The 2014-2015 Oregon Drought: The Roles of the Ocean and Climate Change

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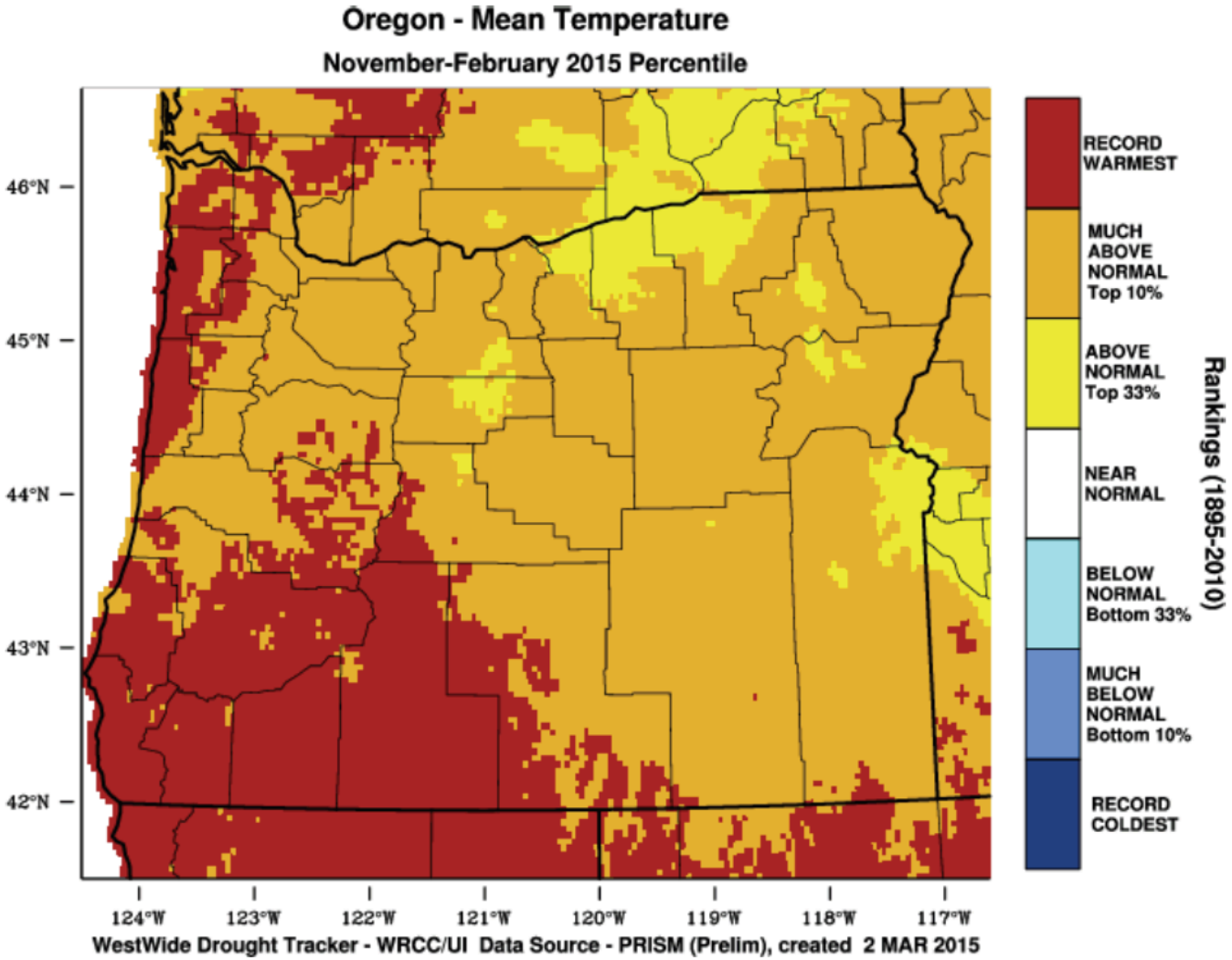
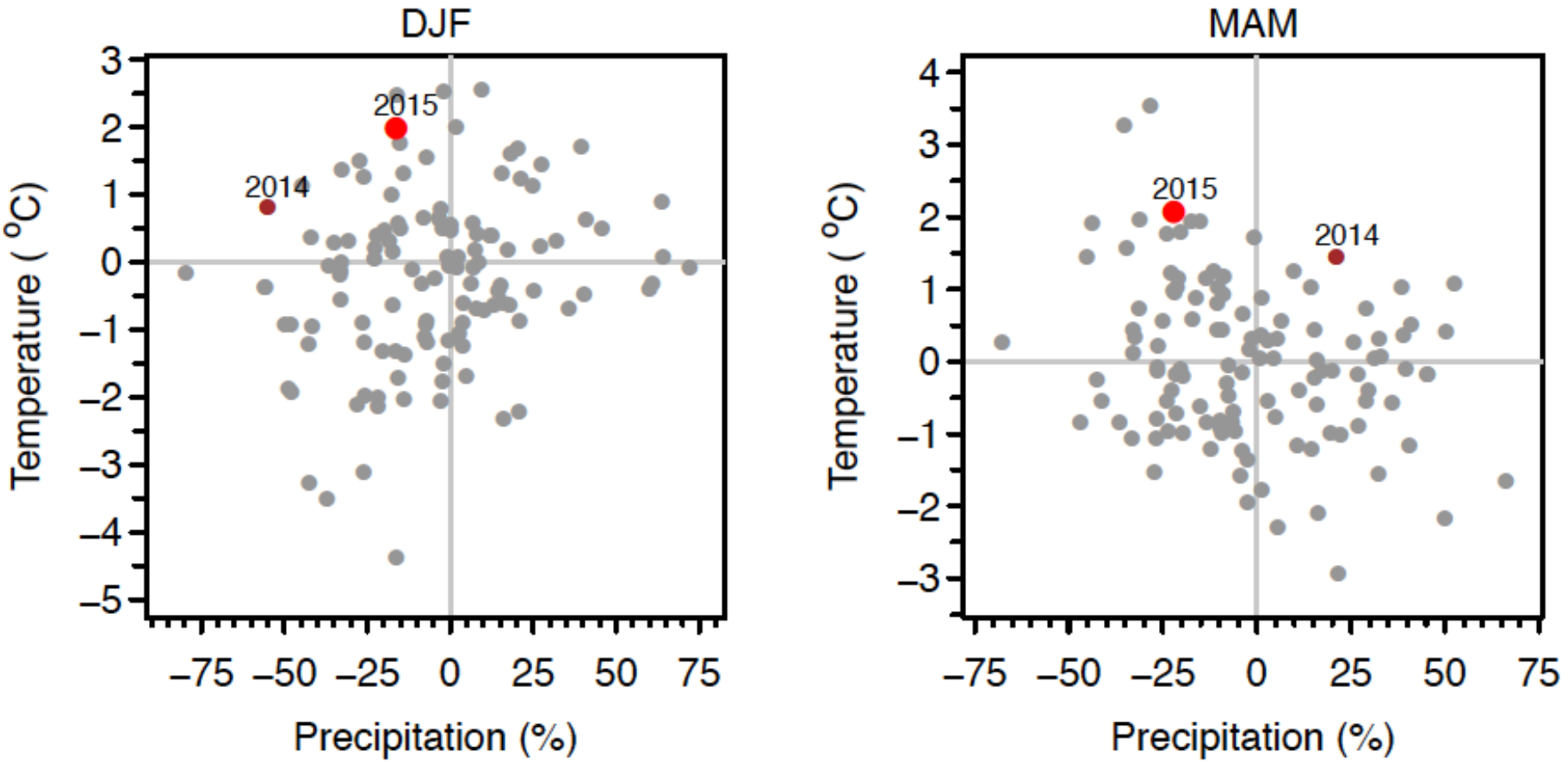

Oregon - Mean Temperature
November-February 2015 Percentile
46°N
45°N
44°N
43°N
42°N
124°W
123°W
122°W
121°W
120°W
119°W
118°W
117°W
RECORD WARMEST
MUCH ABOVE NORMAL Top 10%
ABOVE NORMAL Top 33%
NEAR NORMAL
BELOW NORMAL Bottom 33%
MUCH BELOW NORMAL Bottom 10%
RECORD COLDEST
Rankings (1895-2010)
WestWide Drought Tracker - WRCC/UI Data Source - PRISM (Prelim), created 2 MAR 2015

Oregon temperature vs. precipitation

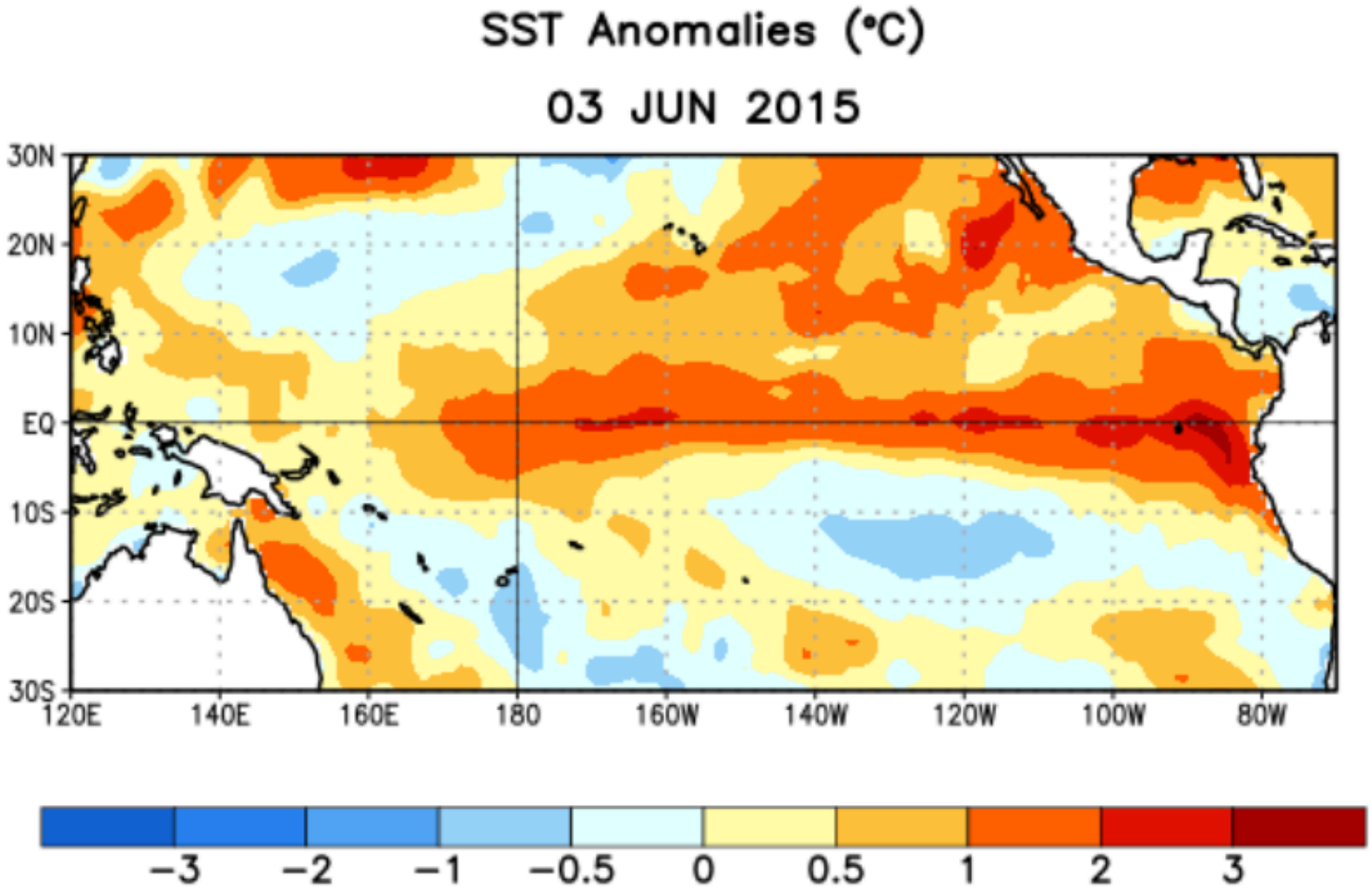
(relative to 1950-1999 baseline)



slide by David Rupp

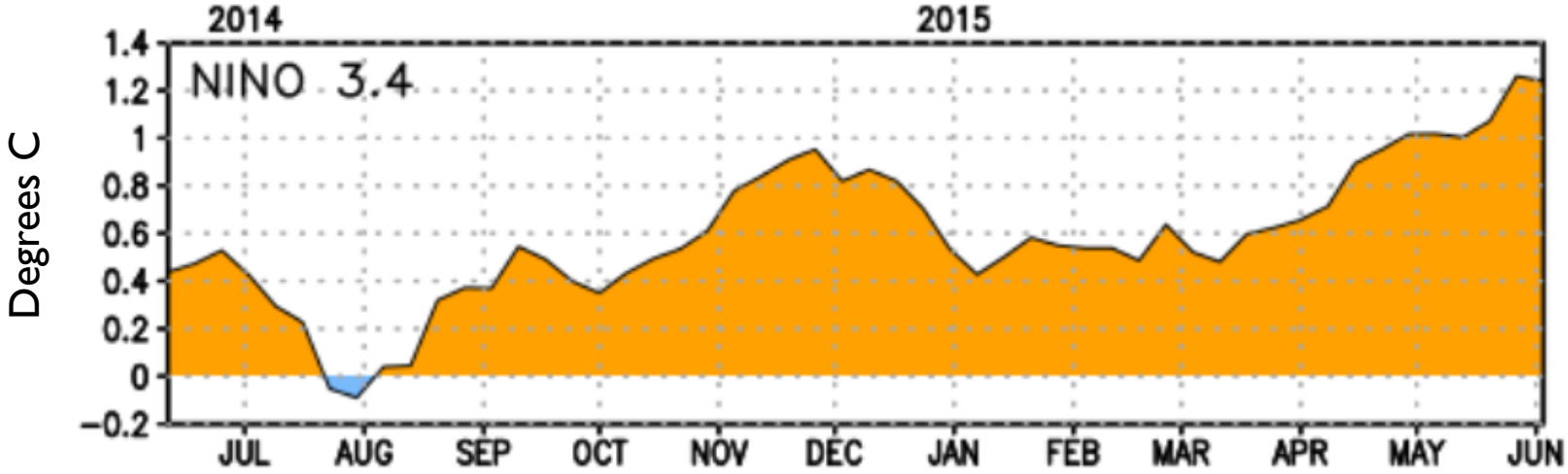
The Ocean

ENSO



CLIMATE PREDICTION CENTER/NCEP/NWS

ENSO June 2014 – May 2015



CLIMATE PREDICTION CENTER/NCEP/NWS

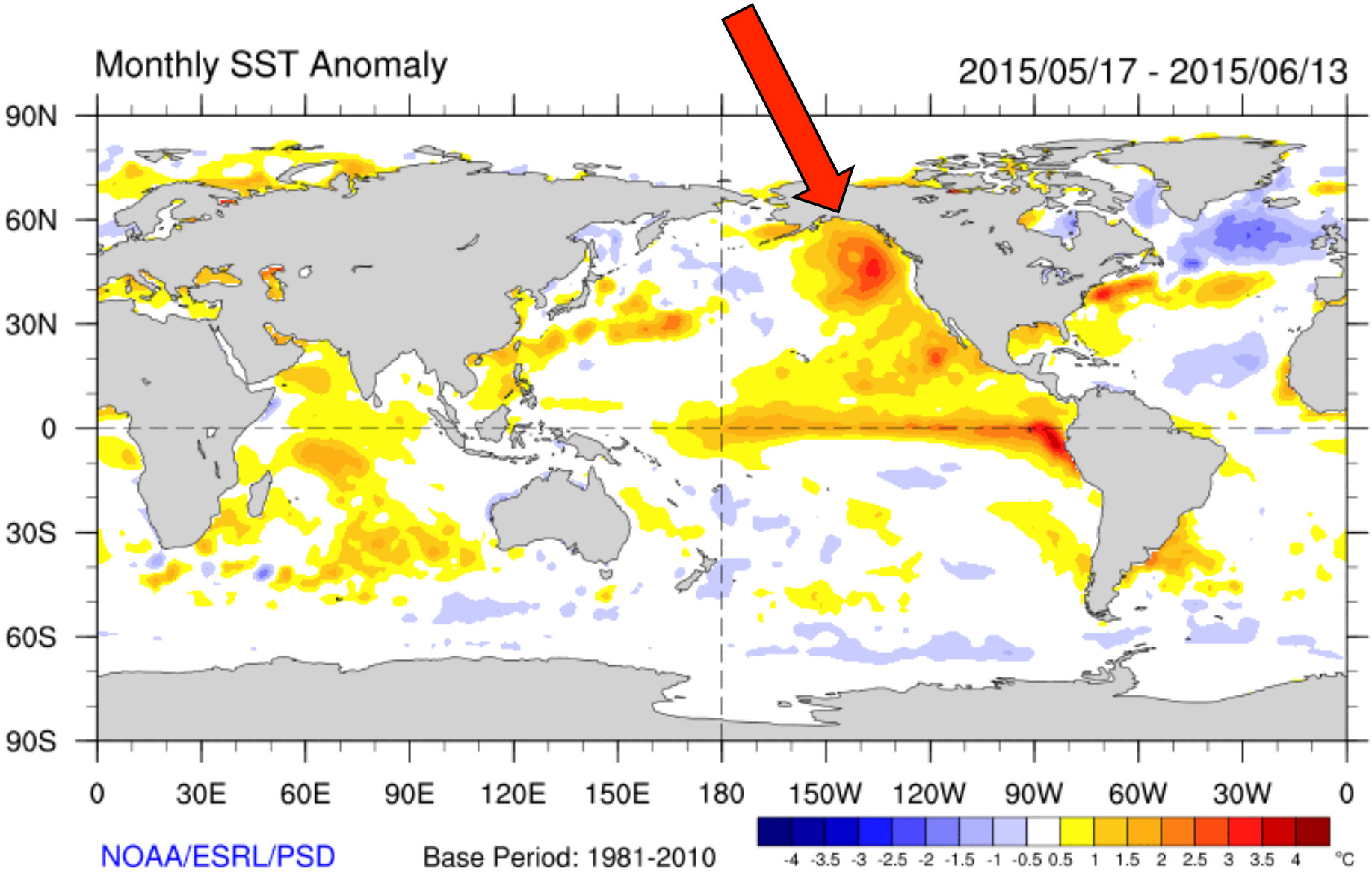
Winter: 1° rise in NINO3.4 ➔ 0.5° rise in temperature
and 5% decrease in precipitation in PNW

ENSO Alert System Status: El Niño Advisory

Greater than **90%** chance that El Niño will continue through fall 2015.
~85% chance it will last through the 2015-16 winter.

CLIMATE PREDICTION CENTER/NCEP/NWS, June 16, 2015

THE BLOB


Monthly SST Anomaly
2015/05/17 - 2015/06/13
90N
60N
30N
0
30S
60S
90S
0
30E
60E
90E
120E
150E
180
150W
120W
90W
60W
30W
0
NOAA/ESRL/PSD
Base Period: 1981-2010
-4 -3.5 -3 -2.5 -2 -1.5 -1 -0.5 0.5 1 1.5 2 2.5 3 3.5 4
°C

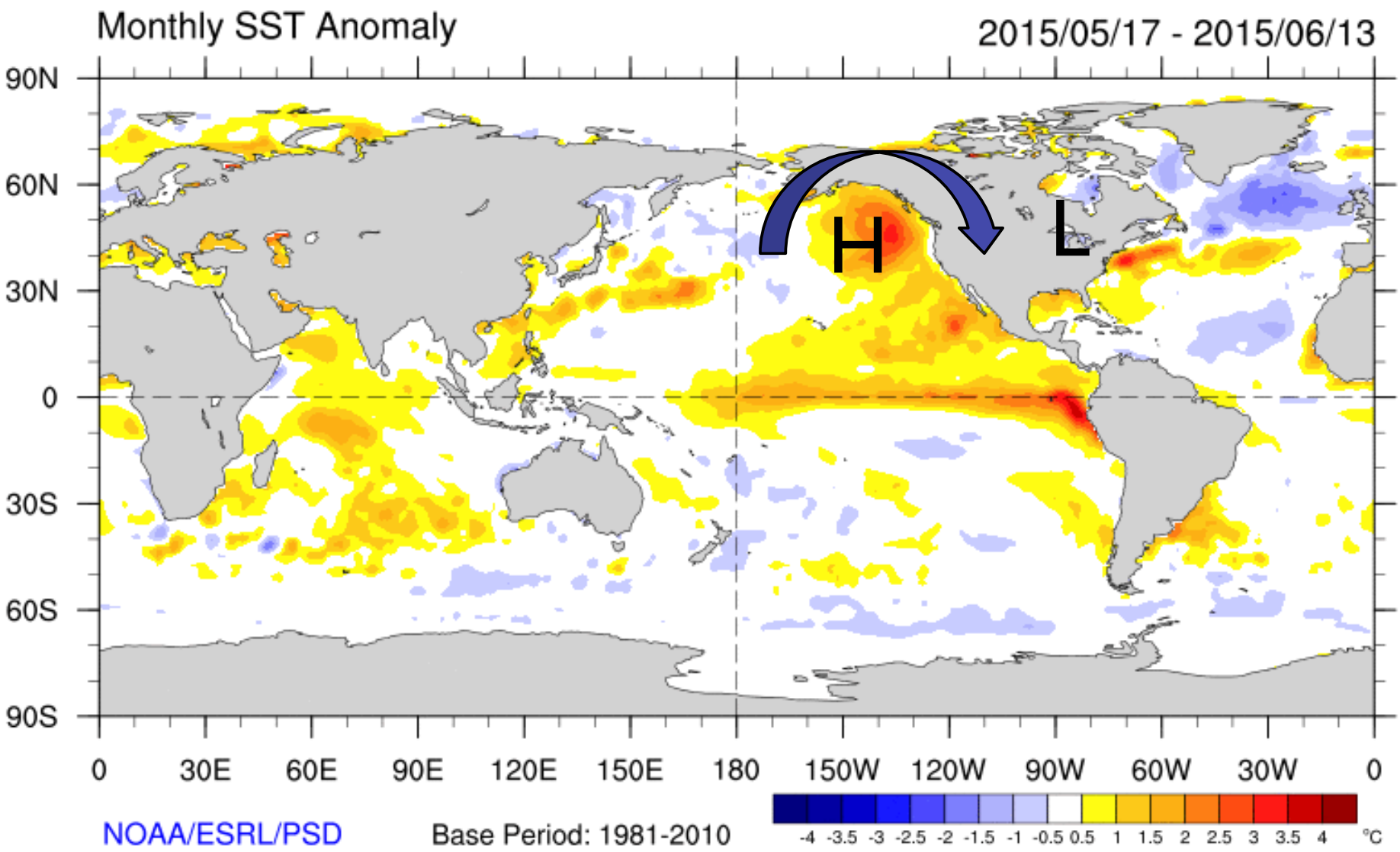
THE BLOB

Mar-May regional temperature (WA) correlated to Feb. SST in the zone of the blob

$r = 0.42$

(Bond et al., 2015)

THE BLOB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90N
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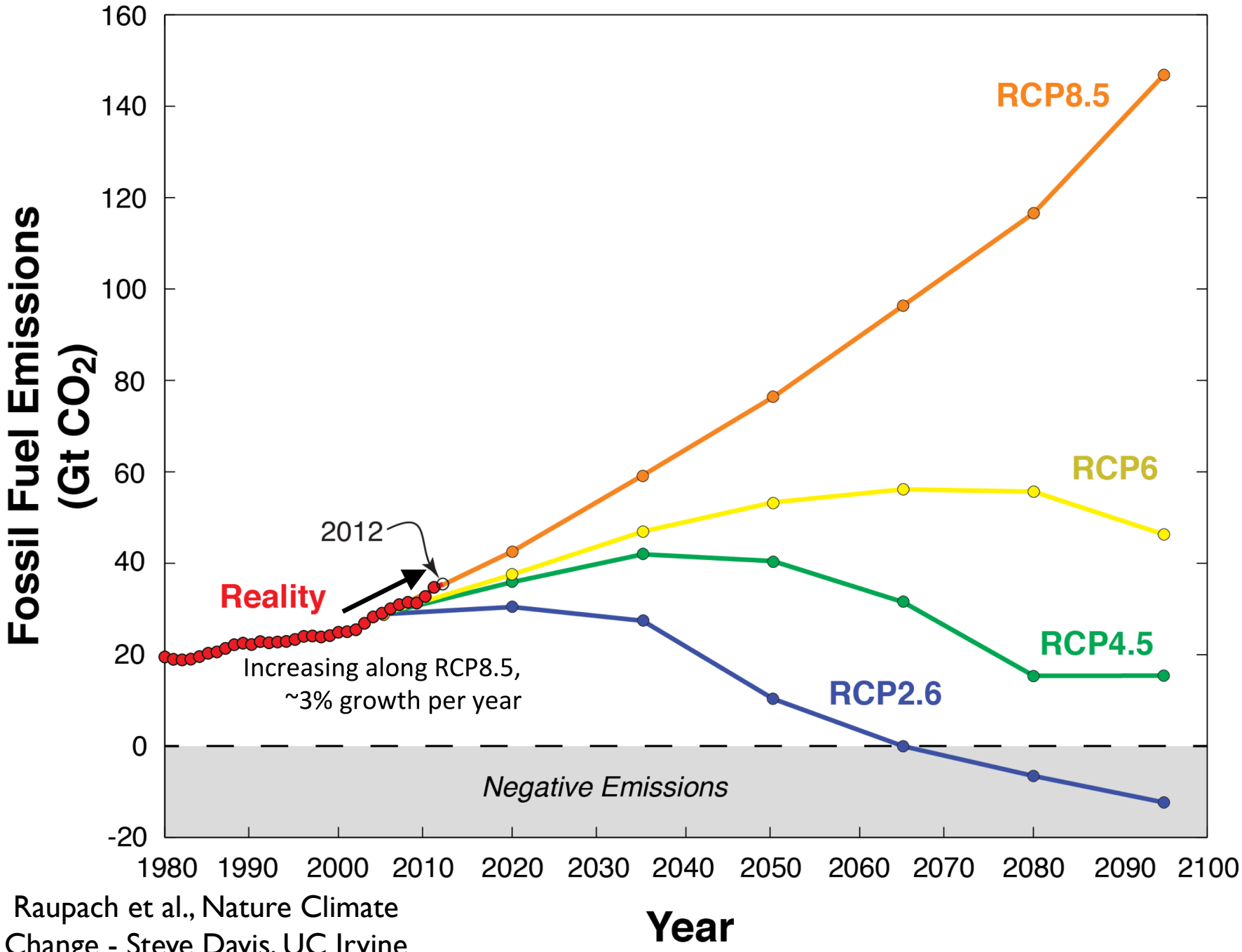
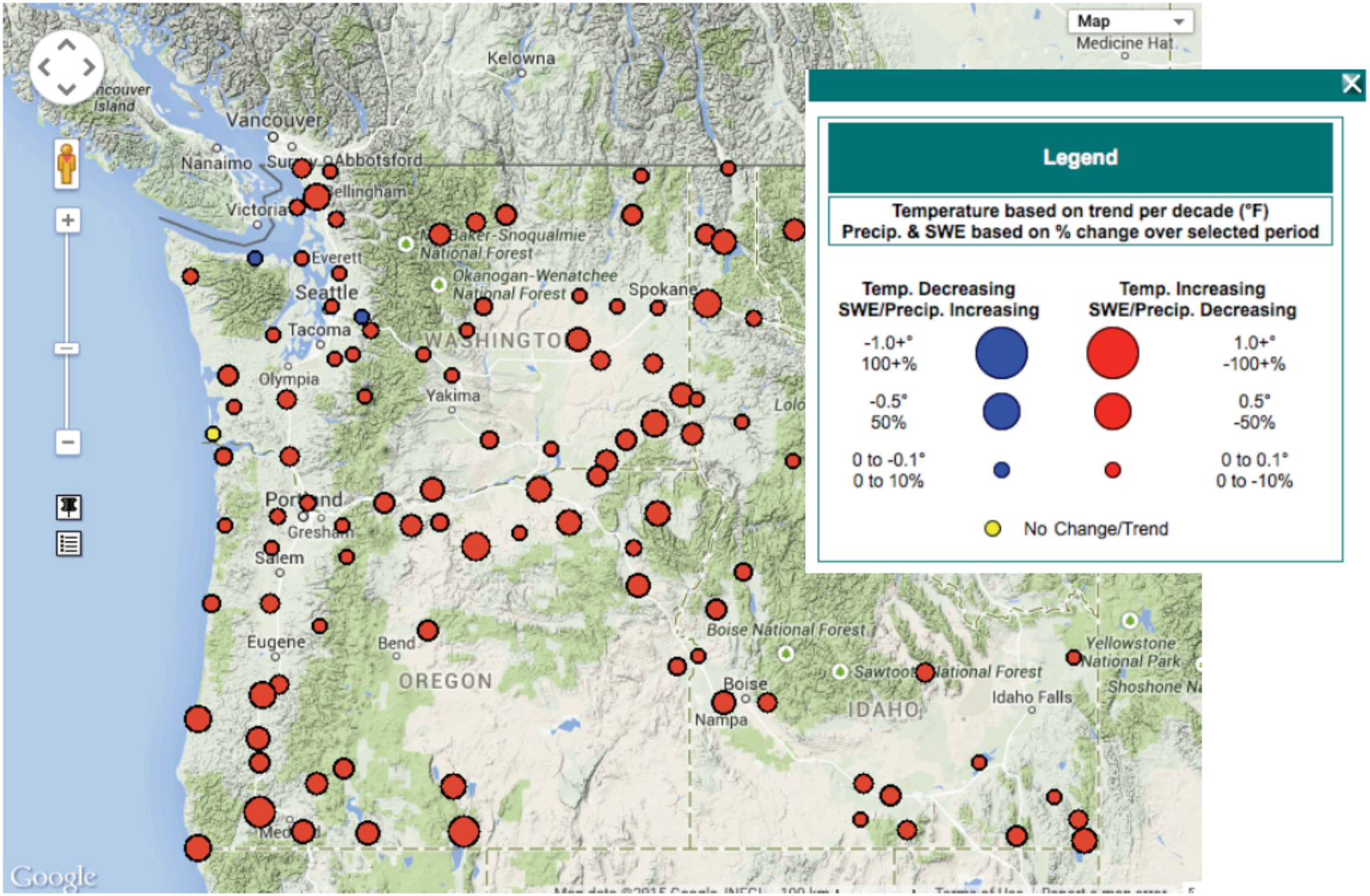
120E
150E
180
150W
120W
90W
60W
30W
0
H
L
NOAA/ESRL/PSD
Base Period: 1981-2010
-4 -3.5 -3 -2.5 -2 -1.5 -1 -0.5 0.5 1 1.5 2 2.5 3 3.5 4
°C

Climate Change



Raupach et al., Nature Climate Change - Steve Davis, UC Irvine

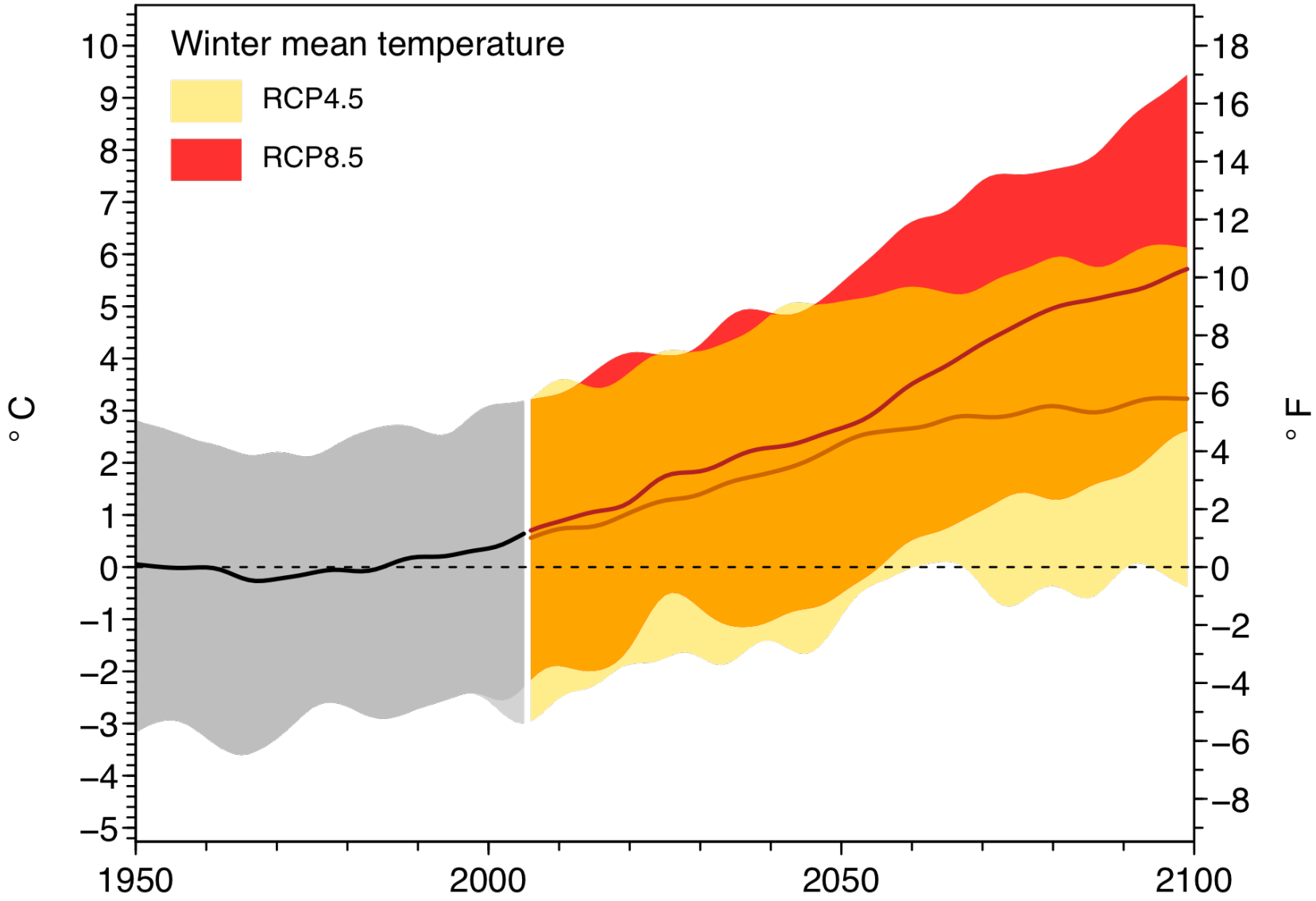
annual temperature trends, 1895-2014



OWSC, climate.washington.edu

PNW temperature*

Difference from 1950-1999 average

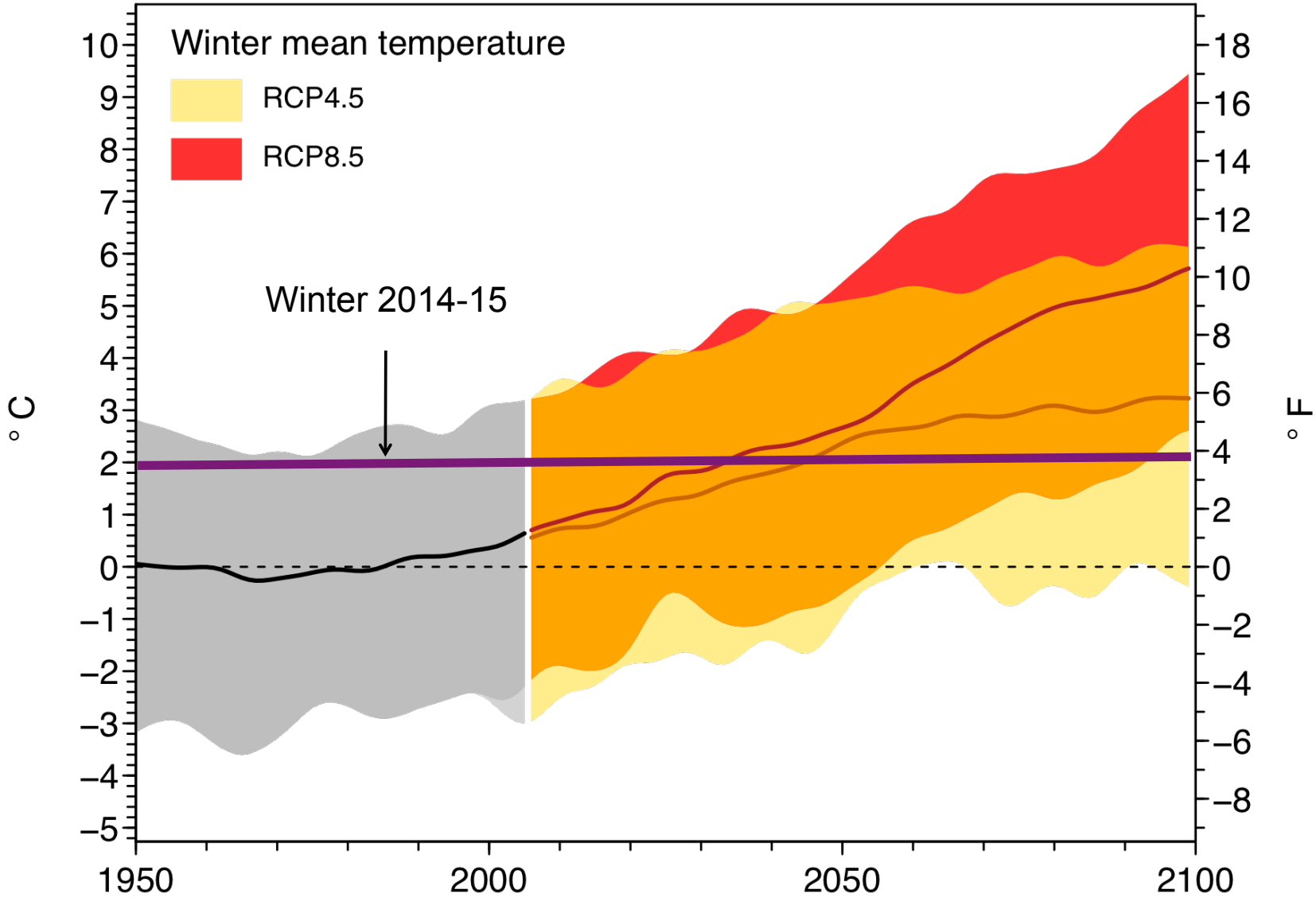


*Data source: 20 CMIP5 GCM simulations, statistically downscaled using MACA.

slide by David Rupp

PNW temperature*

Difference from 1950-1999 average



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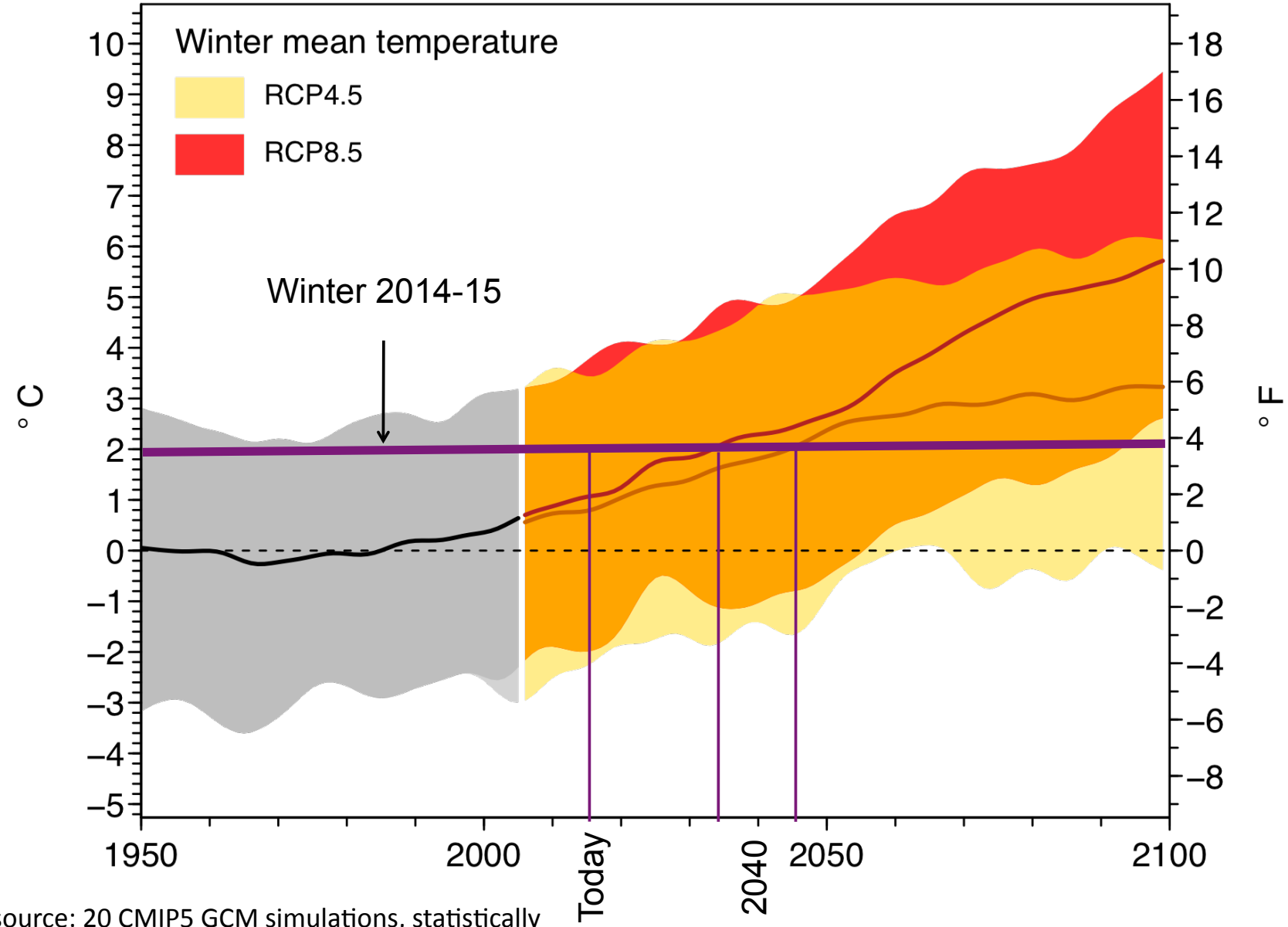
PNW temperature*

Difference from 1950-1999 average



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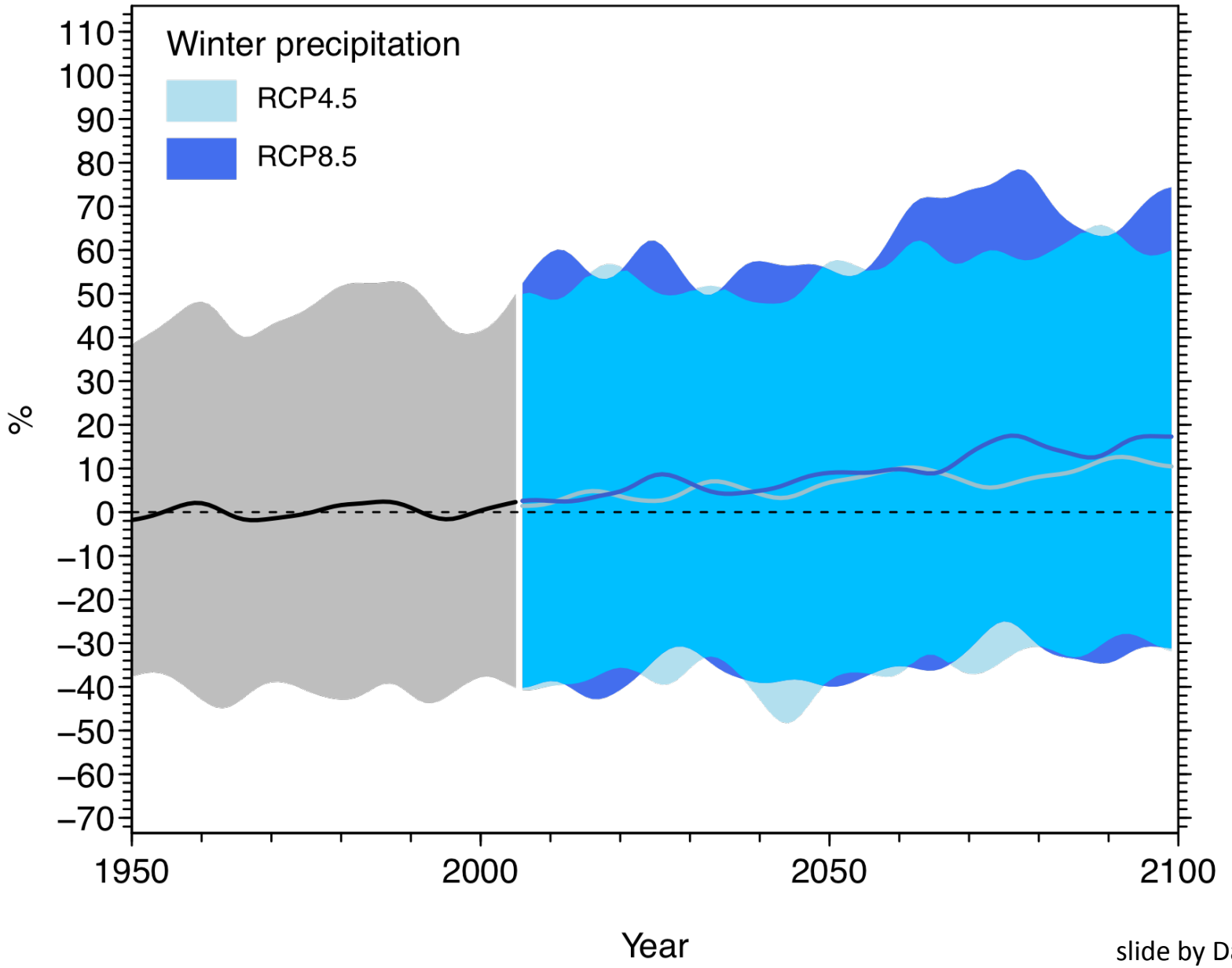
PNW average winter precipitation

Difference from 1950-1999 average



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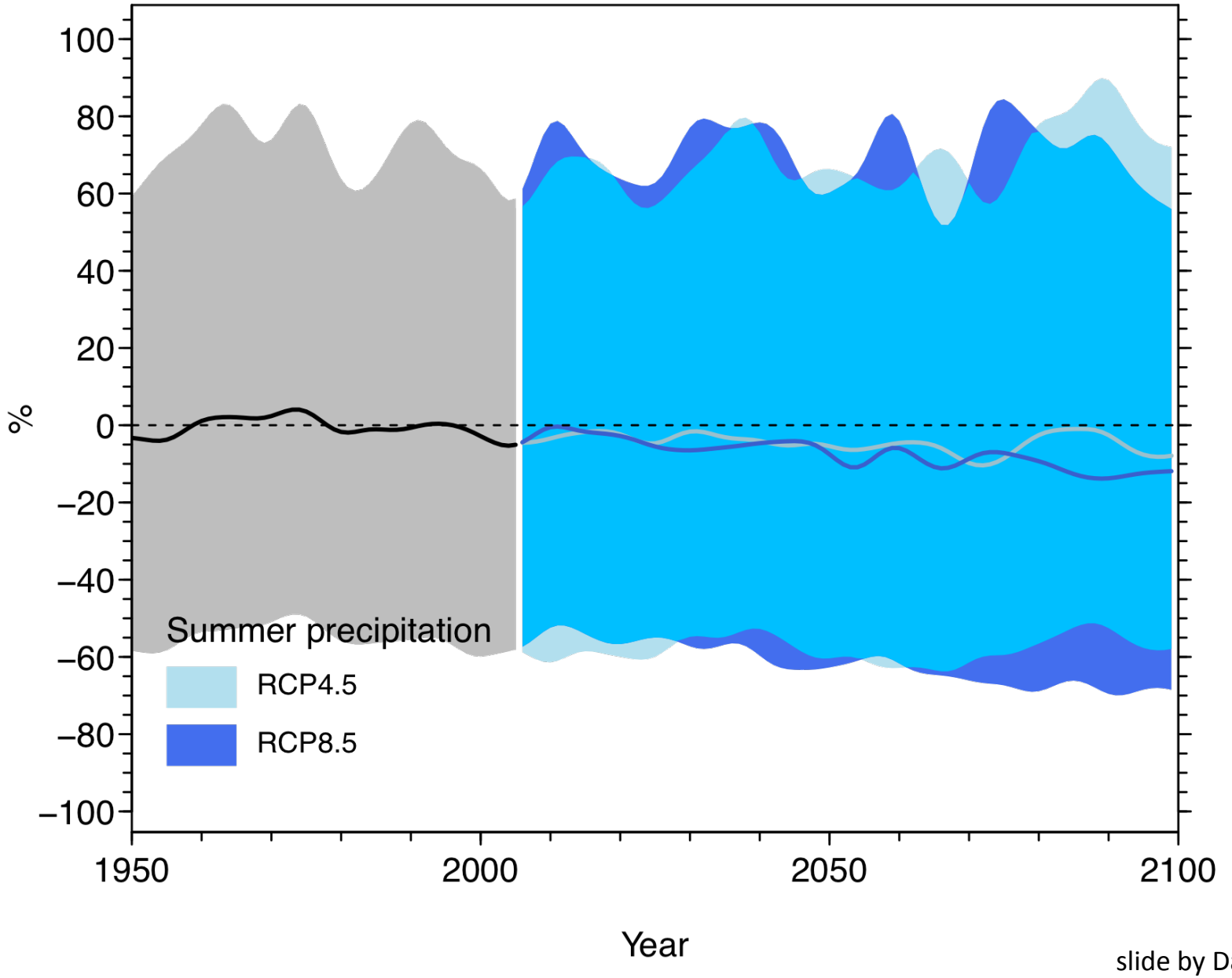
PNW average summer precipitation

Difference from 1950-1999 average



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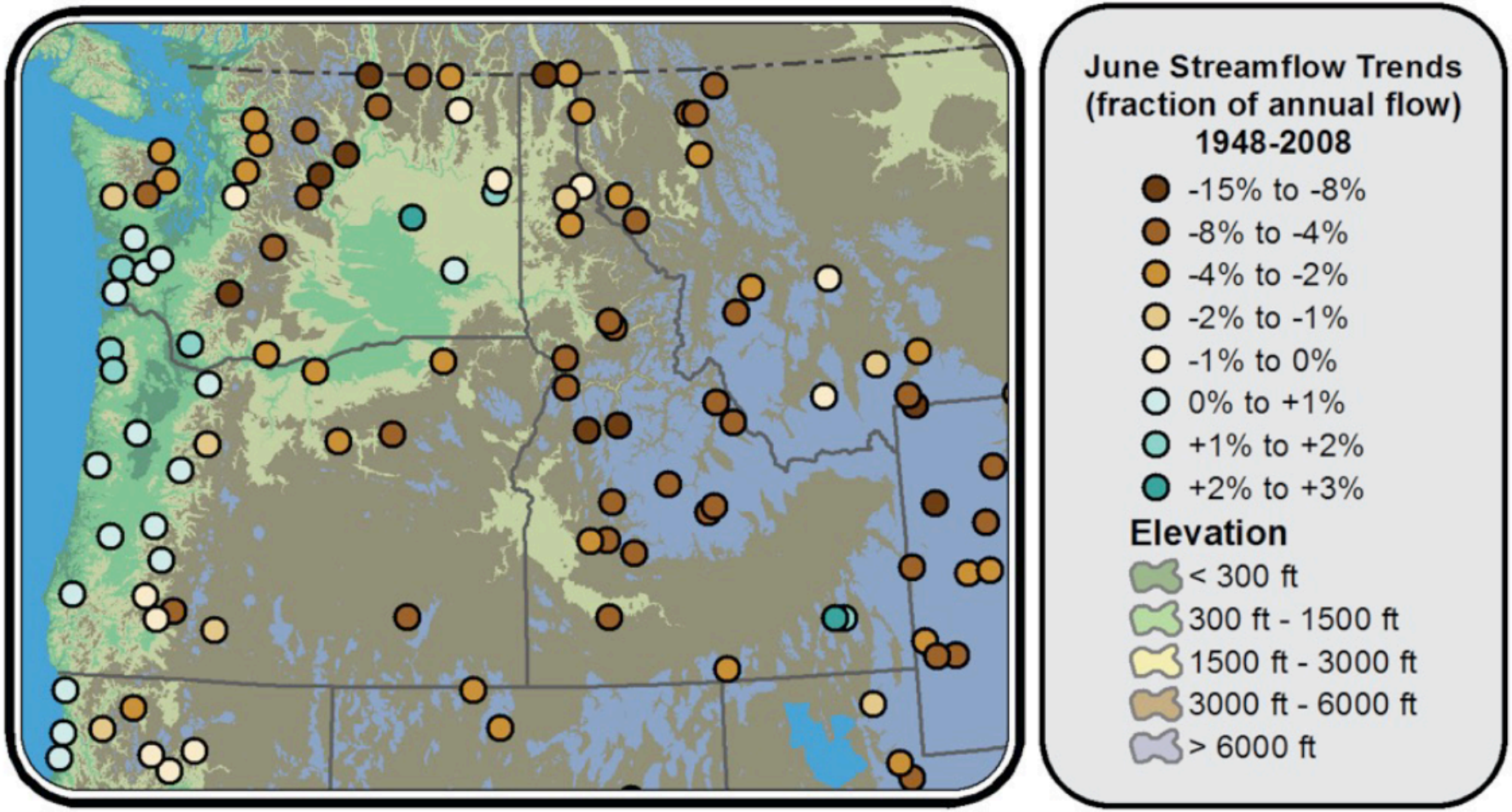
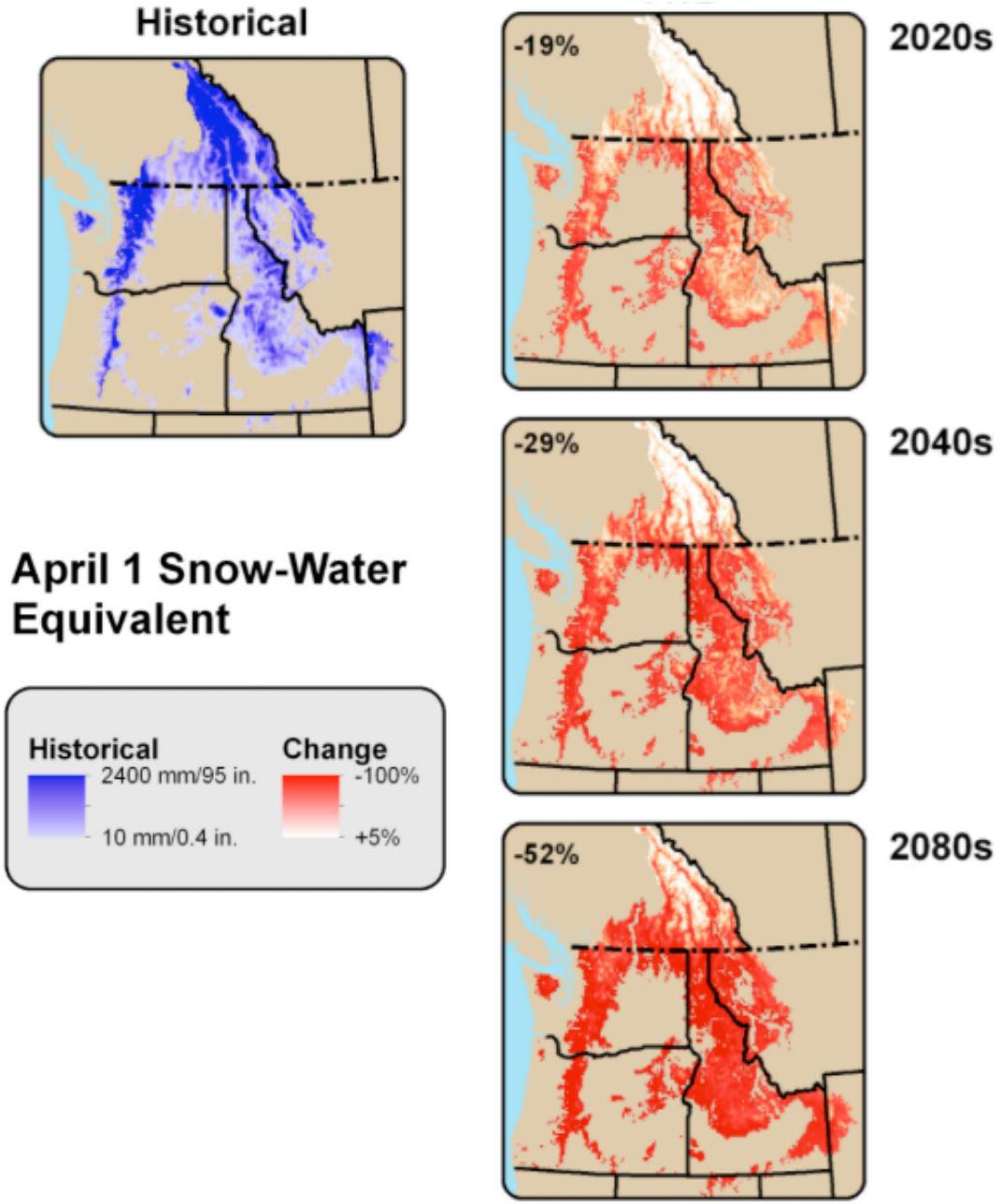
Decreasing summer flow in snowmelt watersheds

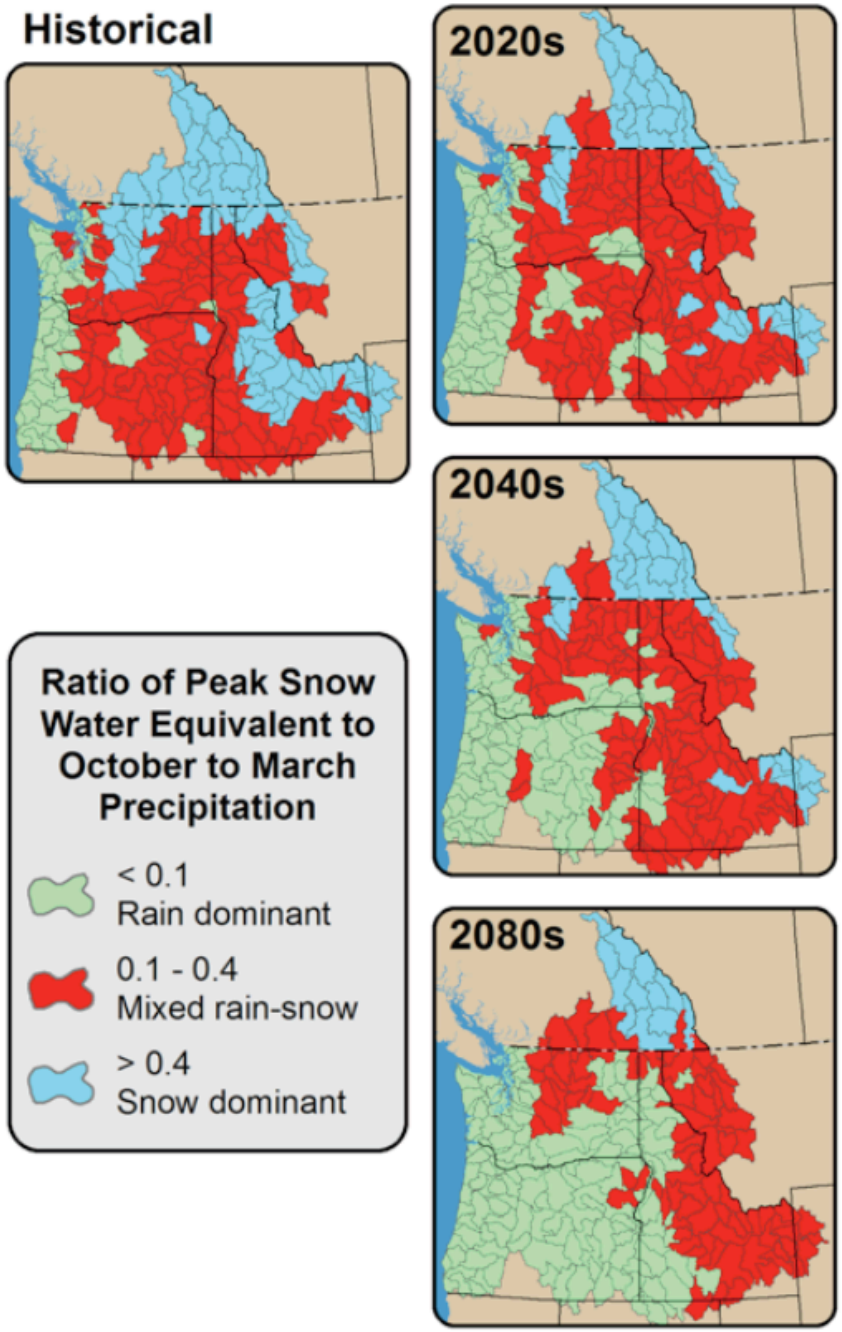


Dalton et al. 2013



Projected snow pack depletion in the Columbia River Basin

Hamlet et al., 2010



transition from snow to rain dominated basins in the Columbia River Basin

Hamlet et al. 2010

Summary

- **El Niño** likely to persist into fall/winter → tendency toward warmer/dryer

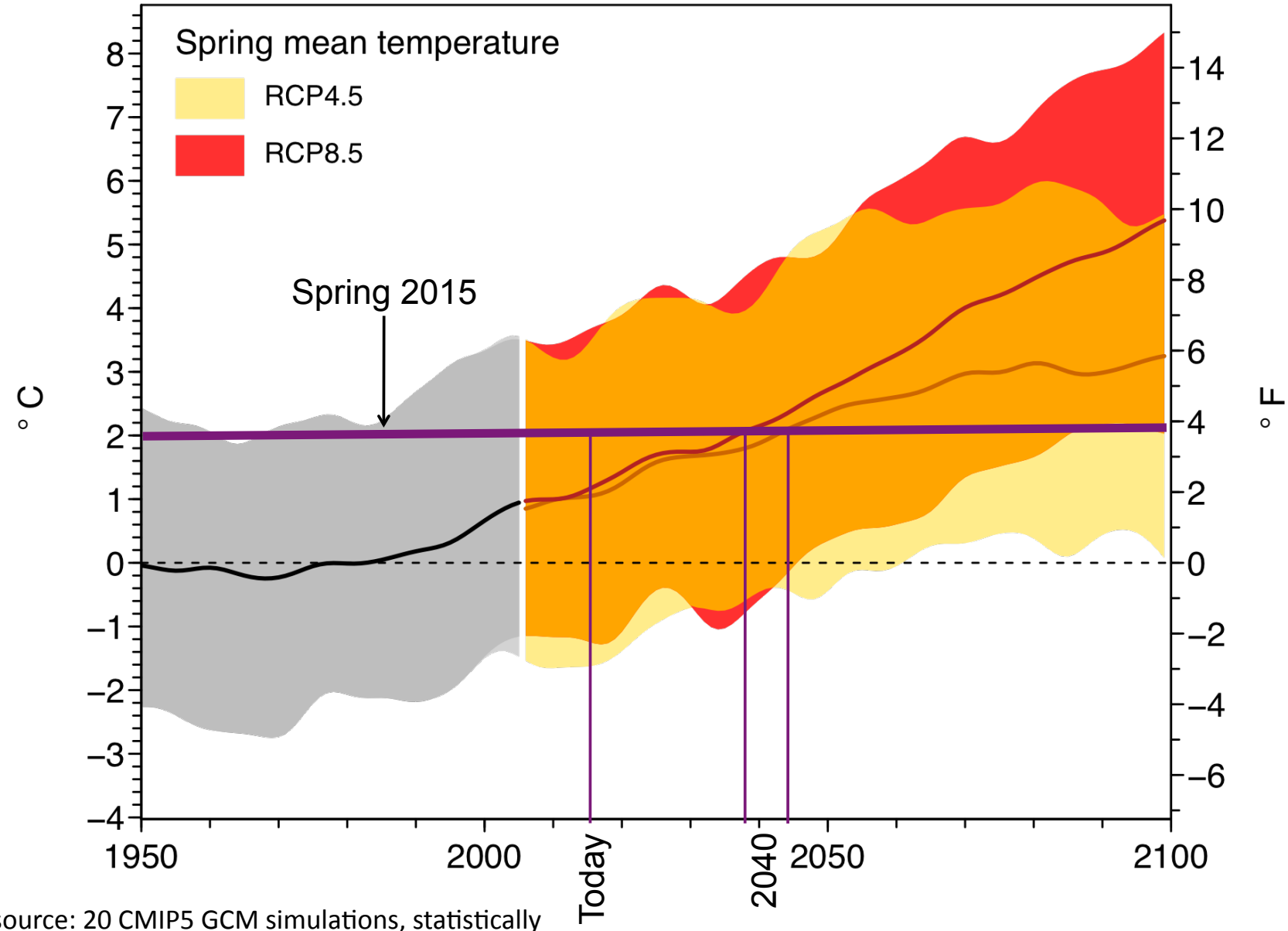
- If **Blob** persists → tendency toward warmer/dryer

- Current "snow drought" may be the norm by mid-century.

Extra Slides

PNW temperature*

Difference from 1950-1999 average



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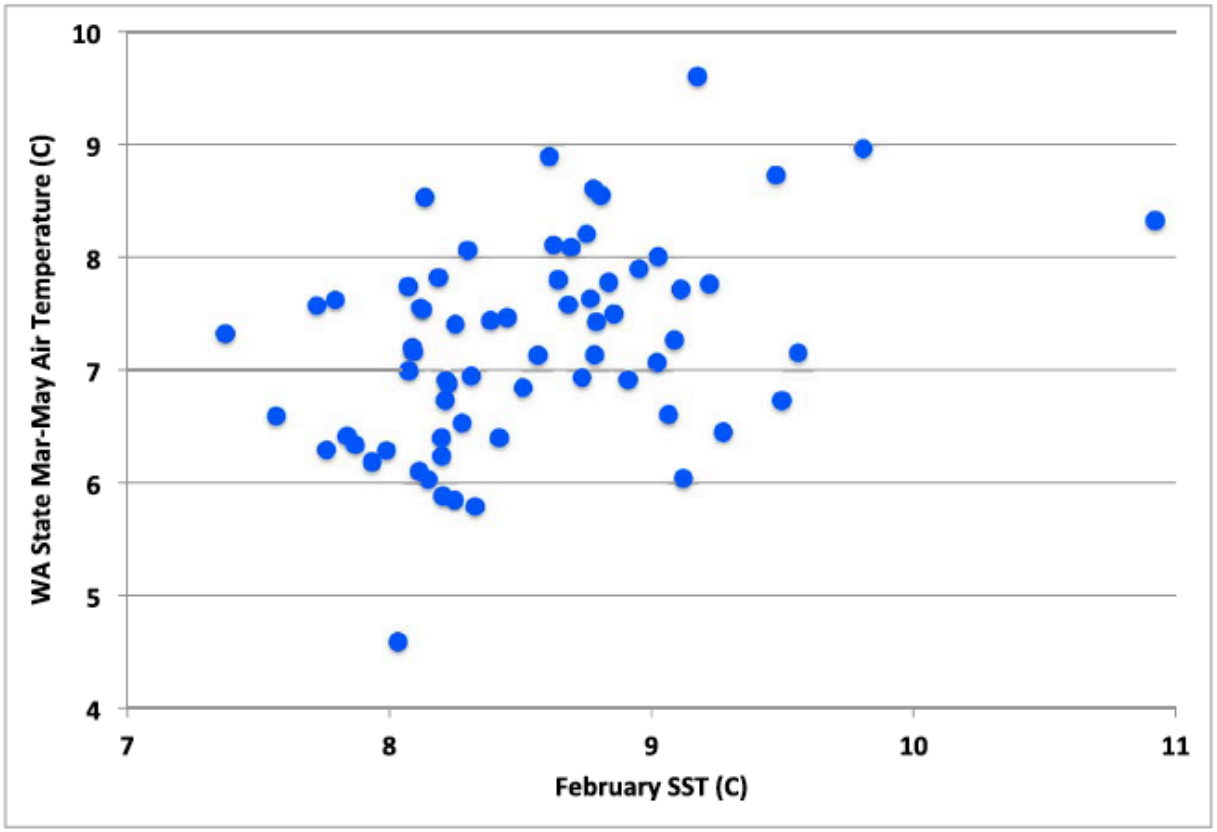
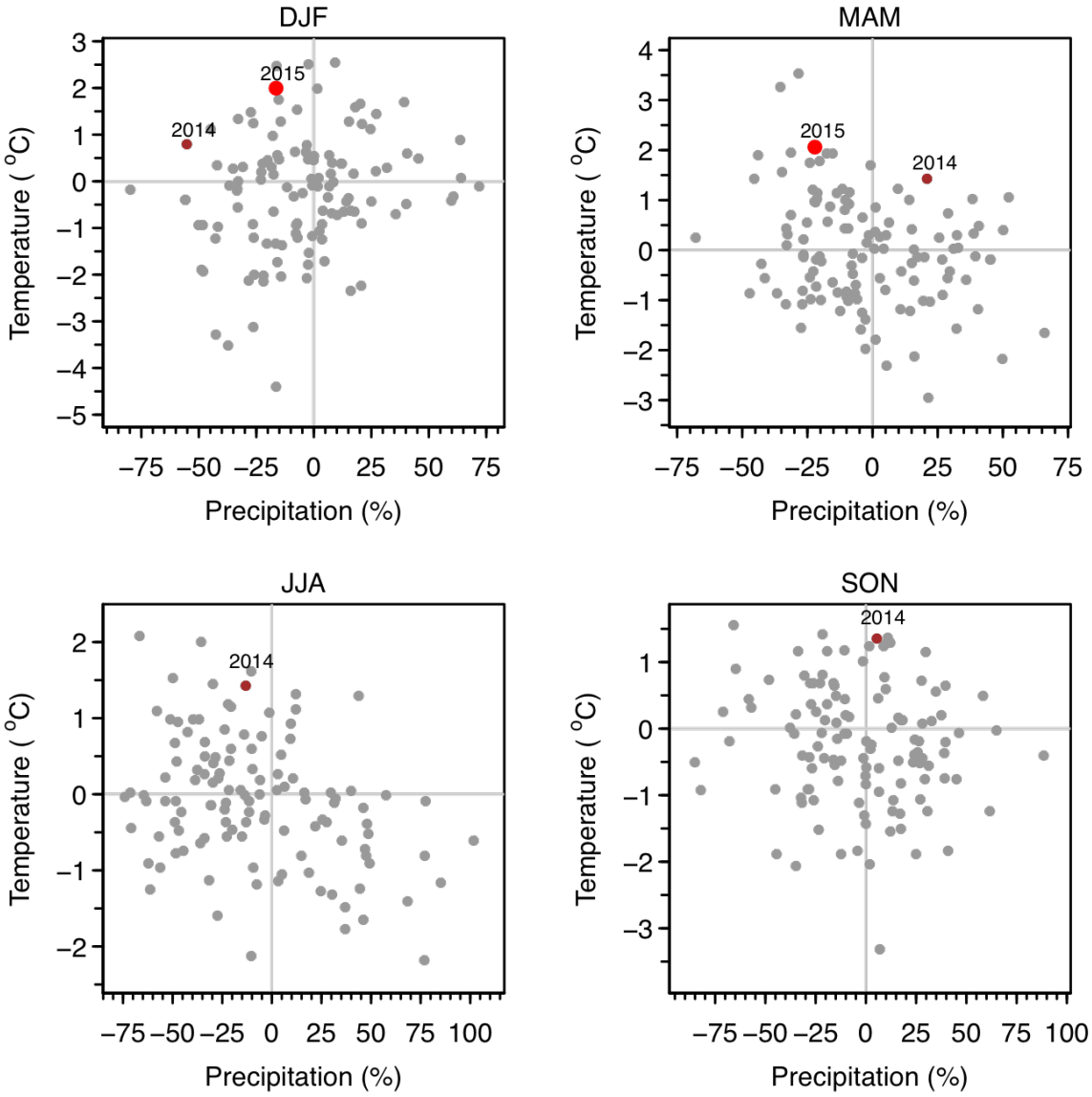


Figure 5. March–May air temperatures in Washington state (°C; *y* axis) versus February sea surface temperature (°C; *x* axis) averaged for the area of 50–40°N, 150–135°W. The year of 2014 is represented by the dot near the right-hand border of the figure.

Bond et al. 2015, *Geophysical Research Letters*

Oregon temperature vs. precipitation

(relative to 1950-1999 baseline)

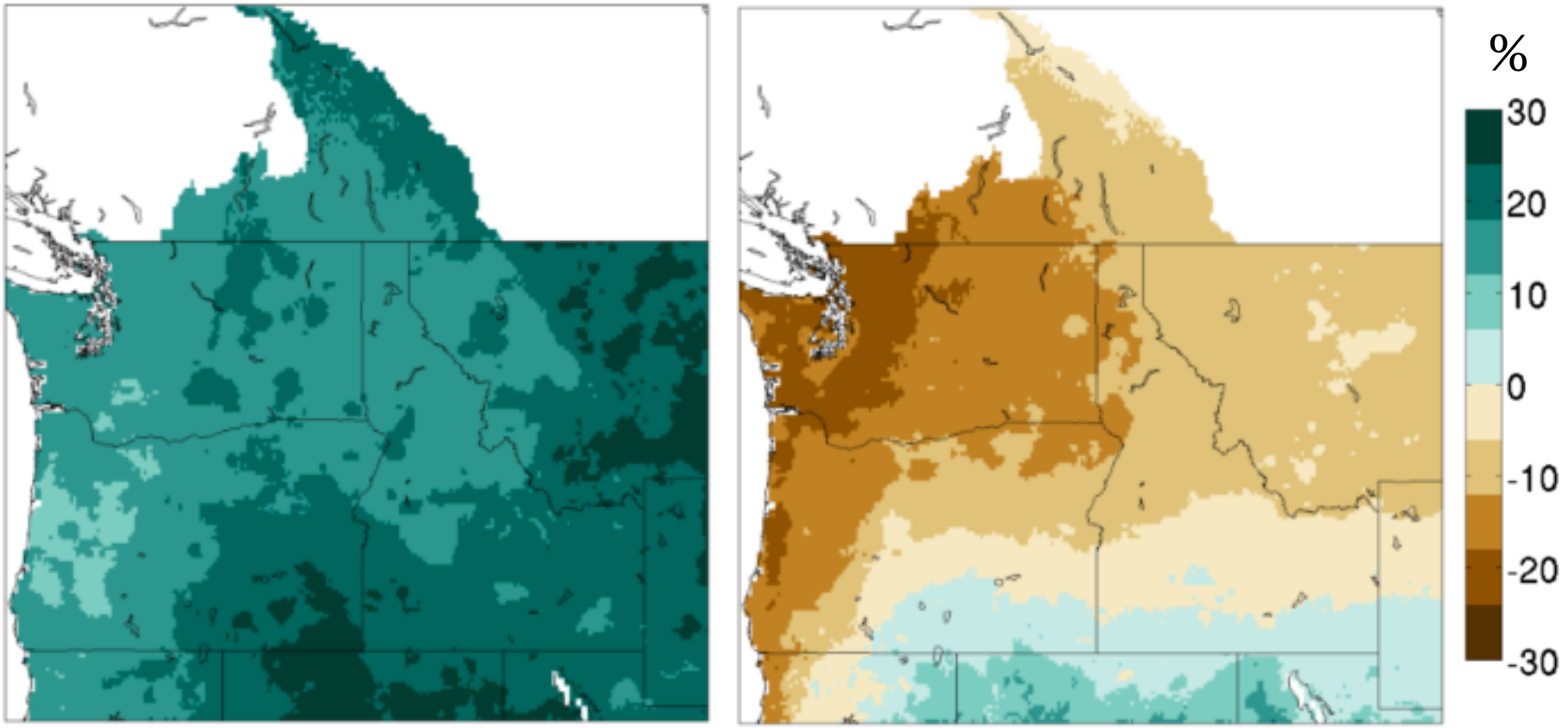


Precipitation

RCP8.5, 2070-2099 minus 1950-2005

Multi-model mean

Winter **Summer**



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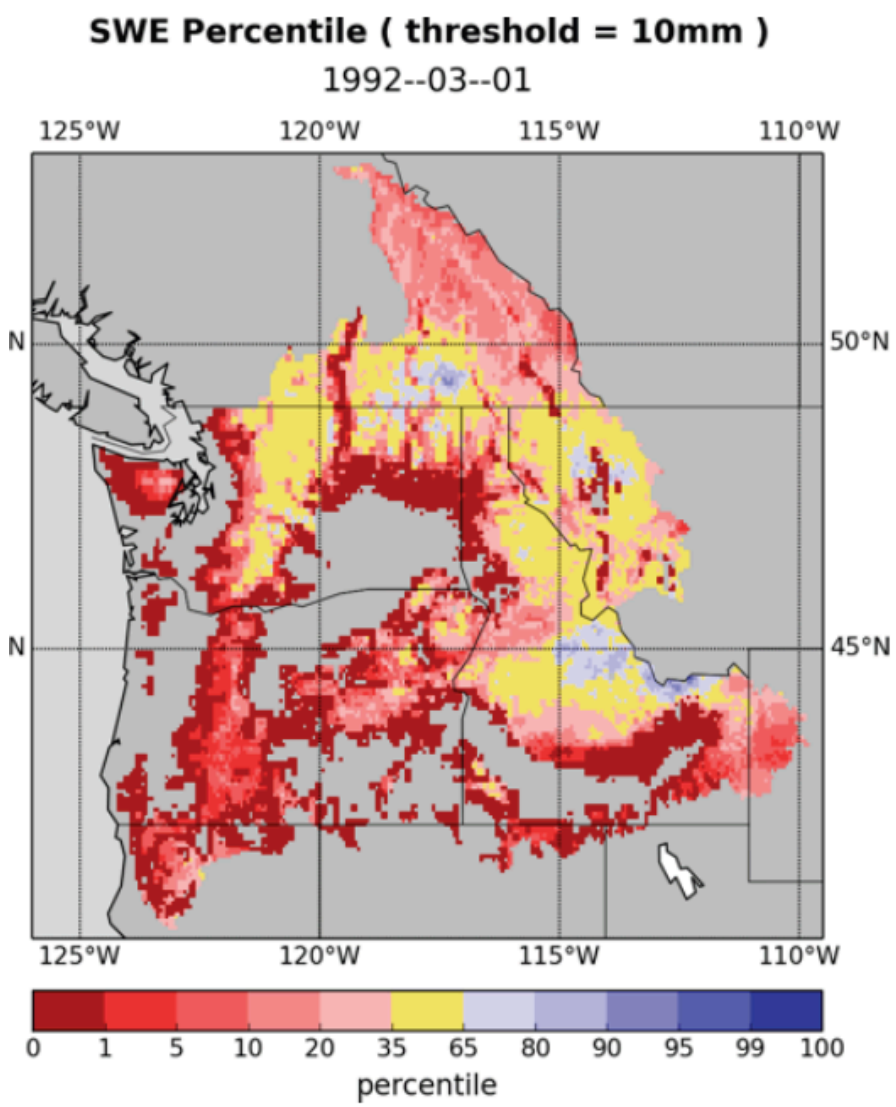
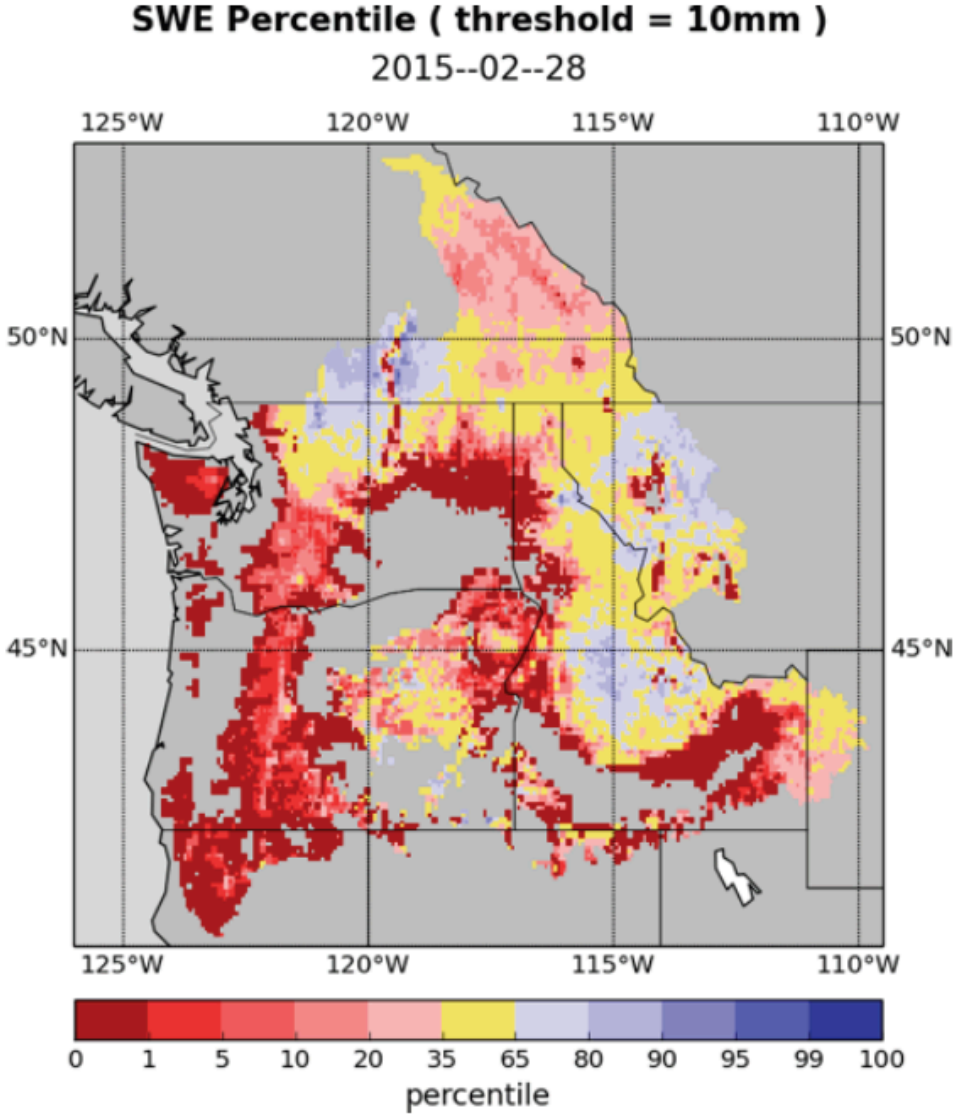

SWE Percentile (threshold = 10mm)
1992--03--01
125°W
120°W
115°W
110°W
50°N
45°N
0
1
5
10
20
35
65
80
90
95
99
100
percentile


SWE Percentile (threshold = 10mm)
2015--02--28
125°W
120°W
115°W
110°W
50°N
45°N
0
1
5
10
20
35
65
80
90
95
99
100
percentile