



Status and Plans for BSRN Stations in the Northern Canadian Archipelago: Alert and Eureka

Christopher J. Cox^{1,2}, Taneil Uttal¹, Sara Crepinsek^{1,2}, Elena Konopleva-Akish^{1,3}, Charles N. Long^{1,2}, Robert Albee³, David Longenecker¹

¹NOAA Earth System Research Laboratory (ESRL), Boulder, CO, USA; ²Cooperative Institute for Research in Environmental Sciences (CIRES), Boulder, CO, USA; ³Science and Technology Corporation (STC), Boulder, CO, USA



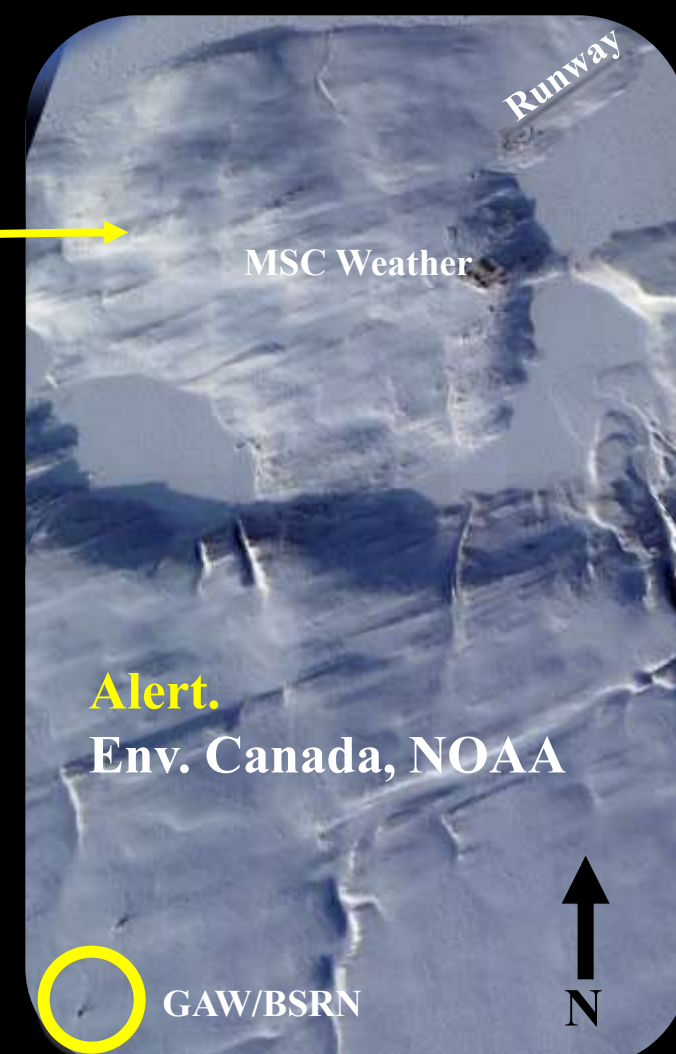
Abstract

Here we provide an overview of recent work involving the acquisition of radiometric observations from the Baseline Surface Radiation Network (BSRN) stations on Ellesmere Island in the northern Canadian archipelago. The stations are Alert (2004-) (Environment Canada) and Eureka (2007-) (CANDAC). The Eureka BSRN station was officially closed in 2011, but was kept operational in collaboration with NOAA. In 2012, Eureka was upgraded to include upwelling measurements. Work is underway to re-establish Eureka as regularly contributing BSRN member station. Both locations are involved in efforts to increase standardization of data accessibility, metadata documentation, and post-processing for Arctic environments through the International Arctic Systems for Observing the Atmosphere (IASOA). As a result, new, updated versions of the data sets are in preparation. Efforts continue within the BSRN Cold Climate Issues Working Group (CCIWG) to create innovative solutions for problems unique to polar and high altitude environments, in particular frost and rime growth that form obstructions on radiometer domes.

Locations

Alert BSRN #18, 84.49°N, 62.42°W, 127 m

Eureka BSRN #19, 79.99°N, 85.94°W, 85 m



Site	Beg. Date	BSRN St. #	Surface Type	Components	Comments
Alert (ALE)	8/2004	18	tundra, hilly, rural	LWD, SWD, DIF, DIR, LWU, SWU	New station scientist: Christopher J. Cox christopher.j.cox@noaa.gov . New data version in preparation with enhanced QC and updated calcs.
Eureka (EUR)	9/2004	19	tundra, hilly, rural	LWD, SWD, DIF, DIR	Station closed 2011. Measurements ongoing. Upwelling added 2012. New version in prep.

Metadata: Datagrams

The complexity of long-term, multi-instrument observation stations requires comprehensive and easily accessible metadata. Electronic posters called "datagrams" provide users with the information needed to understand data file contents, basic station information, and station history. Datagrams for these and other data streams are accessible through the IASOA observatories portal at <http://www.iasoa.org>.

Alert: Downwelling

Alert: Downwelling
NOAA Broadband Radiation Downwelling & Meteorological Scaffold Tower

Example Product File:

Year	Month	Day	Time	SW _d [W m ⁻²]	LW _d [W m ⁻²]	DIR [W m ⁻²]	DIF [W m ⁻²]	SW _u [W m ⁻²]	LW _u [W m ⁻²]	DIR _u [W m ⁻²]	DIF _u [W m ⁻²]
2004	08	01	00:00	100	150	50	100	0	0	0	0

Eureka: Downwelling

Eureka: Downwelling
NOAA Broadband Radiation Downwelling

Example Product File:

Year	Month	Day	Time	SW _d [W m ⁻²]	LW _d [W m ⁻²]	DIR [W m ⁻²]	DIF [W m ⁻²]	SW _u [W m ⁻²]	LW _u [W m ⁻²]	DIR _u [W m ⁻²]	DIF _u [W m ⁻²]
2007	09	01	00:00	120	180	60	120	0	0	0	0

Alert: Upwelling

Alert: Upwelling
NOAA Broadband Radiation Upwelling & Meteorological Albeto Rack

Example Product File:

Year	Month	Day	Time	SW _u [W m ⁻²]	LW _u [W m ⁻²]	DIR _u [W m ⁻²]	DIF _u [W m ⁻²]
2012	09	01	00:00	50	80	30	50

Eureka: Upwelling

Eureka: Upwelling
NOAA Broadband Radiation Upwelling

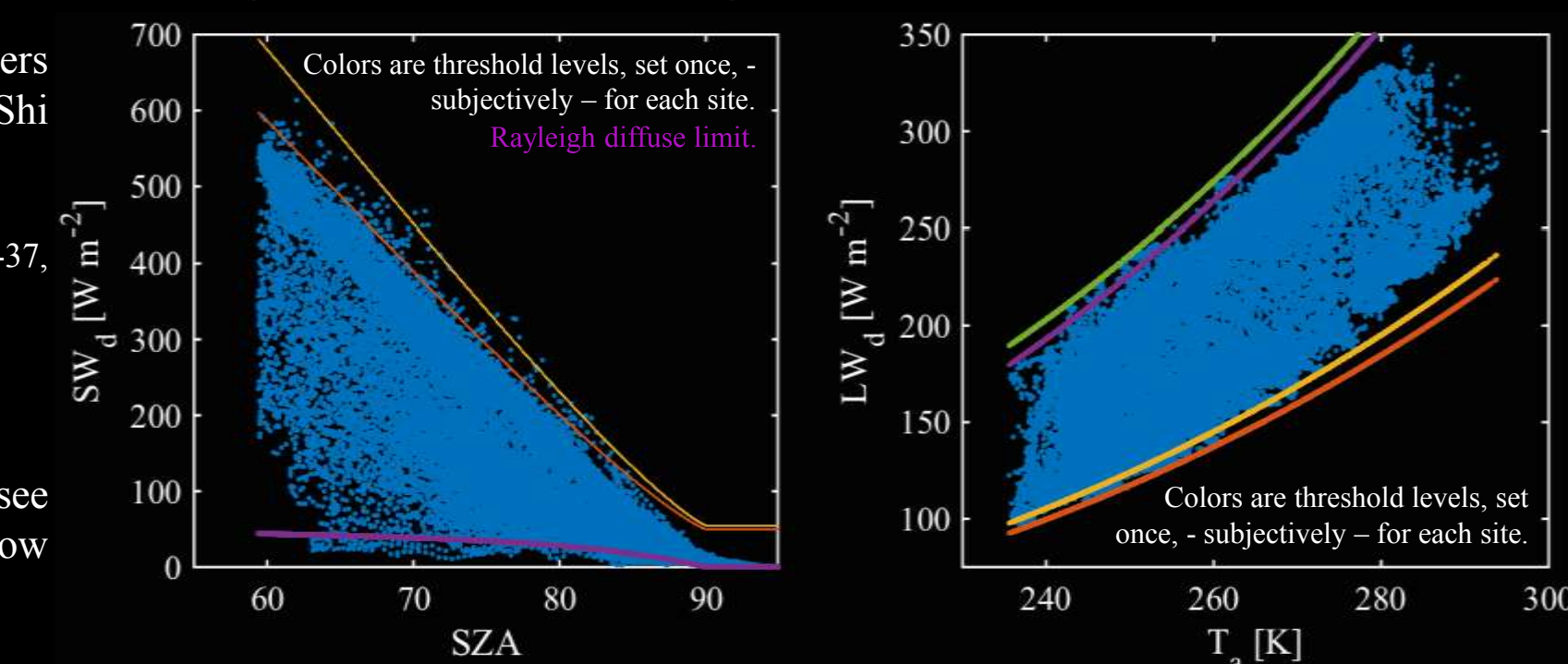
Example Product File:

Year	Month	Day	Time	SW _u [W m ⁻²]	LW _u [W m ⁻²]	DIR _u [W m ⁻²]	DIF _u [W m ⁻²]
2012	09	01	00:00	60	90	40	60

Quality Control and Unique Arctic Challenges

Automated Screening Procedure: Long and Shi (2008)

- Adopting automated detection of outliers developed for BSRN by Long and Shi (2008). Eg. in Figure.



Long, C. and Y. Shi (2008) Op. Atmos. Sci. J., 2, 23-37, doi: 10.2174/18742823008020100023.

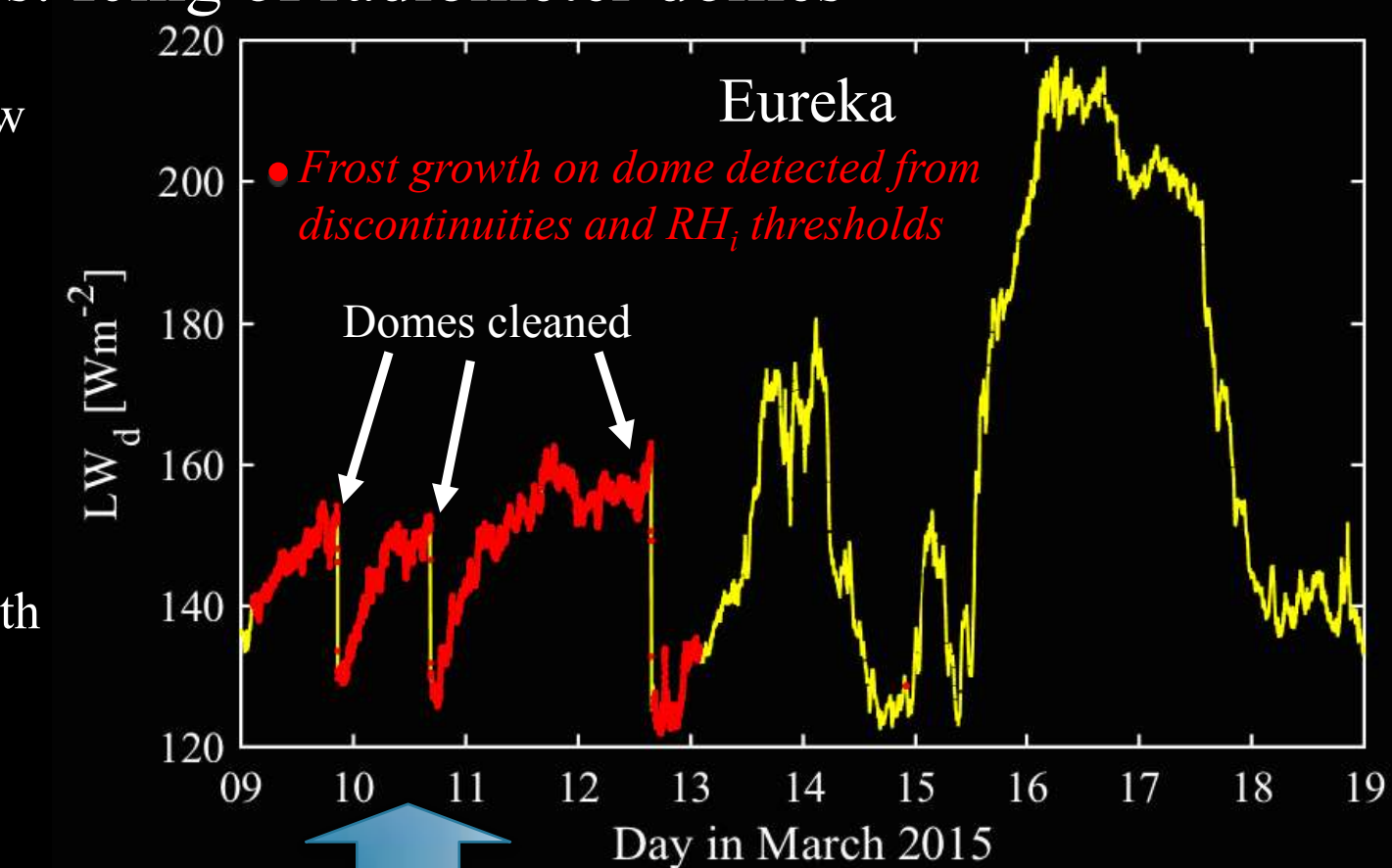
- Complement subjective procedures.
- Method misses most dome icing cases (see below) because obstructed domes show signal similar to that of clouds.

Cold Weather Issues: Icing of radiometer domes

"Icing" of domes can be from rime, frost, or snow



Testing modified housing for mitigating ice growth



As much as 75% of time series discontinuities at Eureka (n=1320) 2008-2015 express growth curves similar to those in the figure during the 12-48 hours prior to cleaning. This corresponds to ~30% of the data (RH_i>100% 5% of time).

Modified housings that improve airflow across radiometer domes were tested at an Arctic-analog station, the Storm Peak Laboratory (3220 m) in Colorado, 2014-2015. Results showed dramatic reduction in dome icing without application of external heat. An assessment of measurement sensitivity to modifications is planned.

Remote environment cross-validation: Traveling Comparison Station

- A "suitcase" traveling broadband radiometer station is in development. Simple, small, lightweight, self-contained design for efficient deployment.
- Common reference to facilitate cross-validation of BSRN stations in remote regions.
- Platform for testing engineering solutions to remote field problems, such as the modified housings.



Ongoing Work

- Re-incorporate Eureka measurements into the BSRN archive.
- Advance observational technology and tools to improve quality/consistency of measurements in the Arctic.
- Create updated version of Alert and Eureka data sets using common automated quality control procedures.

Acknowledgements

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