Extreme Rainfall in the Southeast U.S.

Applications to Agriculture

David F. Zierden

Florida State Climatologist

Center for Ocean Atmospheric Prediction Studies

The Florida State University

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Causes of Extreme Rainfall

Weather Scale

- Mid-latitude low pressure systems
- Slow moving or stalled fronts
- Tropical Storms or cyclones
- Stationary or training convective storms

Climate Scale

- Rainfall accumulated over weeks or months
- Difficult to predict in summer season
- Significant impacts from El Nino in the winter

Recent Extreme Rainfall Events

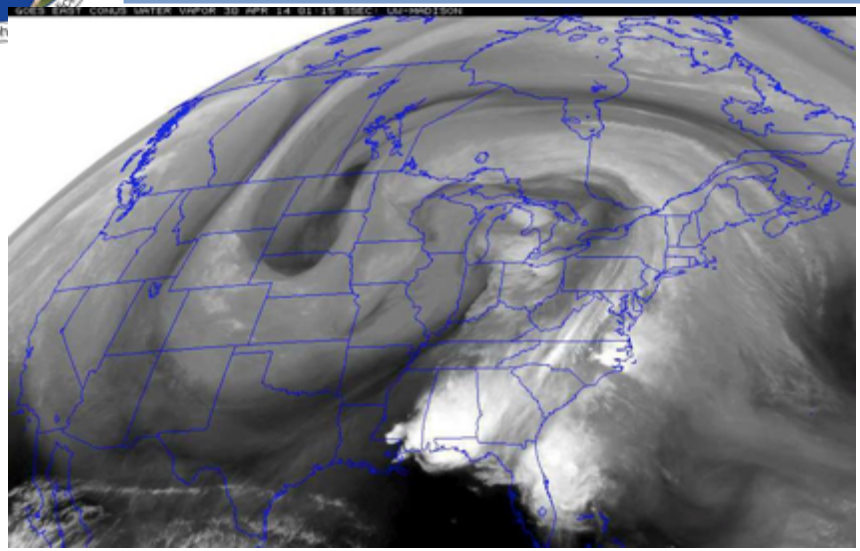
Weather Related

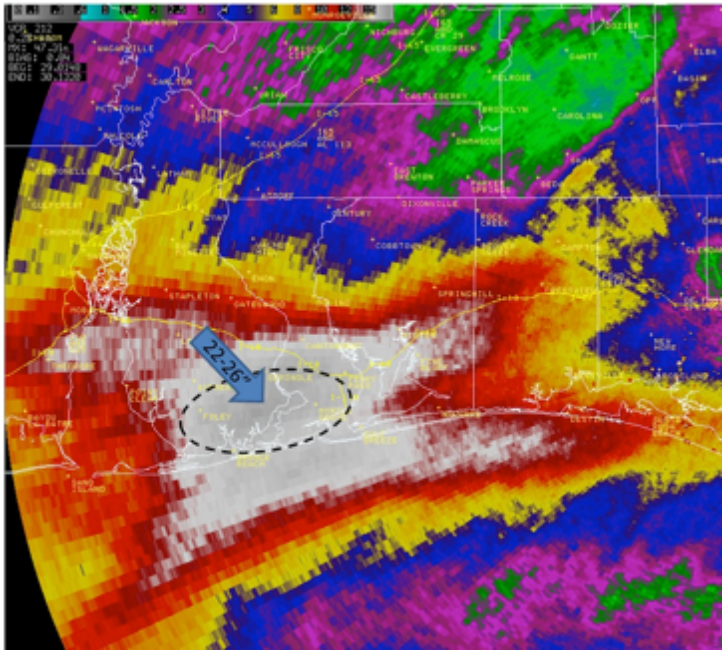
- Tropical Storm Debby 2012
- Panhandle April 2014 floods
- Colorado floods 2013
- South Carolina Sept. 2015

Climate Related

- Winter 1998
- Fall 2009
- Summer 2013
- Texas/Oklahoma May 2015
- Tampa Area July 2015

NW Florida April Flood 2014





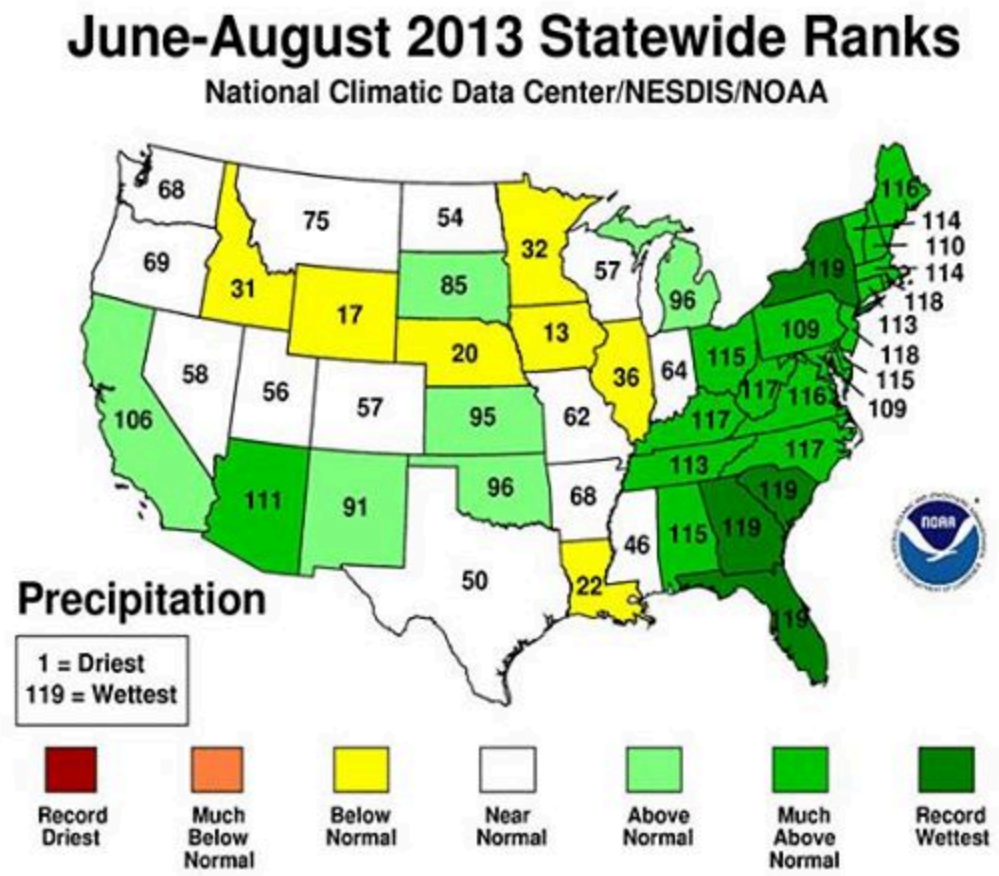
Station Number	Station Name	Daily Precip Sum in.	Multi-Day Precip in.	Total Precip in.
AL-BW-35	Orange Beach 1.3 E	19.00	4.67	23.67
AL-BW-45	Silverhill 5.0 SW	21.80		21.80
AL-BW-9	Foley 0.5 ESE	20.76		20.76
AL-BW-27	Orange Beach 2.1 NE	20.53		20.53
AL-BW-3	Daphne 1.2 NNW	16.47		16.47
AL-BW-32	Fairhope 3.1 NNW	16.13		16.13
AL-BW-40	Fairhope 1.5 WSW	15.51		15.51
AL-BW-65	Silverhill 0.9 SSE	15.47		15.47
AL-BW-68	Spanish Fort 1.6 W	15.45		15.45
AL-BW-13	Fairhope 3.7 NNW	14.29		14.29
AL-BW-4	Daphne 0.4 SW	14.23		14.23
AL-BW-1	Fairhope 2.3 N	14.12		14.12
AL-BW-60	Daphne 1.5 SSW	13.98		13.98
AL-BW-58	Spanish Fort 1.2 NE	13.83		13.83
AL-BW-36	Daphne 4.2 NE	13.81		13.81
AL-BW-26	Loxley 0.4 SSW	13.78		13.78
AL-BW-8	Foley 7.4 SW	13.47		13.47
AL-BW-41	Fairhope 2.3 E	13.44		13.44
AL-BW-31	Foley 2.0 SSW	13.17		13.17
AL-BW-20	Summerdale 4.3 WSW	13.03		13.03
AL-BW-53	Elberta 3.1 SSW	12.67		12.67
AL-BW-30	Fairhope 3.5 E	11.54		11.54
AL-BW-59	Bay Minette 10.9 N	5.98		5.98

FL-ES-21	Pensacola 9.2 NW	19.56		19.56
FL-ES-4	Gonzalez 2.5 NNW	15.43		15.43
FL-ES-15	Gonzalez 2.1 E	13.22		13.22
FL-ES-1	Pensacola 2.7 N	12.00		12.00
FL-ES-10	Pensacola 3.8 N	12.00		12.00

*Pensacola record calendar day rainfall – 15.55 inches
(CO 7-day total 18.13 inches)

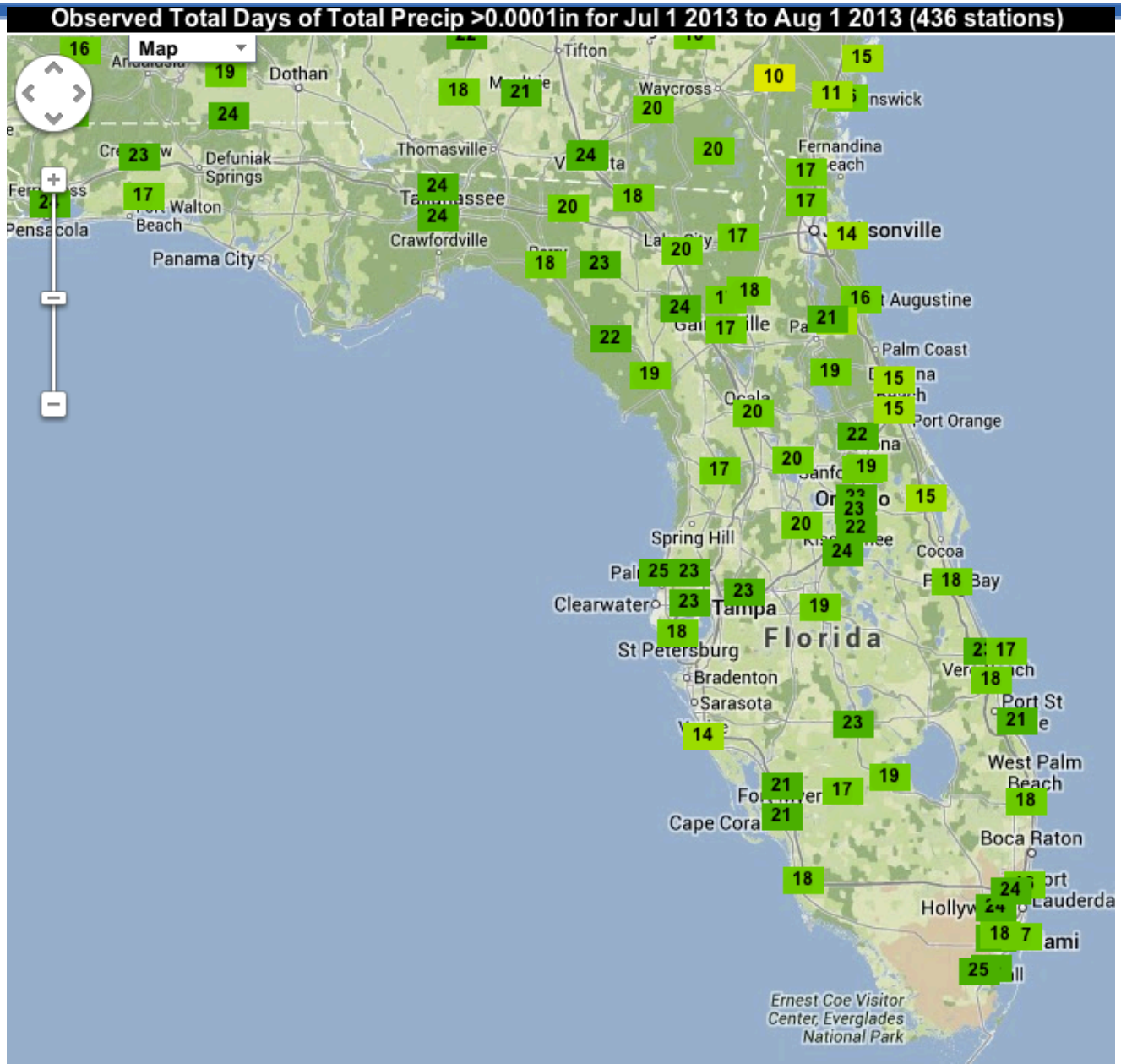
NW Florida April Flood

2013 Wettest Summer Ever?

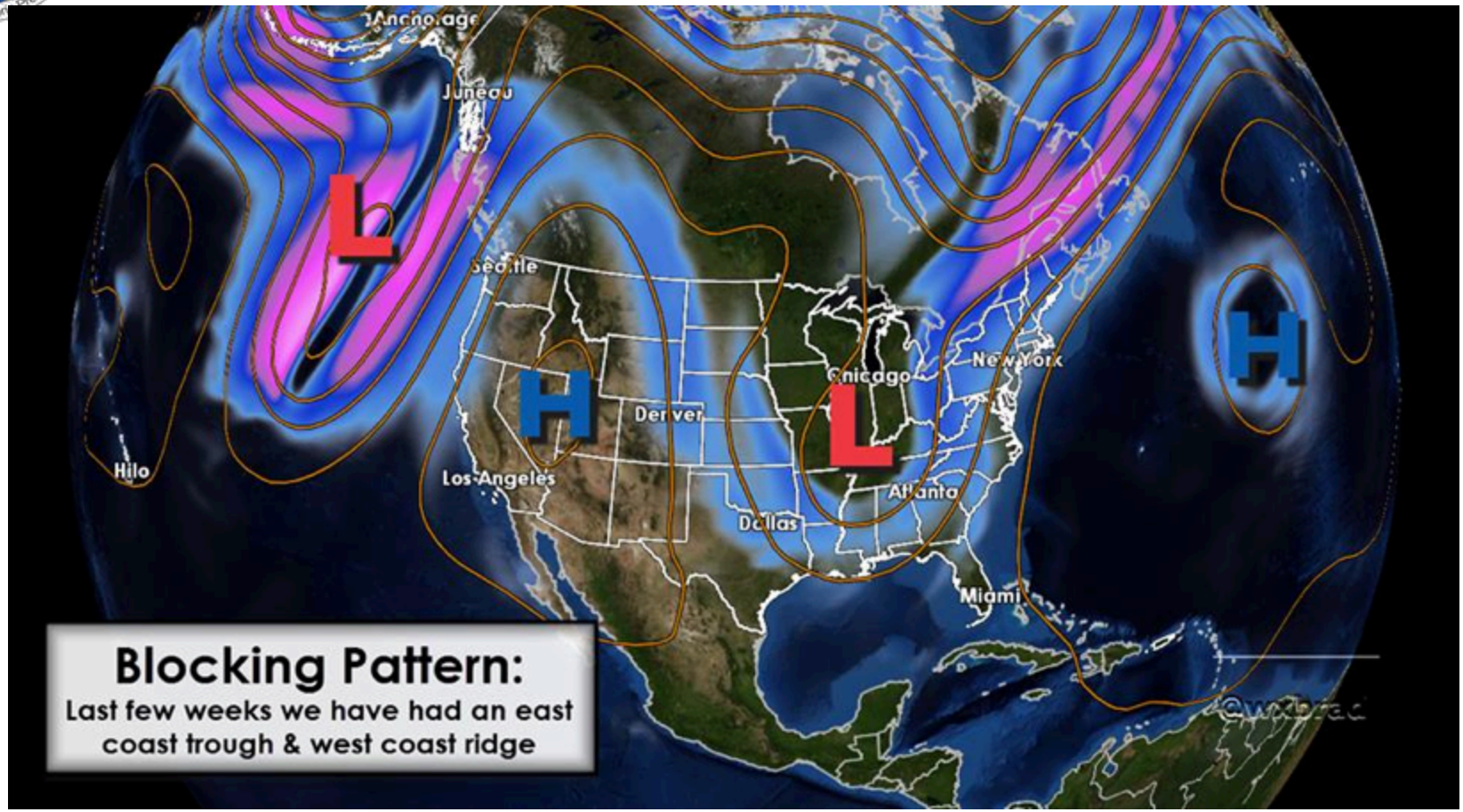


- Wettest July on record for Florida, Georgia and Alabama 4th wettest
- Wettest May-July on record for South Carolina, Florida 2nd wettest and Georgia 3rd
- Wettest Feb-July on record for Georgia and South Carolina
- Wettest June-August for entire Southeast Region

July – Days with Measureable Rainfall



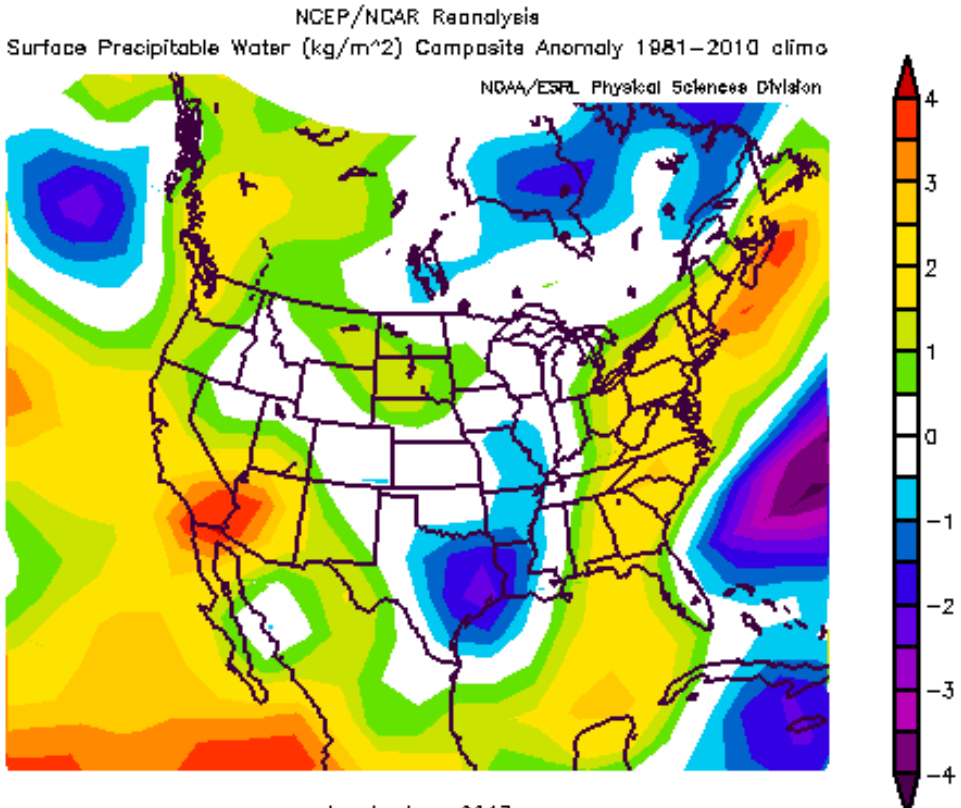
Blocking Pattern

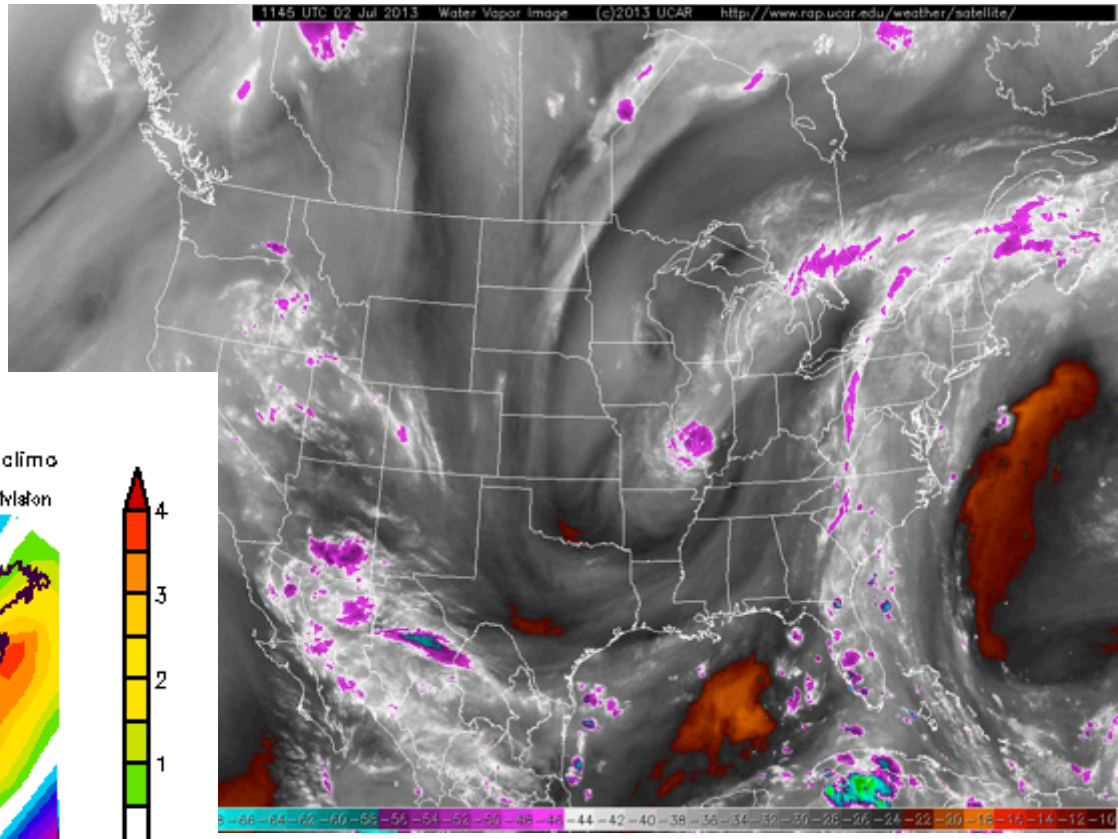


June 6-7, 9-10; June 29-July 7, July 22-29, Aug. 16-20

Moisture Anomalies

Precipitable Water Anomalies (JJA)





Water Vapor Image (7/02)

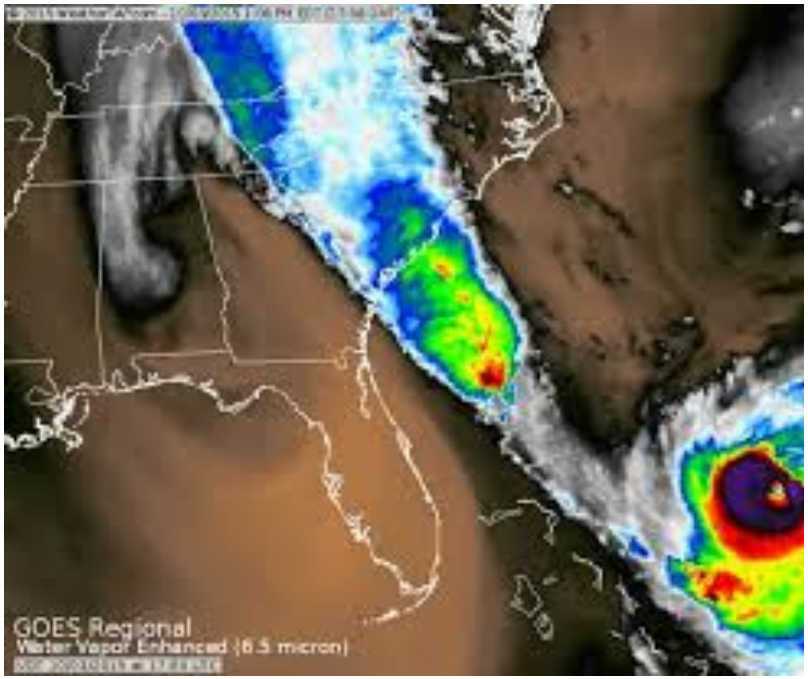
Saturated Peanuts

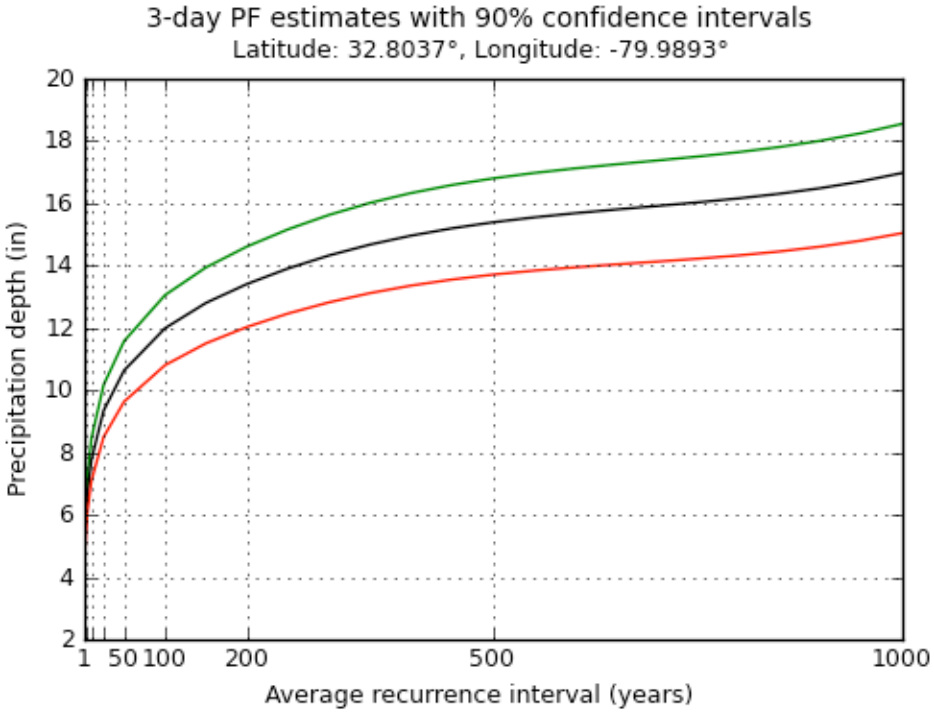
Courtesy Rome Etheridge

Poor Quality Melons

New York Times

South Carolina Floods



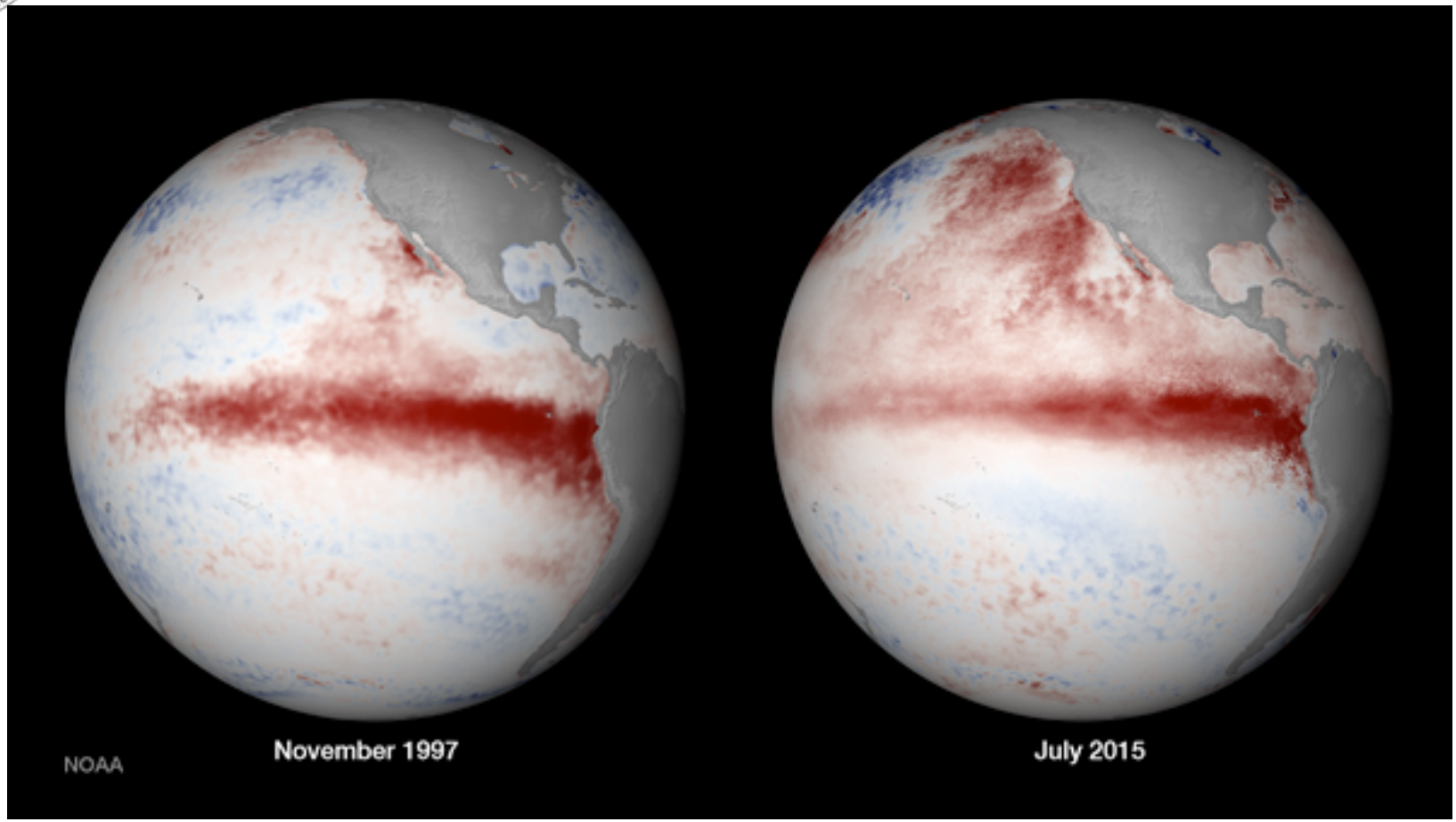


NOAA Atlas 14, Volume 2, Version 3 Created (GMT): Tue Oct 6 18:40:46 2015

Results from the regional trend analysis also indicated that the null hypothesis, that there are no trends in AMS, could not be rejected at the 5% significance level for either climate region for the 1-hour and 1-day durations.

Because tests at both, the 1-hour and 1-day durations indicated no statistically significant trends in the data, the assumption of stationary AMS was accepted for this project area and no adjustment to AMS data was recommended.

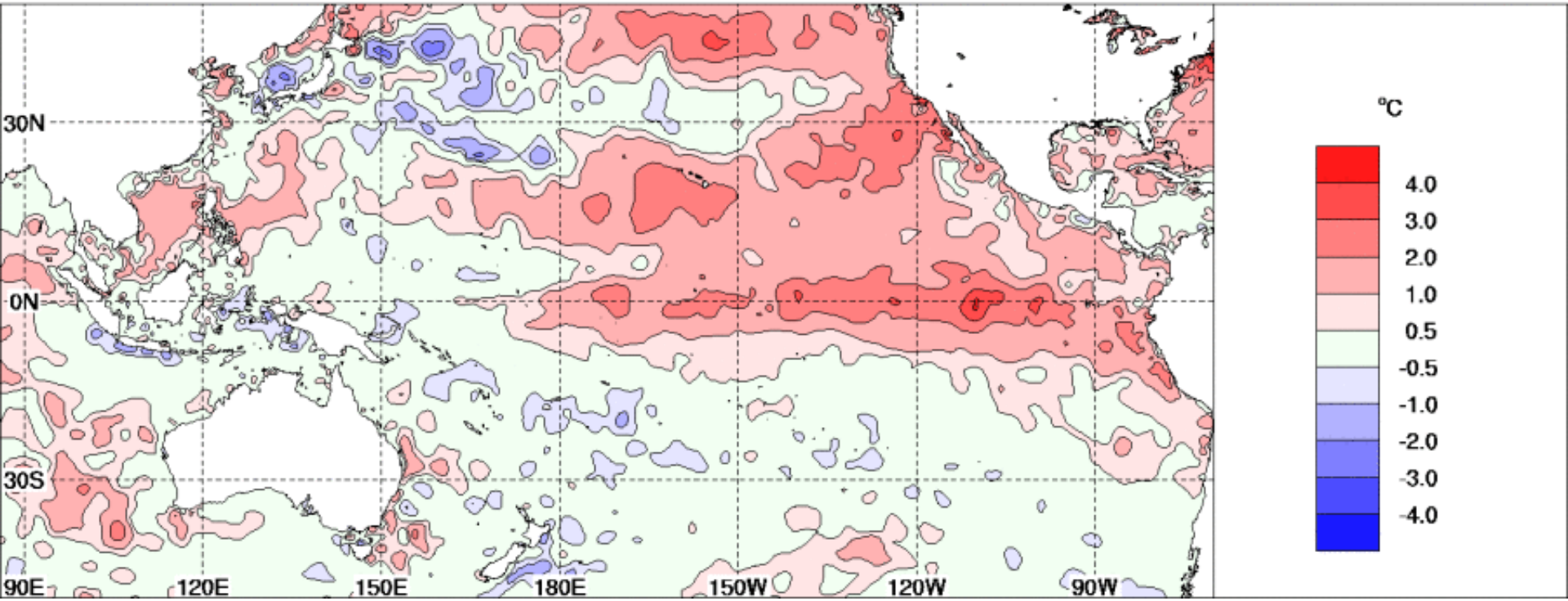
Strong El Nino Currently in Place



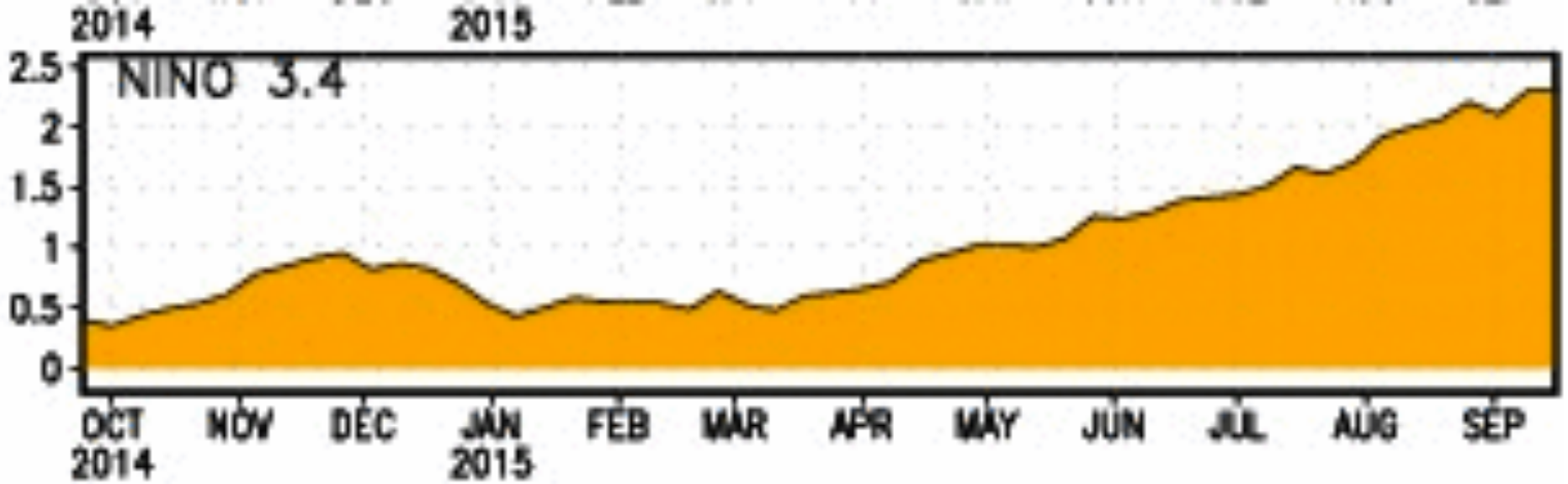
Current El Nino has the potential to rival the super events of 1982/1983 and 1997/1998

Current SST Anomalies

SSTA 1.0X1.0 NMOC OCEAN ANOMALIES (C) 20150907 20150913

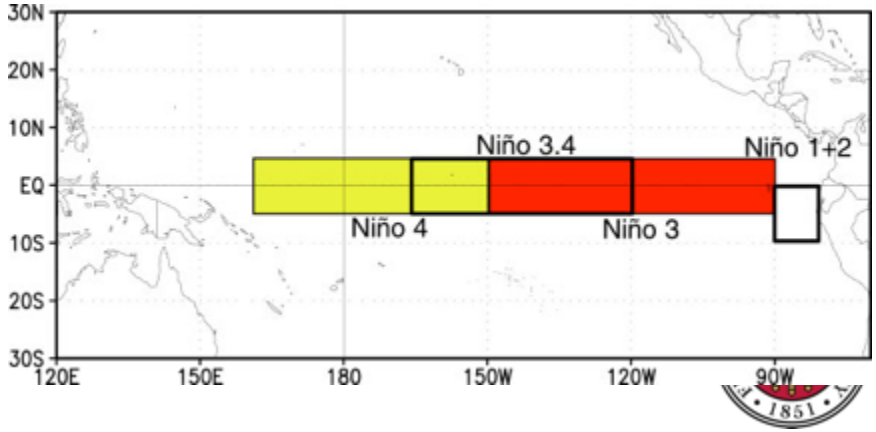


Nino 3.4 Index

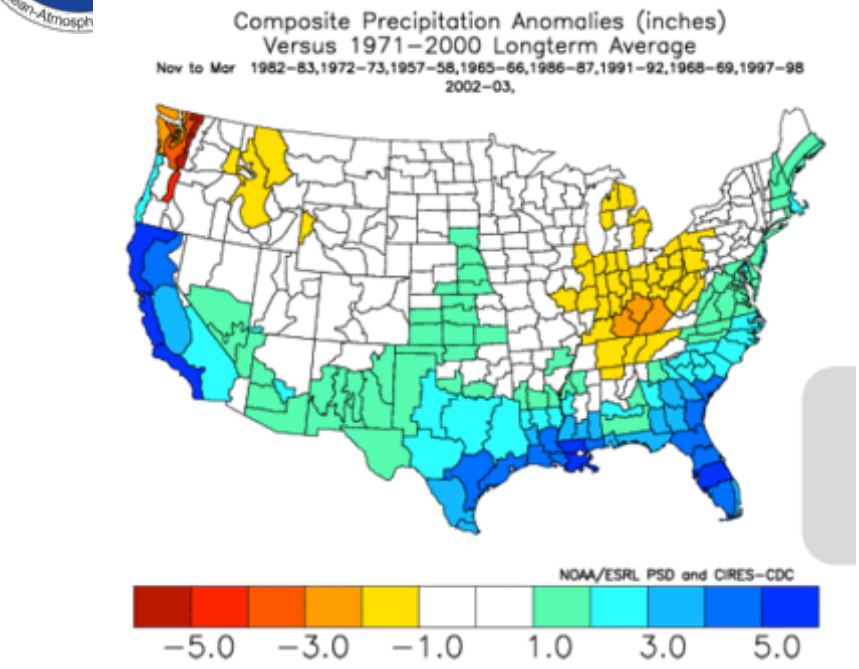


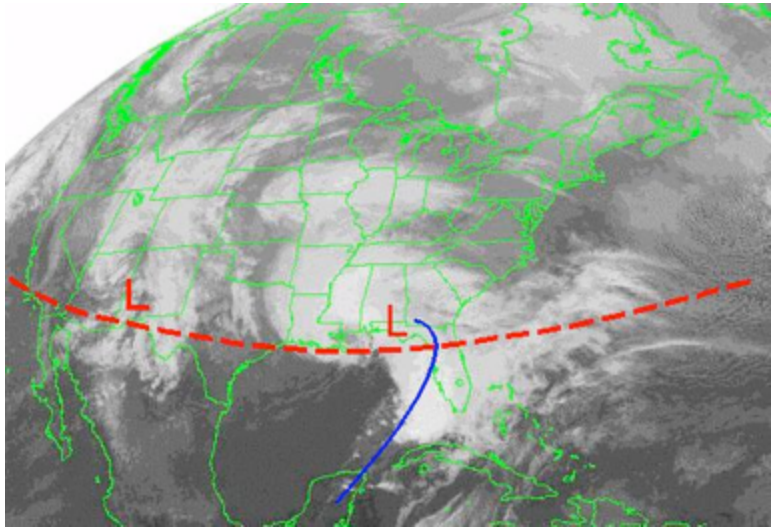
- Current weekly value at +2.3, into the “very strong” range

- Reached weekly peak value of 2.8 in Nov. 1997



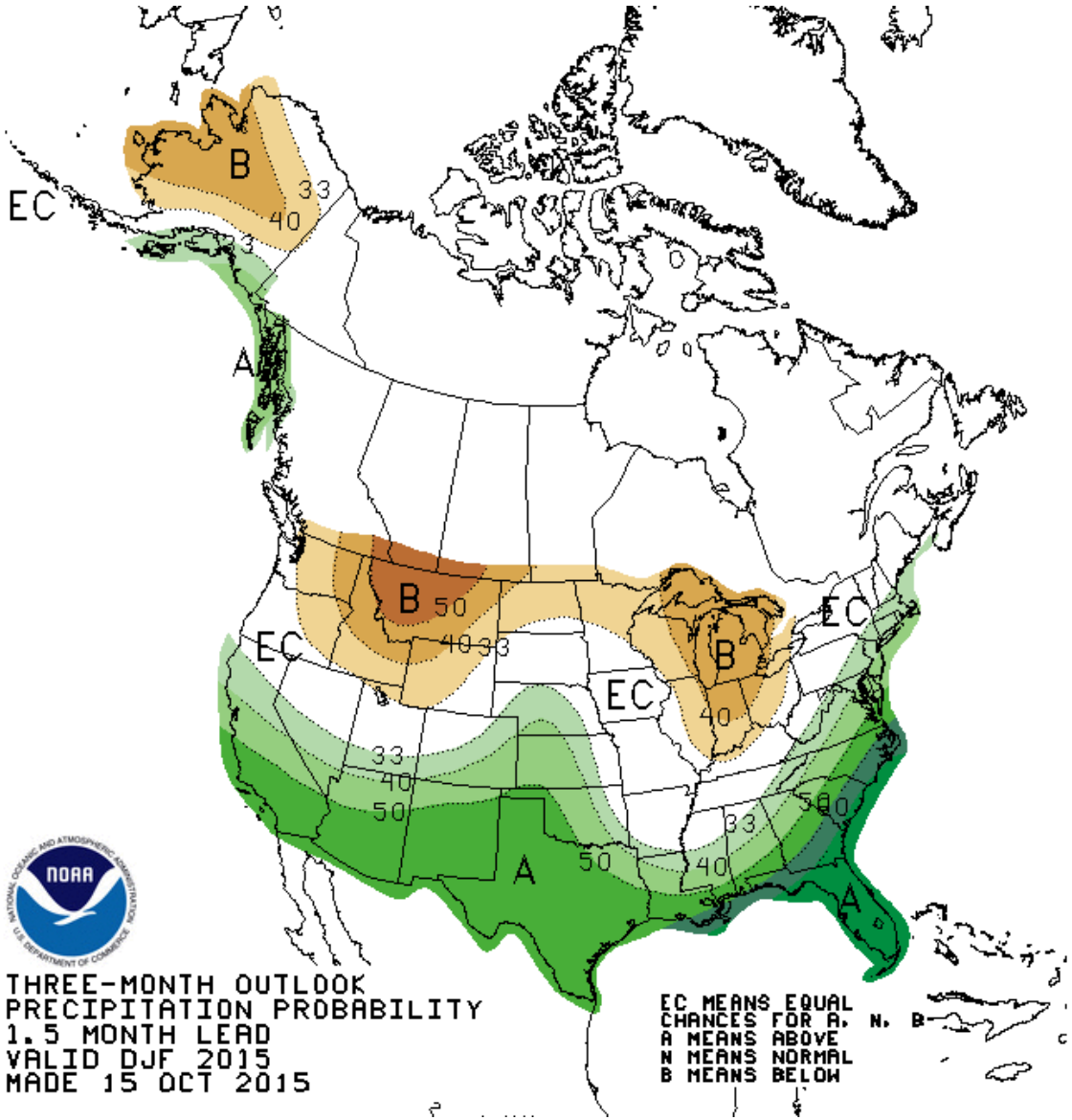
El Nino and Winter Rainfall



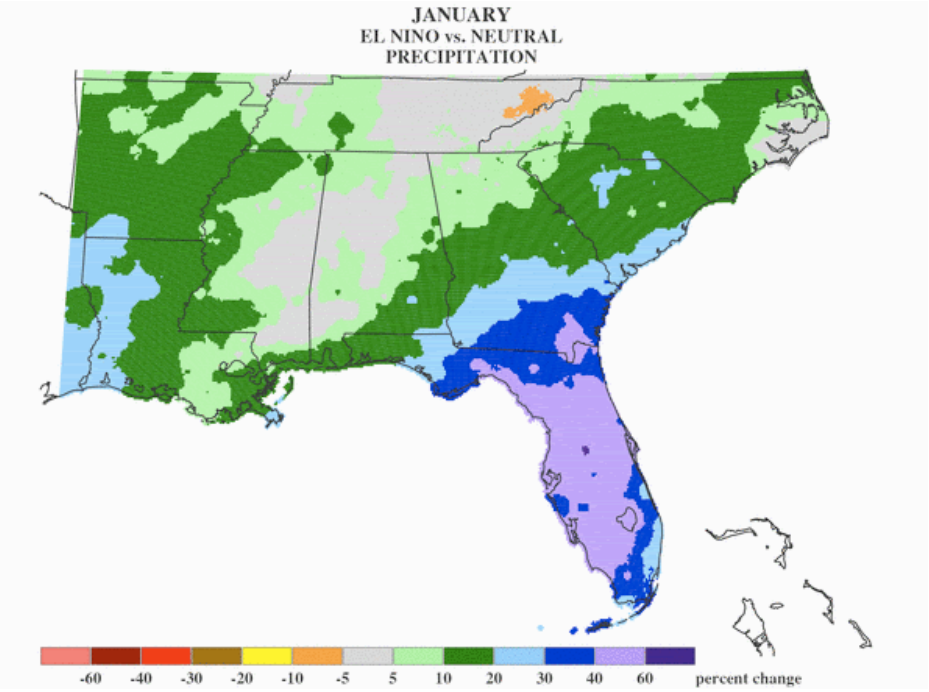


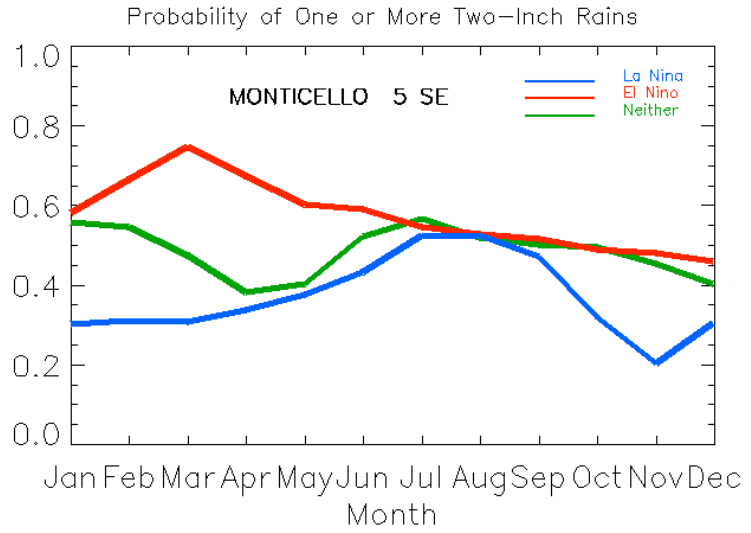
- El Nino typically brings enhanced winter rainfall to California and the southern U.S., including Texas and Florida.
- California Rainfall more hit or miss than other Southern States
- Strong El Nino does not necessarily mean even more rainfall, just more confidence in following the pattern.

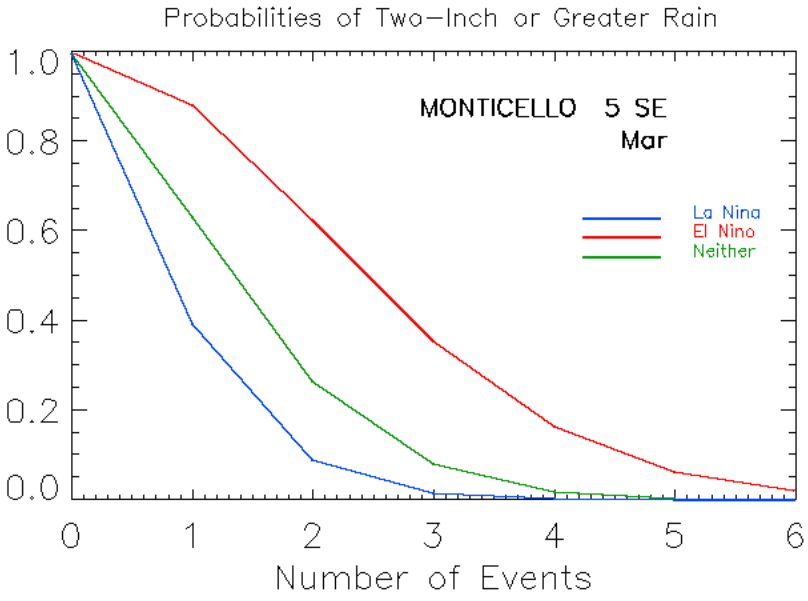
Official NOAA Winter Outlook



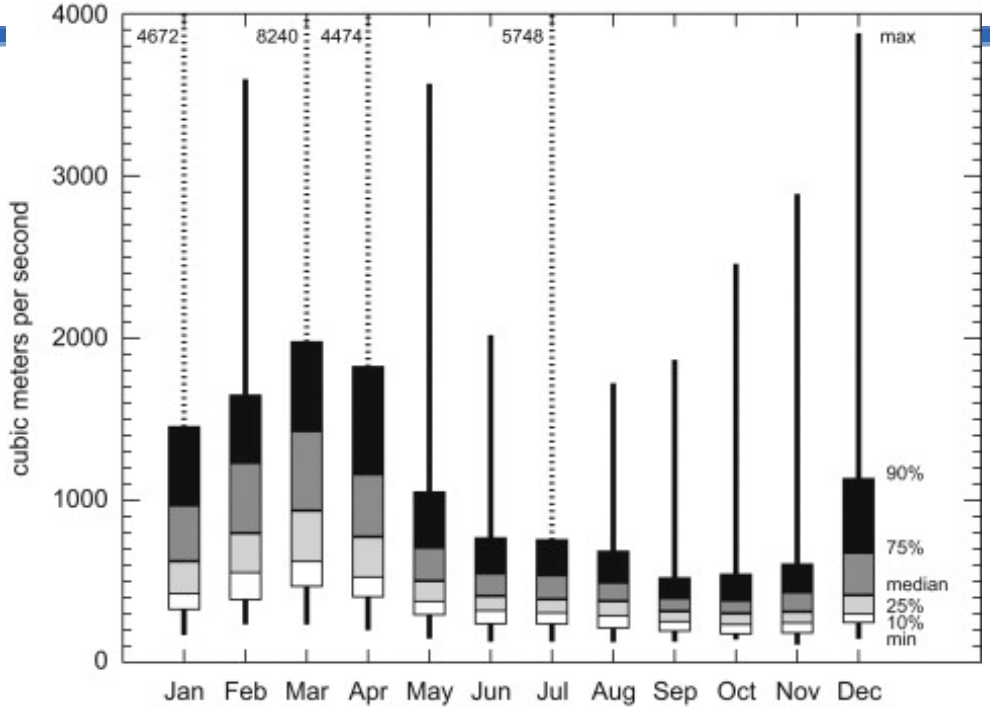
El Nino and Heavy Rain

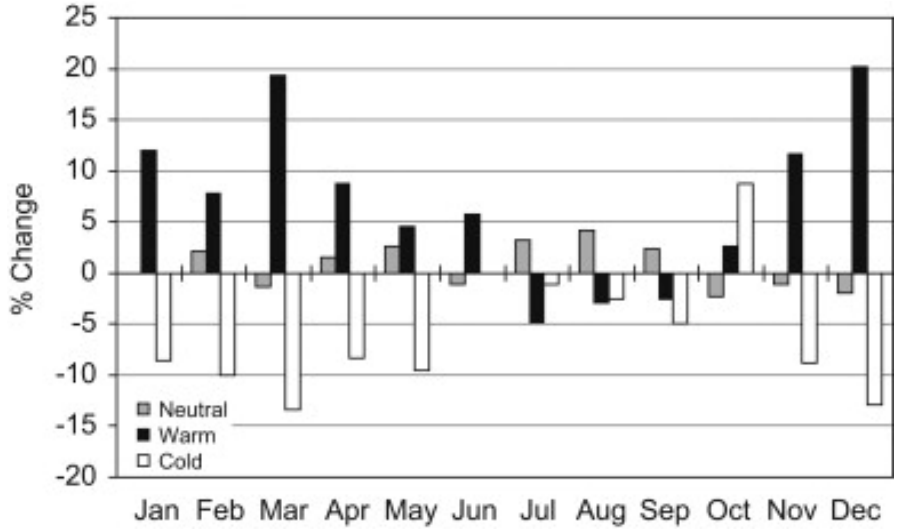




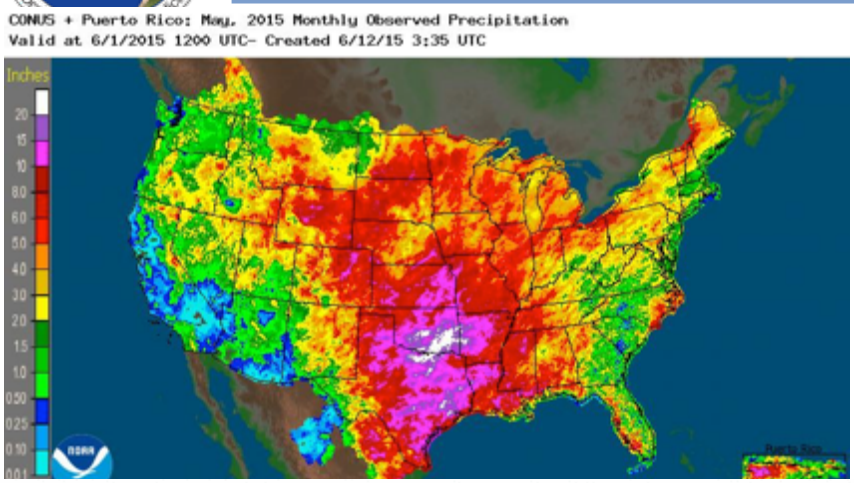


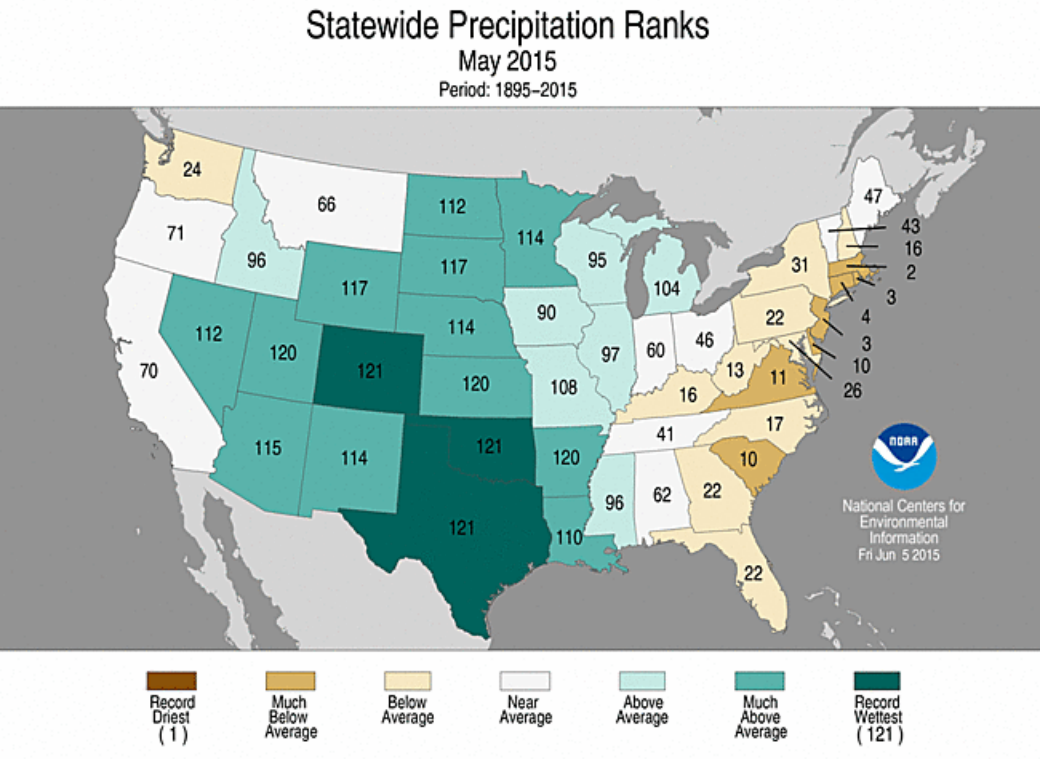
Apalachicola River Flows





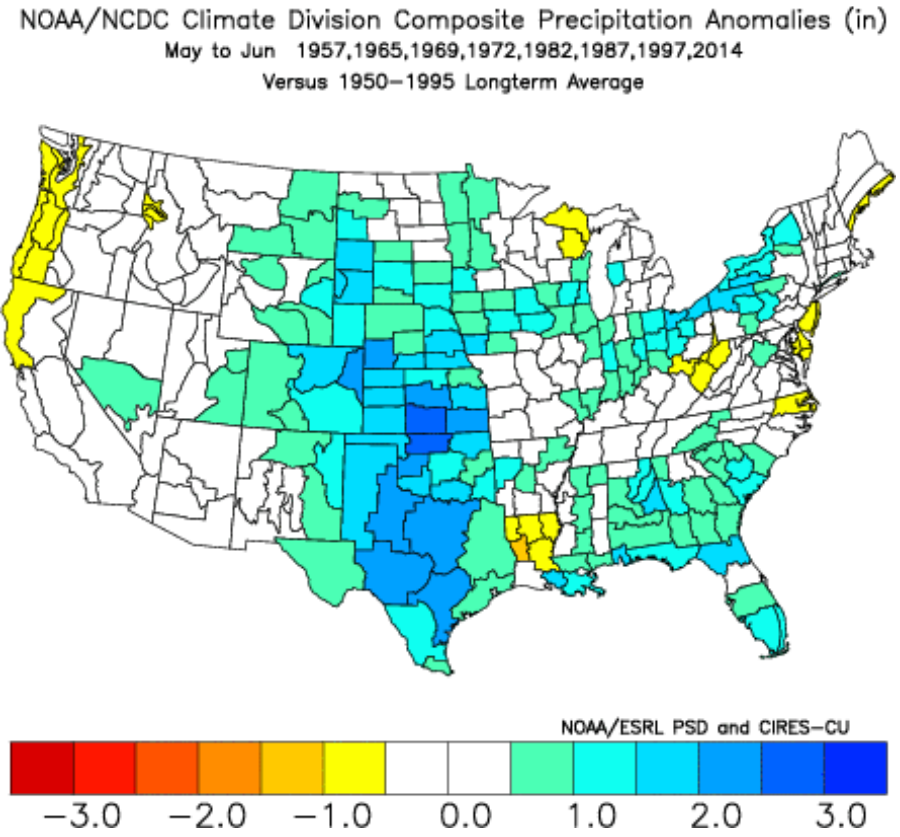
Record Wet May

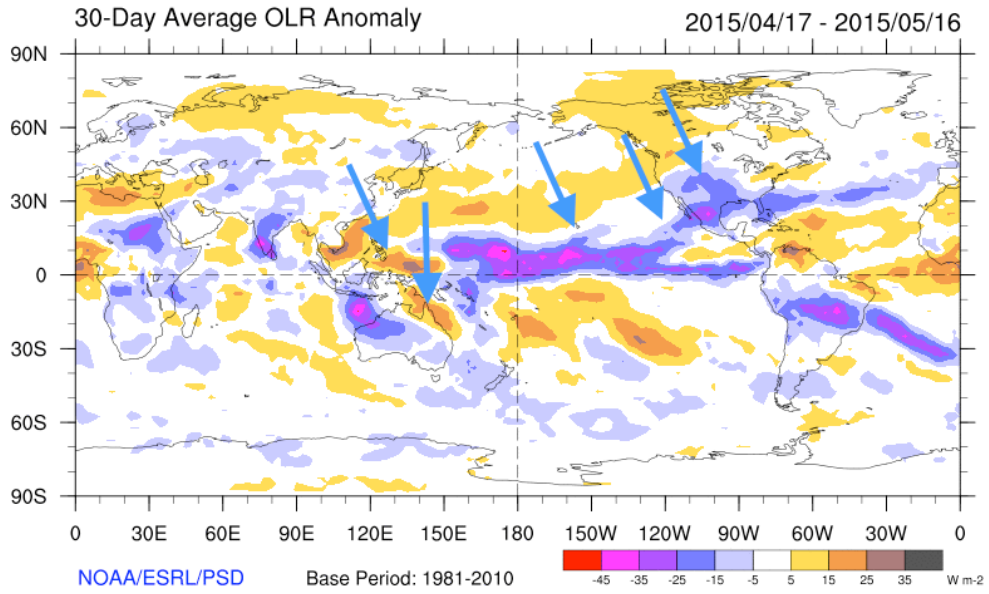




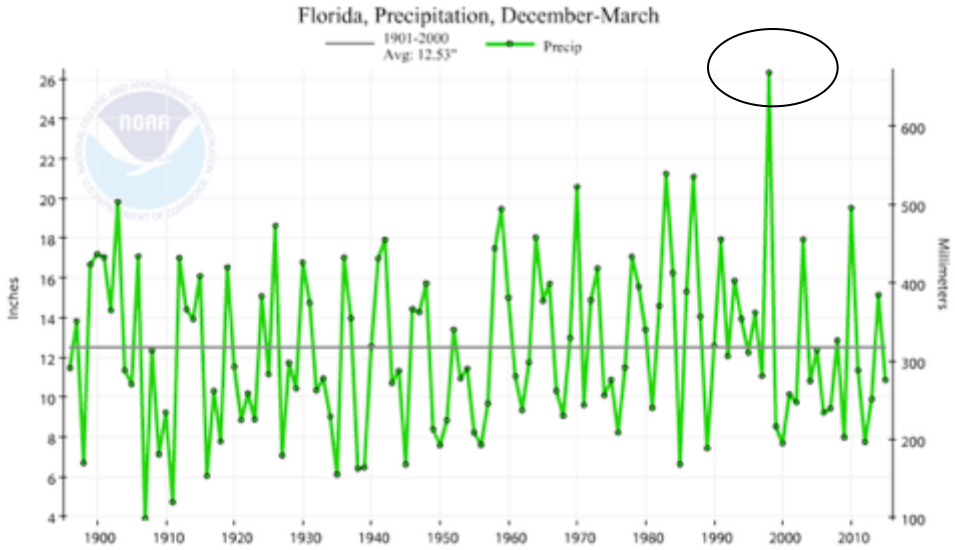
- May set record as wettest month ever for contiguous U.S.
- Over 20 inches across TX and OK, widespread flooding
- TX, OK set records for wettest month ever.
- CO sets record for wettest May

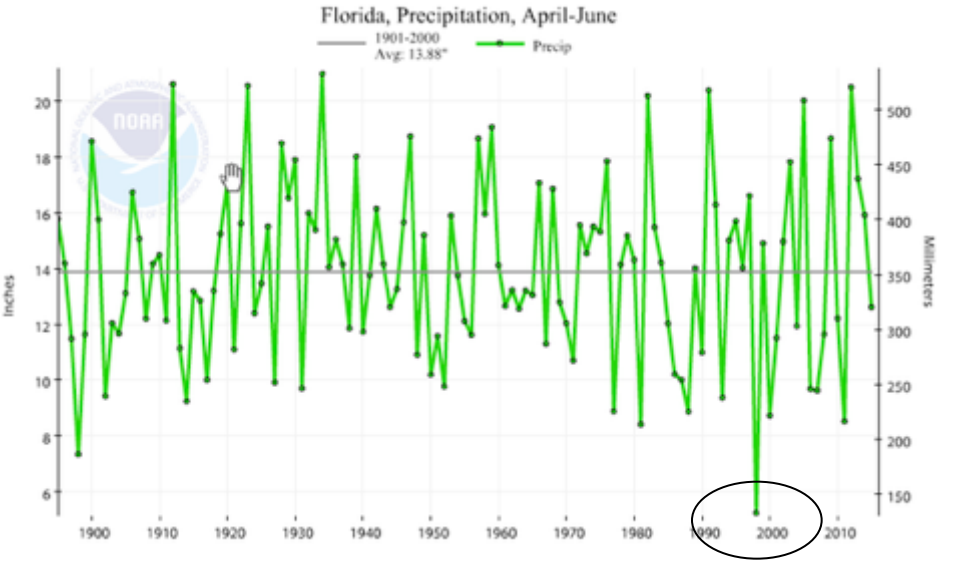
Outgoing Longwave Radiation





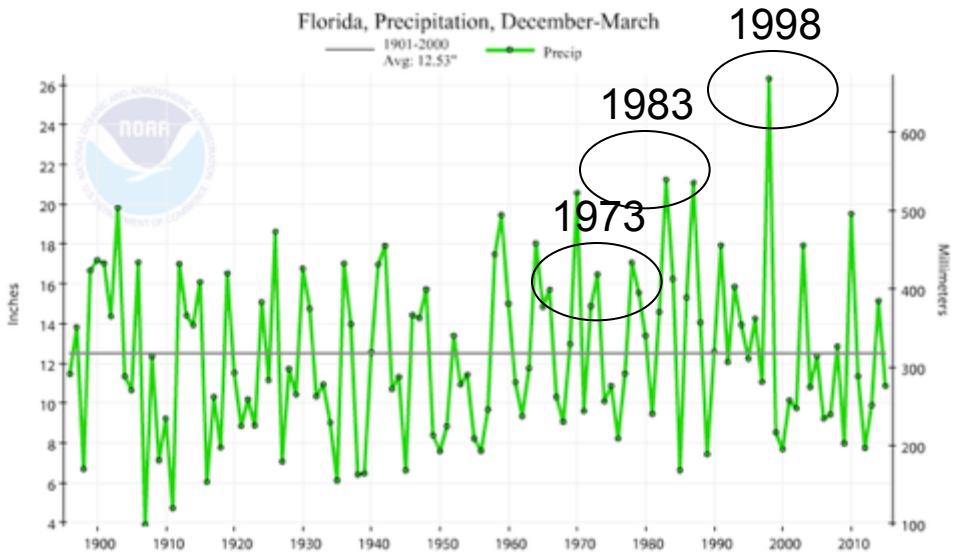
Will 2016 in Florida Repeat 1998?

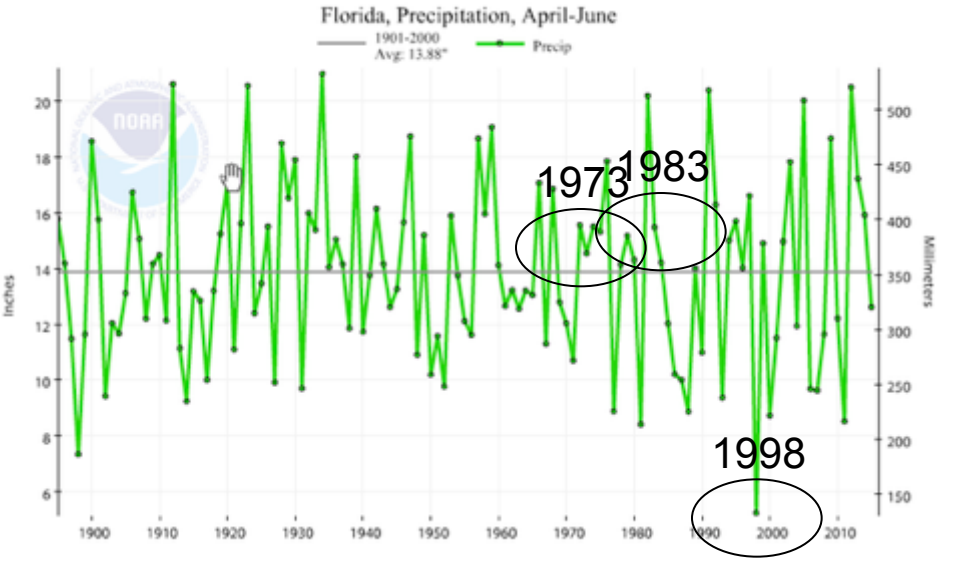




- Super El Nino of 1998 brought record winter rainfall to Florida
- April-June brought record dryness
- Over half million acres burned in worst wildfire season in memory
- In April and May, Pacific Ocean had unprecedented rapid transition from El Nino to La Nina, contributing to the changing weather patterns
- Similar transition unlikely, but Pacific conditions should be monitored closely as spring approaches

Similar El Nino's to 1998?





- 1983 was El Nino of similar strength
- 1973 was strong El Nino with rapid spring transition to La Nina.
- 1998 brought record winter rainfall, 1983 set previous record, 1973 above normal.
- 1998 brought record spring dryness.
- 1983 and 1973 brought above normal spring rainfall.
- No precedent for the record spring drought in Florida in 1998.

Impacting Agriculture

- Do not delay harvest, take advantage of good weather windows
- Plant cover crops early
- Make sure fields are well-drained
- Good conditions for winter pasture
- Anticipate more fungicide
- Cover crops can be left longer in the spring

Kirk Brock

Farms nearly 2,000 acres near Monticello, FL

Most of the acreage is on leased parcels of less that 5 acres

The Problem…

The year-to-year variability in yields was causing too much financial risk and losses during down years.

Climate Considerations

- Climate variations causing drought years and affecting yields

- Heavy rainfall events leading to erosion, nutrient leaching, and water losses to runoff

The Solution…

High-residue cover crops and conservation tillage

Benefits

For the field itself…

- Reduced erosion and runoff, greater infiltration to the soil
- Less evaporative losses
- Weed control
- Increased organic matter in the soil
- Cooler soil temperatures

Climate connections…

- Use of cover crops makes the whole system more resilient to climate variations (change)
- Seasonal forecasts (El Nino/La Nina) used to manage cover crops

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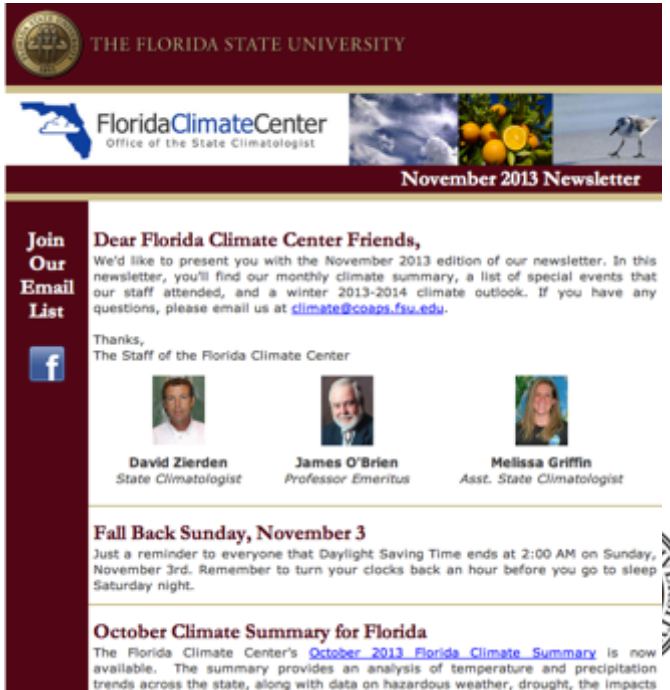

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