Climate influence on strawberry production and pest management practices

Tapan Pathak, Ph.D.
Climate Adaptation in Agriculture - CE Specialist
University of California Merced

Email: tpathak@ucmerced.edu

Phone: (209) 228-2520

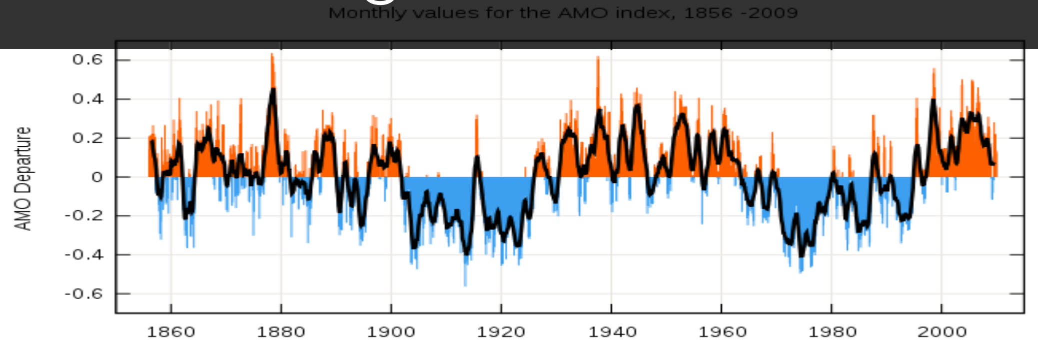
UCMERCED

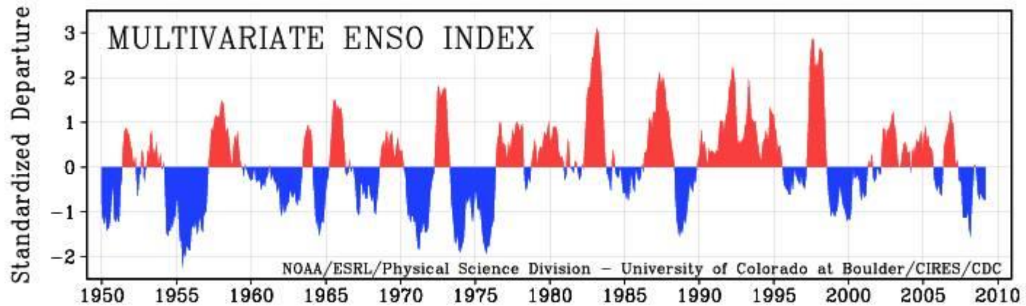
UC CE
University of California
Agriculture and Natural Resources
Cooperative Extension

Outline

- Climate Basics
- Historic Trends in Climate
- Impacts on pest management
- El Nino Southern Oscillation
  - Current Status
  - What it means locally?
- Seasonal (3 month) climate outlook
- Climate influence on strawberry yield

What is difference the between Climate Variability and Climate Change?

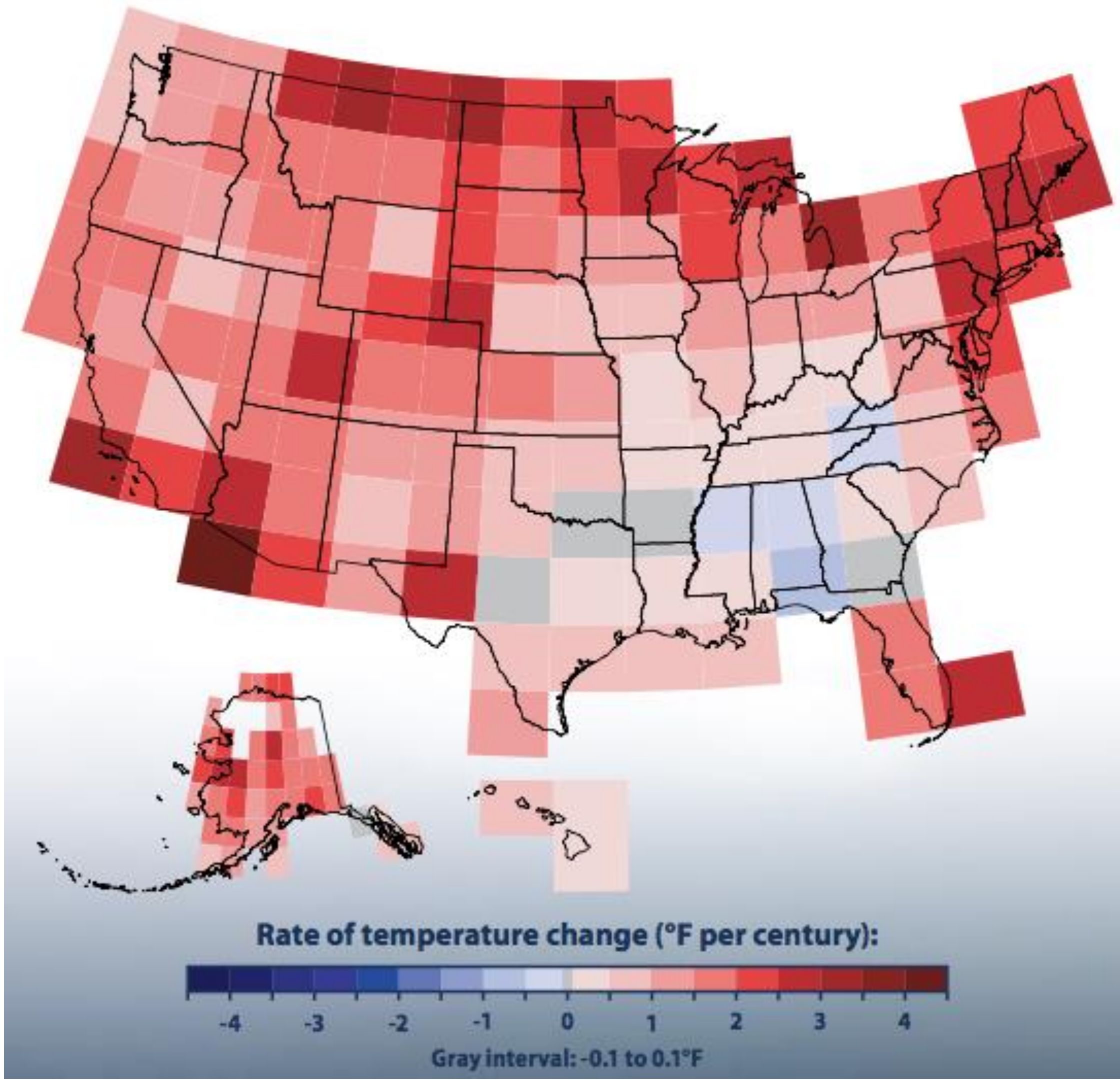




- **Climate Variability** is a measure of shorter term climate fluctuations above or below long term average

- **Climate Change** is a measure of longer term statistically significant continuous change (increase or decrease)

Changes in Average US temperatures



This figure shows how annual average air temperatures have changed in different parts of the United States since the early 20th century (since 1901 for the contiguous 48 states, 1905 for Hawaii, and 1918 for Alaska).

Data source: NOAA, 2013[3]

Changes in California Temperatures

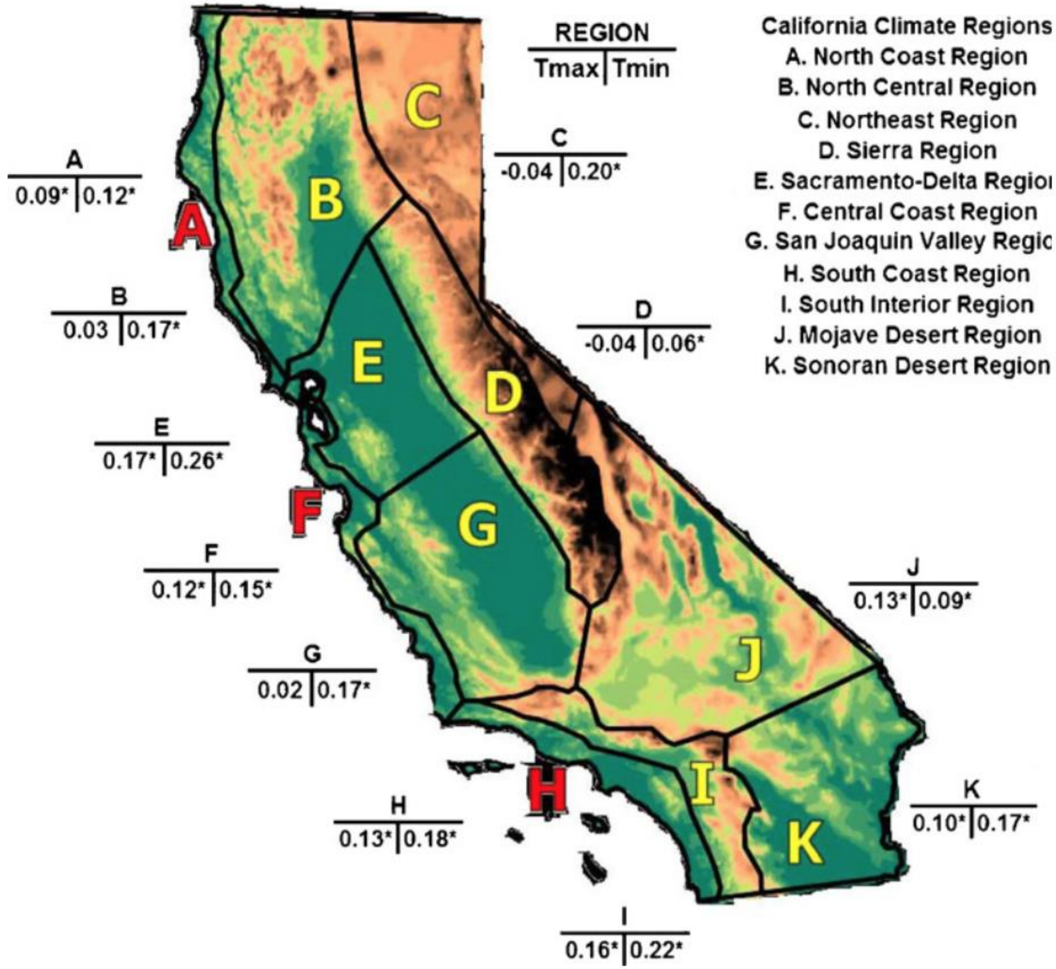


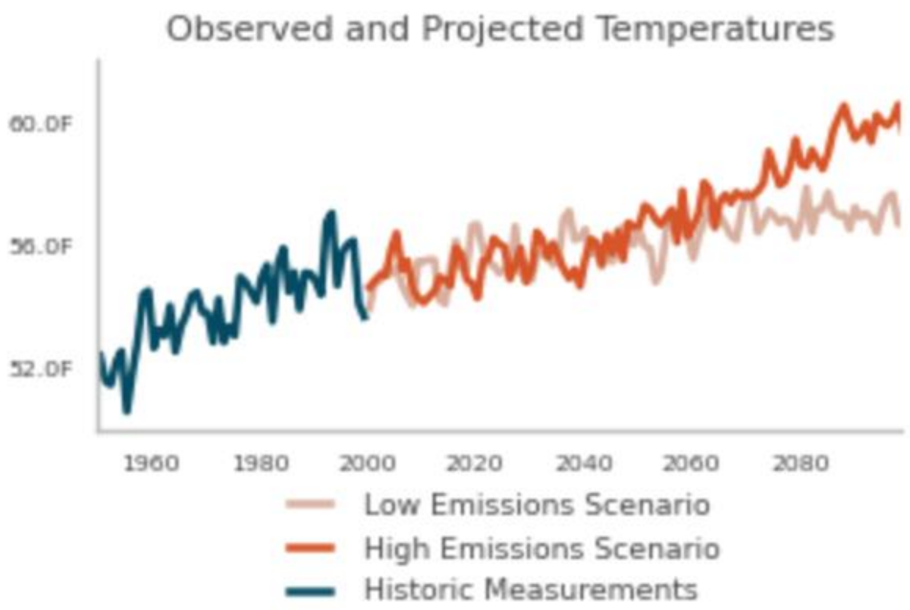
Fig. 4 Annual temperature trends (°C dec^{-1}) for the 11 climate regions labeled *A-K* computed between 1918–2006 for Tmax (*left*) and Tmin (*right*), where the trends that are statistically significant at the 95% confidence level are indicated with an *asterisk*

Cordero et al. (2011)

SANTA MARIA AREA

The information in the chart below corresponds to the selected area on the map (outlined in orange).

Historical Average	54.1 °F	
Low-Emissions Scenario:	57.1 °F	+3.0 °F
High-Emissions Scenario:	59.2 °F	+5.1 °F



disclaimer uncertainty

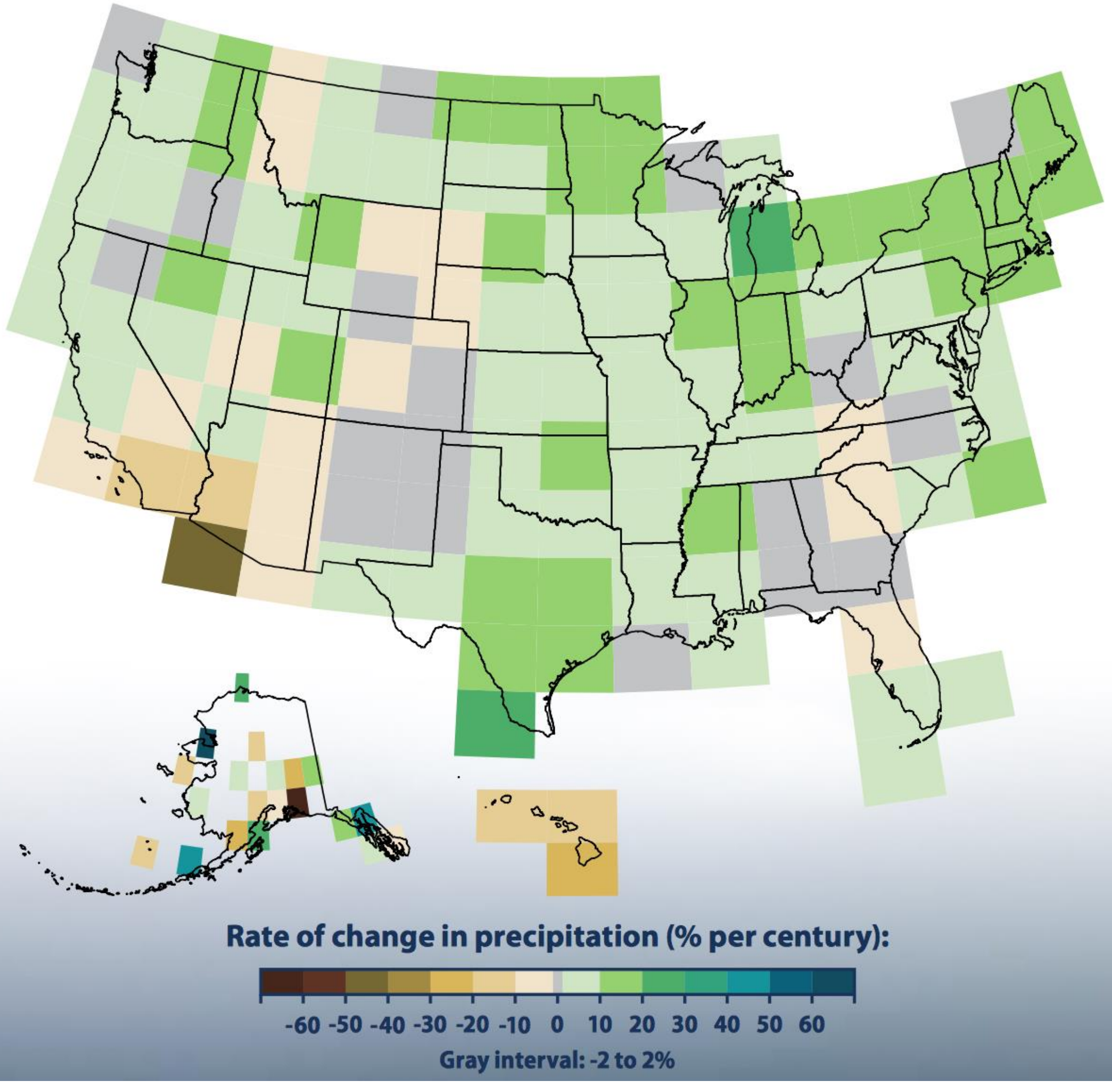
cal-adapt.org

Impacts of warmer temperature

- Enhance lifecycle and rate of growth of certain pests
- Introduce new pests and disease
- Shifts in timing
- IPM may need to adapt to these changing conditions
- Low chill hours accumulations

Precipitation Trends

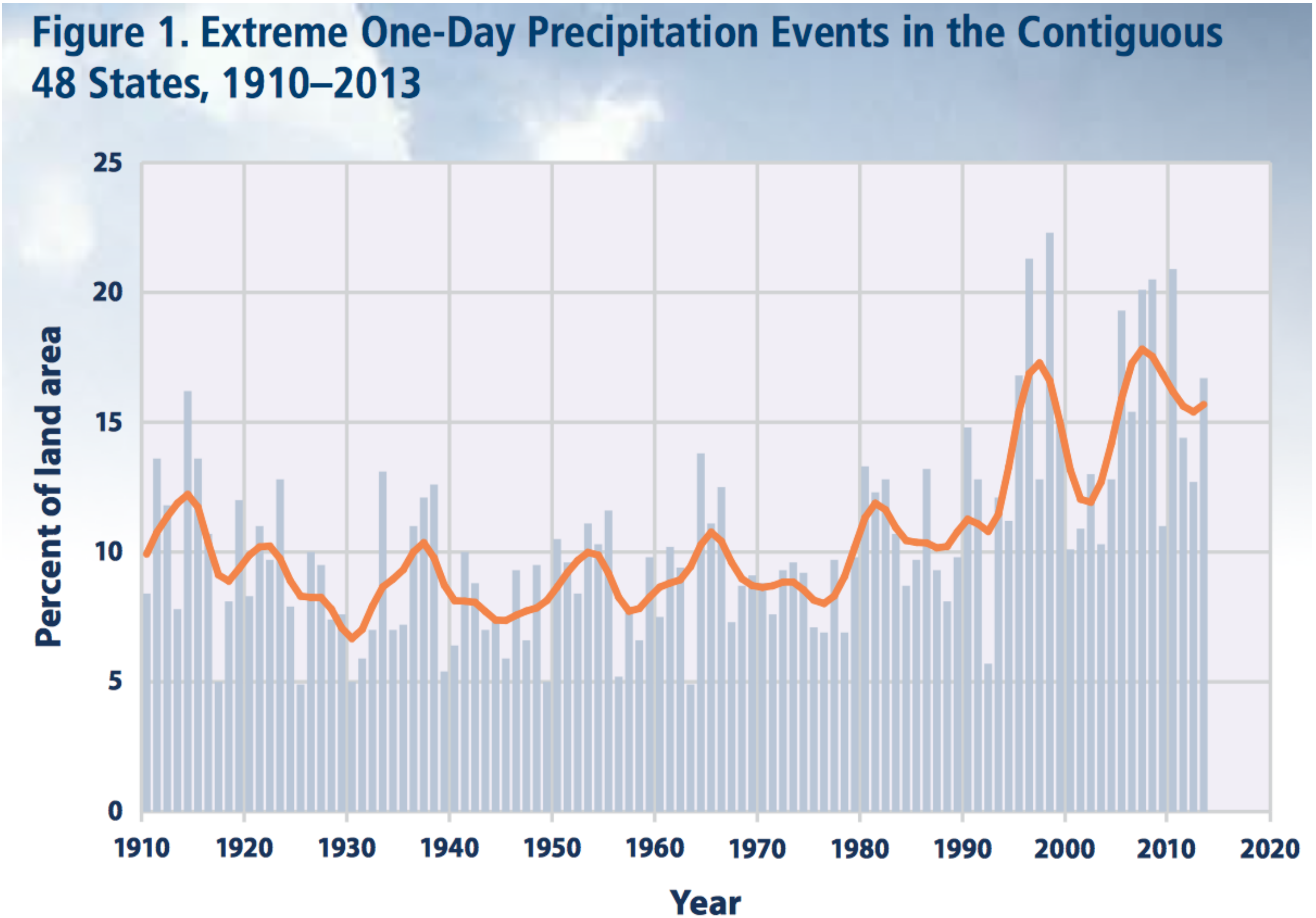
Figure 3. Rate of Precipitation Change in the United States, 1901–2012



This figure shows the rate of change in total annual precipitation in different parts of the United States since the early 20th century (since 1901 for the contiguous 48 states, 1905 for Hawaii, and 1918 for Alaska).

Data source: NOAA, 2013[17]

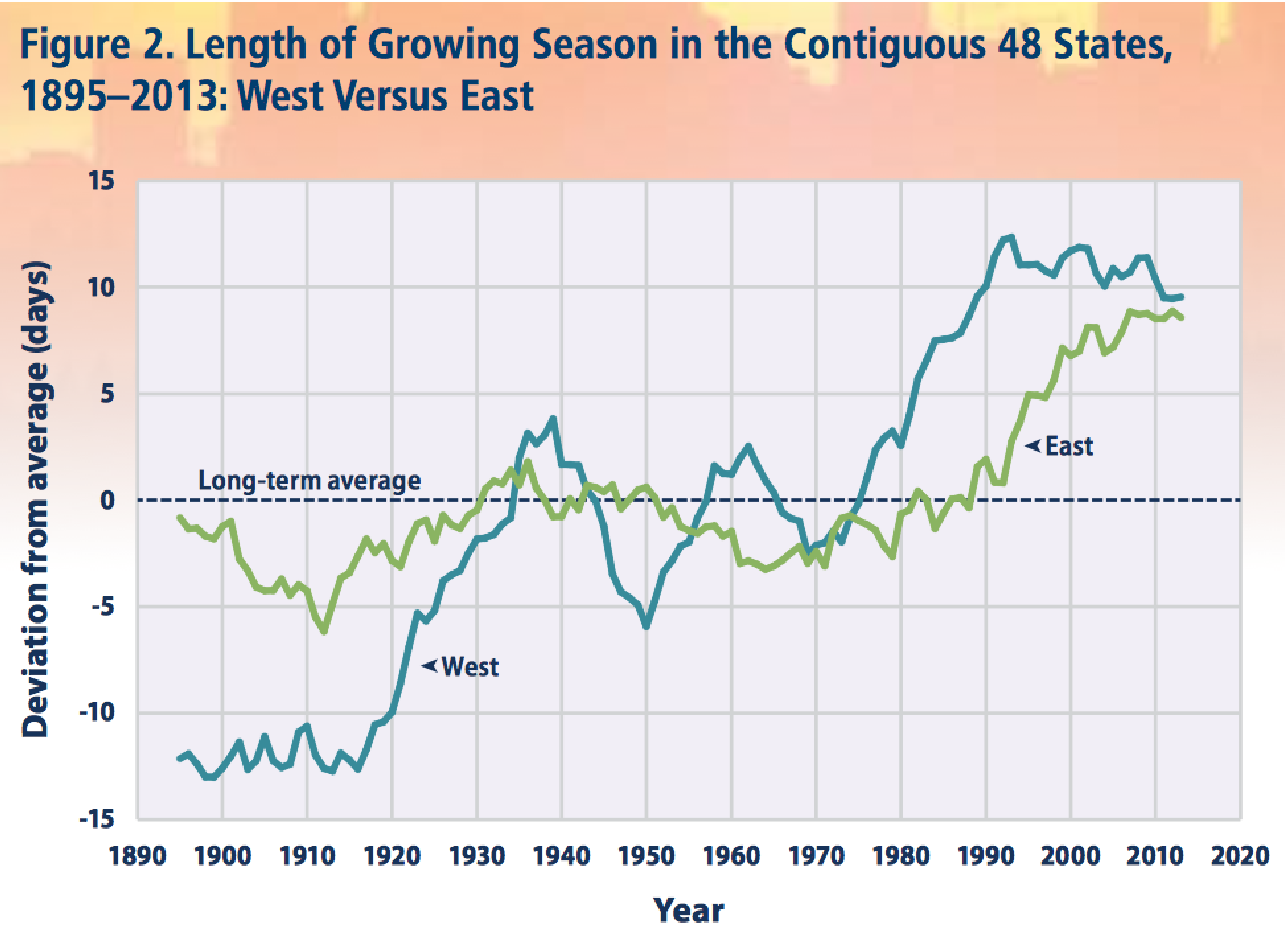
Extreme Precipitation Indicators



This figure shows the percentage of the land area of the contiguous 48 states where a much greater than normal portion of total annual precipitation has come from extreme single-day precipitation events. The bars represent individual years, while the line is a nine-year weighted average.

Data source: NOAA, 2014[21]

Length of Growing Season



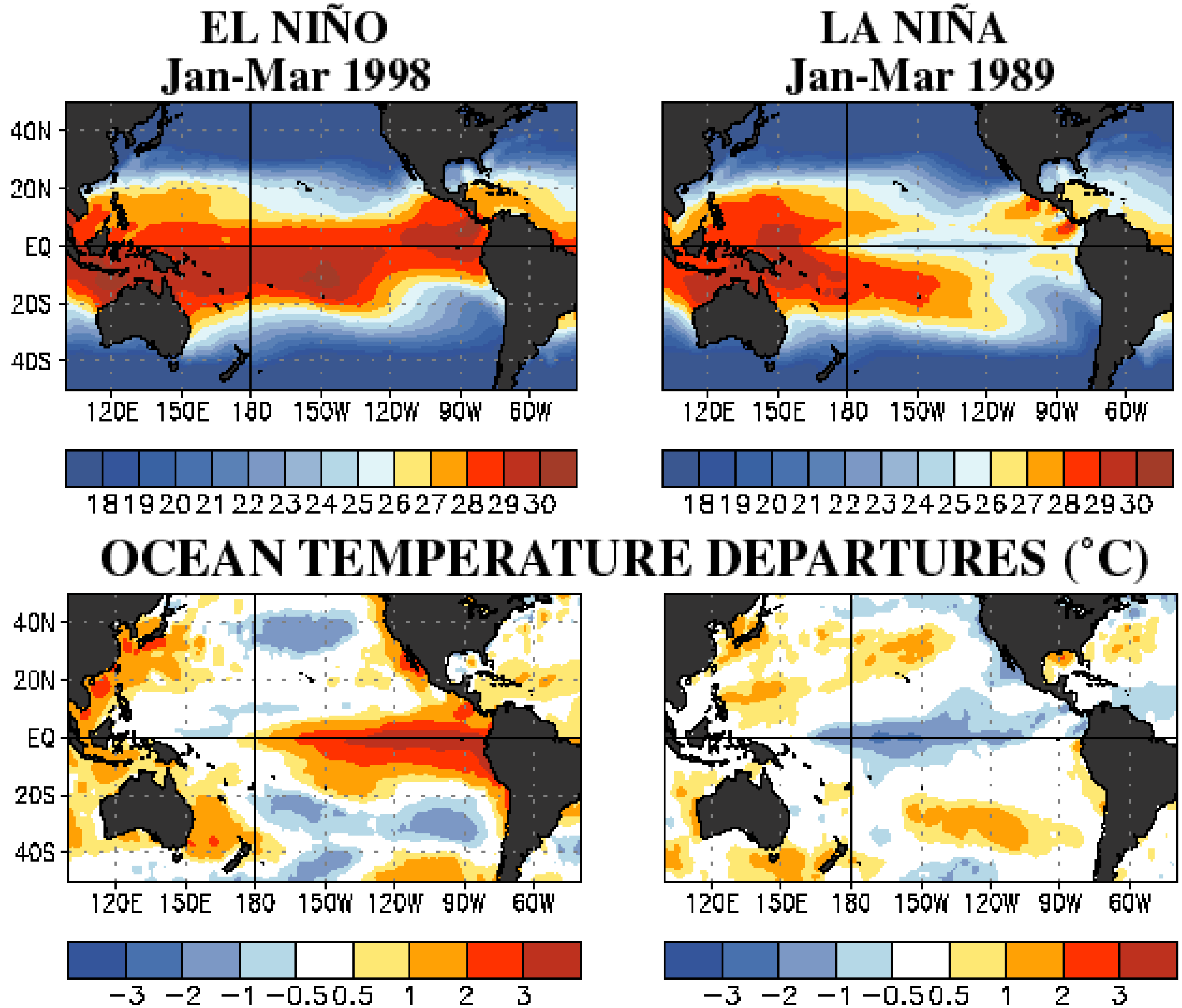
California state wide snowpack is projected to shrink drastically

Cayan et al. Climatic Change (2007)

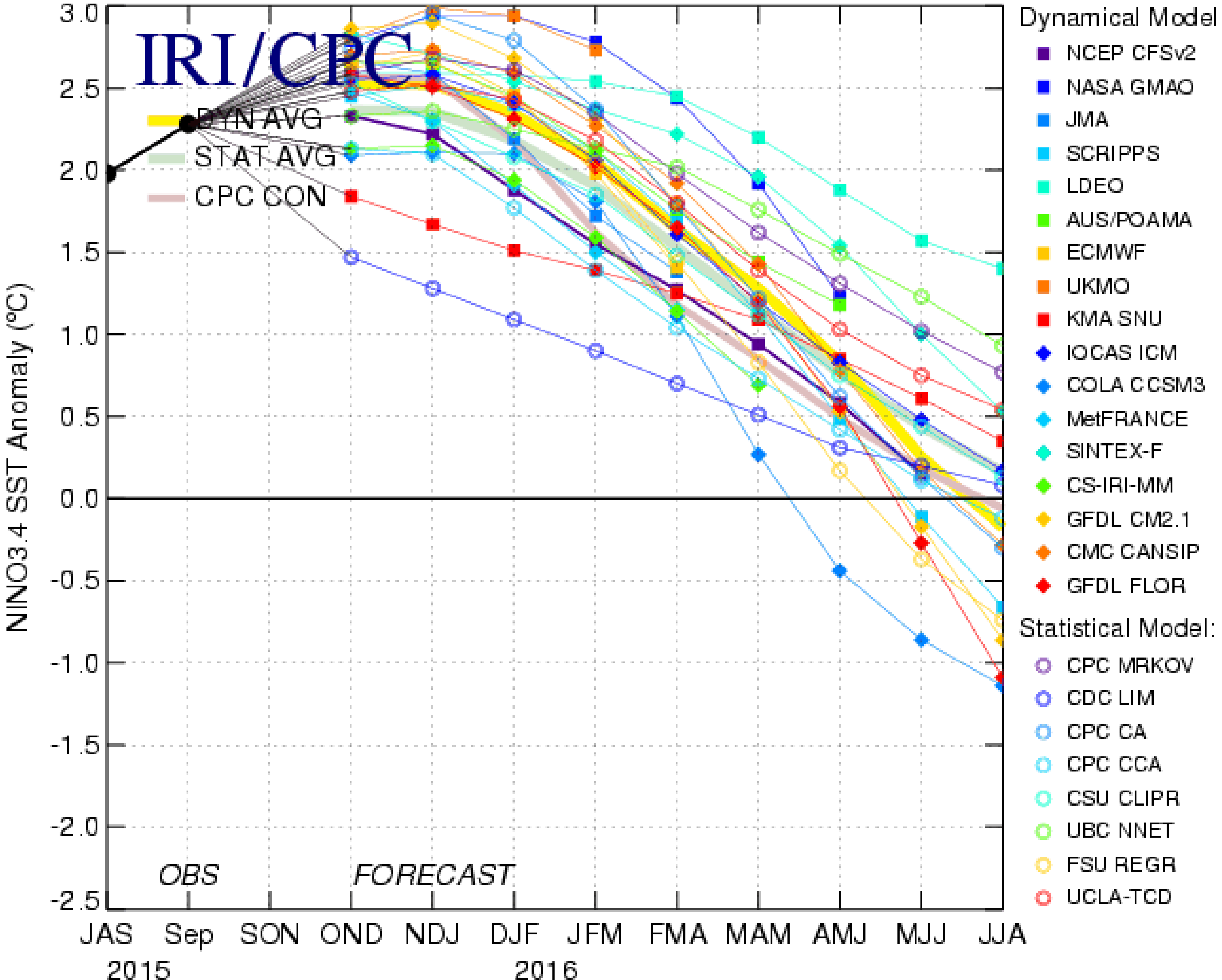
25% of Sierra snowpack will be lost by **2050**

Department of Water Resources, State of California

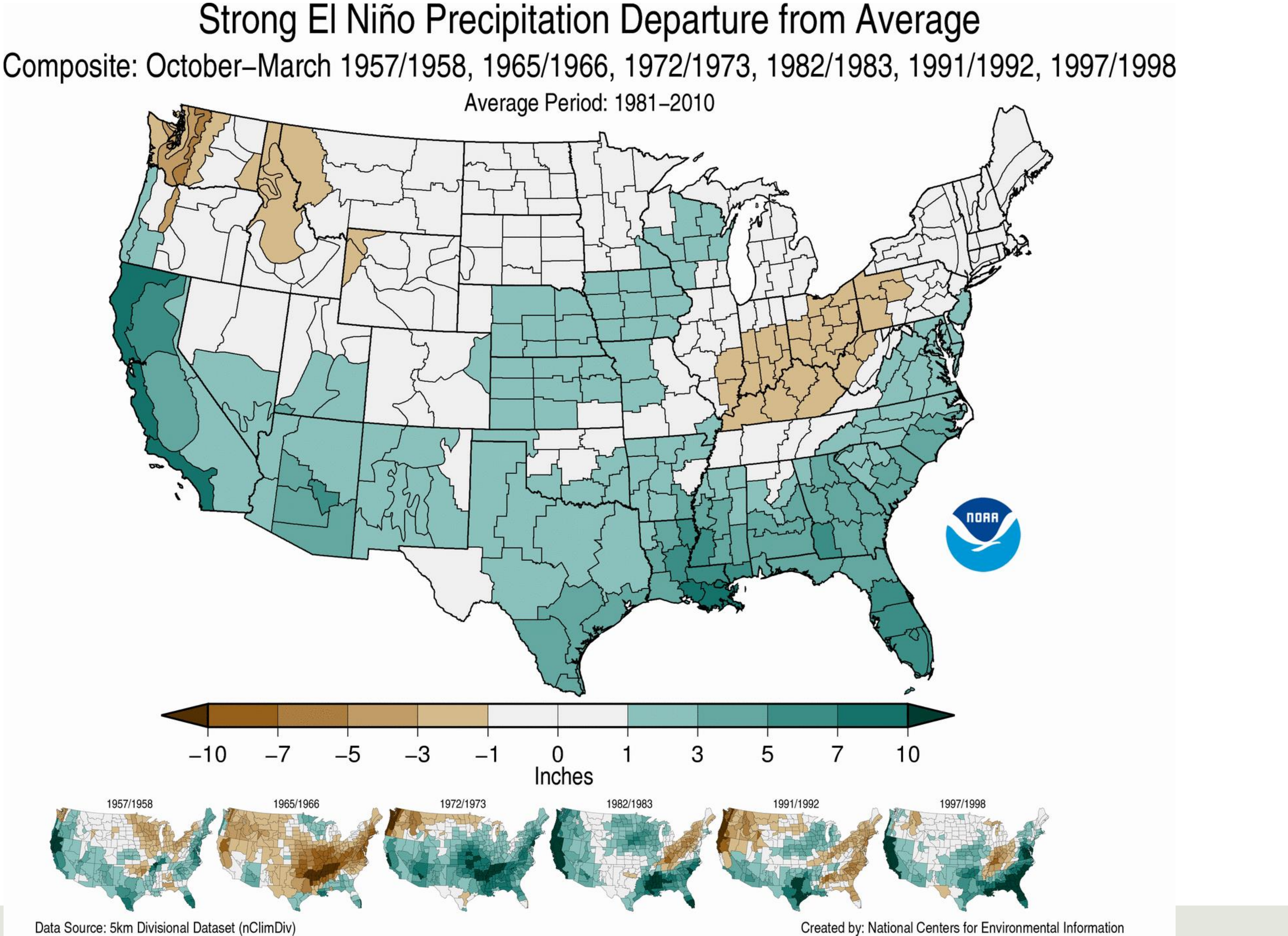
What is an El Niño? La Niña?



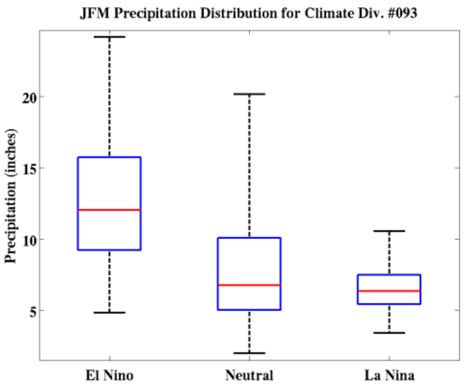
Mid-Oct 2015 Plume of Model ENSO Predictions



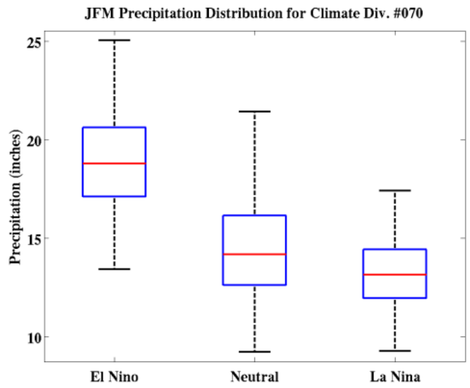
What to expect in Strong El Niño?



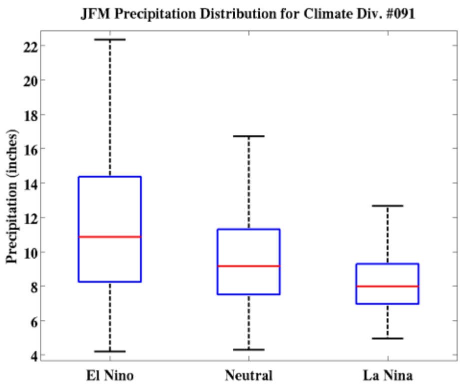
January-March



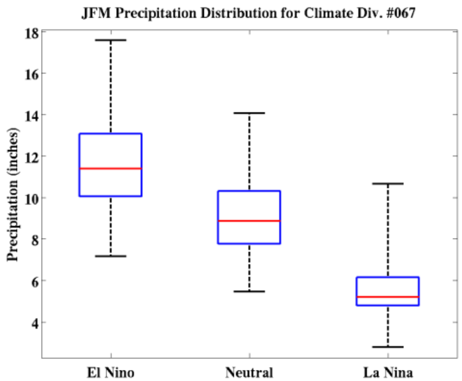
So. CA Coast



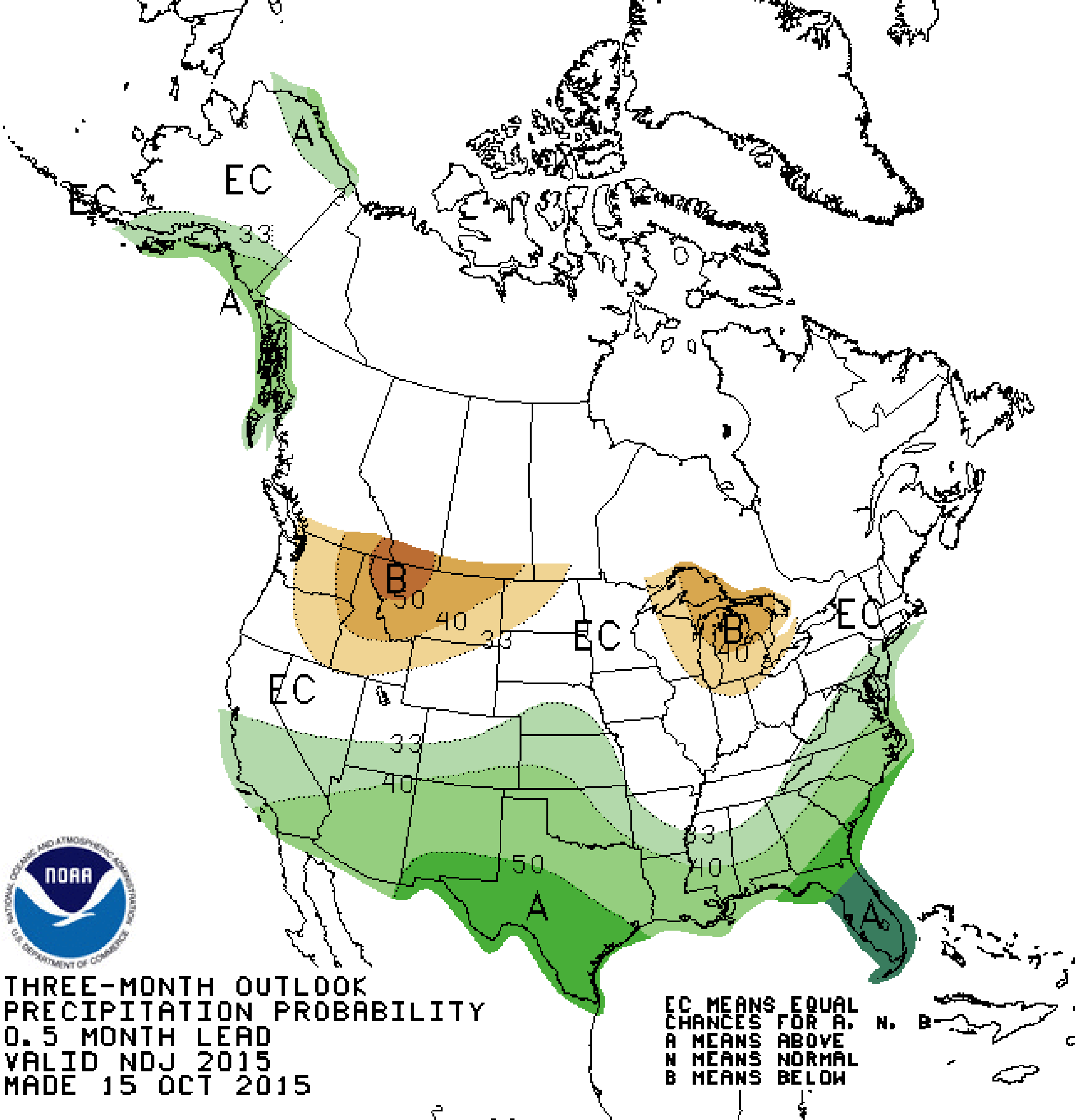
Coastal LA

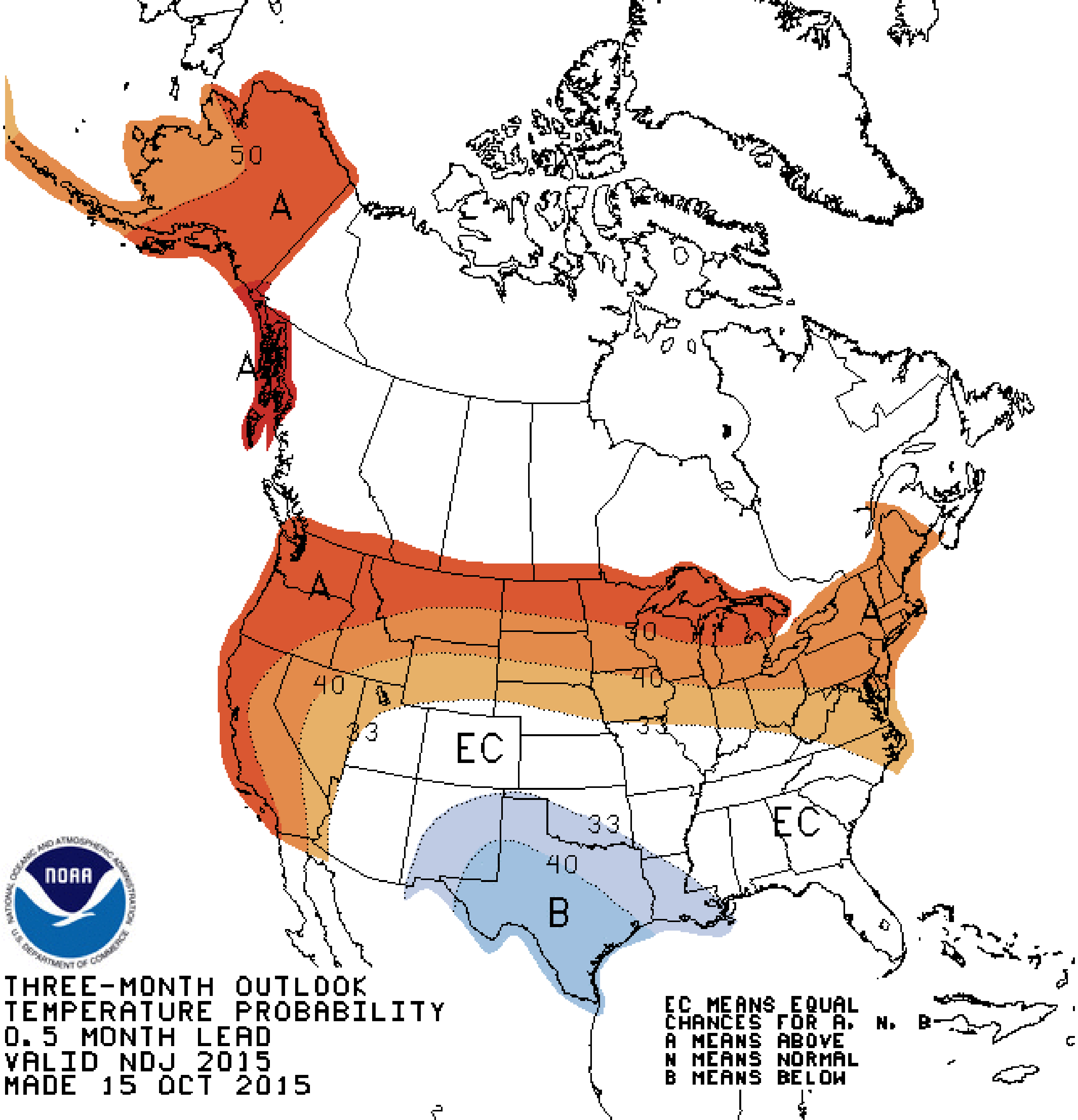


Fresno Region (CA)



Central FL


THREE-MONTH OUTLOOK
PRECIPITATION PROBABILITY
0.5 MONTH LEAD
VALID NDJ 2015
MADE 15 OCT 2015
EC MEANS EQUAL
CHANCES FOR A, N, B
A MEANS ABOVE
N MEANS NORMAL
B MEANS BELOW
NOAA
EC
A
B
33
40
50


50
A
A
A
50
40
A
40
33
EC
33
33
EC
40
B
NOAA
THREE-MONTH OUTLOOK
TEMPERATURE PROBABILITY
0.5 MONTH LEAD
VALID NDJ 2015
MADE 15 OCT 2015
EC MEANS EQUAL
CHANCES FOR A, N, B
A MEANS ABOVE
N MEANS NORMAL
B MEANS BELOW

Climate influence on Strawberries

TABLE 2. Months and weather variables* used for yield forecasts

	Year prior to harvest					Year of harvest								
Crop†	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept
Grapes, wine		ppt							tmn		ppt			
Lettuce			tmx				tmx		tmx					
Almonds						ppt	tmn							
Strawberries				all										
Grapes, table			ppt			ppt			tmn			tmn		
Hay							ppt				ppt			
Oranges					tmn					ppt				
Cotton										tmx	tmn			
Tomatoes, processing									tmx		tmx			tmn
Walnuts				tmx			ppt							
Avocados	tmx		ppt							tmn				

* tmn = average minimum temperature; tmx = average maximum temperature; ppt = total rainfall; all = all three variables.
† No weather variables are shown for pistachios, which were modeled using only previous years' yields.

***Lobell et al., 2006. California Agriculture* 60(4):211-215. DOI: 10.3733/ca.v060n04p211.**

Thank You

Tapan Pathak, Ph.D.
Climate Adaptation in Agriculture - CE Specialist
University of California Merced
Email: tpathak@ucmerced.edu
Phone: (209) 228-2520