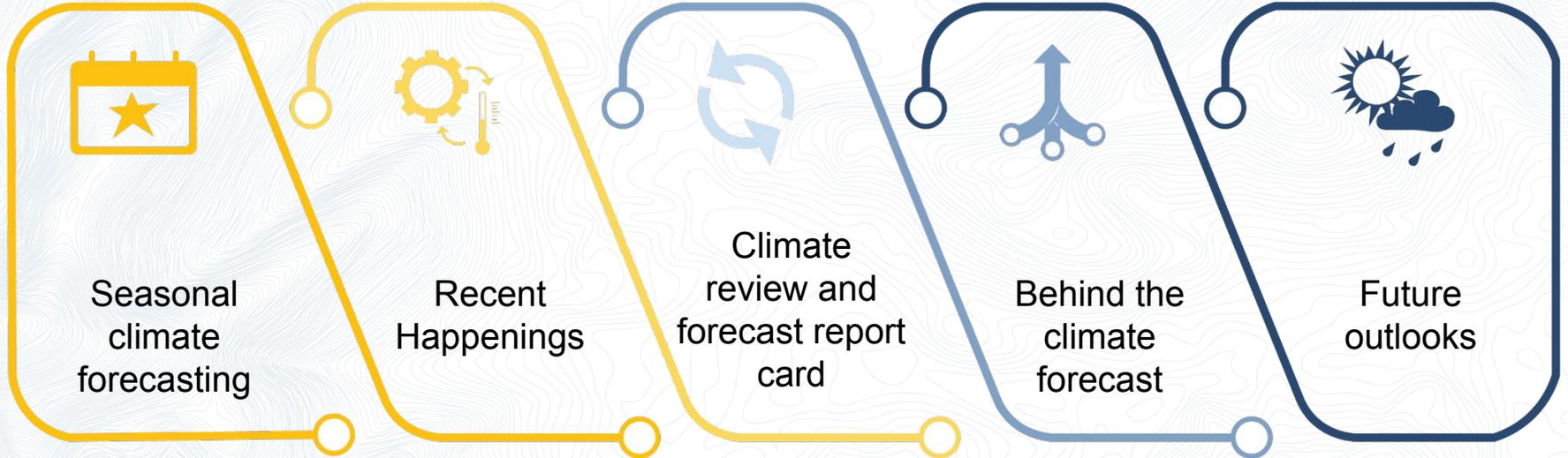




Alaska climate outlook briefing December 2024

Rick Thoman
ACCAP Climate Specialist
December 20, 2024





Seasonal
climate
forecasting

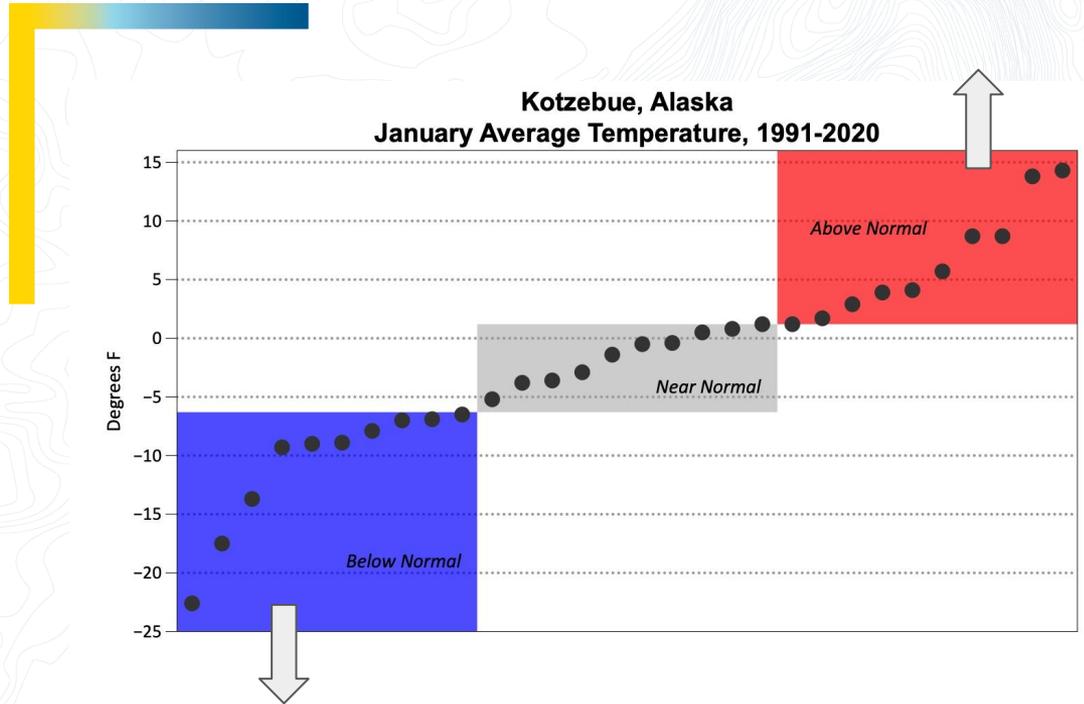


NOAA Center for Weather and Climate Prediction

Climate Prediction Center (CPC) ➤
primary NOAA/NWS forecast responsibility
for two weeks to a year in the future

The basics

- Relation to long-term normal (1991-2020)
- 3 categories
- Probabilistic
- Temperature
 - Centered on average
- Precipitation
 - Centered on median > can significantly differ from “normal”
- Normals temperature and precip ranges for selected Alaska places at ACCAP climate graphics





Recent Happenings

- **Statewide:** December 10th: second warmest Dec day for Alaska since 1950
- **Northwest Alaska:** Highest December temps
 - Kotzebue Dec 11: 39F
 - Nome Dec 11: 44F and schools closed two days due to ice and rain
- **Central Interior:** Coldest Thanksgiving since 1994
- **Southcentral:**
 - Homer Dec 12-13: heavy snow and ice, widespread power outages
 - Anchorage: 2.7 inches snow since Nov 15, third lowest mid-Nov to mid-Dec total



Homer area

December 13, 2024

Photo credit: Homer Electric Association



Climate Review

- What happened?
- How did climate outlooks perform?

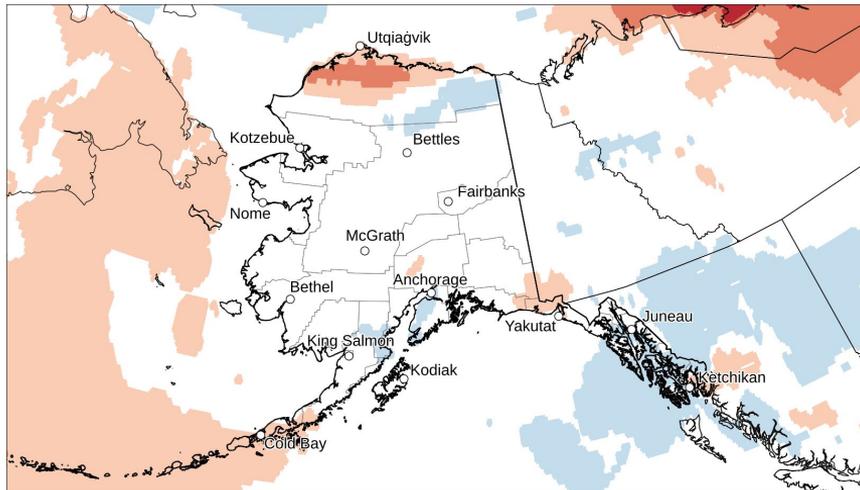


Aurora over Tok

Photo credit: K. Turk

Model- based regional analysis > Average temperatures

Temperature Classification for Nov 2024



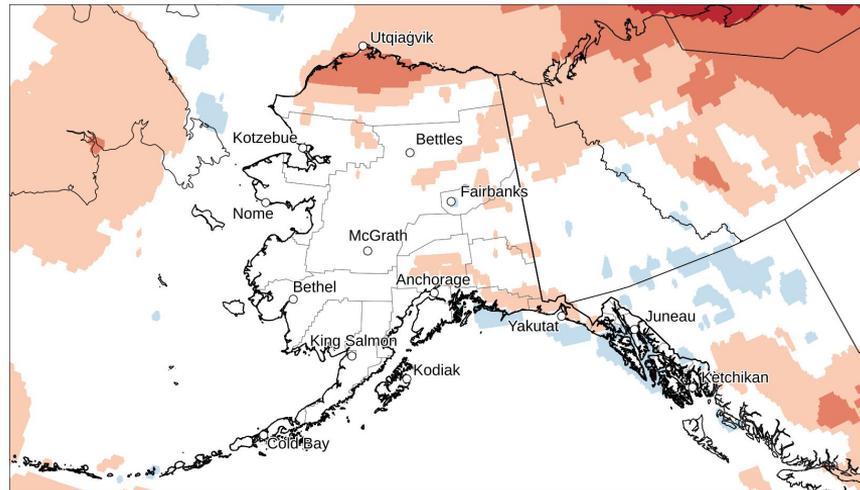
Source: ERA5 Reanalysis

Map by: Brian Brettschneider

Record **Much Below** **Below** **Near Normal** **Above** **Much Above** **Record**

Compared to 1991-2020 Base Period (Records Since 1950)

Temperature Classification for Sep-Nov 2024



Source: ERA5 Reanalysis

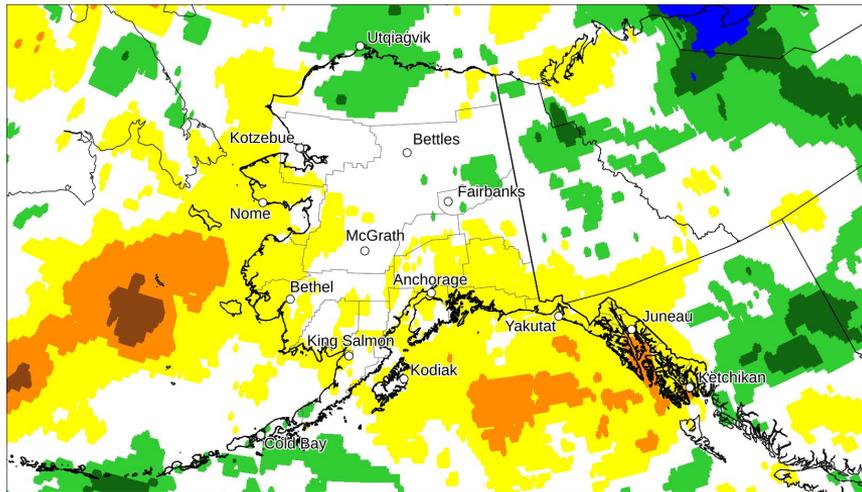
Map by: Brian Brettschneider

Record **Much Below** **Below** **Near Normal** **Above** **Much Above** **Record**

Compared to 1991-2020 Base Period (Records Since 1950)

Model- based regional analysis > Total precipitation

Precipitation Classification for Nov 2024



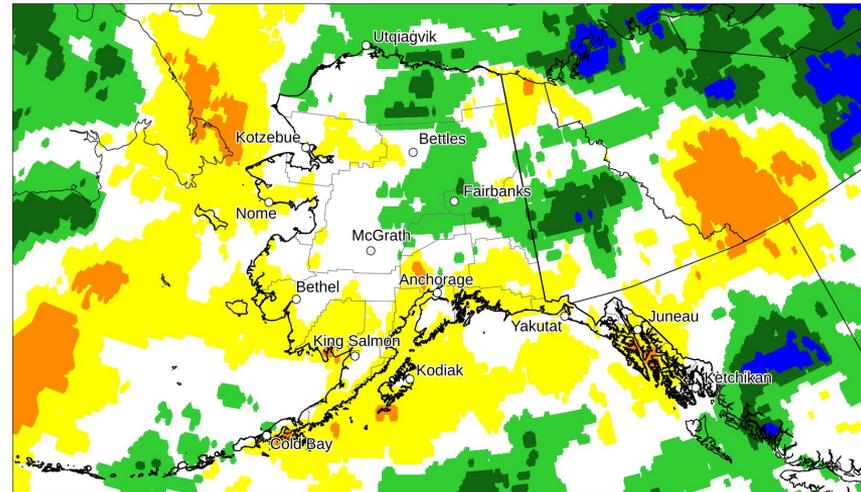
Source: ERA5 Reanalysis

Map by: Brian Brettschneider



Compared to 1991-2020 Base Period (Records Since 1950)

Precipitation Classification for Sep-Nov 2024



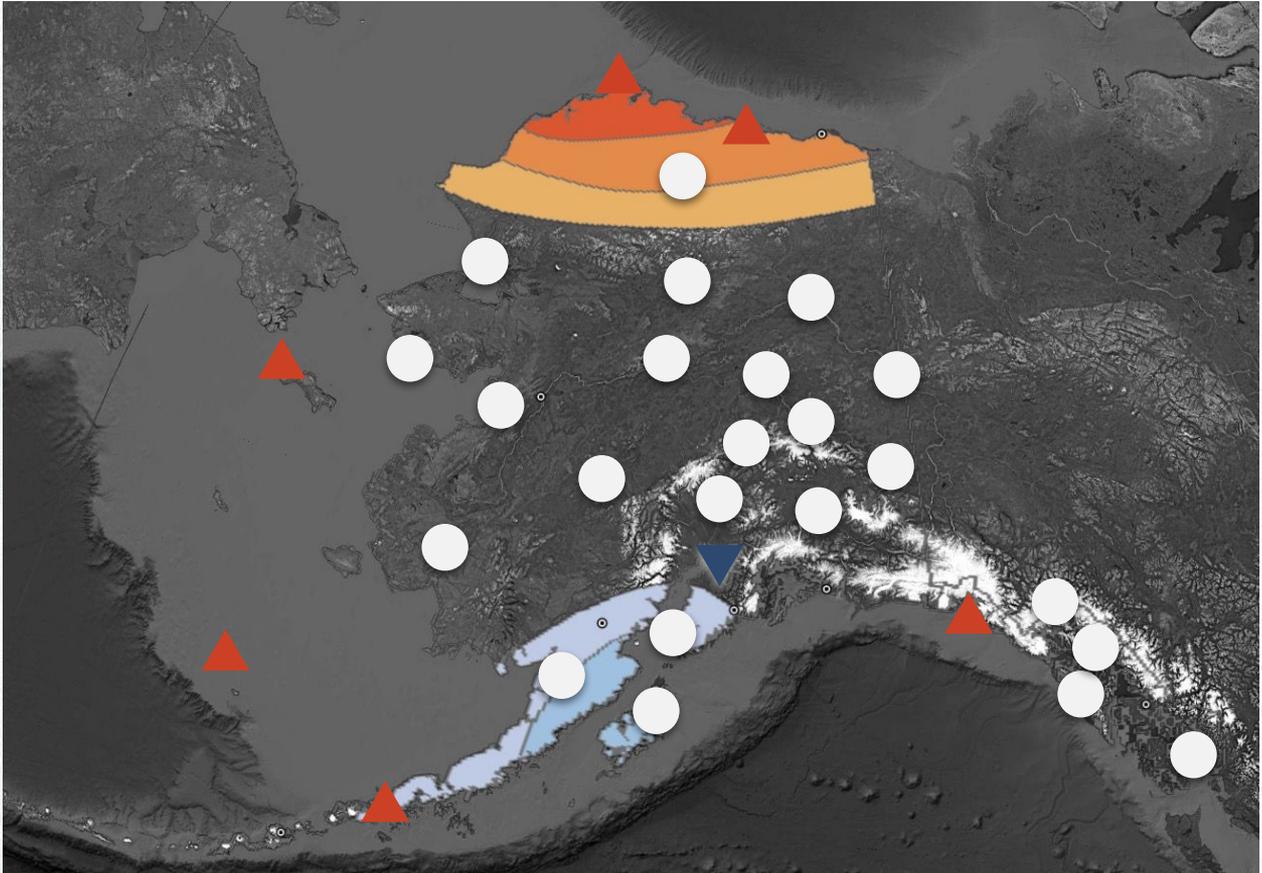
Source: ERA5 Reanalysis

Map by: Brian Brettschneider



Compared to 1991-2020 Base Period (Records Since 1940)

November 2024 temperature > CPC outlook and observed



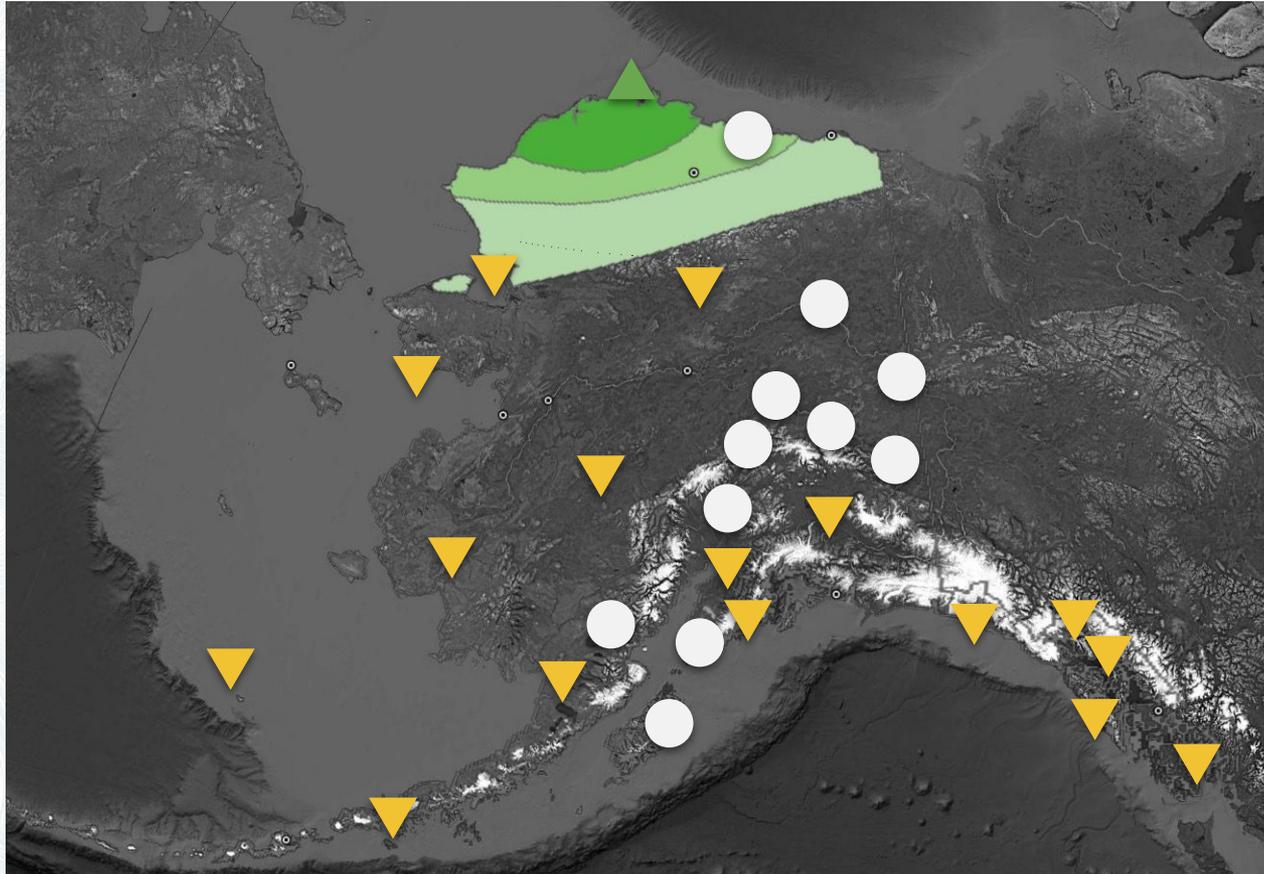
Non-EC skill score: 0

Percent correct: 33%

Mid-month outlook

- ▲ Above normal
- Near normal
- ▼ Below normal

November 2024 precipitation > CPC outlook and observed



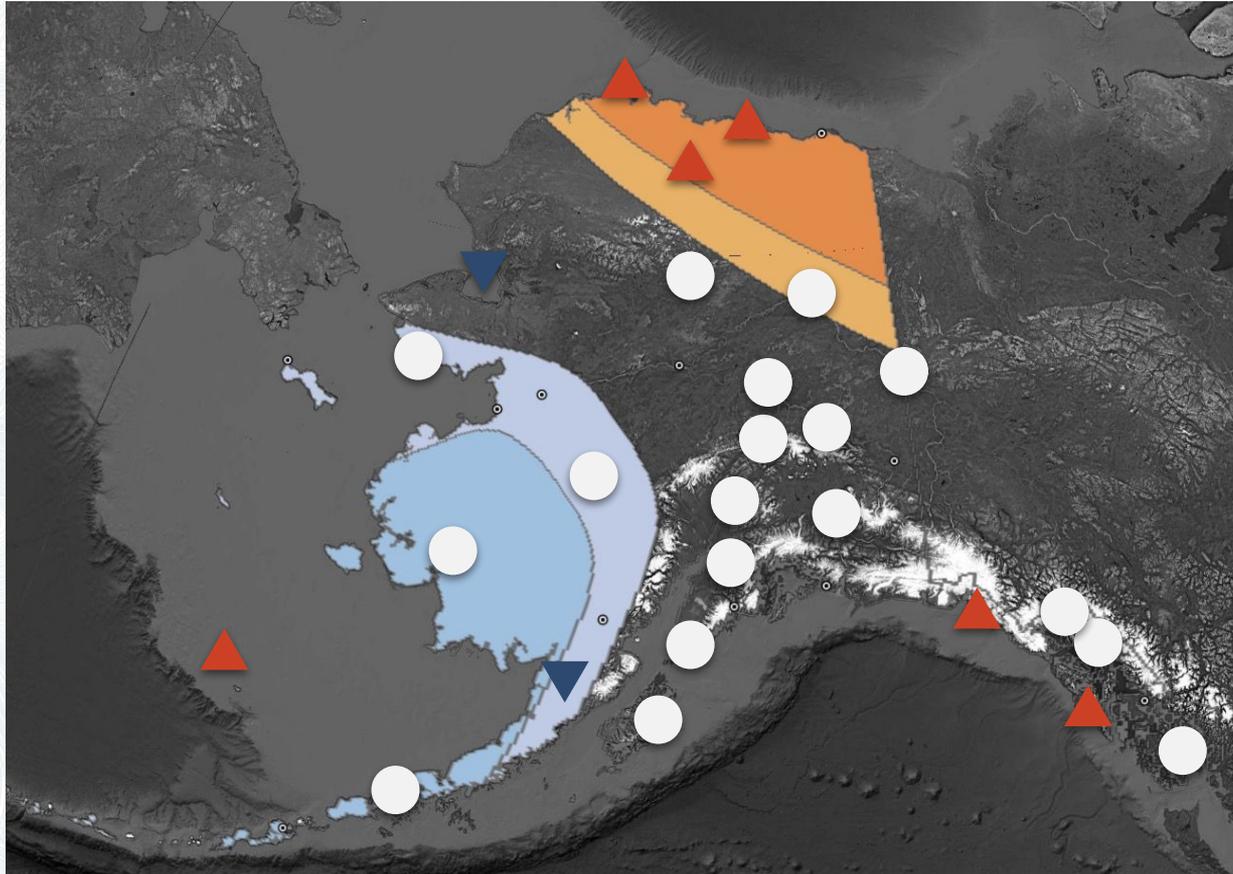
Non-EC skill
score: 0

Percent
correct: 33%

Mid-month
outlook

- ▲ Above normal
- Near normal
- ▼ Below normal

September-November 2024 temperature > CPC outlook & observed

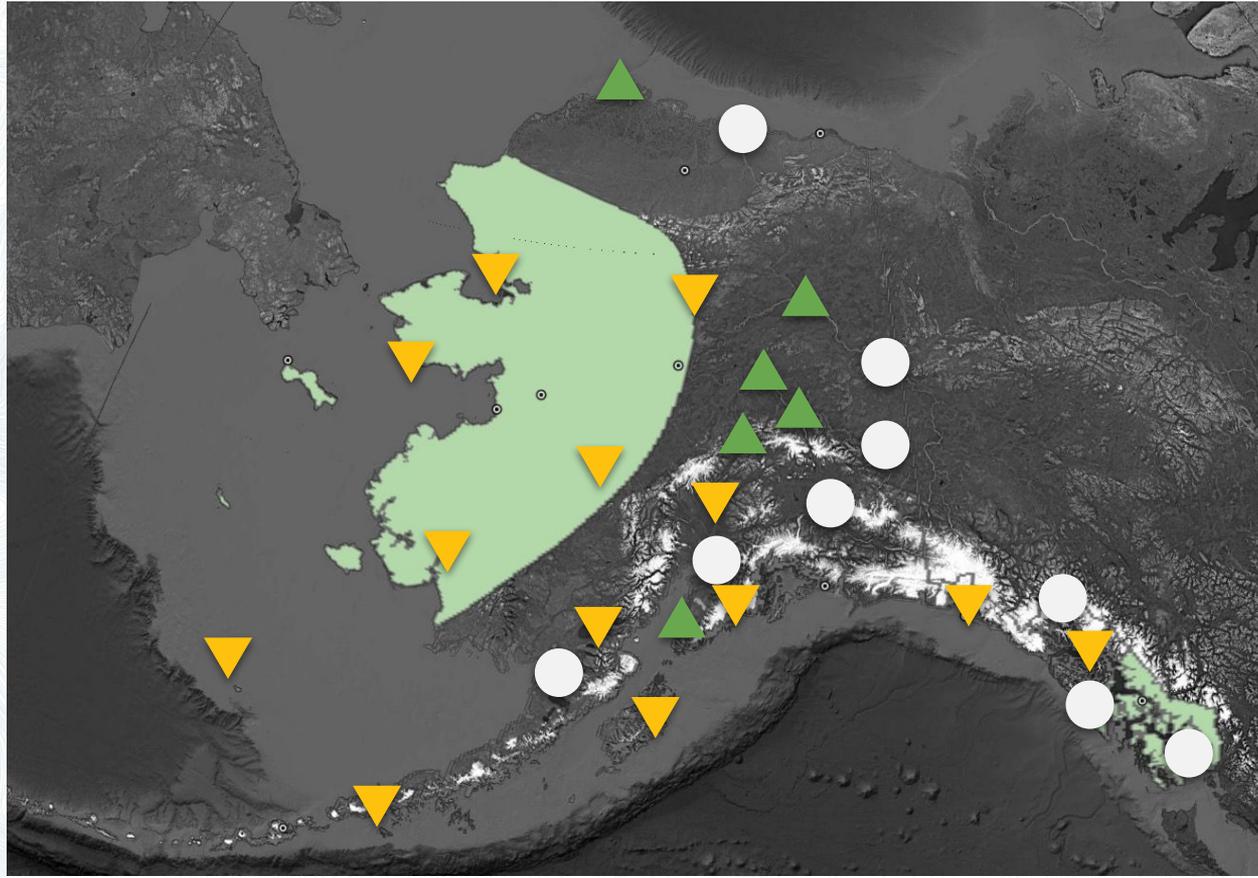


Non-EC skill
score: -20

Percent
correct: 20%

- ▲ Above normal
- Near normal
- ▼ Below normal

September-November 2024 precipitation > CPC outlook & observed

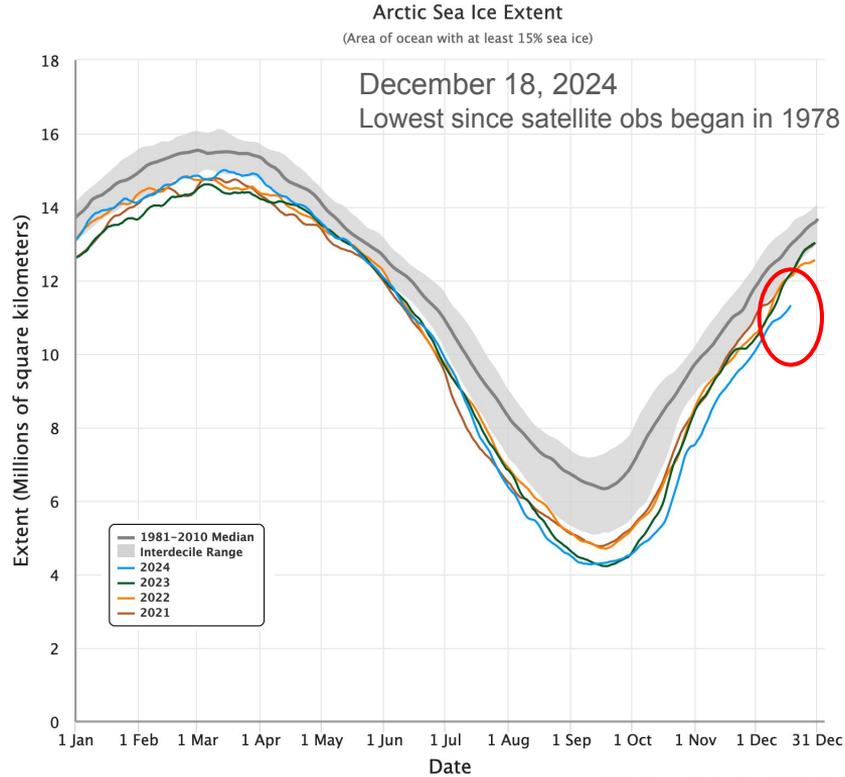


Non-EC skill
score: -50

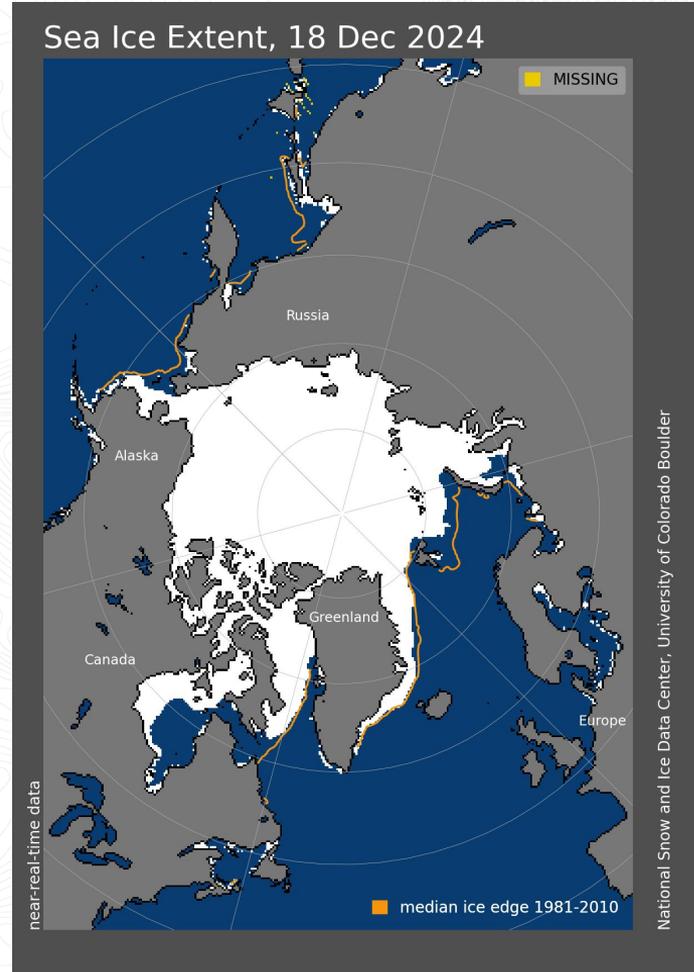
Percent
correct: 0%

- ▲ Above normal
- Near normal
- ▼ Below normal

Arctic wide sea ice

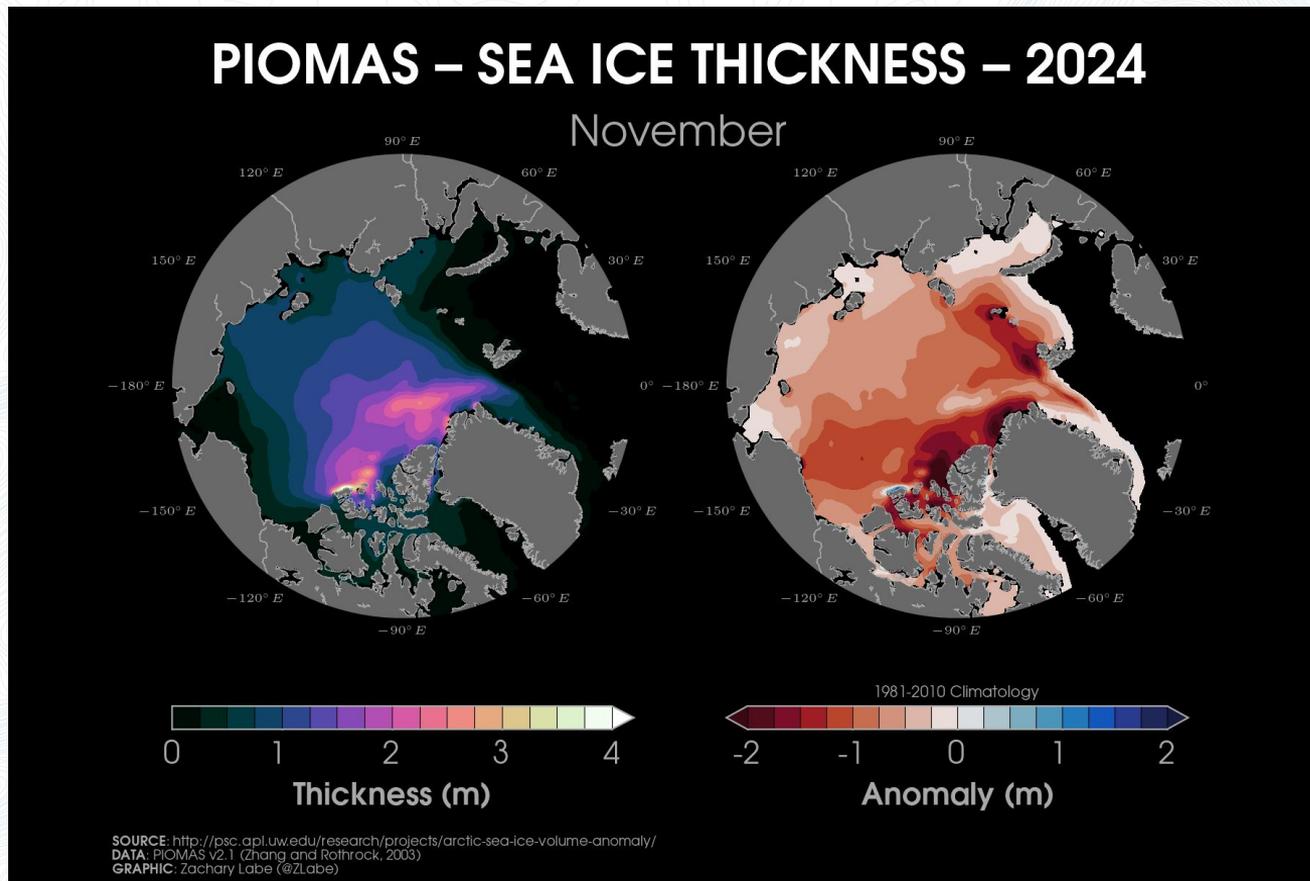


National Snow and Ice Data Center, Boulder, CO



Arctic sea ice thickness

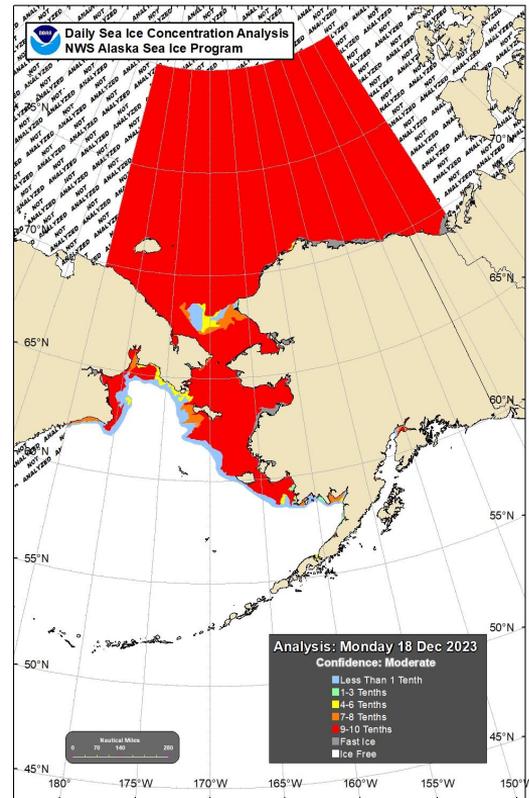
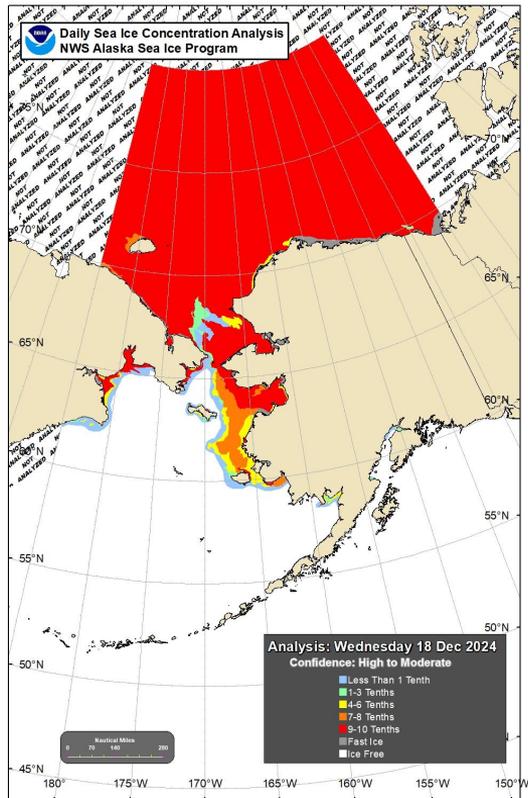
Sources:
Data from U.
Wa./PIOMAS data
Graphics by Z. Labe,
Princeton U.



December 18, 2024

December 18, 2023

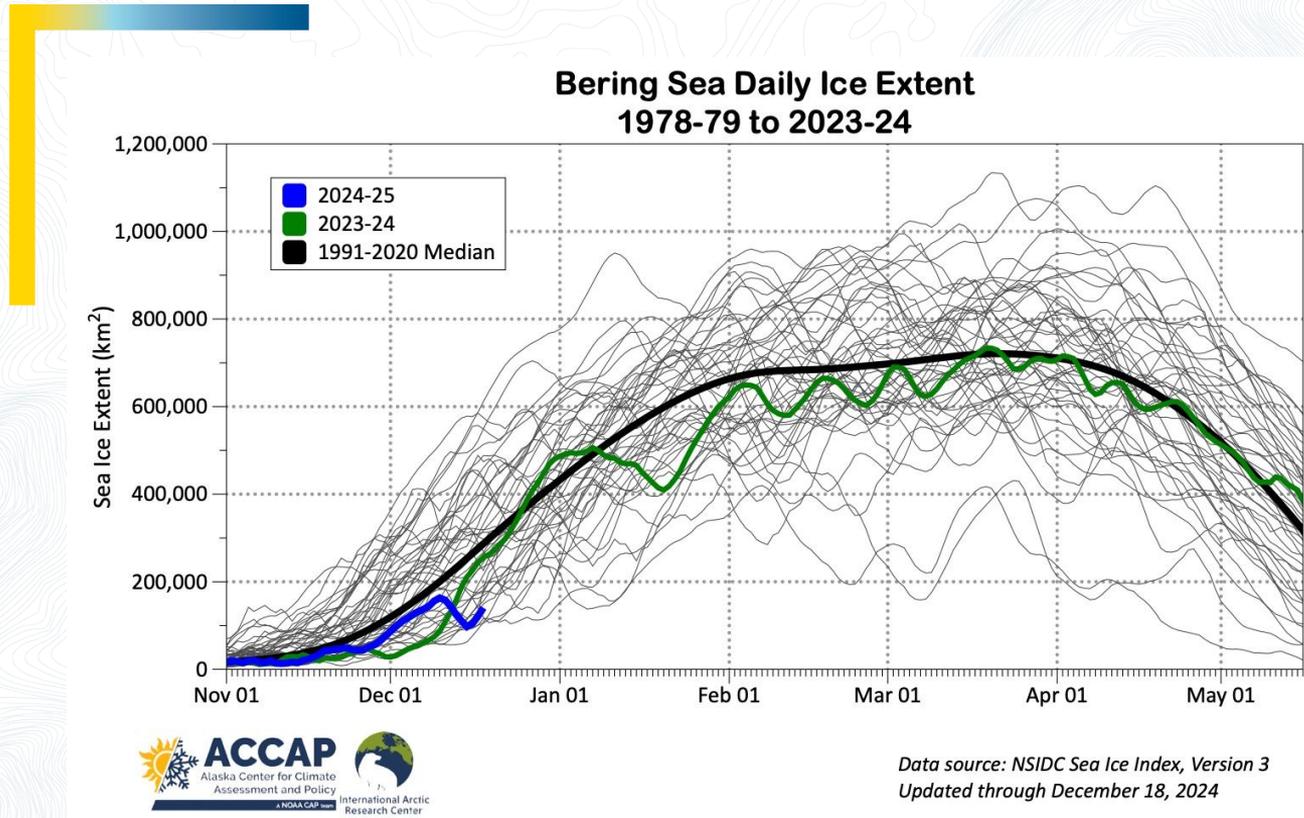
Mid-December sea ice comparison



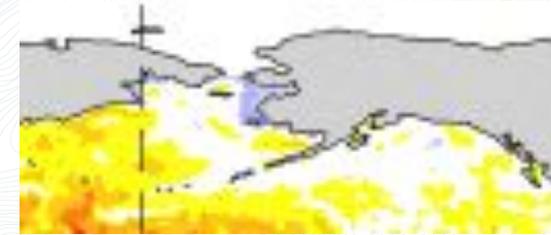
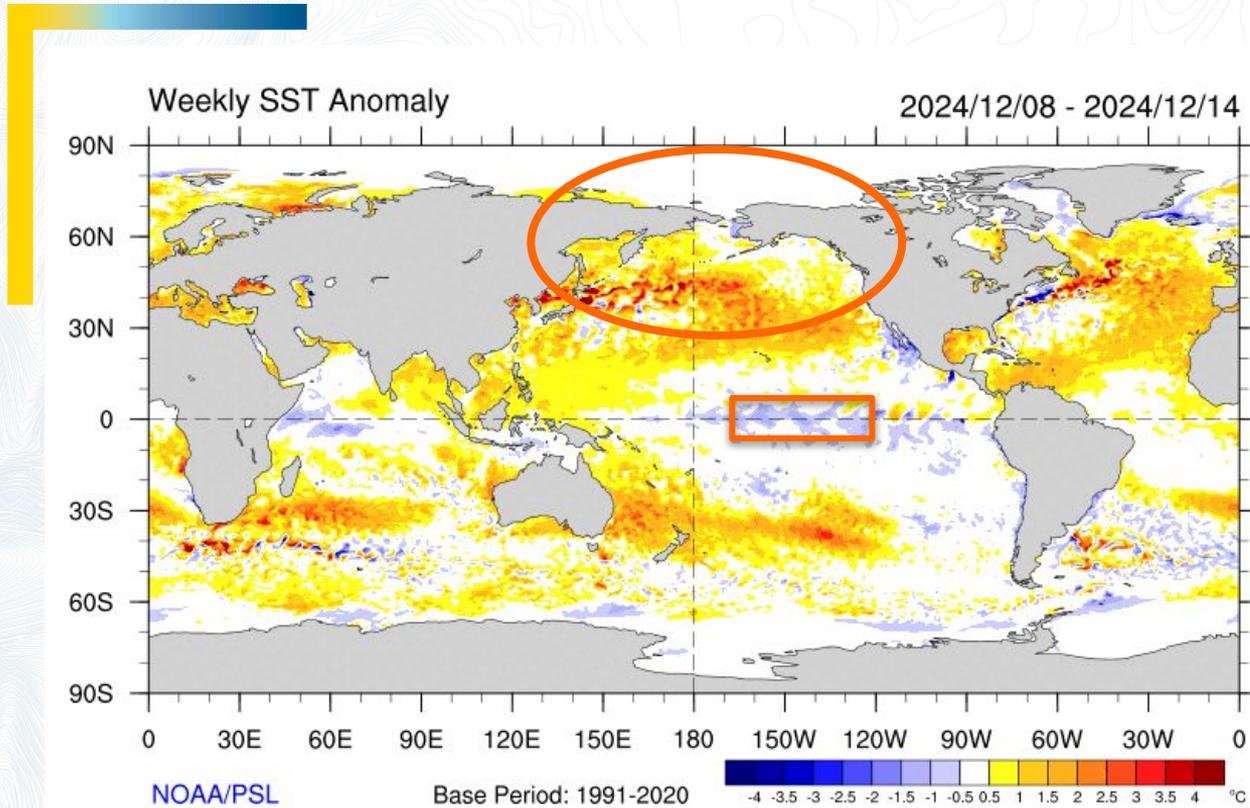
Source: National Weather Service
Alaska Region Sea Ice Program

Sea ice extent through the season

Sources:
Data NSIDC Sea Ice Index,
Version 3.



Global sea surface temperature departure from normal

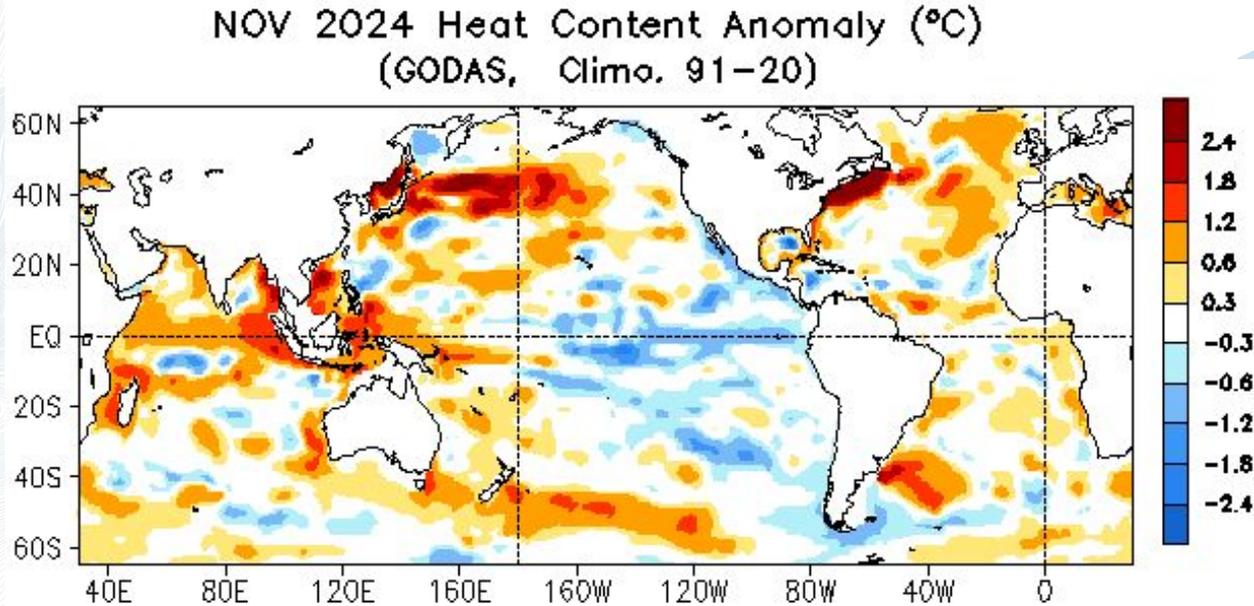


ONI for **Sep-Nov**: -0.2

PDO for **Nov 2024**: -2.1

Sources: ONI from CPC
PDO Index from WCS

Upper ocean heat departure from average



Little change in the Gulf of Alaska

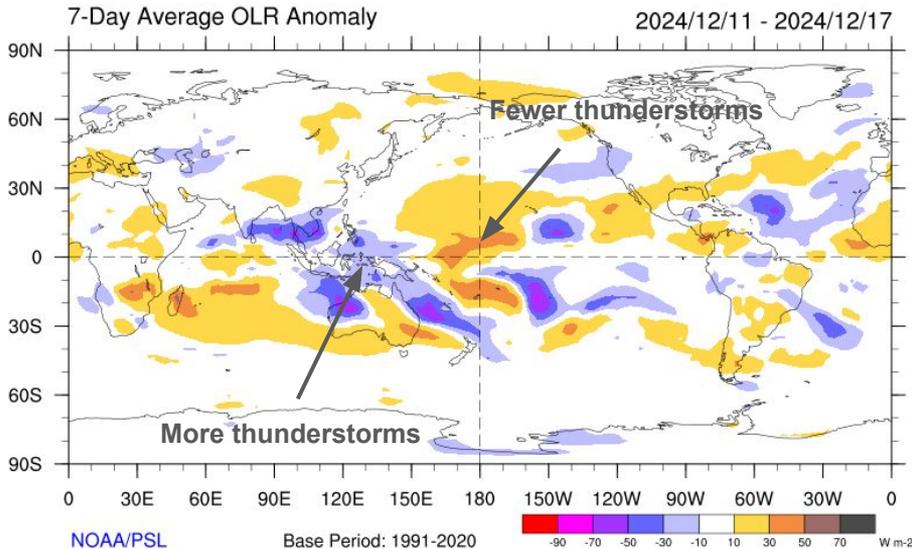
Upper 300 meters of the ocean

Source: NOAA/CPC

Tropical Pacific atmosphere

Sep-Nov Oceanic Niño Index: -0.2

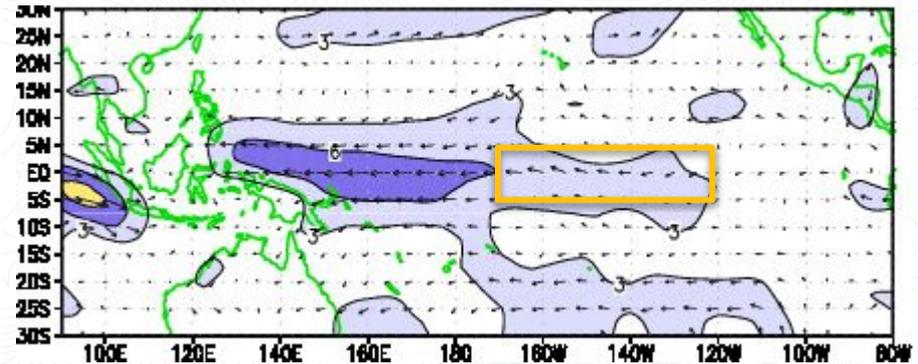
Deep tropical convection
Via “outgoing longwave radiation”



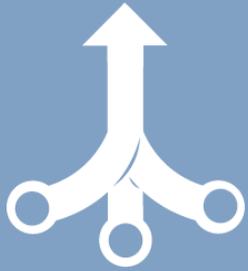
Above average trade winds
Niño Region 3.4



Trade winds
850 mb wind difference from average
Nov 17-Dec 16, 2024



Behind the
climate
forecast



El Niño/La Niña (ENSO) > expert
evaluation

Statistical models > using the past

Dynamical models > All physics, all
the time

- Sea surface temperatures
- Sea Ice
- Temperature and Precipitation

CPC Niño 3.4 forecasts > experts

November 2024

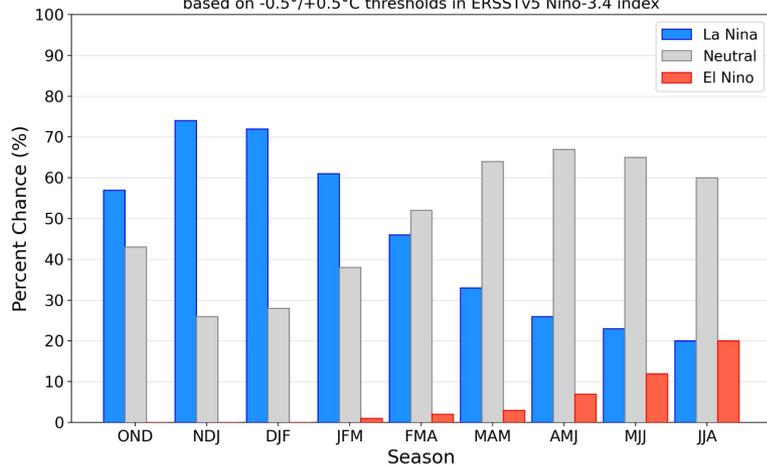
December 2024

ENSO Alert System Status:
La Niña Watch



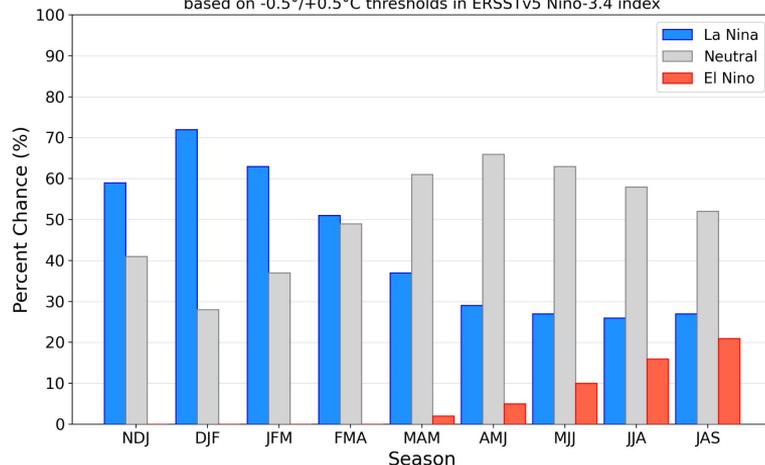
Official NOAA CPC ENSO Probabilities (issued November 2024)

based on $-0.5^{\circ}/+0.5^{\circ}\text{C}$ thresholds in ERSSTv5 Niño-3.4 index



Official NOAA CPC ENSO Probabilities (issued December 2024)

based on $-0.5^{\circ}/+0.5^{\circ}\text{C}$ thresholds in ERSSTv5 Niño-3.4 index



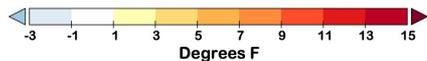
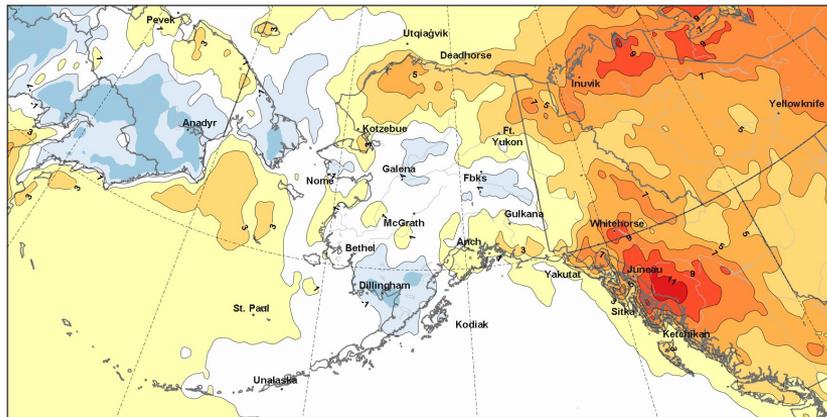
**Statistical
guidance** ➤
using the past
to predict the
future

- Long term trends
- Optimum climate normals: Alaska trends the past 15 years
- La Niñas since 1976

January half century trends

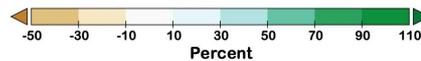
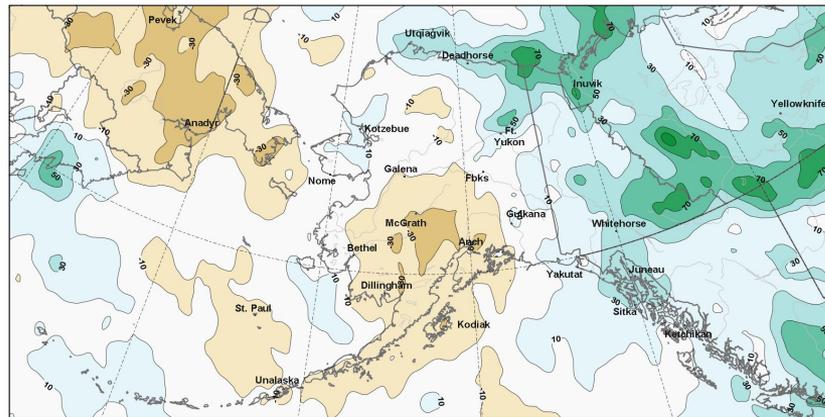
Temperatures

Change in January Average Temperature
1975 to 2024



Precipitation

Change in January Average Precipitation
1975 to 2024

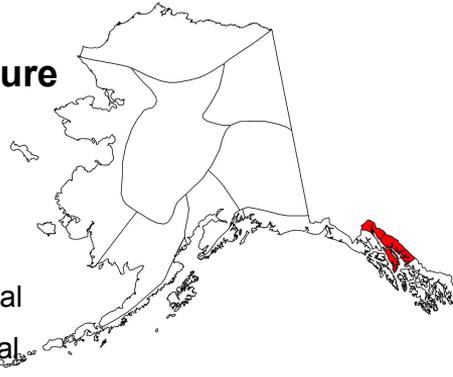
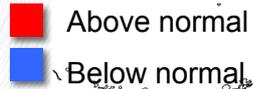


Trend over 50 years

2010 to 2024 trends

Past 15 years compared to 1991-2020

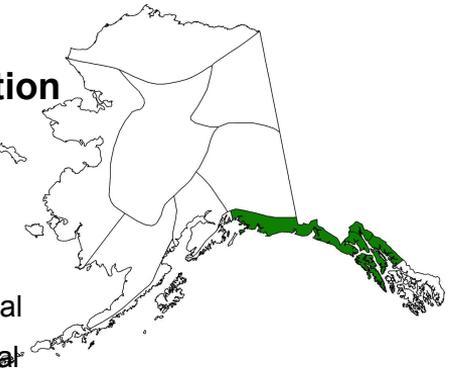
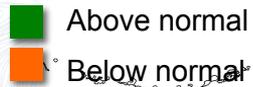
January Temperature



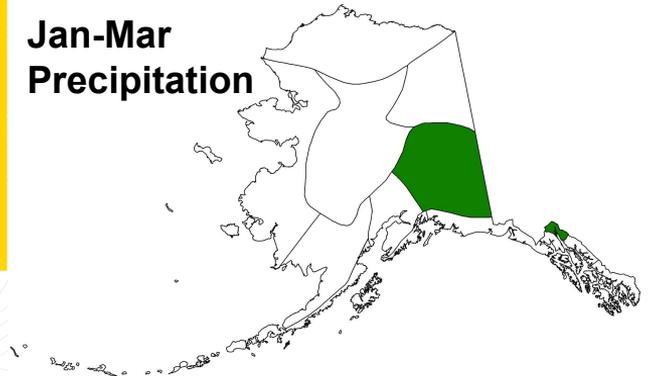
Jan-Mar Temperature



January Precipitation



Jan-Mar Precipitation



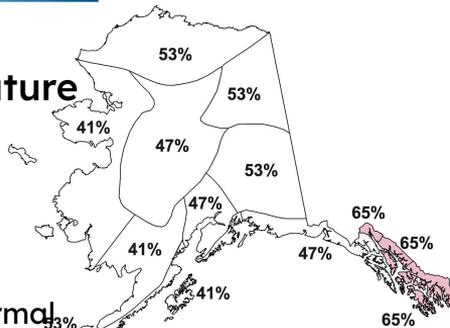
17 La Niña since 1976

1983, 1984, 1988, 1995, 1998, 1999, 2000, 2005, 2007, 2009, 2010, 2011, 2016, 2017, 2020, 2021, 2022

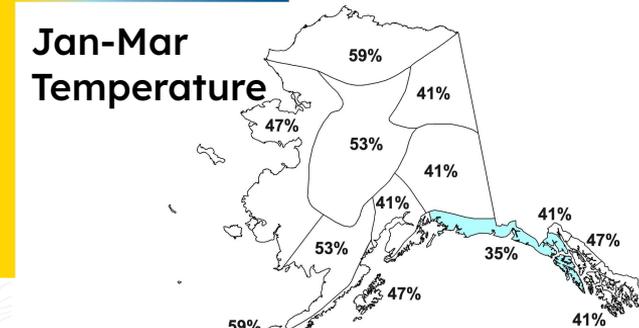
Percent years above average

January Temperature

■ Above normal
■ Below normal

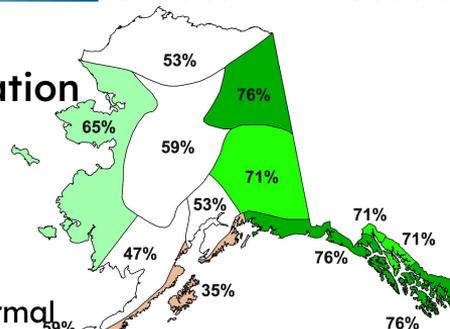


Jan-Mar Temperature

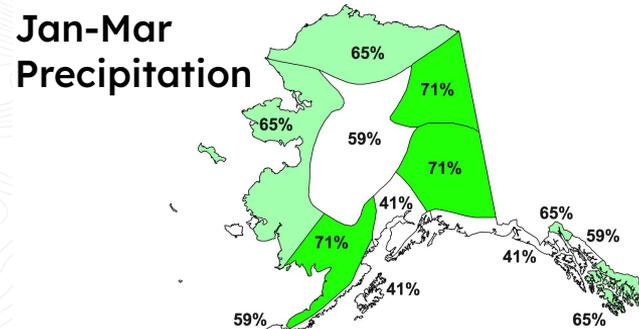


January Precipitation

■ Above normal
■ Below normal



Jan-Mar Precipitation



Dynamic model forecasts

Current suite of Dynamic Climate Models

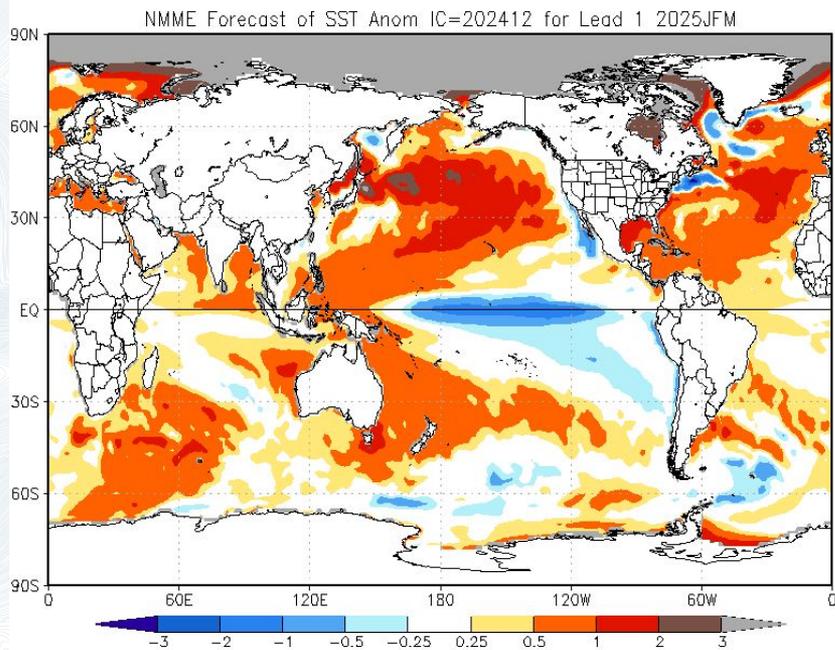
- CPC Experimental Sea Ice Ensemble
- World Climate Service Multi-Model Ensemble
- North American Multi-Model Ensemble (NMME)

What's being forecasted

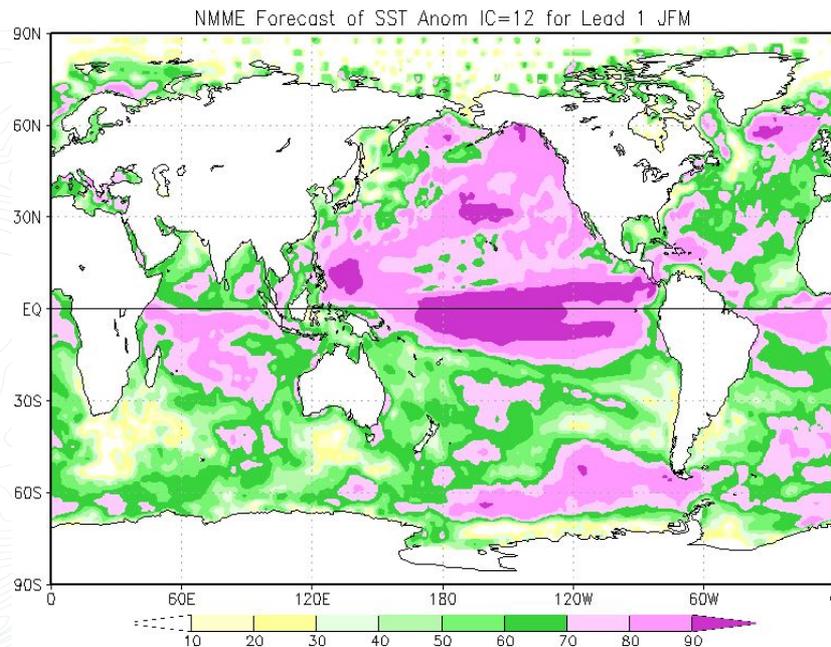
- Sea surface temperatures
- Sea ice forecast
- Temperature and precip relative to normal

January-March 2025 sea surface temperature ➤ NMME

Forecast
departure from normal

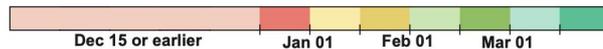
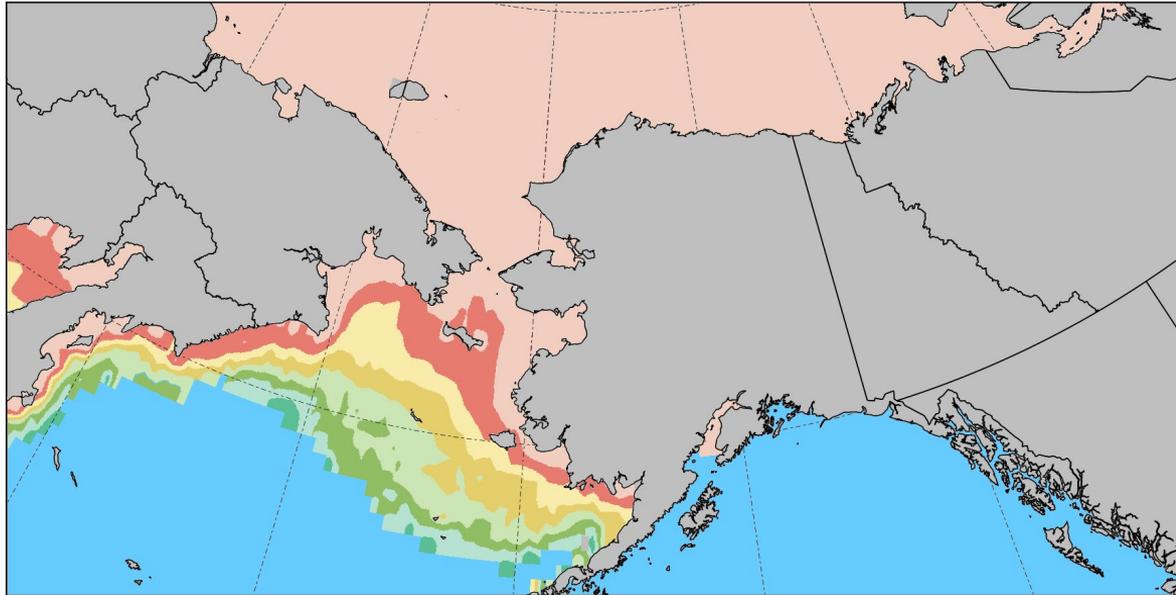


Skill
of the forecast



Experimental sea ice forecast > CPC

Freeze-up: first date sea ice concentration ≥ 15 percent
Autumn/Winter 2024-25



Outlook is the 20-models average date of first occurrence of ice concentration 15 percent or higher

Forecast made in late November
Data: NOAA/CPC Exp. Sea Ice Outlook

January 2025 calibrated probability forecast ➤ NMME

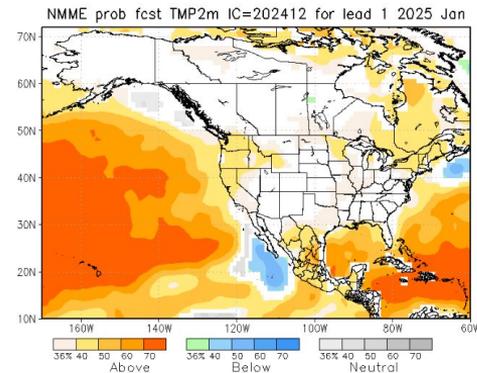
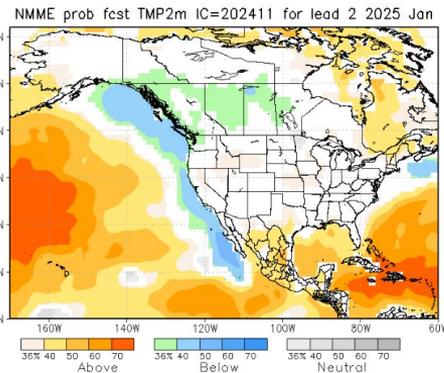
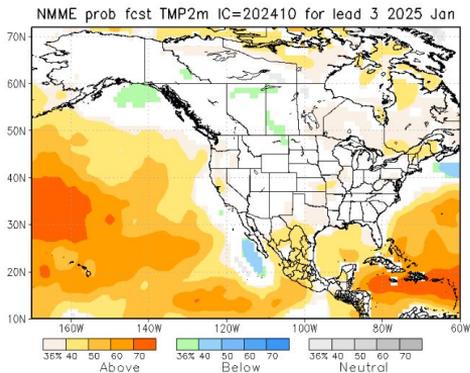
Forecast from →

October

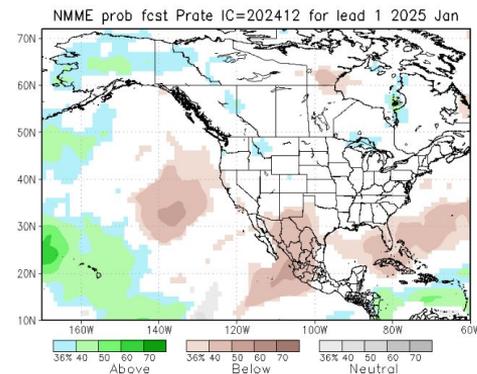
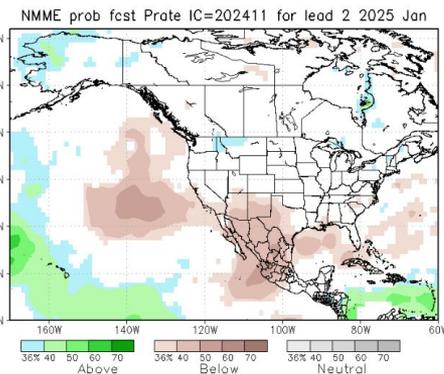
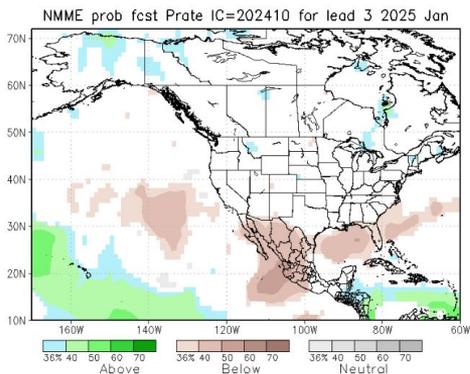
November

December

Temperature



Precipitation

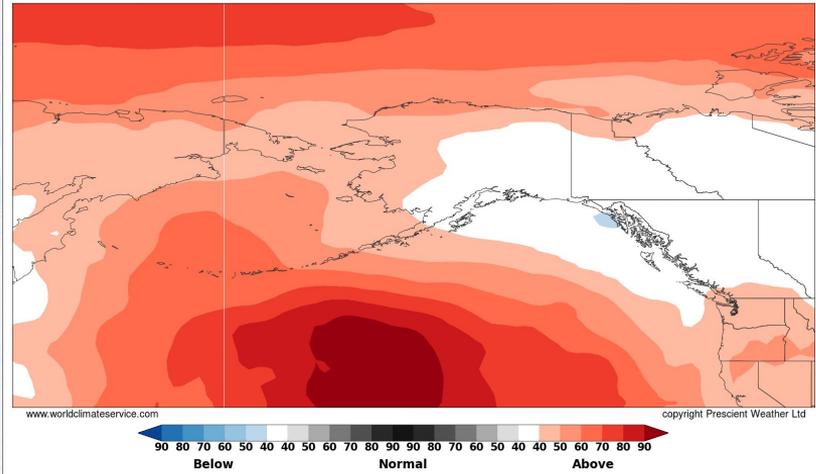


January 2025 outlooks ➤ World Climate Service

Temperature



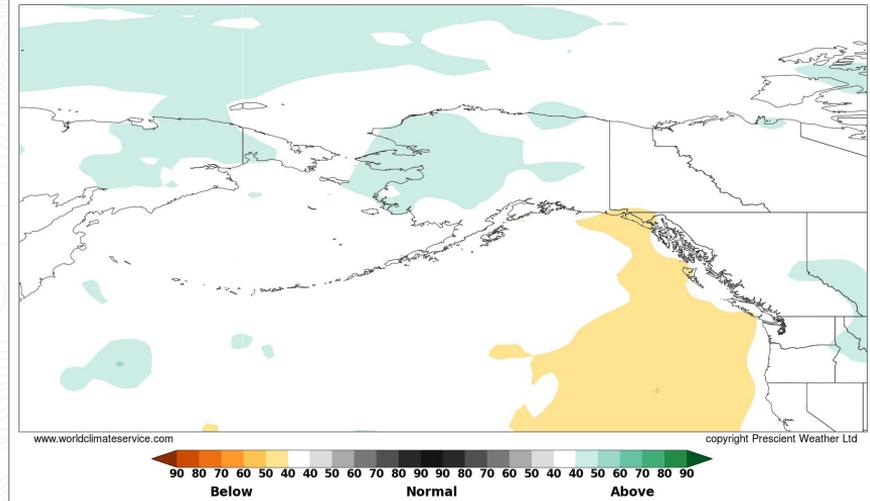
Multi-Model T2m Probability Above/Normal/Below
Forecast Valid January 2025
Initialized December 2024 1991-2020 Climatology



Precipitation



Multi-Model Precipitation Probability Above/Normal/Below
Forecast Valid January 2025
Initialized December 2024 1991-2020 Climatology



Bias Corrected, Skill Weighted CFS + ECMWF

January-March 2025 calibrated probability forecast ➤ NMME

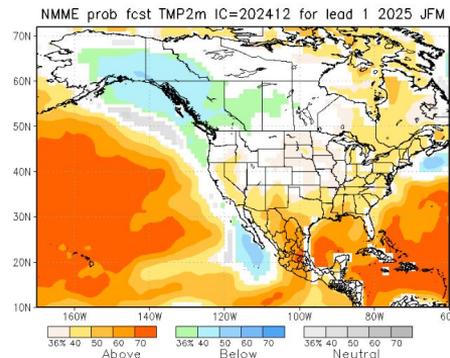
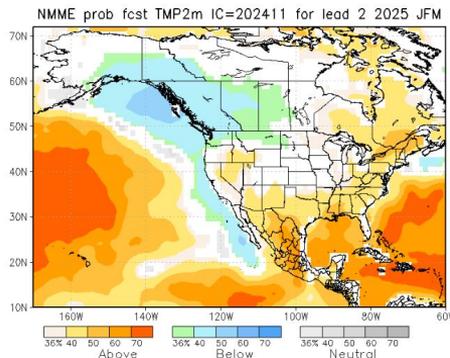
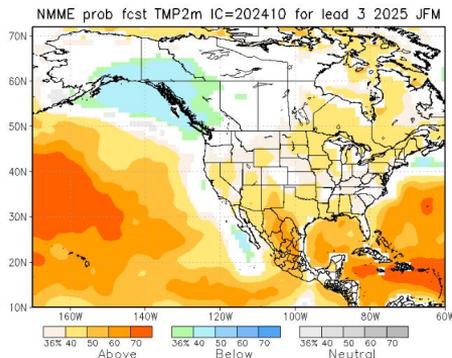
Forecast from →

October

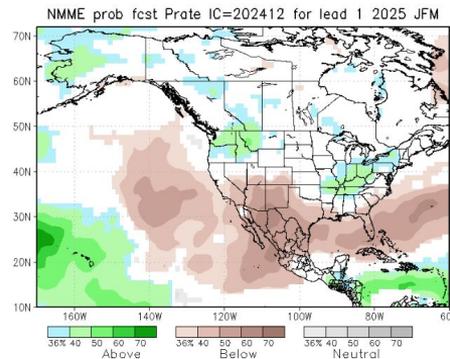
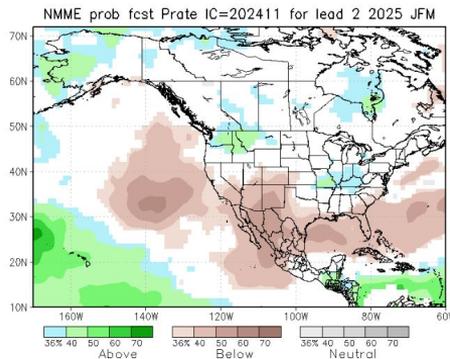
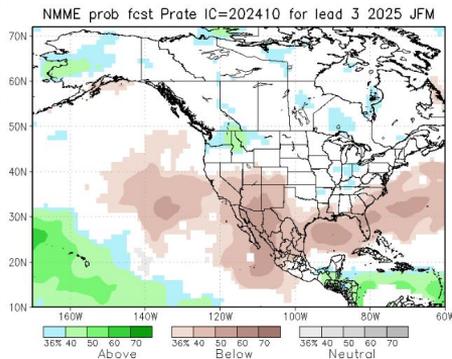
November

December

Temperature



Precipitation



January-March 2025 outlooks > World Climate Service

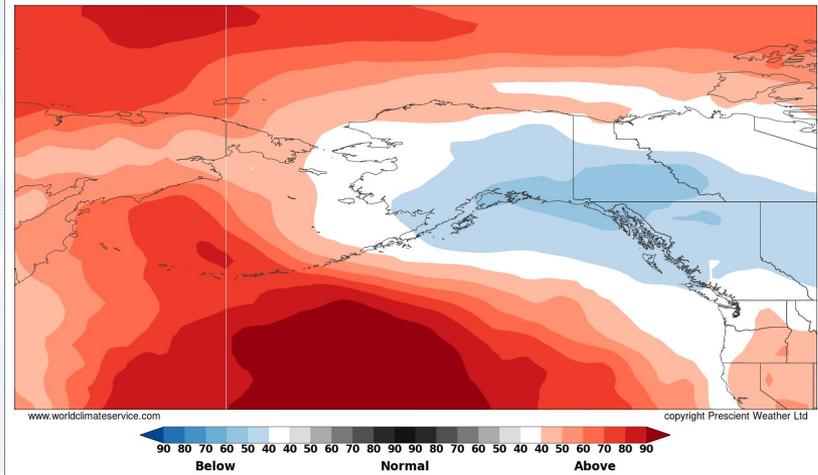
Temperature



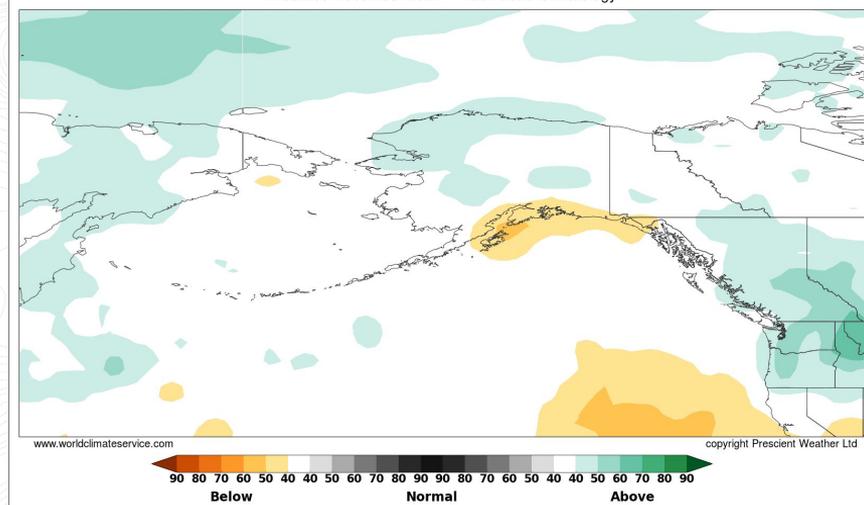
Precipitation



Multi-Model T2m Probability Above/Normal/Below
Forecast Valid Jan 2025 - Mar 2025
Initialized December 2024 1991-2020 Climatology

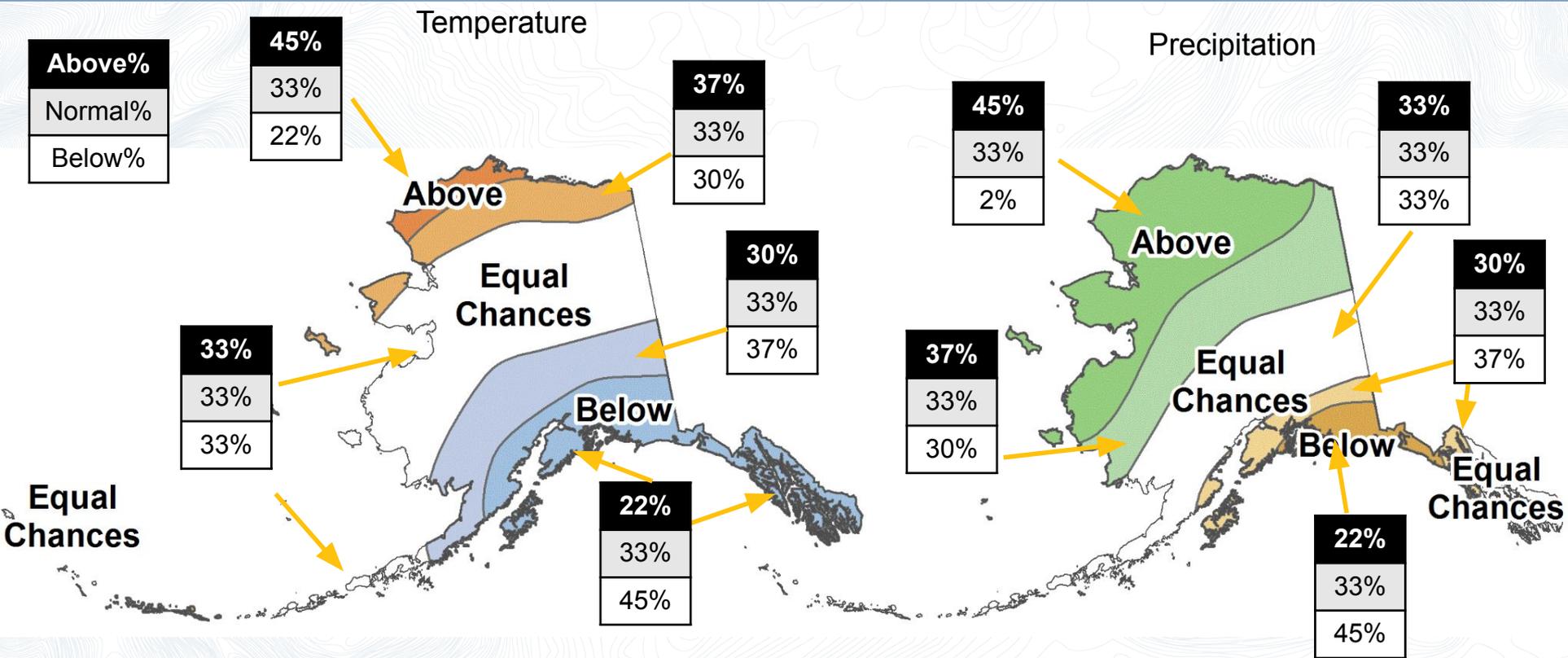


Multi-Model Precipitation Probability Above/Normal/Below
Forecast Valid Jan 2025 - Mar 2025
Initialized December 2024 1991-2020 Climatology



Bias Corrected, Skill Weighted CFS + ECMWF

January-March 2025 outlooks from **November**



Future
outlook

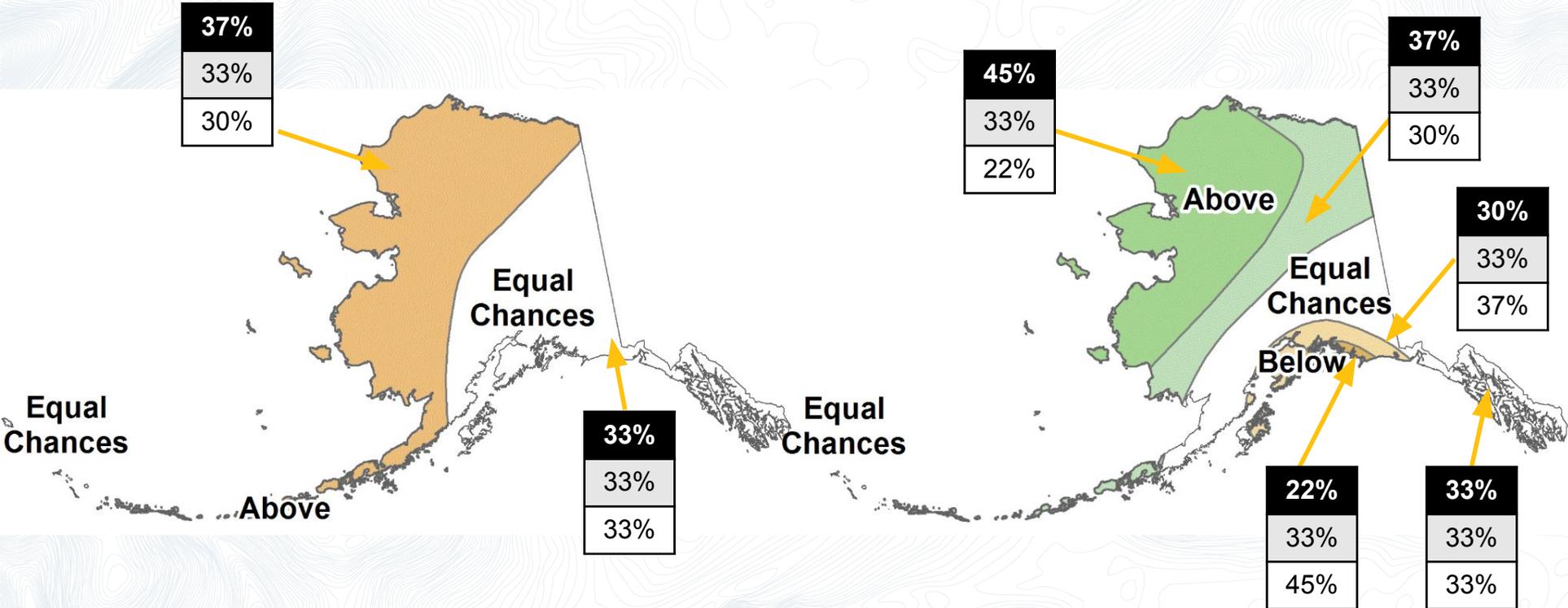


And the answer is...

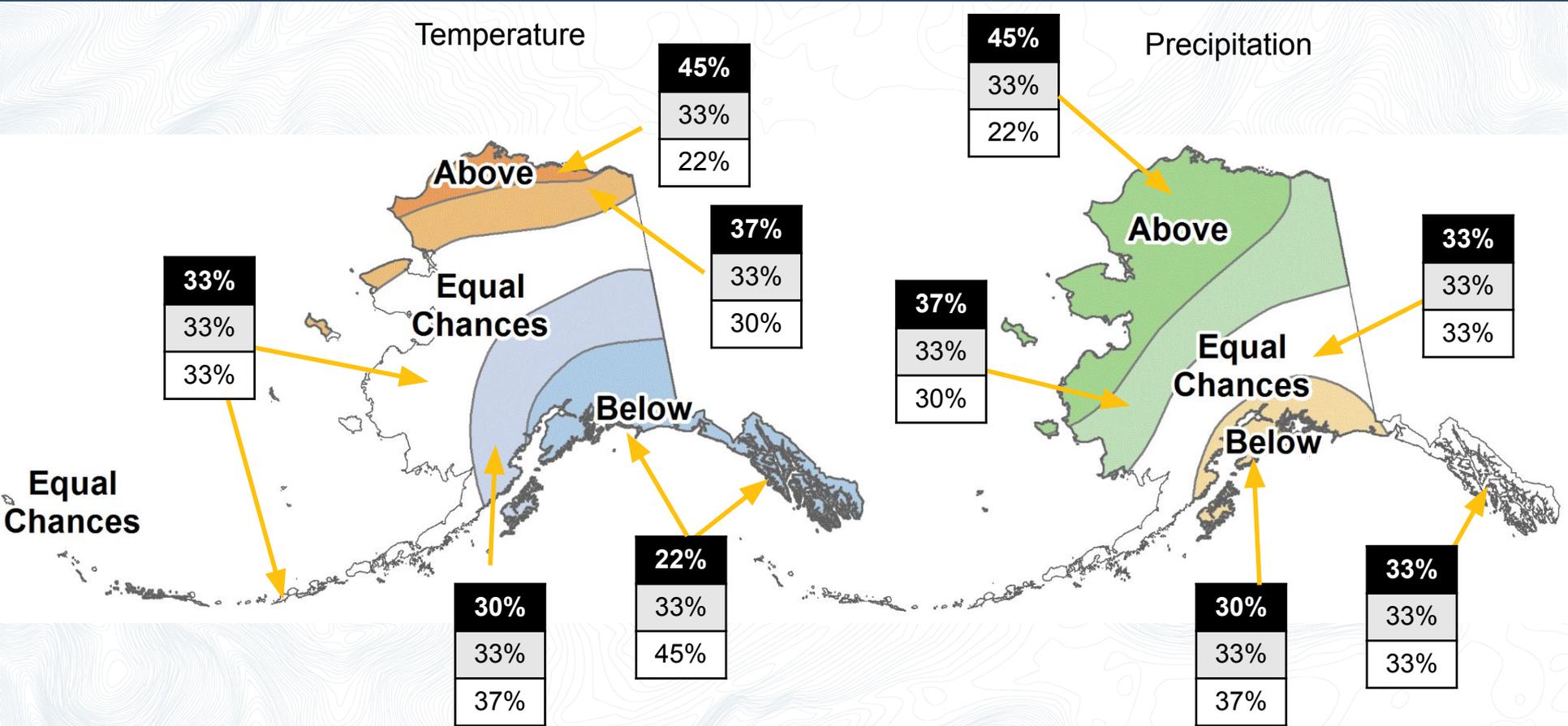
CPC January 2025 outlooks

Temperature

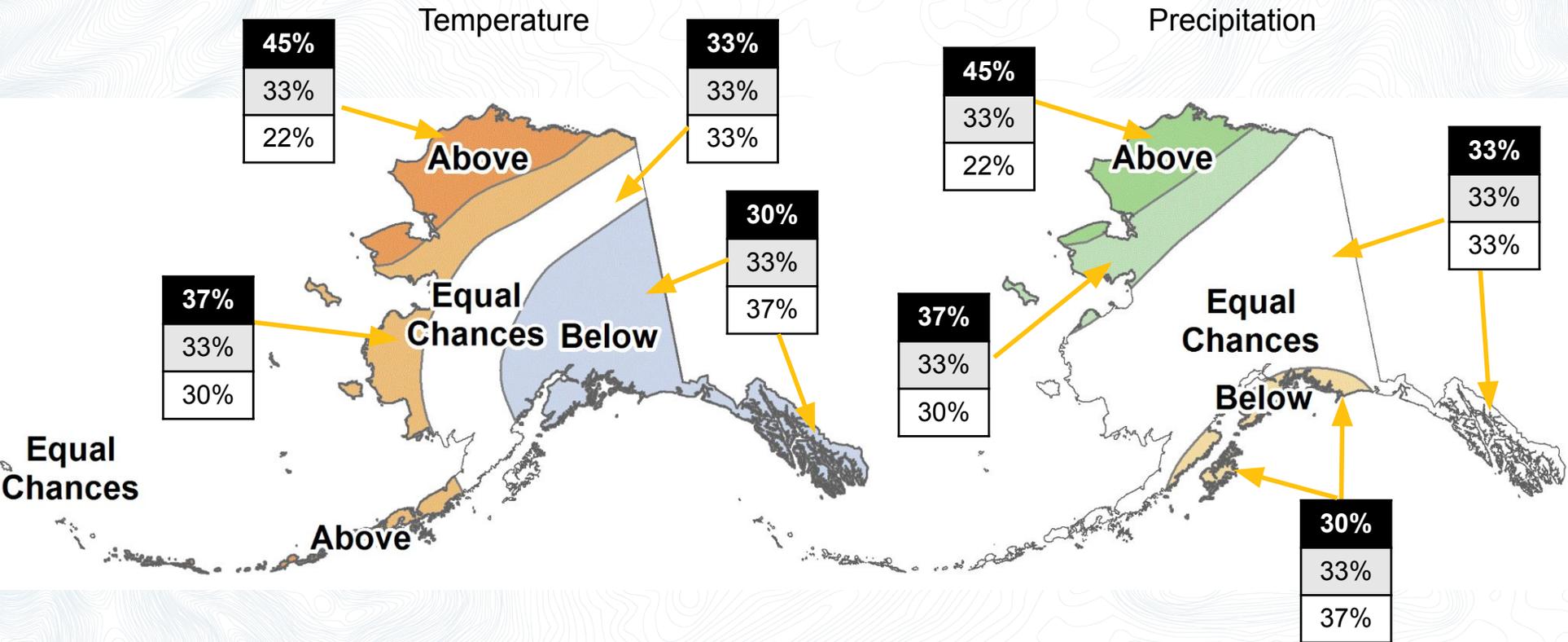
Precipitation



CPC January-March 2025 outlooks



Spring 2025 outlook



Brand new reports



<https://uaf-accap.org/alaskas-changing-environment/>



<https://arctic.noaa.gov/report-card/report-card-2024/>

Upcoming ACCAP webinars

Upcoming ACCAP webinars accap.uaf.edu/events

- January 17 ▶ *NWS Alaska Climate Outlook Briefing*
- January 21 ▶ *Alaska Changing Environment*
- January 22 ▶ *VAWS: water vapor, blowing snow and sea spray*

Email Rick Thoman rthoman@alaska.edu



ACCAP is housed at the International Arctic Research Center on the University of Alaska Fairbanks Troth Yeddha' Campus