



U. S. 2022 – 2023 Winter Outlook

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Outline

- **Seasonal outlook background**
- Potential climate factors impacting U. S. Winter
- Tools used to generate the U.S. Winter Outlook
- 2022-23 U. S. Winter (DJF) Outlook





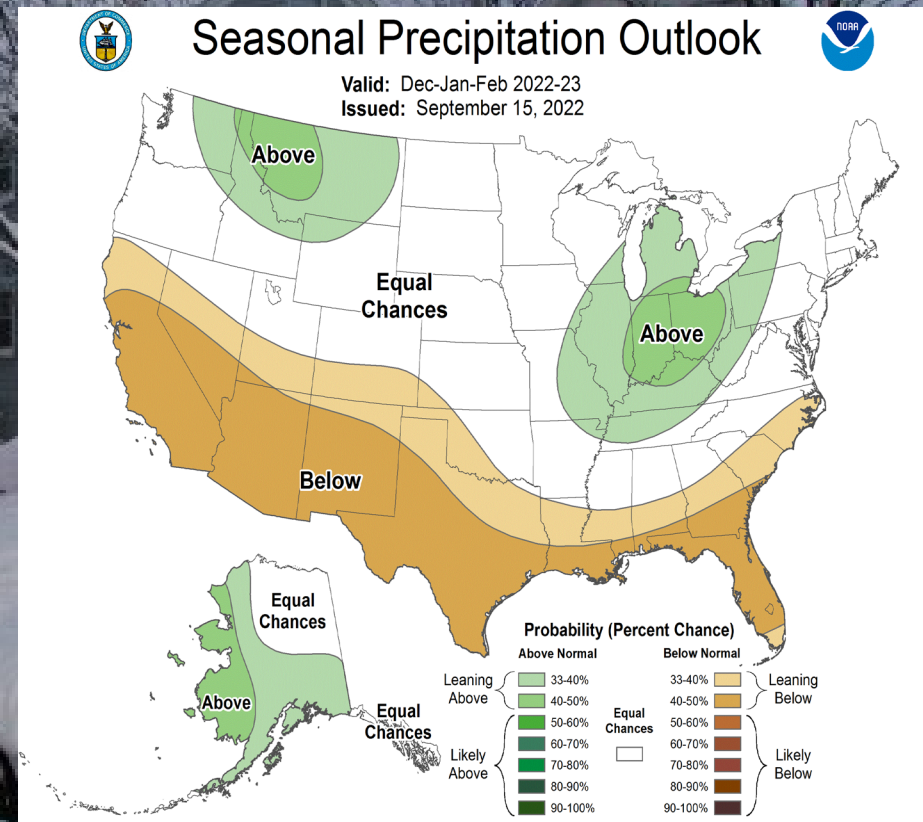
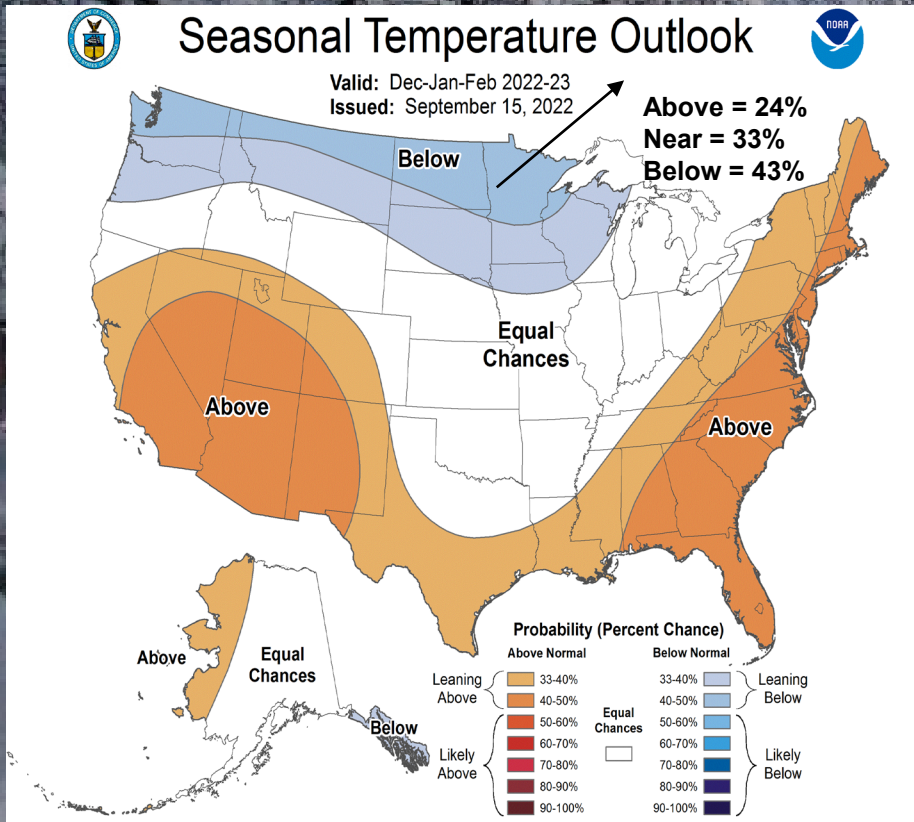
Outlook Categories and Probabilities

- 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 20

Final Winter Outlook: November 17

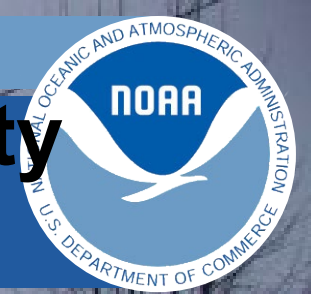
- The outlook for each successive/prior lead time overlaps the prior/successive one by 2 months. This overlap makes for a smooth variation from one map to the next.



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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 (2nd Thursday)*

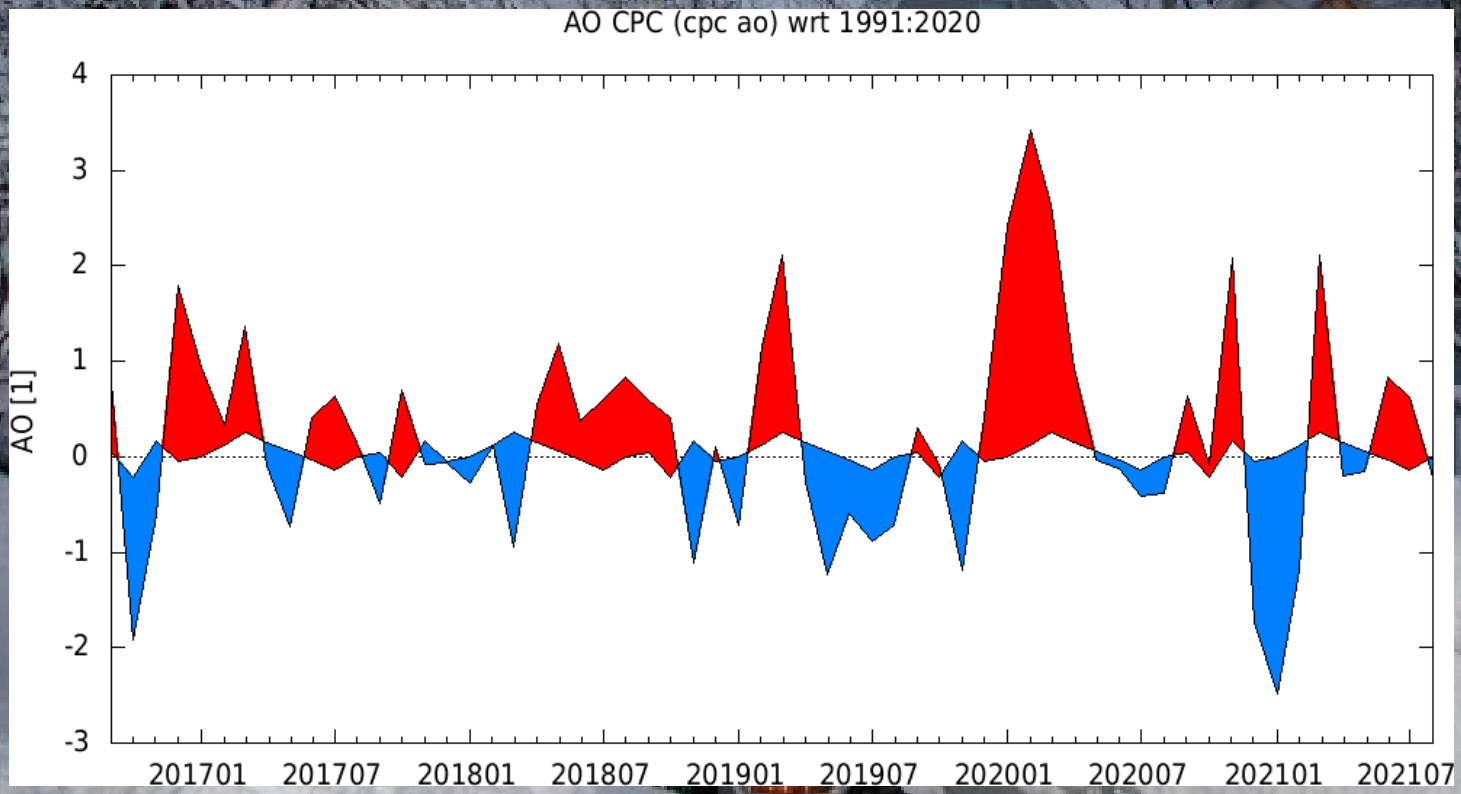


NORTH ATLANTIC OSCILLATION/ ARCTIC OSCILLATION

- **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)



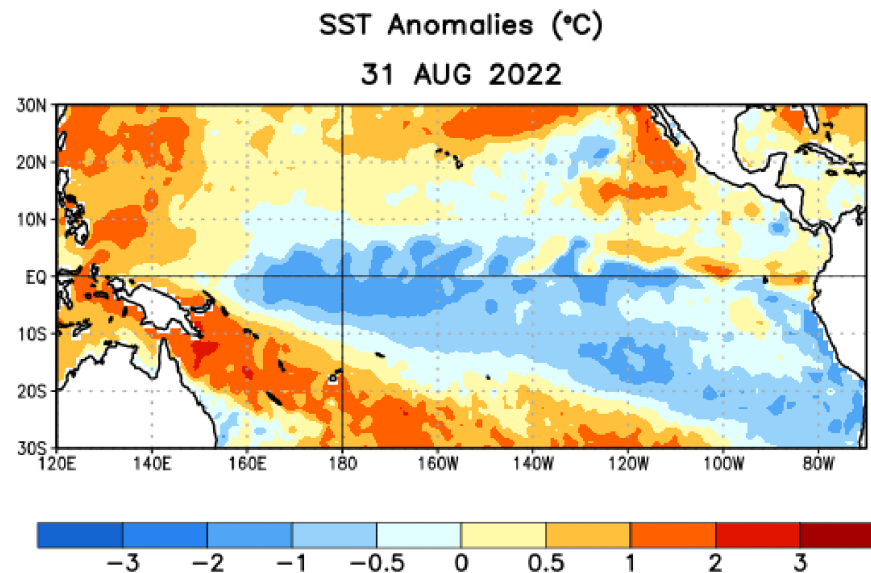


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La Niña conditions are present and are likely to continue through the Northern Hemisphere winter (~54% chance)





Pacific Niño 3.4 SST Outlook

Models generally favored Niño 3.4 SST being less than -0.5°C during late 2022 and early 2023. La Niña conditions favored at 65% probability for December – February.

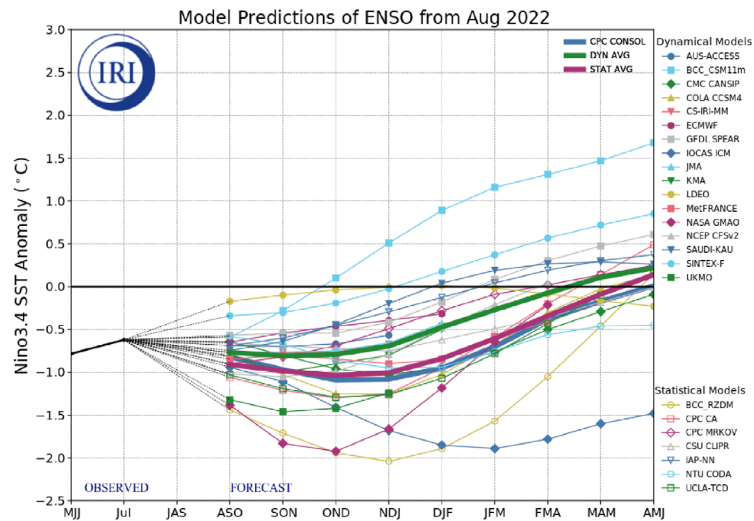


Figure 6. Forecasts of sea surface temperature (SST) anomalies for the Niño 3.4 region (5°N - 5°S , 120°W - 170°W). Figure updated 19 August 2022 by the International Research Institute (IRI) for Climate and Society.

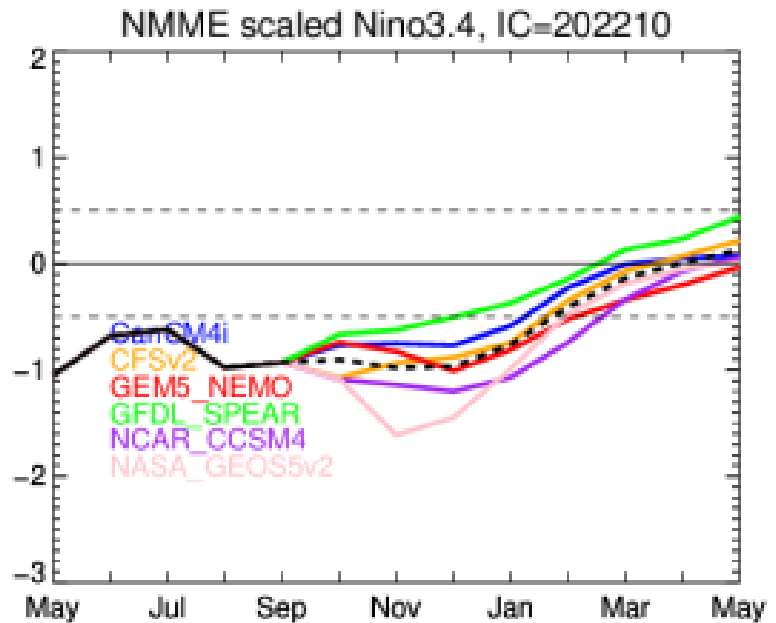
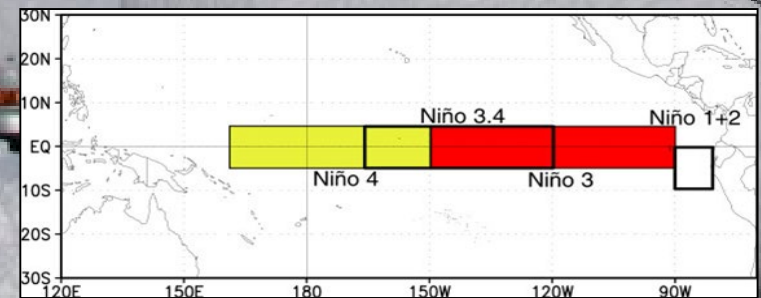


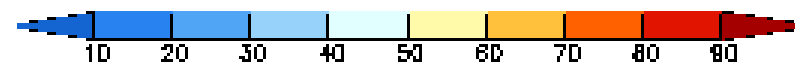
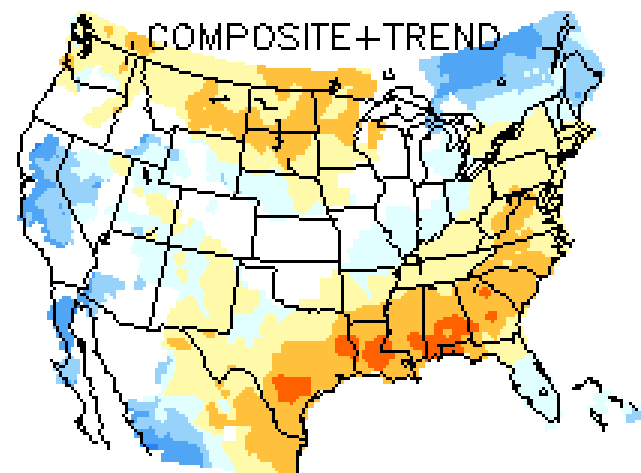
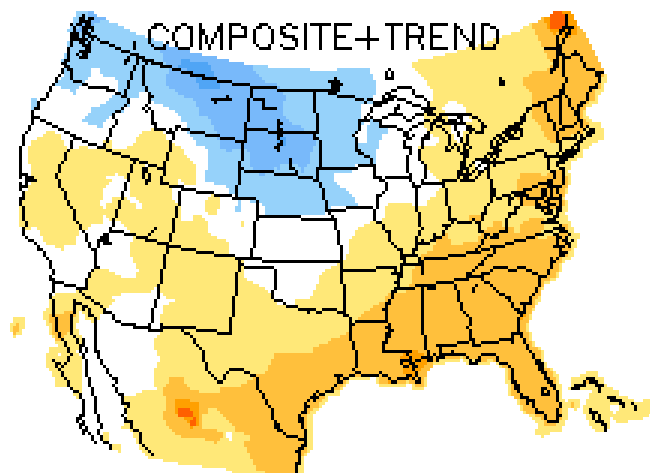
Figure provided by the International Research Institute (IRI) for Climate and Society (updated 8 September 2022).



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 2008 2008 2009 2011 2012 2018)

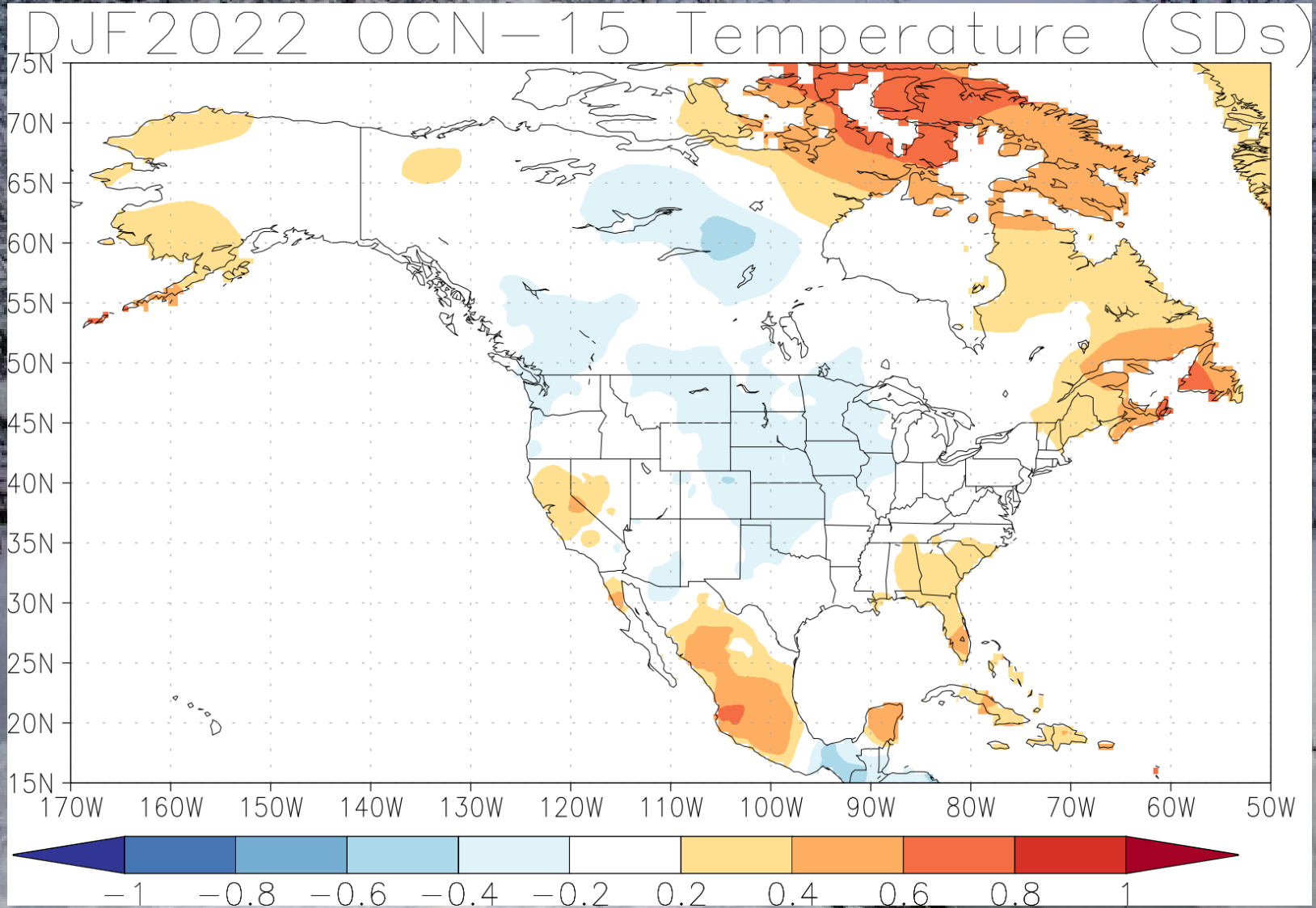


Optimal Climate Normal (OCN)

- **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 2022-2023

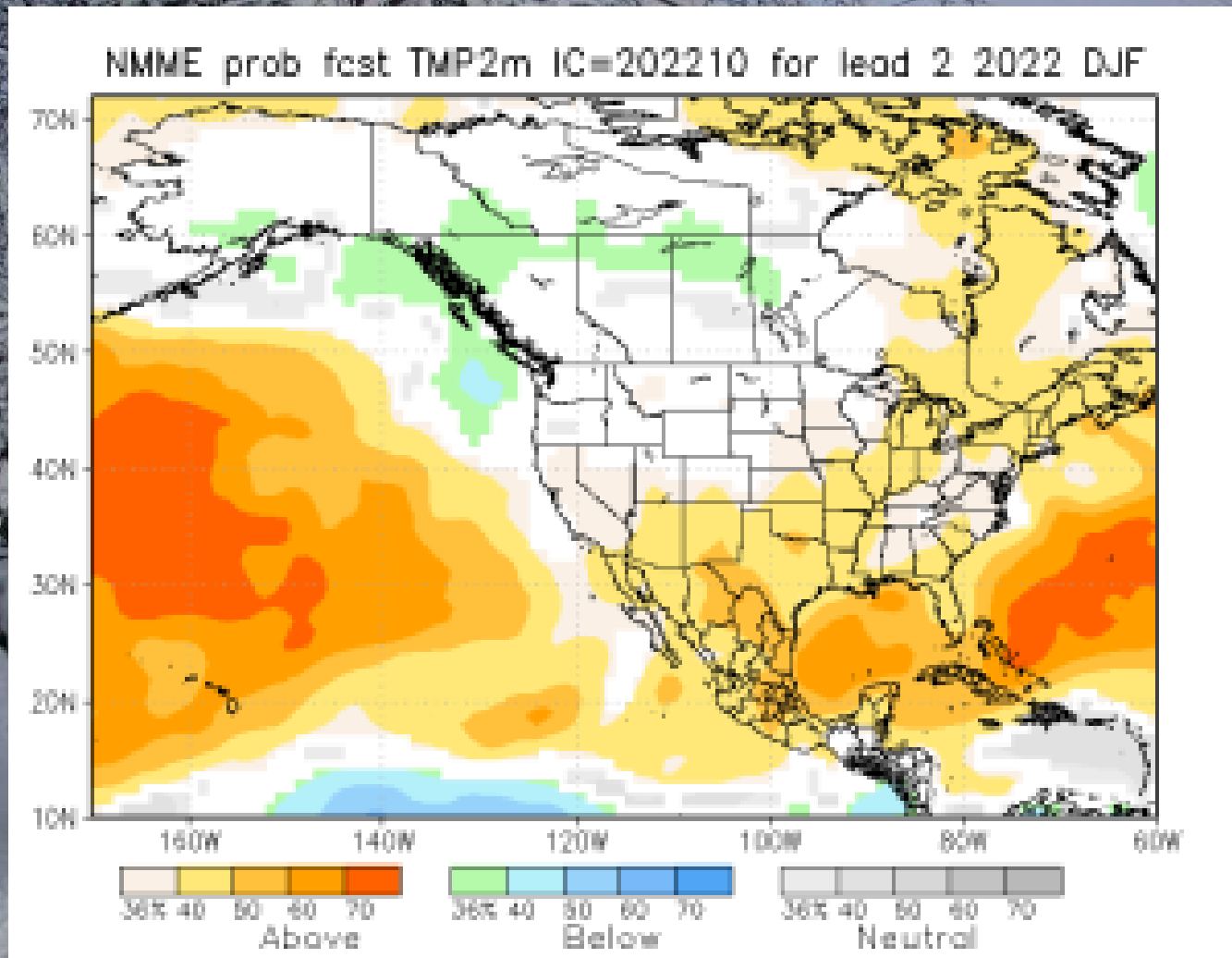




North American Multi-Model Ensemble (NMME)

- **NMME is a set of dynamical models from NOAA, NASA, NCAR, and Environment and Climate Change Canada. These models are calibrated to have the correct historical probabilistic distribution.**

NMME Temperature Forecast DJF 2022-2023



Forecast updated Oct. 8, 2022



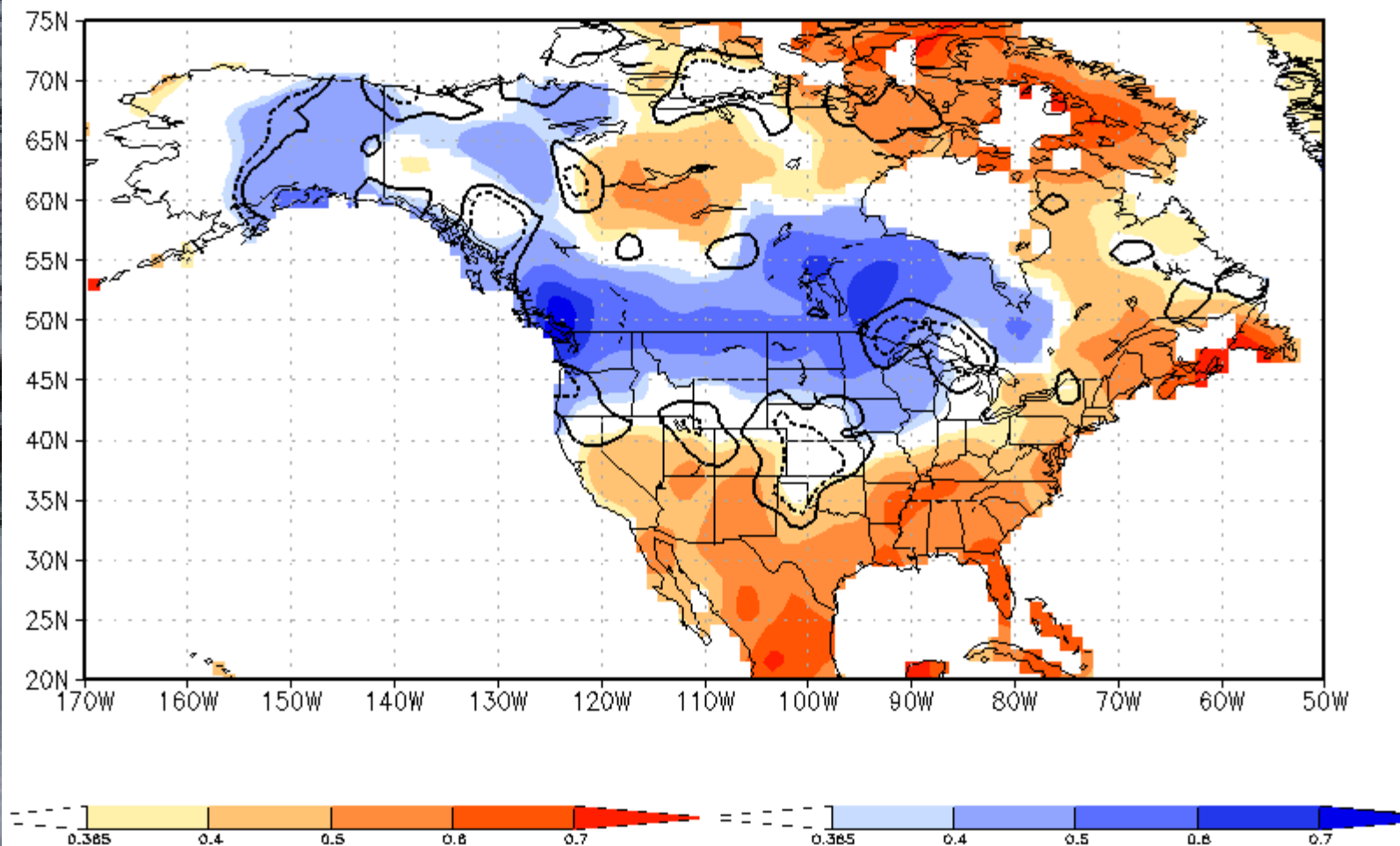
CPC Multi-Tool Consolidation

- The CPC consolidation skill weights the dynamical and statistical tools to produce a first-guess for forecasters.



Consolidated Tool Forecast for DJF 2022-2023

Final CON DJF Lead-3 Scaled





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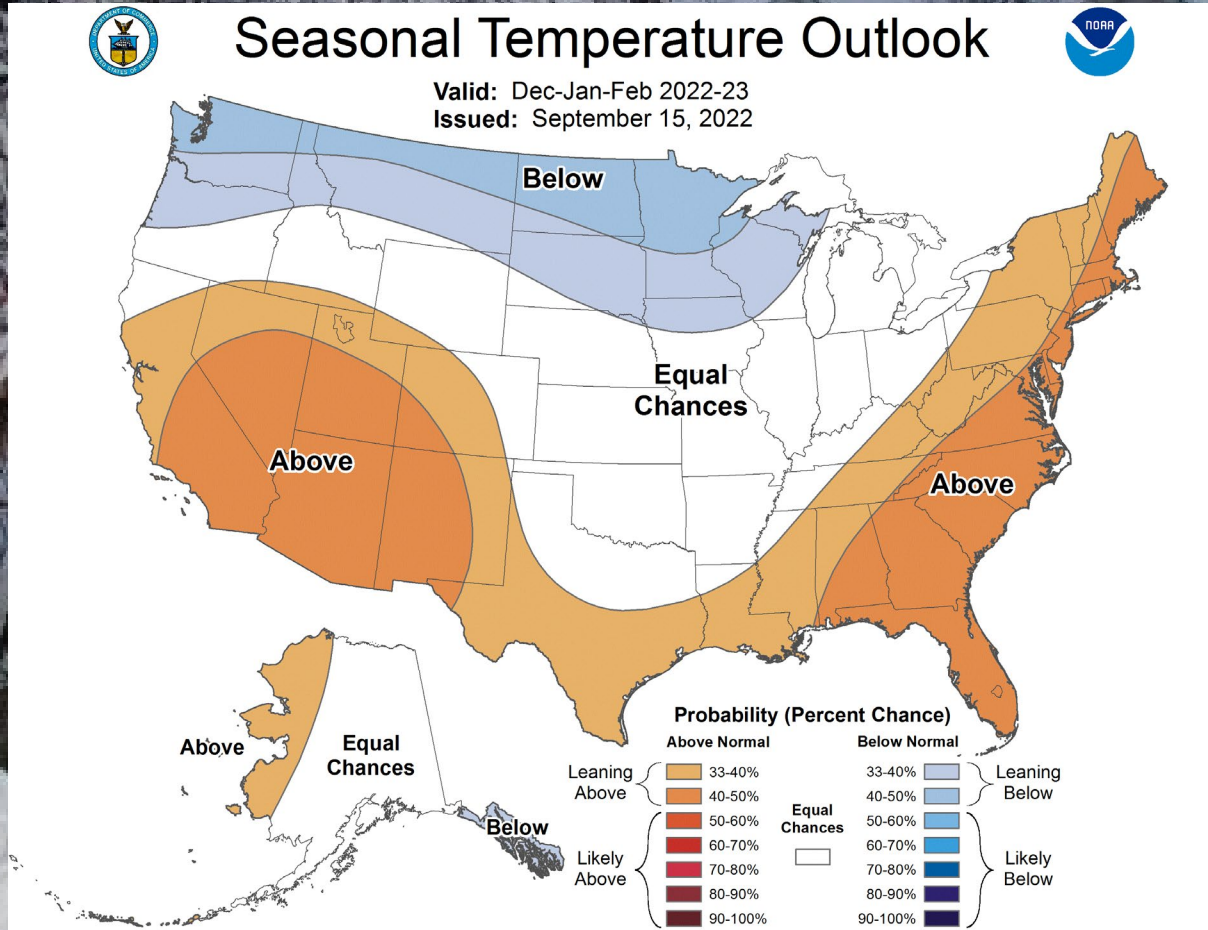


Winter 2022-23 Outlook Rationale

- **La Niña conditions are present. A continuation of La Niña is likely through the Northern Hemisphere Winter 2022-23, with an 89 percent chance during October-November-December (OND) decreasing to a 54 percent chance for January-February-March (JFM).**
- **The CPC multi-tool consolidation, which objectively weights the various tools was used as the first guess for the forecast.**
- **The forecast is consistent with La Niña composites, dynamical and statistical models and long-term trends. Adjustments are possible as we get closer to winter.**



Temperature Outlook (Sep. Release) December 2022 – February 2023

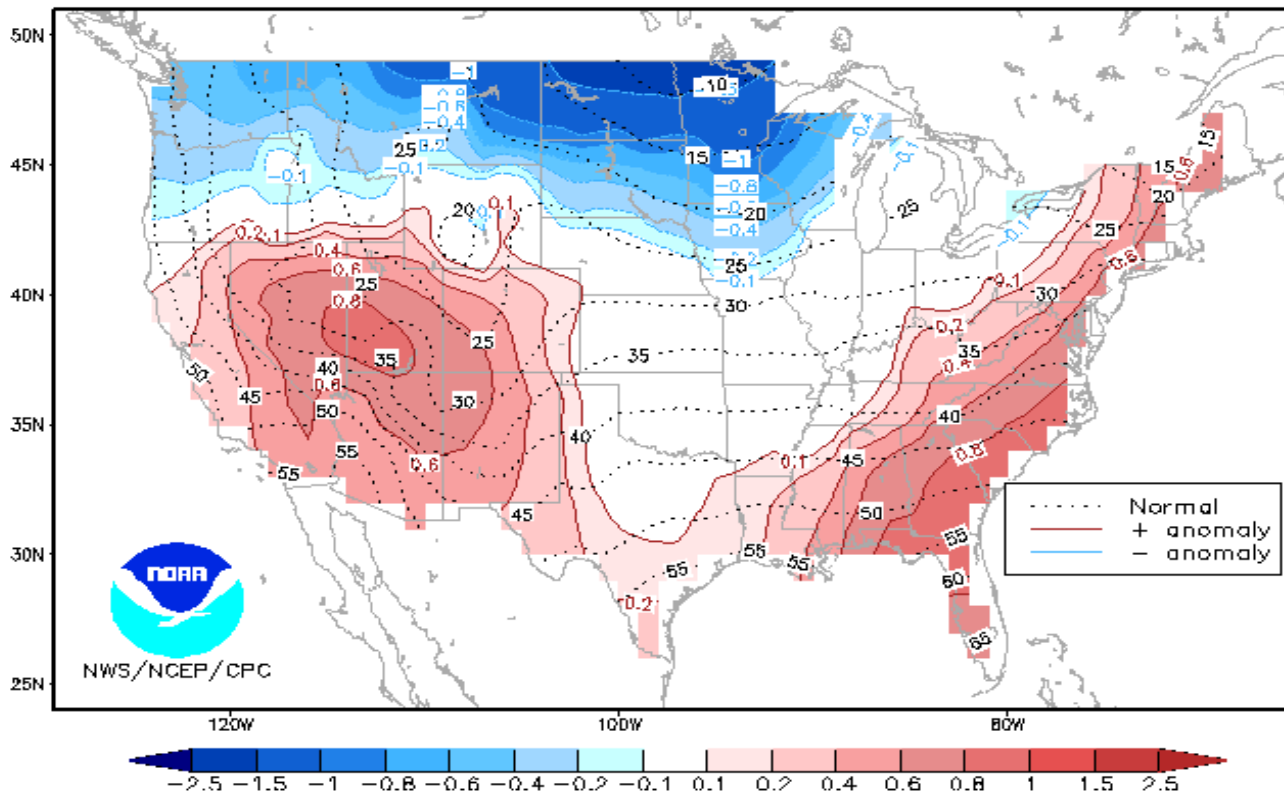




Average Departure of Mid-Value Temperature Outlook Distribution

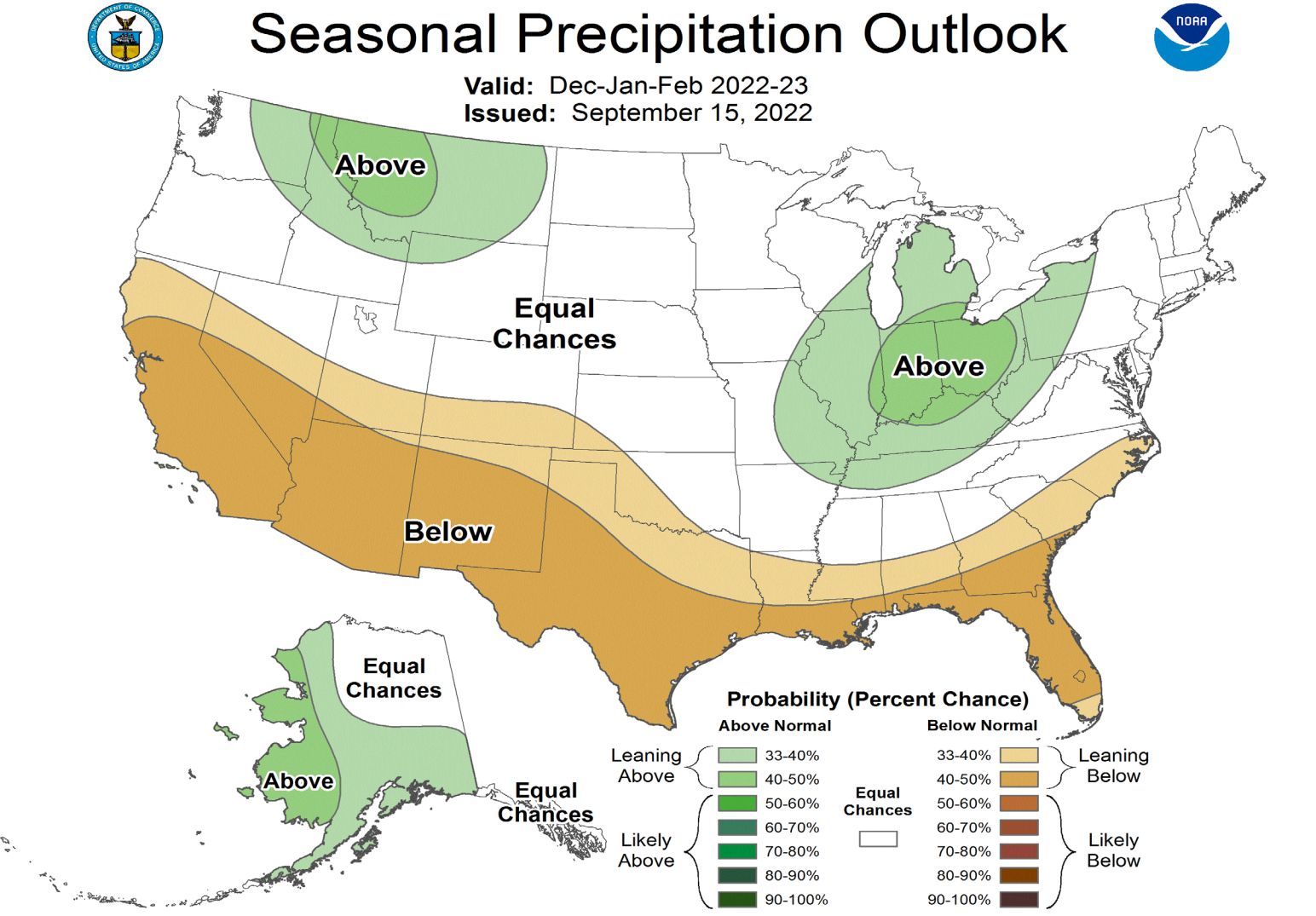
Anomaly (deg F) of the Mid-value of the 3-Month Temperature Outlook Distribution for DJF 2022-23

Dashed lines are the median 3-month temperature (degrees F) based on observations from 1991-2020. Shaded areas indicate whether the anomaly of the mid-value is positive (red) or negative (blue) compared to the 1991-2020 average. Non-shaded regions indicate that the absolute value of the anomaly of the mid-value is less than 0.1. For a given location, the mid-value of the outlook may be found by adding the anomaly value to the 1991-2020 average. There is an equal 50-50 chance that actual conditions will be above or below the mid-value. Please note that this product is a limited representation of the official forecast, showing the anomaly of the mid-value, but not the width of the range of possibilities. For more comprehensive forecast information, please see our additional forecast products.





Precipitation Outlook (Sep. Release) December 2022 – February 2023





Seasonal Temperature Outlooks NDJ 2022-23 – AMJ 2023

