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Background

Icebergs and ice islands represent significant hazards to marine navigation and offshore infrastructure at a time when demand for access to Canada's Arctic waters is increasing.

There is a growing demand for in situ iceberg tracking data to monitor their drift trajectory and improve predictions of ice hazard occurrence and behaviour, yet the high cost of commercial tracking devices often prevents monitoring at optimal spatial and temporal resolutions.

Objective

The goal of this project is to determine if the Cryologger, a tracking beacon based on inexpensive, open-source hardware and software, can provide a reliable and cost-effective platform for monitoring the drift of icebergs and ice islands in the Canadian Arctic.

Methods - Design

- Low-cost
 - Open-source
 - Easy-to-use
 - Rugged
 - Modular
 - Low-power

The Cryologger is based on the open-source Arduino platform (www.arduino.cc) and built using low-cost, do-it-yourself electronics that can be easily modified to meet the needs of the end-user (Table 1).

Code was written using the Arduino Integrated Development Environment (IDE) and benefits from the availability of community-generated libraries.

Planned for extended deployments in harsh Arctic conditions, the Cryologger can provide long-term measurements of GPS position, temperature, pressure, pitch, roll, tilt-compensated heading and battery voltage (Figure 2).

Data are transmitted over the Iridium satellite network at specified intervals and can be re-updated based on the desired sampling frequency.

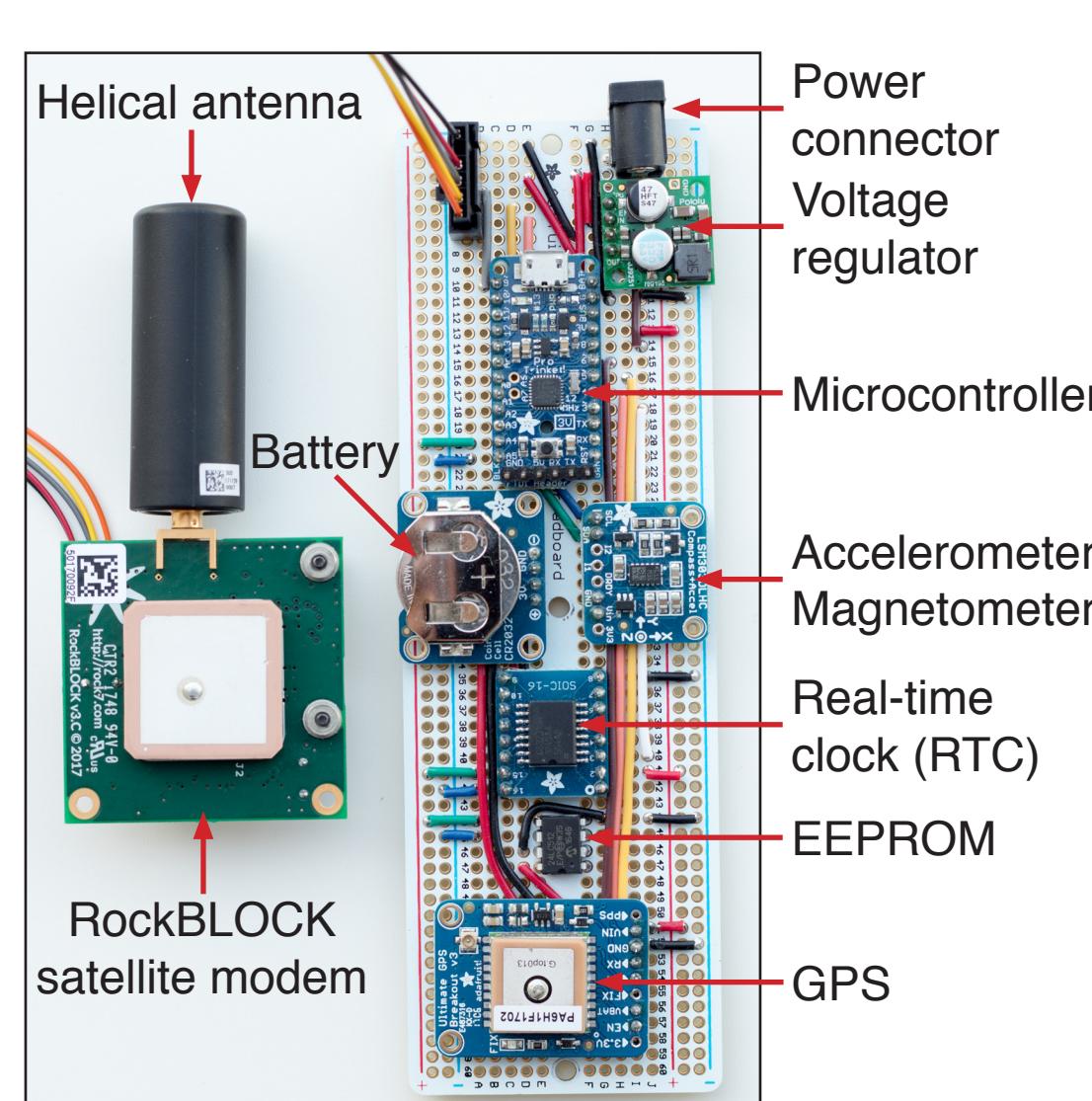


Figure 1. Design of Cryologger tracking beacon configuration.

Table 1. Component costs

Component	Cost
Microcontroller	\$25
Iridium satellite transceiver	\$400
Real-time clock	\$20
GPS	\$50
Accelerometer/magnetometer	\$10
Battery	\$150
Enclosure	\$50
Wiring, connectors, etc.	\$20
Total	\$725



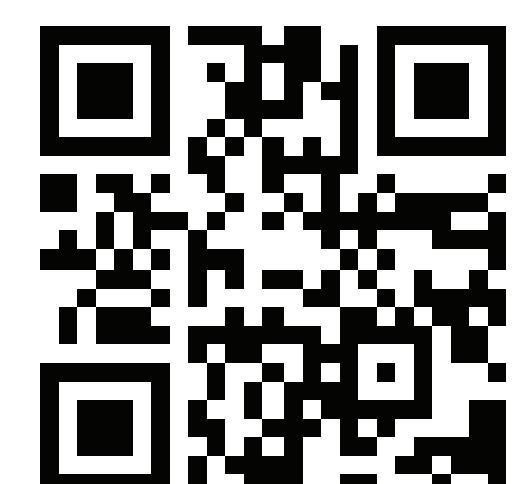
Figure 2. Drift tracking beacon deployments.

Conclusions & Future Work

The success of the Cryologger drift tracking beacon deployments have demonstrated that low-cost, open-source hardware and software can provide a reliable, cost-effective data collection platform for the monitoring icebergs and ice island drift patterns in the Canadian Arctic.

Collected in-situ iceberg tracking data has provided key insights to iceberg drift and deterioration processes in the Canadian Arctic.

Development of the next version of the Cryologger tracking beacon is currently underway and will focus transition to an ocean drifter buoy once the icebergs break apart, as well as explore the use of more environmentally friendly materials.



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