Alaska Climate Research Center

Alaska State Climate Center

MONTHLY REPORT

IN THIS ISSUE

Alaska's Statewide Climate Summary for January 2021 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 1981-2010 period. Here, we report on temperatures, precipitation and drought conditions in the state, as well as the condition of the Arctic sea ice.

HIGHLIGHTS

Very warm January across the state of Alaska with particularly high temperatures in the Interior.

Lower than normal precipitation for the interior part of the state, especially Fairbanks; **higher than normal precipitation was observed** for the Panhandle.

Fairbanks remains incredibly dry, receiving **only 5% of its normal snowfall** for this time of year.

The January **average sea ice extent** was the 6th lowest in the satellite record.

Temperature

Below normal sea level pressure and relatively mild air from the mid-latitudes prevailed across Alaska during the month of January 2021 (Figure 1A, B). Sea surface temperatures have been significantly warmer than normal in the southern Bering Sea and the Gulf of Alaska (Figure 1C). Accordingly, all reporting stations around the state of Alaska observed warmer than usual temperatures for the month of January, with the largest departures from normal in the interior of the state (Delta Junction with 13 ºF; Bettles with 8.3 ºF; and McGrath with 8.2 ºF above normal), as seen in Figure 2 and Table 1. Up north, in Utqiaġvik, temperatures 6.6 ºF above normal were observed. Along the west coast, Kotzebue recorded 4.2 ºF above normal and Nome, 4.1 ºF. Less extreme temperature anomalies were observed at Ketchikan (2.8 ºF), St. Paul Island (2.7 ºF) and Cold Bay (1.1 ºF). Figure 3 shows the climograph for Delta Junction which had the largest mean monthly temperature departure from normal for the month.

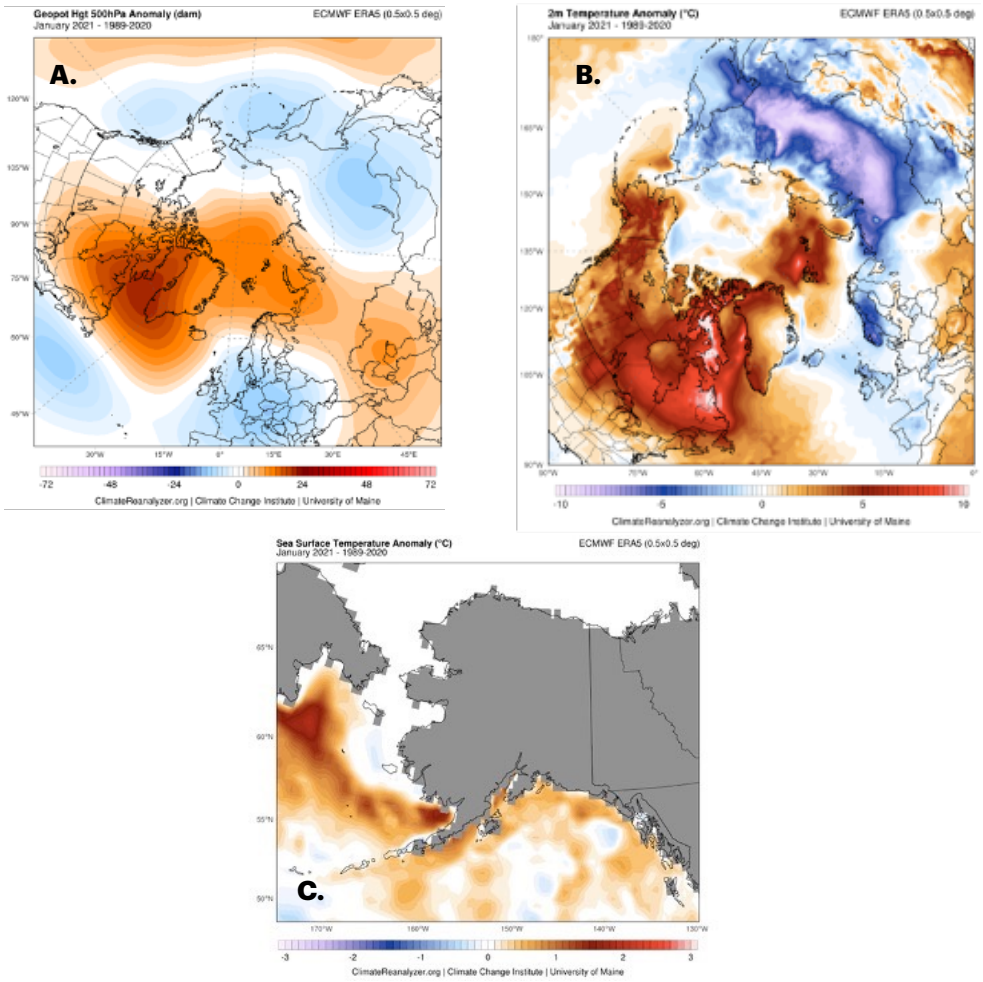


Figure 1. Data from the ECMWF ERA5 reanalysis shows (A) 500 hPa anomaly; (B) 2m temperature anomaly; and (C) sea surface temperature anomaly for January 2021. Together, below normal sea level pressure, mild air from the mid-latitudes and significantly warmer than normal sea surface temperatures led to a warm dry January in Alaska. Graphics generated using https://climatereanalyzer.org/, Climate Change Institute, University of Maine.

Daily mean temperatures (Figure 4) reveal that all locations showed more than half of the month with temperatures warmer than usual. Two new records for highest mean daily temperatures were set, along with one new highest maximum daily temperature record and two new records for highest minimum daily temperatures. See the appendix for more details on this month's record-breaking high temperatures.

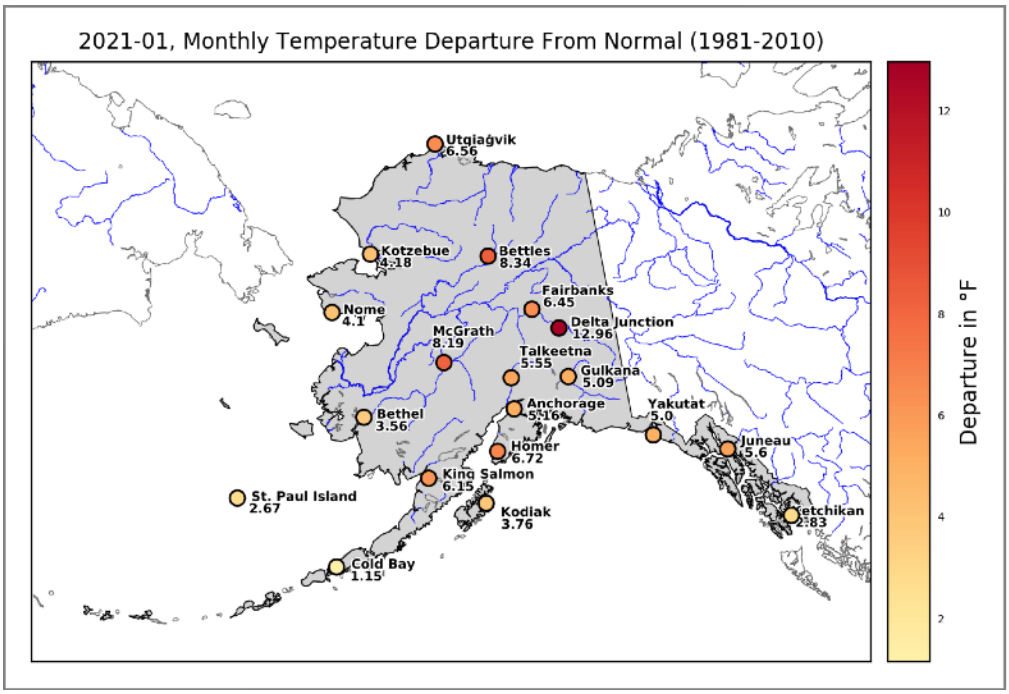


Figure 2. Monthly mean temperature departure from normal, January 2021, for selected stations around the state of Alaska.

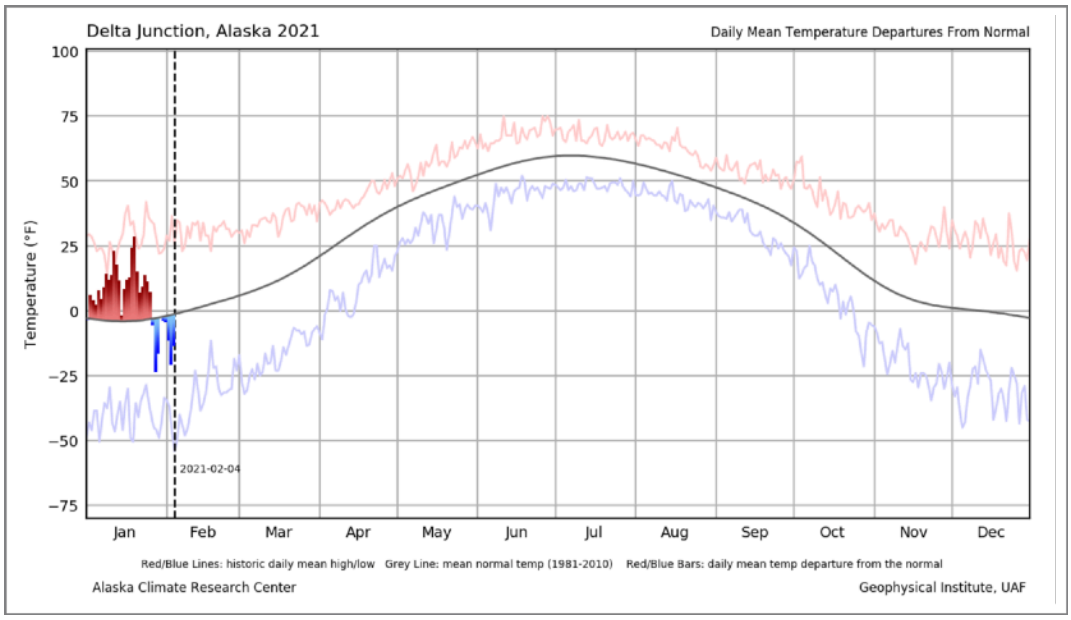


Figure 3: Delta Junction daily mean temperature departures from normal (1981-2010) for 2021. Red and blue bars represent positive and negative temperature departures. Grey line represents the mean normal temperature, red and blue lines represent respectively the historic highest and lowest records of mean daily temperature.

Figure 4: Daily mean temperature departures for each day in January 2021, at the selected stations.

Precipitation

Dry conditions prevailed in the interior of Alaska (Bettles, McGrath, Fairbanks, Delta Junction, Talkeetna and Gulkana), as well as in Utqiaġvik up North. Significantly less snow precipitation than during average years was observed at the above locations for the month of January, while coastal stations observed more precipitation than normal (Figures 5 & 6; Table 2).

Along the Panhandle, Juneau received 117% of normal and Ketchikan received 110% of normal precipitation, which fell predominantly as rain due to the warmer than average, above freezing temperatures. On January 6, rain showers and lightning/ thunder were reported along the Panhandle, reaching as far south and inland as

Station	Observed (ºF)	Normal (ºF)	Departure (ºF)
Anchorage	22.3	17.1	5.2
Bethel	10.2	6.6	3.6
Bettles	-1.7	-10.1	8.3
Cold Bay	29.4	28.2	1.2
Delta Junction	11.9	-1.1	13.0
Fairbanks	-1.5	-7.9	6.5
Gulkana	2.2	-2.9	5.1
Homer	31.5	24.8	6.7
Juneau	33.9	28.3	5.6
Ketchikan	37.7	34.9	2.8
King Salmon	22.4	16.2	6.1
Kodiak	34.2	30.4	3.8
Kotzebue	1.4	-2.8	4.2
McGrath	1.7	-6.5	8.2
Nome	9.2	5.1	4.1
St. Paul Island	27.7	25.1	2.7
Talkeetna	19.7	14.2	5.5
Utqiaġvik	-6.9	-13.4	6.6
Yakutat	33.1	28.1	5.0

Table 1: Mean monthly air temperature, normal (1981-2010) and departure for selected stations throughout the state, January 2021. Color-coded to Figure 2 (yellow-orange-red = warmer than usual; shades of blue = cooler than usual).

Ketchikan. On January 15, record-breaking snowfall amounts fell in the northern Panhandle, with Haines breaking a previous record set in 2007 (5.5 inches) with two feet of snow in 2021. Just a few days later, a quick-moving atmospheric river brought high winds and heavy rains to the Panhandle on January 19, with record rainfall falling in and around Juneau (1.95 inches at the Juneau Airport, which broke a previous record of 1.84 inches set in 1976; 3.63 inches in Pelican, breaking a previous record of 2.01 inches set in 1975; and 1.57 inches in Skagway, breaking a

previous record of 0.93 inches, set in 1924). In total, for the month of January, Juneau saw more days of light rain (21) versus light snow (12). In Ketchikan, there were 22 days of light rain (and 11 days of rain) versus 5 days of light snow. Patterns for the Panhandle in January saw a continuation of warmer than normal, wet and windy conditions that were present in December. In Kodiak, precipitation was observed to be 166% of normal while in Cold Bay, it was over 200% of normal. Figure 5 shows the monthly precipitation sums for January 2021 at the selected stations compared to the normal (1981-2010), in inches.

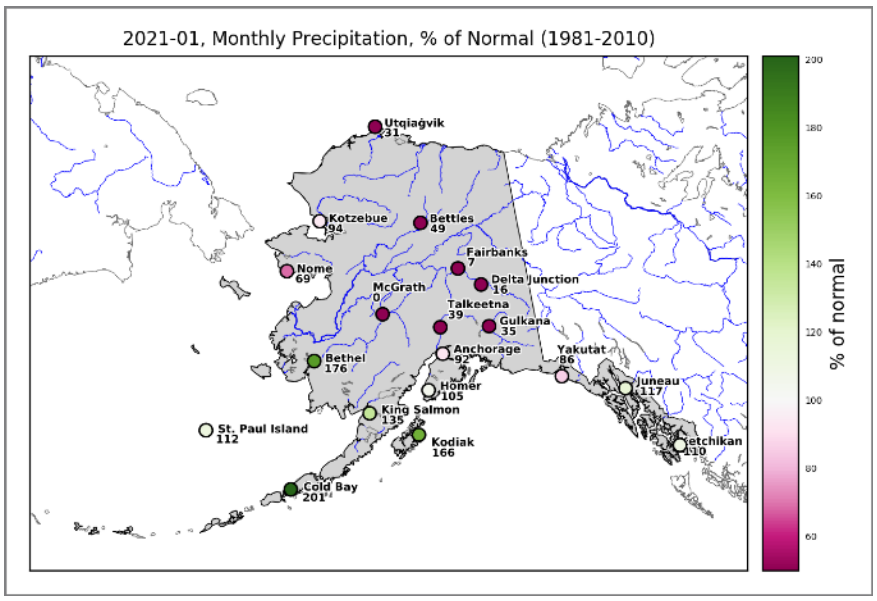


Figure 5. Monthly precipitation sums expressed as percent of normal (1981-2010), January 2021.

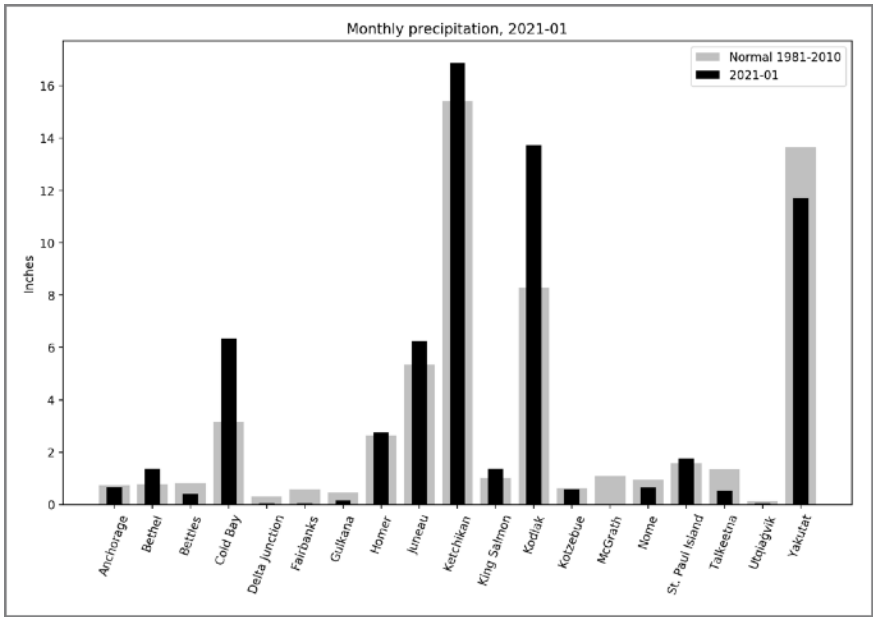


Figure 6. Monthly precipitation sums for January 2021 at the selected stations compared to the normal (1981-2010), in inches.

Station	Precipitation (in)	Normal (in)	% of Normal
Anchorage	0.7	0.7	91.8
Bethel	1.4	0.8	175.6
Bettles	0.4	0.8	49.4
Cold Bay	6.4	3.2	201.3
Delta Junction	0.0	0.3	16.1
Fairbanks	0.0	0.6	6.9
Gulkana	0.2	0.5	34.8
Homer	2.8	2.6	105.3
Juneau	6.3	5.4	117.0
Ketchikan	16.9	15.4	109.5
King Salmon	1.4	1.0	135.3
Kodiak	13.7	8.3	165.6
Kotzebue	0.6	0.6	93.5
McGrath	0.0	1.1	0.0
Nome	0.7	0.9	69.1
St. Paul Island	1.8	1.6	112.0
Talkeetna	0.5	1.4	39.0
Utqiaġvik	0.0	0.1	30.8
Yakutat	11.7	13.7	85.7

Table 2. Monthly precipitation sum, normal (1981-2010) and departure expressed as a percentage of the normal (1981-2010) for selected stations throughout the state, January 2021. Shades of purple and green correlate with Figure 5.

Table 3 shows the monthly snowfall, normal, percentage of normal, and snow depth for all reporting locations for which the National Weather Service still collects snowfall data. All locations received significantly less snowfall than normal for the month with Fairbanks faring the worst, receiving only 0.5 inches of snow or, 5% of normal. Anchorage and Juneau received only a quarter of their normal snowfall while Bettles fared the best, receiving 54% of normal snowfall for the month.

Station	Snow (in)	Normal (in)	Deviation (%)	Snow depth (in)
Anchorage	3.0	11.3	26.5	17
Bettles	7.5	13.9	54	21
Fairbanks	0.5	10.3	4.9	14
Juneau	7.3	27.7	26.4	2

Table 3. Monthly snowfall sum, normal (1981 - 2010), departure expressed as a percentage of the normal, and end-of-month snow depth for the selected stations that measure snowfall, January 2021.

Drought

No significant drought conditions were present in the state for the month of January, but abnormally dry conditions (rated D0 in Figure 7) were more prevalent in the northwestern part of the state along with the interior, which correlates well with figure 5. The figure below has been produced through a collaboration of the USDA, NOAA and the National Drought Mitigation Center.

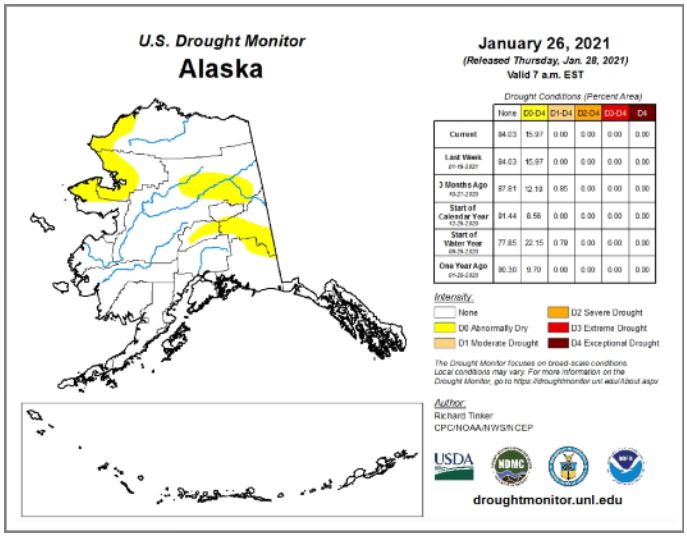


Figure 7. U.S. Drought Monitor map for Alaska, updated on January 26, 2021. The table on the right shows the percent area affected by different categories of drought intensity. Figures and data produced and released by the U.S. Drought Monitor, a partnership between the National Drought Mitigation Center at the University of Nebraska-Lincoln, the United States Department of Agriculture, and the National Oceanic and Atmospheric Administration (https://droughtmonitor.unl.edu).

Arctic Sea Ice

Arctic sea ice extent tracked below average for January 2021, with the monthly average finishing 6th lowest in the satellite record. Below average sea ice locations include the Barents Sea, Baffin Bay, Davis Strait, the Labrador Sea, and the Russian side of the Bering Sea. Elsewhere the ice edge was near its average location for this time of year. Ice growth was prominent on the Alaskan side of the Bering Sea, with the Sea of Okhotsk and in the northern Barents Sea west of Svalbard. While sea ice extent tracked below measured values in early January, by the middle of the month, extent rose above the average for the last 10 years (from 2011 - 2020). Overall, in January the Arctic gained 1.42 million square kilometers (548,000 square miles) of ice. Figure 8 shows a time series of sea ice extent while Figure 9 is a graphical representation of sea ice extent on January 31, 2021.

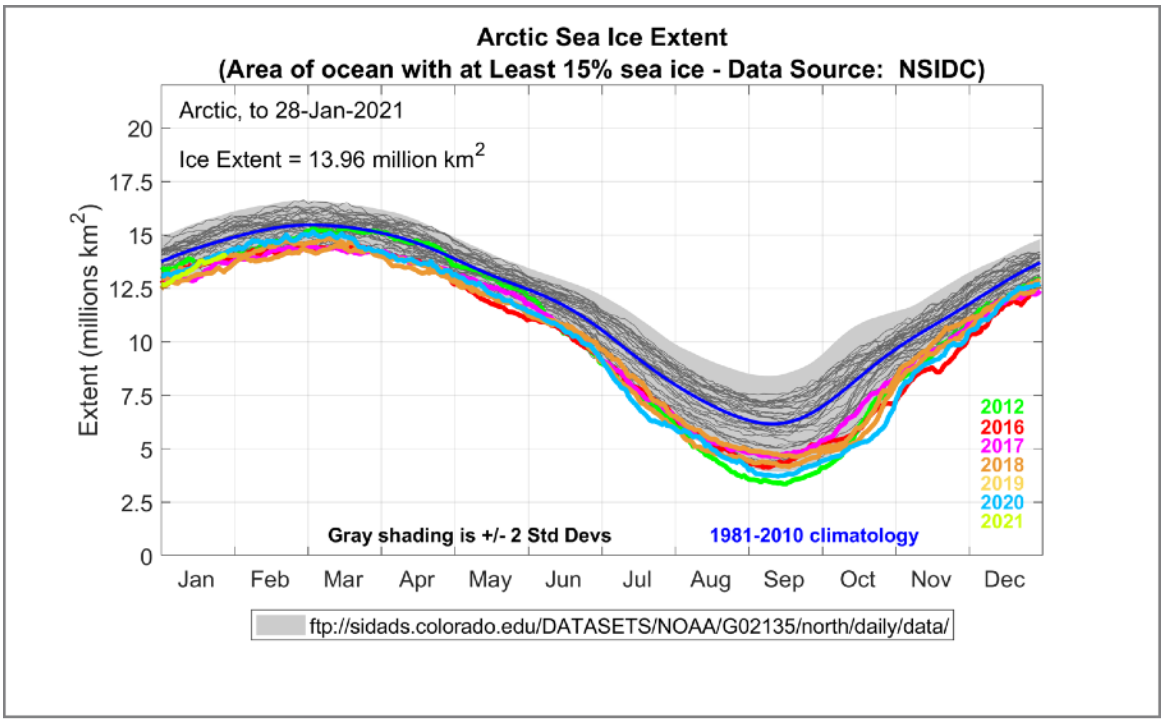


Figure 8. Time series of daily Arctic sea ice extent. This year's data (lime green) are updated until January 28, 2021. The median sea ice extent for the 1981-2010 reference period is depicted in blue. Specific years are highlighted in colors. Plot Compiled by: Howard J. Diamond, PhD; Climate Science Program Manager at NOAA's Air Resources Laboratory Data Source: National Snow & Ice Data Center (https://nsidc.org/).

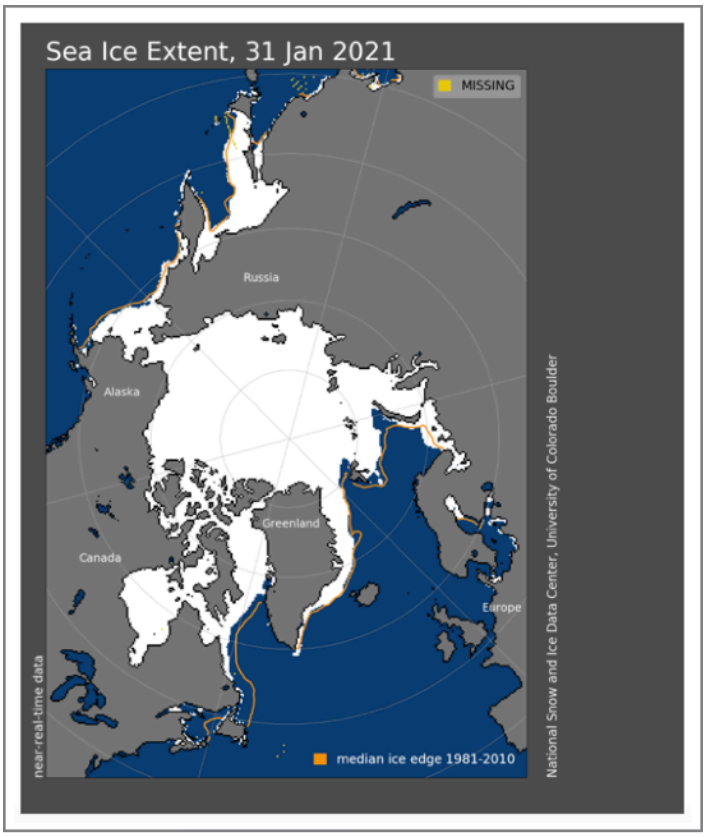


Figure 9. Sea ice extent in the in the Arctic, as of January 31, 2021. Image: NSIDC (nsidc.org)

Newsworthy Information

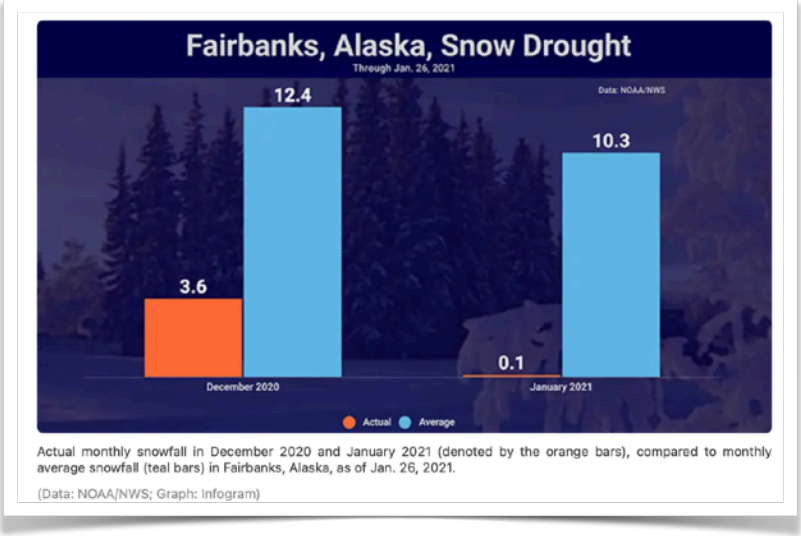
On January 2, 2021 the Howard Pass weather station recorded an air temperature of -33 F and wind speeds of 47 mph, resulting in a windchill of -78 F. The station, located in the western Brooks Range, has recorded windchills of -70 F or colder each year since its installation: https://www.adn.com/alaska-news/science/2021/01/09/a-new-year-brings-giant-storms-big-waves-and-chilly-winds/

Photo: Howard Pass, showing a weather station that just recorded a windchill of minus 78 degrees F. Ken Hill/National Park Service.

January 23rd was the 50th anniversary of Alaska's all-time lowest temperature. A low of -80 F was recorded in 1971 at Prospect Creek Camp, located about 160 miles north of Fairbanks. The high temperature that day was -64 F, two degrees higher than the state's record for the lowest high temperature: https://www.adn.com/alaska-news/science/2021/01/23/alaskas-all-time-cold-record-turns-50/

Photo: The valleys of Jim River and Prospect Creek in northern Alaska, where an official thermometer registered Alaska's all-time low of minus 80 degrees F on January 23, 1971 (Ned Rozell).

Only 0.5 inches of snow were recorded in Fairbanks for January 2021 (0.1 inches as of January 26, when this article was published). A persistent storm track to the south of Fairbanks has kept precipitation away from Alaska's eastern interior. Overall, seasonal snowfall in Fairbanks has been on the decline, particularly in the fall: https://weather.com/storms/winter/news/2021-01-27-fairbanks-alaska-snow-drought



Actual monthly snowfall in December 2020 and January 2021 (denoted by the orange bars), compared to monthly average snowfall (teal bars) in Fairbanks, Alaska, as of Jan. 26, 2021.

(Data: NOAA/NWS; Graph: Infogram)

Appendix

Table A1: January 2021 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. Two new records for highest mean daily temperatures were set and none for lowest mean daily temperature record.

Highest Mean Daily Temperature on Record				
Station	**Date**	**New Record (°F)**	**Year of Old Record**	**Old Record (°F)**
Juneau	2021-01-08	41.0	1987	40.5
Kotzebue	2021-01-22	32.0	1961	27.0

Table A2: January 2021 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. One new highest maximum daily temperature records was set and none for lowest maximum daily temperature records.

Highest Maximum Daily Temperature Record				
Station	**Date**	**New Record (°F)**	**Year of Old Record**	**Old Record (°F)**
Kotzebue	2021-01-22	34.0	2008	33.0

Table A3: January 2021 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. Two new records for highest minimum daily temperatures were set and none for lowest minimum daily temperature.

Highest Minimum Daily Temperature on Record				
Station	**Date**	**New Record (°F)**	**Year of Old Record**	**Old Record (°F)**
King Salmon	2021-01-21	39.0	1963	38.0
Kotzebue	2021-01-22	30.0	1961	23.0

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 any errors to webmaster@akclimate.org.