Alaska Climate Research Center
The Alaska State Climate Center

STATEWIDE CLIMATE SUMMARY OCTOBER 2022

Photo: Snow measurements near Galbraith Lake during NASA SnowEx Alaska fall field campaign, October 23, 2022, S. Stuefer.

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Alaska's Statewide Climate Summary for October 2022 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

Coastal flooding on Arctic coast due to Chukchi Sea storm

New record for October precipitation in Gulkana (3.86 inches)

Very warm in the Panhandle and on the Arctic coast

Seasonal snow cover has arrived in most of Alaska, with record SWE at some South East stations

Synoptics and Significant Weather Events

October in Alaska began as September ended, with the remnants of ex-typhoon Kulap causing stormy weather along the Bering Coast. Kulap weakened and rapidly dissipated during the first days of October and most of the state saw relatively benign weather with a mix of sunshine and some snow and rain at seasonable temperatures. By October 5th, the large scale upper level pattern consisted of weak troughing over the Chukchi and Bering Sea with a cut off low centred just south of the Aleutians, and ridging over the South East, South Central, and Eastern Interior. As the low over the Aleutians moved further south into the Gulf of Alaska, the increasingly zonal polar front and associated storm systems became the dominant upper level weather feature for much of Alaska.

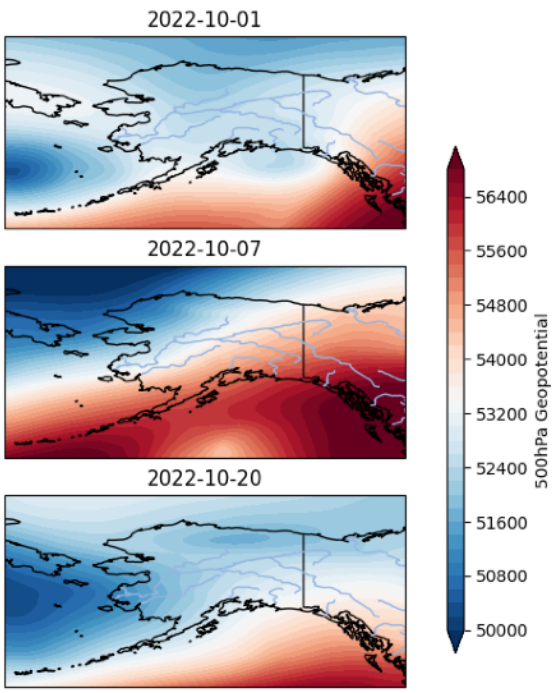

Figure 1: *ERA5 reanalysis data of 500hPa geopotential for October 1, 7, and 20: Remnants of ex-typhoon Kulap in the Bering Sea (Oct. 1), strong storm in the Chukchi Sea (Oct. 07) and one of multiple October Bering Sea storms (Oct. 20).*

Warnings and advisories were issued for much of the west coast due to a strong storm that moved from Wrangel Island towards the Alaskan Chukchi coast around October 6th. A substantial storm surge produced flooding in communities from along the Chukchi and Western Arctic coasts. The water level remained below that of September's very destructive ex-typhoon Merbok. The Chukchi Sea storm and associated fronts rapidly moved east into and across Alaska, bringing high winds and precipitation further inland. Temperatures dropped throughout most of the state as cold air masses arrived with the storm, bringing widespread snow fall.

The strong west- to southwesterly flow persisted in the following days and multiple stormy short wave troughs moved across Alaska in a broadly west-to-east direction. Conditions were frequently blizzard-like particularly on the

northwestern coasts and in the mountain ranges, with minor flooding and high surf, e.g. in Utqiaġvik, and significant snowfall in the Alaska Range. By about October 12, Alaska remained sandwiched between a strong area of low pressure in the High Arctic Ocean and another low near the Aleutians. This combination caused wintery conditions with snow and seasonably cold temperatures throughout the state.

After a brief period of calmer weather and clear skies, a new storm system developed in the Gulf of Alaska. This storm grew rapidly and once again brought very unsettled conditions to much of the state. Due to the more southerly position of the low pressure area, a southerly flow brought warmer temperatures compared to the previous period of cold and stormy weather. Winter weather advisories were issued for parts of northern Alaska and some areas saw problems due to freezing rain as temperatures rose. The low in the Gulf of Alaska eventually dissipated, allowing for a brief period of calmer weather before the next round of Bering Sea low pressure arrived around October 20th. A succession of storms followed, with a Rex-block type pattern of low pressure in the Gulf of Alaska and high pressure in the north establishing itself for some days in late October. Moving into November, this pattern looks about to change to troughing over most of the state. Wintery weather can be expected.

Temperature

Monthly mean temperatures in October were largely above normal throughout the state (Fig. 2, Table 1). Kotzebue and St. Paul Island were the only two First Order stations to record negative monthly anomalies this month (-0.3 and -0.48°F, respectively). South Central Alaska was relatively close to normal, with Talkeetna, Homer, Anchorage and King Salmon each reporting positive anomalies of less than half a degree. The First Order stations in the panhandle as well as Utqiaġvik were warmest in relative terms, with positive anomalies between 2.9°F (Yakutat) and 3.7°F (Juneau).

Daily anomalies (Fig. 3) were once again almost entirely positive throughout the month in Utqiaġvik. The strong positive anomalies here are consistent with climatic trends that show more pronounced warming in Northern Alaska than in other parts of the state during the fall season due to the decline of sea ice. The Southeast similarly recorded mostly positive daily temperatures anomalies until October 20th, when a cooler system moved in and temperatures dropped to seasonally average levels. At the remaining First

Order stations, the daily anomaly patterns are relatively homogenous in their reflection of the shifts in flow direction associated with the weather systems throughout the month. The first week or so of October saw a southerly upper level flow associated with ex-typhoon Kulap that brought warmer air masses from the south. With the arrival of the strong Chukchi Sea storm around October 8th much cooler Arctic air moved in. The pattern then changed again to a southwesterly flow (stormy period mid-month) and positive anomalies, before flipping again to colder conditions for about the last week of October. Numerous new daily temperature records were set, particularly in the southern parts of the state and in Utqiaġvik, for daily average temperatures as well as high and low temperatures (see Appendix). Notably, no new records for low temperatures were set.

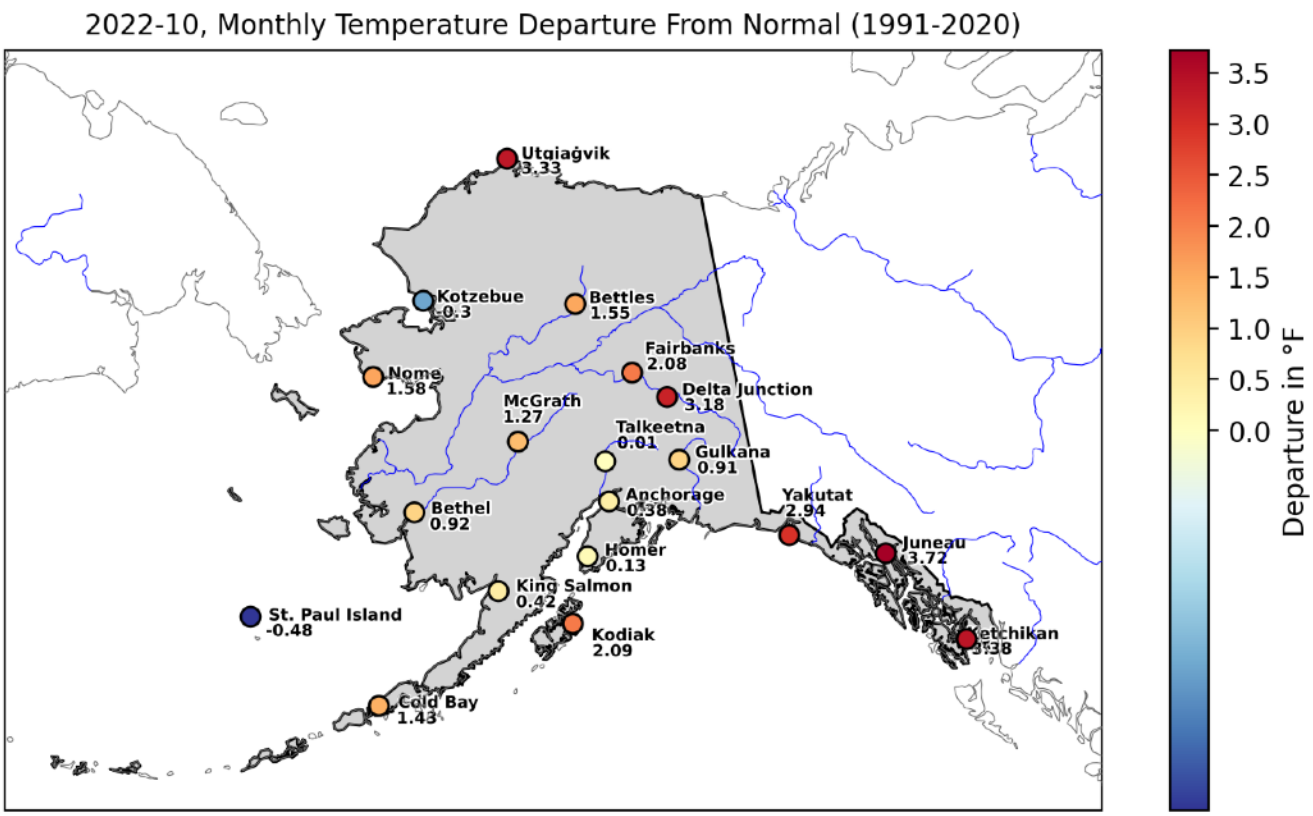

Figure 2. *Monthly mean temperature departure from normal (ºF), October 2022, at the selected First Order stations in Alaska. Values at McGrath and Delta Junction are missing data from the last week to 10 days of October, see Fig. 3. Data should be interpreted with care.*

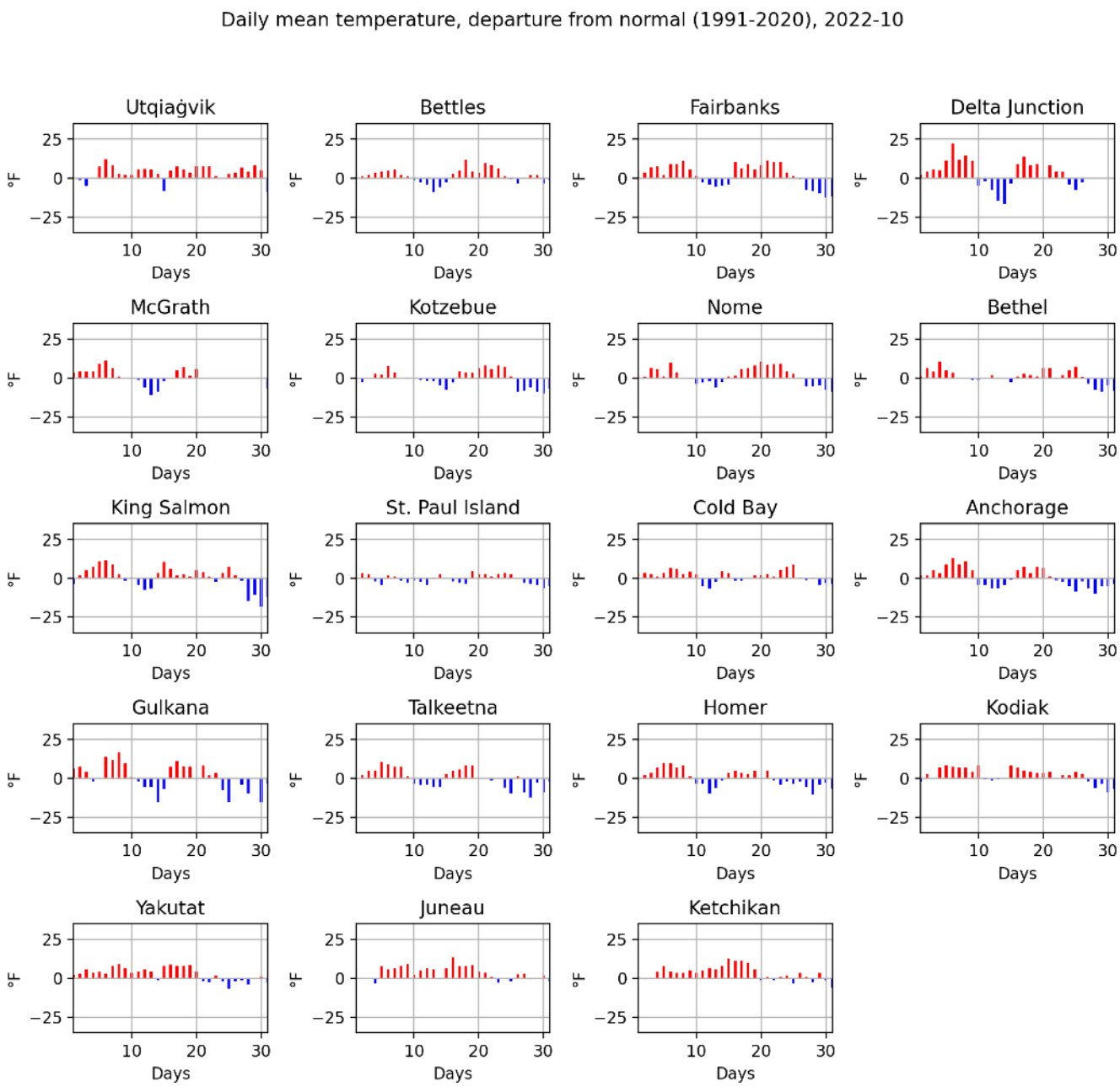

Figure3. *Daily mean temperature departures for each day in October 2022 at the selected stations. Note that McGrath and Delta Junction are missing the last week to 10 days of October due to technical problems.*

Table 1. *Mean monthly air temperature, normal (1991-2020) and departure for selected stations throughout the state, October 2022. Color-coded to match Figure 3 (yellow-orange-red = warmer than usual; shades of blue = cooler than usual). Delta Junction and McGrath are shown in grey due to missing data affecting the monthly value.*

Station	Observed (ºF)	Normal (ºF)	Departure (ºF)
Anchorage	36.7	36.3	0.4
Bethel	33.1	32.2	0.9
Bettles	22.9	21.4	1.5
Cold Bay	42.7	41.3	1.4
Delta Junction	31.8	26.5	3.2
Fairbanks	28.3	26.3	2.1
Gulkana	28.5	27.1	0.9
Homer	40.4	40.2	0.1
Juneau	45.9	42.2	3.7
Ketchikan	49.6	46.2	3.4
King Salmon	36.8	36.4	0.4
Kodiak	44.2	42.1	2.1
Kotzebue	26.6	26.9	-0.3
McGrath	33.1	28.5	1.3
Nome	32.0	30.4	1.6
St. Paul Island	39.0	39.5	-0.5
Talkeetna	34.2	34.2	0.0
Utqiaġvik	24.5	21.2	3.3
Yakutat	44.8	41.9	2.9

Precipitation

October was wetter than average or close to normal in most of Alaska. Of the First Order stations, Bethel, Homer, and Yakutat were noticeably below normal, with Yakutat ranking driest for this month at 49% of average precipitation. Gulkana was wettest by far and clocked in at 3.9 inches or 386% of normal. This is a new October record for the station and beats the previous record from 1917 by more than an inch. King Salmon and Utqiaġvik were the next wettest stations and each recorded 187% of normal (Figures 4, 5; Table 2). During the month of October, precipitation shifted from mostly rain to a greater fraction of mixed and solid precipitation, which affects measurement uncertainty to some extent. Small snow falls can be difficult to record accurately, particularly in windy conditions. When considering Figure 4, note that the stations at McGrath and Delta Junction are suffering from data outages and the data for this month is incomplete at these locations.

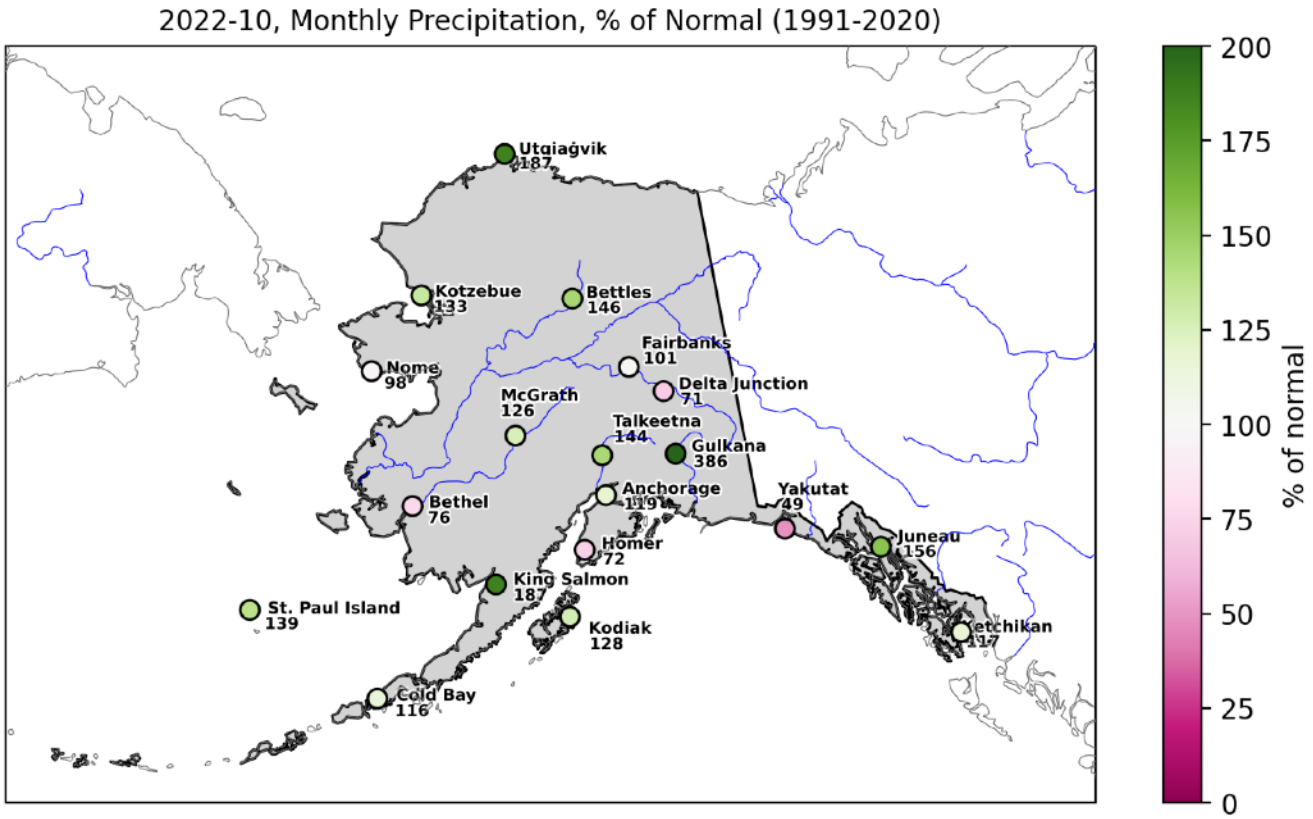

Figure 4. *Monthly mean precipitation departure from normal (in percent), October 2022, for selected stations around the state of Alaska. Note that McGrath and Delta Junction are missing data for the last week to 10 days of the month, affecting the monthly average value.*

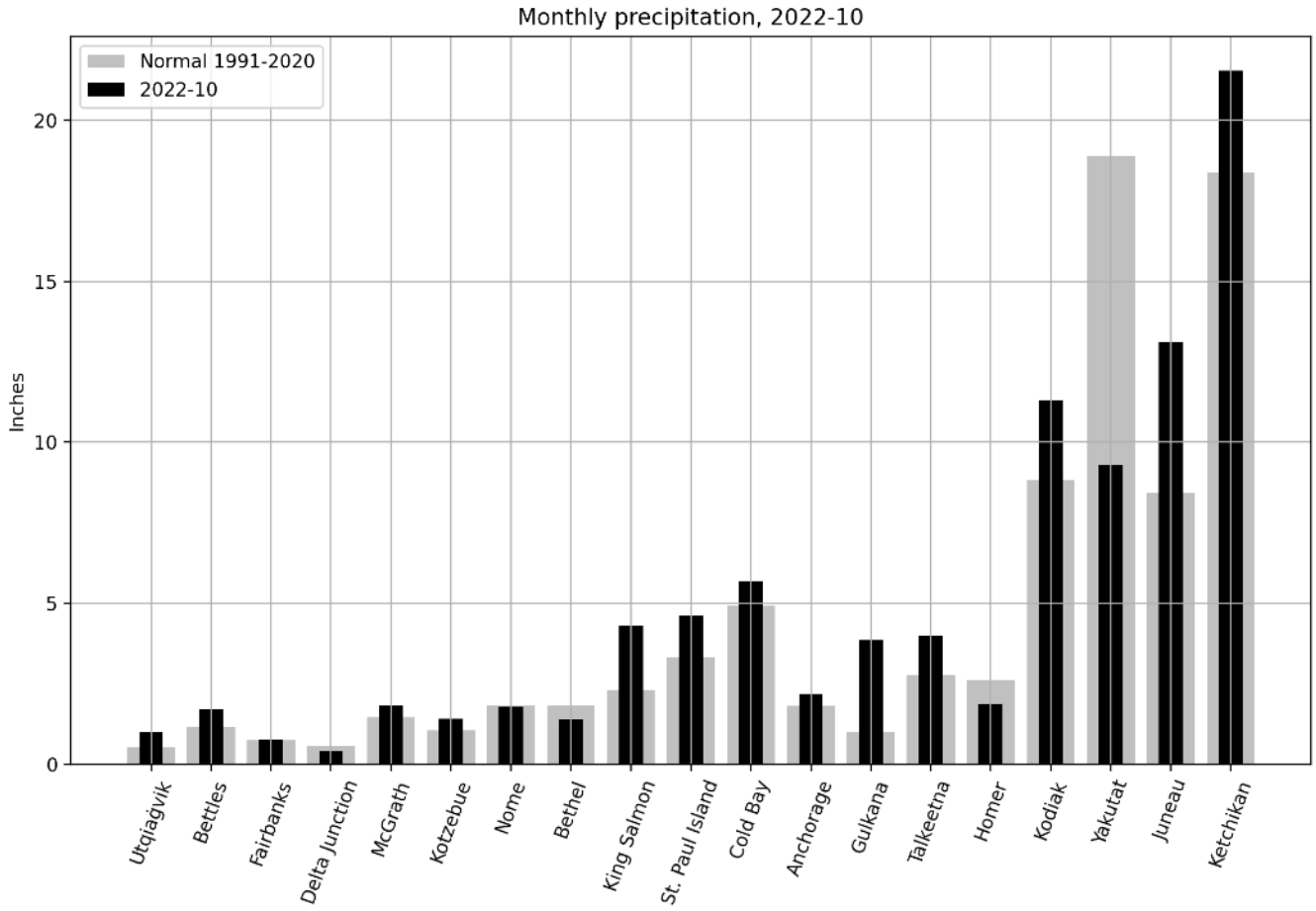

Figure 5. *Monthly precipitation sums for October 2022 at the selected First Order stations compared to the normal (1991-2020), in inches. Note that McGrath and Delta Junction are missing data for the last week to 10 days of the month, affecting the monthly average value.*

Snow

At the start of the month, snow cover was limited to mountain regions and parts of the North Slope. As October progressed, the new winter's seasonal snow cover began to extend to lower lying areas as colder storms moved in. By the end of October, almost the entire state of Alaska has at least a thin snow cover. Unfortunately, many of the First Order stations do not measure snowfall and snow depth, have frequent data gaps, or have only short time series. Of the selected stations, Anchorage (4.3 inches, 78% of normal), Fairbanks (5 inches, 61% of normal), Bettles (9.9 inches, 82% of normal), and Juneau (0.1 inches, 11% of normal) recorded measurable snowfall in October.

Figure 6 shows that the onset of snow accumulation and snow cover occurred later than average in Fairbanks and Anchorage this year and is now at about average levels for the

time of year. In contrast, the Panhandle and parts of Southcentral are reporting significantly above average SWE values of up to over 10 times the seasonal median (Fig. 7). Most of this snow fell around mid-month during relatively high temperatures and was produced by storm systems in the Gulf of Alaska and south of the Aleutians. Chisana in the Wrangell mountains received about 2.5 inches of SWE during the second half of October (Fig. 8). This constitutes a record start to the snow season at the location, with current SWE about an inch over the previous maximum. Other locations in the Wrangells are similarly snowy.

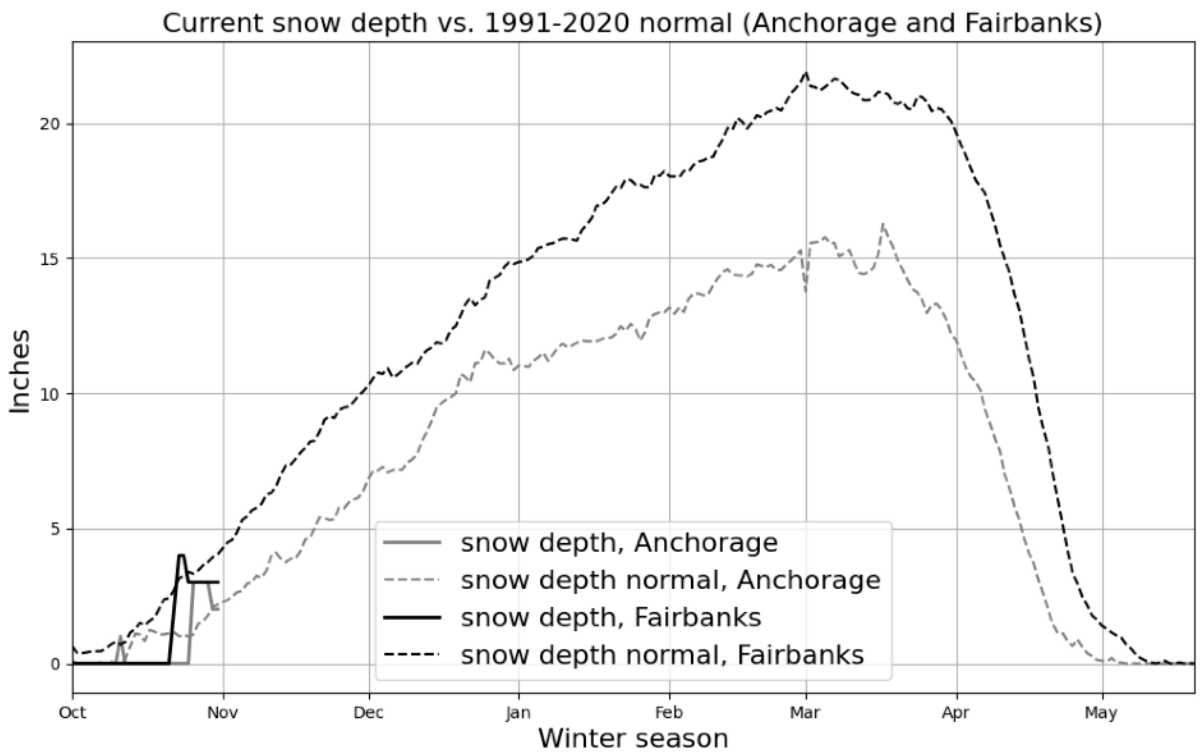

Figure 6. *Snow depth in Fairbanks (black) and Anchorage (grey). Solid lines show current snow depth at the respective stations. Dashed lines show the 1990/91-2019/20 mean value throughout the winter season.*

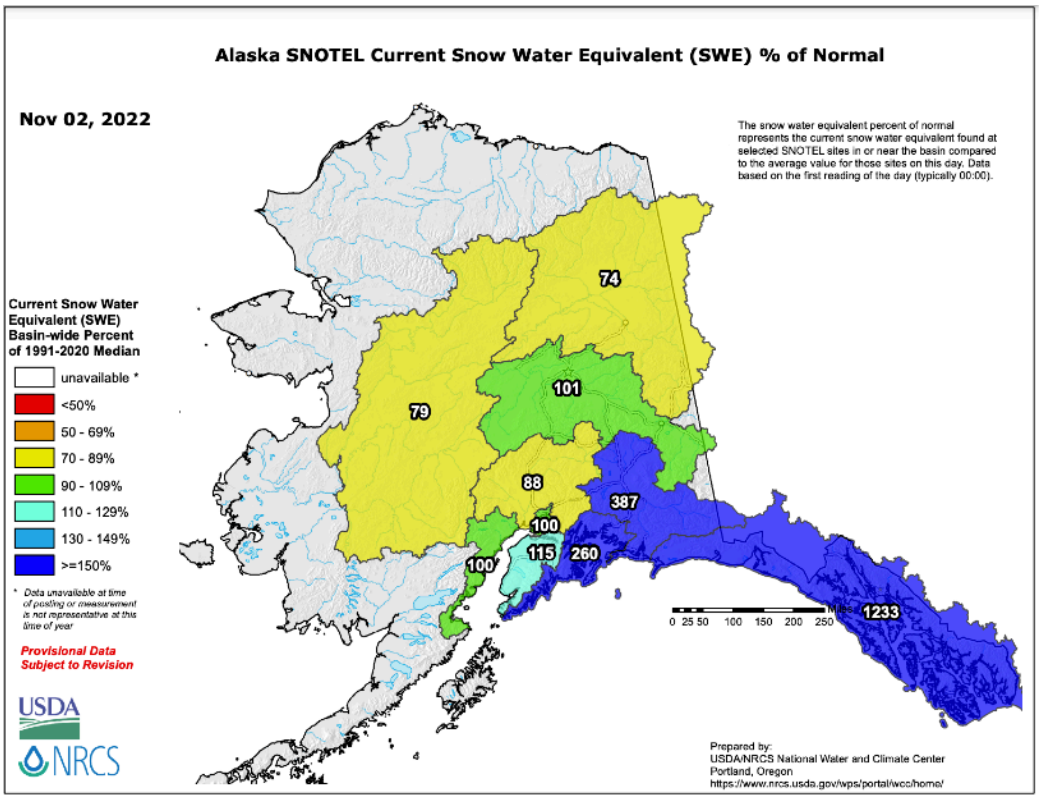

Figure 7. *Snow water equivalent (SWE) in percent of the 1991-2020 median, based on Alaska SNOTEL data. Image courtesy of USDA, NRCS.*

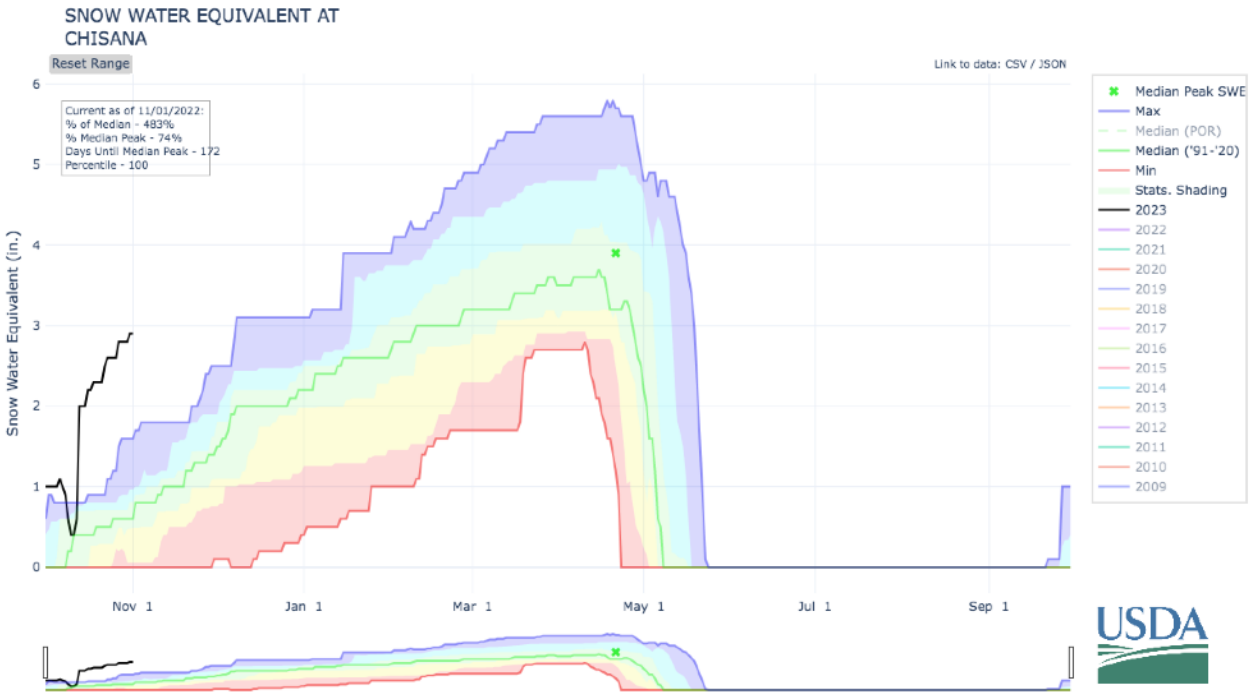

Figure 8. *Snow water equivalent (SWE) in inches at Chisana. Black line shows current year compared to previous maximum and median. Image courtesy of USDA.*

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, October 2022. Colors match the color scale in Figure 4. Delta Junction and McGrath are shown in grey due to missing data affecting the monthly value.*

Station	Precipitation (in)	Normal (in)	% of Normal
Anchorage	2.2	1.8	118.7
Bethel	1.4	1.8	75.5
Bettles	1.7	1.2	146.2
Cold Bay	5.7	4.9	115.6
Delta Junction	0.4	0.6	71.2
Fairbanks	0.8	0.8	101.3
Gulkana	3.9	1.0	386.0
Homer	1.9	2.6	71.6
Juneau	13.1	8.4	155.7
Ketchikan	21.5	18.4	117.2
King Salmon	4.3	2.3	187.0
Kodiak	11.3	8.8	127.7
Kotzebue	1.4	1.1	132.7
McGrath	1.8	1.5	126.0
Nome	1.8	1.8	97.8
St. Paul Island	4.6	3.3	139.5
Talkeetna	4.0	2.8	143.9
Utqiaġvik	1.0	0.5	187.0
Yakutat	9.3	18.9	49.2

Drought and Wildfire Activity

No part of Alaska is currently experiencing drought or abnormally dry conditions and the fire season has come to a close. Controlled burns for wildfire mitigation programs were underway during the first weeks of October in some parts of the state. Remaining active wildfires have largely been put out by the wet weather conditions the month.

Please check our UAFSmoke website at http://smoke.alaska.edu for current and updated fire information. UAFSmoke shows current wildfire status information and up to 72 hours forecast of concentrations of black carbon and particulate matter emitted from Alaska wildfires.

Arctic Sea Ice

As of October 27th, Arctic sea ice extent was at 7.976 M km2. Sea ice extent increased throughout the month at rates of about 8% per week during the first half of October and up to 10%-13% later on. The strong storm in the Chukchi Sea during the second week of the month caused a temporary decrease in Chukchi ice extent, but ice growth resumed once the storm passed. Bering Sea ice growth appeared to be picking up by the end of the month along the western coast.

Figure 9 shows a time series of sea ice extent while Figures 10 A and B show the sea ice extent and concentrations as of October 31, 2022 compared to the average from 1981-2010.

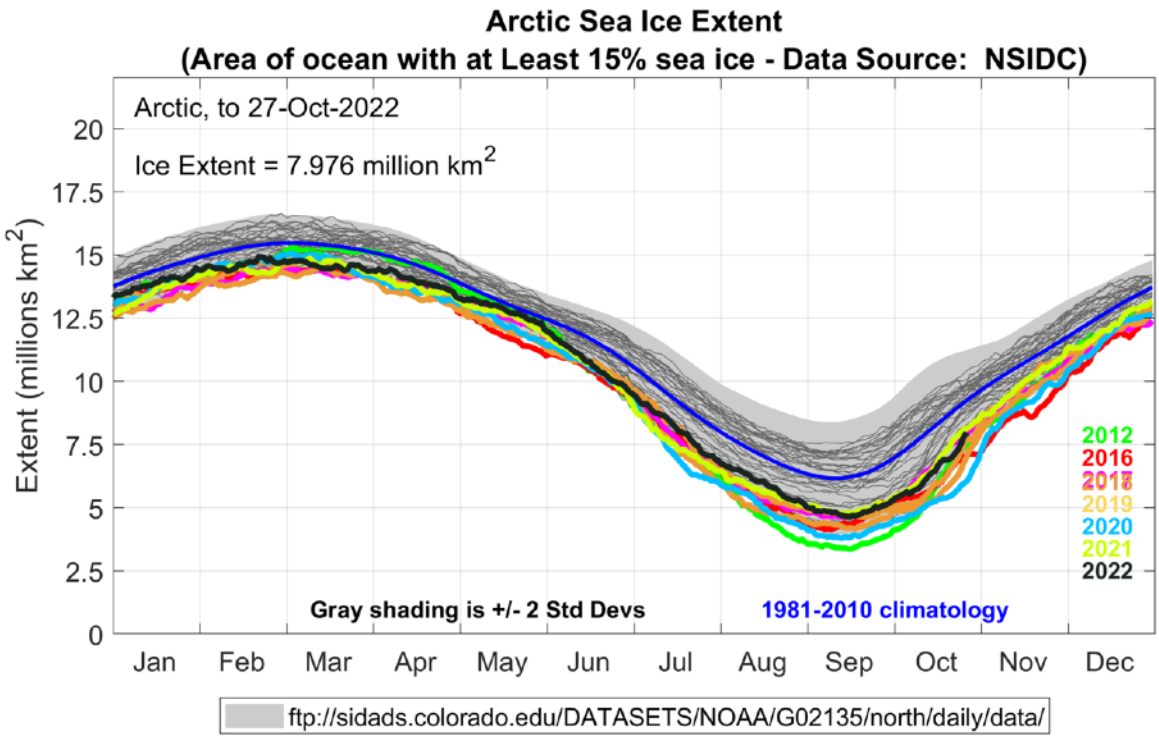

Figure 9. *Time series of daily Arctic sea ice extent. This year's data (black) are updated until October 27, 2022. The median sea ice extent for the 1981-2010 reference period is depicted in blue. Specific years are highlighted in colors. Plot Compiled by: Howard J. Diamond, PhD; Climate Science Program Manager at NOAA's Air Resources Laboratory*

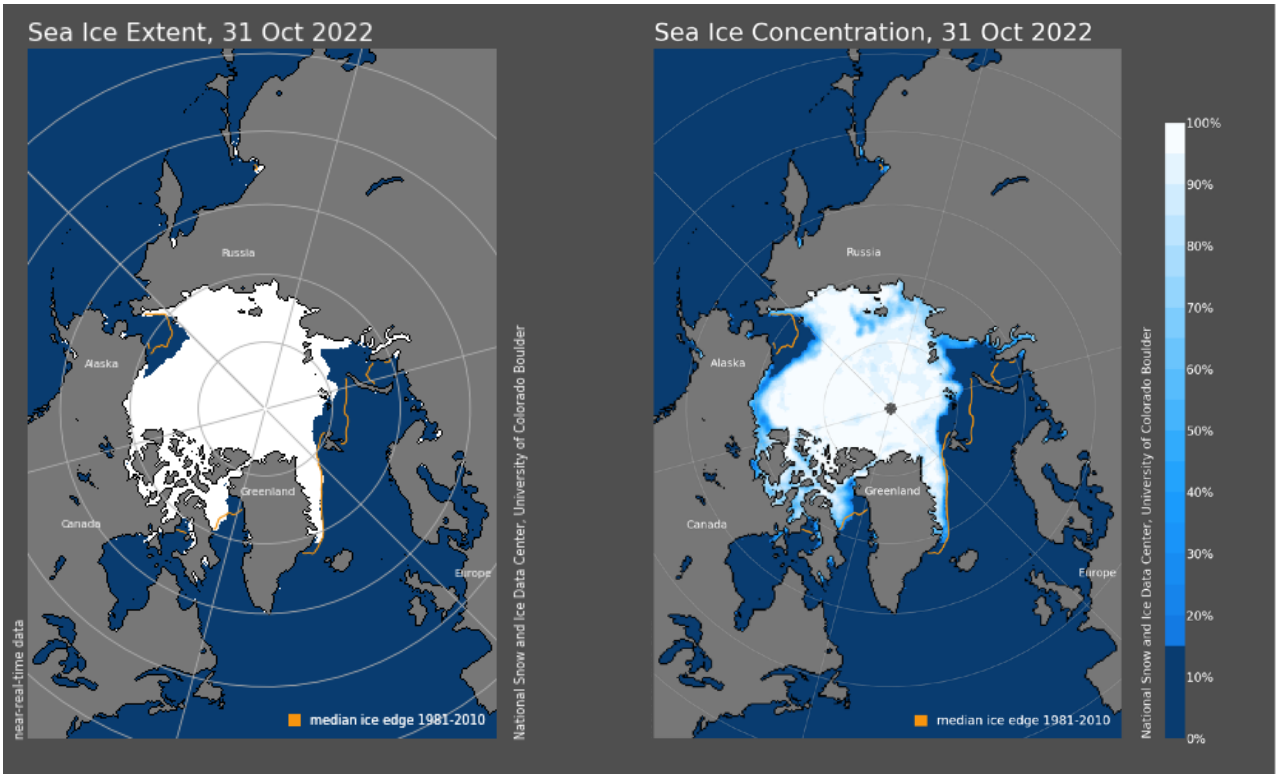

Figure 10. *(A) Sea ice extent and (B) sea ice concentration as of October 31, 2022, and as compared with the 1981 - 2010 median edge. Images: National Snow and Ice Data Center (nsidc.org).*

Newsworthy Information

Utqiaġvik and other communities on the Chukchi and western Arctic coast saw substantial flooding from the storm surge associated with a powerful storm system in the Chukchi Sea that arrived on Alaskan coasts around October 7 and 8. Water levels were lower than those of ex-typhoon Merbok in September, although not by much. The Bering Coast, which was suffered widespread damage from Merbok, was not strongly affected by this October storm.

Landslides caused multiple road closures this month. Haines Highway was hit on October 1st and cleared soon after. Edgerton Highway was blocked by a slide on October 17th and again on October 19 at a different location. On October 31st, a slide occurred near Petersburg on the Miktof Highway.

Many Alaskan rivers have begun to freeze. Unseasonable ice jams caused elevated river levels on the Tanana near Fairbanks and the Kuskokwim near McGrath. If ice forms during high water levels and the water under the ice later drains, the remaining ice can be dangerously unstable. The figure below shows the extreme jump in gage height at the Tanana in Fairbanks in late October.

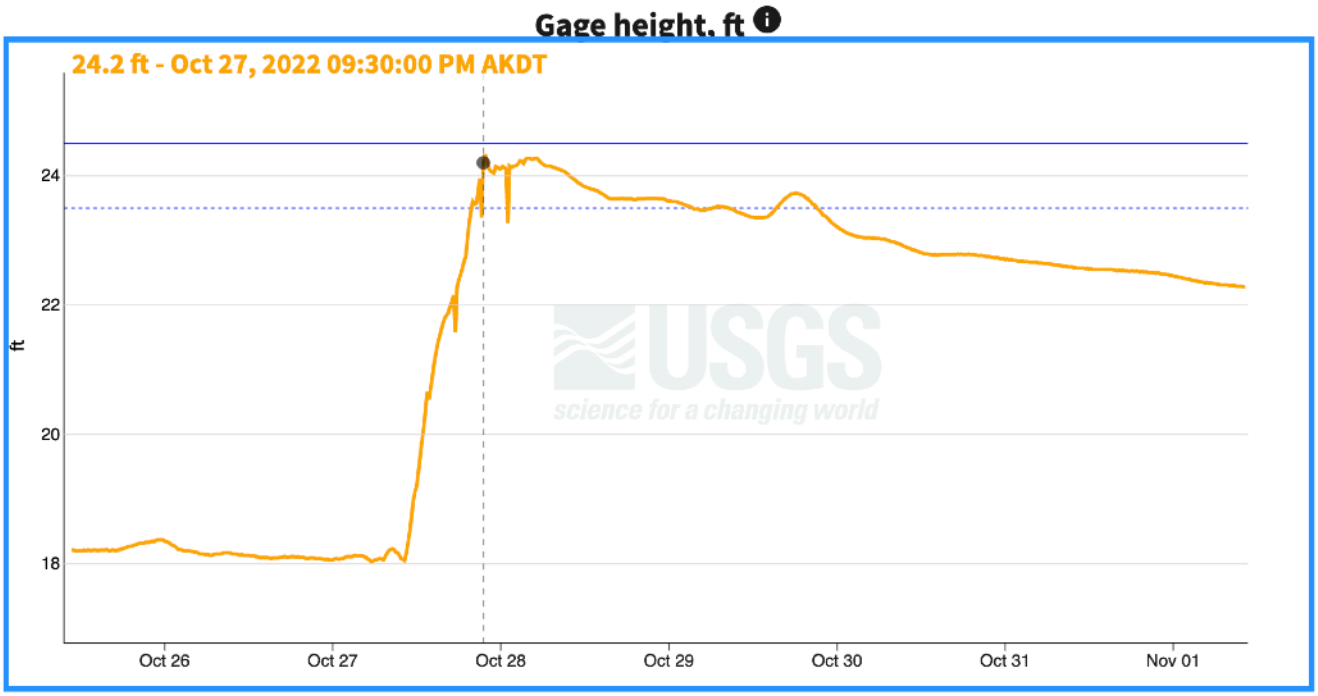

Figure 11. *Gage height at the Tanana in Fairbanks, October 26-November 1. Image courtesy of USGS (https://waterdata.usgs.gov/monitoring-location/15485500/)*

Appendix

Table A1: October 2022 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. 18 new highest mean daily temperature records were set and none was set for lowest mean daily temperature record.

Highest Mean Daily Temperature on Record				
Station	**Date**	**New Record (°F)**	**Year of Old Record**	**Old Record (°F)**
Anchorage	2022-10-06	54.5	1963	54.0
Anchorage	2022-10-07	50.0	2006	49.0
Anchorage	2022-10-08	51.5	1993	50.5
Cold Bay	2022-10-24	47.0	2020	46.5
Cold Bay	2022-10-25	48.0	2004	47.5
Delta Junction	2022-10-06	56.5	1963	51.0
Homer	2022-10-05	54.0	2003	52.5
Homer	2022-10-06	53.5	1963	51.0
Juneau	2022-10-08	53.0	1978	51.0
Juneau	2022-10-09	54.0	1979	52.5
Juneau	2022-10-16	56.0	2002	50.0
Juneau	2022-10-18	49.5	2015	49.0
Ketchikan	2022-10-05	57.0	1923	56.0
Ketchikan	2022-10-16	57.5	2015	56.5
Ketchikan	2022-10-17	57.5	2015	54.5
Ketchikan	2022-10-18	55.5	1938	54.5
Kodiak	2022-10-04	52.0	1978	51.5
Utqiaġvik	2022-10-06	38.0	2012	35.5
Yakutat	2022-10-08	54.0	1925	51.0

Table A2: October 2022 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. Sixteen new highest maximum daily temperature record were set and no new lowest records were set.

Highest Maximum Daily Temperature Record				
Station	**Date**	**New Record (°F)**	**Year of Old Record**	**Old Record (°F)**
Cold Bay	2022-10-24	53.0	1980	52.0
Delta Junction	2022-10-05	60.0	2012	59.0
Delta Junction	2022-10-06	60.0	1969	58.0
Homer	2022-10-05	60.0	1941	59.0
Homer	2022-10-06	59.0	1993	57.0
Juneau	2022-10-08	57.0	1943	56.0
Juneau	2022-10-09	61.0	1942	57.0
Juneau	2022-10-15	56.0	1963	55.0
Juneau	2022-10-16	62.0	2015	54.0
Juneau	2022-10-17	60.0	2014	54.0
Juneau	2022-10-18	57.0	1979	56.0
Ketchikan	2022-10-16	65.0	2015	63.0
King Salmon	2022-10-05	61.0	2018	59.0
King Salmon	2022-10-06	63.0	2003	59.0
Utqiaġvik	2022-10-06	42.0	1992	38.0
Yakutat	2022-10-04	60.0	1959	58.0

Table A3: October 2022 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. 16 new records for highest minimum daily temperature were set, while no new record was set for lowest minimum daily temperature.

Highest Minimum Daily Temperature Record				
Station	**Date**	**New Record (°F)**	**Year of Old Record**	**Old Record (°F)**
Anchorage	2022-10-06	51.0	1963	48.0
Anchorage	2022-10-07	47.0	2006	46.0
Delta Junction	2022-10-06	53.0	1952	48.0
Homer	2022-10-06	48.0	2003	47.0
Juneau	2022-10-08	49.0	1963	47.0
Juneau	2022-10-16	50.0	2002	49.0
Ketchikan	2022-10-05	55.0	1980	53.0
Ketchikan	2022-10-14	53.0	1937	52.0
Ketchikan	2022-10-17	55.0	2015	52.0
Ketchikan	2022-10-18	53.0	1938	51.0
Kodiak	2022-10-04	50.0	1978	49.0
Kodiak	2022-10-05	51.0	2003	49.0
Kodiak	2022-10-06	50.0	2003	49.0
Talkeetna	2022-10-07	43.0	1964	42.0
Talkeetna	2022-10-08	45.0	2009	43.0
Utqiaġvik	2022-10-06	34.0	1985	33.0
Yakutat	2022-10-08	52.0	1993	49.0

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 errors to uaf-climate@alaska.edu.