



Quarterly Weather & Climate Summary Western Arctic Parklands Fall 2015

Kotzebue Fall Weather

September was colder and drier than normal in Kotzebue. The average temperature for the month was 40.8°F compared to a normal of 42.3°F. The coldest temperature recorded for the month was 27°F on September 19 and 21. Only 0.60 inches of precipitation fell during the month, which is 38% of normal. Only 10 years have had drier Septembers since 1949.

Weather patterns shifted in October and all but three days were warmer than normal. Although no records were set, almost the entire month was consistently warmer than normal. Overall, the average monthly temperature was 30.5°F, 6.2°F warmer than normal and the seventh warmest October on record. Almost every day from October 1-27 had maximum daily temperatures exceeding the freezing threshold. Precipitation was just about normal with 1.03 inches for the month. Over six inches of snow fell in October and the snow depth on Halloween was four inches.

With a monthly average temperature of 14.8°F, it was 5.7°F warmer than normal for November. A cold spell mid-month brought the temperature down to -23°F on November 18 – the coldest reading of the month and a record low for the date. Warm temperatures and precipitation returned for the end of the month with over eight inches of snow (= 0.43 inches of water) falling between November 19-24 (Figures 1 and 2, table 1, 2, and 3).

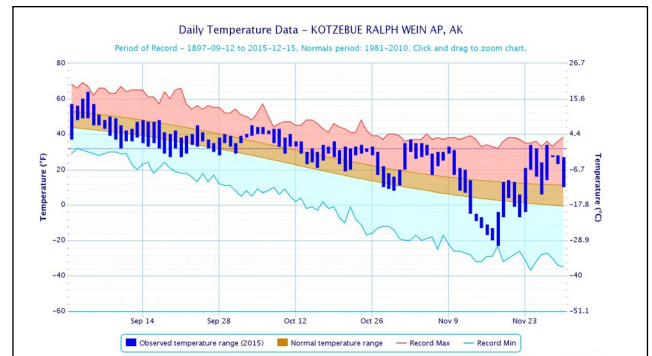


Figure 1. Fall 2015 daily temperatures at Kotzebue showing **record maximum** (red), **record minimum** (blue), **normal** (brown) and **observed range** (blue bars).

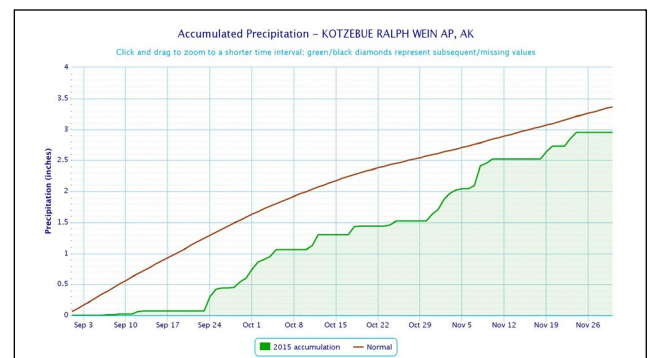


Figure 2. Fall 2015 accumulated precipitation at Kotzebue (green) compared to **normal** (brown line).

Table 1. Temperature: Fall 2015 average monthly temperatures compared to the 1981-2010 normal.

Fall 2015	Average Monthly Temp (°F)	1981-2010 Normal (°F)	Departure from Normal (°F)	Monthly High (°F / Date)	Monthly Low (°F / Date)
September	40.8	42.3	-1.5	64 / Sept. 4	27 / Sept. 19, 21
October	30.5	24.3	+6.2	45 / Oct. 4	8 / Oct. 30
November	14.8	9.1	+5.7	37 / Nov. 2	-23 / Nov. 18

Fall Season Temperature Departure from Normal: +3.5 °F

Table 2. Precipitation: Fall 2015 monthly precipitation totals compared to normal.

Fall 2015	Total Monthly Precip. (in.)	1981-2010 Normal (in.)	% of Normal	Greatest 24-hr. total (in. / Date)	# Days with >=0.01 (in.) water
September	0.60	1.58	38%	0.23 / Sept. 24	10
October	1.03	1.01	102%	0.18 / Oct. 12	12
November	1.32	0.77	171%	0.32 / Nov. 8	13

Fall Season Precipitation Departure from Normal: -0.41 inches (88% of normal)

Table 3. Snowfall: Fall 2015 monthly snowfall totals compared to normal

Fall 2015	Total Monthly Snowfall (in.)	1981-2010 Normal (in.)	% of Normal	Greatest 24-hr snow-fall total (in. / Date)	Cumulative since 1-July (in.)
September	1.1	0.8	138%	0.6 / Sept. 24	1.1
October	6.7	6.1	110%	1.8 / Oct. 12	7.8
November	13.7	10.5	131%	3.3 / Nov. 23	21.5

Fall Season Snowfall Departure from Normal: +4.1 inches (124% of normal)

NPS Climate Monitoring Stations

We now have additional NPS climate stations in Cape Krusenstern, Noatak, and Kobuk Valley that complement existing National Weather Service stations at Kotzebue and along the Kobuk River to the south of the parks (Figure 3).

These new NPS stations will provide critical data on high elevation sites in the Arctic and will help characterize the climate gradients and patterns affecting resources in the Western Arctic Parklands.

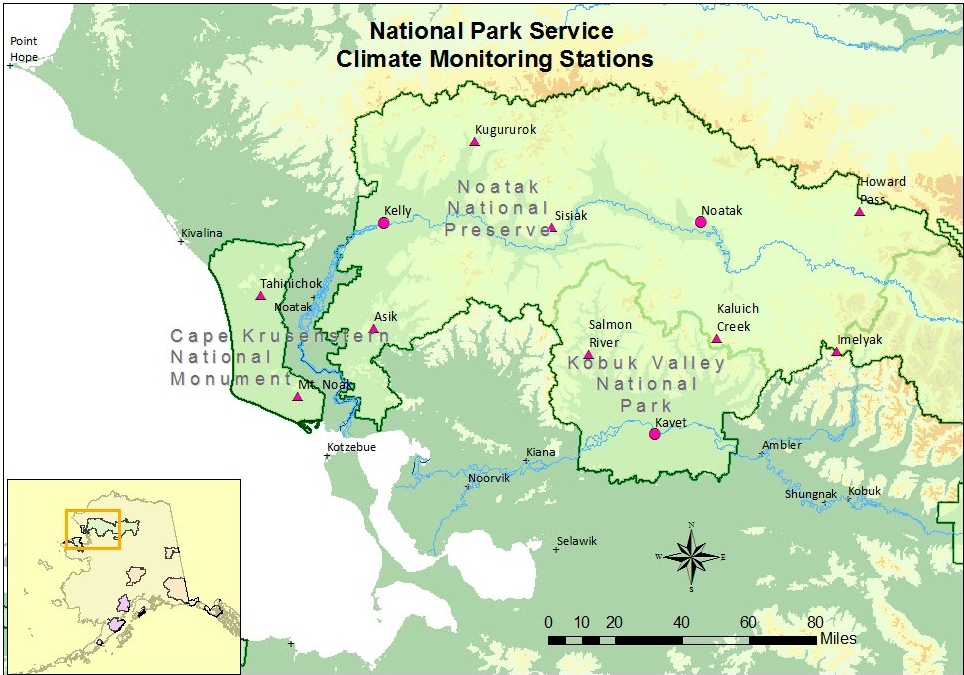


Figure 3. NPS climate stations in Western Arctic Parklands.

Long-Term Perspective

Temperature

The average fall temperature for 2015 in Kotzebue was 28.7°F which is 3.5°F warmer than the 1981-2010 normal and 3.7° F warmer than the long-term record beginning in 1949. 2015 ranks as the 11th warmest fall on record.

We calculate the average fall temperature by simply taking the average of September, October, and November monthly temperatures. Average fall temperatures show great variability with a range between 16.2°F in 1956 and 32.0°F in 2002 (Figure 4).

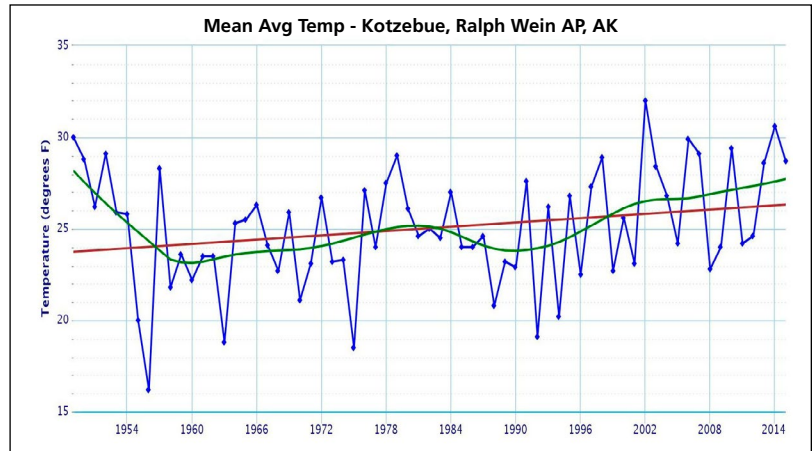


Figure 4. Average fall temperatures (September-November) at Kotzebue since 1949. The green line is locally weighted scatterplot smoothing (LOESS). The brown line is a simple linear regression.

Precipitation

Fall precipitation in 2015 was 2.95 inches which is 0.41 inches less than the 1981-2010 normal and 0.04 inches less than the long-term record beginning in 1949. Fall precipitation is highly variable with a range between 0.81 inches in 1967 and 7.65 inches in 1993 (Figure 5).

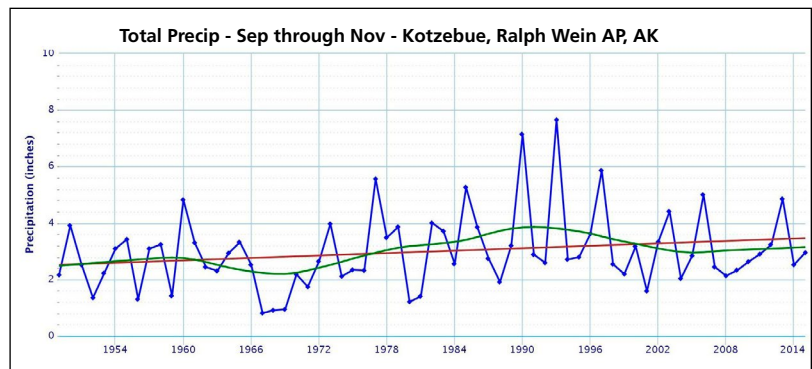


Figure 5. Fall (September-November) precipitation totals at Kotzebue since 1949. The green line is locally weighted scatterplot smoothing (LOESS). The brown line is a simple linear regression.

Rime Ice

Rime ice forms when supercooled water droplets freeze to the outer surfaces of exposed objects. Rime usually forms during weather conditions with some wind (> 5 mph), high relative humidity (often fog), and relatively mild temperatures (10-30°F). Weather stations are prime targets for riming (unfortunately) because of their exposed location above the ground surface. Rime is usually white in color and less dense than freezing rain or glaze.

ARCN weather stations do not directly measure any form of ice, but rime formation and persistence can be inferred through wind speed, air temperature, relative humidity, and other measurements. The easiest way to identify potential riming events is to monitor the wind speed sensor. When rime ice forms on the sensor, the propeller stops spinning and the sensor incorrectly records measurements of zero (Figure 7).

Rime ice may have formed at some stations in WEAR in fall



Figure 6. An extreme rime ice example at a meteorological station on the Seward Peninsula in 2012. The ice encased and destroyed the 10-foot tall tripod. (photo Walker Gusse)

2015. Air temperatures from 15-25°F, high relative humidity (90-100%) and moderate wind speeds (5-20 mph) were measured at most stations in early November. Following these meteorological conditions, some wind sensors began recording values of 0 mph, indicating that the propellers may have been affected by icing.

In total, icing on the wind sensor at Kaluich may have persisted

for 2-4 weeks in October-November 2015. Other stations potentially affected by rime for less than one week in mid-November include Tahinichok, Kavet Creek, and Imelyak. The wind sensors at Mt. Noak, Asik, Kugururok, Sisiak, and Howard Pass did not indicate icing, suggesting that rime may not have formed at these locations over the same time period. Station locations are shown in Figure 3.

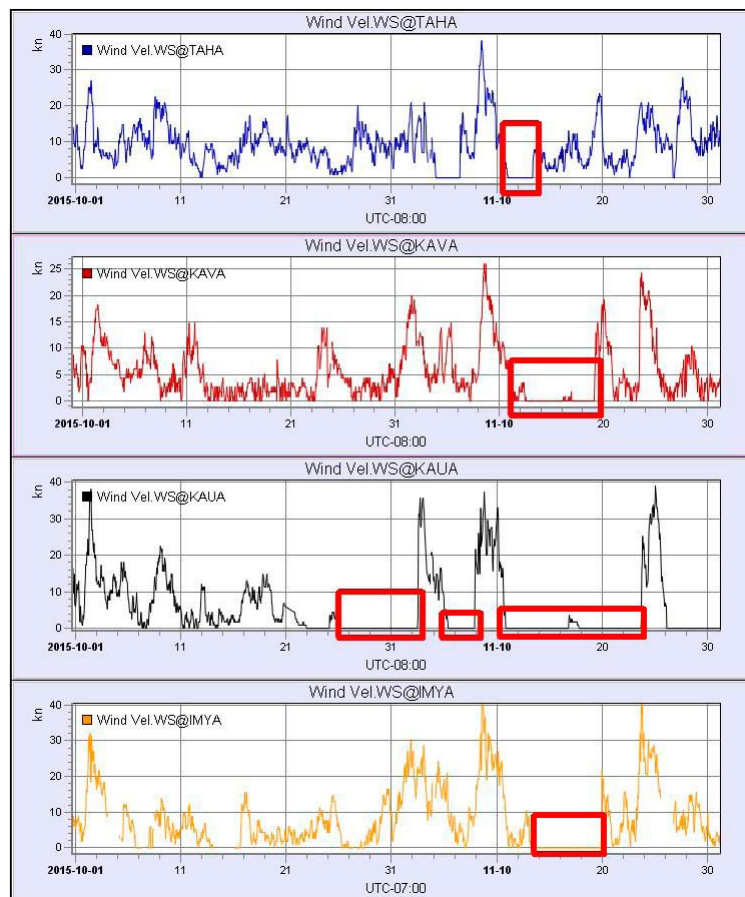


Figure 7. Wind speed at Tahinichok (top; blue), Kavet Creek (red), Kaluich (black), and Imelyak (bottom; yellow) for October-November 2015. Circled areas indicate time periods of potential rime ice. Please note: all data are preliminary and subject to review.



Figure 8. Salmon River station in March 2015. The top image (March 11) shows the station's shadow following an icing event. The bottom photo (March 21) shows that the ice has degraded. The fence post at center right is approximately 5 feet in height.

Connecting Further

- Previous weather summaries and other climate monitoring documents on the [Arctic Network web portal](#)
- Access near real-time data from [Western Regional Climate Center](#) and [MesoWest](#)
- The 2015 [Arctic Report Card](#) was recently released. Highlights include updated trends on sea ice, air temperature, snow cover, ocean temperatures, wildlife, and vegetation.

- [Maps](#) of projected temperature and precipitation changes for Noatak, Kobuk and Cape Krusenstern

More Information

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