

# **U. S. 2021 – 2022 Winter Outlook**

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# Outline

- **Seasonal Outlook Background**
- Review of 2020-21 U. S. Winter (DJF) Outlook
- Potential climate factors impacting U. S. Winter
- 2021-22 U. S. Winter (DJF) Outlook





# Outlook Categories and Probabilities

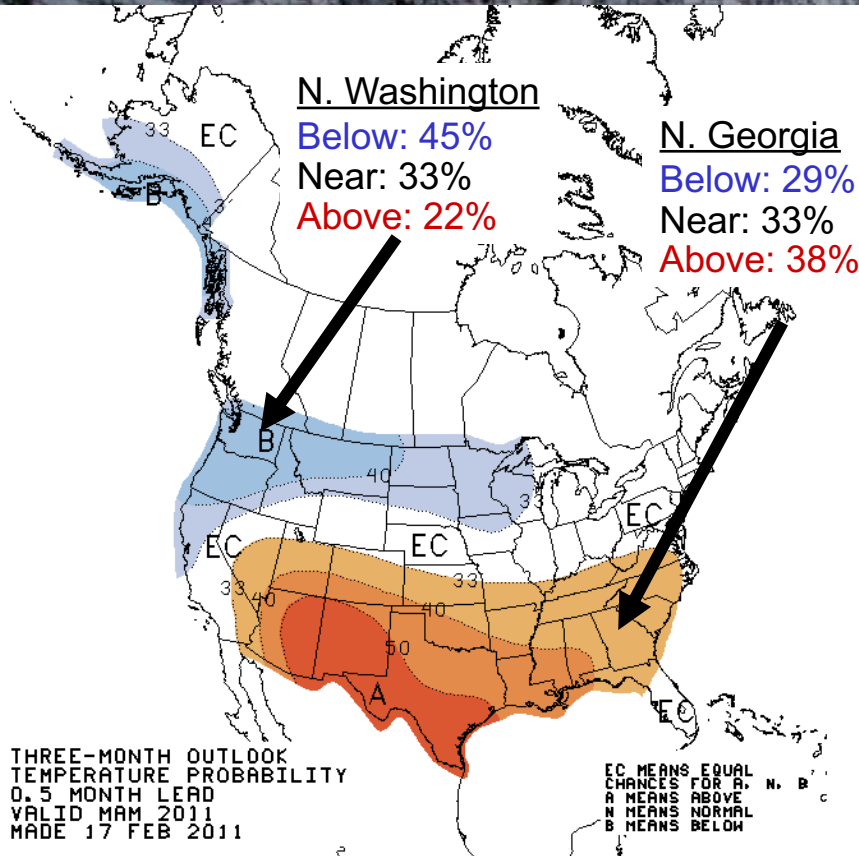
- Seasonal outlooks are prepared for average temperature and total accumulated precipitation category
- Three categories are used (terciles). These are BELOW-, NEAR- and ABOVE-normal (median), for temperature (precipitation).
- Regions where the likelihoods of the three categories are the same (33.33...% each) are designated as “EC”, for equal chances.
- The shaded regions on the maps give the probability of the dominant category. Interactive maps are available for the full probability distribution.



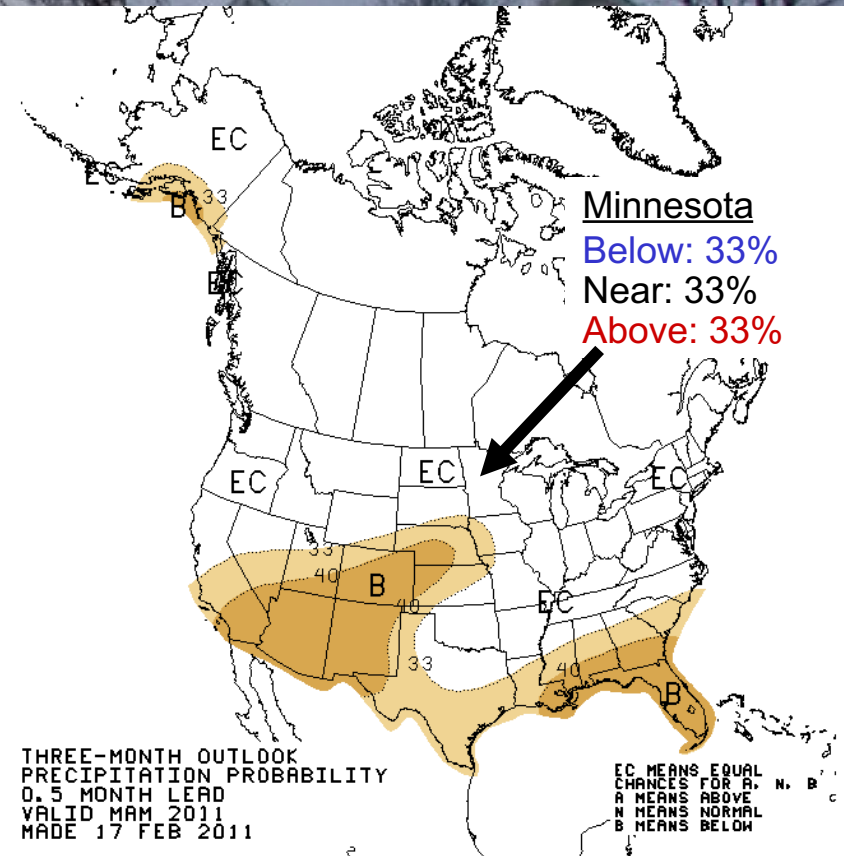
# U. S. Seasonal Outlooks

## Interpretation

### Temperature



### Precipitation







# Seasonal Outlook Cadence

- Each month, near mid-month CPC prepares a set of 13 outlooks for 3-month “seasons” (any set of 3 adjacent months) for lead times ranging from  $\frac{1}{2}$  month,  $1\frac{1}{2}$  months,  $2\frac{1}{2}$  months,  $3\frac{1}{2}$  months, ...,  $12\frac{1}{2}$  months.

**Next Outlook: October 21**

**Final Winter Outlook: November 18**

- The outlook for each successive/prior lead time overlaps the prior/successive one by 2 months. This overlap makes for a smooth variation from one map to the next.



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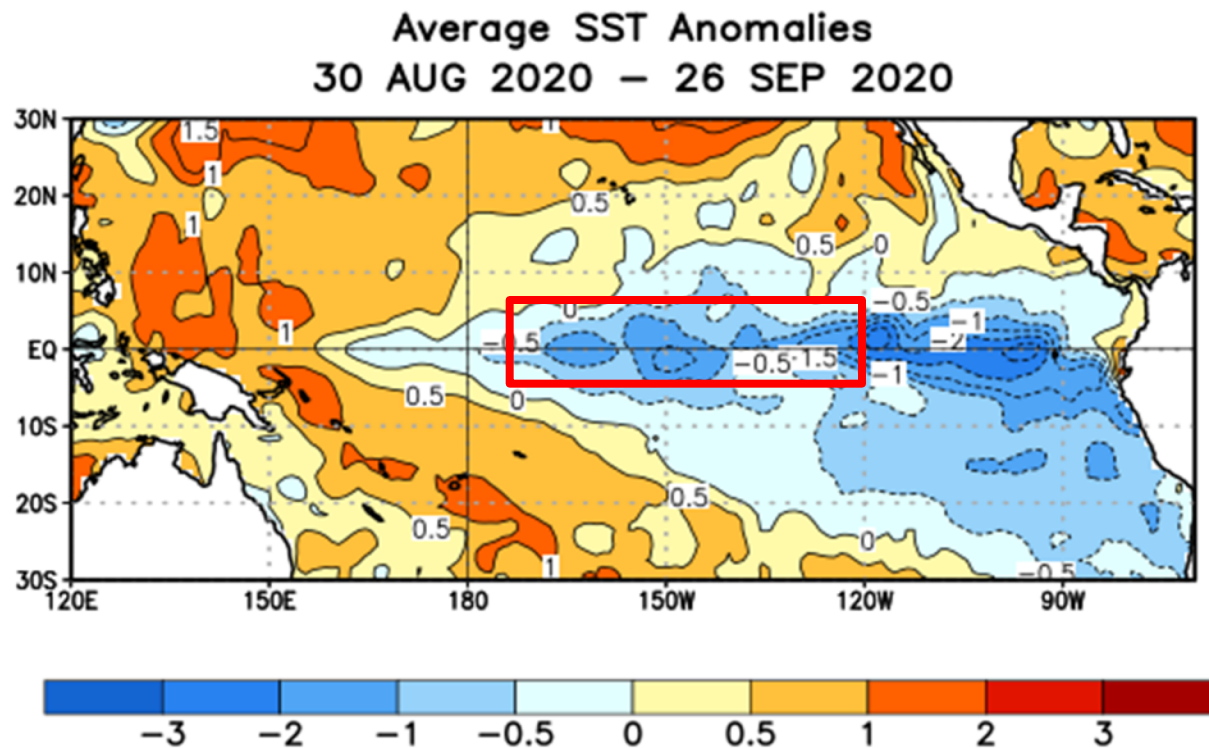


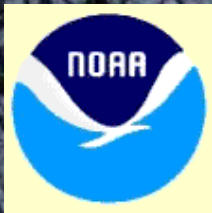
# Winter 2020-2021 Outlook Rationale (from October 2020)

- La Niña conditions developed in August 2020 and were expected to persist through the winter (~75% chance).
- AO had been positive last 7 years (2<sup>nd</sup> strongest last winter). However, large swings are still possible in any year (e.g. DJF 2009-10), and predictability is low.
- DJF temperature trends relative to 1981-2010 base period are positive across the South and along the East Coast.
- Forecast is consistent with La Niña, models and long-term trends. Adjustments possible as we get closer to winter.



**La Niña conditions are present and are likely to continue through the Northern Hemisphere winter (~75% chance).**





# Pacific Niño 3.4 SST Outlook

Models generally favored Niño 3.4 SST being less than  $-0.5^{\circ}\text{C}$  during late 2020 and early 2021, but with fairly large spread. ENSO forecast favored La Niña (75%) for December – February.

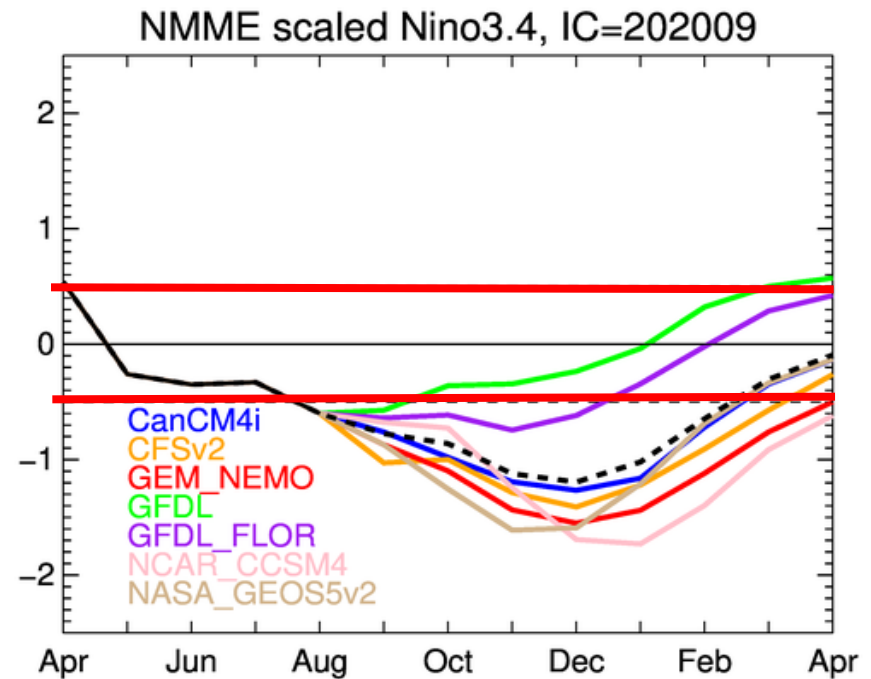
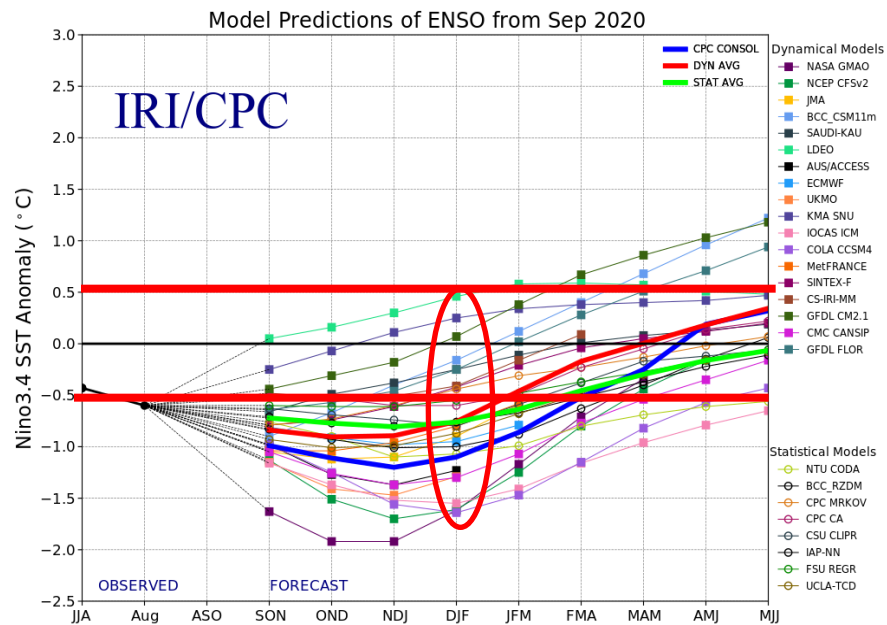
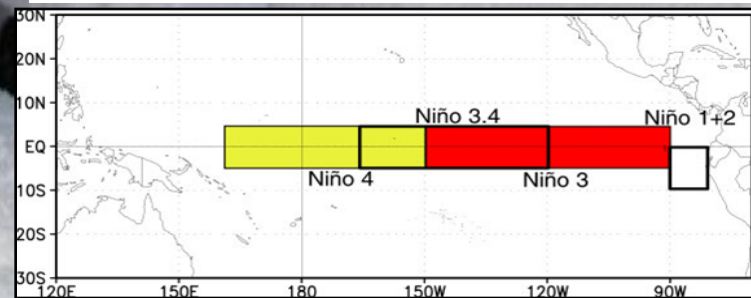


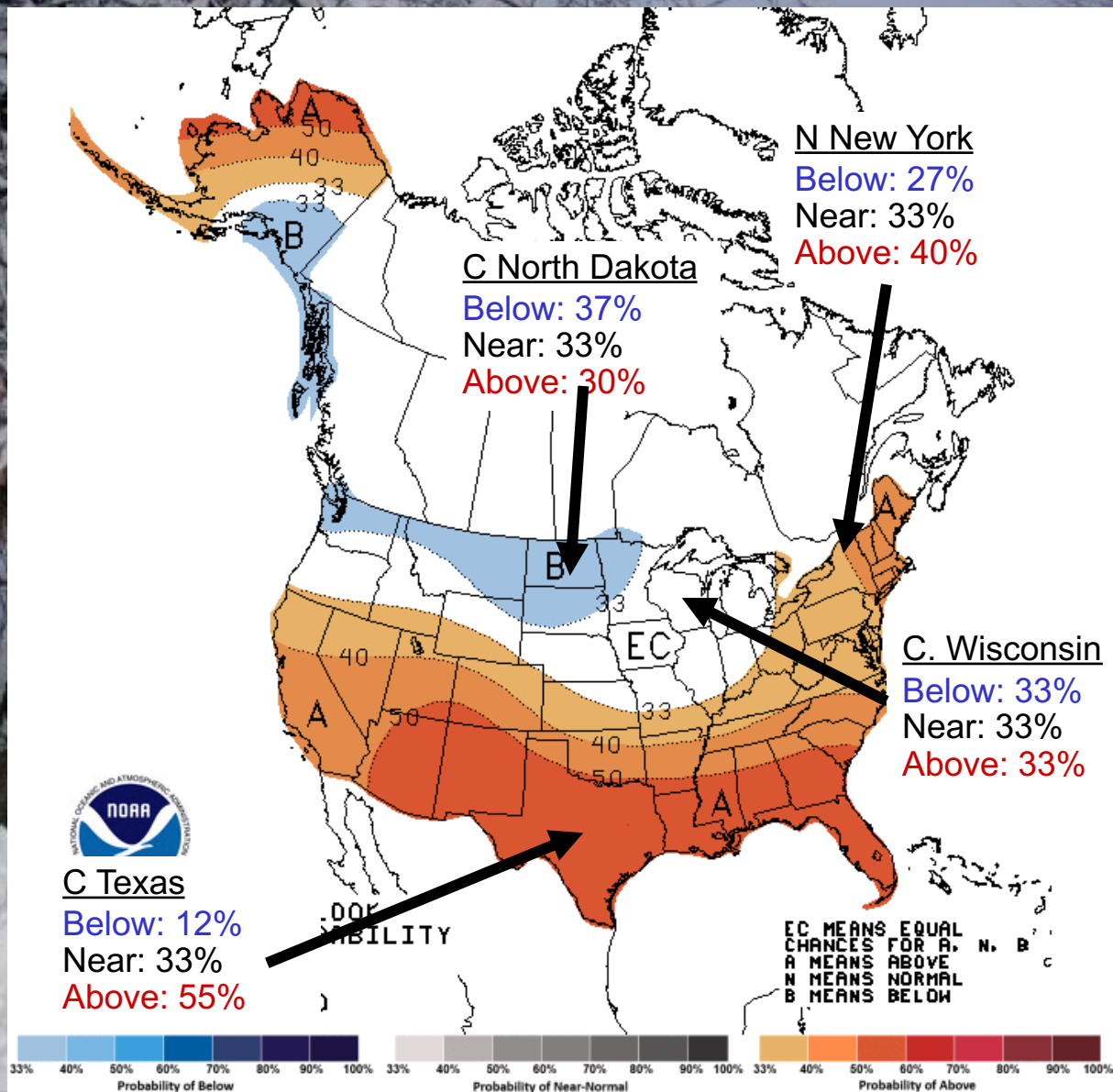
Figure provided by the International Research Institute (IRI) for Climate and Society (updated 19 September 2020).







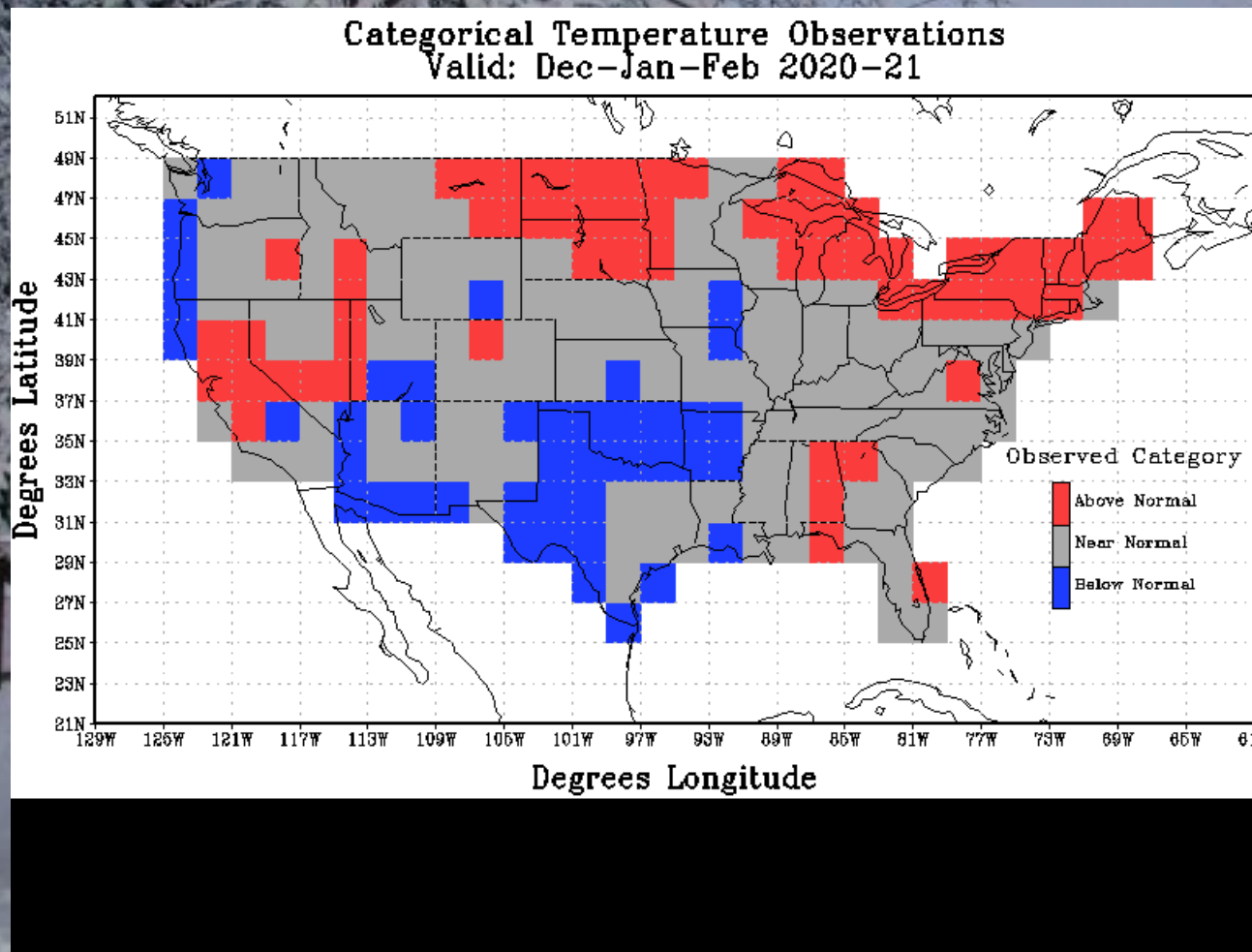
# December 2020 – February 2021 Temperature Outlook (Sep Release)







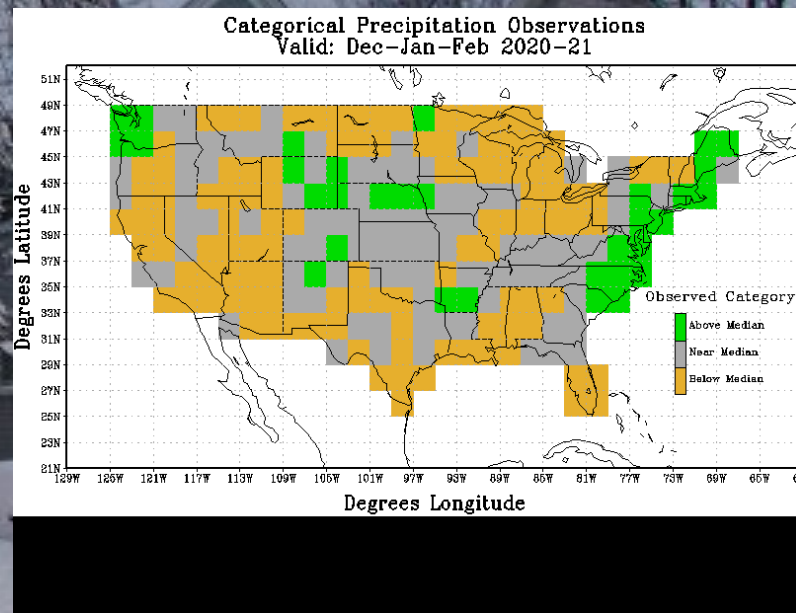
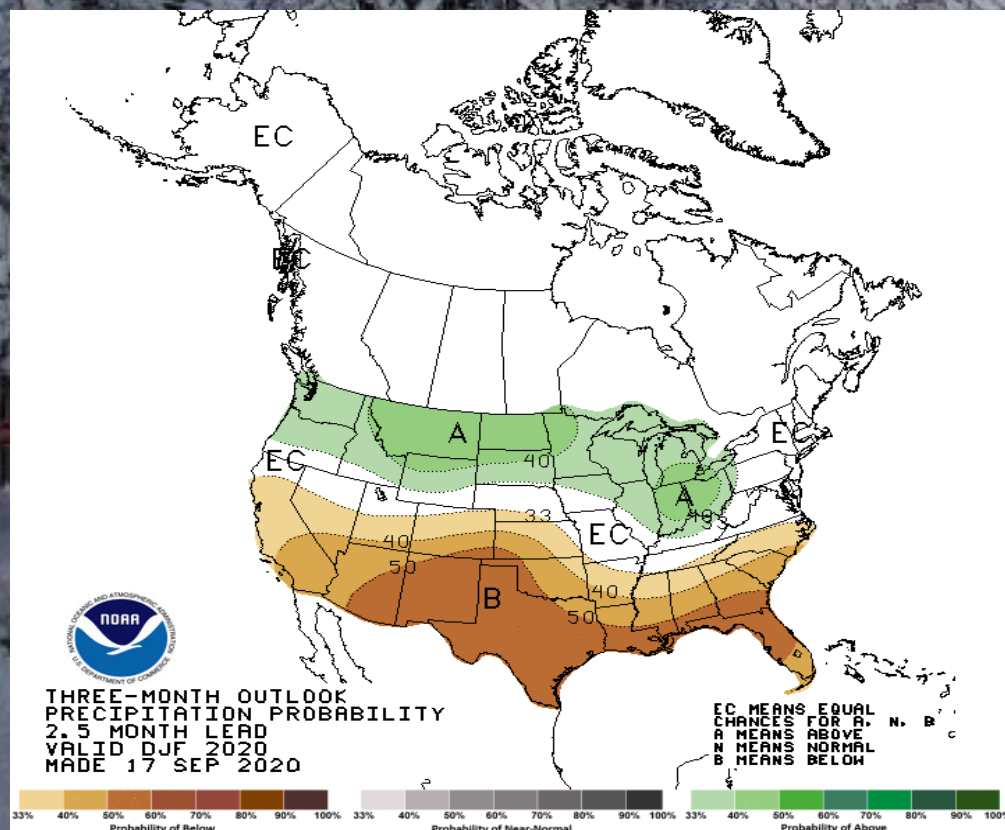
# December 2020 – February 2021 Temperature Observations



Heidke Skill Score: -22  
Coverage: 77%



# December 2020 – February 2021 Precipitation Outlook



Heidke Skill Score: 0  
Coverage: 74%





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# Where does seasonal predictability come from?

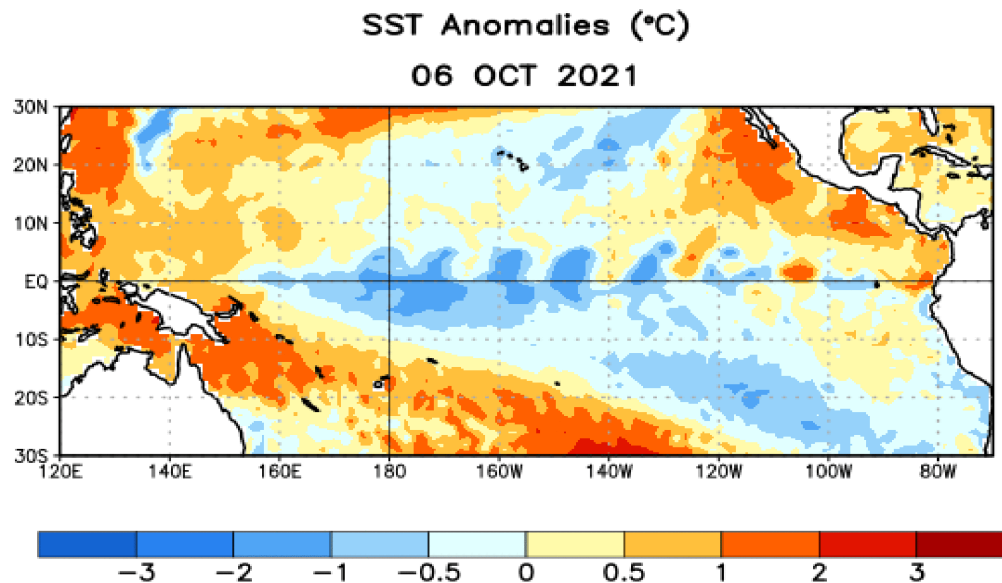
- *Persistent or recurring atmospheric circulation patterns* associated with anomalies in
  - The initial state of the climate system
  - Boundary conditions
- *El Niño and La Niña*: anomalous climate states whose development, persistence and evolution are somewhat understood
- Potentially persistent or recurring atmospheric circulation patterns that are less well understood: AO, NAO, PNA
- *Decadal variability or trends*:
  1. Climate change
  2. Anomalies in the large scale ocean circulation, e.g. Atlantic Meridional Overturning (AMOC)



# How Does CPC Make Operational Seasonal Climate Outlooks?

- Seasonal temperature and precipitation forecasts are based on a combination of *statistical* and *dynamical* forecasts
- An objective *consolidation* of forecast information provides the starting point for the outlook map
- Model forecasts (specifically the NMME) now play a large role
- A forecaster utilizes the available tools to produce the final outlook.
- A team of seasonal forecasters reviews the forecasts with input from across NOAA and other agencies
  - Internally, forecasters gather Friday before release date to review the current climate state and previous forecasts and draw preliminary maps
  - Call on Tuesday before release date to review the forecaster's preliminary maps is open to entire NWS
- Release date every third Thursday of the month
- *Monthly ENSO forecast is always updated prior to the start of the seasonal forecast process (2<sup>nd</sup> Thursday)*

**La Niña conditions are present and are likely to continue through the Northern Hemisphere winter (~87% chance).**

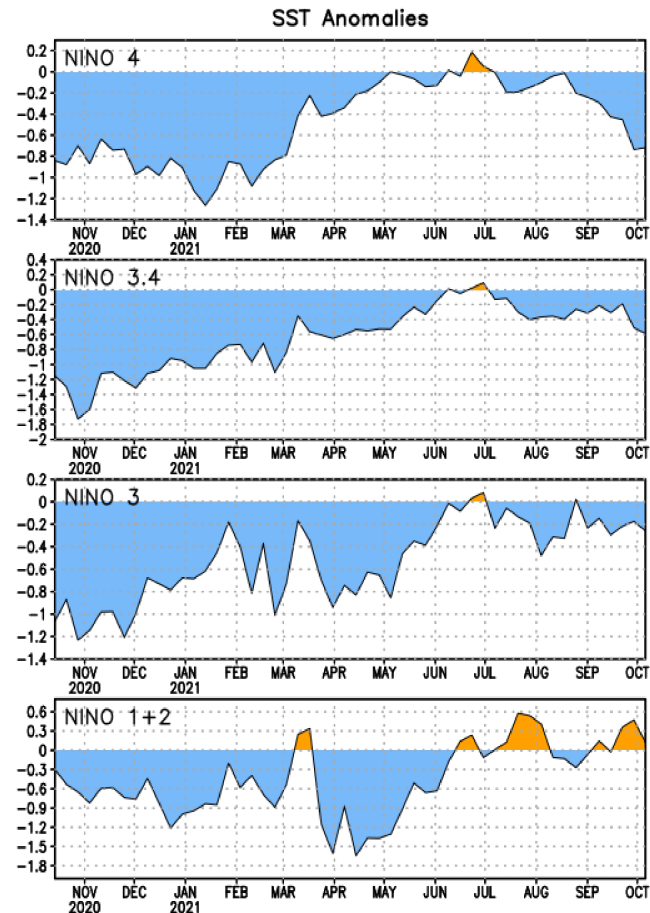
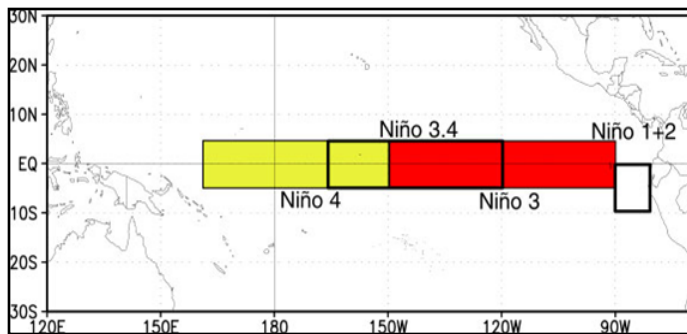


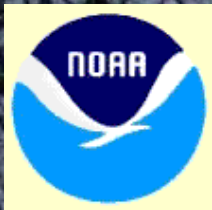


# Niño Region SST Departures (°C) Recent Evolution

The latest weekly SST  
departures are:

Niño 4	-0.7°C
Niño 3.4	-0.6°C
Niño 3	-0.3°C
Niño 1+2	0.1°C





# Pacific Niño 3.4 SST Outlook

Models generally favor that Niño 3.4 will be between less than  $-0.5^{\circ}\text{C}$  during late 2021 and early 2022, but fairly large spread. ENSO forecast favors La Niña (87%) for December – February.

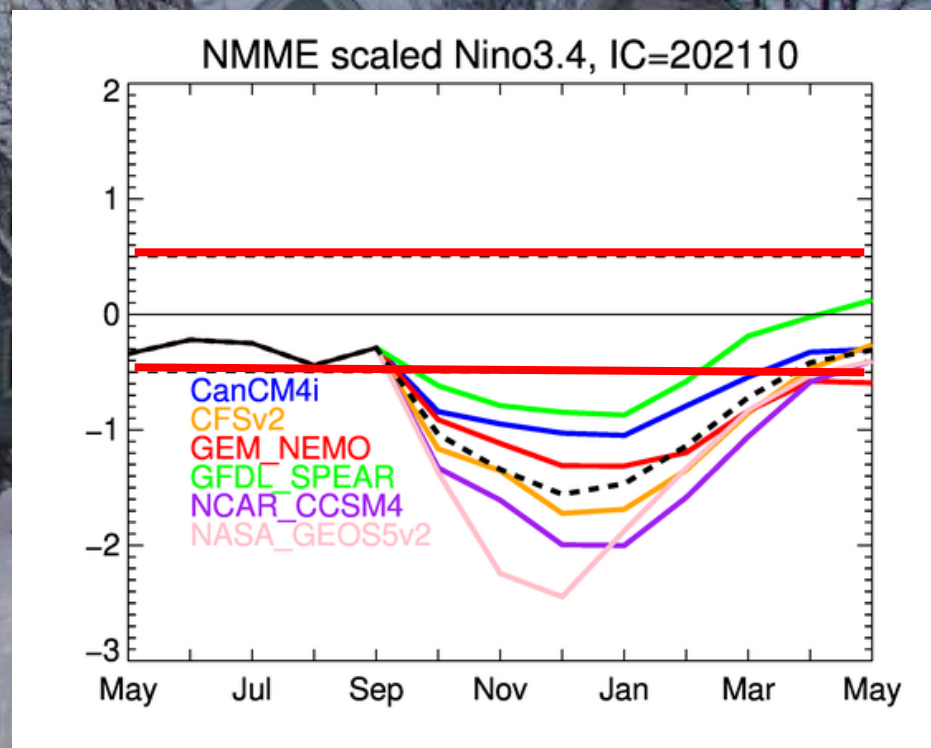
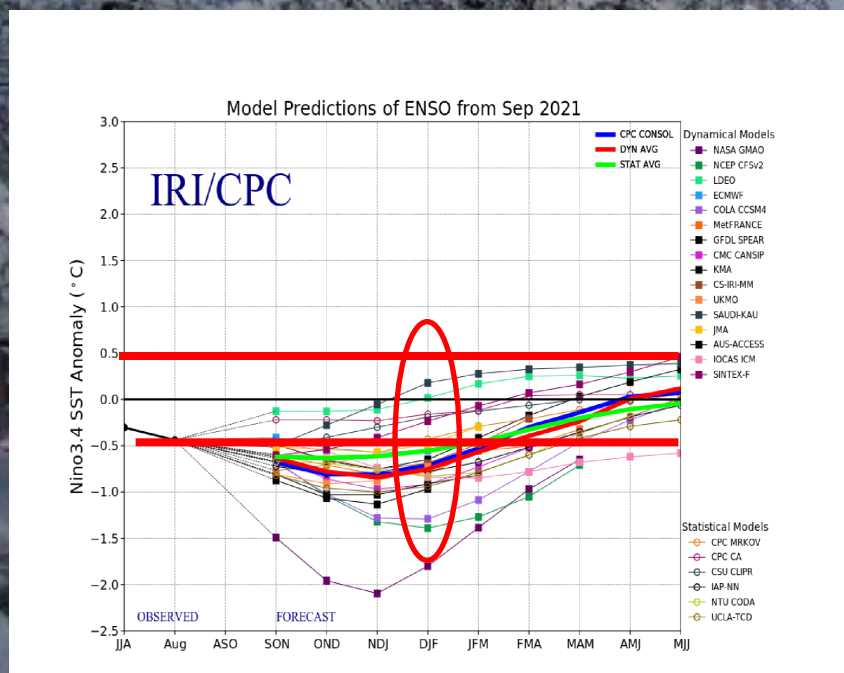
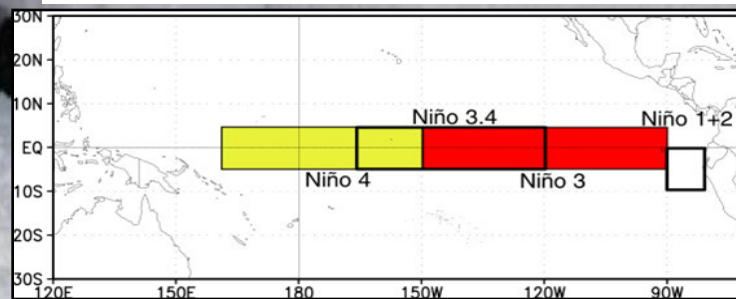


Figure provided by the International Research Institute (IRI) for Climate and Society (updated 20 September 2021).

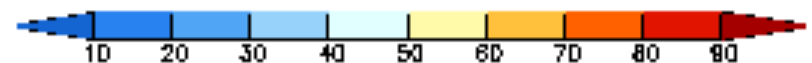
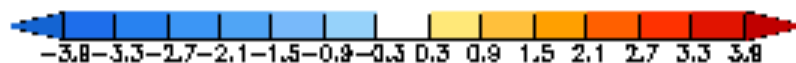
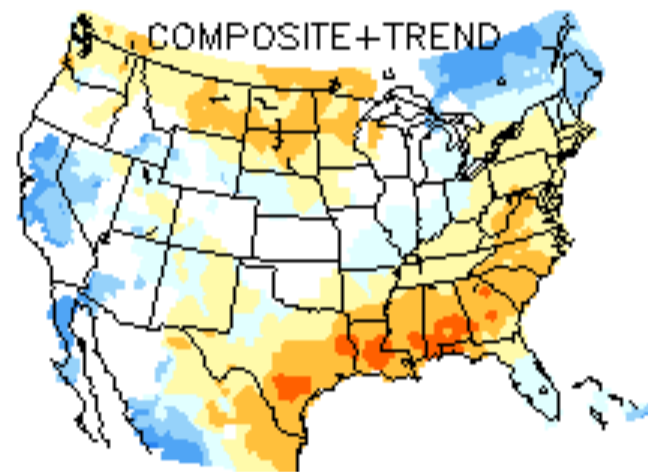
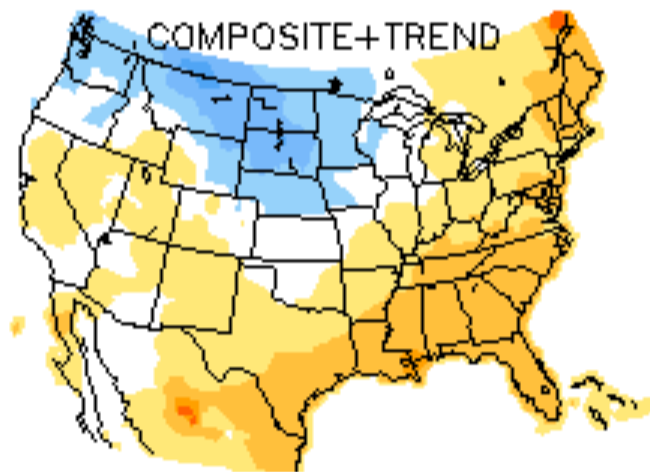




# La Niña Temperature Composites

Average Departure

Frequency



(22 CASES: 1950 1955 1956 1965 1971 1972 1974 1975 1976 1984 1985 1989 1996 1999 2000  
2001 2006 2008 2009 2011 2012 2018)



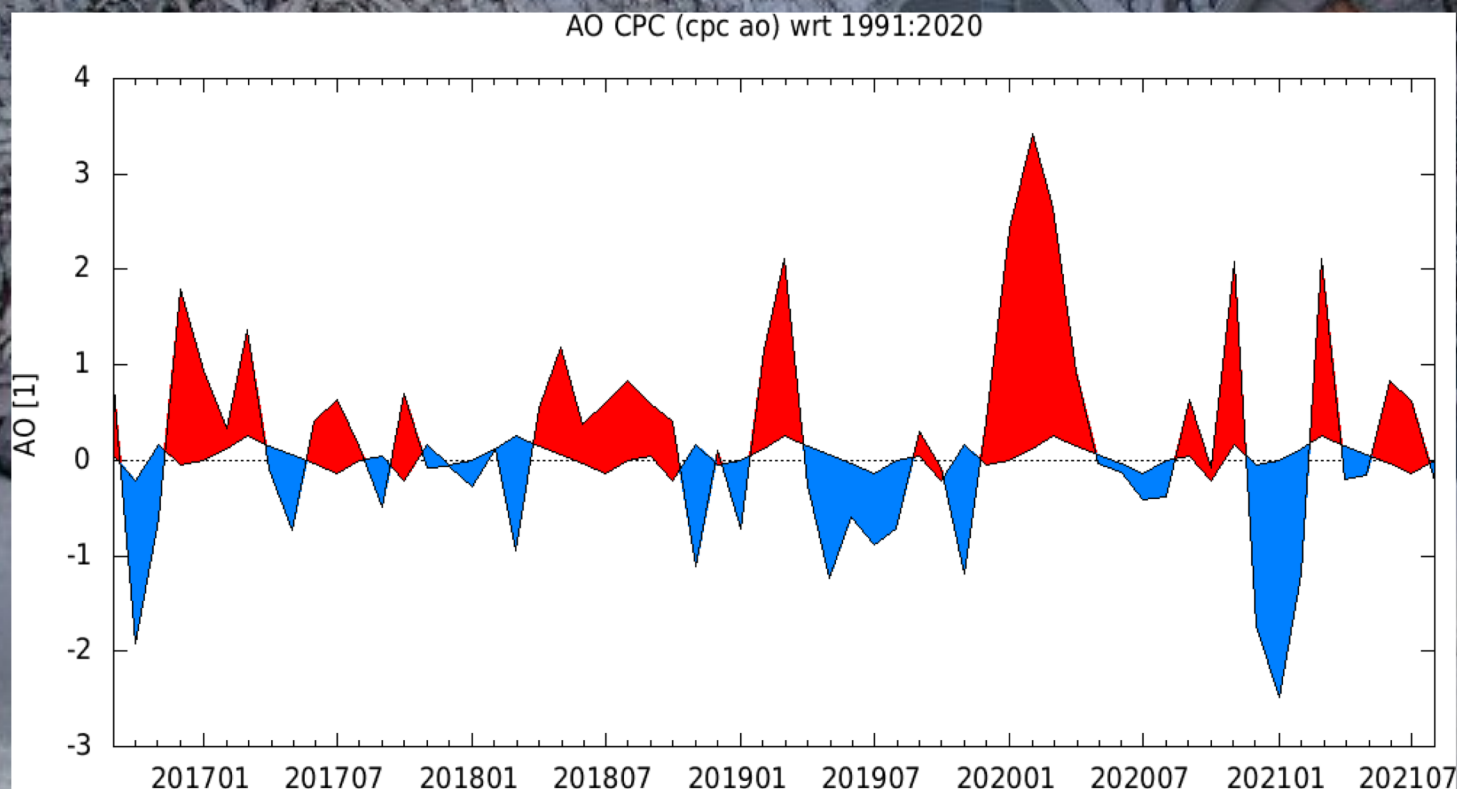


# **NORTH ATLANTIC OSCILLATION/ ARCTIC OSCILLATION**

- **A major source of intra-seasonal variability over the U. S., Atlantic and Europe during winter.**
- **Modulates the circulation pattern over the high latitudes thereby regulating the number and intensity of significant weather events affecting the U.S., such as cold air outbreaks.**
- **Currently there is no reliable capability to forecast the seasonal phase.**



# NH Winter Arctic Oscillation (AO)







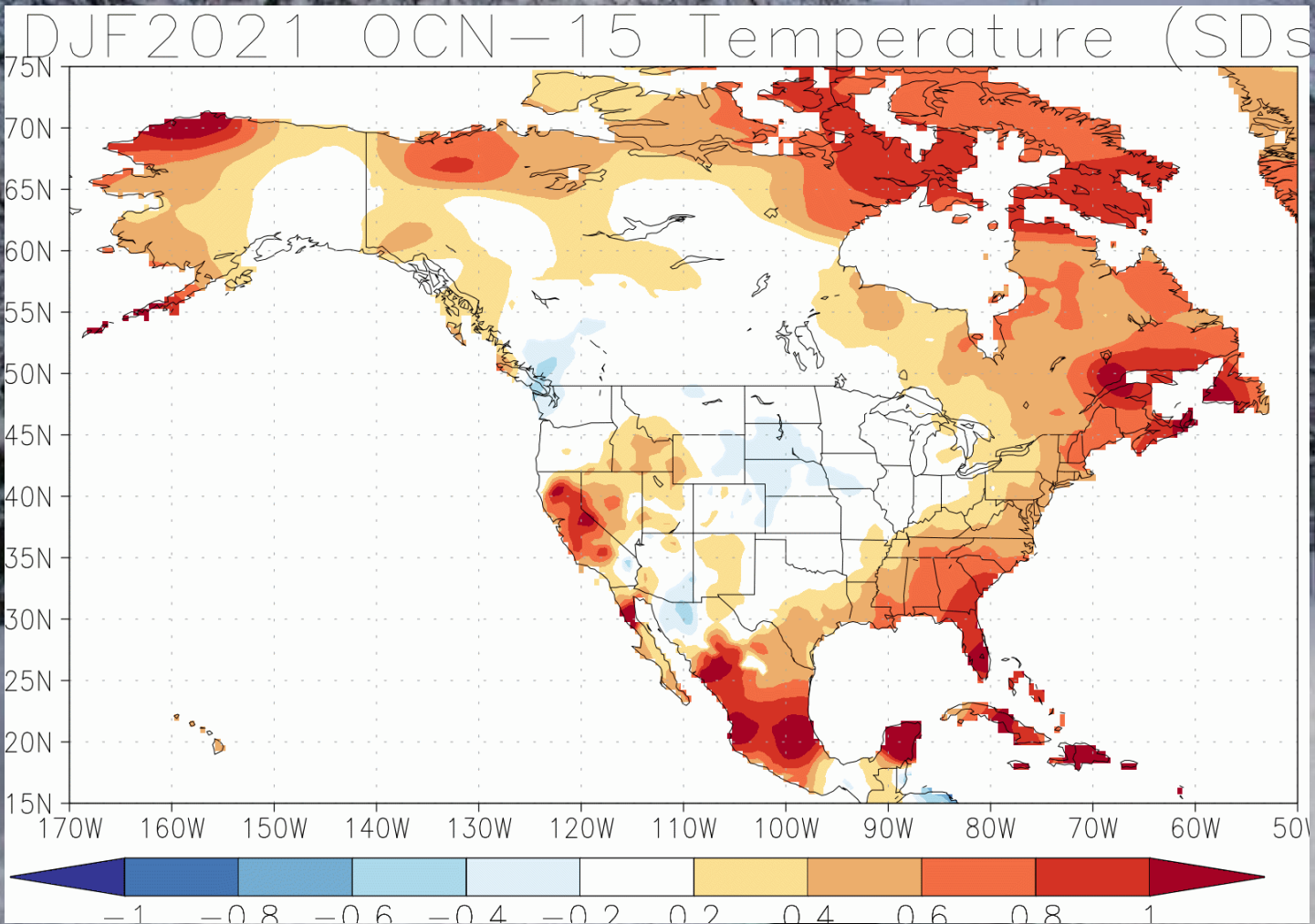
# Optimal Climate Normal (OCN)

- **OCN, as it is used as a tool at CPC is, quite simply, a measure of the trend. For a given station and season, the OCN forecast is the difference between the seasonal mean temperature during the last 15 years and the 30 year climatology.**

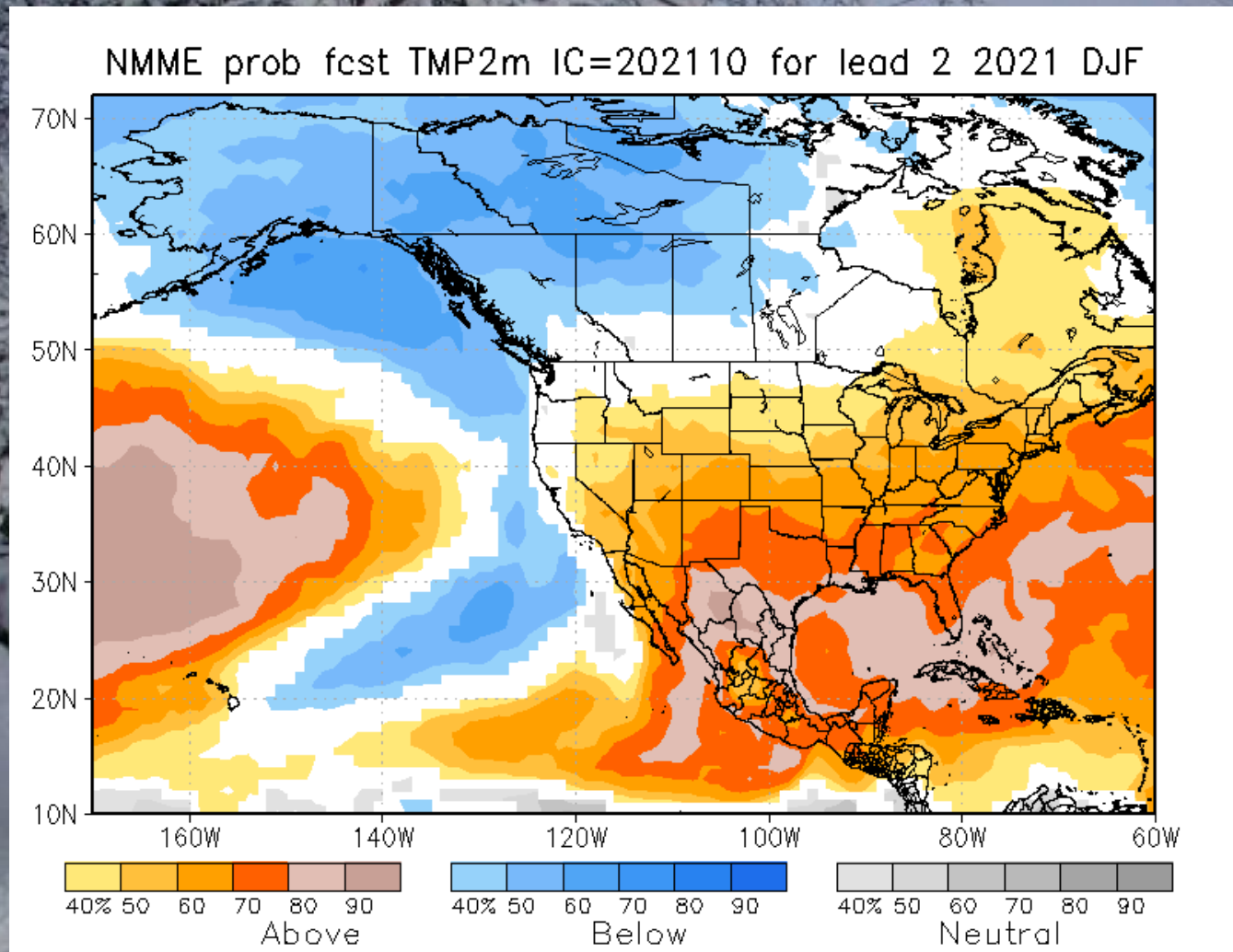




# Optimal Climate Normals (OCN) Trend Forecast for DJF 2021-2022



# NMME Temperature Forecast DJF 2021-2022



Forecast updated Oct. 8, 2021





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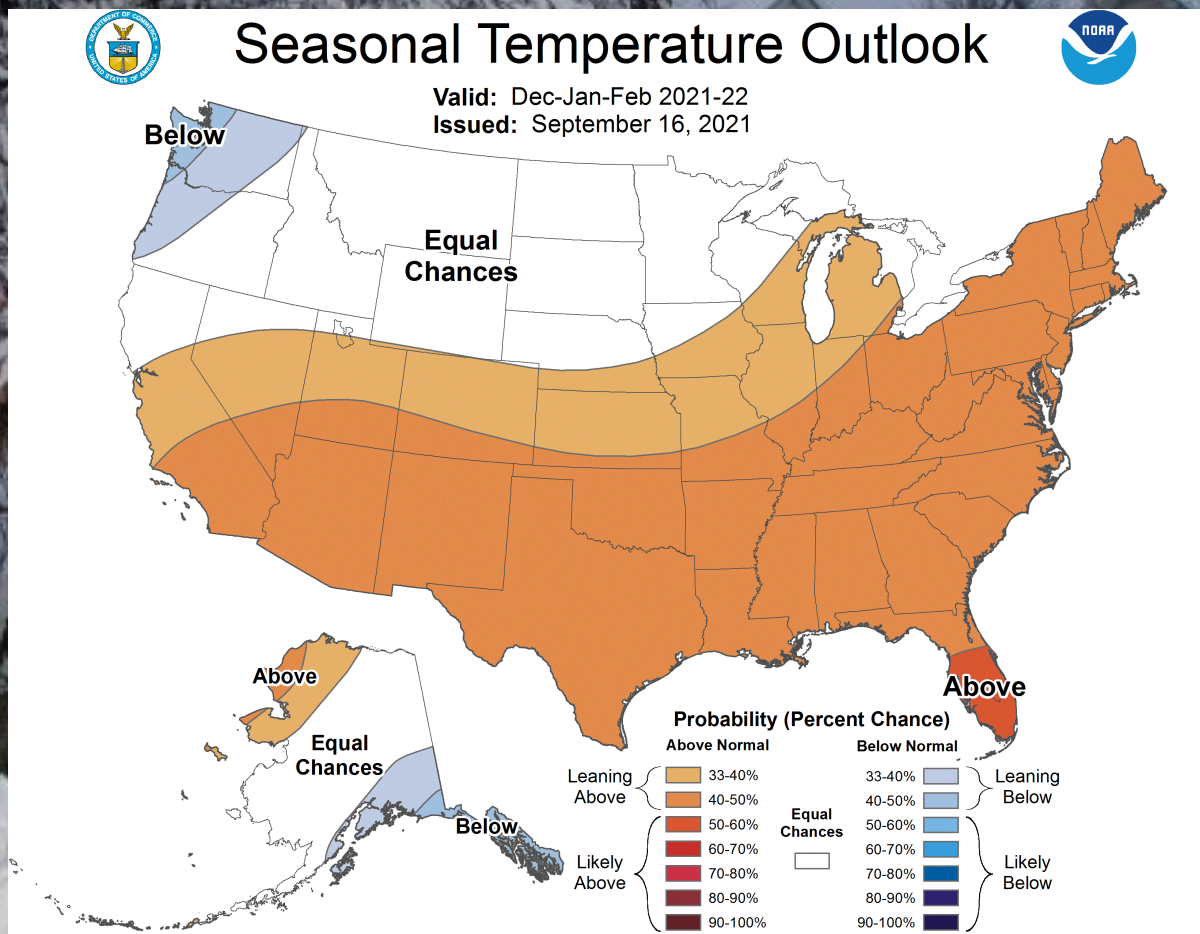


# Winter 2021-22 Outlook Rationale

- **La Niña conditions developed in October and are expected to persist through the winter (~87% chance).**
- **DJF temperature trends relative to 1991-2020 base period are positive across the South and along the East Coast.**
- **The forecast is consistent with La Niña, models and long-term trends. Adjustments are possible as we get closer to winter.**



# Temperature Outlook (Sep. Release) December 2021 – February 2022

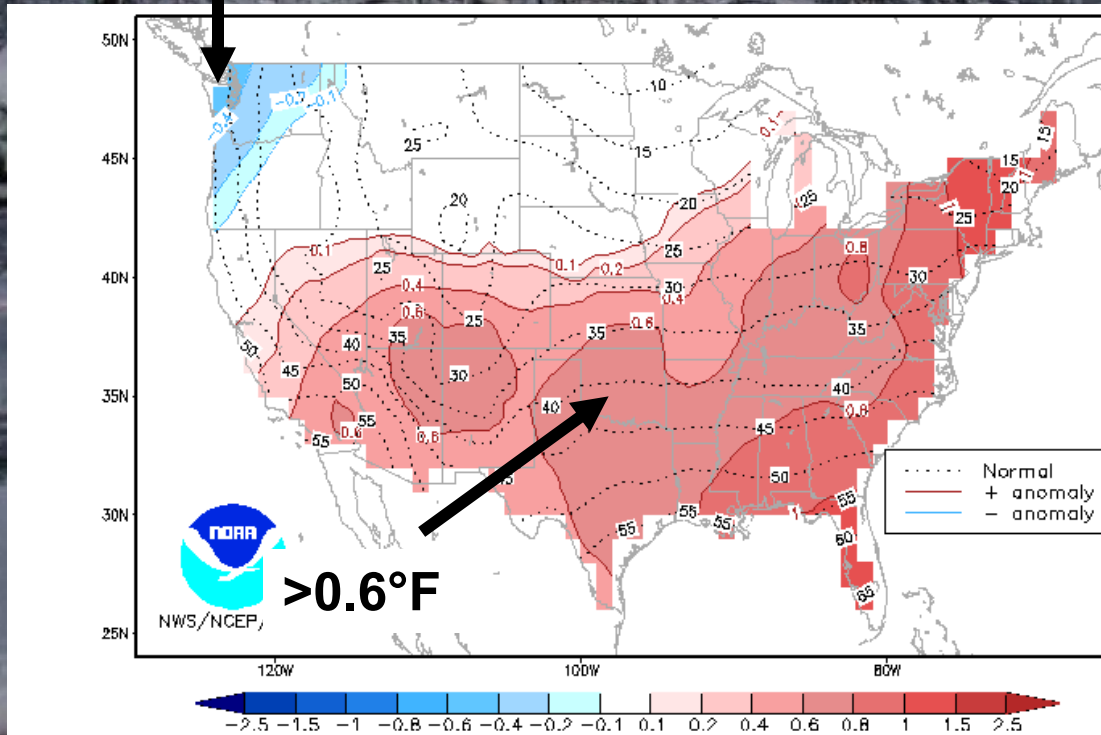






# Average Departure of Mid-Value Temperature Outlook Distribution

**-0.4°F**

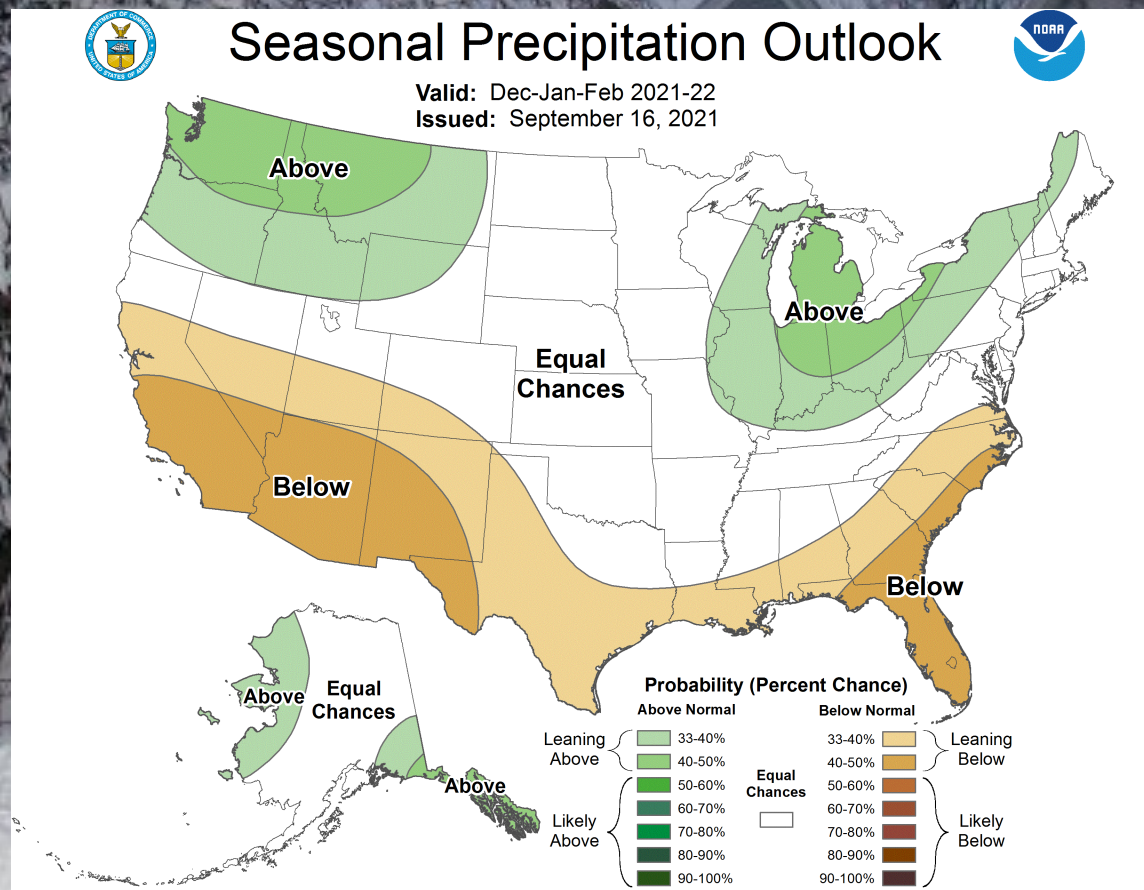






# Precipitation Outlook (Sep. Release)

## December 2021 – February 2021







# Seasonal Temperature Outlooks

## NDJ 2021-22 – AMJ 2022

