Alaska Climate Research Center

Alaska State Climate Center

MONTHLY REPORT

IN THIS ISSUE

Alaska's Statewide Climate Summary for March 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 temperature and precipitation conditions in the state, as well as the condition of the Arctic sea ice.

HIGHLIGHTS

Cold March across the state of Alaska with particularly cold temperatures in the Interior.

Warmer than usual temperatures at St. Paul Island, Cold Bay and Utqiaġvik.

Regions from the West Coast, the North Slope, and the Interior to the Cook Inlet continued to receive **significantly above-normal snowfall this month**.

Arctic sea ice reached its maximum extent on March 21 and **tied for 7th lowest** sea ice extent on record.

Temperature

Most reporting stations around the state of Alaska observed colder than usual temperatures for the month of March, with the largest departures from normal in the Interior, the Cook Inlet and West Coast regions (e.g., Talkeetna with -9.3 ºF; Anchorage with -7.4 ºF; and Gulkana with -6.6 ºF from normal), as seen in Figure 1 and Table 1. Anchorage ended a period of consecutive days without a high temperature at or above freezing on March 24th, marking the 2nd longest streak recorded (57 days). As of March 31st, Fairbanks has had 171 consecutive days below 40F, which is tied for the 3rd longest streak, and the cold weather period is set to continue with current conditions. Warmer than normal temperatures were observed in a few locations with the biggest departures at St. Paul Island (+6.1 ºF) and Cold Bay (+7.2 ºF), where there have been continued warmer than average ocean surface temperatures over a wide swath of the Bering Sea south of the sea ice. Utqiaġvik was also warmer than normal (+2.9 ºF), ending a 43-day streak of temperatures at or below 0 ºF on March 8th (Figure 2). This is also consistent with positive ocean surface temperature trends seen in the North. Near-normal temperatures were found along the Panhandle and Kodiak Island. Figure 3 shows daily mean temperature departures for each day in March 2021, for which it is clear that at St. Paul Island, nearly every day this month was warmer than normal.

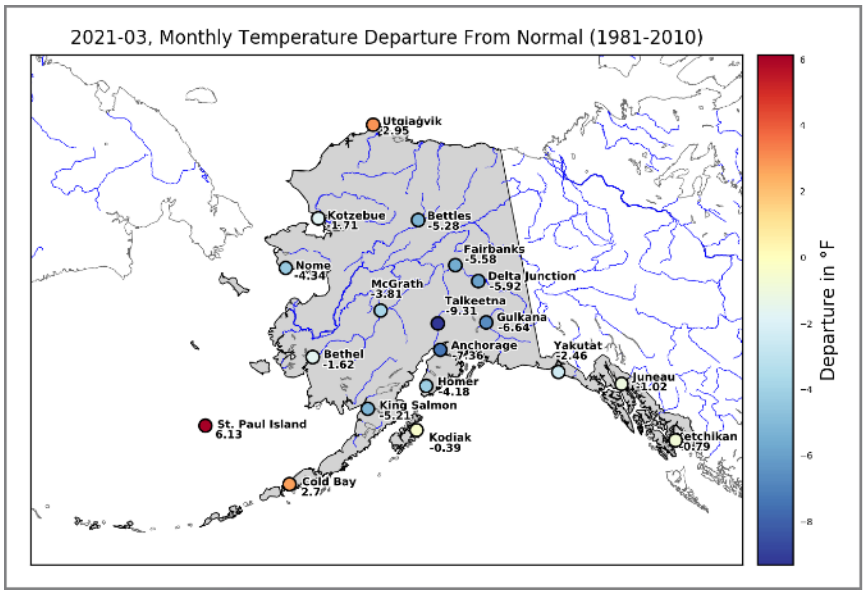

Figure 1. Monthly mean temperature departure from normal, March 2021, for selected stations around the state of Alaska.

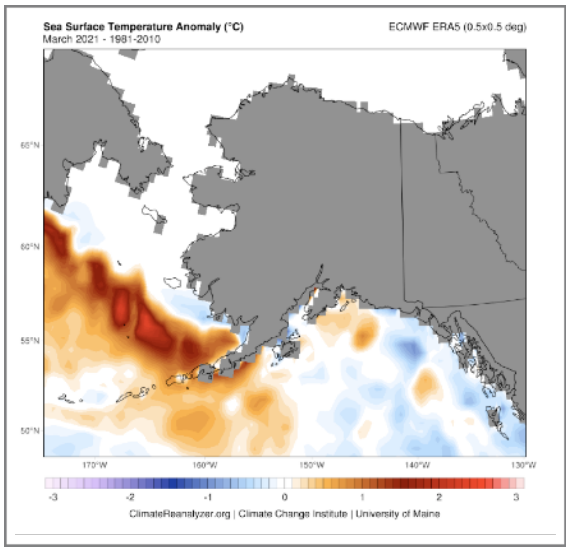

Figure 2. Average sea surface temperatures (SST) anomalies for the month of March 2021 relative to the 1981 to 2010 temperature normal as derived from ECMWF ERA5 4th generation reanalysis data (data source: Climate Reanalyzer, Climate Change Institute, University of Maine).

Station	Observed (ºF)	Normal (ºF)	Departure (ºF)
Anchorage	19.2	26.5	-7.4
Bethel	13.6	15.2	-1.6
Bettles	-0.9	4.4	-5.3
Cold Bay	32.8	30.1	2.7
Delta Junction	8.2	14.1	-5.9
Fairbanks	5.9	11.4	-5.6
Gulkana	8.9	15.6	-6.6
Homer	25.8	29.9	-4.2
Juneau	32.8	33.8	-1.0
Ketchikan	37.0	37.8	-0.8
King Salmon	18.9	24.1	-5.2
Kodiak	32.4	32.8	-0.4
Kotzebue	-0.7	1.0	-1.7
McGrath	7.8	11.6	-3.8
Nome	6.0	10.3	-4.3
St. Paul Island	31.0	24.9	6.1
Talkeetna	15.6	24.9	-9.3
Utqiaġvik	-9.7	-12.6	2.9
Yakutat	29.5	32.0	-2.5

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

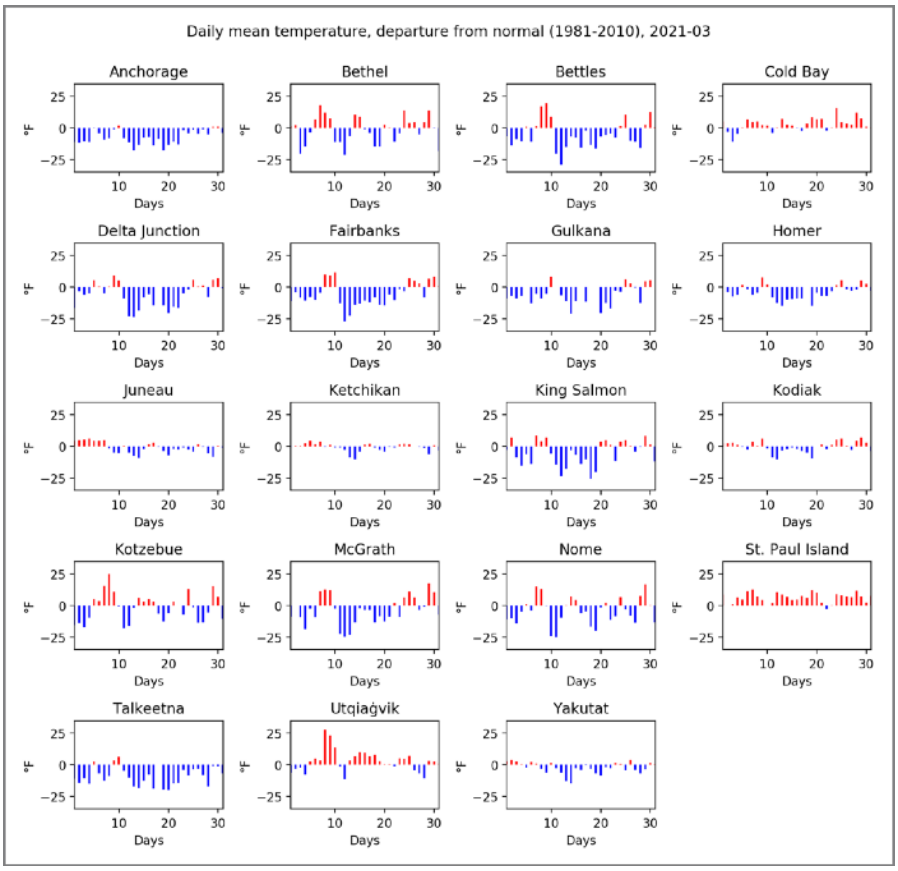

Figure 3. Daily mean temperature departures for each day in March 2021, at the selected stations.

Precipitation

Most reporting stations across the state showed high amounts of precipitation for the month due to several frontal systems passing mostly from westerly directions, open and warm waters in the Bering Sea and adjacent Arctic Ocean, along with typical La Niña conditions favoring above-normal precipitation. Significant above-normal precipitation was recorded in Fairbanks (356% of normal) and King Salmon (310% of normal) while Kodiak (58% of normal) and Yakutat (59% of normal) showed the lowest precipitation compared with the normal for this time of year (Figure 4). Precipitation gauge problems at multiple locations: Bethel, Bettles, Delta Junction, Kotzebue and Nome required using observations from nearby SNOTEL sites. Given the precipitation gauge went out on March 13, values were used from the Aniak SNOTEL site, 40 miles northeast of Bethel. The Bettles precipitation gauge is still out, thus values were used from the Bettles Field SNOTEL site. For Delta Junction, observations from the nearby Granite Creek SNOTEL site were substituted. While no problems were reported with the Kodiak AP precipitation

gauge, nearby stations (Kodiak WWTP and Kitoy Bay) reported, ranges in 3 inches of precipitation for the month compared with 1.9 inches at the airport. In Nome, data from the Pargon Creek SNOTEL site measured 1.3 inches while METAR for the region showed that the precipitation gauge went out for 4 days of the month. Figure 5 shows the precipitation anomaly for the month using the Climate Reanalyzer to confirm where values of precipitation were high and low when compared to the normal for this time of year. Figure 6 shows the monthly precipitation sums for March 2021 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. All locations reported above-normal snowfall with Fairbanks receiving three times its normal amount for this time of year, bringing its snow depth up to nearly 2.5 feet, the highest end-of-March snow depth since 1993. Despite Juneau receiving a significant amount of snow (33 inches), its snow depth remains low, at only 3 inches, given a couple of rain events (including freezing rain on March 27th), which impacted the end-of-month total.

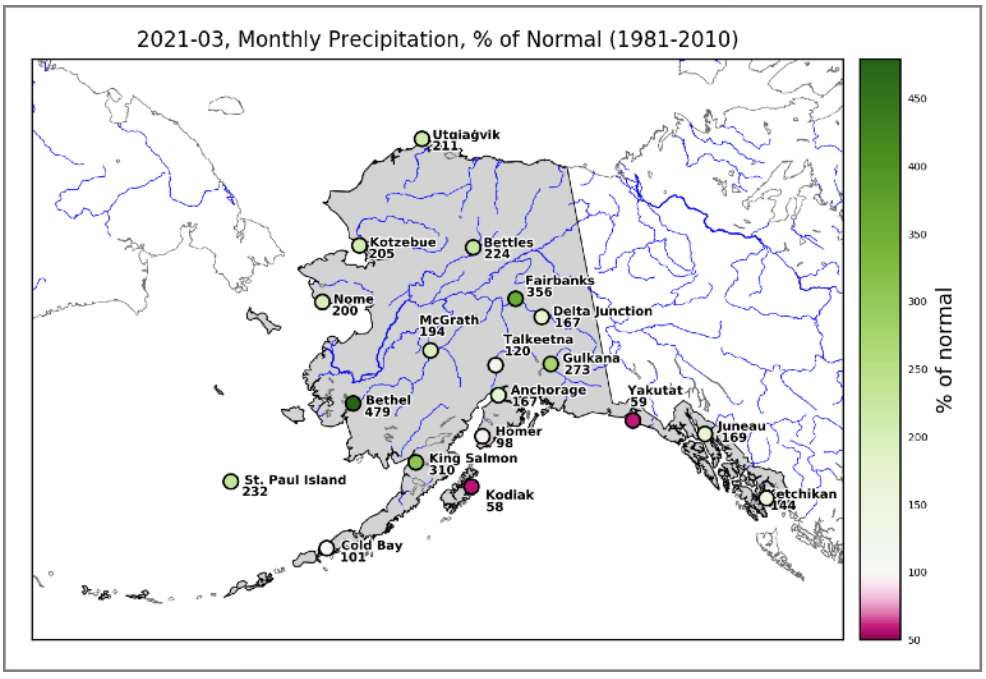

Figure 4. Monthly mean precipitation departure from normal (in percent), March 2021, for selected stations.

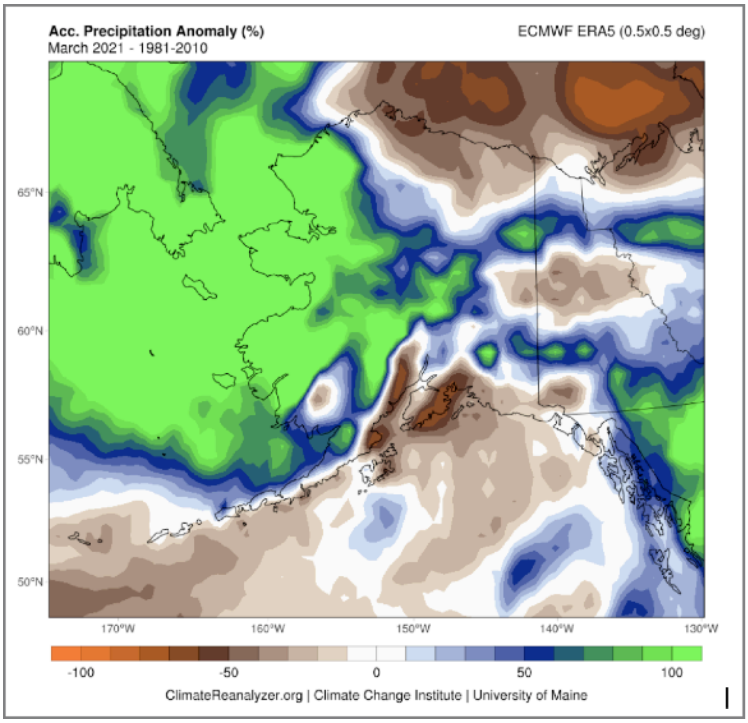

Figure 5. Precipitation anomaly for the month of March 2021 relative to the 1981 to 2010 precipitation normal as derived from ECMWF ERA5 4th generation reanalysis data (data source: Climate Reanalyzer, Climate Change Institute, University of Maine).

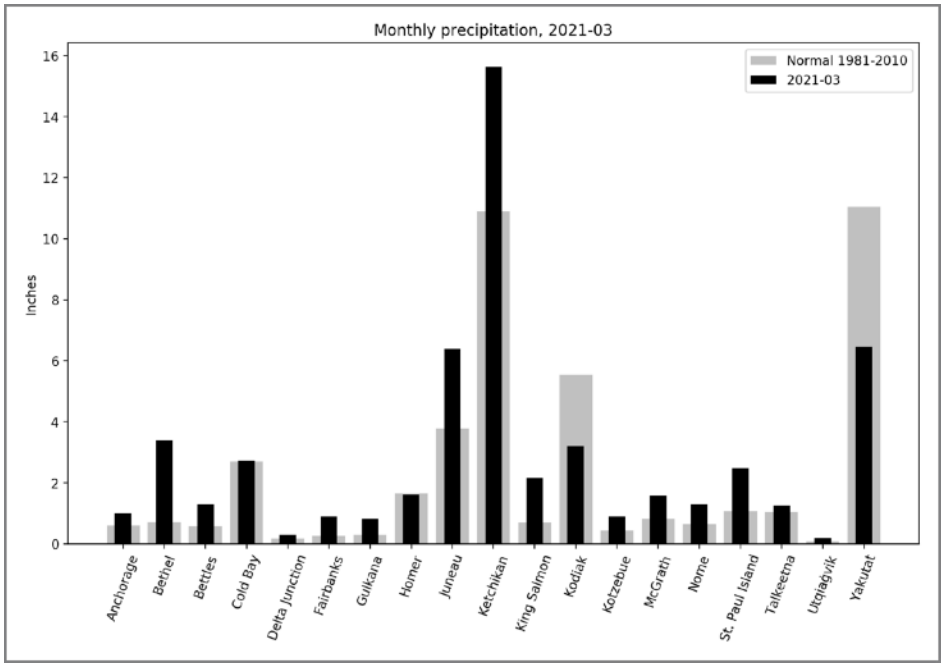

Figure 6. Monthly precipitation sums for March 2021 at the selected stations compared to the normal (1981-2010), in inches.

Station	Precipitation (in)	Normal (in)	% of Normal
Anchorage	1.0	0.6	166.7
Bethel	3.4	0.7	478.9
Bettles	1.3	0.6	224.1
Cold Bay	2.7	2.7	101.1
Delta Junction	0.3	0.2	166.7
Fairbanks	0.9	0.3	356.0
Gulkana	0.8	0.3	273.3
Homer	1.6	1.6	98.2
Juneau	6.4	3.8	168.8
Ketchikan	15.6	10.9	143.5
King Salmon	2.2	0.7	310.0
Kodiak	3.2	5.5	57.9
Kotzebue	0.9	0.4	204.5
McGrath	1.6	0.8	193.8
Nome	1.3	0.7	200
St. Paul Island	2.5	1.1	231.8
Talkeetna	1.3	1.1	120.0
Utqiaġvik	0.2	0.1	211.1
Yakutat	6.5	11.0	58.5

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, March 2021. Shades of purple and green correlate with Figure 4.

Station	Snow (in)	Normal (in)	Deviation (%)	Snow depth (in)
Anchorage	13.5	9.9	136.4	25
Bettles	16.0	9.3	172.0	32
Fairbanks	15.1	4.9	308.2	29
Juneau	33.6	11.6	289.7	3

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, March 2021.

Arctic Sea Ice

Near the end of February (02/25/2021), the sea ice started to decrease and it was thought that the seasonal transition from increasing to decreasing sea ice extent may have been initiated. But, by the end of the first week of March, the sea ice had **increased** again, by a rate of +3.82% from the level on 02/25/2021 of 14.218 M km^2 to 14.782 M km^2 for the week. By March 11, the sea ice had increased from last week but only by a small rate of +0.56% from the level on 03/04/2021 of 14.782 M km^2 to 14.865 M km^2. By March 18th, the sea ice **decreased** from last week by a rate of -0.54% from the level on 03/11/2021 of 14.865 M km^2 to 14.785 M km^2. Finally, on March 25th, the sea ice decreased from last week by a rate of -2.05% from the

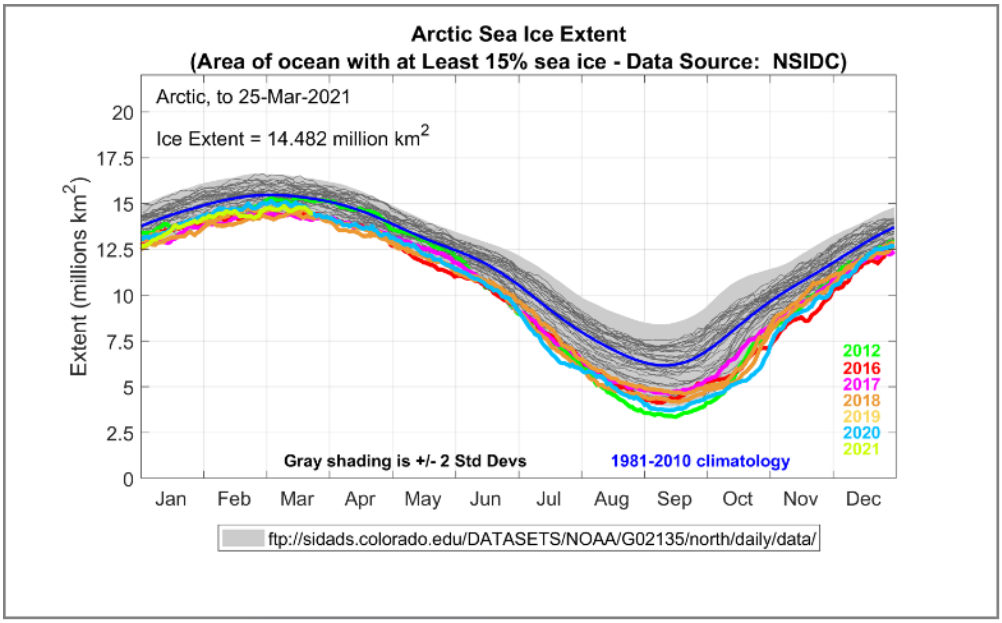

Figure 7. Time series of daily Arctic sea ice extent. This year's data (lime green) are updated until March 25, 2021. The median sea ice extent for the 1981-2010 reference period is depicted in blue. Specific years are highlighted in colors. Plot Compiled by: Howard J. Diamond, PhD; Climate Science Program Manager at NOAA's Air Resources Laboratory Data Source: National Snow & Ice Data Center (https://nsidc.org/).

level on 03/18/2021 of 14.785 M km^2 to 14.482 M km^2 (Figure 7). On March 21, 2021, the Arctic sea ice likely reached its maximum extent for the year, totaling 14.77 million square kilometers (5.70 million square miles). This ties the year 2021 or the 7th lowest extent in the satellite record with 2007 (Figure 8). The date of the maximum this year was nine days later than the 1981 to 2010 median date of March 12 (Table 4).

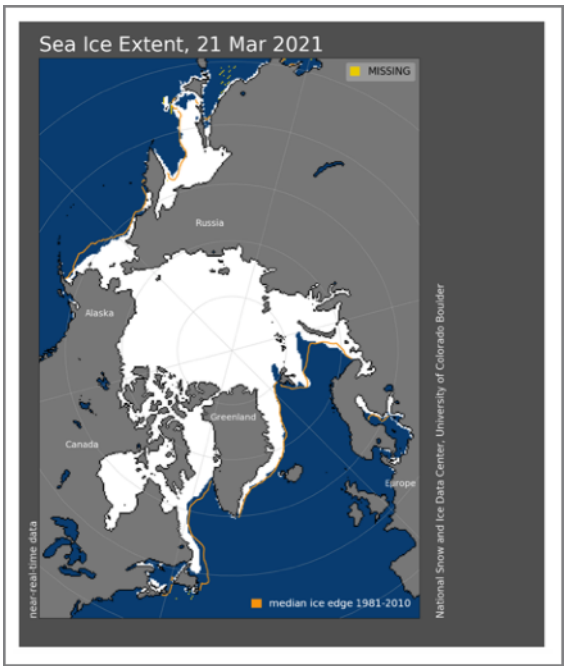

Figure 8. Arctic sea ice extent for March 21, 2021 was at 14.77 million square kilometers (5.70 million square miles) with the orange line showing the 1981 - 2010 average extent for that day. Image credit: https://nsidc.org/

Rank	Year	In millions of square kilometers	In millions of square miles	Date
1	2017	14.41	5.56	March 7
2	2018	14.47	5.59	March 17
3	2016 2015	14.51 14.52	5.60 5.61	March 23 February 25
5	2011 2006	14.67 14.68	5.66 5.67	March 9 March 12
7	2007 2021	14.77 14.77	5.70 5.70	March 12 March 21
9	2019	14.82	5.72	March 13
10	2005	14.95	5.77	March 12

Table 4. The ten lowest maximum Arctic sea ice extents in the satellite record from 1979 to present. Note how 2021 tied 2007 for the 7th lowest maximum extent. Data from the National Snow & Ice Data Center (https://nsidc.org/)

Newsworthy Information

Season's biggest snowstorm drops more than a foot of snow in some parts of Anchorage

A low pressure system centered around the northern Gulf transported significant amounts of humidity into the Gulf coastal regions and the Cook Inlet. The Anchorage area was blanketed with up to 17 inches of snow from the afternoon of March 10 and into Thursday, March 11. Thus far, it was the biggest snowstorm of the season for Anchorage: https://www.adn.com/alaska-news/weather/2021/03/11/seasons-biggest-snowstorm-drops-more-than-a-foot-of-snow-in-some-parts-of-anchorage/

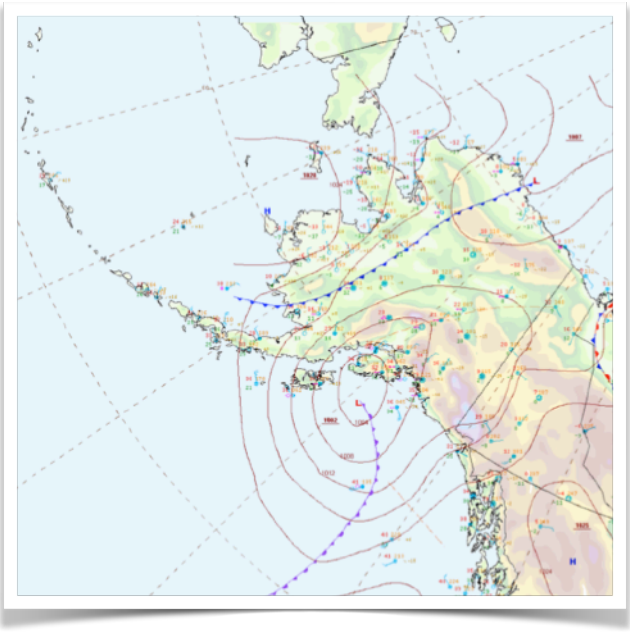

Image credit: National Weather Service Weather Prediction Center

Melting Glaciers contribute to Alaska Earthquakes

Glaciers in SE Alaska have been melting since the end of the Little Ice Age. When this melting occurs, the land can rebound (rise). Given the proximity of these glaciers to strike-slip faults, the melting can initiate "unclamping" of the faults, leading to earthquakes.

https://www.sciencedaily.com/releases/2021/03/210318170319.htm

Glaciers such as the Yakutat in Southeast Alaska, shown here, have been melting since the end of the Little Ice Age, influencing earthquakes in the region.

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Appendix

Table A1: March 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. One new record for highest mean daily temperatures was 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)**
Cold Bay	2021-03-24	46.0	2020	41.5

Table A2: March 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. Three new highest maximum daily temperature records were set and none for lowest maximum daily temperature records.

Highest Maximum Daily Temperature on Record				
Station	**Date**	**New Record (°F)**	**Year of Old Record**	**Old Record (°F)**
Cold Bay	2021-03-24	55.0	1964	48.0
Cold Bay	2021-03-28	49.0	1977	47.0
Utqiaġvik	2021-03-08	31.0	1949	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.