



# Status and plans for BSRN stations in the northern Canadian archipelago and Greenland

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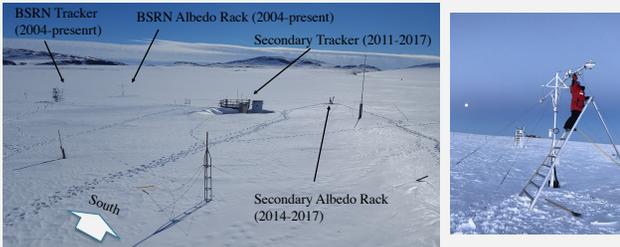


## Alert

- Alert, Nunavut, Canada (ALE)
- 82.49°N, 62.42°W, 127 m
- BSRN Status: Active
- 2004-present (no archived data after 2012, though measurements have continued, see below)
- Station Scientist: Chris Cox christopher.j.cox@noaa.gov
- NOAA collaboration with Environment and Climate Change Canada (ECCC), represented by Andrew Platt (ECCC).



Layout of the radiometric measurements at Alert



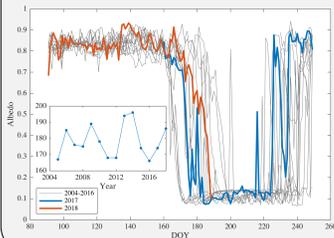
(left) Image from the roof of the Global Atmospheric Watch (GAW) station, ~7 km southwest of CFS Alert taken on June 11, 2017, 12 days before the snow melted. (right) Sara Morris removes a radiometer for recalibration in October 2016.

- Due to logistical constraints during management transition from ECCC to NOAA after 2011, the Alert station missed calibration cycles for an extended period. In June 2017, radiometers were exchanged with a newly calibrated set (calibrated by NOAA-GMD).

- Comparison of calibrations (table) indicates that the change in the calibration is within uncertainty (~2%), suggesting no detectable drift. Relatively low sun angles in the Arctic, in addition to the fact that each radiometer had been used for 5+ years before its most recent pre-2017 cal may have contributed to the stability.

Type	Obs	SN	Old Cal.	Old Cal. Date	New Cal.	New Cal. Date	Change [%]
Eppley BW	DIF	33799	9.250	Mar 2009	9.125	Sep 2017	-1.351
Eppley PIR	LWD	33688	3.520	Feb 2008	NaN	NaN	NaN
Eppley PIR	LWI	33689	3.100	Feb 2008	NaN	NaN	NaN
Eppley NIP	DIR	33856	7.920	Mar 2009	7.973	Sep 2017	0.659
Eppley NIP	DIR	33822	7.810	Mar 2009	7.858	Sep 2017	0.615
KZ CM22	DIF	30084	9.230	Mar 2014	9.112	Apr 2017	-1.278
KZ CM22	SWD	30083	9.890	Mar 2014	9.808	Apr 2017	-0.829
KZ CM22	SWU	30085	9.480	Mar 2014	9.446	Apr 2017	-0.359

- NOAA-GMD, which submits data for 13 BSRN stations, is currently consolidating the software and procedures for producing the Station-to-Archive files. Alert will be included as a 14<sup>th</sup> site in this new process, and return to submitting data to the archive as part of this effort.



(left) Daily mean albedo from Alert 2004-2018. Data beginning with the new radiometers installed in June 2017 is shown for 2017 (blue) and 2018 (red). Melt date is defined as the first day when the daily mean albedo < 0.3 (Stone et al. 2002).

There is no trend in the date of snowmelt at Alert since 2005.

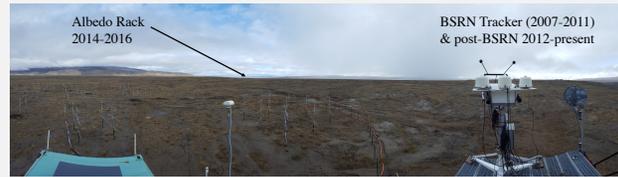
The mean melt date is DOY 178 (June 27) ± 10 days. Melt for 2018 was later than average by 8 days, DOY 186 on (July 5).

## Eureka

- Eureka, Nunavut, Canada (EUR)
- 79.99°N, 85.94°W, 85 m
- BSRN Status: Closed
- Active 2007-2011
- NOAA collaboration with the Canadian Network for the Detection of Atmospheric Change (CANDAC), represented by Pierre Fogal (Univ. Toronto).

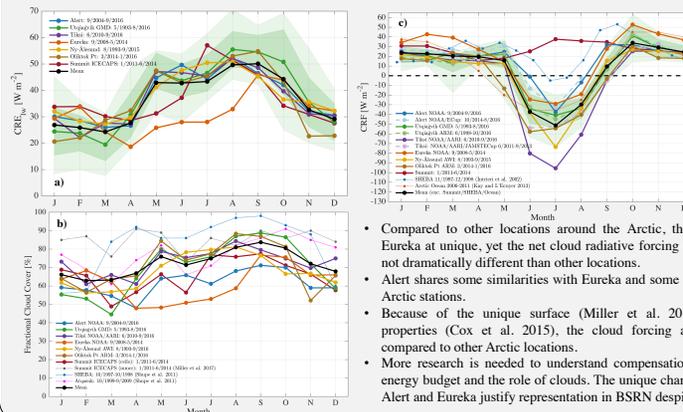


Layout of the radiometric measurements at Eureka, Aug. 4, 2016



- Eureka officially closed as a BSRN station in 2011, but observations continue to be collected and continue to inform scientific inquiry at Eureka (e.g., Grachev et al. 2018; Mungall et al. 2018; Cox et al. in prep; Blanchard et al. in prep).
- Eureka is currently being refurbished: In June 2018, a new data acquisition system, cables, ventilators, communications and radiometers were shipped to the station for installation in July 2018 for contributions to the Year of Polar Prediction (YOPP) Special Observing Period (SOP) 2, July 1-Sept 30, 2018.
- Future work will include building a new albedo rack and resite from its current location to accommodate other research infrastructure in the area. We anticipate nearly 2 years of measurements available in time for the 2020 BSRN Workshop when we expect to propose that Eureka be reinstated as a BSRN station.

## Spatial Comparison of Cloud Properties Across the Arctic



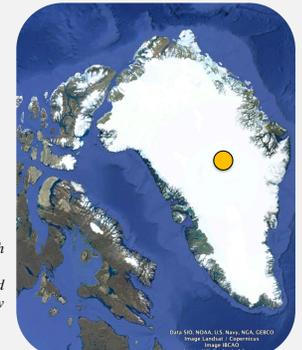
- Compared to other locations around the Arctic, the cloud properties at Eureka at unique, yet the net cloud radiative forcing (Cox et al. in prep) is not dramatically different than other locations.
- Alert shares some similarities with Eureka and some similarities with other Arctic stations.
- Because of the unique surface (Miller et al. 2015) and atmospheric properties (Cox et al. 2015), the cloud forcing at Summit is unique compared to other Arctic locations.
- More research is needed to understand compensations within the surface energy budget and the role of clouds. The unique characteristics of Summit, Alert and Eureka justify representation in BSRN despite close proximity.

## Summit

- Summit Station, Greenland (SUM)
- 72.58°N, 38.48°W, 3210 m
- BSRN Status: non-BSRN



Temporary Atmospheric Watch Observatory (TAWO), proposed location for the new station



Summit is a desirable location for BSRN for the following reasons:

- Currently, there are no BSRN stations in Greenland yet the Greenland Ice Sheet is a unique feature with global climatological significance.
- The atmosphere is very dry with precipitable water vapor (PWV) ranging from < 0.1 cm in winter to 0.4 cm in summer. The low PWV is associated with semi-transparent far-infrared spectrum, important for radiometry (Gröbner et al. 2014) and cloud forcing (Cox et al. 2015).
- The surface is continuously ice covered, a challenge for satellite retrievals (Crane and Anderson 1984), but because it is also homogenous and lacks topography, it is well suited for comparing gridded data to point measurements.
- The high albedo in summer means that clouds continuously warm the surface at Summit (Miller et al. 2015), a unique property compared to other terrestrial locations (see CRF figure, below).
- The proposed station will be within the accumulation zone, but a second station within the ablation zone would be desirable as well.

### Plans for a BSRN station at Summit

- Broadband radiometric measurements have been made by ETH, Zurich since 2004. This station was until 2016 a BSRN Candidate station, but never submitted data.
- New plans are being made at NOAA-GMD and NOAA-PSD, in collaboration with the ICECAPS observatory (Shupe et al. 2013) to install a new tracker and albedo rack over the 2018 summer and 2019 spring field season.
- This station will serve the YOPP and the MOSAiC drifting observatory campaign.
- We anticipate having a full annual cycle of measurements in time for officially proposing this new site during the 2020 BSRN Workshop.

## References

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