading Indicator*

## PDP and California Current System SSTs



## Lead/Lag Relation



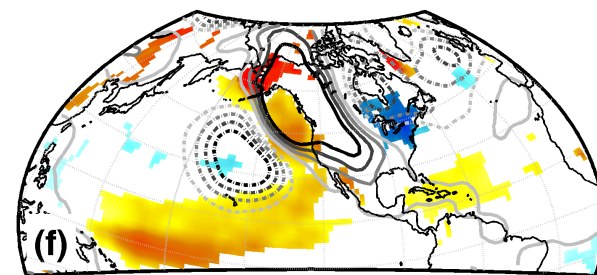
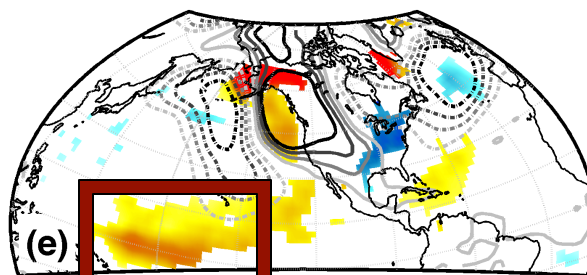
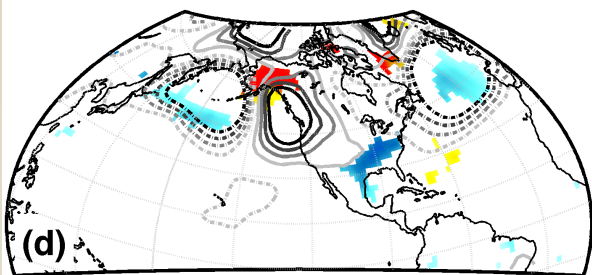


# *Drivers of the PDP Teleconnection Phases*

Year 0

Year 1

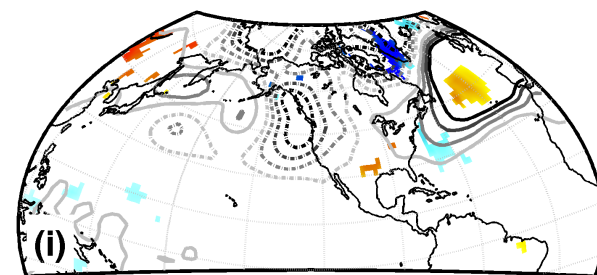
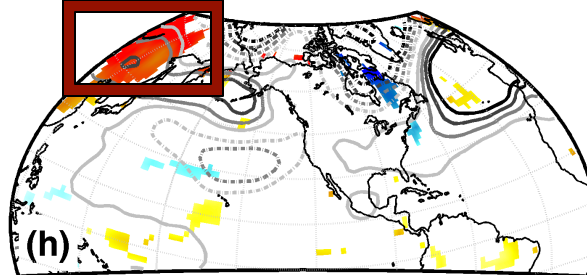
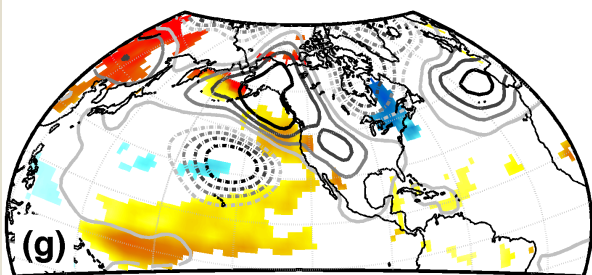
Year 2

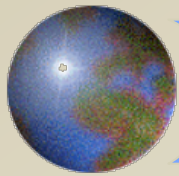


Year 3

Year 4

Year 5

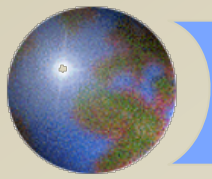




# Conclusions

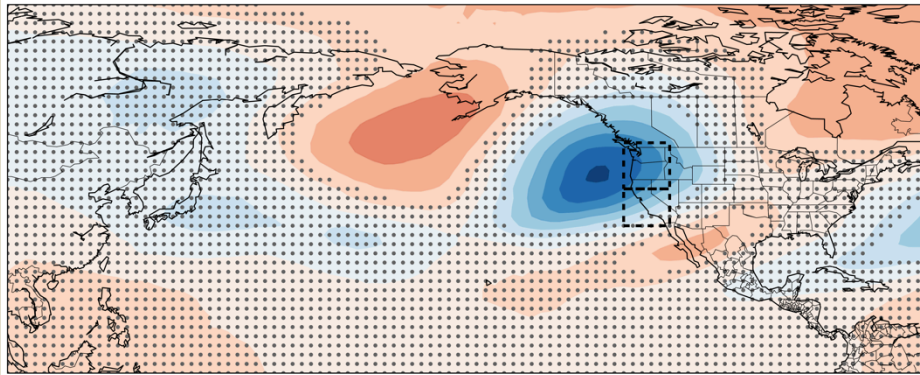
- ✚ Analyses of meteorological and dynamical fields across the tropical and extratropical North Pacific reveal a robust mode of quasi-decadal variability termed the *Pacific Decadal Precession (PDP)*
  - ✚ Characterized by an ~10-year counter-clockwise progression of an atmospheric pressure dipole around the North Pacific
  - ✚ The two teleconnection phases of the PDP can induce many regional-scale effects, including severe drought across the western US, more frequent cold extremes over the eastern US, and prolonged marine heatwaves in the Northeast Pacific
- ✚ Outstanding Questions
  - ✚ What is the source of the PDP's quasi-decadal periodicity?
  - ✚ How are the PDP's atmospheric teleconnection phases maintained?
  - ✚ **How can we best capture and exploit the statistically and/or dynamically predictable components of the PDP for long-term (>2 year) regional climate forecasting?**



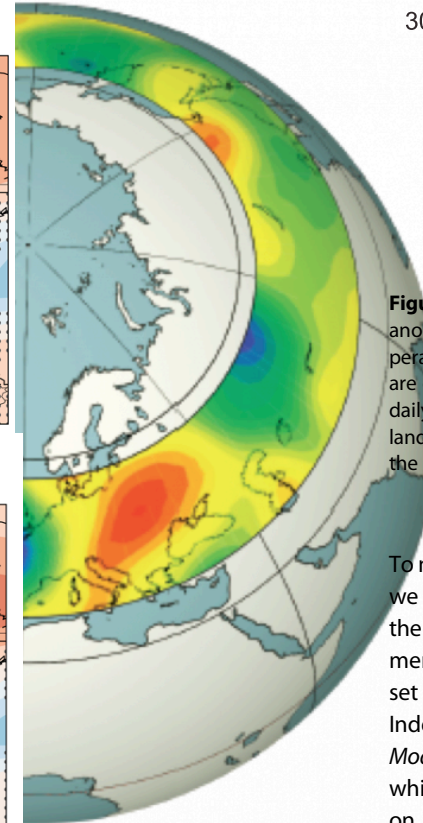
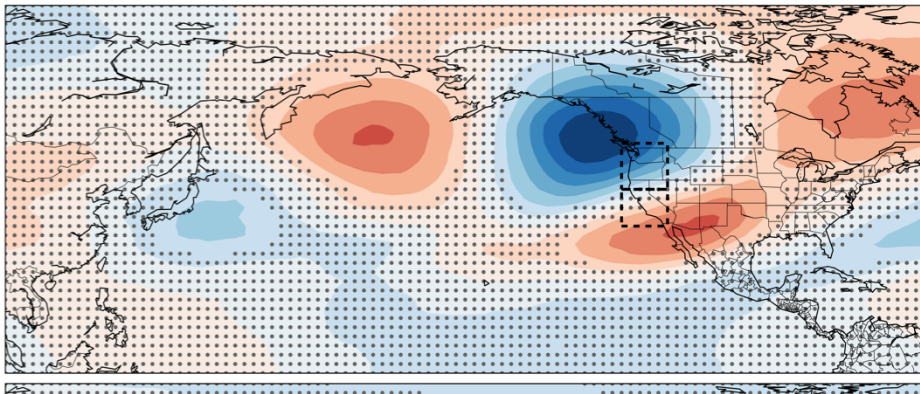


# Climate Shifts Associated with CTP

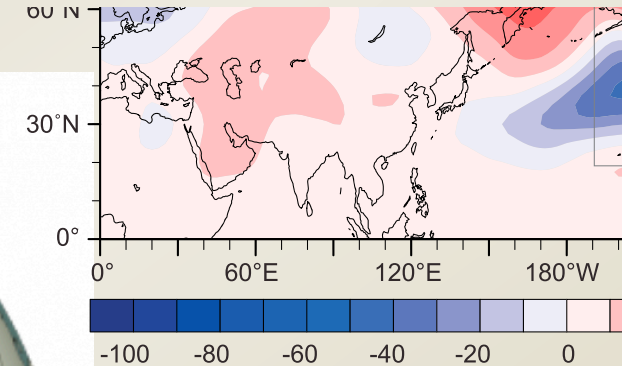
## South Coast



## North Coast

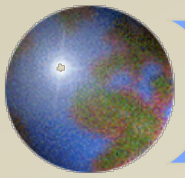


May 2013



**Figure 1.** North American winter temperature dipole (NAWTD): Observed anomalies and (b) mid-tropospheric (500mb) geopotential height and temperature dipole event occurrences defined using a 15% geographic area. The daily dipole event to be the co-occurrence of (1) daily maximum temperature anomalies greater than their 84th percentile threshold and (2) daily minimum temperature anomalies less than their 16th percentile threshold.

To maintain physical consistency with atmospheric variables used in the analysis, we primarily use temperature and geopotential heights from reanalysis products. To assess the sensitivity of the trends in temperature extremes by using different data sets, we use two instrumental data sets—Oregon State University's high-resolution (32 km) reanalysis product [Parameter-estimation Model, 2015] and the University of Idaho's Meteorological Model (M2) reanalysis product, which have a spatial resolution of 4 km (Figure S1 in the supplemental material). In addition, we use the network of ground-based observations, METDATA, and some variables from regional-scale reanalysis products to validate the data set.



# *Decadal Variability in the Tropics (?)*

Decadal Variance: T0-300m

