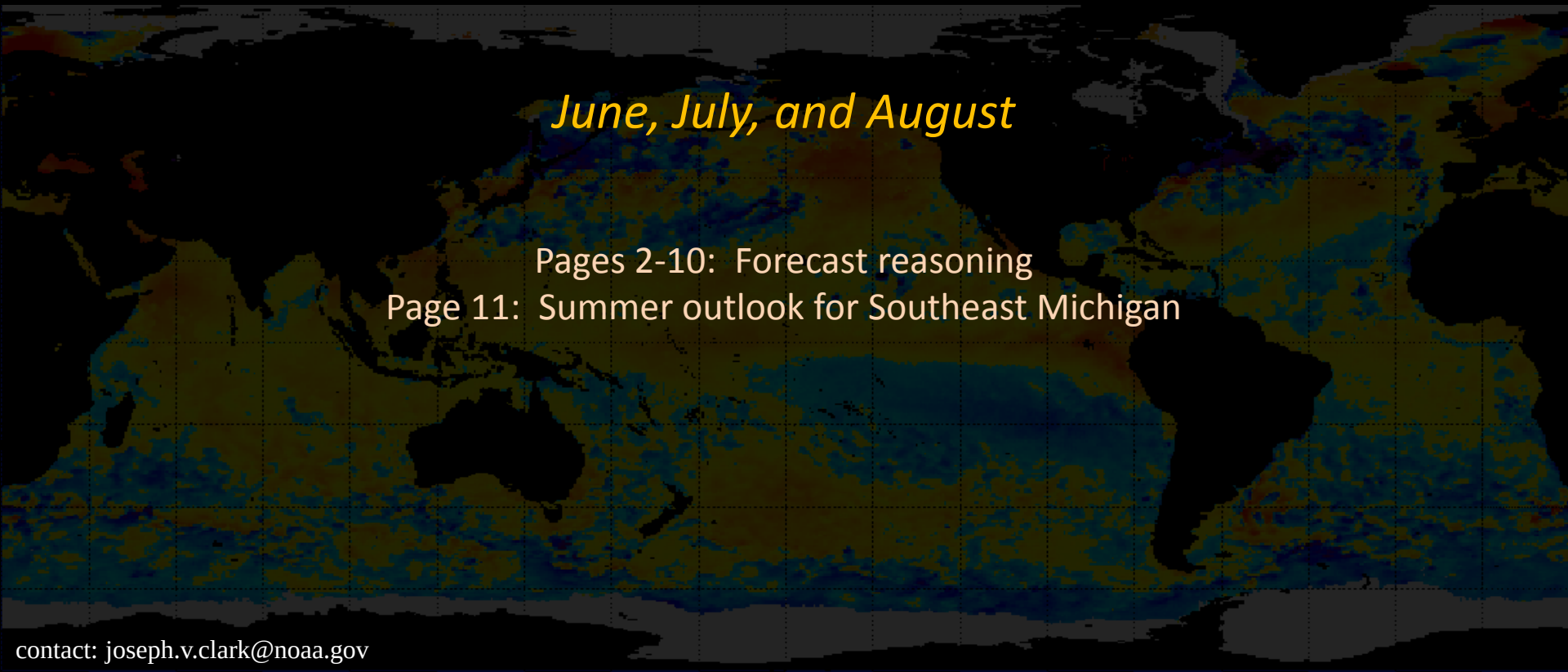
Summer Outlook 2015

Southeast Lower Michigan



June, July, and August

Pages 2-10: Forecast reasoning
Page 11: Summer outlook for Southeast Michigan

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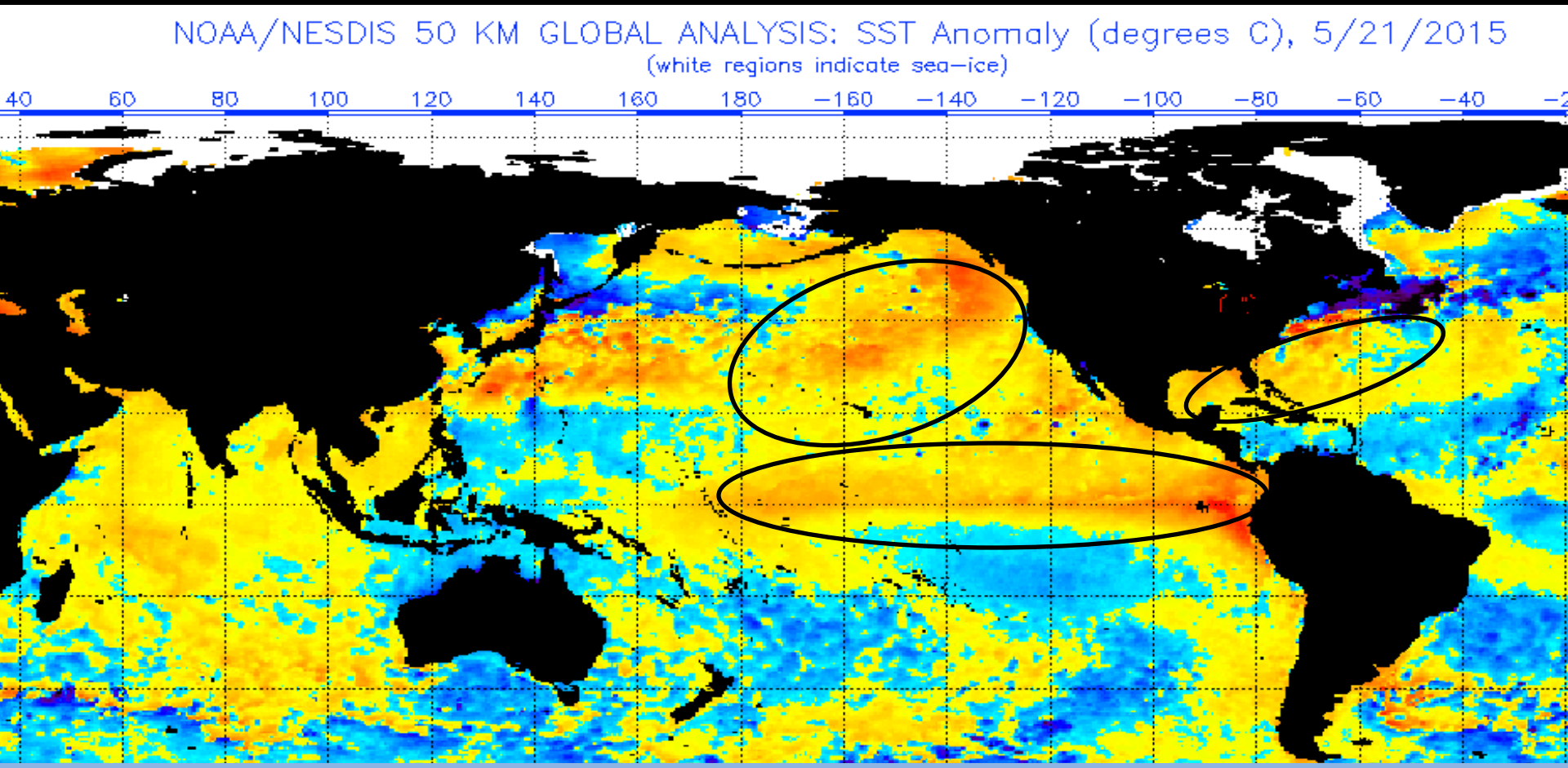
Current Conditions

Current Sea Surface Temperature Anomalies



A mature, basin-wide el Nino has taken shape in the Tropical Pacific. Other large scale SST anomalies include abundant warmth in the north and east Pacific and the west Atlantic.

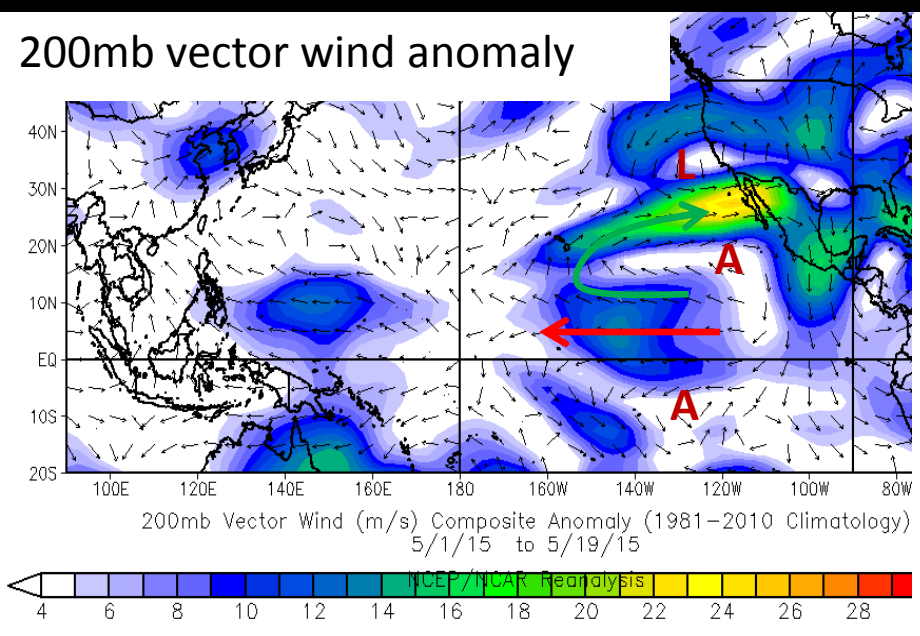
Current Conditions
State of the Tropical Atmosphere

1. Red arrow on both images. Anomalous flow toward the west aloft (left) and anomalous flow toward the east in the low-levels (right). This anomalous circulation is the result of a larger scale rise-fall couplet associated with el Nino (ascent in the east Pacific, subsidence in Indonesia). It indicates a weakening of the Walker Circulation in the tropical Pacific.

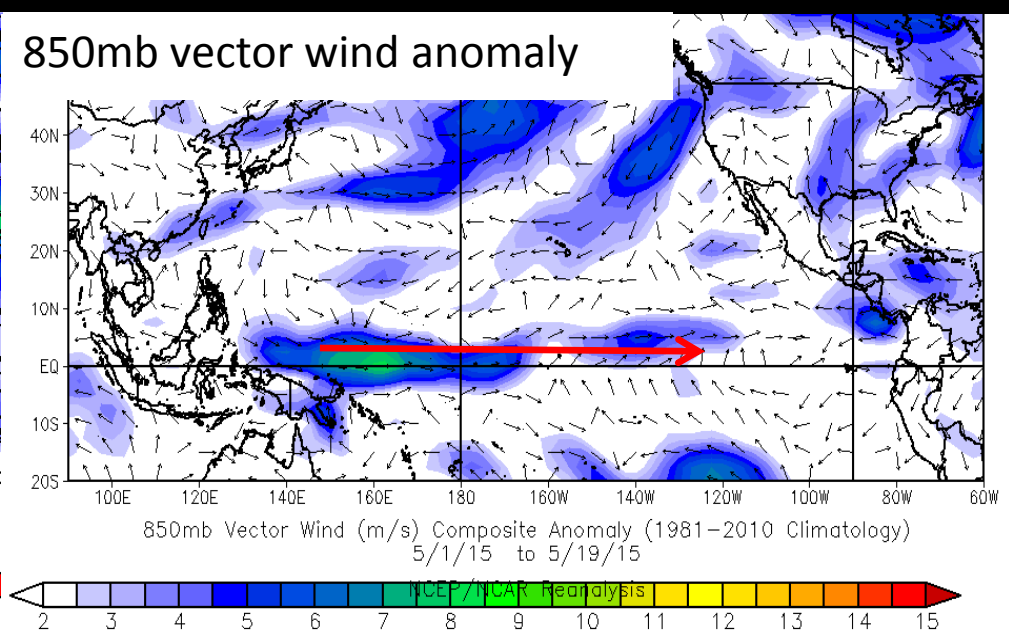
2. Red "A". Twin anticyclones straddling the equator show up in the anomalies, further confirming a healthy ocean-atmosphere coupling in the tropics and a classic el Nino-driven Hadley/Walker setup.

3. Curved green arrow. An active subtropical jet has formed around the northern anticyclone.

200mb vector wind anomaly



850mb vector wind anomaly

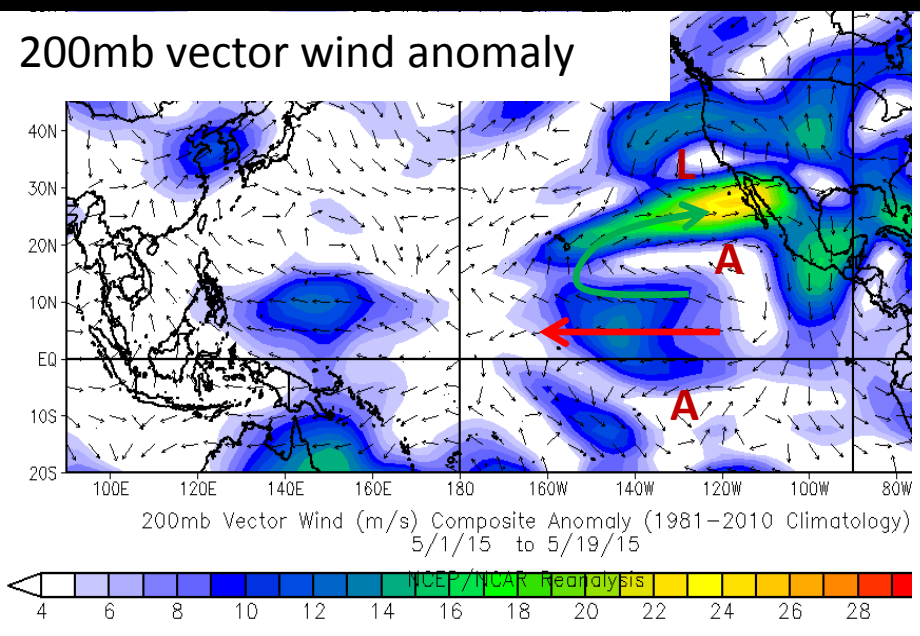


Current Conditions
State of the Tropical Atmosphere (cont.)

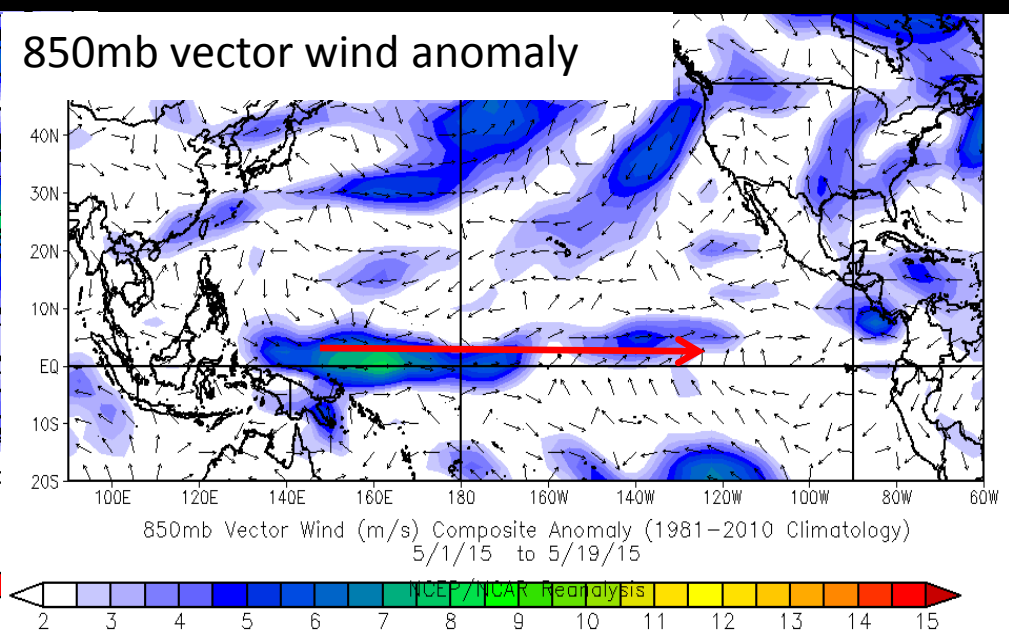
4. Red "L". Low pressure off the west coast of California/Baja completes the train of semi-permanent atmospheric features emanating from el Nino.

The Hadley Cell is strong for this time of year, and the features of note below are located quite far to the east. These features be will semi-permanent through the summer as el Nino strengthens and will destructively interfere with seasonal weakening of the Hadley Cell and contribute to further weakening of the Walker Circulation.

200mb vector wind anomaly



850mb vector wind anomaly



Current Conditions

Outgoing Longwave Radiation and Precipitation Anomalies

<u>Top</u>

Negative (Purple) outgoing longwave radiation (OLR) anomalies indicate areas of enhanced clouds and rainfall.

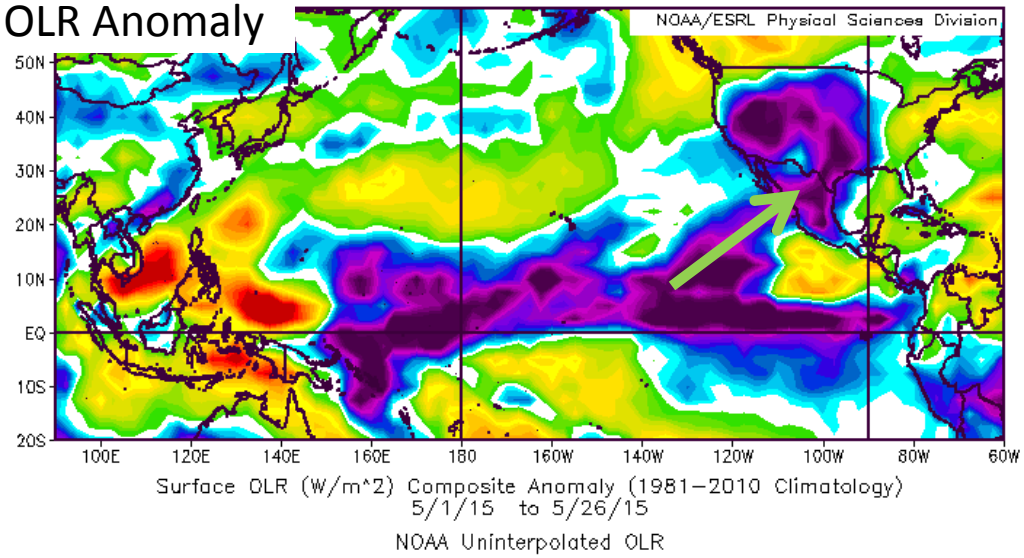
Note the subtropical connection.

<u>Bottom</u>

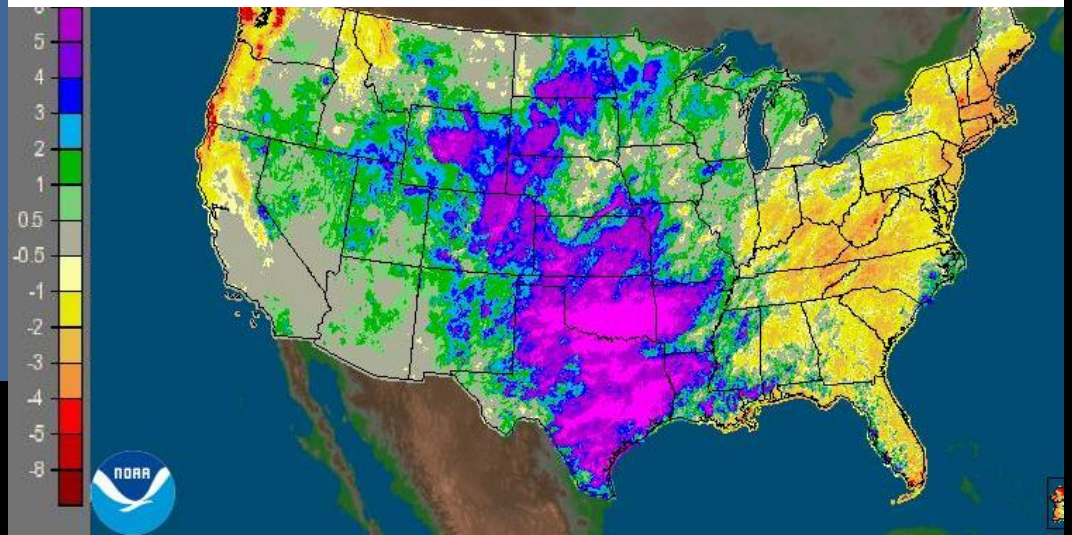
Warm colors indicate dry conditions and cold colors indicate above-normal rain.

We have identified important features in the pattern for upstream locations in the Great Plains, but the signal is poor in Southeast Michigan.

OLR Anomaly



May rainfall departure from normal (as of 5/28)



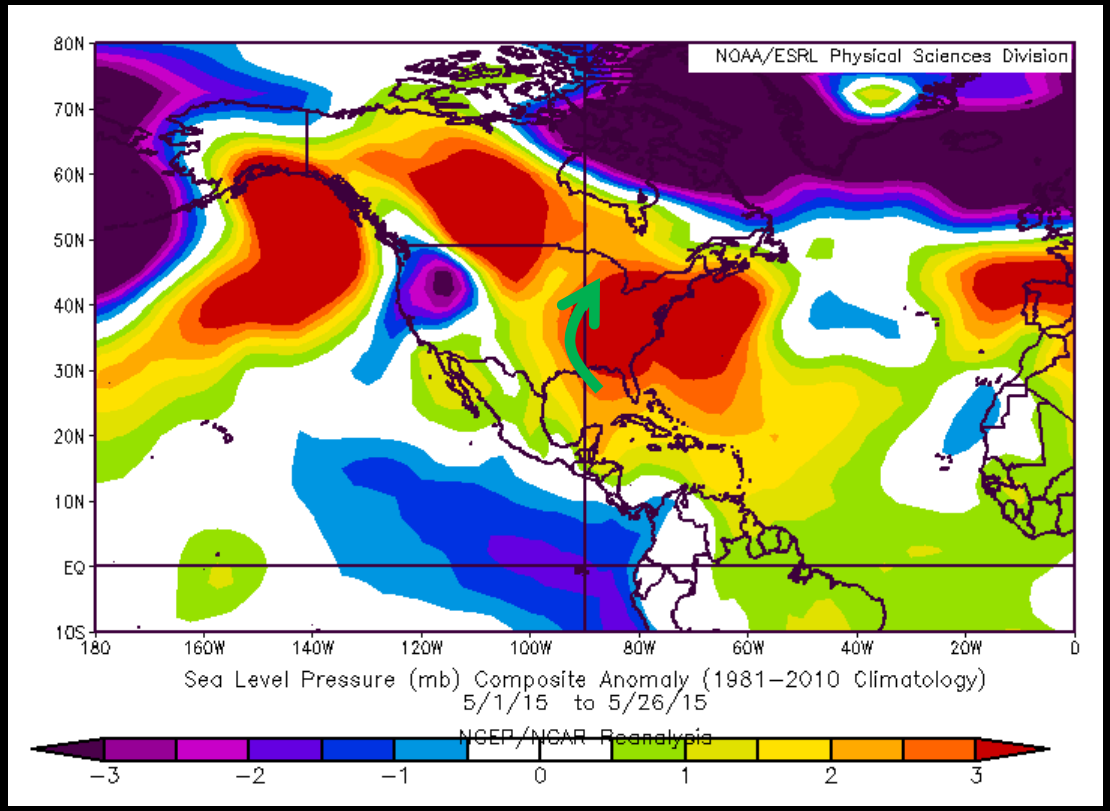
Current Conditions

May MSLP Anomalies

Anomalous high pressure dominates the west Atlantic, Northeast, and Great Lakes. Increased southerly flow can be inferred from the graphic (green arrow).

As we have seen so far this May, episodes of warm southerly flow have been frequent. Positive rainfall anomalies across the Great Plains, especially Oklahoma and Texas, have all but eliminated extreme heat potential for Michigan.

But warmth and humidity have still been common.

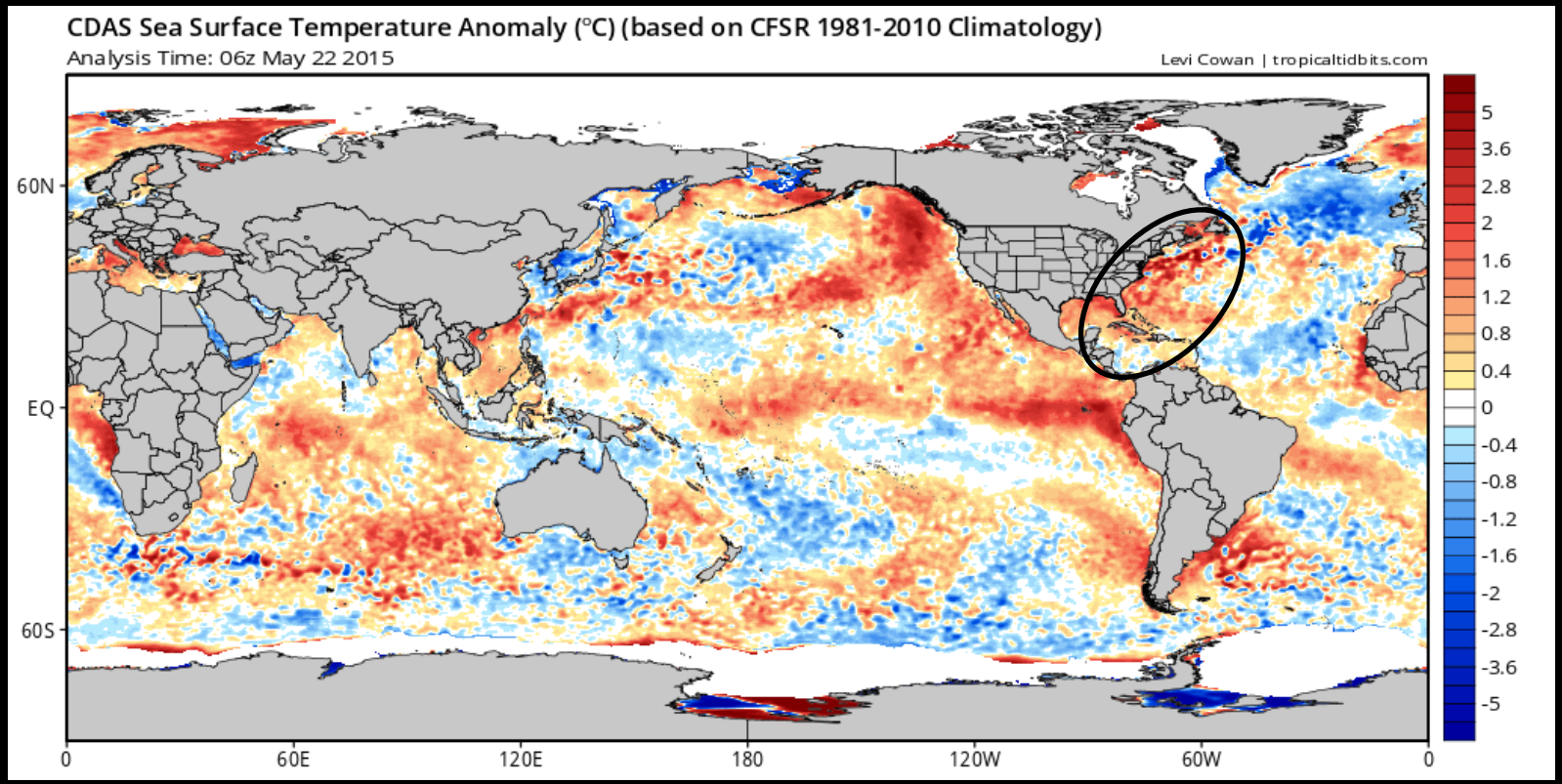


Current Conditions

MSLP Anomalies

The stable pattern of warm sea surface temperatures (SSTs) is a potential reinforcing mechanism for high pressure over the eastern United States. This suggests potential staying power for the pattern identified on the previous slide.

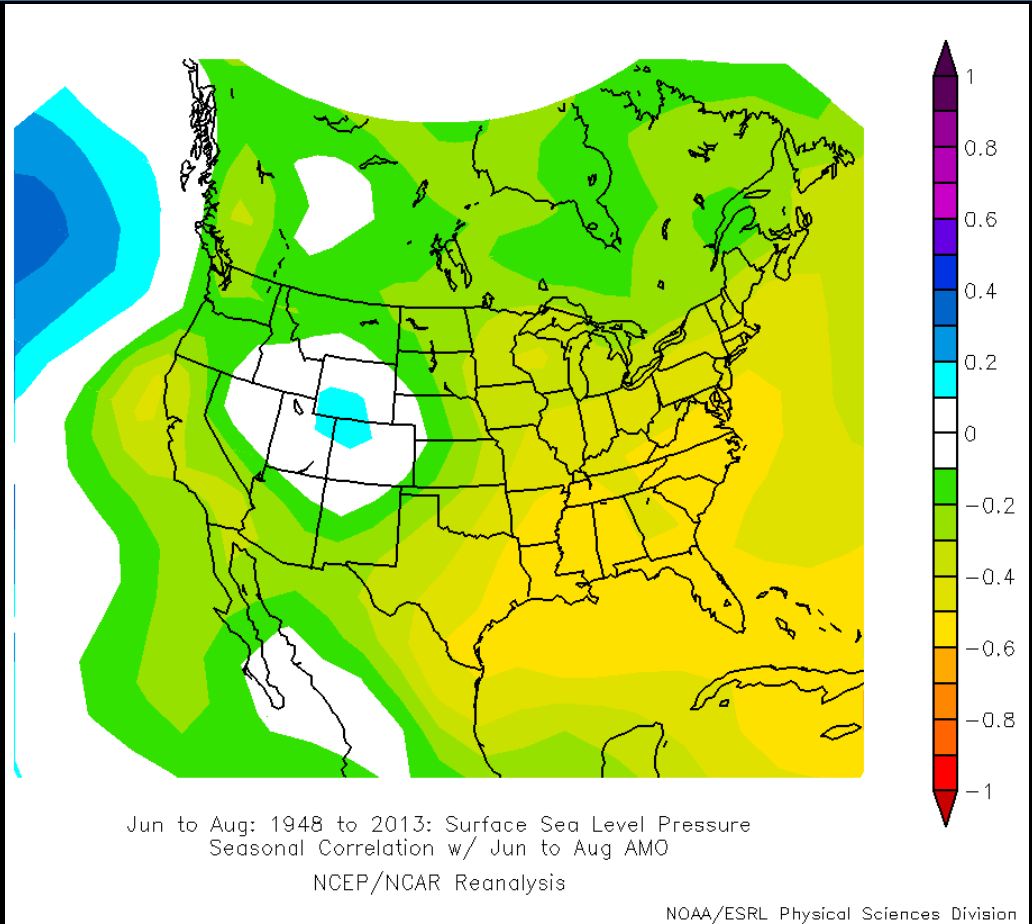
In fact, the next slide will show that this particular pattern of SSTs has a reasonably strong linear correlation with eastern CONUS MSLP during the summer.



Current Conditions

MSLP Anomalies

Given that large scale SST patterns tend to be stable, even in the middle latitudes, this correlation may have implications for Summer 2015. Specifically, it appears that the warm west Atlantic SSTs may reinforce the existing pattern of surface high pressure being dominant to our south and east, helping to funnel warmer and more humid air into the region.

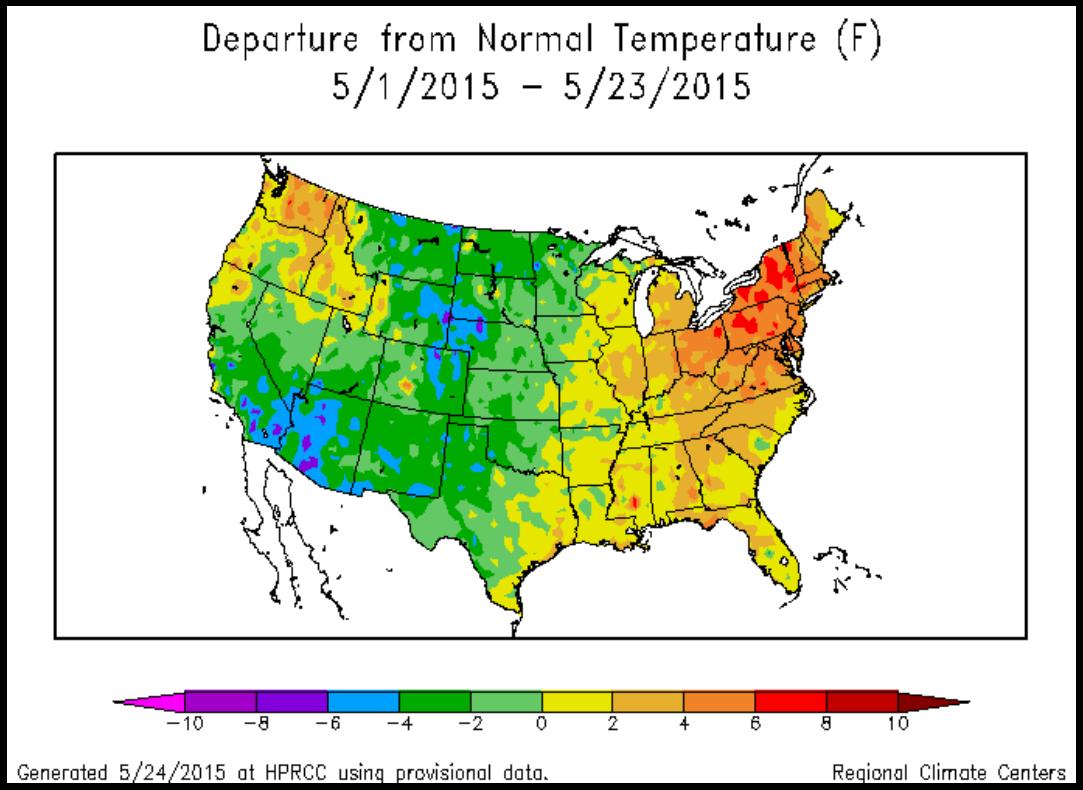


Current Conditions

May Temperature Anomalies

Cold anomalies coincide with high precipitation across the Great Plains, an important source region for warmth, especially extreme warmth, in Southeast Michigan.

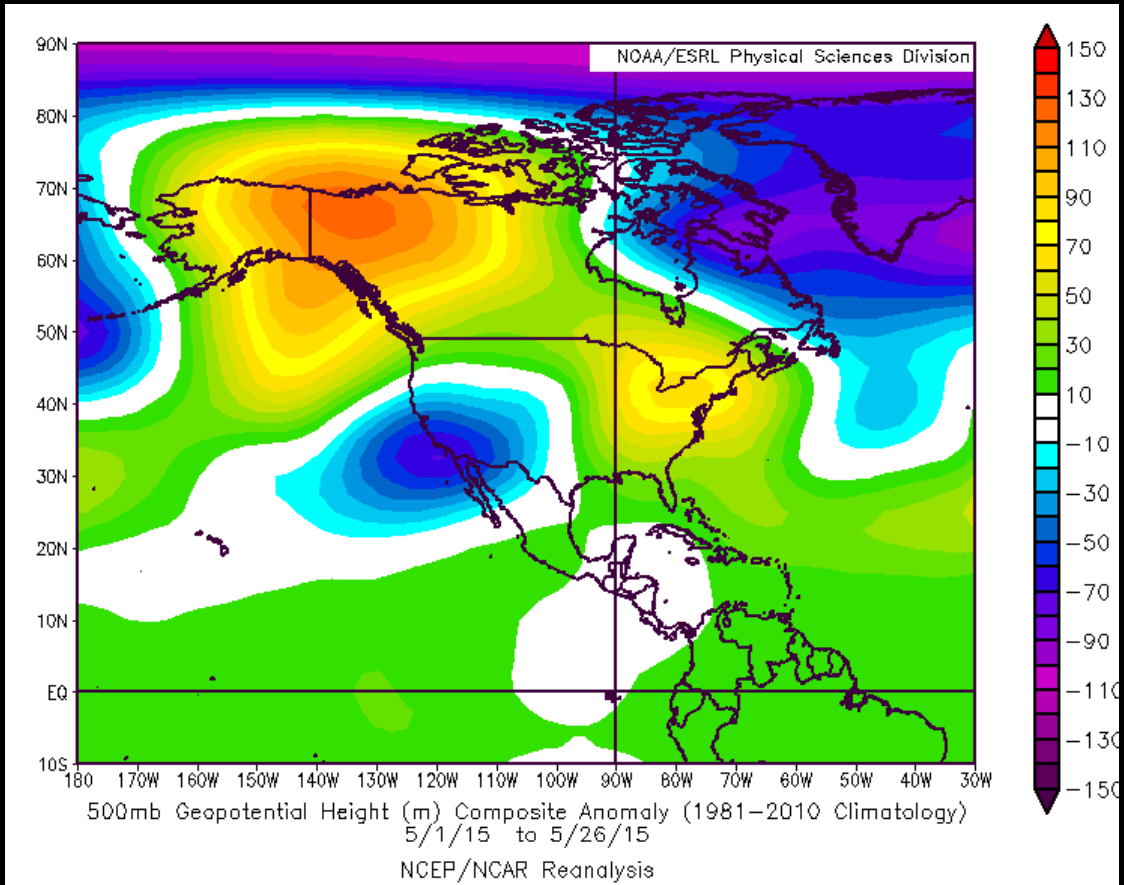
The Great Lakes and areas south and east are entrenched in warm anticyclonic (high pressure) flow.



Summer Outlook

Persistence against a background of seasonal variability

Current prominent features appear to have persistent large scale support. This increases confidence that they will continue to be prominent features heading into the summer. The map below indicates current anomalies (through 26 May) in the middle-atmosphere. Based on the previous analysis, it also a reasonable approximation of expectations going forward.



Summer Outlook for Southeast Michigan

Temperature Trends

Temperatures will remain warmer than normal. However, the apparent lack of a source region for extreme heat this year suggests that extreme heat is very unlikely. The number of 90 degree days (11 is normal for Detroit) is still expected to be below normal. Increased humidity will favor warmer overnight low temperatures. Regular cool intrusions are still expected given the prominence of upstream ridging and colder-than-normal Great Lakes which will favor an increased frequency of backdoor cold fronts.

Warmer than normal in June. Near to slightly warmer than normal in July and August. Fewer 90 degree days than normal. Increased humidity, but still regular relief from the north

Precipitation Trends

Warm season precipitation is dominated by thunderstorm activity and is notoriously difficult to predict at seasonal time scales. Southeast Michigan has seen frequent opportunities for rainfall as remnants of activity over the Plains lifts northeast, but this type of activity will usually be disorganized by the time it reaches Southeast Michigan. The forecast for “persistence” means that while rain opportunities may remain frequent, there is still no dominant signal to indicate more rainfall than normal. Thus, confidence in achieving normal rainfall amounts is slightly lowered.

Normal to slightly drier than normal

Summer Trivia for Southeast Michigan

Warmest temperature: **Tri-Cities: 111F** (7/13/1936), **Flint: 108F** (7/13/1936), **Detroit: 105F** (7/24/1934)
Warmest month: **Tri-Cities**: **77.5F** (Jul 1921), **Flint: 78.0F** (Jul 1921), **Detroit: 79.3F** (Jul 2011)
Warmest summer: **Tri-Cities: 73.3F** (1933), **Flint: 74.2F** (1933), **Detroit: 74.8F** (2012)

Coldest temperature: **Tri-Cities**: **33F** (6/8/1949), **Flint: 33F** (6/4/1998), **Detroit: 36F** (6/11/1972)
Coldest month: **Tri-Cities**: **60.6F** (Jun 1982), **Flint: 60.1F** (Jun 1969), **Detroit: 62.8F** (Jun 1985)
Coldest summer: **Tri-Cities**: **64.8F** (1915), **Flint: 65.4F** (1992), **Detroit: 66.5F** (1915)

Wettest month: **Tri-Cities: 9.43”** (Aug 2012), **Flint: 11.18”** (Aug 1937), **Detroit: 8.76”** (Jul 1876)
Wettest summer: **Tri-Cities: 16.28”** (1928), **Flint: 18.39”** (1937), **Detroit: 16.96”** (1896)

Driest month: **Tri-Cities: 0.27”** (Aug 1927), **Flint: 0.16”** (Jul 1939), **Detroit: 0.16”** (Aug 1894)
Driest summer: **Tri-Cities: 3.54”** (1927), **Flint: 3.76”** (1930), **Detroit: 3.58”** (1911)

Average first 90 degree temperature: **Tri-Cities:** Jun 17th , **Flint:** Jun 18th, **Detroit:** Jun 19th
Climatological chance of reaching 100 degrees: 13-14% or once every 18-20 years.