



Alaska Climate Research Center
Alaska State Climate Center

MONTHLY REPORT



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Alaska’s Statewide Climate Summary for December 2020 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. We report on temperatures, precipitation and drought conditions in the state, as well as the condition of the Arctic sea ice.

HIGHLIGHTS

Very warm December across the state of Alaska; **multiple new high temperature records** were observed in Juneau.

Dry with typically less than half average snowfall for the interior part of the state, and **higher than normal** for the panhandle (Juneau and Ketchikan) and in the far North (Utqiagvik).

A **new Alaska land-based low pressure record was set** in the Aleutians when the barometric pressure dropped to 921 millibars.

The December **average sea ice extent** was the 3rd lowest in the satellite record.

Temperature

Eighteen out of nineteen first-order stations around the state of Alaska reported warmer than usual temperatures, with the largest departures from normal in the interior of the state (Bettles with 7.9 °F; Delta Junction with 6.0 °F; and Gulkana with 7.2 °F) and along the Panhandle (e.g., Juneau with 6.6 °F), as seen in Figure 1 and Table 1. While Utqiagvik temperatures have been continuously above normal since mid-September with the most extreme anomaly (14 °F higher than normal) observed in November 2020, temperatures were only 3.2 °F above normal for the month of December. Juneau broke multiple high temperature records for the month (Figure 2). Specific dates and values are listed in the appendix. The only station reporting colder than average temperatures was at Cold Bay (-1.8 °F) for the month.

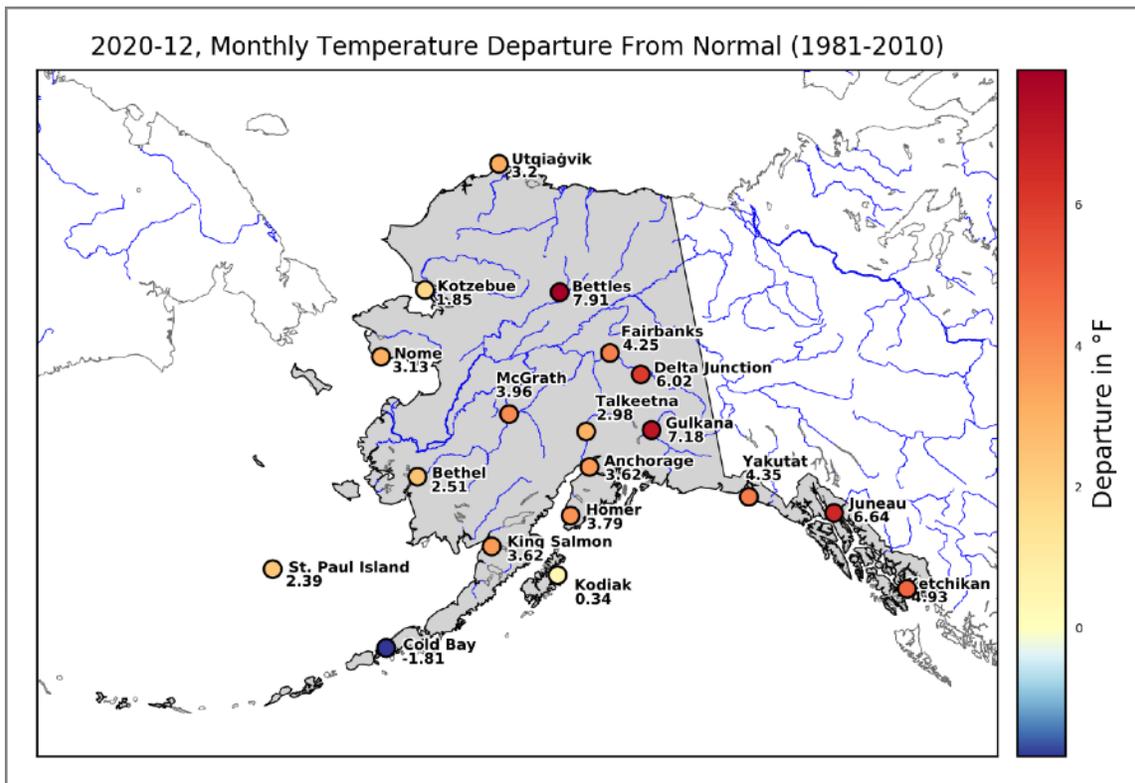


Figure 1. Monthly mean temperature departure from normal, December 2020, for selected stations around the state of Alaska.

Daily mean temperatures (Figure 3) reveal that, aside from Juneau, the cities of Anchorage, Bettles, Delta Junction, Fairbanks, Gulkana, Ketchikan, King Salmon, Nome and Yakutat showed more than half of the month with temperatures warmer than usual.

Station	Observed (°F)	Normal (°F)	Departure (°F)
Anchorage	22.6	19.0	3.6
Bethel	12.9	10.4	2.5
Bettles	2.2	-5.7	7.9
Cold Bay	29.3	31.1	-1.8
Delta Junction	8.1	2.1	6.0
Fairbanks	0.2	-4.0	4.3
Gulkana	7.6	0.5	7.2
Homer	30.8	27.1	3.8
Juneau	36.5	29.8	6.6
Ketchikan	40.3	35.3	4.9
King Salmon	22.2	18.6	3.6
Kodiak	31.5	31.2	0.3
Kotzebue	4.1	2.3	1.9
McGrath	0.8	-3.2	4.0
Nome	12.5	9.5	3.1
St. Paul Island	31.2	28.8	2.4
Talkeetna	19.0	16.0	3.0
Utqiagvik	-4.6	-7.8	3.2
Yakutat	34.0	29.7	4.3

Table 1: Mean monthly air temperature, normal (1981-2010) and departure for selected stations throughout the state, December 2020. Color-coded to Figure 1 (yellow-orange-red = warmer than usual; shades of blue = cooler than usual).

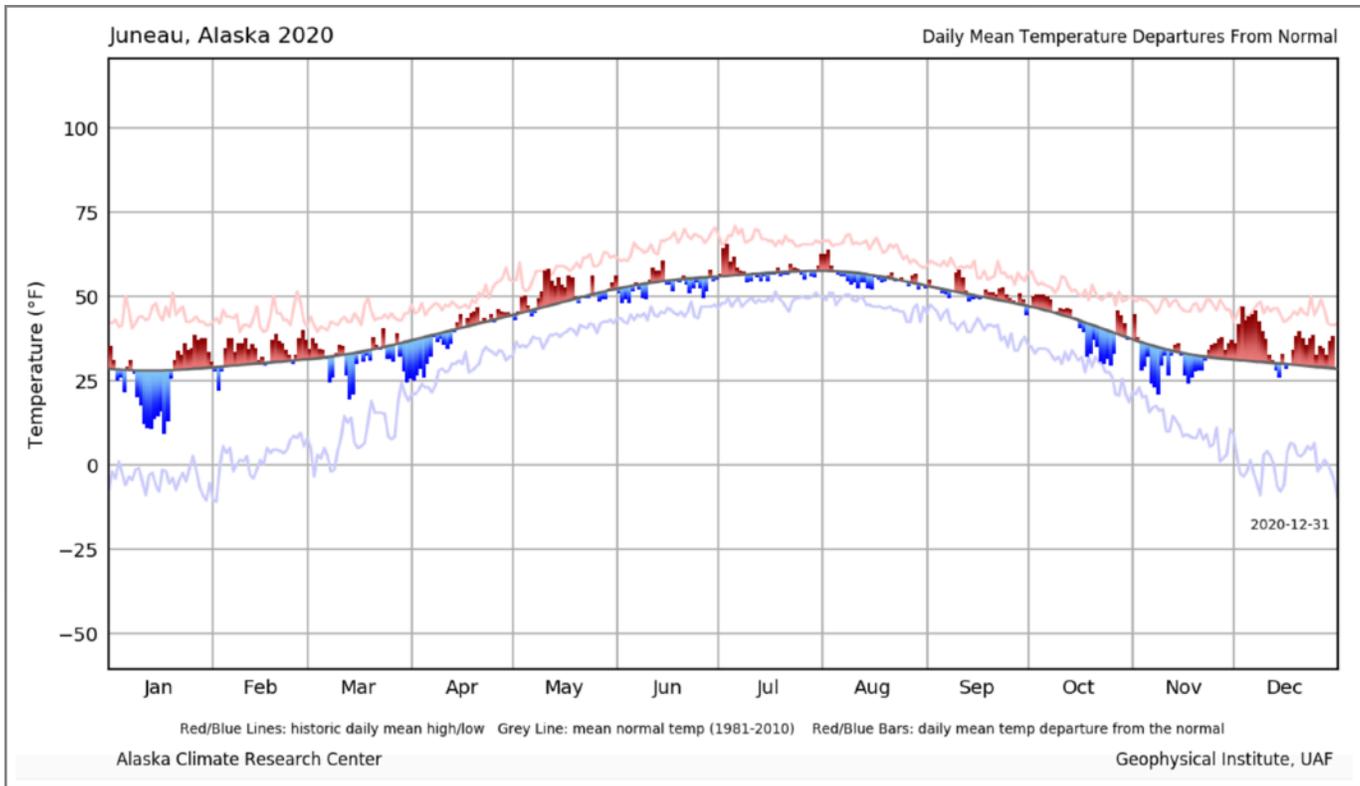


Figure 2: Juneau daily mean temperature departures from normal (1981-2010) for 2020. Red and blue bars represent positive and negative temperature departures. Grey line represents the mean normal temperature, red and blue lines represent respectively the historic highest and lowest records of mean daily temperature.

Seven new records for highest mean daily temperatures were set, along with six new highest maximum daily temperature records, six new records for highest minimum daily temperatures and one new record for lowest minimum daily temperature. See the appendix for more details on this month’s record-breaking high and low temperatures.

Precipitation

Significant above normal precipitation was recorded along the North Slope and the Panhandle of Alaska. Utqiagvik received a total of 0.7” compared with the normal of 0.1” for the month of December (Figure 4; Table 2). On December 3rd, Utqiagvik received 0.4” of precipitation, beating the previous record of 0.1” for the day, set back in 1924. Along the Panhandle, Juneau received 218% of normal and Ketchikan received 216% of normal precipitation. On December 23rd, Ketchikan received 4.5”, beating a previous record for the day of 3.5” of precipitation, set back in 1925.

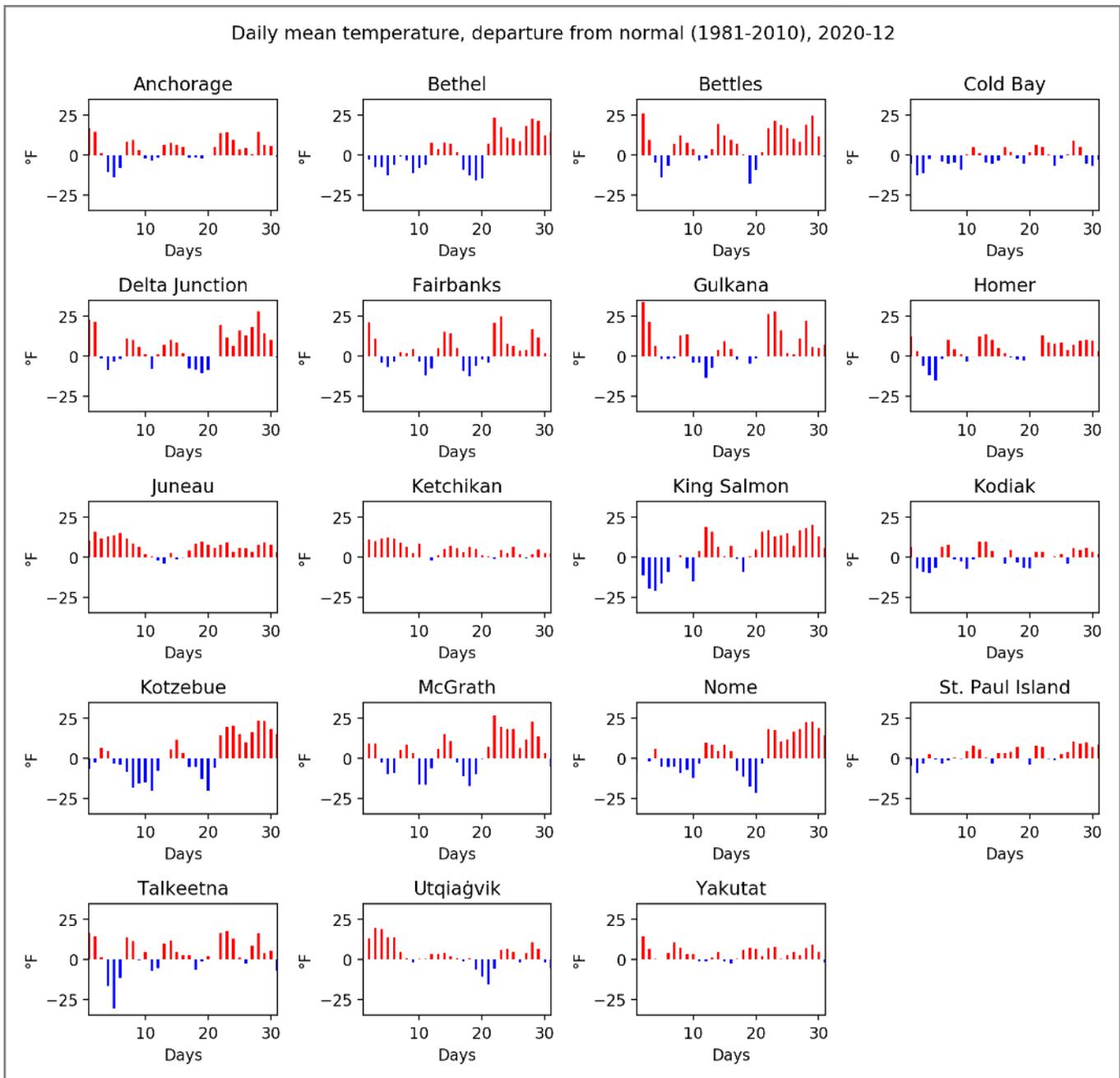


Figure 3: Daily mean temperature departures for each day in December 2020, at the selected stations.

Figure 5 shows the monthly precipitation sums for December 2020 at the selected stations compared to the normal (1981-2010), in inches. 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. Anchorage received a total of 22.2 inches of snow, resulting in 132% of the normal for this time

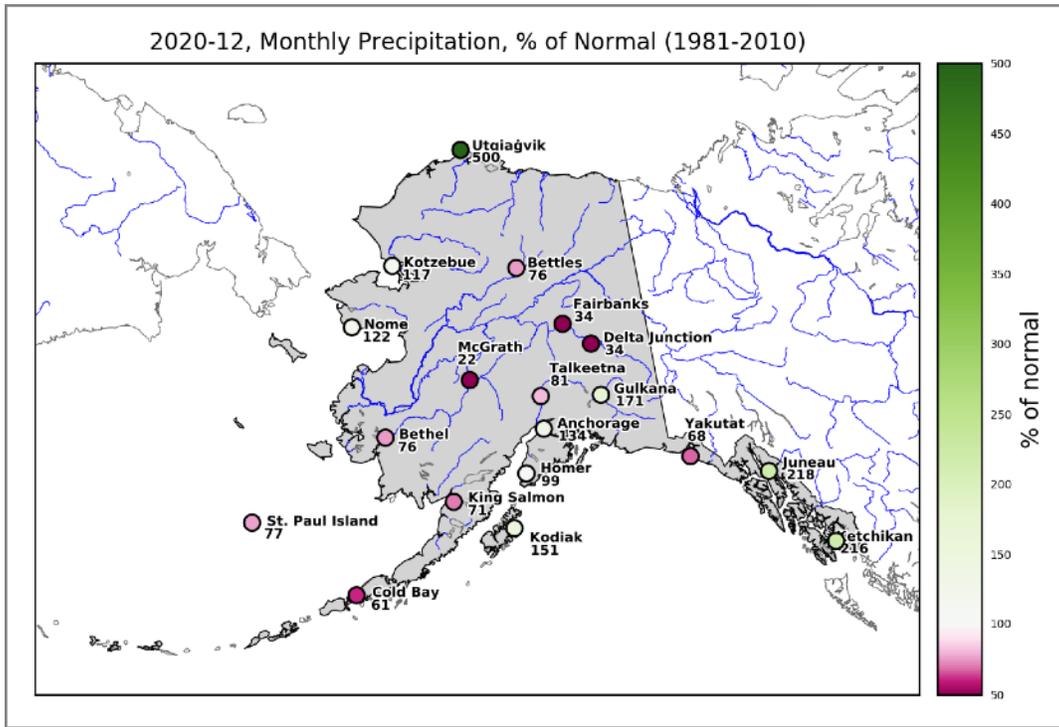


Figure 4. Monthly precipitation sums expressed as percent of normal (1981-2010), December 2020.

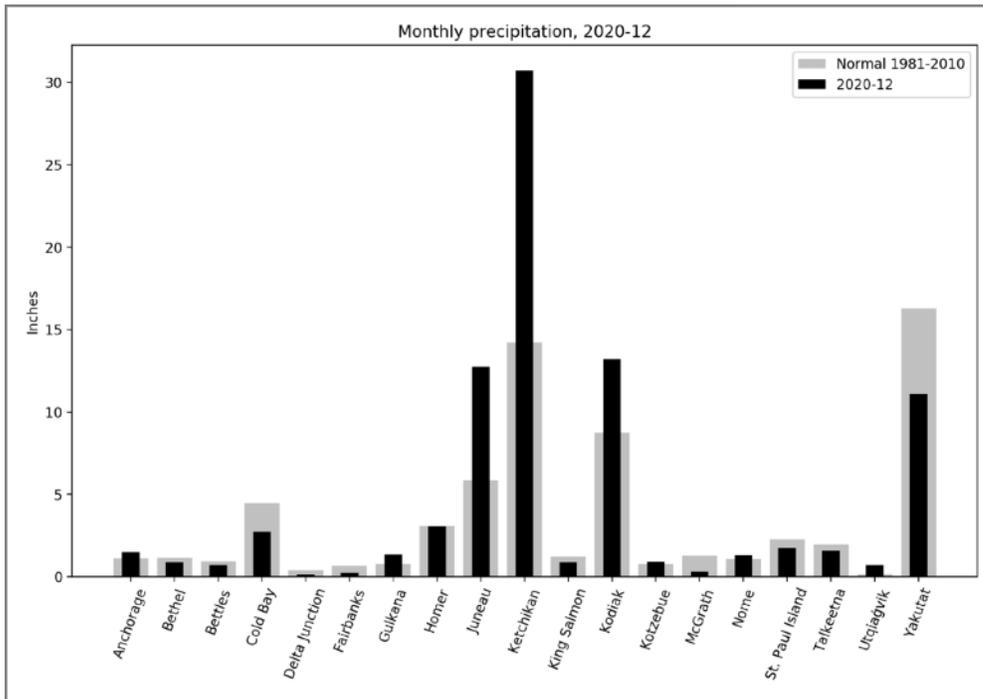


Figure 5. Monthly precipitation sums for December 2020 at the selected stations compared to the normal (1981-2010), in inches.

Station	Precipitation (in)	Normal (in)	% of Normal
Anchorage	1.5	1.1	134.2
Bethel	0.8	1.1	75.9
Bettles	0.7	0.9	76.1
Cold Bay	2.7	4.5	61.0
Delta Junction	0.1	0.4	34.2
Fairbanks	0.2	0.6	34.4
Gulkana	1.3	0.8	170.5
Homer	3.0	3.1	98.7
Juneau	12.7	5.8	218.2
Ketchikan	30.7	14.2	215.9
King Salmon	0.9	1.2	70.7
Kodiak	13.2	8.7	151.3
Kotzebue	0.9	0.8	117.1
McGrath	0.3	1.3	22.5
Nome	1.3	1.1	122.2
St. Paul Island	1.7	2.3	77.3
Talkeetna	1.6	1.9	81.3
Utqiagvik	0.7	0.1	500.0
Yakutat	11.1	16.3	68.1

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, December 2020. Shades of purple and green correlate with Figure 4.

of year. On December 19th, 8 inches fell in a single day, beating the previous record of 7.3 inches which fell on the same day in Anchorage back in 2003.

Fairbanks received significantly less snowfall than usual (only 3.6 inches, or, 30% of the normal). Juneau received only 53% of its normal with the snow melting away by the end of the month.

Station	Snow (in)	Normal (in)	Deviation (%)	Snow depth (in)
Anchorage	22.2	16.7	132.9	16
Bettles	9.5	15.6	60.9	17
Fairbanks	3.6	12.1	29.8	15
Juneau	8.3	15.6	53.2	0

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, December 2020.

Drought

No significant drought conditions were present in the state for the month of December, but abnormally dry conditions (rated D0 in Figure 6) were more prevalent in the northwestern part of the state, along with Kodiak Island. The figure below has been produced through a collaboration of the USDA, NOAA and the National Drought Mitigation Center.

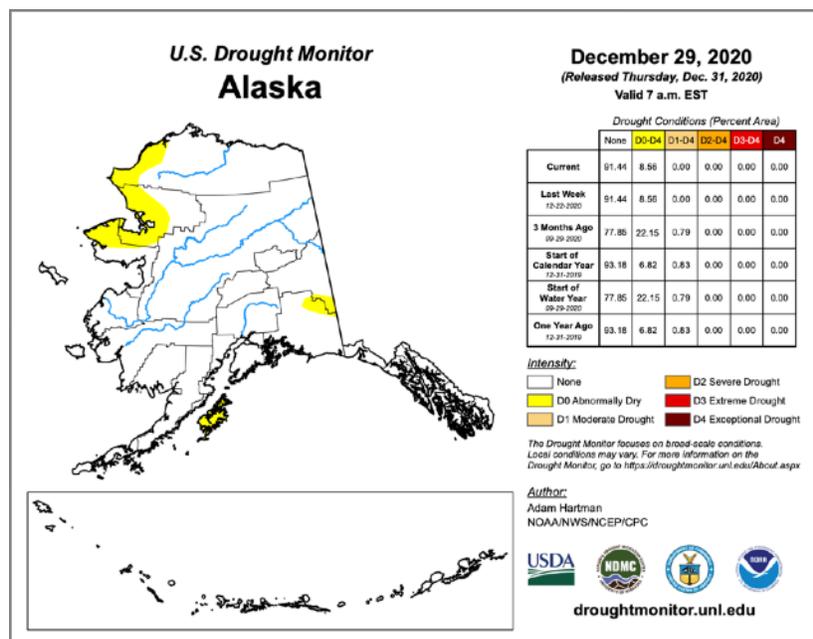


Figure 6. U.S. Drought Monitor map for Alaska, updated on December 29, 2020. The table on the right shows the percent area affected by different categories of drought intensity. Figures and data produced and released by the U.S. Drought Monitor, a partnership between the National Drought Mitigation Center 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

While Arctic sea ice growth was faster than average through the month of December, sea ice extent was the 3rd lowest in the satellite record: 11.77 million square kilometers (4.54 million square miles), or 1.07 million square kilometers (413,000 square miles) below the 1981-2010 December average. On the Pacific side, sea ice cover was below average in the Bering Sea, while on the Atlantic side, it was below average in the Barents Sea. Despite a rapid early and mid-month gain of ice, the rate of extent increase slowed considerably. The cumulative loss of ice in December over the 43-year satellite record is 1.97 million square kilometers (761,000 square miles) - about three times the size of Texas. Figure 7 shows a time series of sea ice extent while Figure 8 is a graphical representation of sea ice extent for the month of December 2020.

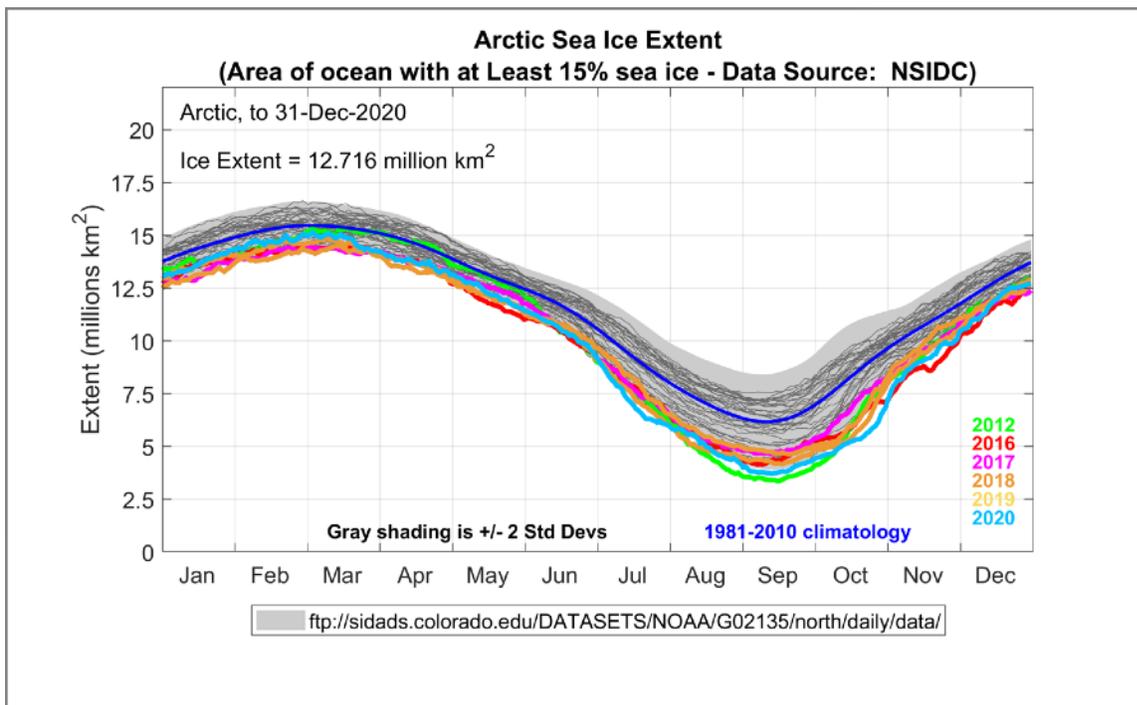


Figure 7. Time series of daily Arctic sea ice extent. This year’s data (light blue) are updated until December 31, 2020. The median sea ice extent for the 1981-2010 reference period is depicted in blue. Specific years are highlighted in colors. Plot Compiled by: Howard J. Diamond, PhD; Climate Science Program Manager at NOAA’s Air Resources Laboratory Data Source: National Snow & Ice Data Center (<https://nsidc.org/>).

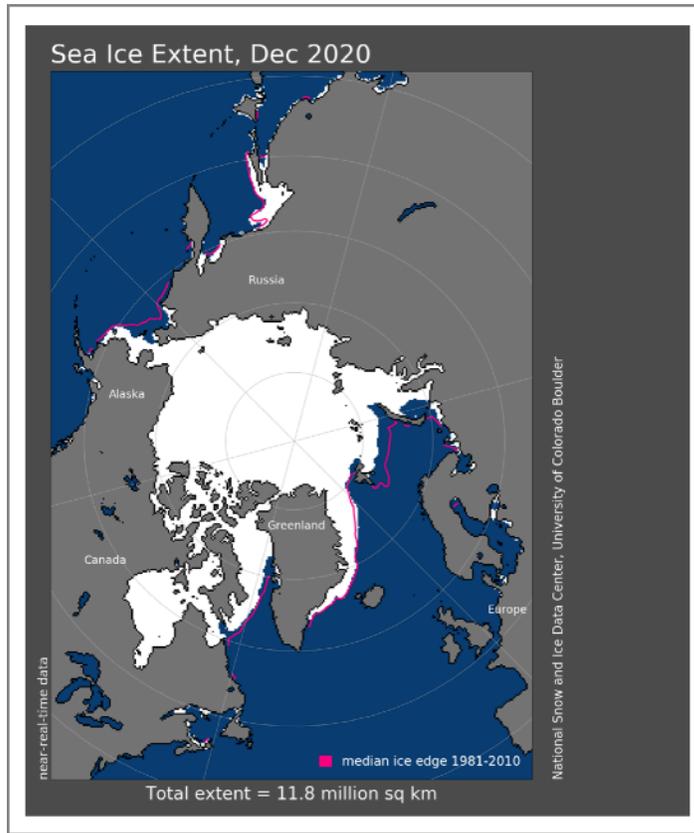
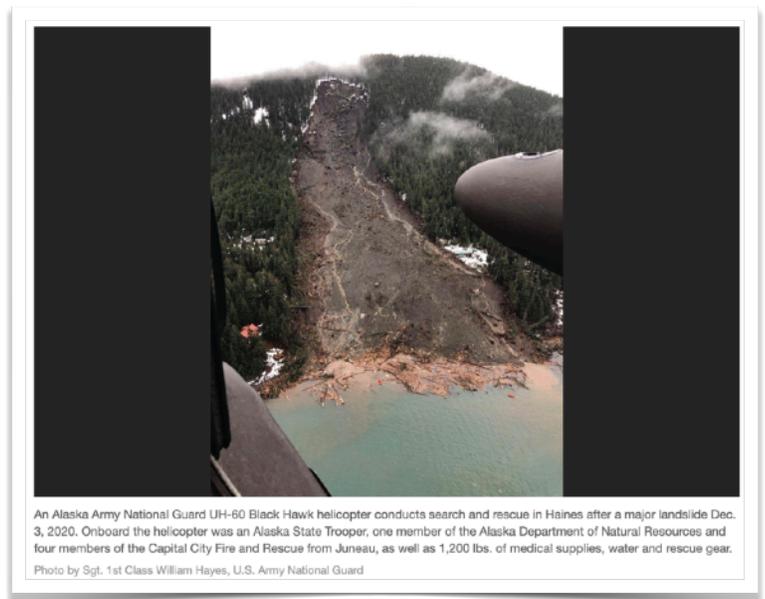


Figure 8. Monthly Arctic sea ice extent for December 2020. Image: NSIDC (nsidc.org).

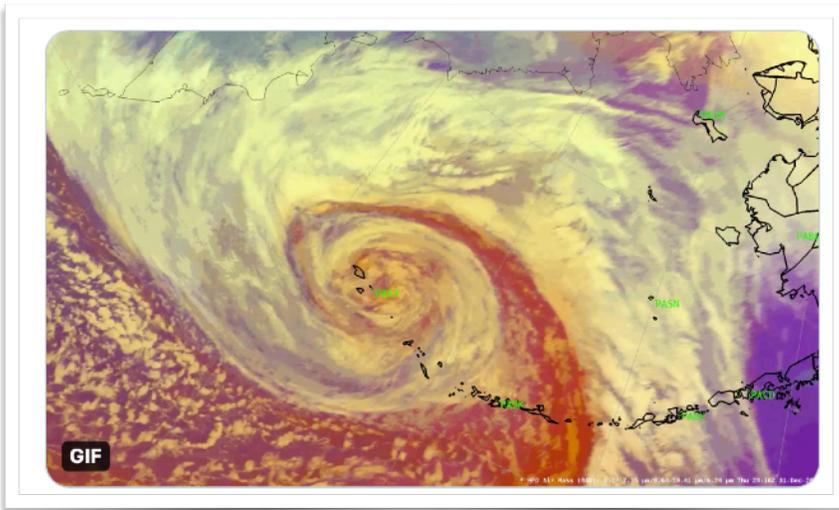
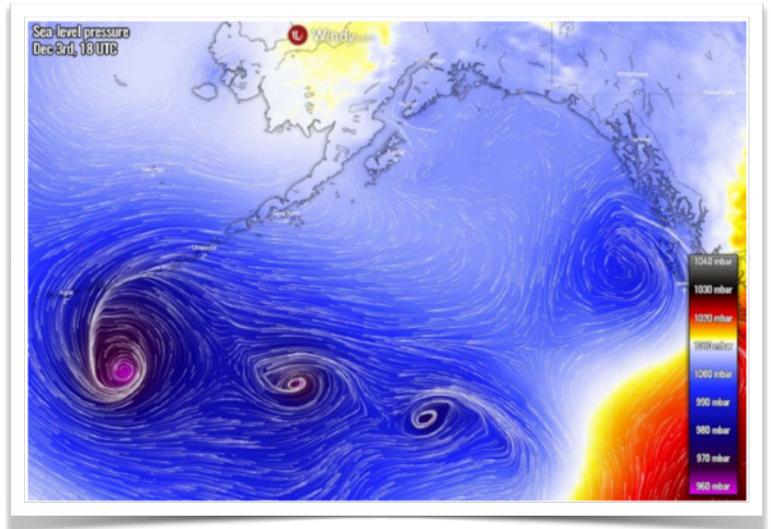
Newsworthy Information

At the beginning of the month, on December 2, 2020, a severe storm with heavy rainfall led to destructive landslides, mudslides and flooding in communities throughout Southeast Alaska. Several homes were destroyed and two residents were killed in Haines. The disaster is considered to be a 200-500 year storm event: http://www.newsminer.com/news/alaska_news/haines-disaster-considered-200-500-year-storm-event/article_1d078756-499a-11eb-afc7-0793b6e202dd.html

More on the record amounts of rainfall here: <http://floodlist.com/america/usa/floods-landslides-southeast-alaska-december-2020>



On December 3, 2020, a tandem of three surface cyclones was observed off the coast of Alaska, connected to each other with the frontal boundary in between. The westernmost system was the strongest and most organized, with a central pressure of 978 mbar. Image provided by [windy.com](https://www.windy.com). Read more here: <https://www.severe-weather.eu/global-weather/extratropical-storm-waves-alaska-united-states-mk/>



At the end of the month, on December 31, 2020, a new Alaska land-based low pressure record was set when pressure dropped to 921 mb. The strongest wind gust recorded at Shemya Island in Alaska, located about 1,450 miles southwest of Anchorage, was 83 mph, with high winds and pounding waves battering the western Aleutian Island chain. The storm was too far from large populated areas to pose a direct hazard to many people besides those traveling in the region by aircraft or vessel: <https://www.adn.com/alaska-news/weather/2020/12/31/bomb-cyclone-heading-toward-aleutian-islands-becomes-strongest-storm-ever-to-hit-alaska/>

Appendix

Table A1: December 2020 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. Seven 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)
Bettles	2020-12-01	30.5	1979	20.5
Gulkana	2020-12-02	35.5	1992	35.0
Homer	2020-12-01	40.5	2004	39.5
Homer	2020-12-13	41.5	1940	40.0
Juneau	2020-12-02	47.0	1963	45.5
Juneau	2020-12-04	44.0	1989	41.0
Juneau	2020-12-05	44.5	2017	41.5

Table A2: December 2020 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. Six new highest maximum daily temperature records were 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)
Bettles	2020-12-01	30.0	2018	26.0
Fairbanks	2020-12-01	39.0	1929	37.0
Juneau	2020-12-01	49.0	1997	48.0
Juneau	2020-12-02	52.0	1963	49.0

Juneau	2020-12-04	47.0	1989	46.0
Juneau	2020-12-05	49.0	2017	46.0

Table A3: December 2020 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. Six new records for highest minimum daily temperatures were set, while one was set for lowest minimum daily temperature.

Highest Minimum Daily Temperature on Record				
Station	Date	New Record (°F)	Year of Old Record	Old Record (°F)
Bettles	2020-12-01	31.0	1979	16.0
Gulkana	2020-12-02	33.0	1992	31.0
Homer	2020-12-13	39.0	1940	37.0
Juneau	2020-12-04	41.0	1944	39.0
Juneau	2020-12-05	40.0	1943	37.0
Juneau	2020-12-06	43.0	2017	42.0

Lowest Minimum Daily Temperature Record				
Station	Date	New Record (°F)	Year of Old Record	Old Record (°F)
Cold Bay	2020-12-02	10.0	1971	11.0

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.