

REAL-TIME SNOWPACK TEMPERATURE PROFILING

CASE STUDY



CHUGACH NATIONAL
FOREST AVALANCHE
INFORMATION CENTER &
KASTELER CONSULTING

Tincan Ridge,
Turnagain Pass,
Alaska, USA




"It's not the Holy Grail, it's just one piece of information -- one really great piece. We will use that to see change in temperatures. It can tell us how much snow has fallen during a storm. It can tell us how quickly the snow's coming in. It's super important for forecasting."

-Wendy Wagner, Director & Forecaster



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CNFAIC recognized a need in their instrumentation network to monitor temperature and snow depths along Tincan Ridge as they were seeing high instances of avalanches in this popular backcountry area.

The installed beadedstream solution provided them with real-time data of these parameters throughout the snow season, allowing for forecasters to better predict avalanche conditions and issue warnings to backcountry users.

Application

Turnagain Pass is a highly-used backcountry area but also avalanche prone with only a sparse instrumentation network. Tincan Ridge is particularly popular with backcountry enthusiasts and has seen more than its share of avalanches. CNFAIC was looking for a solution to aid in avalanche forecasting by monitoring snow depth and temperature changes. These forecasts are critical for backcountry skiers when they are planning their excursions and can help to avoid having people caught up in avalanches.

beadedstream Solution

A **beadedstream** Digital Temperature Cable was installed vertically in the snowpack along with a sonic snow depth sensor. The cable is 4.5m and has 31 sensors spaced at 15cm (6 inch) intervals. Both sensors were attached to a D405 Satellite Data Logger for collection of readings every 2 hours and remote transmission to **beadedcloud**.

Project staff installed and continues to maintain the site at 701m (2300 ft) on Tincan Peak. Prior to the snow season, site materials (mast, timbers, etc.) were helicoptered in from Girdwood, AK and staff proceeded to set the mast in place and build a snow deflector aimed at shoring up lateral creep.



D405 Data Logger mounted on top of a post during low snow conditions. The temperature cable can be seen suspended from the arm to the left of the post.

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Left - D405 logger with temperature cable in white heat shrink.

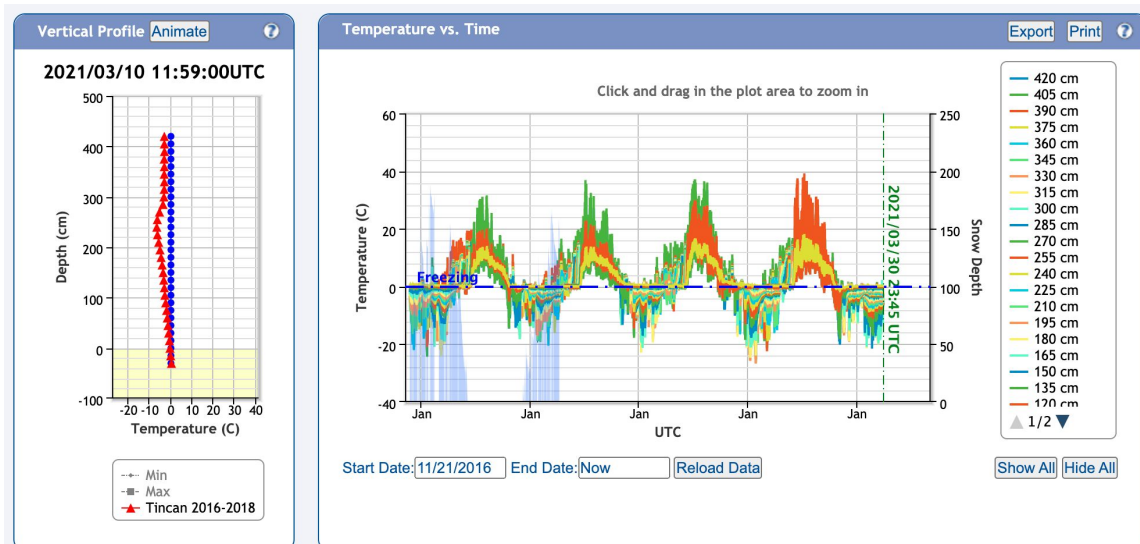
Right - Avalanche cable in white heat shrink.

beadedstream Solution Benefits

The **beadedstream** solution was compact and lightweight which allowed for easy transport to site via helicopter and quick installation. Since the sensors were installed on a ridge with limited protection from the elements, a wedge was installed to protect them from strong winds and incoming weather.

The benefits of having a direct-to-orbit data logger allowed forecasters to have access to the latest data by simply logging into **beadedcloud** in a web browser. They were also able to make this data visible to the public on their own website.

Having real-time data from the sensors allows forecasters to have actual site data so they can assess conditions. Changes in temperatures can indicate how much snow has fallen, how quickly snow is approaching, or if it's raining which are important forecast inputs including knowing if the snow is wet and heavy or light and dry.



Left - vertical profile of temperatures on the cable from one timestamp (red).

Right - Data set from 2016 to 2021 showing the seasonal variations in temperature (°C).