

# SEASONAL ARCTIC LAKE FREEZE/THAW MONITORING

CASE STUDY



University of  
Alaska Fairbanks

Various Locations,  
Alaska, USA



*In Alaska's North Slope, renowned for its cold climate and permafrost, researchers from the University of Alaska, Fairbanks, and the US Geological Survey are investigating the impact of climate change on Arctic lakes. Warming winters with thinner ice growth are shifting bedfast ice lakes towards floating ice regimes, potentially causing permafrost thaw and intensifying environmental transformations. To aid this study, beadedstream delivered a customized real-time monitoring solution, offering valuable insights into evolving lake dynamics in challenging environments.*

## Application

Covering nearly 40% of Arctic lowland regions, shallow lakes traditionally freeze solid during winter, preserving sublake permafrost. The Arctic Lake Ice Systems Science (ALISS) Project is dedicated to unraveling the complexities of bedfast and floating ice lake dynamics in correlation with permafrost and climate. Confronted with logistical challenges in the remote Arctic, ALISS scientists sought a solution for the real-time transmission of lake surface and sub-surface data.

In addressing this need, ALISS scientists turned to **beadedstream** for a customized solution tailored to outfit a low-footprint Arctic lake buoy. The instrumentation is designed to facilitate the seamless real-time transmission of lake conditions from a series of remote Arctic lakes.

The operational monitoring and remote data acquisition contributed to modeling efforts and enhancing outreach initiatives. This approach, standing as an alternative to traditional methods like in-situ logging and non-digital temperature monitoring, mitigates the risk of data loss, providing a robust and reliable solution for the ALISS Project's unique requirements.



An ALISS buoy retrofitted with **beadedstream** D405 data logger deployed into a lake during the summer.

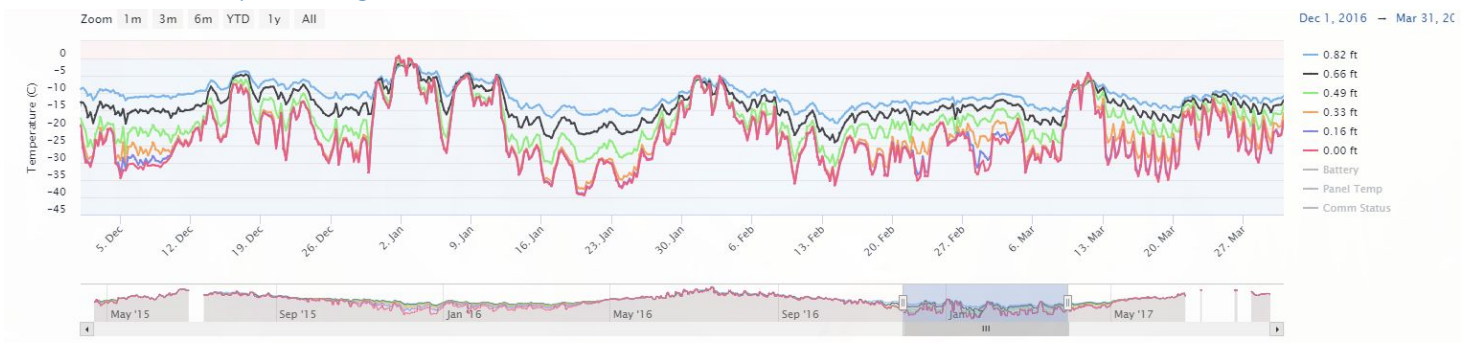
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### beadedstream Solution

To meet the unique requirements of the project, **beadedstream** undertook the task of designing a bespoke buoy frame dedicated to real-time data transmission. Integrated into each of the 10 deployed sites were **beadedstream**'s D405 data logger on ALISS' buoys. This comprehensive solution included two digital temperature cables (DTC), one for lake ice profiling, each equipped with approximately 20 sensors spaced at 10cm intervals, and one for lake surface monitoring, featuring 6-7 sensors spaced at 5cm intervals, to monitor the lake's surface.

In tandem with the sub-surface temperature cables, an air temperature DTC was incorporated to capture atmospheric dynamics. A critical component of the instrumentation suite, the ultra-sonic digital snow-stake provided accurate measurements of snow depth. Recognizing the remote and challenging conditions of Alaska's northern coastal plain, a custom 360-degree solar recharge kit was integrated into each buoy. This optimization allowed the buoy to spin in the water, maximizing exposure to solar panels and ensuring sustained power supply. Through this meticulously crafted instrumentation suite, **beadedstream** not only met the specific needs of the ALISS project but also demonstrated its commitment to providing tailored solutions that thrive in harsh Arctic environments.



Graph from beadedcloud displaying lake-surface monitoring data at one of the project locations, captured between December 2016 and March 2017.

### beadedstream Solution Benefits

The customized solution significantly enhanced the ALISS project's operational efficiency in the challenging Arctic conditions. Facilitating real-time data capture, transmission, storage, and presentation, **beadedstream**'s technology eliminated the necessity for ALISS scientists to physically travel to remote locations during harsh winter conditions. The rugged and adaptable nature of the temperature monitoring gear, integrated with the ALISS buoys, proved crucial for seamless performance in the remote and extreme environment of Alaska's northern coastal plain. By incorporating the D405 Datalogger and digital temperature cables into the buoy system, researchers gained invaluable insights into lake dynamics, mitigating the challenges posed by the region's harsh climate and remote accessibility. This not only streamlined monitoring processes but also exemplified **beadedstream**'s commitment to providing robust solutions tailored to the specific needs of scientific endeavors in extreme environments.