

The Climate of Alaska for 2013

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This review of the climate of Alaska is predominantly based on the 20 first order climatological stations in Alaska, which are operated by NOAA's National Weather Service. These stations are all of high quality, operated by professional meteorologists with identical or similar meteorological instrumentation and observational practices. However, this should not be taken as a sign that other stations, which might be operated by other agencies, industries or private individuals, are of unsuitable quality. Further, the normals used in this analysis are based on means of the 30-year time period from 1981-2010 and were calculated by NOAA's National Climate Data Center (NCDC). A convenient source for the NCDC normals of all stations for Alaska can be obtained at:

<http://akclimate.org/Climate/Normals>

Temperature

The mean average annual temperature in 2013 for the twenty stations was 33.8°F, a slight positive departure of 0.7°F from the 30-year normal of 32.9°F. This is in stark contrast to the previous year, when Alaska was substantially below normal with a deviation of -2.9°F. There were 16 stations with a positive deviation and only four stations that were below normal. Barrow in Northern Alaska was relatively the warmest with a deviation of +2.6°F, continuing the trend of warming observed on the North Slope over the last decades. The second highest deviation was observed at King Salmon with positive value of 2.0°F. The largest negative deviation was observed at St. Paul Island with a modest -1.0°F, continuing the cooling trend observed for the Bering Sea (Wendler, Chen and Moore 2012).

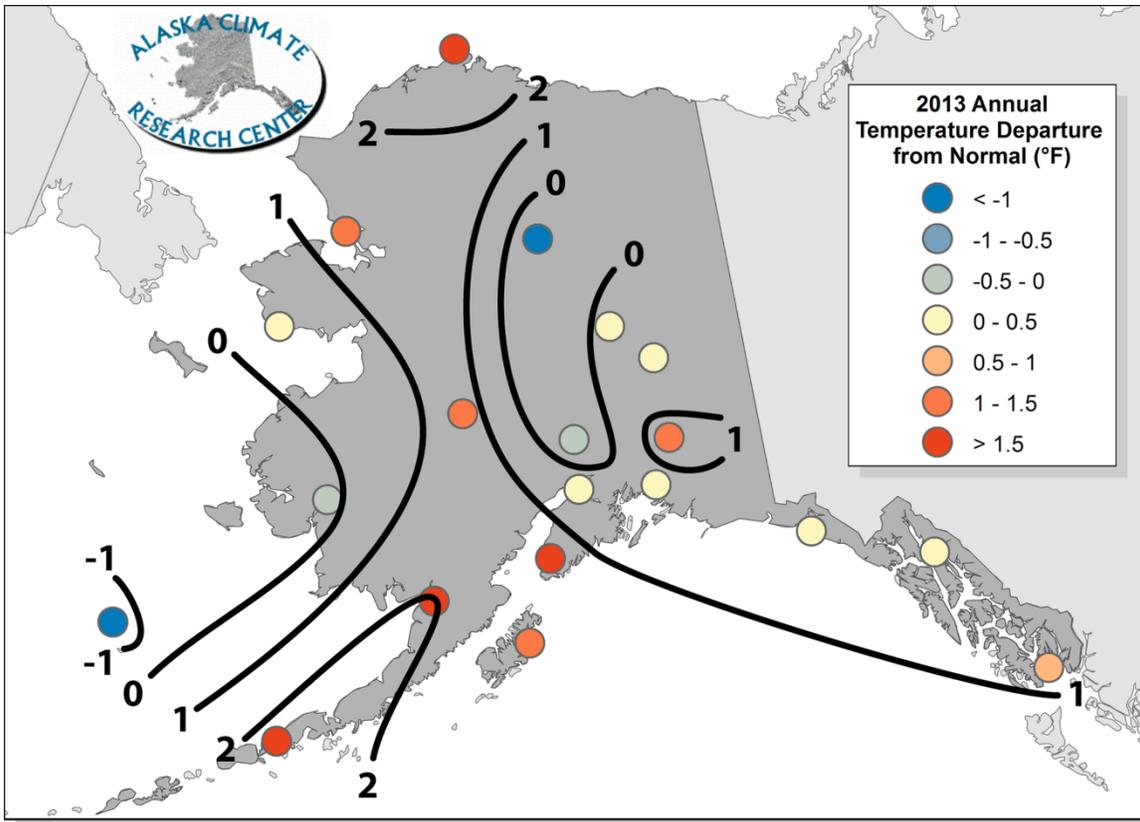


Figure 1: Isoplete presentation of the temperatures deviations from the normal (1981-2010) for 2013 based on all first order Alaskan meteorological stations.

Figure 1 presents the temperature deviation data, and it can be seen that predominately western Alaska was below normal, while most of the rest of Alaska was too warm when compared to the normal, with the maximum deviation found in Northern Alaska. It is interesting to note that the strong decrease in sea ice in the Beaufort and Chukchi Seas affected most strongly the autumn temperatures, with monthly temperature deviations of 7.5°F and 6.8°F, respectively, for October and November at Barrow.

In summary, most of Alaska was above normal for 2013, which is in contrast to the two previous years, which had been too cold. Actual temperature deviations by station can be seen from Table A, with 16 of the 20 stations recorded positive temperature deviations, and an overall mean deviation of 0.7°F.

Station	Temperature		
	Observed (°F)	Normal (°F)	Delta (°F)
Anchorage	37.6	37.1	0.5
Annette	47.5	46.6	0.9

Barrow	14.4	11.8	2.6
Bethel	30.6	30.7	-0.1
Bettles	22.5	23.5	-1.0
Cold Bay	41.1	38.8	2.3
Delta Junction	29.3	29.0	0.3
Fairbanks	28.1	27.7	0.4
Gulkana	29.5	28.2	1.3
Homer	40.6	38.7	1.9
Juneau	42.4	42.1	0.3
King Salmon	37.2	35.2	2.0
Kodiak	42.0	40.9	1.1
Kotzebue	24.2	22.9	1.3
McGrath	28.6	27.4	1.2
Nome	27.6	27.4	0.2
St. Paul Island	34.3	35.4	-1.1
Talkeetna	35.7	36.0	-0.3
Valdez	39.4	39.0	0.4
Yakutat	40.8	40.3	0.5

Table A: Mean temperature for 2013, normal temperature (1981-2010) and deviations from the mean for the 20 first order meteorological stations in Alaska.

For the 20 first order stations the mean deviation of temperatures by month is presented in Figure 2. The figure shows that substantially above normal temperatures in decreasing order were observed in October (+7.4°F), January (+5.6°F) and June (+3.3°F), while April recorded the highest negative deviation of -6.9°F, which delayed the onset of spring. Such magnitude in deviations can be easily observed for a single station; however, they are very substantial for the mean of 20 stations that are distributed over an area as large as Alaska. For example, Fairbanks displayed a positive mean annual

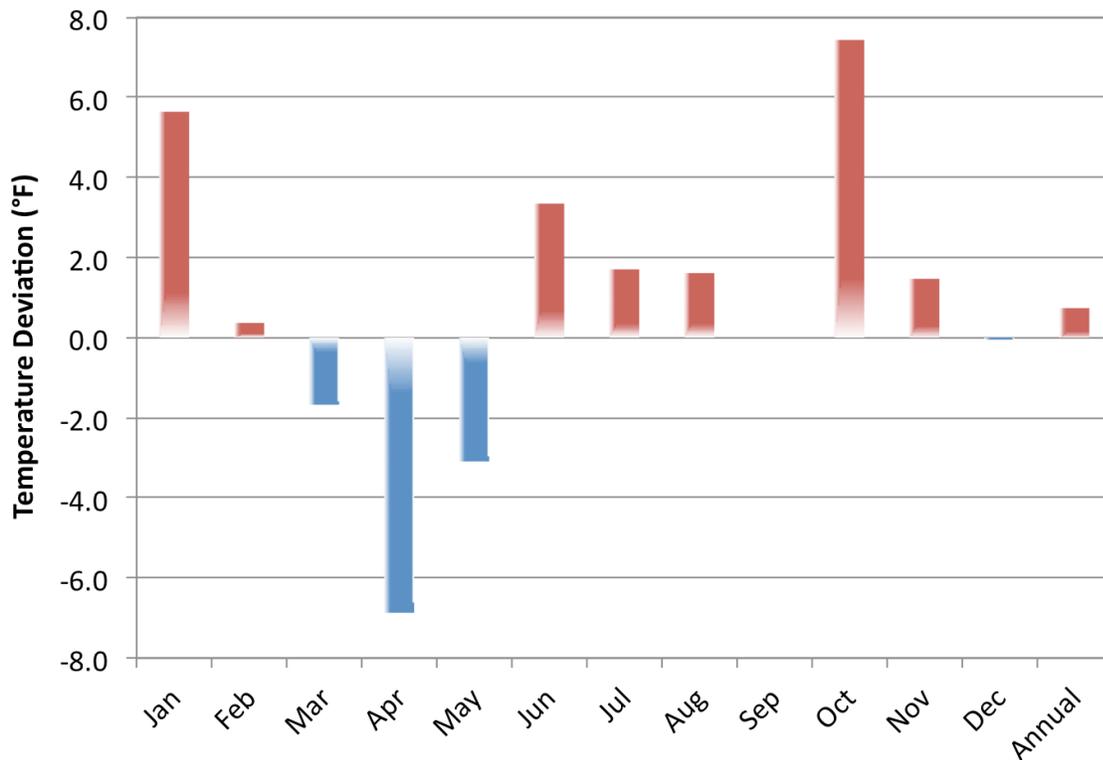


Figure 2: Mean monthly temperature deviation for the 20 first order stations in Alaska by month for 2013.

temperature deviation close to the mean value for the State while April was the third coldest on the record for Fairbanks for more than 100 years. The highest temperature for the year of 92°F was observed on the 25th and 26th of June 2013, close to the summer solstice with over 21.5 hours of sunlight. There were 30 days with temperatures above 80°F in Fairbanks, surpassing the long-term mean of twelve days by more than twofold. Anchorage experienced 15 days in 2013 with temperatures at or above 70°F, a new annual record. The old record was twelve days from 1953. Temperatures above 90°F are seldom in Alaska, and this year was the 3rd warmest summer in Fairbanks. McGrath reported a new all time high for May of 86°F, measured on the last day of the month. Furthermore, on June 17th the temperature went up to 94°F, a new all time high for the station. Valdez, in the Prince William Sound, reported a high temperature of 90°F on June 17th, establishing a new absolute maximum for the station and on the same day, Talkeetna reported a temperature of 86°F, surpassing the previous maximum, set in 1962, by a substantial 5°F. Further, Nome tied the all time record high of the year of 86°F on 19 July 2013.

Demonstrating how warm October was, the following stations set new record high average monthly temperatures: Anchorage with 43.0°F (42.1°F in 1963), Cold Bay with 46.0°F (44.0°F in 2002), Delta Junction with 37.2°F (35.11°F in 1969) and McGrath with 38.7°F (35.0°F in 2006).

Concerning low temperatures, King Salmon reported a minimum temperature of 31°F on the 5th of July, replacing the old record low for this day (35°F), set in 1981. This is the lowest temperature on record for July in King Salmon. On the last day of August, Bettles, in the Northern Interior, recorded a temperature of 15°F, the lowest temperature ever measured in August and surpassing the old record low of 22°F, measured in 1934.

Precipitation

The mean annual precipitation of the twenty stations was 39.50", which is 8% above the long-term mean of 36.86". As reported previously (Shulski and Wendler 2007), there is a very large variation in the precipitation totals, when traversing from the southeast, e.g. Yakutat reported in 2013 a total of 137.14", then to the north with Barrow recording a total value of just 8.41". It is even more remarkable that for 2013 Barrow reported 191% of normal precipitation, a value that is, when expressed as a percentage, not surpassed by any other first order station in Alaska for 2013. This large gradient in precipitation explains the fact that the most glaciers are found in southern Alaska, with many calving in the ocean, while in the Brooks Range, in Northern Alaska, with much colder temperatures glaciers are less common and smaller in size. In Figure 3 the precipitation values are presented across Alaska, however isolines are not provided, as large variations can occur over short distances, especially in the summer due to localized shower activities. The figure shows that the western part of Alaska is close to normal in precipitation, while Barrow (191%) and Anchorage (157%) had an abundance of precipitation, and Delta Junction measured a deficit with only 68% of the expected value. More details can be seen in Table B, in which the actual deviation values by station are presented.

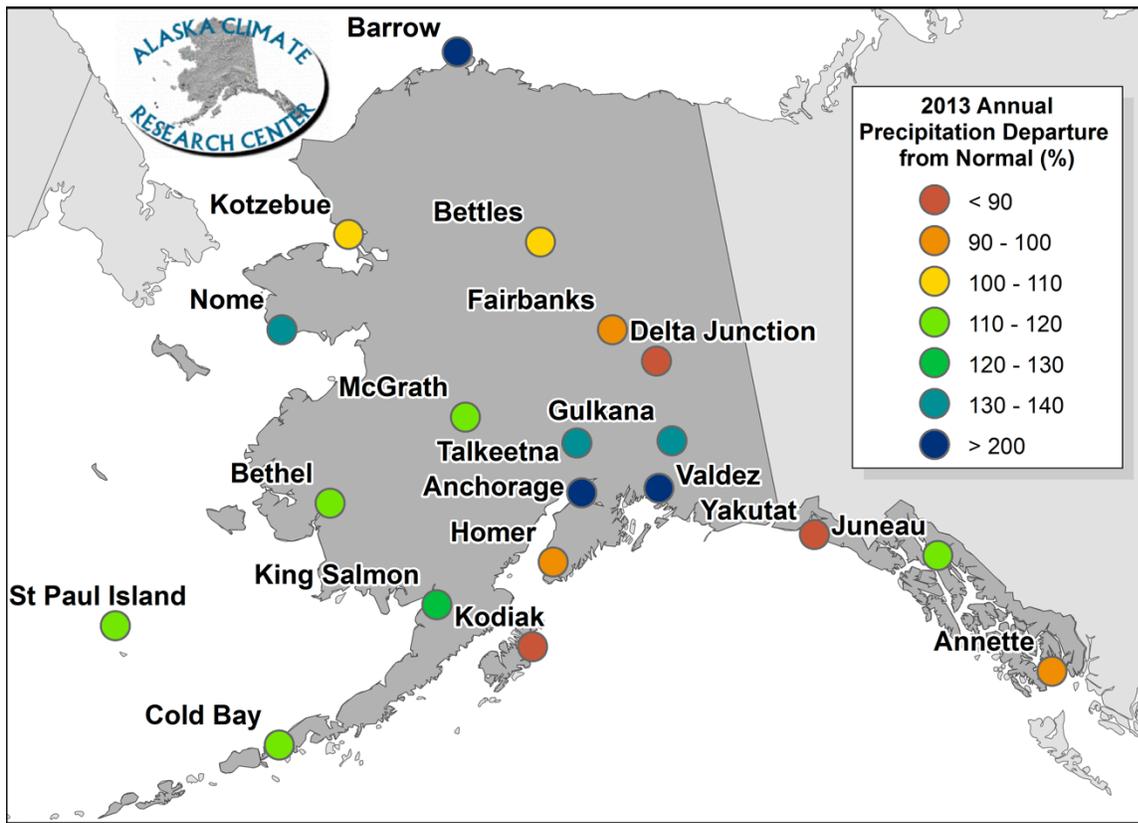


Figure 3: Precipitation deviations (%) from the normal (1981-2010) for 2013 based on all twenty first order stations in Alaska.

Station	Precipitation
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	Observed (in)	Normal (in)	Delta (in)	Delta (%)	(%)
Anchorage	25.97	16.58	9.39	57%	157%
Annette	99.58	101.63	-2.05	-2%	98%
Barrow	8.65	4.53	4.12	91%	191%
Bethel	21.77	18.54	3.23	17%	117%
Bettles	15.35	14.90	0.45	3%	103%
Cold Bay	46.42	41.67	4.75	11%	111%
Delta Junction	7.87	11.62	-3.75	-32%	68%
Fairbanks	10.65	10.81	-0.16	-1%	99%
Gulkana	14.87	11.26	3.61	32%	132%
Homer	22.54	24.34	-1.80	-7%	93%
Juneau	73.84	62.27	11.57	19%	119%
King Salmon	24.54	19.49	5.05	26%	126%
Kodiak	65.45	78.00	-12.55	-16%	84%
Kotzebue	12.08	11.00	1.08	10%	110%
McGrath	20.89	18.00	2.89	16%	116%
Nome	22.33	16.81	5.52	33%	133%
St. Paul Island	27.46	23.67	3.79	16%	116%
Talkeetna	37.48	27.97	9.51	34%	134%
Valdez	97.32	69.03	28.29	41%	141%
Yakutat	137.39	155.12	-17.73	-11%	89%

Table B: Observed precipitation for 2013, normal precipitation (1981-2010) and deviations from the mean for the 20 first order stations in Alaska.

The precipitation deviations by month are presented in Figure 4 for the mean of the twenty stations. The figure displays that the first three months of the year observed above normal precipitation, while April was too dry. May too wet, while June and July reported below normal precipitation. The rest of the year was too wet, especially October and November, with values of at least 50% above normal.

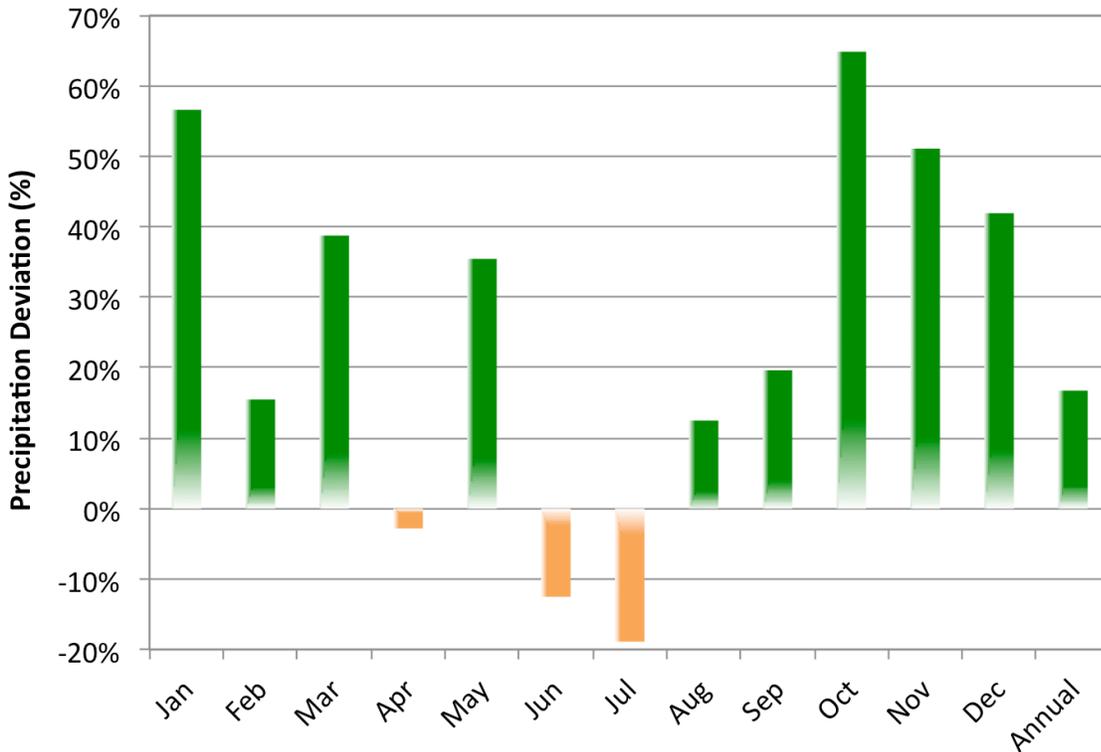


Figure 4: Precipitation deviation for the mean of the 20 first order stations in Alaska by month for 2013.

Valdez set several precipitation records in 2013. The annual value of 96.82” was a new maximum, higher than the previous value of 93.30” set in 1981. Also, the amount of 10.69” in May is a new record, the old value being 8.12” set back in 1956. The month of October observed 17.83” of rain. This surpasses slightly the old value for the month (17.31”) set in 2006. Finally, in Anchorage the precipitation of 1.27” on the 11th of November set a new record for the day, surpassing the old value of 1.16” set in 1964, as well as the highest single day precipitation for any day in November.

Snowfall

Precipitation falls in summer as rain, but in winter as snow. "Winter" is, of course, much longer in Northern Alaska, e.g. Barrow, then in the Southeast, e.g. Annette. In Figure 5 the annual snowfall for the stations is

presented. It should be pointed out that four stations did not report snowfall amounts (Big Delta, Gulkana, Homer and Talkeetna). It can be seen that three stations reported values substantially above the normal. They are Barrow with 169% of normal, King Salmon with 147% and Anchorage with 139%. Insufficient snow was reported for Annette with only 30% of normal, Bethel and Cold Bay, both with 69%. Looking at extreme values, the snowfall in May at Nome measured 10.5", breaking the previous record year of 1977 by 0.8".

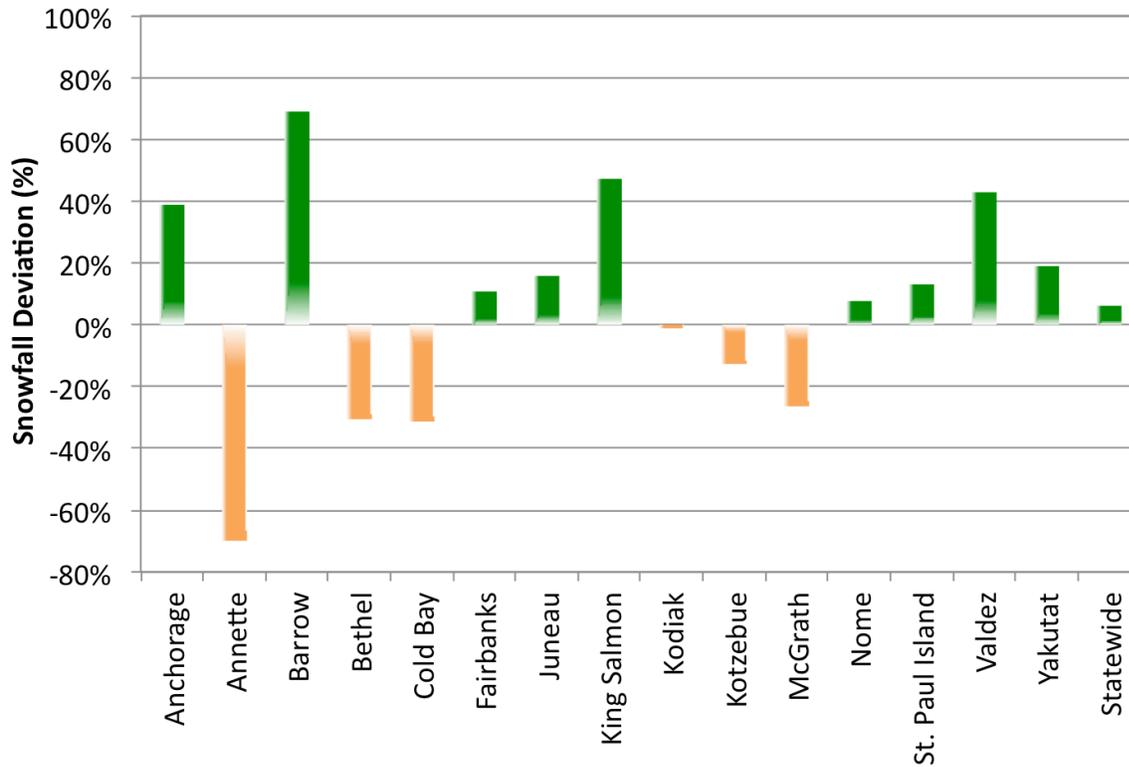


Figure 5: Mean annual snowfall deviations for sixteen of the first order stations in Alaska for 2013.

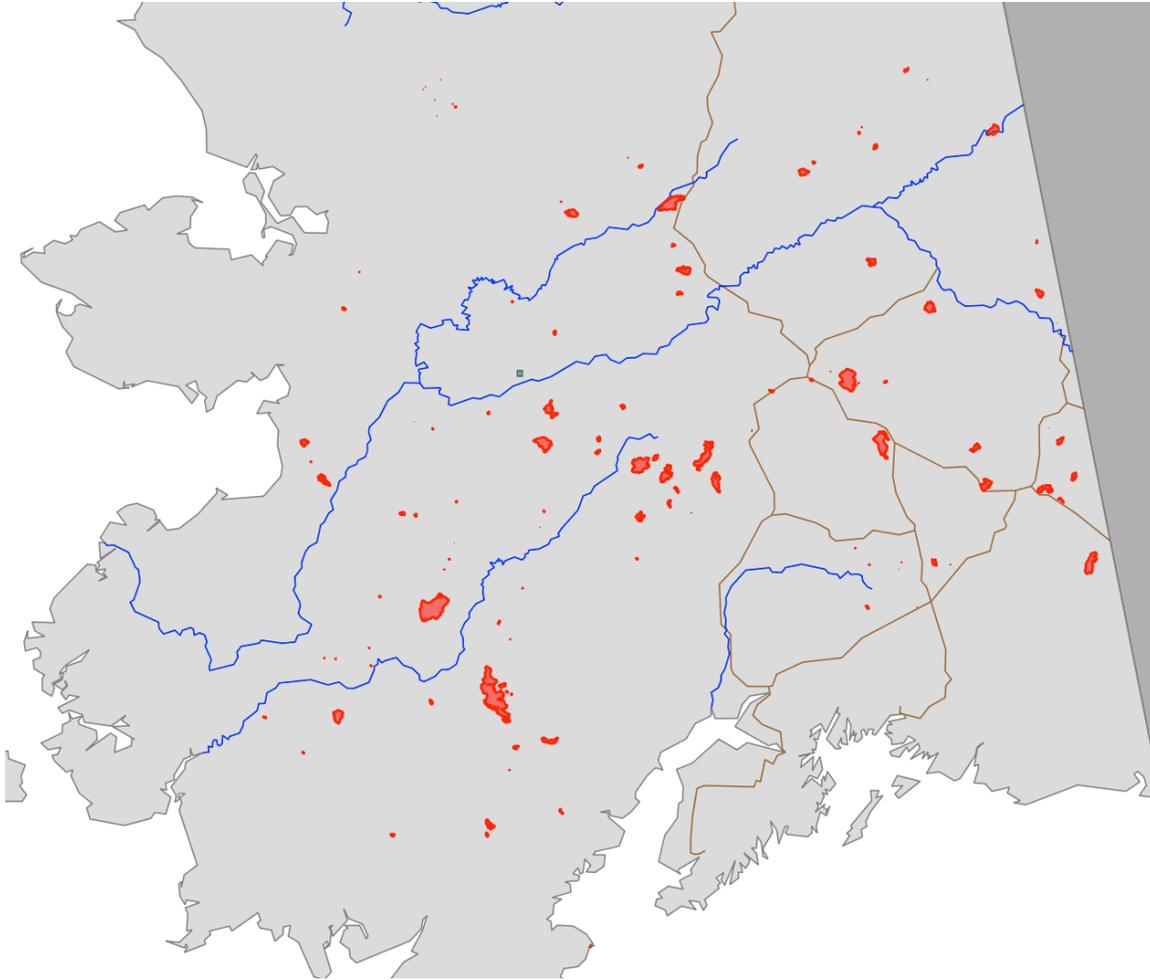


Figure 6: Map displaying the fire perimeters in Alaska for 2013. Data courtesy of Alaska Interagency Coordination Center.

Forest fires are a normal summer occurrence in Alaska, and most of the acreage burned is located in the Interior. The combination of above normal temperatures and below normal precipitation values promote the creation and growth of wildfires. In 2004, the year with the highest temperature in Fairbanks in over 100 years, 6.4 million acres burned. This last summer was only slightly cooler, but only 1.3 million acres burned (Figure F), somewhat higher than the long-term average of about 1 million acres. It is interesting to note that the number of lightning strikes was, on average, much lower in 2013 than for 2004 for identical temperatures regimes. The instrumentation for the lightening strikes has been updated and the number of stations has increased since 1955, when this program started. However, this should work rather in the opposite direction; that is, the improved instrumentation should over report for 2013 compared to what was recorded in 2004. Local observation showed that less cumulus development occurred on summer days afternoons. These clouds develop frequently to cumulonimbus clouds, which bring rain showers and lightning strikes. The absence of such development indicates a drier atmosphere, which was more a frequent occurrence for the summer of 2013. Less lightning would result in fewer wildfires being started.

Extreme values of different meteorological parameters measured in the State in 2013 are summarized in Table C:

Element	Date	Station	Value
Highest Temperature	6/21/2013	Talkeetna	96°F
Lowest Temperature	1/27/2013	Bettles	-53°F
Highest Daily Average	6/25/2013	Fairbanks	81.0°F
Lowest Daily Average	1/27/2013	Bettles	-46.0°F
Maximum Daily Precipitation	10/08/2013	Yakutat	4.06"
Maximum Daily Snowfall	11/10/2013	Valdez	24.4"
Most snow on the ground	4/09/2013	Valdez	84"

Table C: Some interesting facts for 2013 for the 20 first order stations in Alaska.

For more exhaustive monthly statewide summaries as well as some select station summaries, including more detail on record events, please visit the ACRC website at: <http://akclimate.org>. For seasonal values visit ACCAP's website for the Alaska's Climate Dispatch at: <http://ine.uaf.edu/accap/>. In addition, the papers referenced below can be accessed from the ACRC's website.

References

Shulski, M., and Wendler, G. 2007. The Climate of Alaska. **University of Alaska Press**, 216pp

Wendler, G., M. Shulski and B. Moore 2010: Changes in the Climate of the Alaskan North Slope and the ice concentration of the adjacent Beaufort Sea. **Theoretical and Applied Climatology**. 99, 67-74

Wendler, G. and M. Shulski 2010. A Century of Climate Change for Fairbanks, Alaska. **Arctic** 62(3): 295-300

Wendler, G. L. Chen and B. Moore 2012. The first Decade of the New Century: A cooling trend for most of Alaska. **The Open Atmospheric Science Journal** 6, 111-116

This information consists of preliminary climatological data compiled by the Alaska Climate Research Center, Geophysical Institute, University of Alaska Fairbanks. For more information on weather and climatology, contact the center at 474-7885 or visit the center web site at <http://akclimate.org>. Please report any errors to webmaster@akclimate.org.