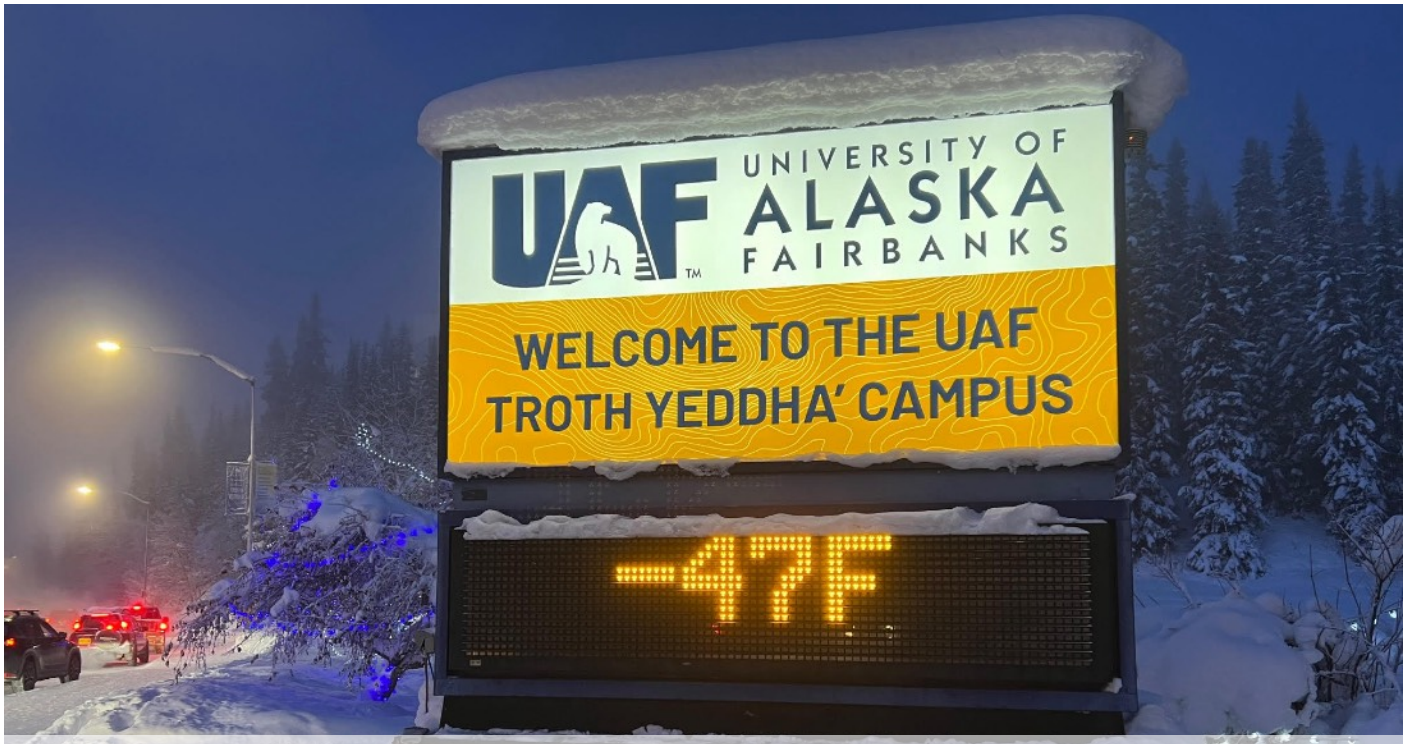
Alaska Climate Research Center
The Alaska State Climate Center



STATEWIDE CLIMATE SUMMARY FEBRUARY 2024

A cold morning commute to the UAF Campus in Fairbanks. Photo taken on Feb. 2nd, 2024, by Sveta Stuefer

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GEOPHYSICAL INSTITUTE
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Alaska's Statewide Climate Summary for February 2024 provides an overview of weather for the month based on data from selected weather stations throughout the state. "Departure from normal" refers to the climatological average over the 1991-2020 normal period. Here, we report on temperature, precipitation and drought conditions in the state, as well as the condition of the Arctic sea ice.

HIGHLIGHTS

Cold spell early and late in the month, warm period mid-month

Temperature swing of over 90°F in the Interior

Generally warm and wet in the west

Cooler and dry in the east and southeast

Significant Weather Events and Synoptics

February brought impressive temperature swings for all of Alaska. The late January cold spell extended into the first week of February and temperatures at the Fairbanks airport dropped to -50°F on February 2nd for the first time since 2017. Anchorage Airport also recorded the coldest day in about 15 years with a low of -21°F. The low temperatures were associated with wide spread upper level troughing that allowed cold Arctic air masses to move south (Fig. 1, top panel). The cold spell broke on February 5th with the arrival of a storm produced by a strong low pressure system in the Bering Sea. This brought high winds and blizzard conditions for the west coast. Much warmer air was pushed into Southcentral and Interior Alaska due to the southerly flow aloft.

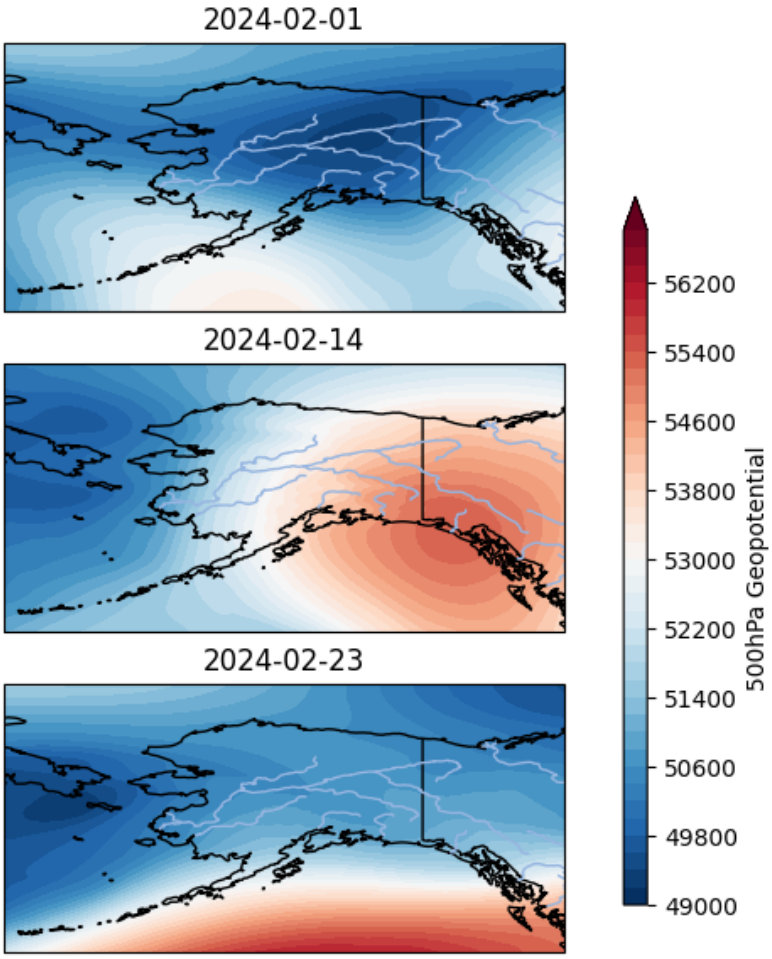

Figure 1. *500hPa Geopotential over Alaska on February 1, 14, and 23*. ERA5 reanalysis data courtesy of copernicus.eu

Starting into the second week of the month, temperatures rose even further as ridging developed over the eastern half of the state and warm air advection from the pronounced low pressure system over the Aleutians continued. In Fairbanks, high temperatures rose to over 20°F and residents reported that this "felt like summer" compared to the previous weeks of -40°F and below. The pattern of upper level troughing over the Bering Sea and extensive ridging along the coast of British Columbia and into Eastern Alaska (Fig. 1, middle panel) persisted and the southerly flow produced strong Chinook winds over the Alaska Range. This further contributed to the mild temperatures in the Interior. On February 20, Fairbanks airport reached 45°F - more than 90°F above the low of -50°F in early February. The same pattern

brought a series of storms and frequent blizzard conditions along the Bering Sea coast and in southwest Alaska.

The pattern flipped again for the last third of the month (Fig. 1, bottom panel). After a storm system in the Gulf of Alaska moved through, the ridging in the east weakened and a deep upper level low over the Chukchi and Bering Sea and eastern Russia was able to extend its reach into Alaska. This once more brought very cold Arctic air and temperatures dropped throughout the state. While this cold snap hasn't been quite as severe as the previous one, temperatures are again well below normal as we move into March, particularly in the west and Interior.

Figure 2. *Mountain wave clouds over the Alaska Range during a Chinook event as seen during a flight from Fairbanks to Anchorage on February 9th. Photo: Martin Stuefer.*

Temperature

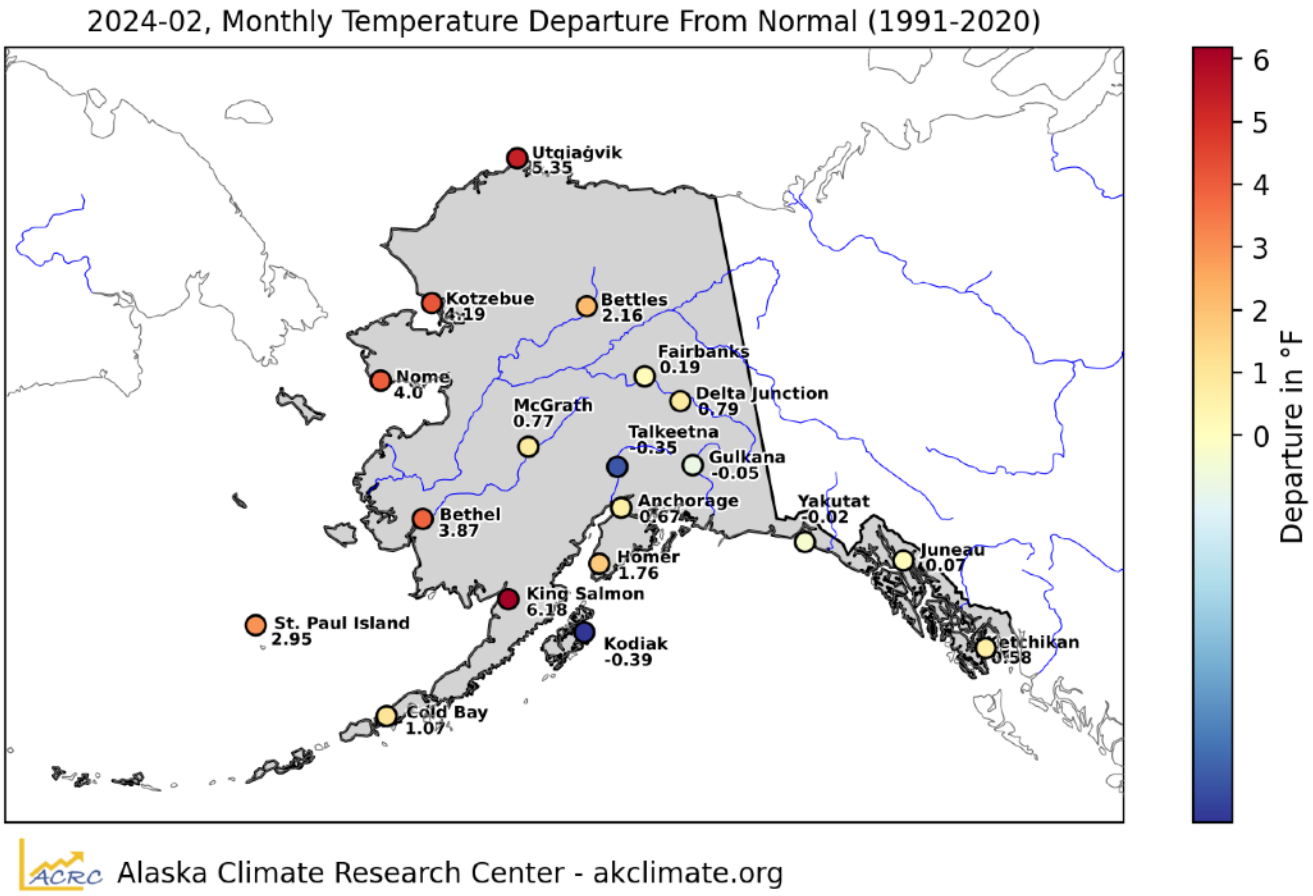

Figure 3 *Monthly mean temperature departure from normal (ºF), February, 2024, at the selected First Order stations in Alaska.*

The west coast and North Slope had a very warm month in terms of February mean temperature. The First Order stations along the Bering and Chukchi coasts all recorded between 3.9°F (Bethel) and 6.2°F (King Salmon) above normal (Fig. 3, Table 1). St. Paul Island and Cold Bay were also warmer than average but the deviations were less pronounced with +2.9°F and +1.0°F, respectively. King Salmon was the warmest station in relative terms followed by Utqiaġvik, where February was 5.3°F warmer than average. The First Order stations in the Interior, South-central, and southeast Alaska were mostly close

to the climatological mean temperature. Homer and Bettles had positive deviations of about 2°F. All other stations had deviations of ±1°F from normal. Kodiak was coldest in relative terms with -0.4°F.

Many stations saw substantial temperature swings despite the "normal" tally for monthly mean temperatures. The Fairbanks monthly mean deviation of +0.2°F hides the 90°F temperature change mentioned above. Delta Junction, Bettles, and Gulkana saw similarly large temperature swings (Fig. 4). The differences were not as extreme at other stations but most of Alaska followed the cold-warm-cold pattern described in the previous section. Utqiaġvik missed out on the unusually low temperatures early in the month but ended February with some below average days. St Paul Island and Cold Bay also did not experience the deep cold spell in late January and early February and started into the month with above average temperatures before a colder period mid-month.

The very warm phase between the two cold snaps produced numerous new daily records for high mean, minimum, and maximum temperatures, mainly between February 13 and February 20 (see Appendix). This is in line with the pattern of daily temperature deviations shown in Fig. 4. As in previous months, new daily low records were comparatively rare despite the substantial negative temperature deviations early and late in the month. Talkeetna recorded new low records for daily temperature on February 1 and Kodiak had a new low record on February 29.

Station	Observed (ºF)	Normal (ºF)	Departure (ºF)
Anchorage	22.0	21.3	0.7
Bethel	17.2	13.3	3.9
Bettles	-1.1	-3.3	2.2
Cold Bay	31.3	30.2	1.1
Delta Junction	8.2	7.4	0.8
Fairbanks	0.5	0.3	0.2
Gulkana	5.7	5.7	0.0
Homer	30.1	28.3	1.8
Juneau	30.2	30.2	0.1

Station	Observed (ºF)	Normal (ºF)	Departure (ºF)
Ketchikan	36.8	36.2	0.6
King Salmon	28.3	22.1	6.2
Kodiak	32.0	32.4	-0.4
Kotzebue	5.6	1.4	4.2
McGrath	5.4	4.7	0.8
Nome	13.1	9.1	4.0
St. Paul Island	28.2	25.3	2.9
Talkeetna	18.5	18.9	-0.3
Utqiaġvik	-6.5	-11.9	5.4
Yakutat	30.6	30.7	0.0

Table 1. *Mean monthly air temperature, normal (1991-2020) and departure for selected stations throughout the state, February 2024. Color-coded to match Figure 2 (yellow-orange-red = warmer than usual; shades of blue = cooler than usual).*

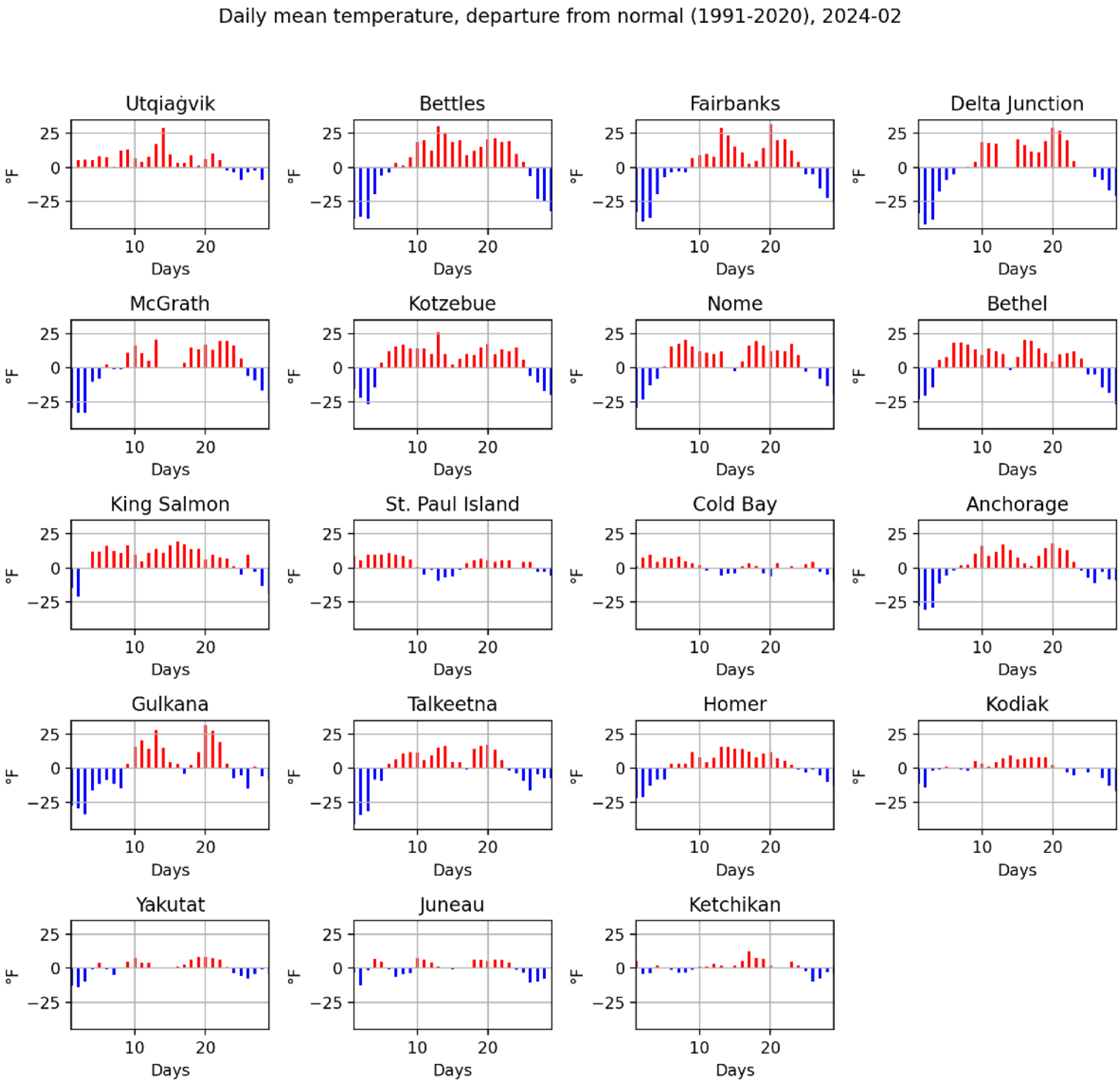

Figure 4. *Daily mean temperature departures for each day in February 2024 at the selected stations.*

Precipitation and snow

Monthly precipitation shows a split pattern with dry conditions in the Interior and on the Panhandle and some very wet weather in the southwest. Bethel tops the list as the wettest station in relative terms with 325% of normal precipitation. King Salmon and Utqiaġvik are in second and third place with 286% and 271%, respectively (Fig. 5 & 6, Table 2). Fairbanks and Delta Junction were the driest stations this month with 23% and 22%, respectively. The southwest was repeatedly hit by Bering Sea storm systems during the February warm spell (Fig. 1, middle panel), while ridging over the Interior prevented precipitation from moving further inland. The Panhandle was also located in the area of high pressure and saw drier than average conditions with 36% of normal precipitation in Ketchikan and around 70% in Juneau and Yakutat.

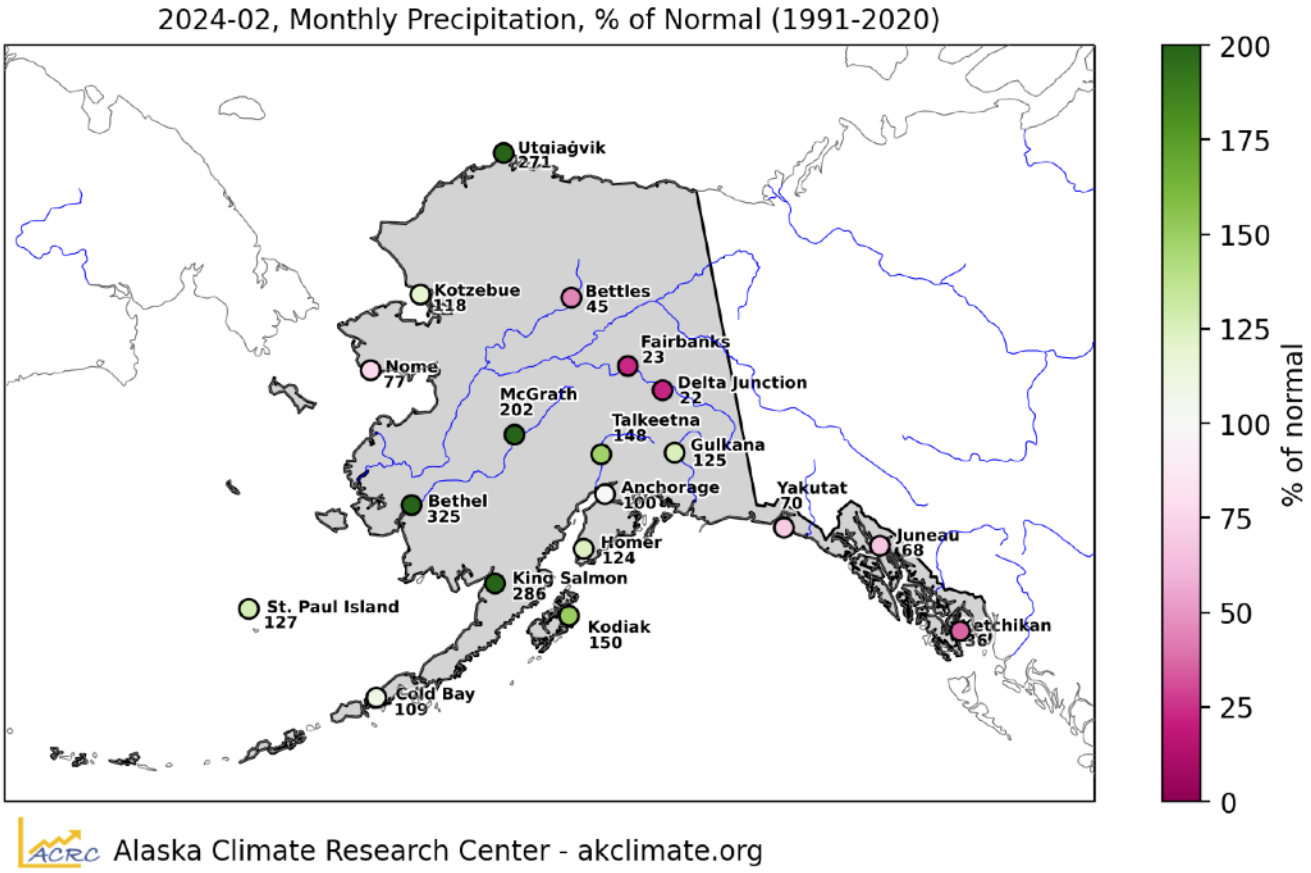

Figure 5. *Monthly precipitation in percentage of normal (ºF, 1991-2020 reference period), February, 2024, at the selected First Order stations in Alaska.*

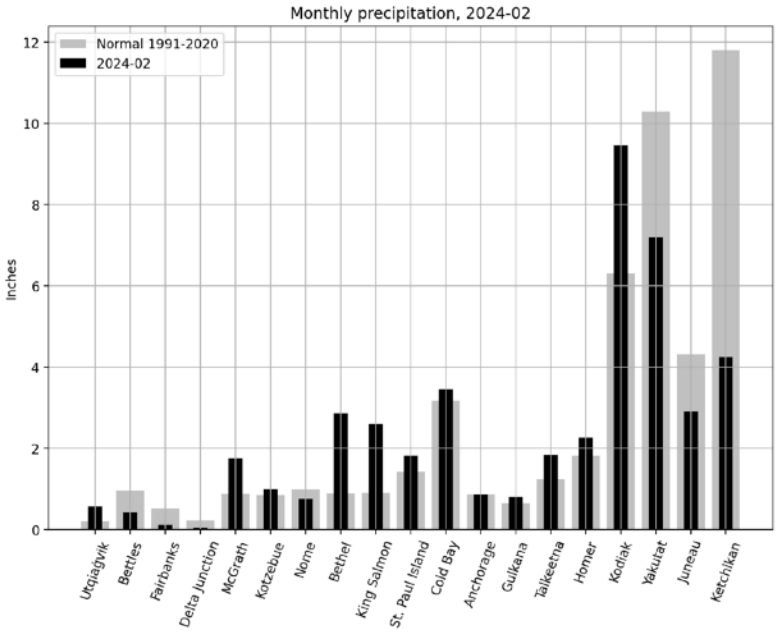

Figure 6. *Monthly precipitation sum (black bars) compared to the 1991-2020 normal (grey bars) at the First Order stations.*

As we start into the spring season, snow depth is close to normal in Bettles and Fairbanks (Fig. 7). Anchorage is still well above average after their record breaking early snow season and another substantial storm in late January. Snow depth in Anchorage mostly decreased throughout February due to the warm temperatures mid-month. Juneau Airport also had a record breaking January and started into February with a decent snowpack, but this didn't survive the warm weather and snow depth at the station dropped to zero during the second week of February. A new round of precipitation and cooler temperatures during the last days of February brought winter back to Juneau, at least temporarily.

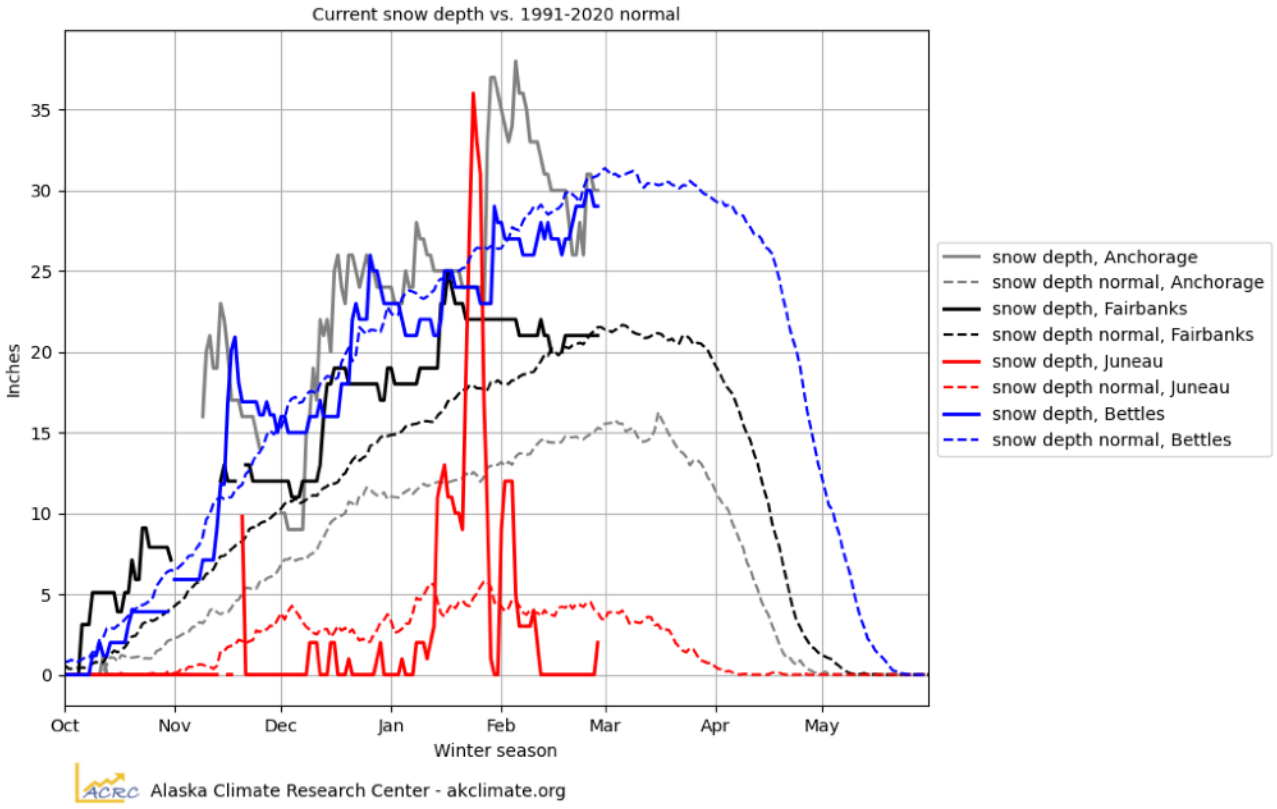

Figure7. *Current snow depth (as of Feb. 29, 2024) compared to the 1991-2020 climatological mean in Anchorage (grey), Fairbanks (black), Juneau (red) and Bettles (blue).*

Station	Precipitation (in)	Normal (in)	% of Normal
Anchorage	0.9	0.9	100.0
Bethel	2.9	0.9	325.0
Bettles	0.4	1.0	44.8
Cold Bay	3.4	3.2	108.8
Delta Junction	0.0	0.2	21.7
Fairbanks	0.1	0.5	23.1
Gulkana	0.8	0.7	124.6
Homer	2.3	1.8	124.2
Juneau	2.9	4.3	67.5
Ketchikan	4.2	11.8	36.0
King Salmon	2.6	0.9	285.7
Kodiak	9.5	6.3	149.9
Kotzebue	1.0	0.8	117.6
McGrath	1.8	0.9	202.3
Nome	0.8	1.0	76.8
St. Paul Island	1.8	1.4	127.3
Talkeetna	1.8	1.2	148.4
Utqiaġvik	0.6	0.2	271.4
Yakutat	7.2	10.3	70.0

Table 2. *Monthly precipitation sum, normal (1991-2020) and departure expressed as a percentage of the normal (1991-2020) for selected stations throughout the state, February 2024. Colors match the color scale in Figure 4.*

Arctic Sea Ice

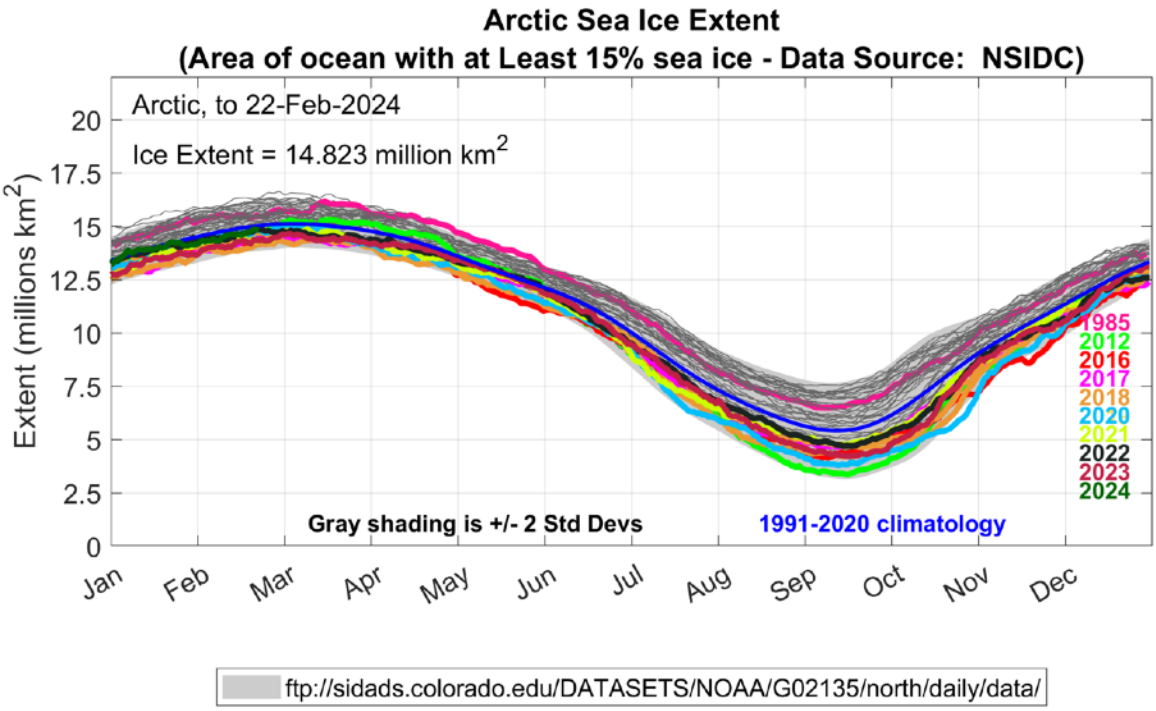

Figure 8. *Time series of daily Arctic sea ice extent. This year's data (dark red) are updated until February 22, 2024. The median sea ice extent for the 1991-2020 reference period is depicted in blue. Specific years are highlighted in colors. Plot Compiled by: Howard J. Diamond, PhD; Climate Science Program Manager at NOAA's Air Resources Laboratory Data Source: National Snow & Ice Data Center (nsidc.org/)*

Arctic sea ice extent alternated between low growth rates and a minor decrease during the past 3-4 weeks. The first week of February say a decrease rate of 0.36%. Sea ice growth then resumed again with weekly increases of 0.6% to around 2%. As of February 22, Arctic sea ice extent was 14.823 M km2, up from 14.274 M km2 on January 25.

Figure 8 shows time series of sea ice extent while Figures 9 A and B show the Arctic sea ice extent and concentrations for February 28, 2024, compared to the average for the period 1981-2010.

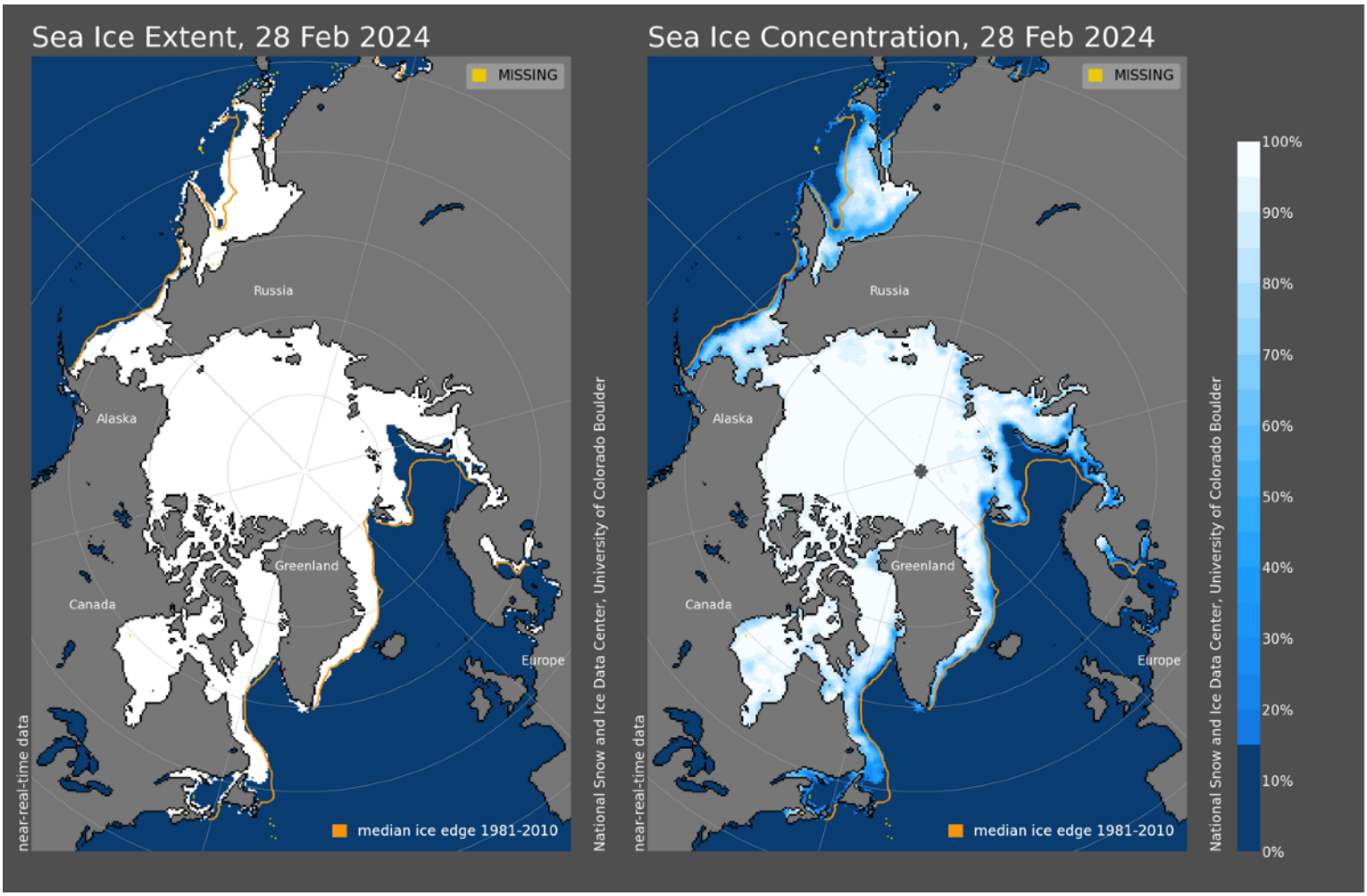

Figure 9. *A (left) Arctic sea ice extent and B (right concentrations as of February 28, 2024 compared to the average from 1981-2010 (Data and images: NSIDC)*

Newsworthy Information

Ice fog in Fairbanks

During the cold spell in early February, thick ice fog formed in Fairbanks. Ice fog occurs during cold temperatures (below about -30°C) and low winds. Water vapour and pollution particles in the air, for example from combustion processes, increase the chance of ice fog since they serve as nuclei for ice crystals. See our recent blog post for more information.

Kuskokwim Ice Road maintenance

Alaska Public Media reported on the work that goes into maintaining safe travel conditions on the Kuskokwim River ice road. While the cold spell in late January and early February was favourable, the changeable weather and frequent storms in February made for challenging conditions. (More information, APM article)

BBC Feature on Mendenhall GLOF

The BBC produced a short segment on glacial outburst flood (GLOF) monitoring at Suicide Basin on Mendenhall Glacier, featuring UA scientists. Suicide Basin produces annual GLOFs. The destructive 2023 event destroyed homes along the Mendenhall river. (Link to video)

Home heating contributes to Fairbanks air pollution

A new study by UAF researchers shows that home heating is a key source of sulfate particles in the Fairbanks air. Fairbanks frequently suffers from poor air quality during winter as cold inversions trap pollution in the near-surface air. (More information, GI news)

Landslide detection using seismic data

Another new study by UAF scientists highlights a method for landslide detection based on seismic sensors. Specifically, the study focusses on Barry Arm in Prince William Sound, where glacier retreat has lead to instabilities that could produce a landslide into the fjord with substantial tsunami hazard. (More information, GI news)

Appendix

Highest Mean Daily Temperature on Record				
Station	**Date**	**New Record (°F)**	**Year of Old Record**	**Old Record (°F)**
Anchorage	2024-02-13	38.5	1978	35.5
Anchorage	2024-02-20	40.0	1977	36.5
Bettles	2024-02-13	27.0	1980	21.5
Bettles	2024-02-14	22.5	1991	20.5
Delta Junction	2024-02-20	38.5	2008	37.5
Delta Junction	2024-02-21	36.0	1977	35.0
Fairbanks	2024-02-20	34.0	2008	27.0
Gulkana	2024-02-13	33.0	2012	31.5
Gulkana	2024-02-20	39.0	1962	35.0
Gulkana	2024-02-21	35.0	1918	34.0
Ketchikan	2024-02-17	48.5	1930	47.0
King Salmon	2024-02-15	39.5	1977	38.5
King Salmon	2024-02-16	42.5	2015	41.5
Kodiak	2024-02-19	40.5	1983	40.0
Talkeetna	2024-02-20	37.0	2010	36.0
Lowest Mean Daily Temperature on Record				
Talkeetna	2024-02-01	-25.0	1993	-17.5

Table A1: February 2024 daily records of mean daily temperature, i.e. highest/lowest values of mean daily temperature ever recorded on specific days. Records are computed since the beginning of the respective time series. 15 new high records and one new low record were set.

Highest Maximum Daily Temperature Record

Station	Date	New Record (°F)	Year of Old Record	Old Record (°F)
Anchorage	2024-02-13	43.0	1978	42.0
Anchorage	2024-02-14	44.0	1977	43.0
Anchorage	2024-02-20	45.0	1977	43.0
Bettles	2024-02-13	31.0	1989	30.0
Cold Bay	2024-02-03	46.0	1985	45.0
Delta Junction	2024-02-13	45.0	1953	37.0
Delta Junction	2024-02-21	46.0	2008	41.0
Fairbanks	2024-02-20	45.0	2008	41.0
Gulkana	2024-02-20	42.0	1964	39.0
Homer	2024-02-14	50.0	1970	48.0
Yakutat	2024-02-16	48.0	2015	47.0
Lowest Maximum Daily Temperature Record				
Kodiak	2024-02-29	19.0	1956	21.0
Talkeetna	2024-02-01	-11.0	1999	-7.0

Table A2: February 2024 daily records of maximum daily temperature, i.e. highest/lowest values of maximum daily temperature ever recorded on specific days. Records are computed since the beginning of the respective time series. 11 new highest and two new lowest maximum daily temperature records were set.

Highest Minimum Daily Temperature Record				
Station	**Date**	**New Record (°F)**	**Year of Old Record**	**Old Record (°F)**
Anchorage	2024-02-13	34.0	2003	32.0
Anchorage	2024-02-20	35.0	1953	31.0

Bettles	2024-02-13	23.0	1980	14.0
Fairbanks	2024-02-20	23.0	1962	21.0
Gulkana	2024-02-13	28.0	2012	26.0
Gulkana	2024-02-20	36.0	1962	33.0
Gulkana	2024-02-21	31.0	1964	30.0
King Salmon	2024-02-16	41.0	2015	38.0
Talkeetna	2024-02-20	34.0	1919	30.0
Lowest Minimum Daily Temperature Record				
Talkeetna	2024-02-01	-39.0	1933	-32.0

Table A3: February 2024 daily records of minimum daily temperature, i.e. highest/lowest values of minimum daily temperature ever recorded on specific days. Records are computed since the beginning of the respective time series. Eight new records for highest minimum daily temperature were set. One was set for lowest minimum daily temperature.

This information consists of climatological data compiled by the Alaska Climate Research Center, Geophysical Institute, University of Alaska Fairbanks. For more information on weather and climatology, visit the center website at http://akclimate.org. Please report any comments, ideas or errors to uaf-climate@alaska.edu.