

El Niño and What it Could Mean for the 2019 Severe Weather Season

April 7, 2019

Photo Credit: NASA

Explore El Niño:

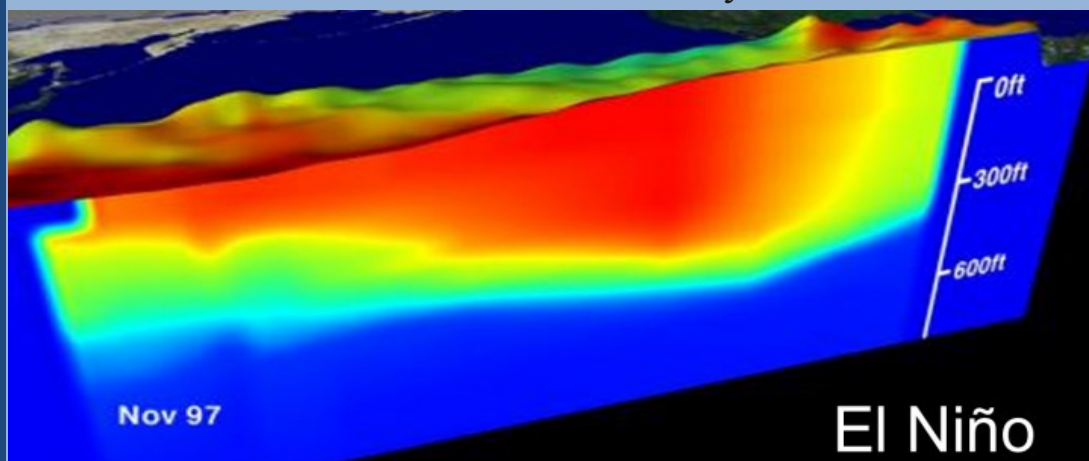
What is El Niño

Current Conditions
and Forecast



WEATHER READY NATION

By: Brandon Locklear



Although it arrived later than expected, weak El Niño conditions finally developed during January 2019 (See Figure 1). Then in February 2019, the associated coupling between the atmosphere and ocean strengthened. Due to the recent strengthening, there is now a high likelihood (80%) that El Niño will continue through the spring months (March-April-May) and a good chance (~60%) that it will persist through the summer (June-July-August). ENSO (El Niño Southern Oscillation - encompasses both the warm El Niño and cold La Niña phases) has long been the main source of predictability and skill for long range seasonal winter forecasts of temperature and precipitation. However, it has only been recently that research has shown that ENSO could also provide skill in long range predictions of severe thunderstorm activity during the spring months.

A paper published in *Nature Geoscience* in April 2015 by John Allen, Michael Tippett, and Adam Sobel examines the influence of ENSO on tornadoes and hail across the United States during winter and spring. The maps shown in Figure 1 are adapted from that paper, and show tornado and hail frequencies for the spring months during El Niño and La Niña. In these maps, purple indicates higher storm frequency, and brown indicates lower storm frequency. In short, springtime tornadoes and hailstorms are less frequent across the southeast US during El Niño and more frequent during La Niña. The research showed that ENSO affects tornado and hailstorm frequency by influencing the position of

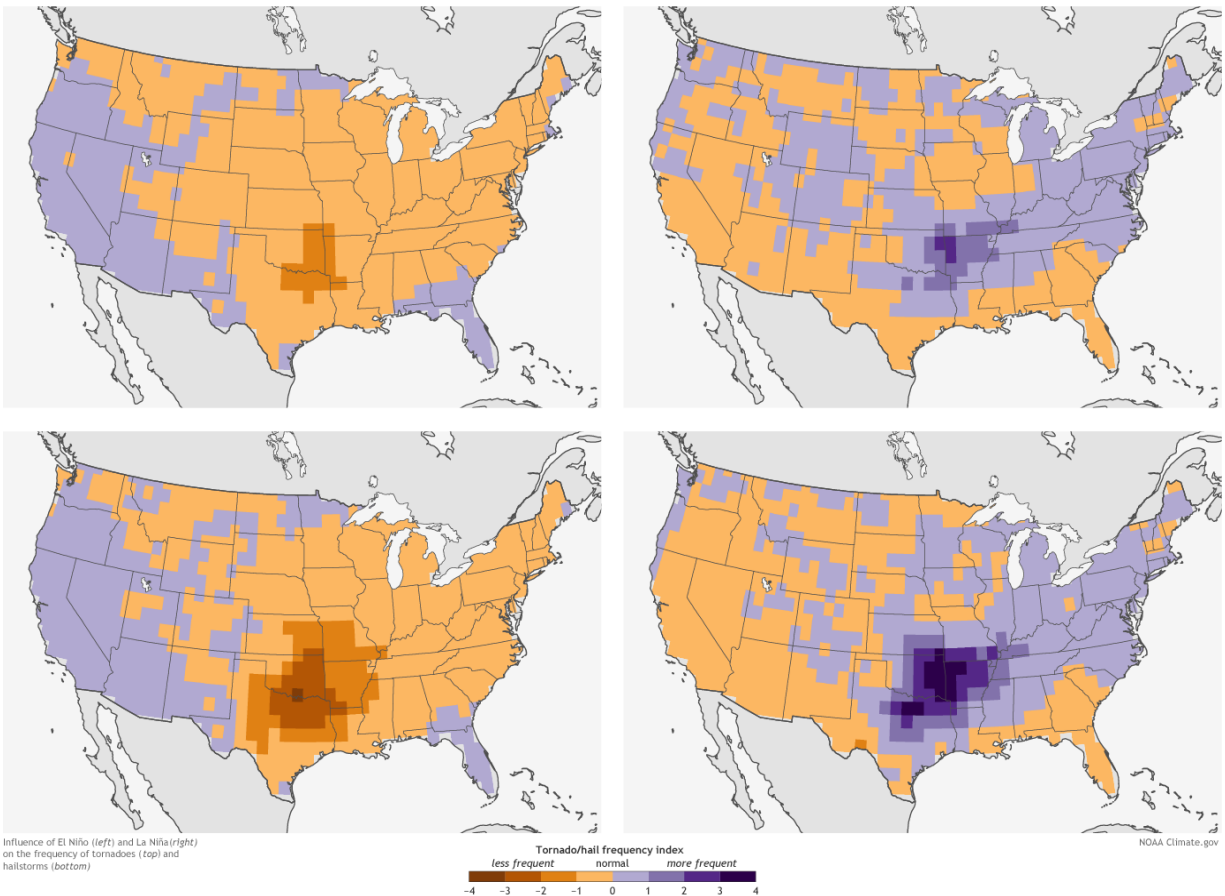


Figure 1: Tornado (top) and hail (bottom) frequencies for the spring months during El Niño (left column) and La Niña (right column).

the jet stream over North America, with the subtropical jet typically focusing the tracks of storm systems across the region as indicated in Figure 2 (right).

In a second paper published in *Environmental Research Letters* in April 2016, a group of researchers led by NOAA scientist Sang-Ki Lee examined patterns of tornado outbreaks during the four different kinds of springtime ENSO phases: strong El Niños and strong La Niñas that persist well into the spring, and weak El Niños and La Niñas that last for only a short time after their winter peak. Using the definition of a regional tornado outbreak as 12 or more F1-F5 “F-scale weighted” tornadoes (weighted to emphasize more intense and vio-

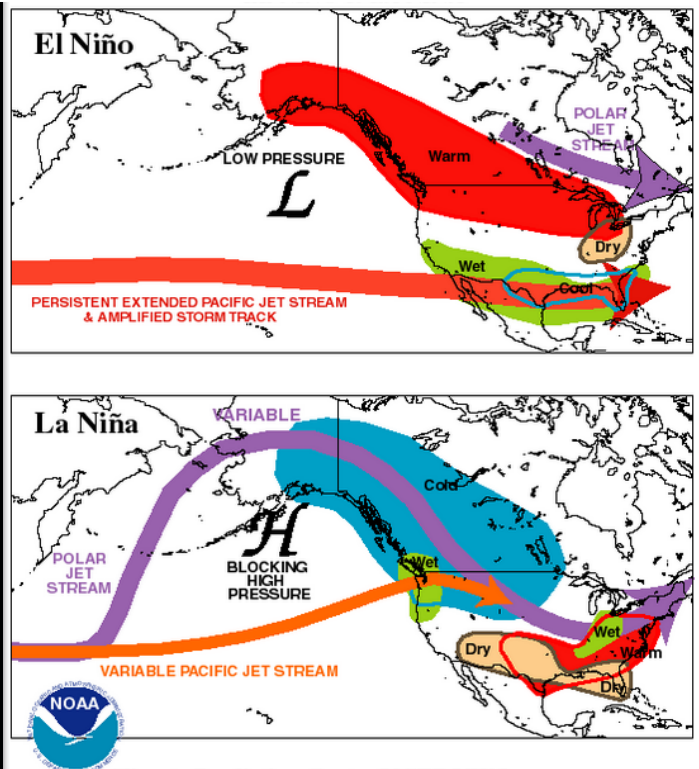


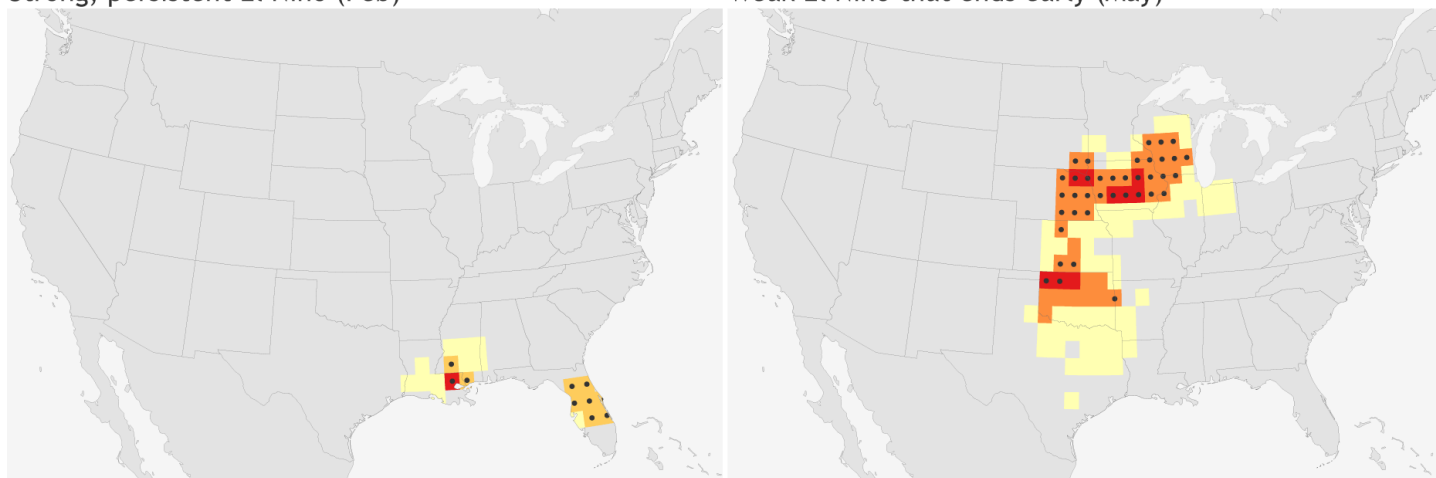
Figure 2

lent tornadoes) occurring within five days and a 200 kilometer radius, the researchers discovered that each ENSO phase had a distinct impact on tornado outbreaks. Figure 3 (below) indicates that when El Niño lingers into spring or ends early (top two graphics), there were no noted increases in probabilities of tornado outbreaks over the Southeast (black dots indicate a significantly heightened risk of an outbreak). However, when La Niña persists into spring and then resurges into another La Niña or transitions into El Niño, the probability of tornado outbreaks increases over the southeast. In fact, the deadly and record-breaking 2011 tornado events occurred during a resurgent La Niña spring. Finally, it's important to remember that a tornado outbreak can occur in any season and almost anywhere in the United States, regardless of the state of ENSO. Over the next few years, scientists and researchers plan to test whether including the ENSO state into seasonal outlook models will add value and insight to seasonal spring outlooks.

Chances of tornado outbreaks by spring ENSO phase and month of greatest impact

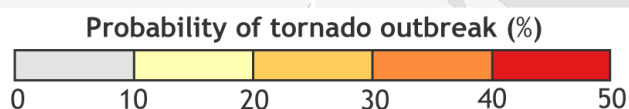
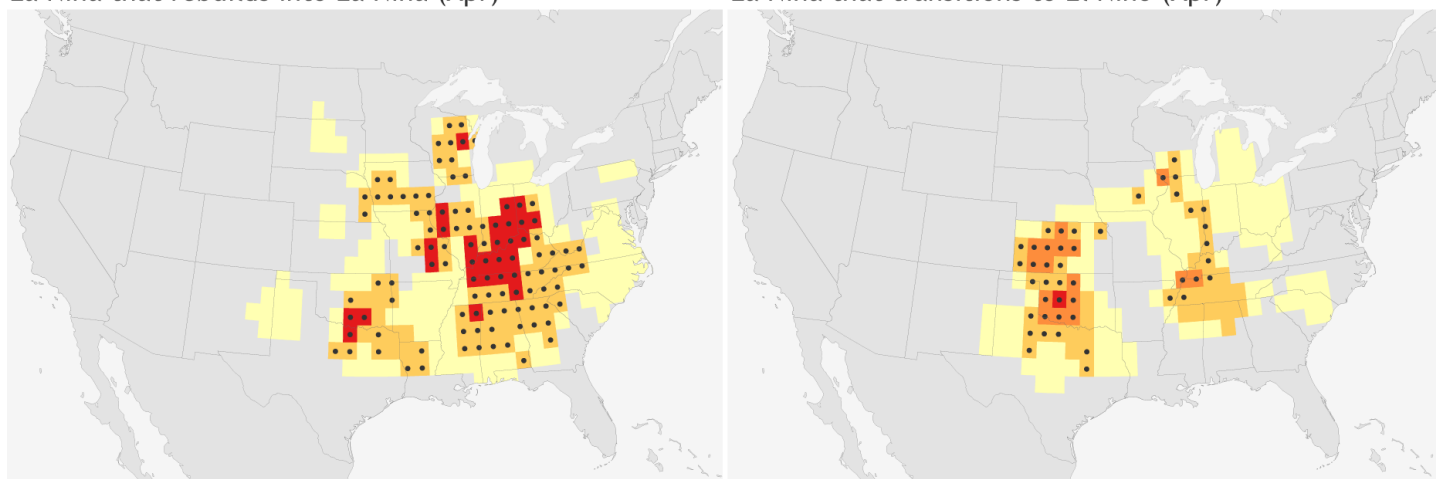
Strong, persistent El Niño (Feb)

Weak El Niño that ends early (May)



La Niña that rebuilds into La Niña (Apr)

La Niña that transitions to El Niño (Apr)



NOAA Climate.gov
Data: S.Lee

Figure 3