How El Niño, La Niña, and Arctic Oscillation Impact Florida's Weather

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El Niño – What it is

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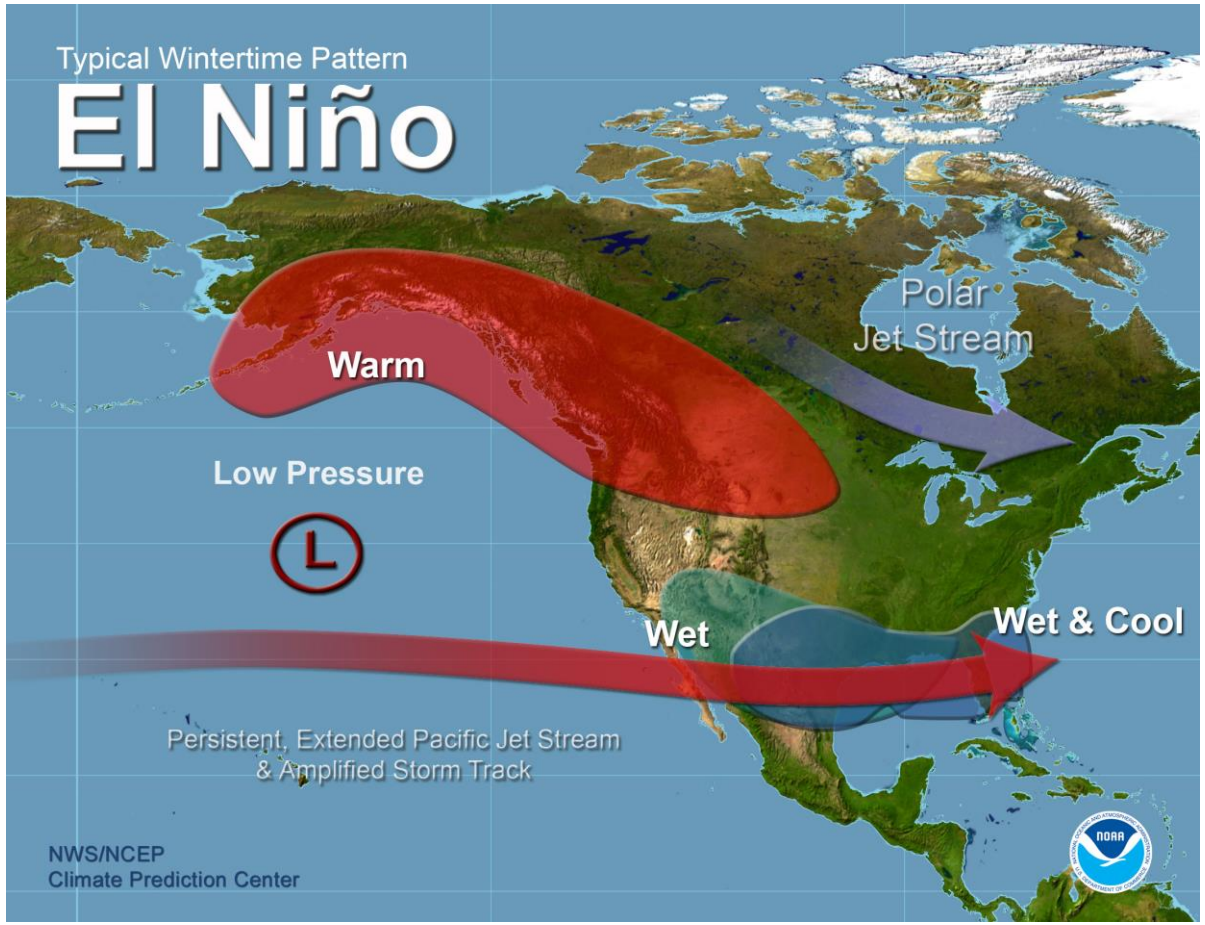
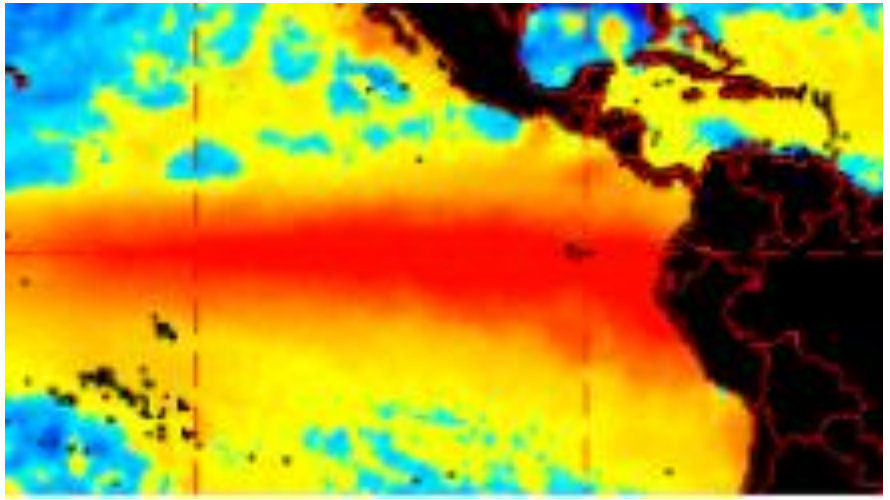


- Characterized by unusually warm water in the equatorial Pacific Ocean
- Happens when tropical Pacific Ocean trade winds die out and ocean temperatures become unusually warm
- Winter El Niño episodes feature a strong jet stream and storm track across the southern part of the United States, and less storminess and milder-than-average conditions across the North



The ENSO pattern can shift back and forth (between El Niño and La Niña) irregularly every two to seven years

El Niño – Local Impacts on Temperature and Rainfall

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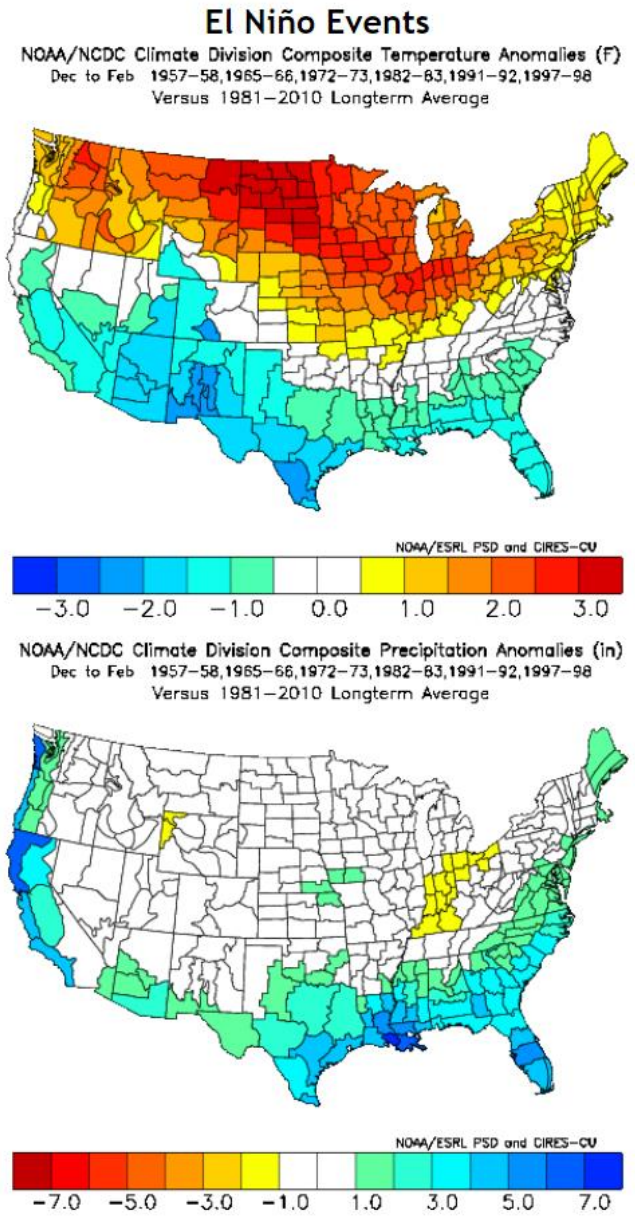
Temperatures and Freezes:

- For strong El Niño events, temperatures were above average in December, then near to below average for January through March
- For weak to moderate El Niño events, temperatures were generally near to slightly below average December through March.
- Separating it into high and low temperatures, highs are much farther below normal than lows during moderate to strong El Niño years, indicating significant cloudiness is present, keeping daytime temperatures low while preventing overnight temperatures from becoming too cold. The additional cloudiness is likely due to a combination of more storms affecting the area as well as a stronger jet stream carrying high clouds across the area from the Pacific Ocean.
- Freezes occur more often than normal in February during a strong El Niño. The likely cause is abnormally strong storms that pass through and to the north of Florida, causing cold air to be dragged southward behind the storms into the state (advective freezes).

Rainfall and River Flooding:

- Rainfall was well above normal in December through March during moderate to strong El Niño years
- More rain means more flooding on area rivers. Data shows that most locations do flood more, some up to twice as often, in the winter and spring of strong El Niño years than all other conditions combined.



La Niña – What it is

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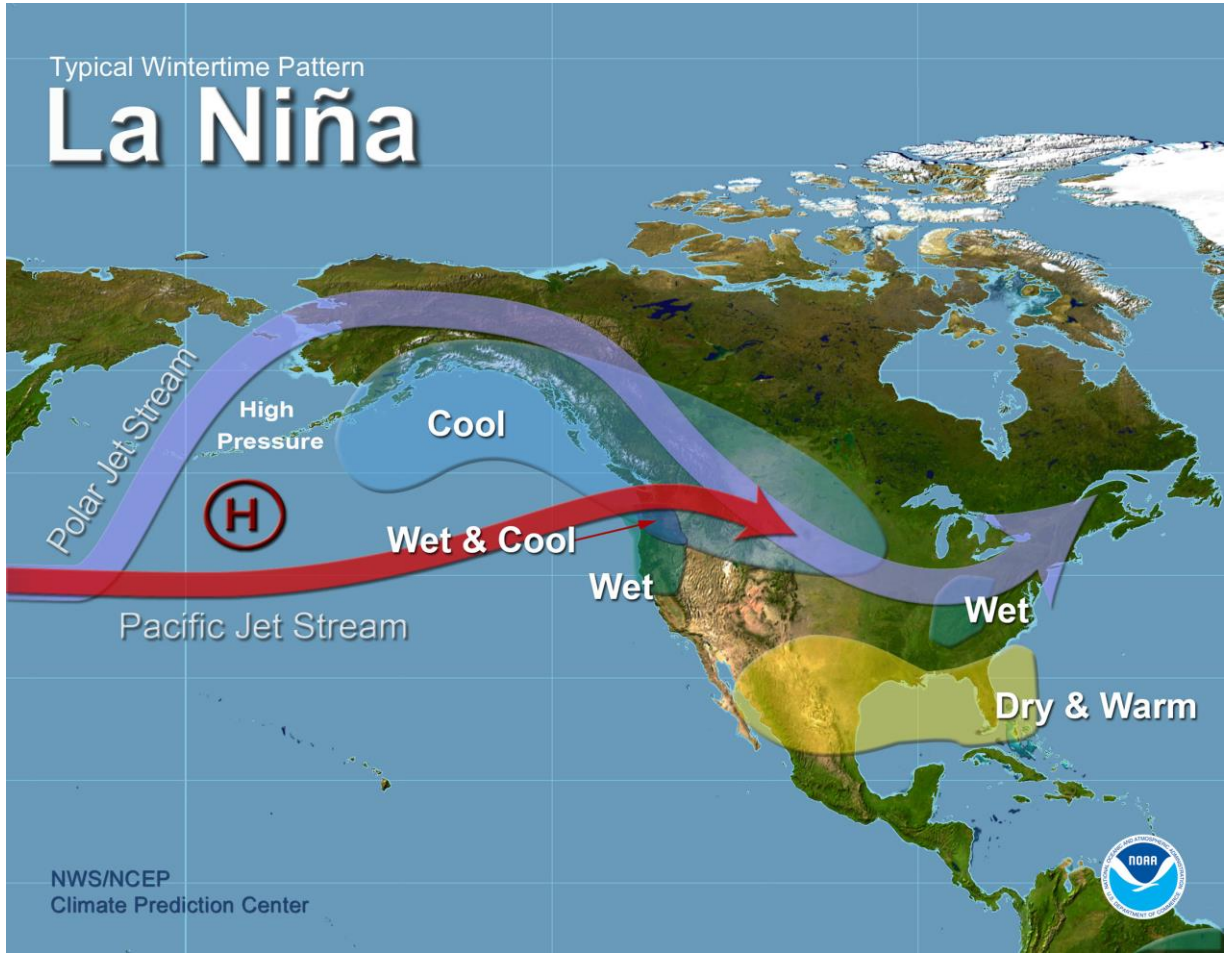
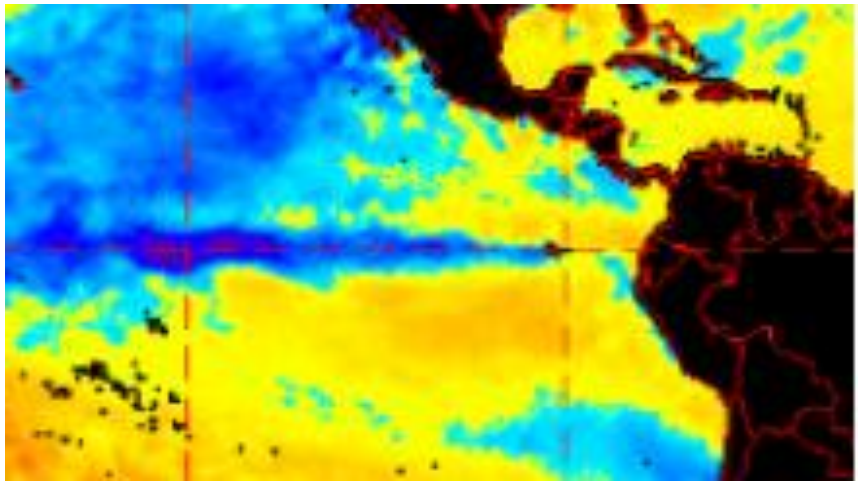


- Characterized by unusually cold water in the equatorial Pacific Ocean
- Occurs when the trade winds blow unusually hard, and the sea temperature becomes colder than normal
- Winter La Niña episodes feature a very wave-like jet stream flow over the United States and Canada, with colder and stormier than average conditions across the North, and warmer and less stormy conditions across the South



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La Niña – Local Impacts on Temperature and Rainfall

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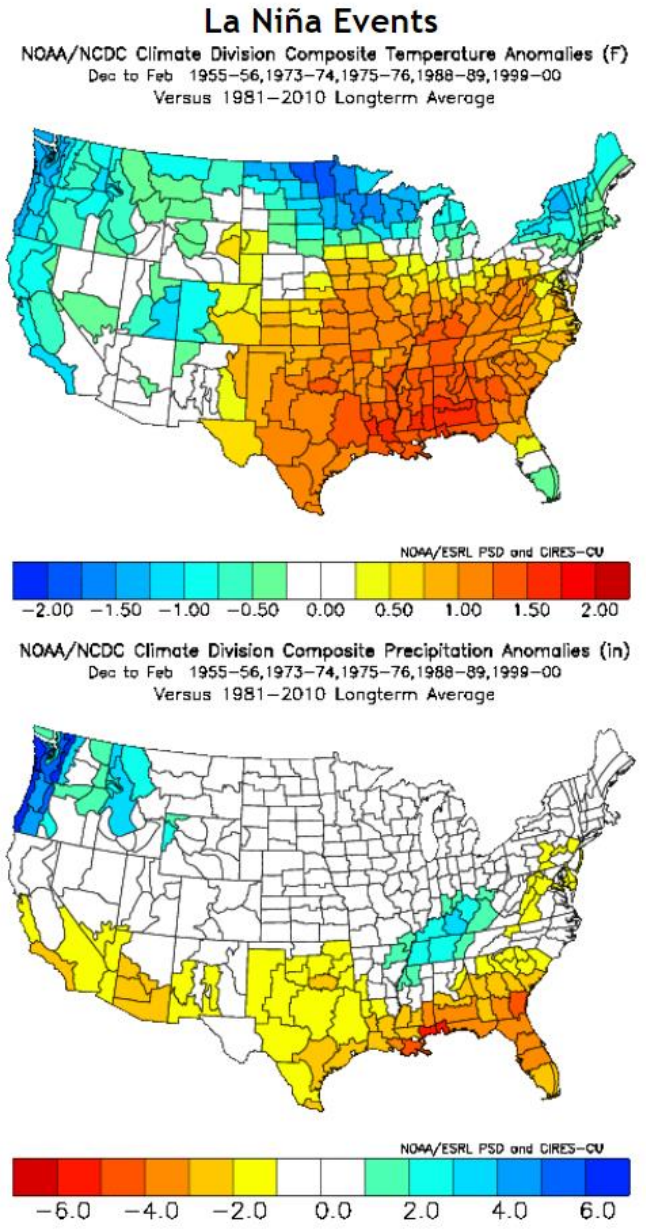
Temperatures and Freezes:

- For strong La Niña events, temperatures were below average in December then generally near to slightly above average for January through March
- For weak to moderate La Niña events, temperatures were generally slightly above average December through March
- Separating it into high and low temperatures, highs are more above normal than lows. This indicates much less cloudiness during moderate to strong La Niña years, allowing for significant solar warming during the day and radiational cooling at night.
- Freezes occur more often than normal in February during a strong La Niña in the central counties. The likely cause is radiational cooling under clear skies with calm wind conditions (radiational freezes).

Rainfall:

- Rainfall was well below normal in December through March during moderate to strong La Niña years



El Niño/La Niña – Severe Weather & Tropical Impacts

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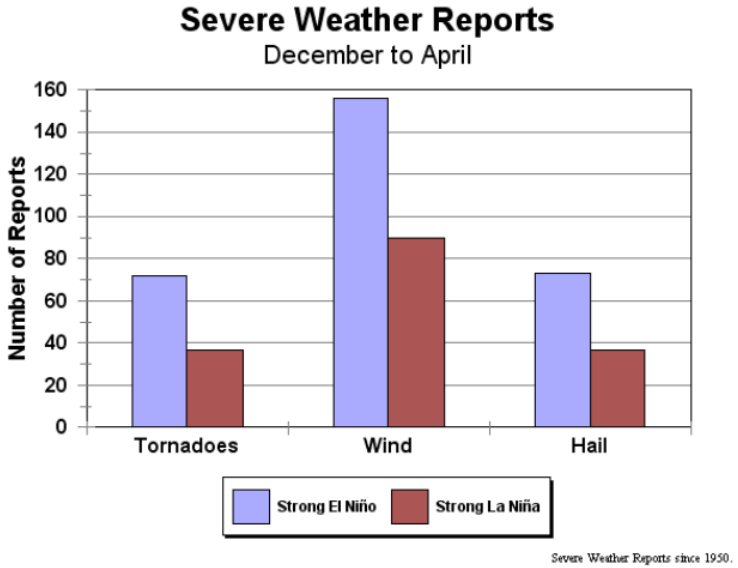
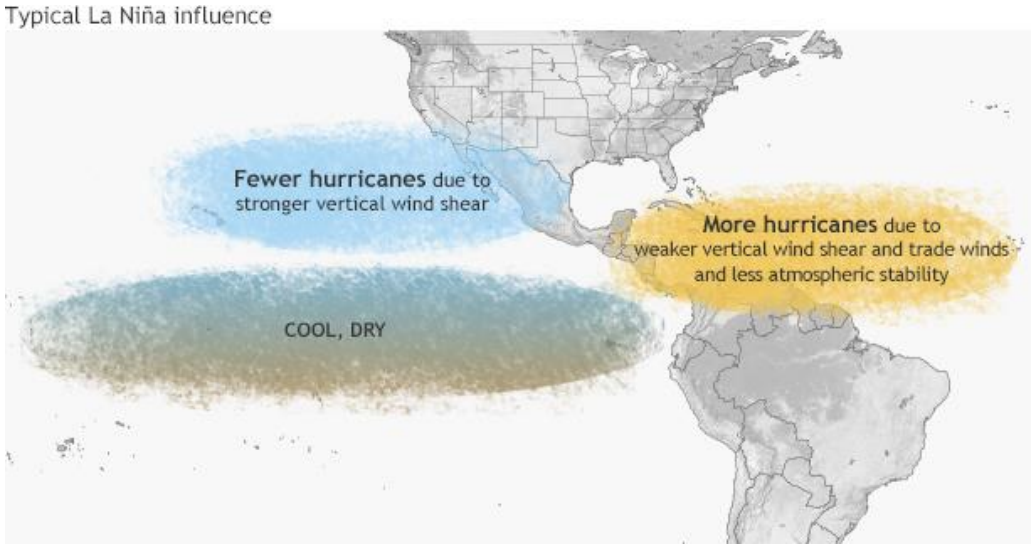


Severe Weather:

- Increased storminess during El Niño can also mean an increase in the amount of severe weather thanks to the frequent cold fronts moving across the state along with a stronger upper-level jet stream
- Since 1950, when comparing severe weather events from December through April during strong El Niño years vs. strong La Niña years, west central and southwest Florida experiences severe weather (i.e., tornadoes, strong damaging winds, and hail) up to twice as often in the winter and spring during strong El Niño conditions than during strong La Niña conditions

Tropical:

- El Niño suppresses hurricane activity in the Atlantic basin by developing an upper-level trough over the Caribbean Sea and western tropical Atlantic that causes stronger winds which increases wind shear, increases the amount of sinking motion, and increases the atmospheric stability
- La Niña enhances hurricane activity in the Atlantic basin by developing an upper-level ridge over the Caribbean Sea and western tropical Atlantic that causes weaker winds which reduces wind shear, decreases the amount of sinking motion, and decreases atmospheric stability
- Hurricane activity in any given season reflects a combination of multi-decadal signals and ENSO. During an AMO high-activity era, El Niño typically results in a near-normal season, and La Niña produces an above-normal season. During an AMO low-activity era, El Niño typically results in a below-normal season and La Niña results in a near-normal season



Arctic Oscillation – What it is

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- It is a pattern in which atmospheric pressure at polar and middle latitudes fluctuates between negative and positive phases. It changes on a weekly to monthly timeframe.
- When the AO is in the negative phase there is higher-than-normal pressure over the polar region and lower-than-normal pressure at about 45 degrees north latitude. The negative phase allows cold air to plunge into the Midwestern/Eastern United States and Western Europe, and storms bring rain to the Mediterranean.
- The positive phase brings the opposite conditions, steering ocean storms farther north and bringing wetter weather to Alaska, Scotland, and Scandinavia and drier conditions to areas such as California, Spain and the Middle East

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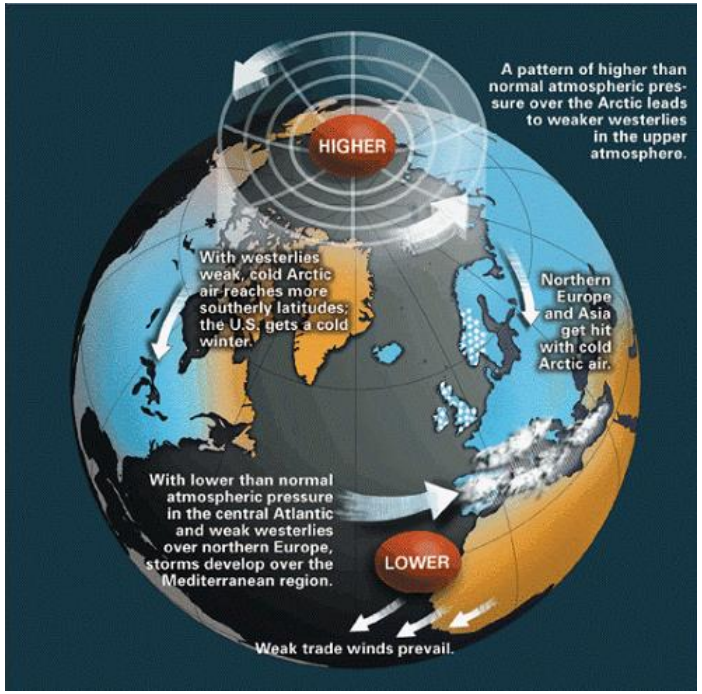
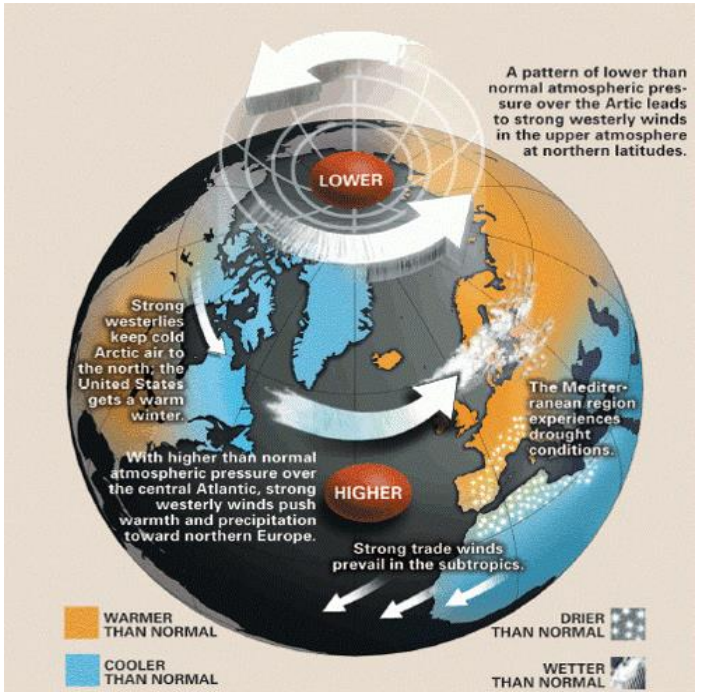


Negative Phase



Positive Phase

Arctic Oscillation – Local Impacts

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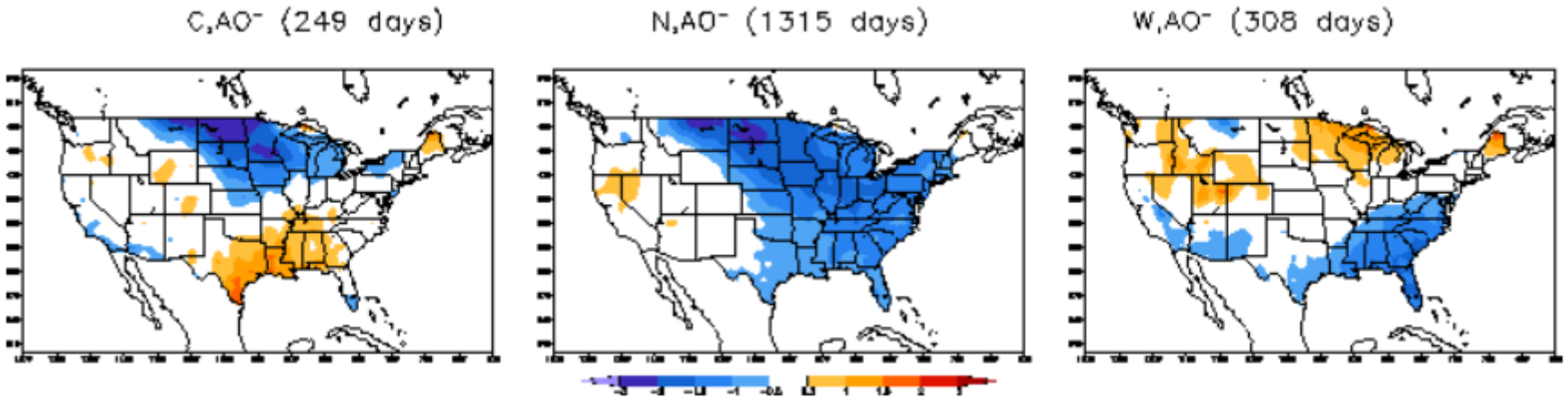
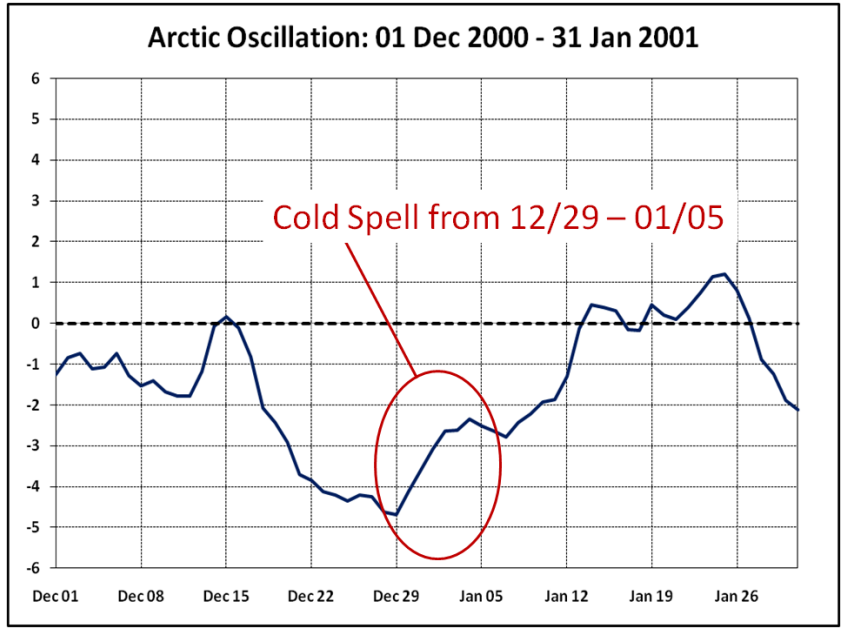


AO negative effects on temperatures in La Niña (left), Neutral (center), and El Niño (right) conditions

Local data has shown that the following AO guidelines can help to identify a possible freeze event a week or two in advance, especially when the ENSO is neutral (no El Niño or La Niña) or positive (El Niño).

- If the AO dips to -3 then there is a potential for a freeze in a week or two across the Nature Coast
- If the AO dips to -4 then there is a potential for a freeze in a week or two across the Nature Coast and inland portions of central Florida
- If the AO dips to -5 then there is a potential for a freeze in a week or two for the entire forecast area, except immediate coastal areas where winds are onshore



Record long cold spell during a La Niña

Current Outlooks

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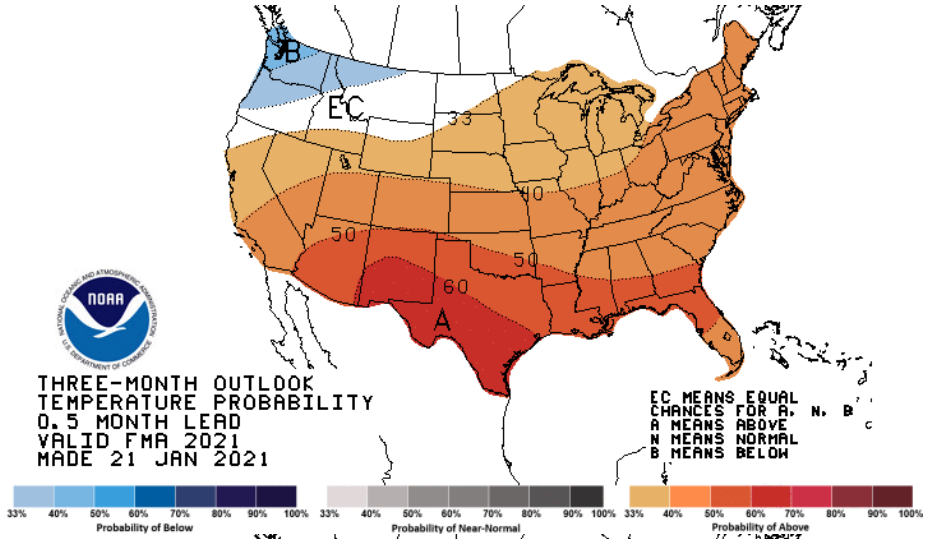
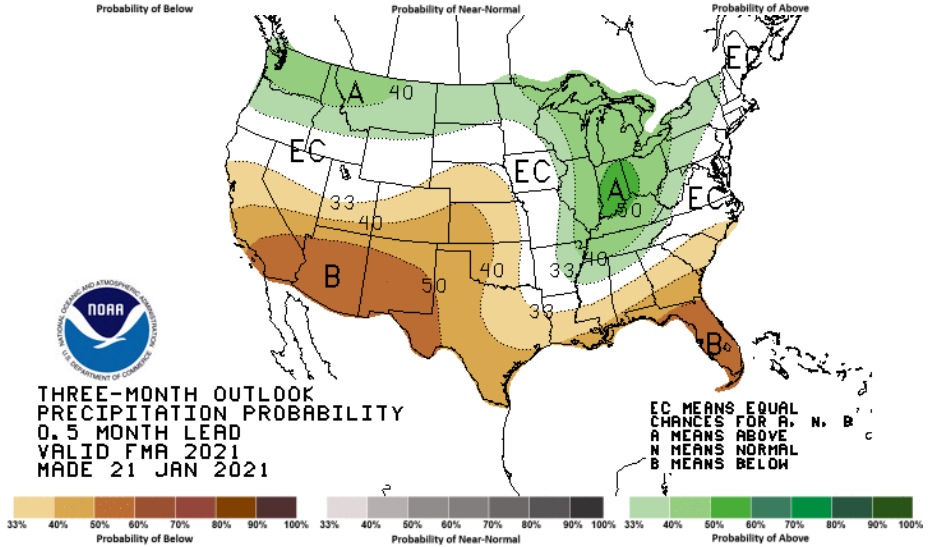
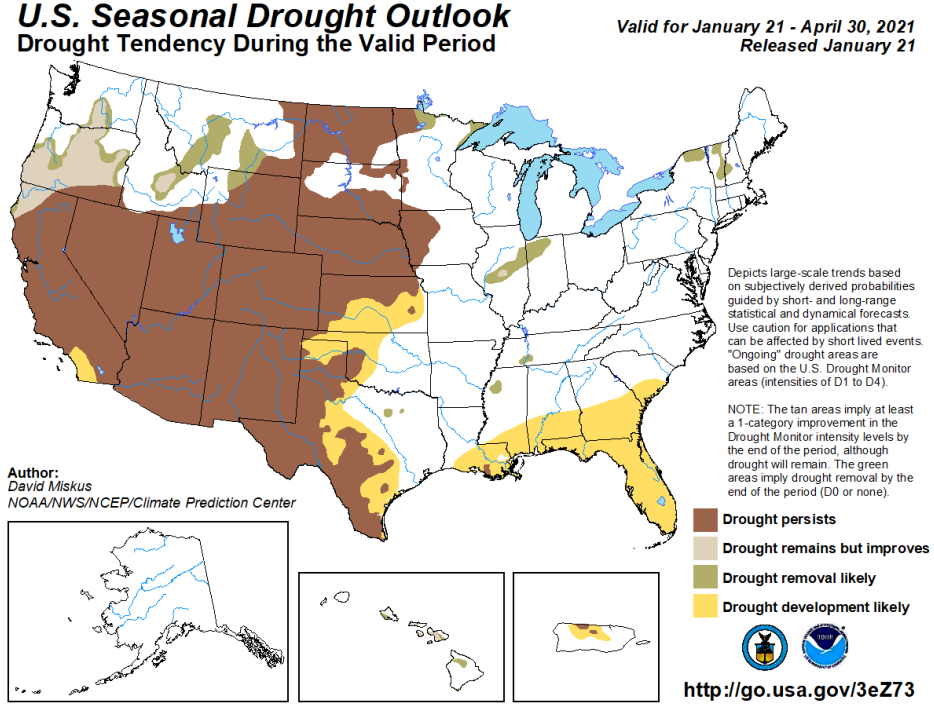
La Niña is expected to persist through winter and early spring, then there's a chance it transitions to neutral conditions in the late spring





Drought Development is likely over Florida through Spring



AO looks to remain negative for a bit longer