



Winter Outlook

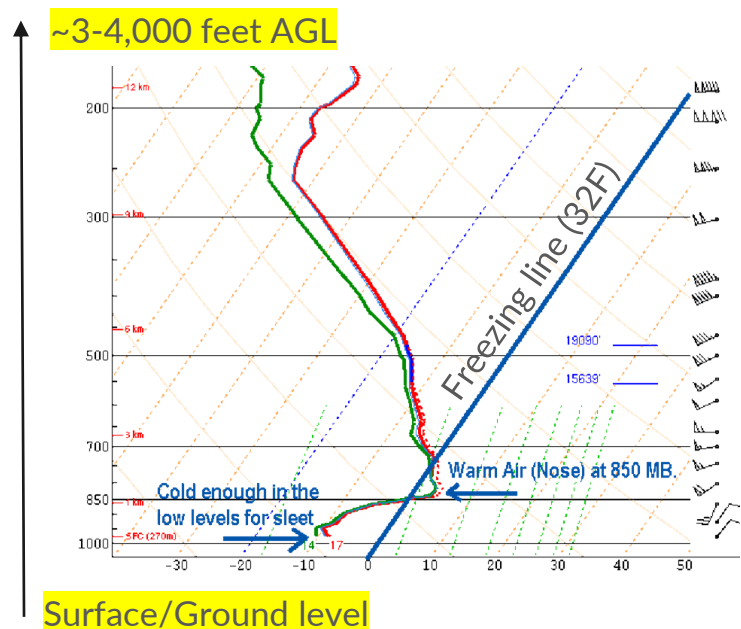
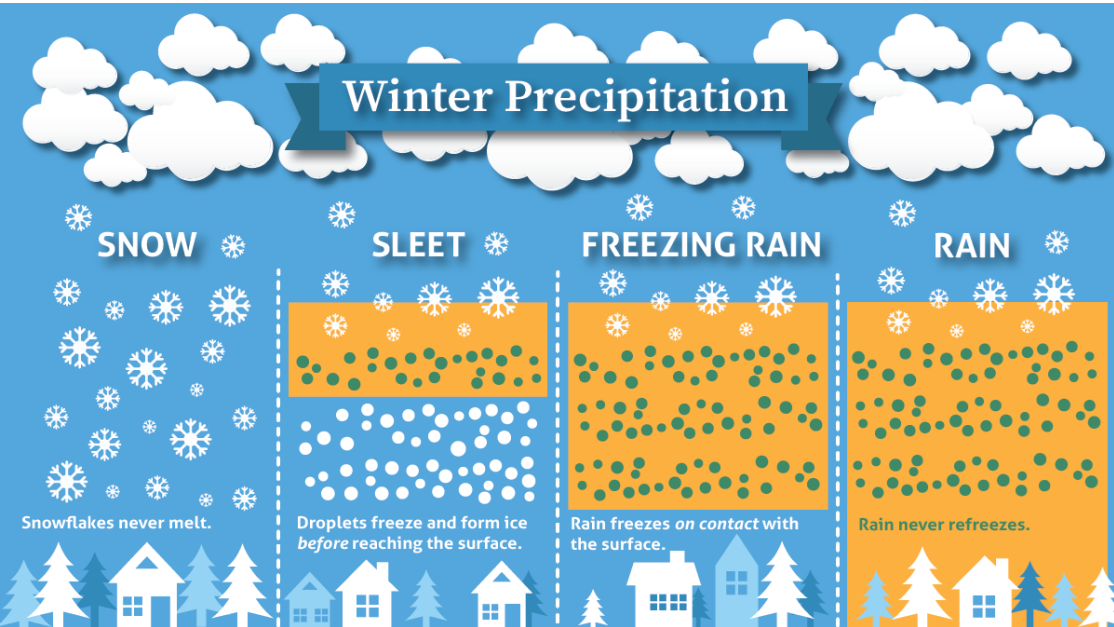
2024-2025

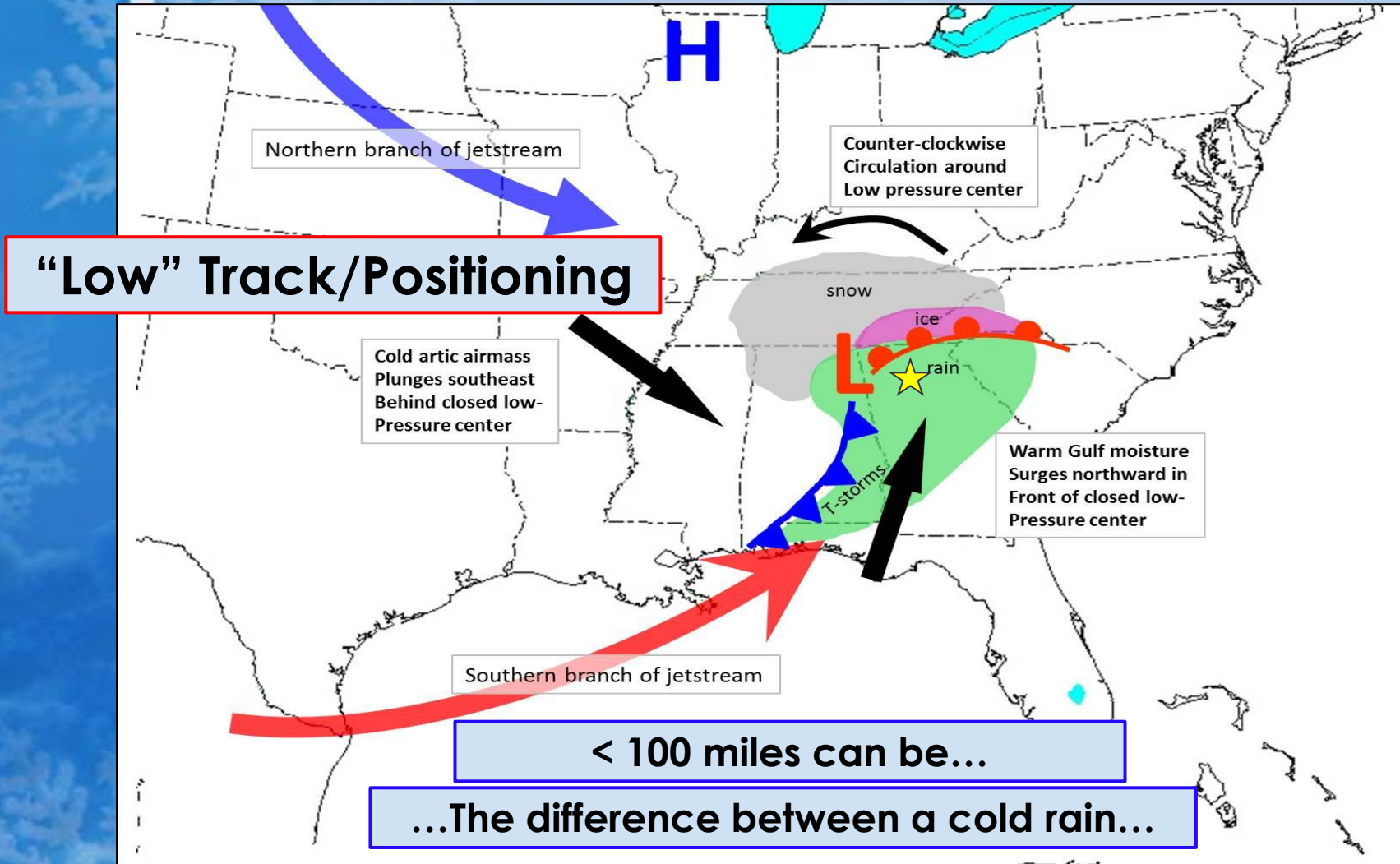


Winter Weather 101

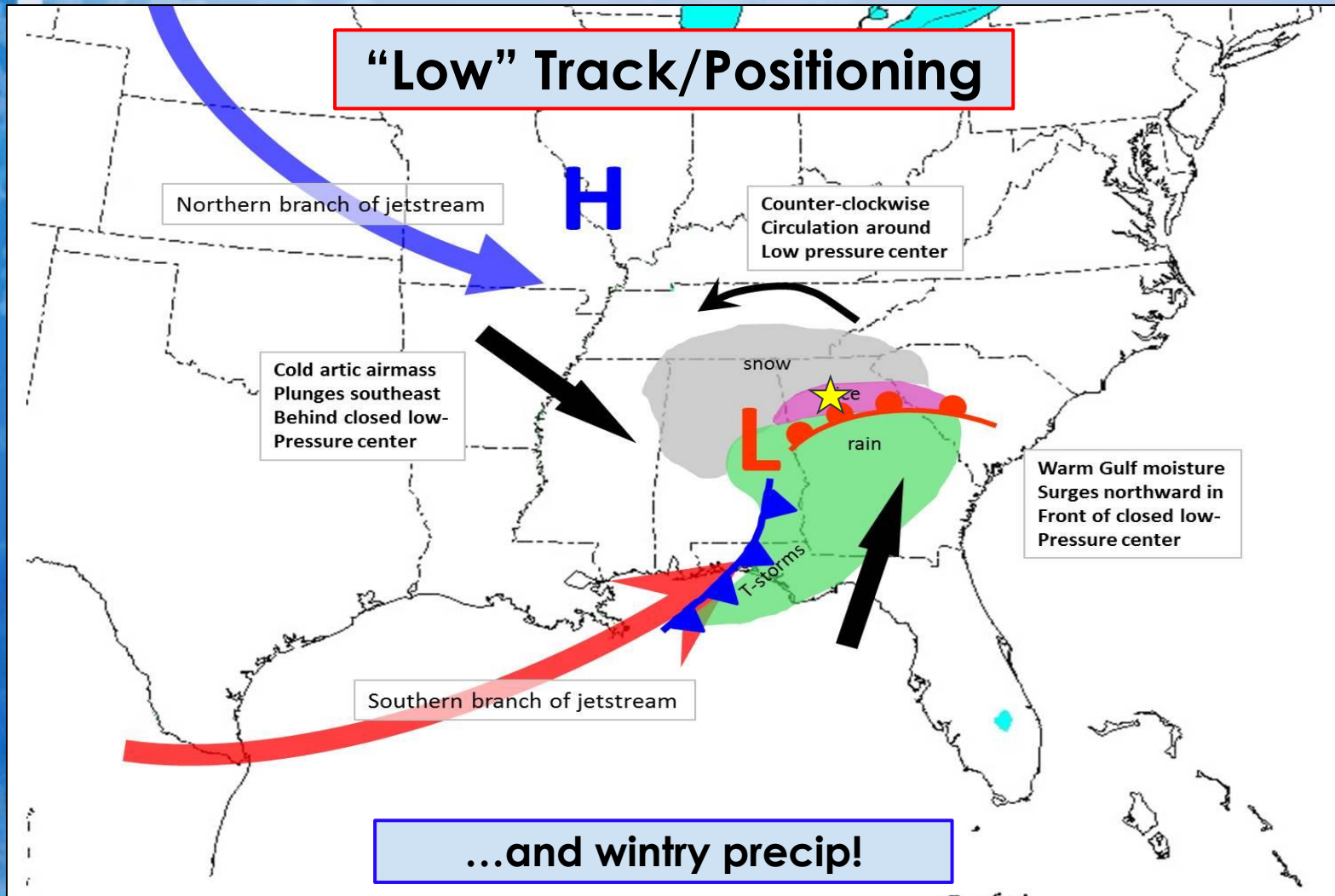
Some basic meteorology that can set the stage for winter weather across parts of Georgia

Winter Weather Precipitation Types can vary with only a 1-2°F difference!





"Low" Track/Positioning



Winter Weather Product Timeline

❄ Outlook = $\geq 30\%$ confidence / 3-7 days out

❄ Watch = $\geq 50\%$ confidence / within 48 hours

❄ Warning/Advisory = $\geq 80\%$ confidence / within 12-24 hours

Outlook: $\geq 30\%$

Watch: $\geq 50\%$

Warning/Advisory: $\geq 80\%$

3-7 days before event

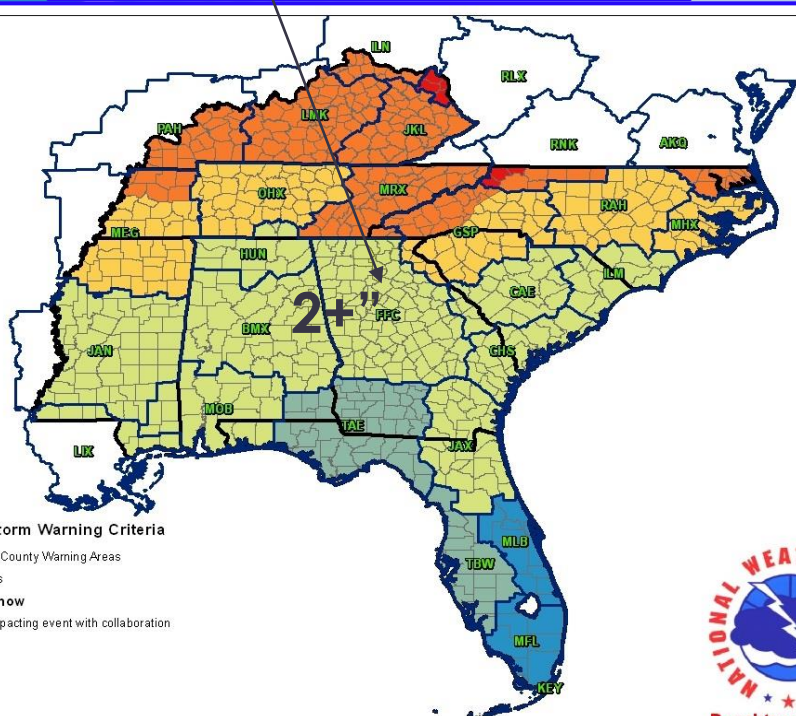
12-48 hours before event

< 24 hours before event

Watch/Warning Criteria: Snow/Ice

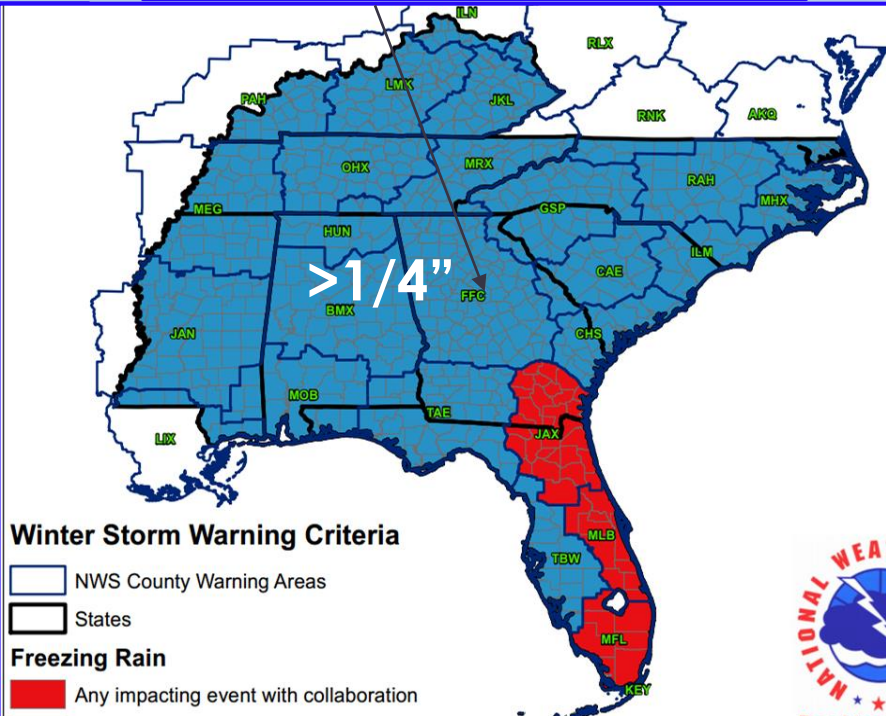
Two or more inches of snow
accumulation in 12 hours or less

0.25" or more of ice in 12 hours
or less



Winter Storm Warning Criteria

- NWS County Warning Areas
- States
- 12 Hour Snow
 - An impacting event with collaboration
 - 1+*
 - 2+*
 - 3+*
 - 4+*
 - 5+*



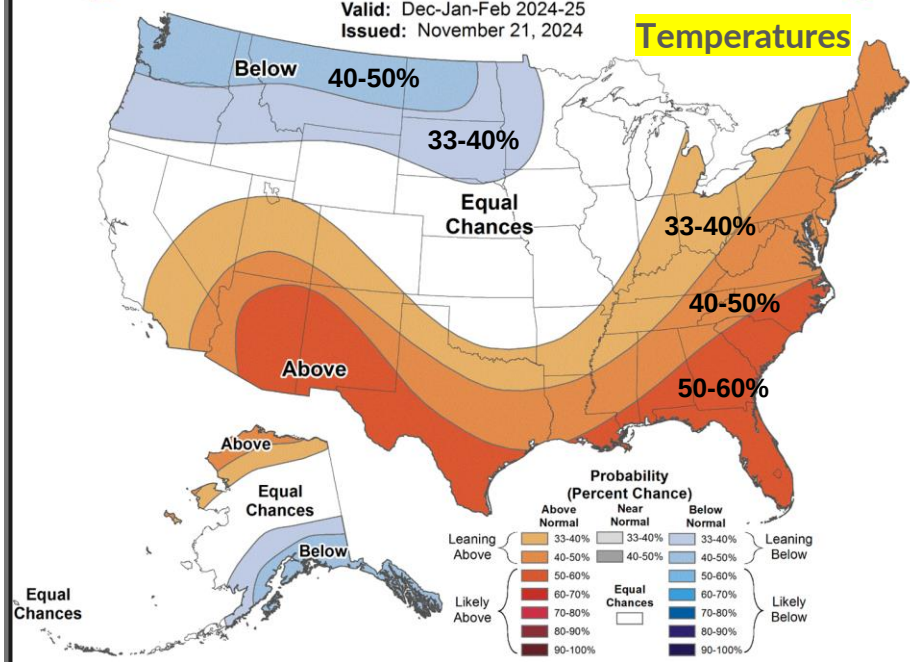
Winter Storm Warning Criteria

- NWS County Warning Areas
- States
- Freezing Rain
 - Any impacting event with collaboration
 - 0.25



Valid: Dec-Jan-Feb 2024-25
Issued: November 21, 2024

Temperatures



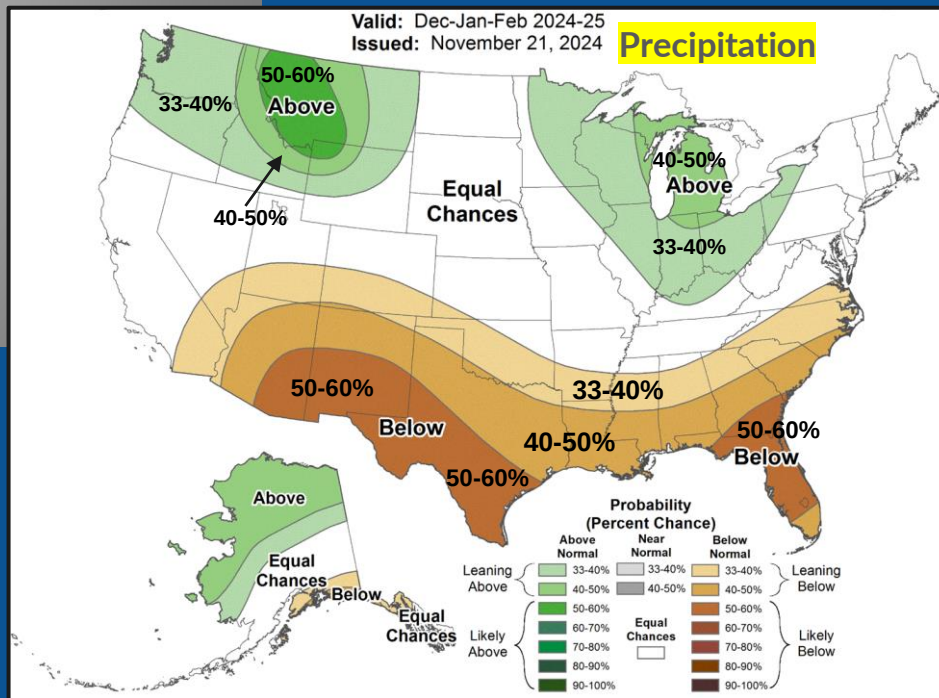
NOAA / CPC's 2024-25 Winter Outlook

December/January/February

Updated: 21 November 2024

Valid: Dec-Jan-Feb 2024-25
Issued: November 21, 2024

Precipitation



These “90-day outlooks” are based on a variety of factors & patterns that result in *the probability* (% chance) of seeing above, below, or near normal temperatures and precipitation (during that 90-day period)



So, in Summary...

This winter will be warm and dry, right?!!!

Not so fast!!



2024-2025 Winter Outlook



DISCLAIMER: Long-range (> 14 days) outlooks are just that – *outlooks*. They are intended to provide a big picture, probabilistic view of potential long-wave patterns that could impact temperatures and precipitation across different regions of the world.





Outlooks are not designed for answering:

- How many snow or ice storms will we see this winter?
- Will it snow 3 inches on New Year's Day?
- Will we have record cold temperatures in February?
- Will December be an unseasonably warm/wet month?

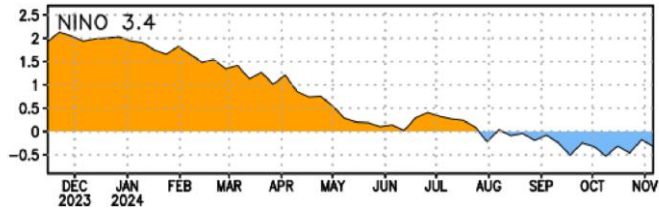
Disclaimer: It's important to know that our Winter seasons can be influenced by a large number of global patterns as well as local/regional-scale meteorological factors! Some of these variables include but are not limited to:

- ENSO (El Nino Southern Oscillation)
- PDO (Pacific Decadal Oscillation) / AMO (Atlantic...)
- NAO / AO (North Atlantic / Arctic Oscillation)
- Other Variables (Upper Level Heights + MSLP anomalies, etc.)

Latest on “ENSO”

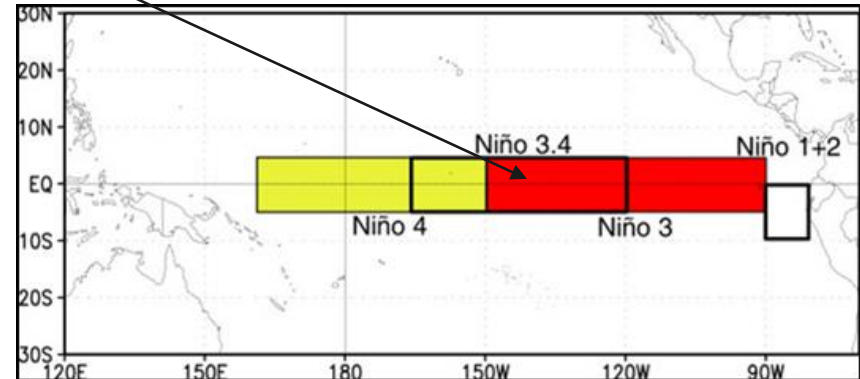
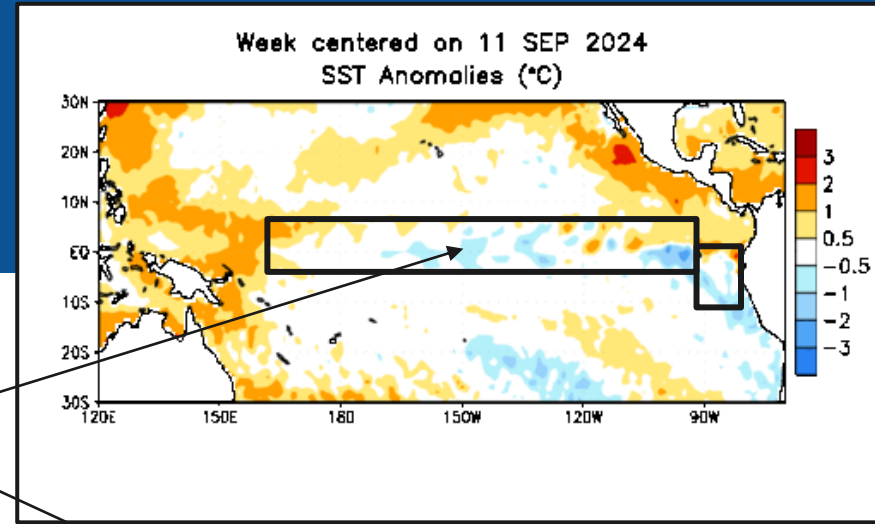
ENSO = a measure of SST anomalies near the equatorial Pacific Ocean (ONI)

- There are four Niño regions
 - Oceanic Niño Index (ONI) is a 3-month average taken from the Niño 3.4 region
 - Latest ‘ONI’ (Sep/Oct/Nov) = **-0.2C**



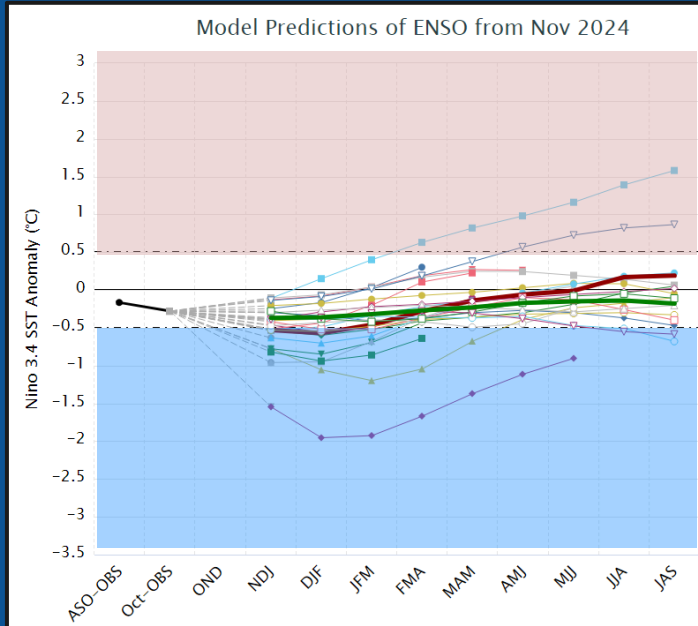
- We are currently in a “neutral” state (-0.2C)
 - 0.5 to -0.9°C = Weak La Niña
 - 1.0 to -1.4°C = Moderate La Niña
 - ≤ -1.5°C = Strong La Niña

Latest loop of SST Anomalies during the past 10+ weeks. Blue (cooler) and orange/red (warmer than

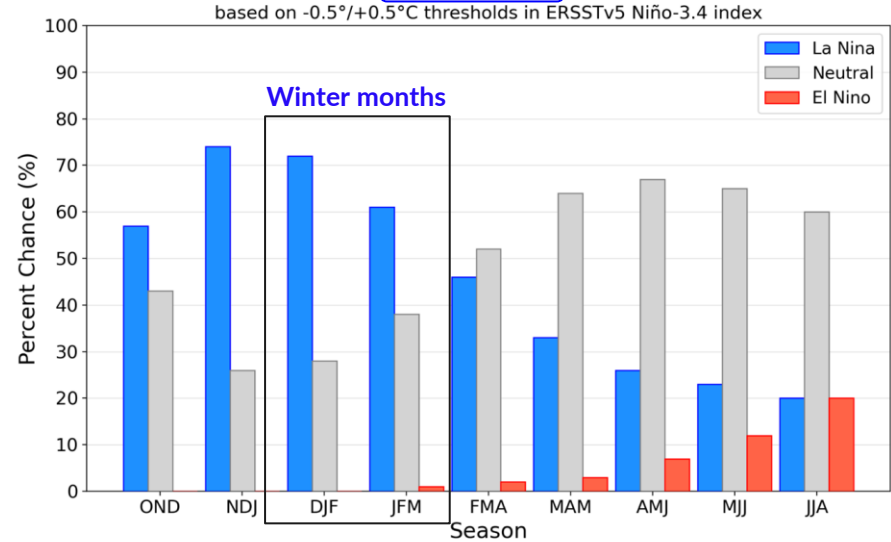


ENSO Forecast:

Climate Prediction Center: El Niño Southern Oscillation (noaa.gov)



Official NOAA CPC ENSO Probabilities (issued November 2024)



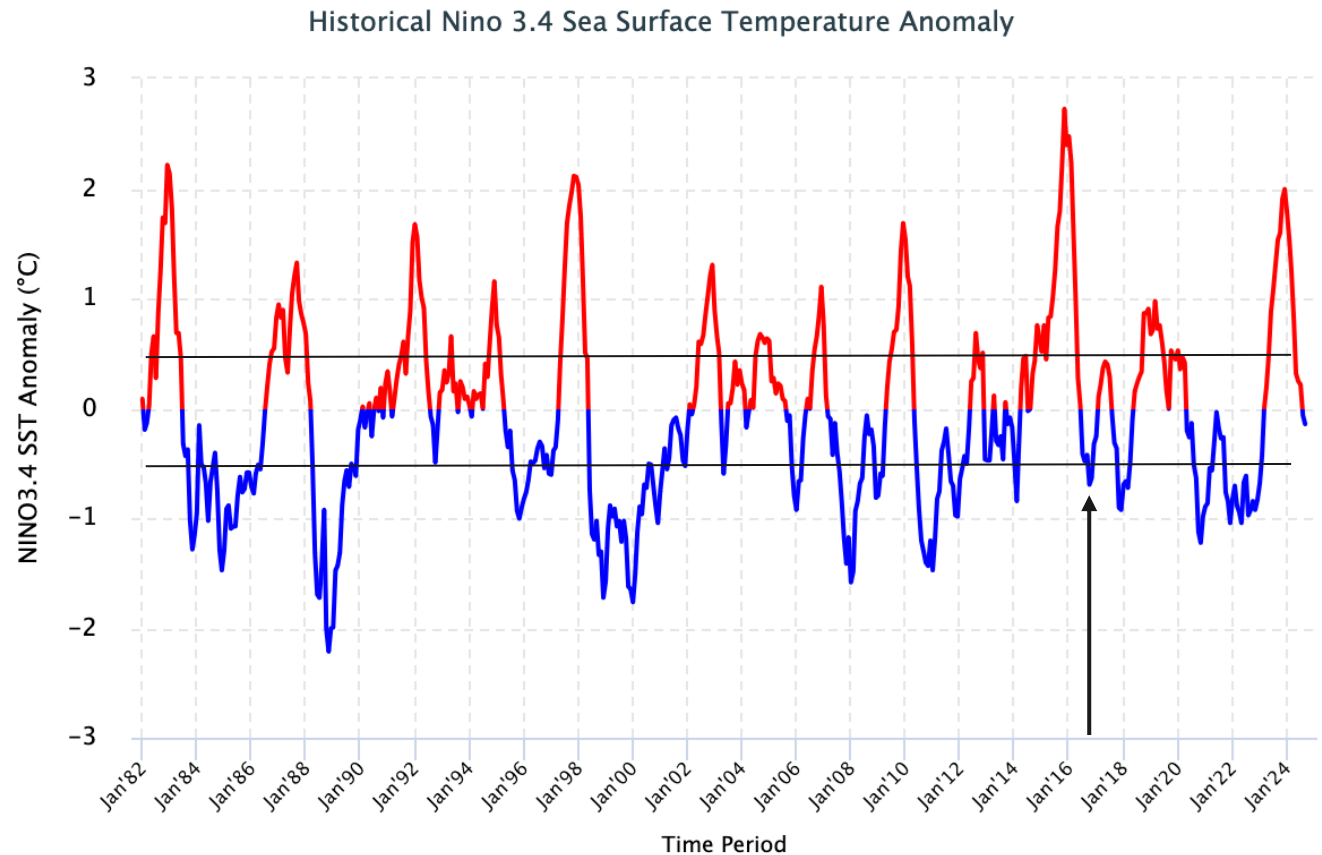
The latest (ASO) Niño 3.4 ONI of -0.2°C is -0.1°C cooler than the JAS 3-month average. There is a $>70\%$ chance of seeing La Niña conditions ($\text{ONI} \leq -0.5^{\circ}\text{C}$) between November and February, however probabilities for La Niña conditions start to decrease with probabilities for ENSO “neutral” conditions increasing into January 2025.

ENSO (ONI values) since 1982

- For what it's worth, the 2016-2017 Winter most closely resembles our current pattern and trends
- That winter was the 3rd warmest on record (for Atlanta) since records started (140+ years)
- January 2017 Tornado Outbreak w/ "High Risk" Day

Event Links:

- [January 6 - 7, 2017 Winter Storm](#)
- [January 21 - 22, 2017 Tornado Outbreak](#)



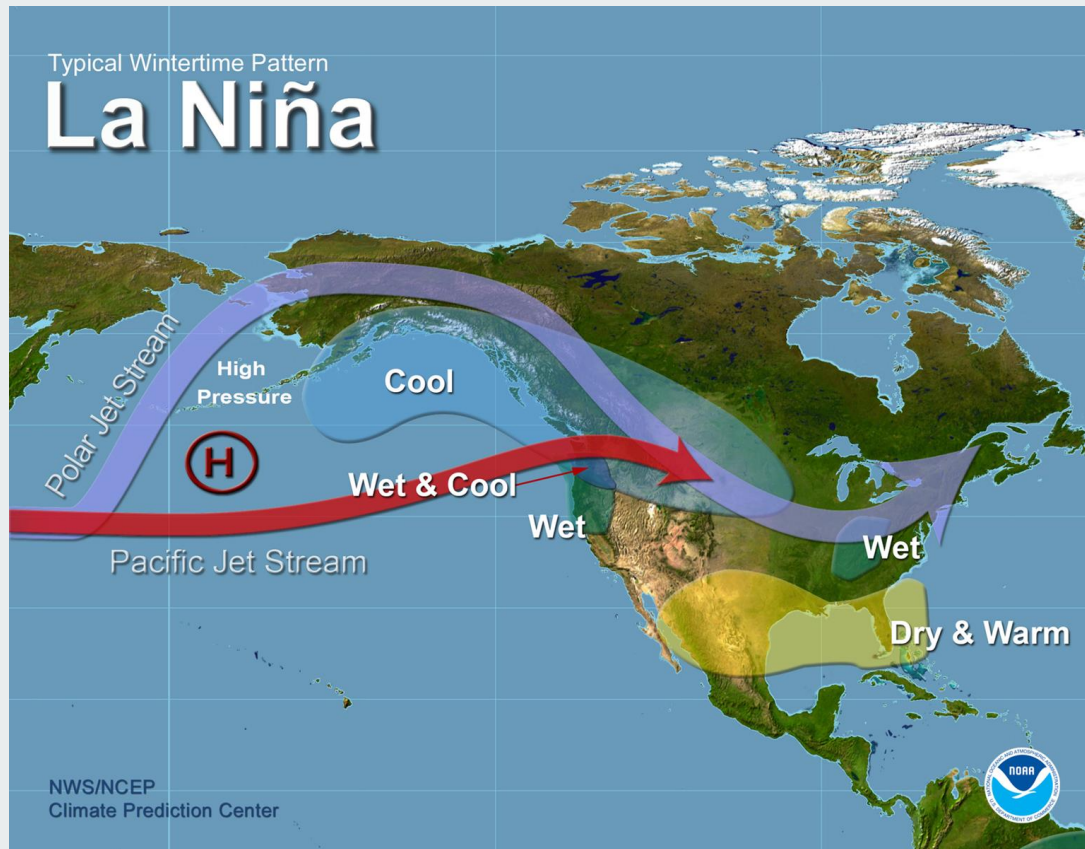
Past “weak” La Nina Winters:

NOTE: These years were used to show past temperature and precipitation anomalies

- 1950-51
- 1954-55
- 1964-65
- **1967-68**
- 1971-72
- 1974-75
- **1983-84**
- 1995-96
- 2000-01
- **2005-06**
- 2008-09
- 2011-12
- **2016-17**
- 2017-18
- **2021-22**
- 2022-23

Additional Notes:

- **1967-68** NDJ was neutral (-0.4C) but then cooled to -0.6 and -0.7C for DJF and JFM
- **2016-17** saw ONI for DJF warm from -0.6C to -0.3C
- **2021-22** technically reached “moderate” (-1.0C) La Nina

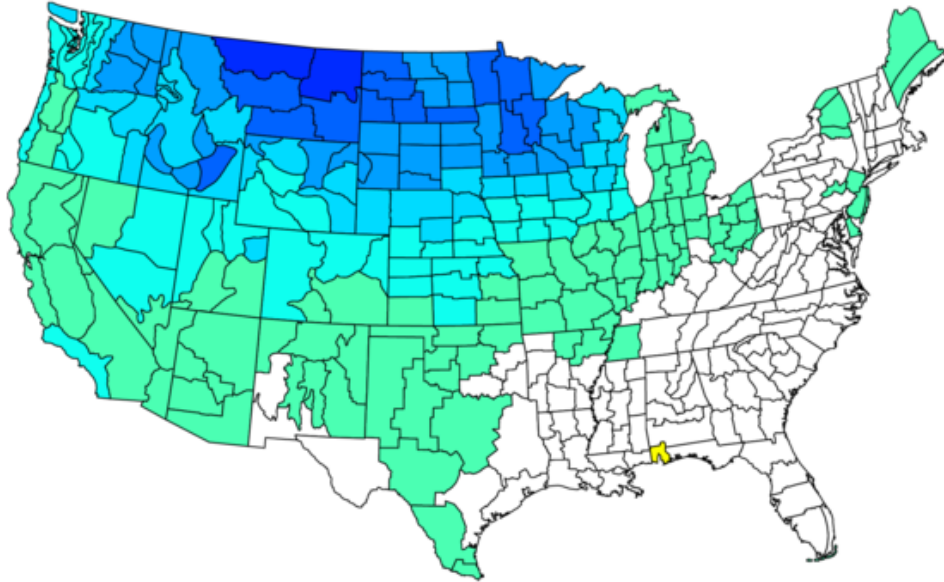


Taking a Look Back: **TEMPERATURE ANOMALIES**

During 'weak La Nina' Winters

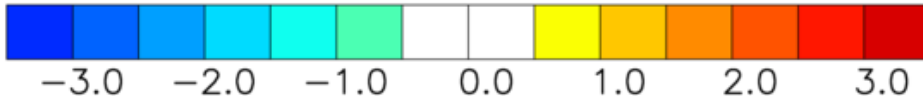
NOAA/NCEI Climate Division Composite Temperature Anomalies (F)
Versus 1991–2020 Longterm Average

Dec to Feb 1950–51, 1954–55, 1964–65, 1967–68, 1971–72, 1974–75, 1983–84, 1984–85
1995–96, 2000–01, 2005–06, 2008–09, 2011–12, 2016–17, 2017–18, 2021–22, 2022–23,

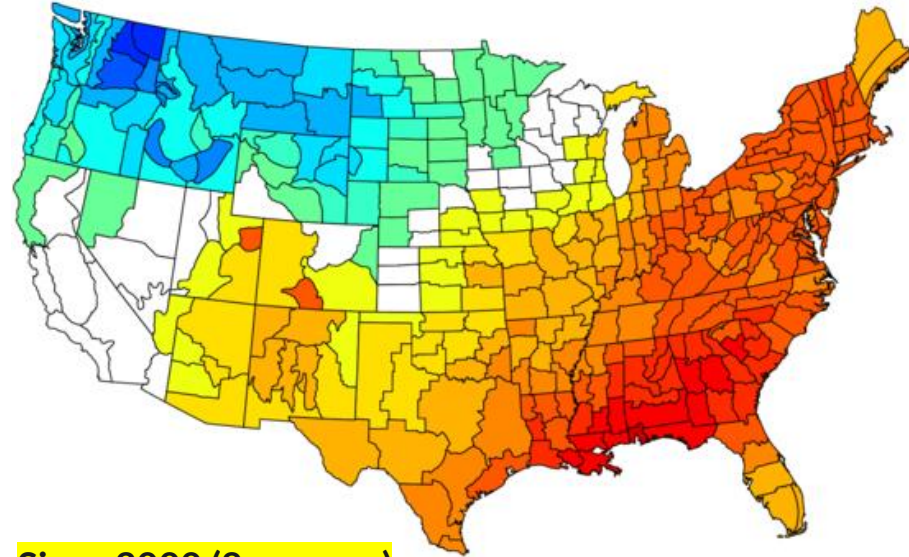


All years back to 1950 (17)

NOAA PSL and CIRES–CU

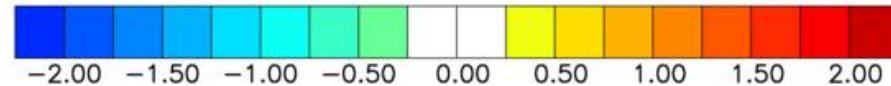


NOAA/NCEI Climate Division Composite Temperature Anomalies (F)
Dec to Feb 2000–01, 2005–06, 2008–09, 2011–12, 2016–17, 2017–18, 2021–22, 2022–23
Versus 1991–2020 Longterm Average



Since 2000 (8 seasons)

NOAA PSL and CIRES–CU

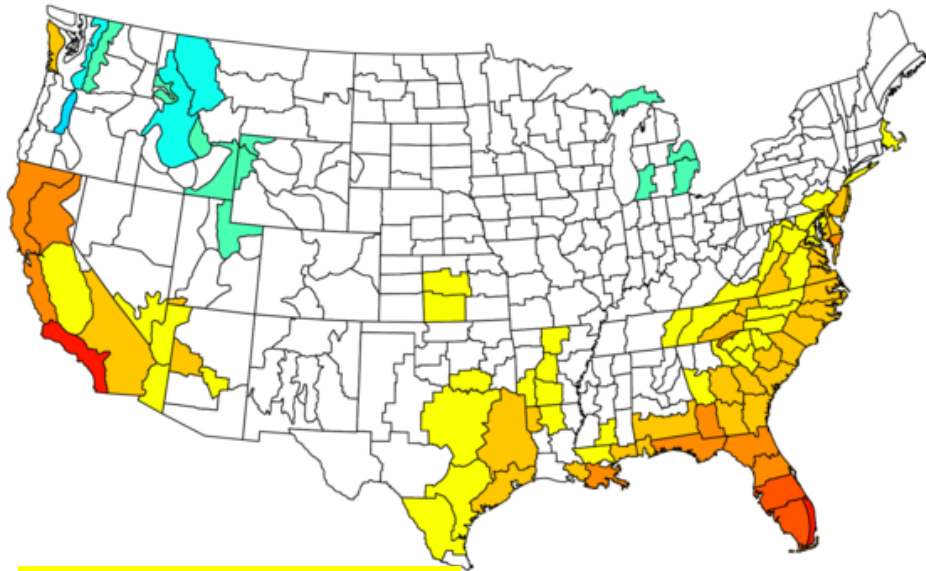


Taking a Look Back: **PRECIPITATION** ANOMALIES

During 'weak La Nina' Winters

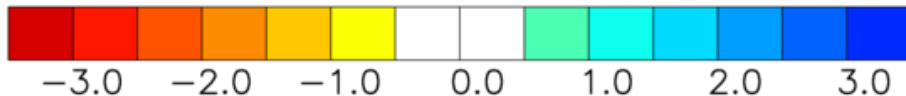
NOAA/NCEI Climate Division Composite Precipitation Anomalies (in)
Versus 1991–2020 Longterm Average

Dec to Feb 1950–51, 1954–55, 1964–65, 1967–68, 1971–72, 1974–75, 1983–84, 1984–85,
1995–96, 2000–01, 2005–06, 2008–09, 2011–12, 2016–17, 2017–18, 2021–22, 2022–23,

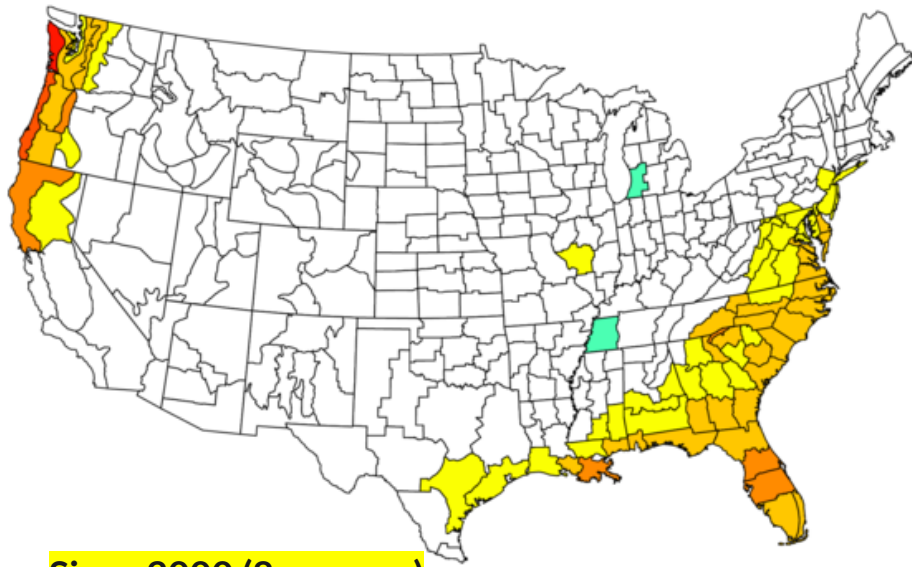


All years back to 1950 (17)

NOAA PSL and CIRES-CU

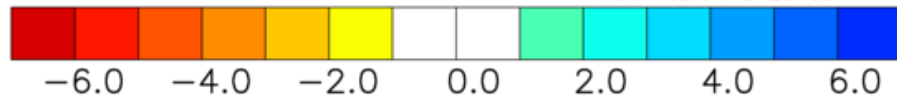


NOAA/NCEI Climate Division Composite Precipitation Anomalies (in)
Dec to Feb 2000–01, 2005–06, 2008–09, 2011–12, 2016–17, 2017–18, 2021–22, 2022–23
Versus 1991–2020 Longterm Average



Since 2000 (8 seasons)

NOAA PSL and CIRES-CU



Atlanta Winter's (during weak La Niña's) since early 1980s



Snowfall

- 1983-84 = 1.3"
- 1995-96 = 2.0"
- 2000-01 = 3.1"
- 2005-06 = Trace
- 2008-09 = 4.2"
- 2011-12 = Trace
- **2016-17 = Trace**
- 2017-18 = 4.7"
- 2021-22 = 0.5"
- 2022-23 = 0.1"

30-year Snowfall Average = **2.2"**

(7 of 10 years below avg)

Precipitation (Dec-Feb)

- 1983-84 = 19.90"
- 1995-96 = 15.65"
- 2000-01 = 9.0"
- 2005-06 = 14.27"
- 2008-09 = 10.97"
- 2011-12 = 11.80"
- **2016-17 = 13.05"**
- 2017-18 = 13.75"
- 2021-22 = 14.74"
- 2022-23 = 12.99"

Seasonal Precip Average = **13.71"**

(50% above avg / 50% below)

Average Temperature (includes High & Low Temp)

- 1983-84 = 42.3F
- 1995-96 = 43.7F
- 2000-01 = 43.2F
- 2005-06 = 45.1F
- 2008-09 = 46.7F
- 2011-12 = 50.3F
- **2016-17 = 52.3F ****
- 2017-18 = 48.2F
- 2021-22 = 50.7F
- 2022-23 = 52.1F

Seasonal Average = 46.9F

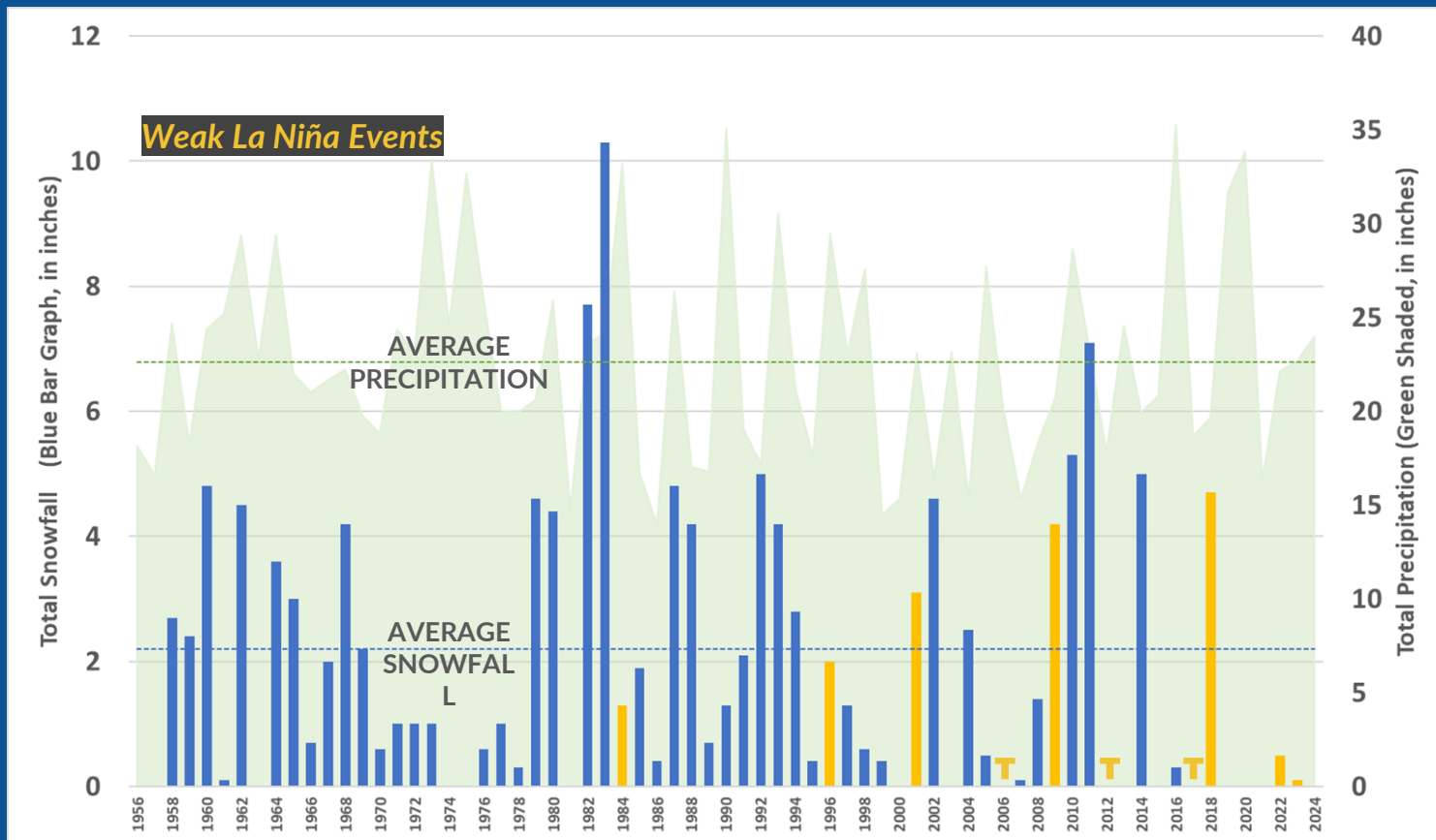
**2016-17 = 3rd warmest winter
on record

Past La Niña Winter **SNOWFALL** (for Atlanta)



Blue histogram shows
Nov-Mar snowfall totals.

Background: Green shaded
area shows total Nov-Mar
precipitation totals.

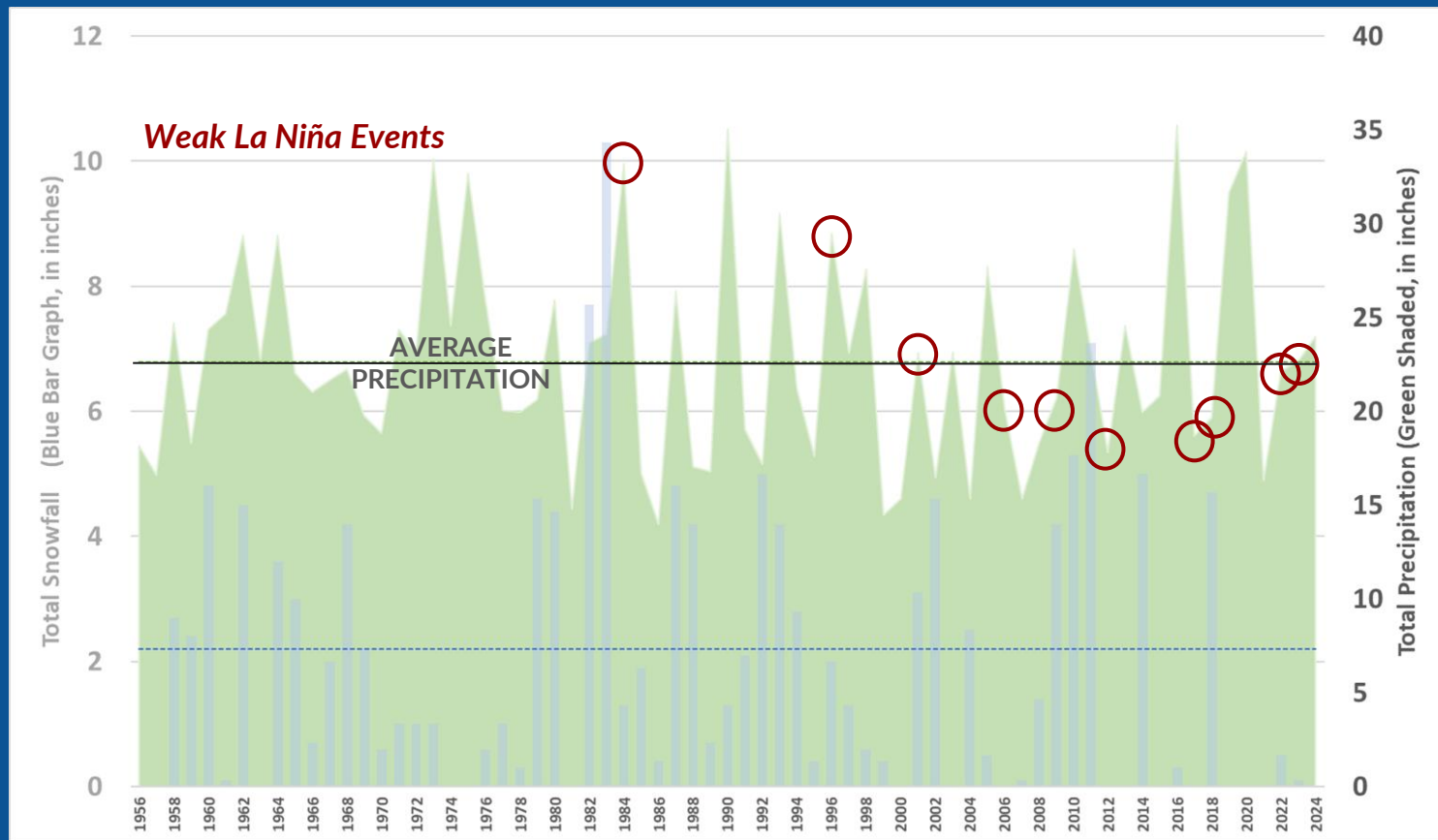


Past La Niña Winter **PRECIPITATION**



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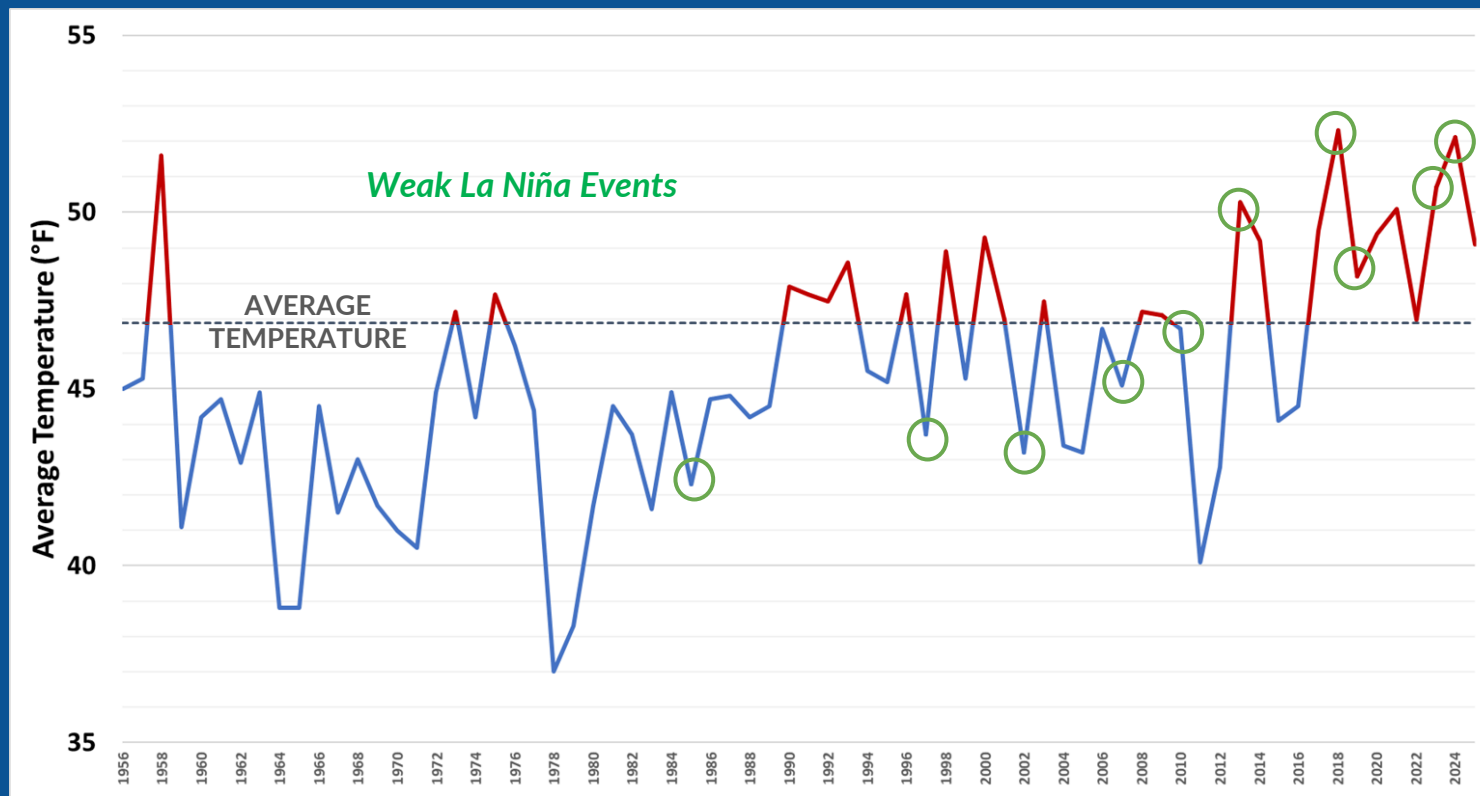


Past La Niña Winter **TEMPERATURES**



Line: Mean monthly average temp for Dec-Feb.

Warmer than period-of-record (POR) average shown in red, and cooler than POR shown in blue.



NOAA Regional Climate Center ThreadEx for Atlanta Area

Note: For the 10 *weak* La Niña winters since 1983-1984, the last 5 have all had above average mean temperatures.

Other Global Patterns that can influence our seasonal weather:

- ENSO (El Niño Southern Oscillation)
- PDO (Pacific Decadal Oscillation) / AMO (Atlantic...)
- NAO / AO (North Atlantic / Arctic)
- Other Variables (Upper Level Heights + MSLP anomalies, etc.)

Both the Atlantic and Pacific have multidecadal (10+year) oscillations that affect land temperatures, ENSO tendencies and extremes like hurricanes, tornadoes, droughts and floods and cold and heat.

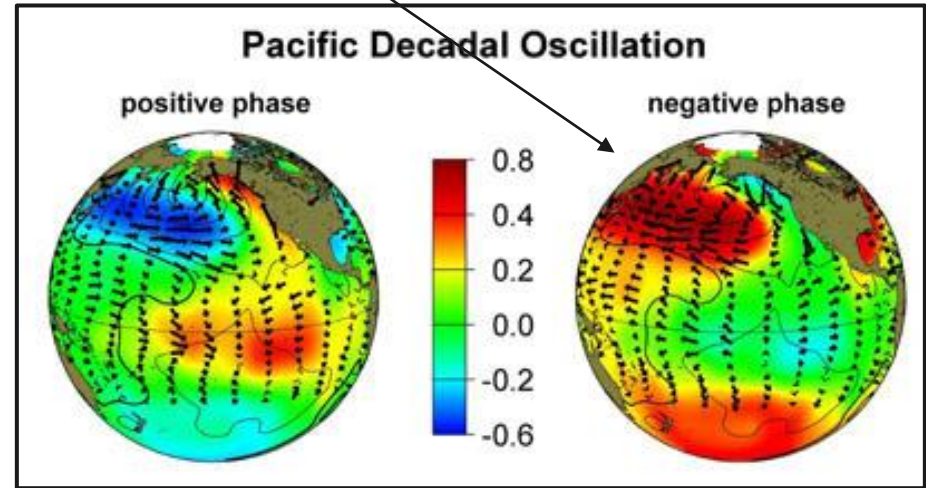
Pacific Decadal Oscillation (PDO)

The Pacific Decadal Oscillation is a sea surface temperature (SST) climate cycle (or teleconnection) describing sea surface temperature anomalies over the Northeastern Pacific Ocean. We are currently in a 'negative phase' period (SSTs warmer than normal)

The 'cool' or 'negative' phase is characterized by a cool wedge of lower than normal sea-surface heights/ocean temperatures in the eastern equatorial Pacific and a warm horseshoe pattern of higher than normal sea-surface heights connecting the north, west and southern Pacific.

In the 'warm' or 'positive' phase, the west Pacific Ocean becomes cool and the wedge in the east warms. A 'cool' phase occurred from 1947 to 1976 (29 years), and a 'warm' phase from 1977 to 1999 (22 years).

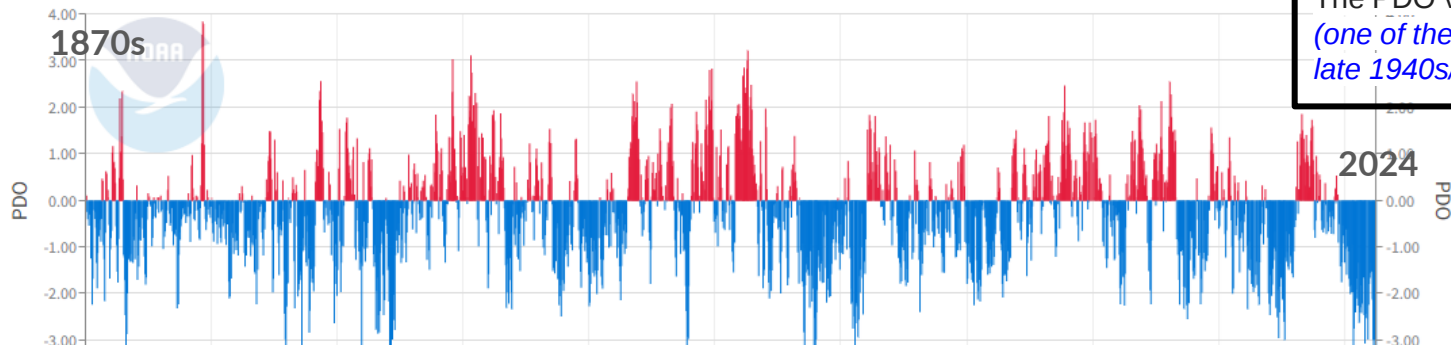
However, more recently, the 'warm' and 'cold' phases have been much shorter.



In 1999, we entered into a 'cold' phase for about 4 years (1999-2002) followed by a 'warm' phase that continued for 3 years. The phase was then neutral until 2007, when we entered into a 'cold' phase that has persisted through current day (late 2024) except for a few years (2013-2015) where PDO jumped to positive (warm phase).

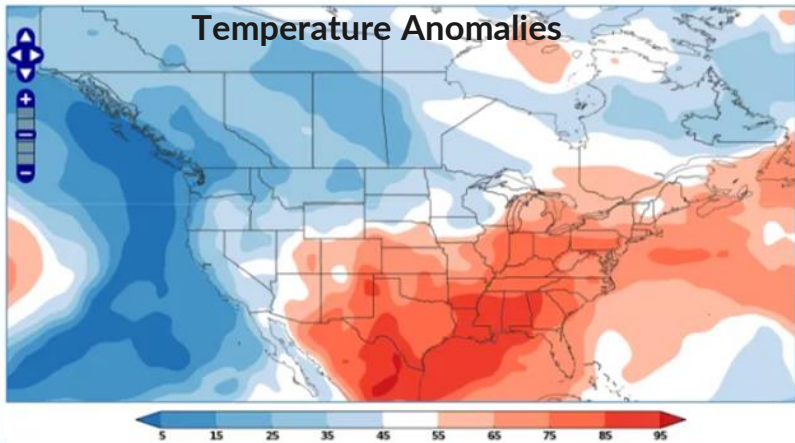
Latest PDO Values / Potential Impacts to Temps & Precip

Pacific Decadal Oscillation (PDO)



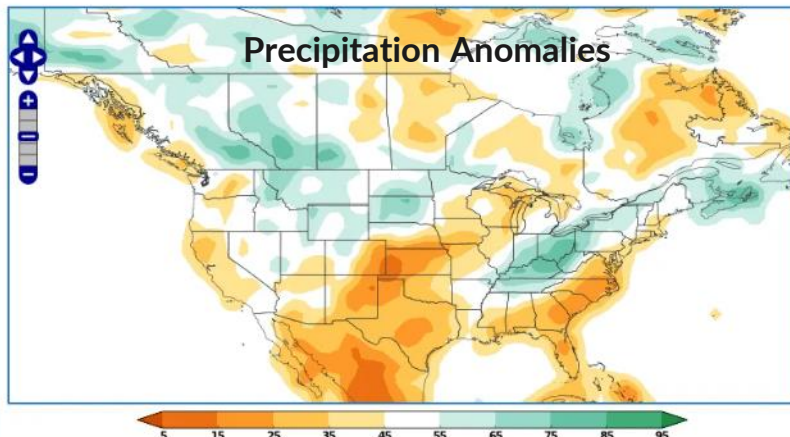
Percent of Years Having Above-Trend DEC-FEB 2m Temperature
1951 1955 1956 1971 1990 1999 2008 2010 2011 2021

Temperature Anomalies



Percent of Years Having Above-Normal DEC-FEB Precipitation (GPCC Gauge-Based)
1951 1955 1956 1971 1975 1990 1999 2008 2010 2011

Precipitation Anomalies



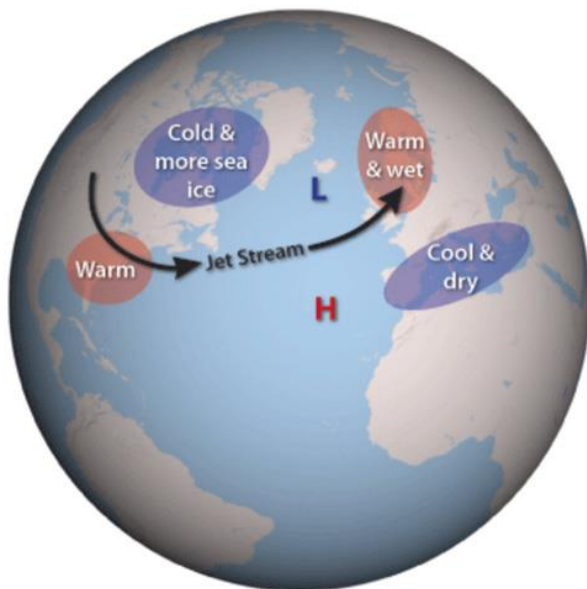
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- Other Variables (Upper Level Heights + MSLP anomalies, etc.)

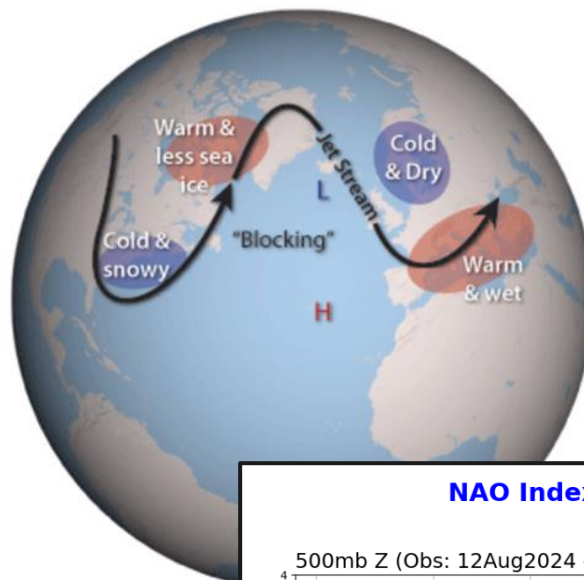
The North Atlantic Oscillation | NAO

** Latest values can be found on the Climate Prediction Center: www.cpc.ncep.noaa.gov

Positive NAO phase

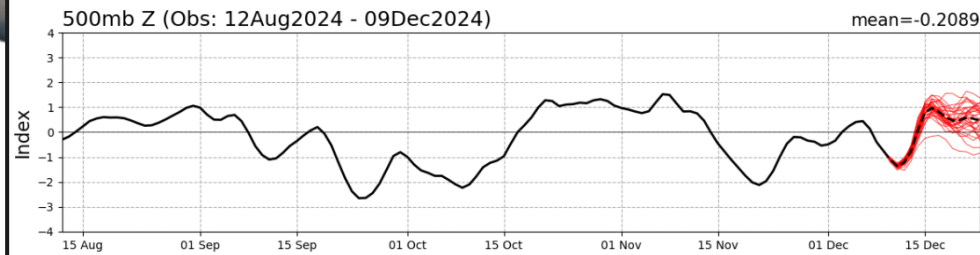


Negative NAO phase



- A result of fluctuations between the “Icelandic Low” and the “Azores High” pressure systems.
- Controls the strength and direction of westerly winds and location of storm tracks across the North Atlantic
- Rapid changes – NAO can fluctuate every 2-3 weeks
- Closely related to the Arctic Oscillation (AO)

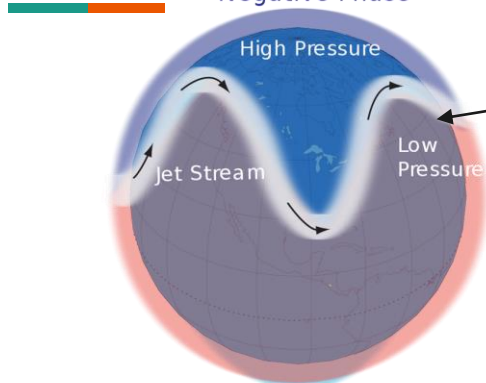
NAO Index: Observed & GEFS Forecasts



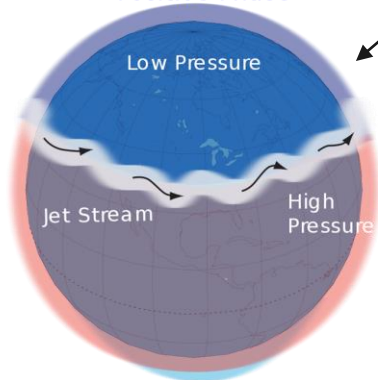
The Arctic Oscillation | AO

** Latest values can be found on the Climate Prediction Center: www.cpc.ncep.noaa.gov

Arctic Oscillation Negative Phase

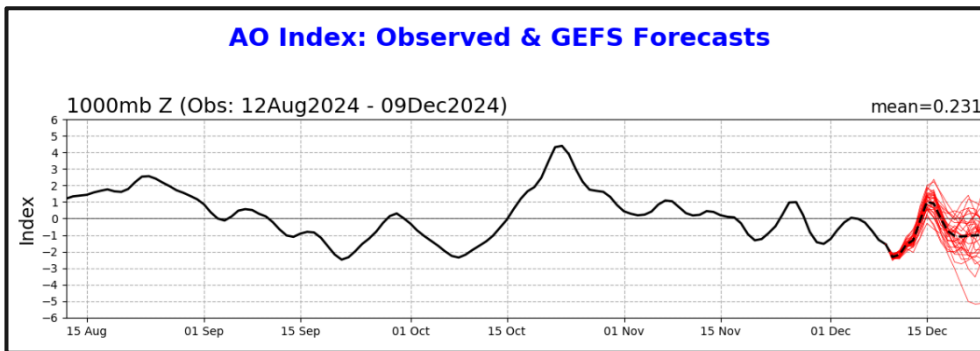


Positive Phase



- The degree to which Arctic air penetrates across North America is related to the AO Index.
- When the AO is negative, tends to be lower pressure over the Polar region which results in weaker zonal (west-to-east) winds and greater movement of Arctic cold air into the mid-latitudes
- When the AO is positive, surface pressure is HIGH in the Polar region which helps the Polar Jetstream flow more consistently west-to-east (thus minimizing Arctic air intrusions across the central/southern U.S.)
- Similar to NAO, changes can occur daily/weekly. Over the past 10 years, data show more of a “neutral” phase - trending toward Negative

AO Index: Observed & GEFS Forecasts



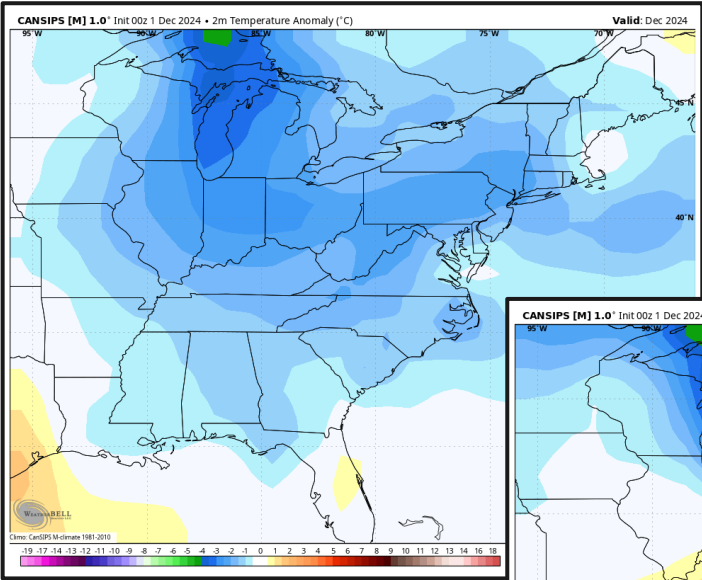


2024-25 Winter Outlook

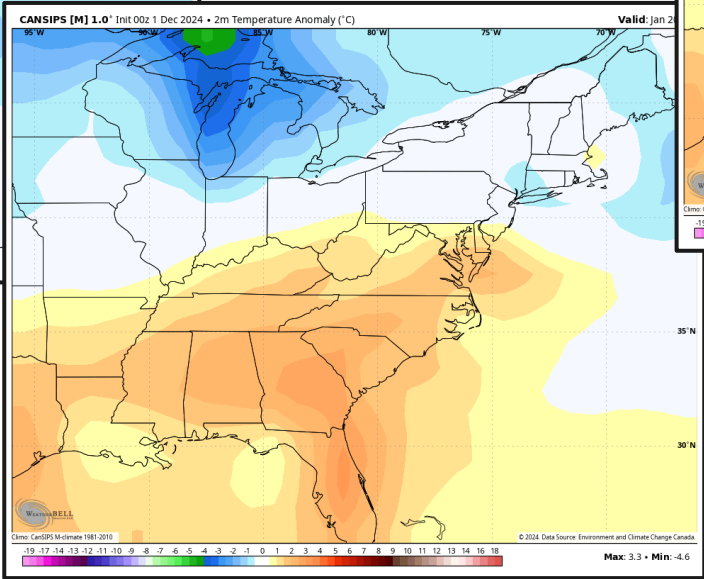
Seasonal (Longer-range) Models

Monthly - Seasonal Model (CANSIPS): TEMPERATURES

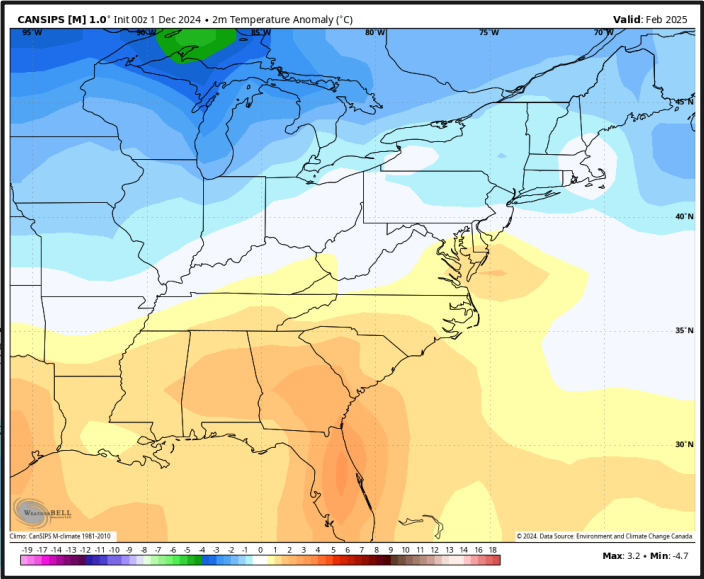
Early December Analysis for next 3 months... (updated monthly)



December



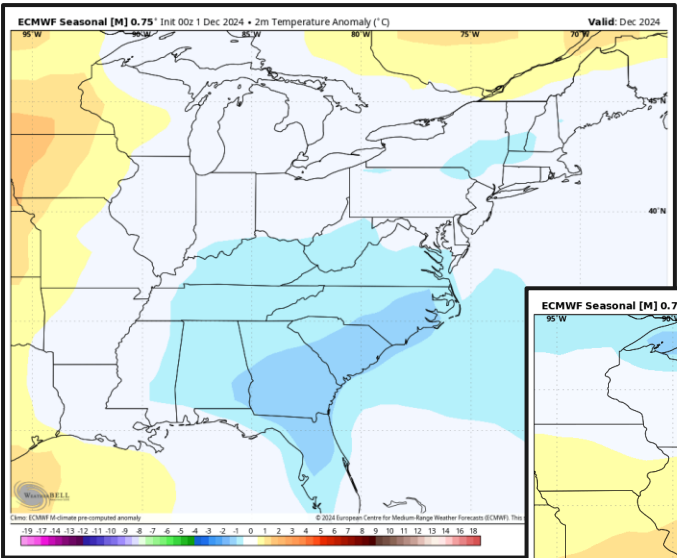
January



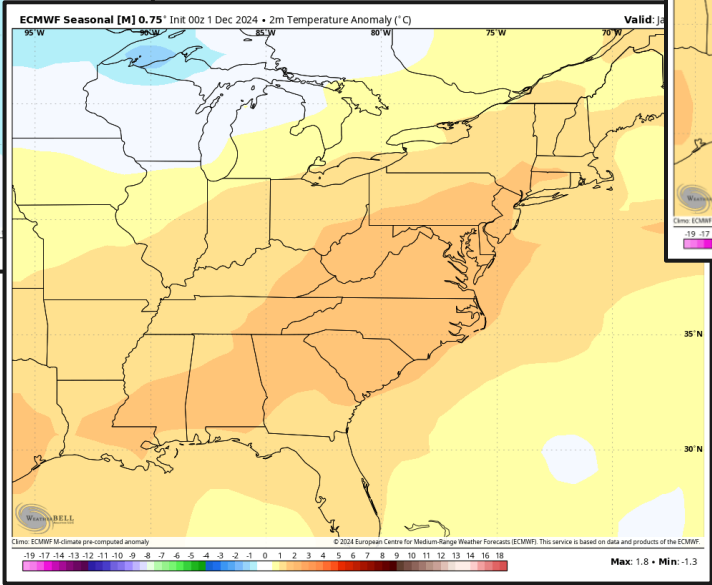
February

Monthly - Seasonal Model (Euro): TEMPERATURES

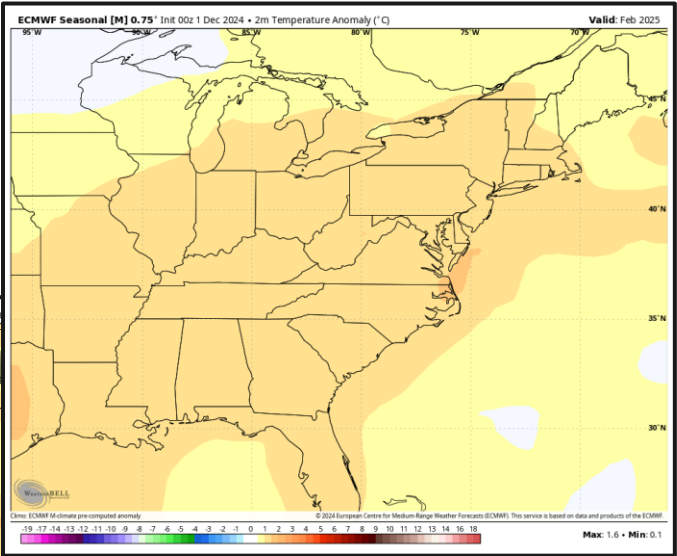
Early December Analysis for next 3 months... (updated monthly)



December



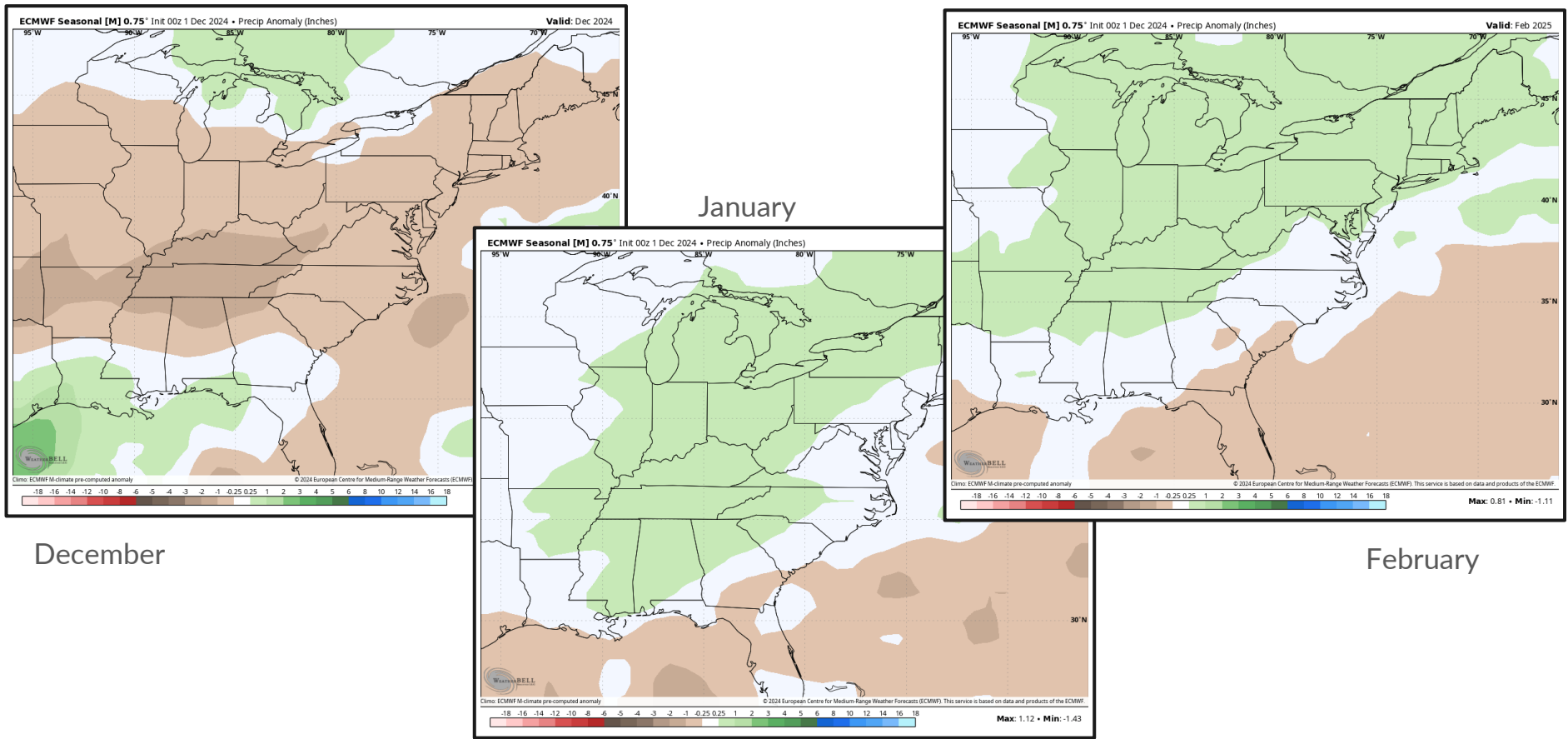
January



February

Longer range Seasonal Model (Euro): **PRECIPITATION**

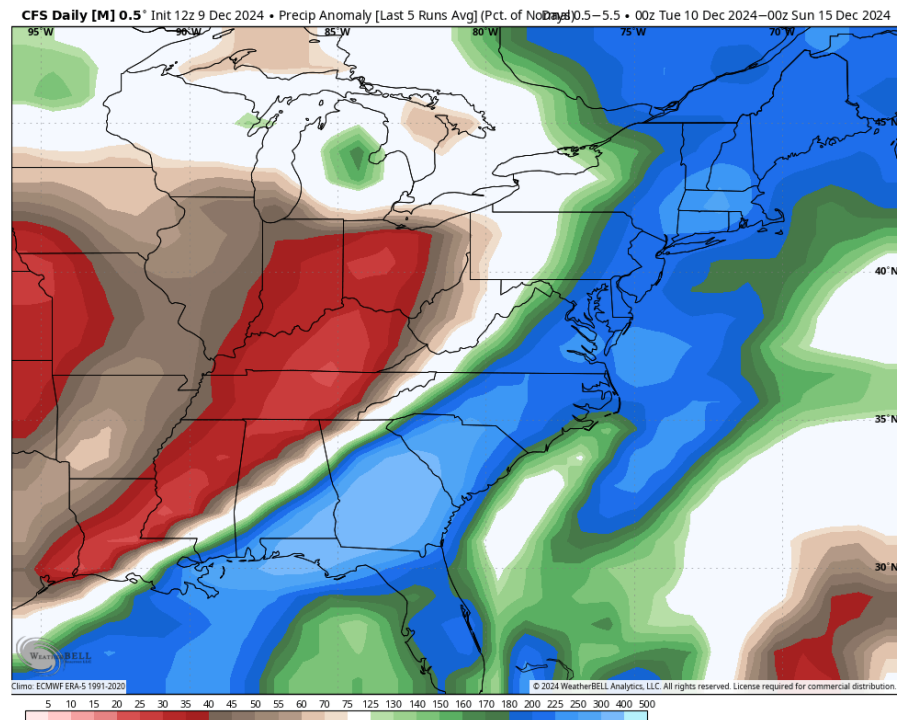
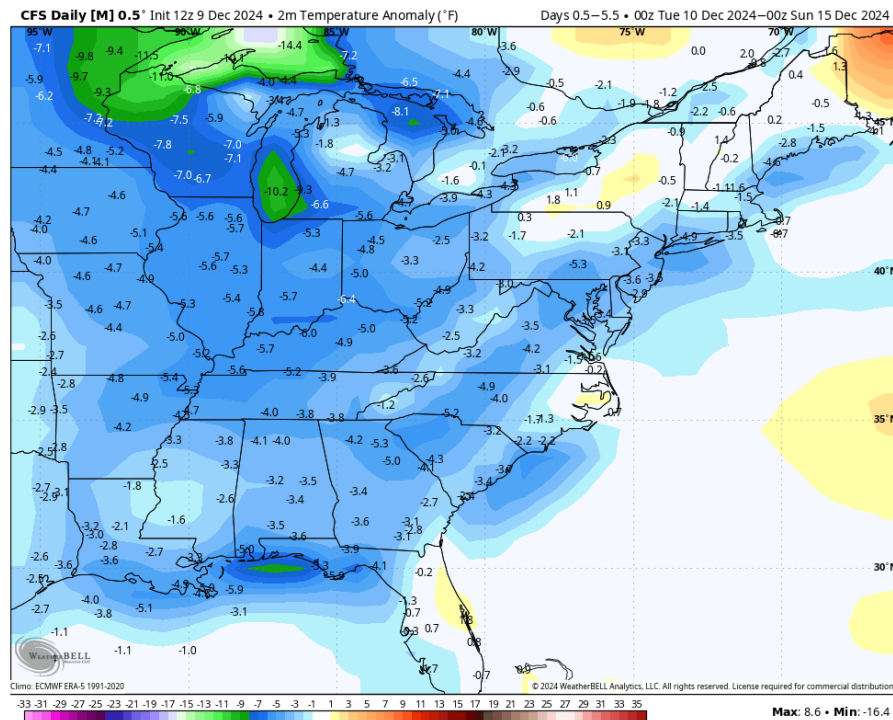
Early December Analysis for next 3 months... (updated monthly)



Weekly - Seasonal Model Outlooks (CFS):

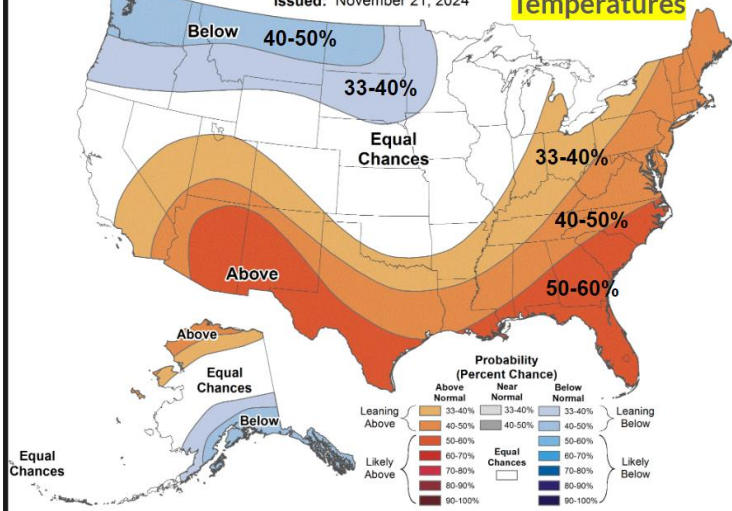
CFS = Climate Forecast Model / global model developed by NCEP (National Centers for Environmental Prediction)

5-day Temp/Precip Anomalies over the next 8 weeks... through ~23 Jan 2025 ****Updated Daily****



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Temperatures



NOAA / CPC's 2024-25 Winter Outlook (Summary)

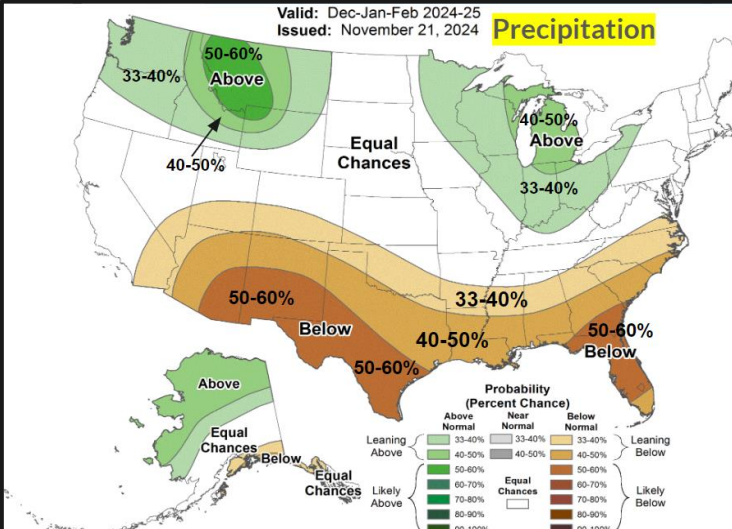
December/January/February

What does this all mean for north & central GA?

- Fairly high confidence the winter “season” (Dec/Jan/Feb) overall will be warmer than normal – based on multiple factors (past years; global patterns; seasonal models)
 - Last 5 ‘weak’ La Nina winters have been above normal
- Less confidence in precipitation, but trends and seasonal predictions suggest *at or slightly below normal* overall.
 - Snow (based on ENSO) could be “all or nothing”
- Local research (since 2000) shows La Nina winters have led to more CAD “wedge” events (ice?)
- Something to watch for – Does potentially warmer (overall) January and February lead to severe/tornado outbreak??

Valid: Dec-Jan-Feb 2024-25
Issued: November 21, 2024

Precipitation





Questions??

David Nadler, Warning Coordination Meteorologist, and Laura Belanger, Senior Service Hydrologist
NWS Peachtree City/Atlanta