Summer Outlook 2014

Southeast Lower Michigan

June, July, and August

Slides 2-8: Forecast Reasoning

Slide 9: Summer Outlook for SE Michigan

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Current Conditions

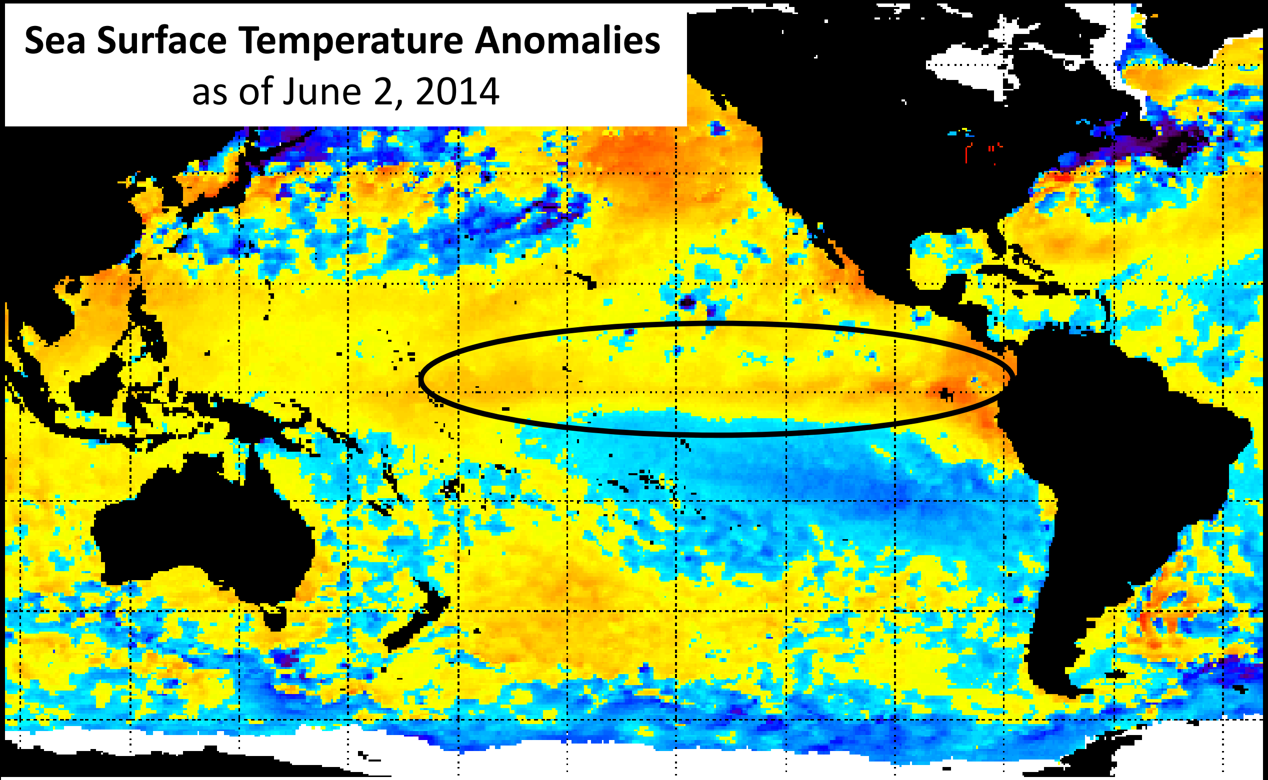
ENSO and the Walker Circulation

ENSO is a powerful forcing mechanism for global weather patterns on seasonal time scales. This means it is almost always the starting point for any type of seasonal outlook.

Sea surface temperatures (SSTs) in the tropical pacific warmed considerably during the spring. Climate models universally predict el Nino conditions to emerge by the end of summer.

Though it could eventually become strong, it will most likely be weak to moderate during the period of interest (June, July, and August).

Sea Surface Temperature Anomalies
as of June 2, 2014



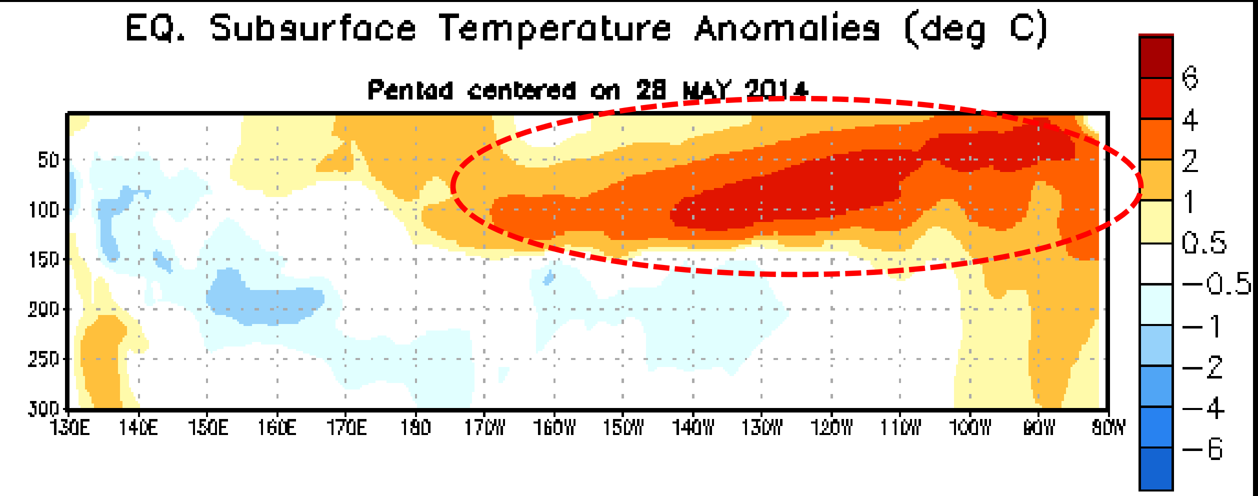
For the latest ENSO conditions, visit the Climate Prediction Center's (CPC) [ENSO page]

Current Conditions

ENSO and the Walker Circulation

This cross-section analysis of temperature anomalies beneath the ocean surface reveals the effects of one of the strongest recorded Kelvin waves to ever traverse the tropical Pacific.

It has resulted in a substantial reservoir of warm sub-surface ocean water available for upwelling, an important feature to note given the expectation for a developing el Nino.

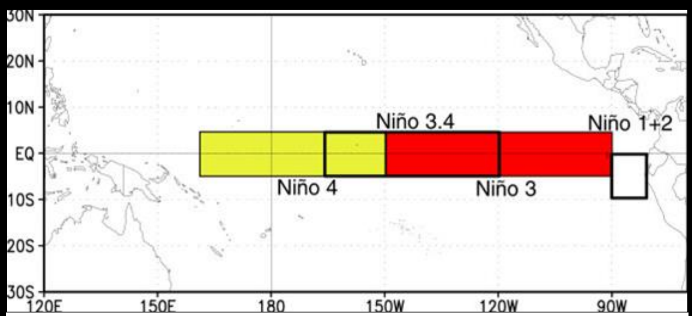


View the latest subsurface temperature anomalies [here]

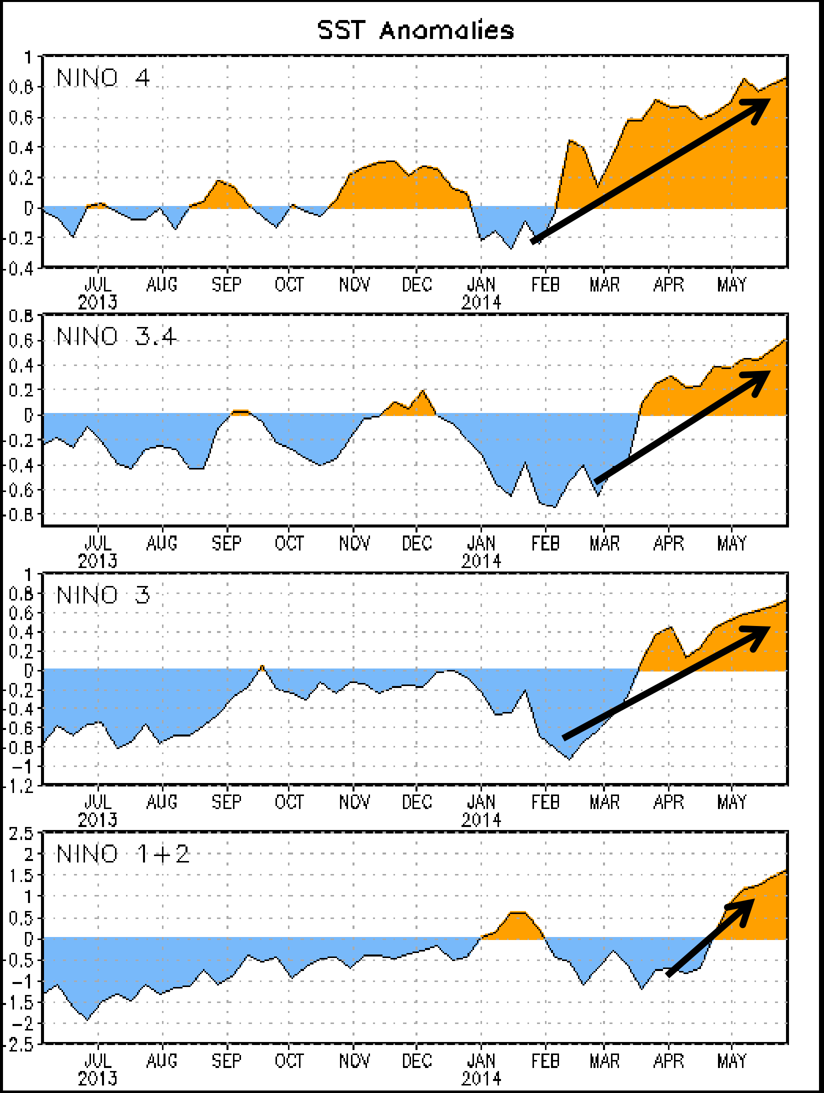
Current Conditions

ENSO and the Walker Circulation

The ENSO regions all warmed considerably during the spring as a result of the aforementioned strong Kelvin wave. In terms of ocean temperatures, el Nino development appears to be well underway as we head into summer.



Source: NWS Climate Prediction Center's (CPC) [ENSO page]



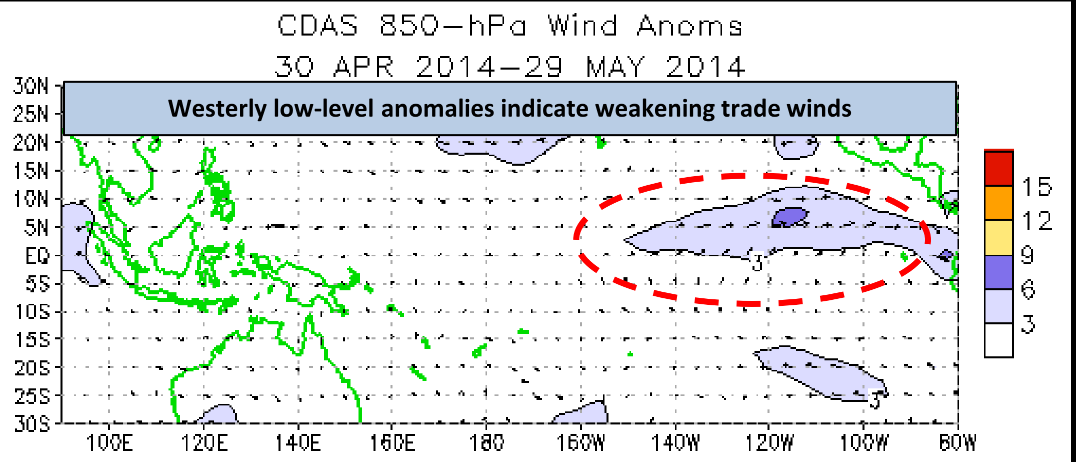
Current Conditions

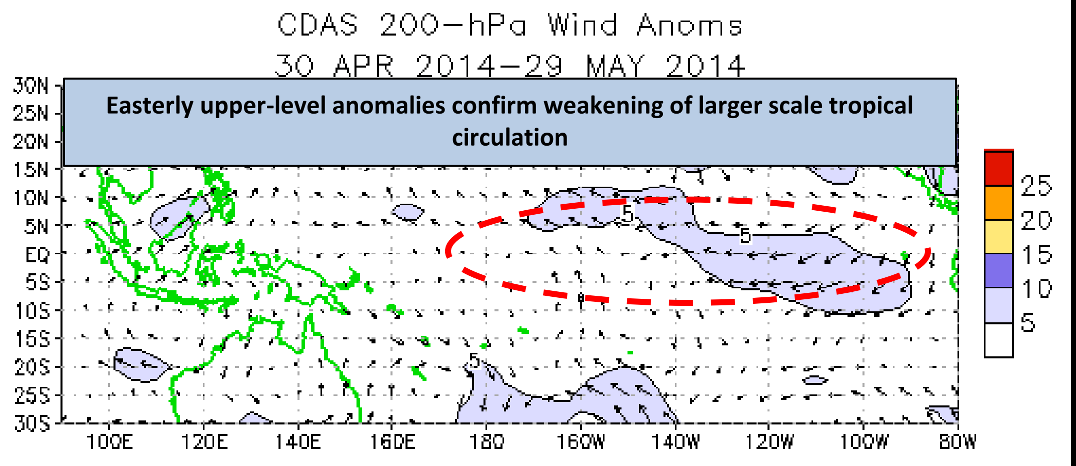
ENSO and the Walker Circulation

The physical importance of the warming waters is the subsequent adjustment of thunderstorm activity and resultant pressure patterns across the tropical pacific. This, in turn, influences the nature of energy transfer to the Northern Hemisphere on a seasonal timescale.

The Walker Circulation has begun to weaken in response to these forces, an indication that el Nino is beginning to exert its influence in the tropics. Note the weakening trade winds (top) and the weakening of upper-level flow in the opposite direction (bottom).

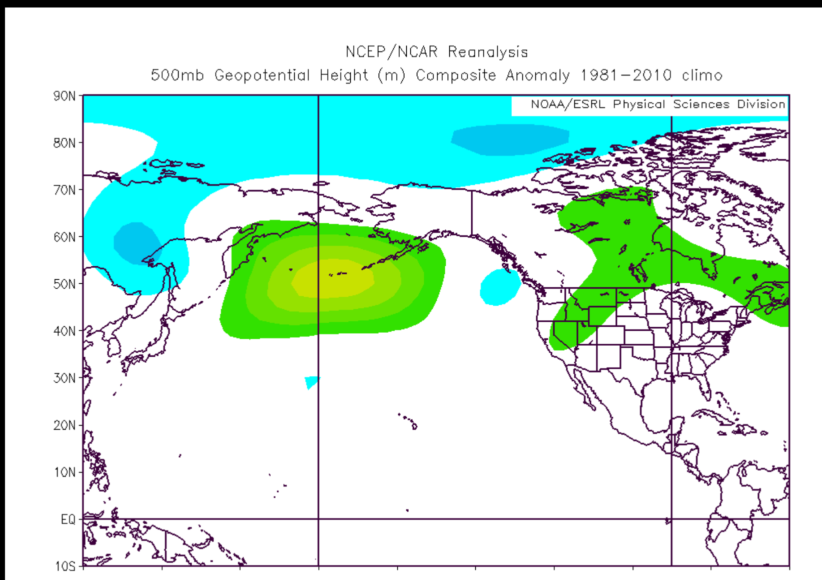
This modification of the tropical wind and pressure pattern confirms that el Nino has begun to exert an influence.



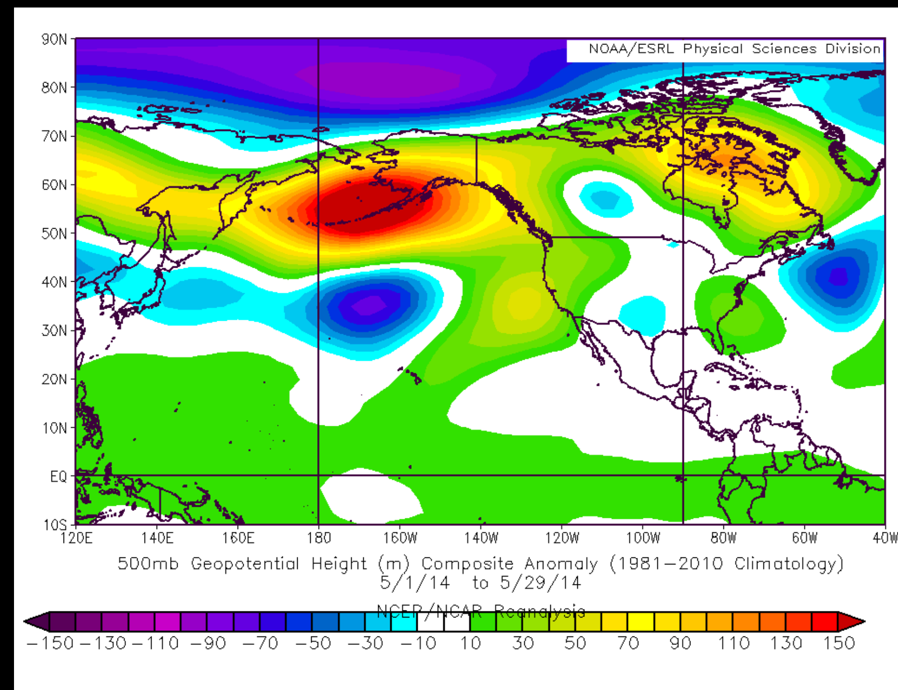


Upper Atmosphere

Downwelling easterlies in the tropical stratosphere



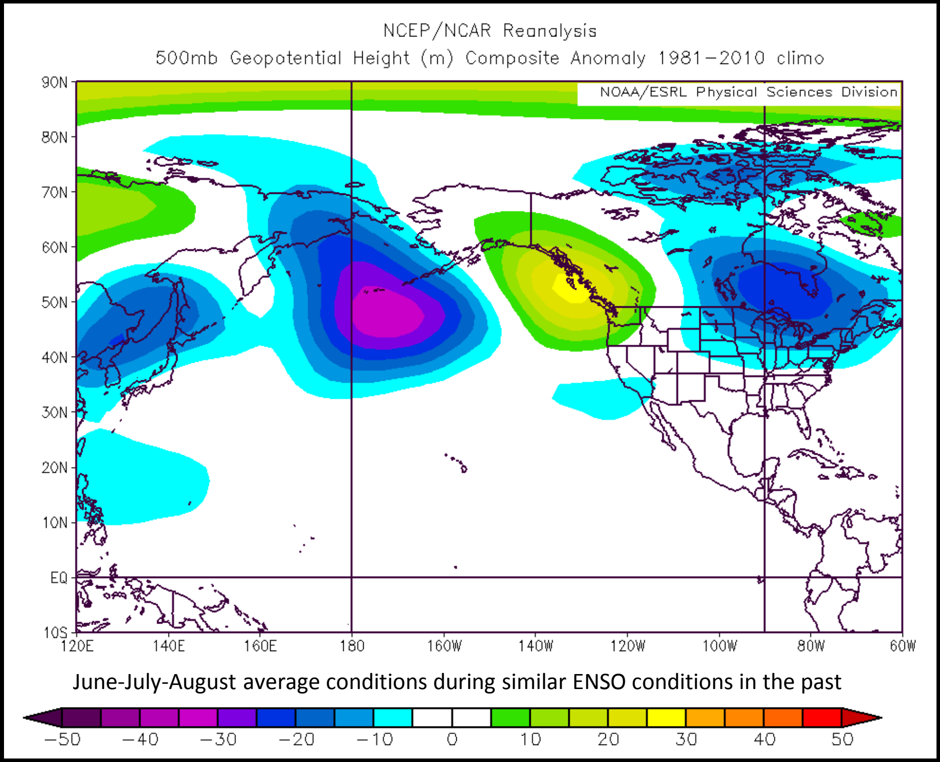
June-July-August average conditions during similar conditions in the past



When similar upper atmospheric conditions have been observed in years past, the data indicate that the longwave pattern becomes anchored by a ridge near the Aleutian Island chain (left). This is similar to conditions that emerged during May 2014, as the northern hemisphere settled into the warm season (right). There is a general absence of a strong signal for the Great Lakes Region.

ENSO Analogs

Strengthening el Nino through the summer



ENSO analogs indicate an eastward shift and amplification of the pattern compared to what is currently being observed. El Nino is a stronger and more direct forcing mechanism than the upper air conditions noted in the previous slide. Thus, given the expected strengthening of el Nino through the summer, it appears reasonable to expect the Northern Hemisphere longwave pattern to evolve in this matter as the season progresses. The data indicate an eventual preference for troughing over the great lakes.

Additional Considerations

The Great Lakes are cold

The cold winter left the Great Lakes in a very cold state as we begin summer. This will have the greatest effect during the first half of summer, before the lakes eventually warm to closer-to-normal temperatures.

Until then…

Stronger lake breezes and enhanced backdoor cold fronts will play a secondary role in the local climate and will contribute a component of cooling to the Summer season.

Summer Outlook for Southeast Michigan

Temperature Trends

Temperatures are expected to remain within 1.5 degrees of normal well into July. By the latter half of summer, a signal for cooler-than-normal temperatures emerges mainly due to developing ENSO influences.

First half of summer: Near Normal (+/- 1.5°)

Second half of summer: Slightly cooler than normal (-1.0 to -2.0°)

Precipitation Trends

Warm season precipitation is dominated by thunderstorm activity and is notoriously difficult to predict at seasonal time scales. The only coherent signal for precipitation is the expectation for an evolution toward troughing by summer's end.

First half of summer: Near Normal rainfall
Second Half: Slightly above 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.