



Hydrological Studies on Alaska's Western North Slope - In support of ASTAR

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Introduction

Between August 8 and 22, 2022, the Alaska Division of Geological & Geophysical Surveys (DGGS) installed three weather stations, nine snow measurement nodes, and five stream gauges in support of the Arctic Strategic Transportation and Resources (ASTAR) project.

This instrumentation will inform environmental models and an environmental impact statement for the ASTAR project. Additionally, many of the waterways on the west-central North Slope have not had long-term monitoring, therefore we hope to release this data for the benefit of the broader scientific community.

Instrumentation

The installed weather towers were accompanied by three snow nodes within one mile from the weather station tower. The snow nodes were strategically placed in locations that would measure variability in snow accumulation (fig. 1) to better capture on-the-ground variation in the snowpack.

All stations are powered by several batteries maintained by a solar panel. Environmental sensors such as air temperature, ground temperature, ground moisture, and downward firing acoustic distance sensors (used to measure snow accumulation) are included on each station. Weather stations also include a suite of environmental sensors, including radiation sensor, wind vein, barometer, ground temperature profiler, a tipping bucket precipitation gauge, and humidity sensor.

Stream gage stations were placed on five waterways in the study area: the Nigisaktuvik River (22RPD001), Inaru River (22RPD002), Kugrua River (22RPD003), Kucehak Creek (22RPD004), and an unnamed Inaru Tributary (22RPD005) (fig. 2). Along with the instrumentation that is included on every station, the gage stations include a camera and a vibrating wire piezometer buried within the subject waterway to measure the river stage. A publication that details the infrastructure installed and data collected is currently in process and expected to be published in spring 2023 (Germann and others, in press).

Installation took place in August 2022 as it was assumed that waterways would be in low flow stage during the summer. The primary source of water in this region is snow-pack melt and rainwater run-off, so staff also measured the channel profile using a differential GPS for centimeter-accurate measurements while installing the gage equipment and calculated the discharge of each waterway using an OTT Hydromet MF Pro (fig. 3). detailed information on the river profile and discharge data can be found in our recent publication (Germann and Daanen, 2022).



Figure 1. Left. Three snow nodes associated with weather station 22RPD006. Snow stations were strategically placed to measure variability along ridgeline surrounding small lake. **Right.** Caribou passing by snow nodes 22RPD007 (background) and 22RPD008 (foreground) showing clear ridgeline from the ground.

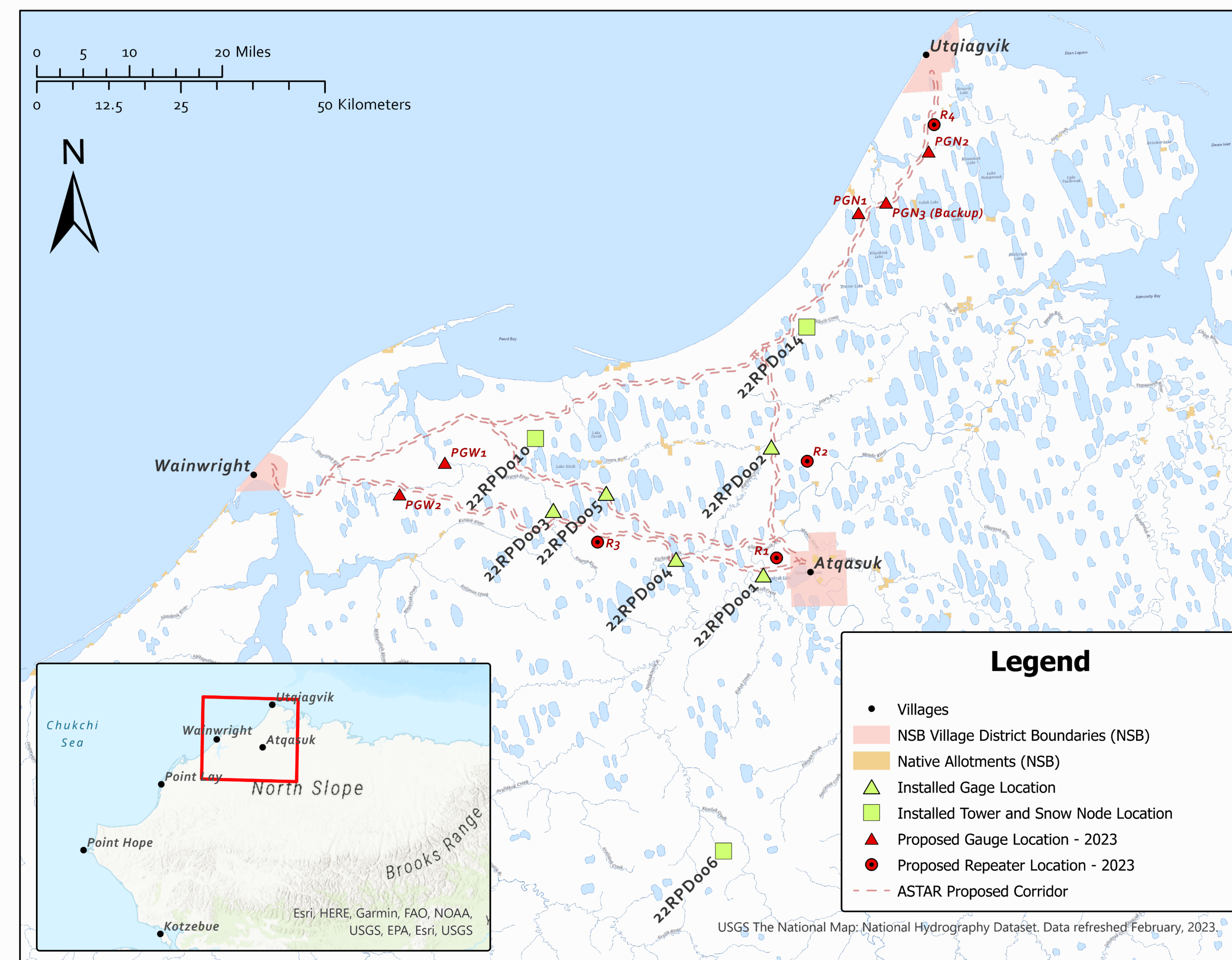


Figure 2. Study area depicting currently installed infrastructure and planned infrastructure for 2023.

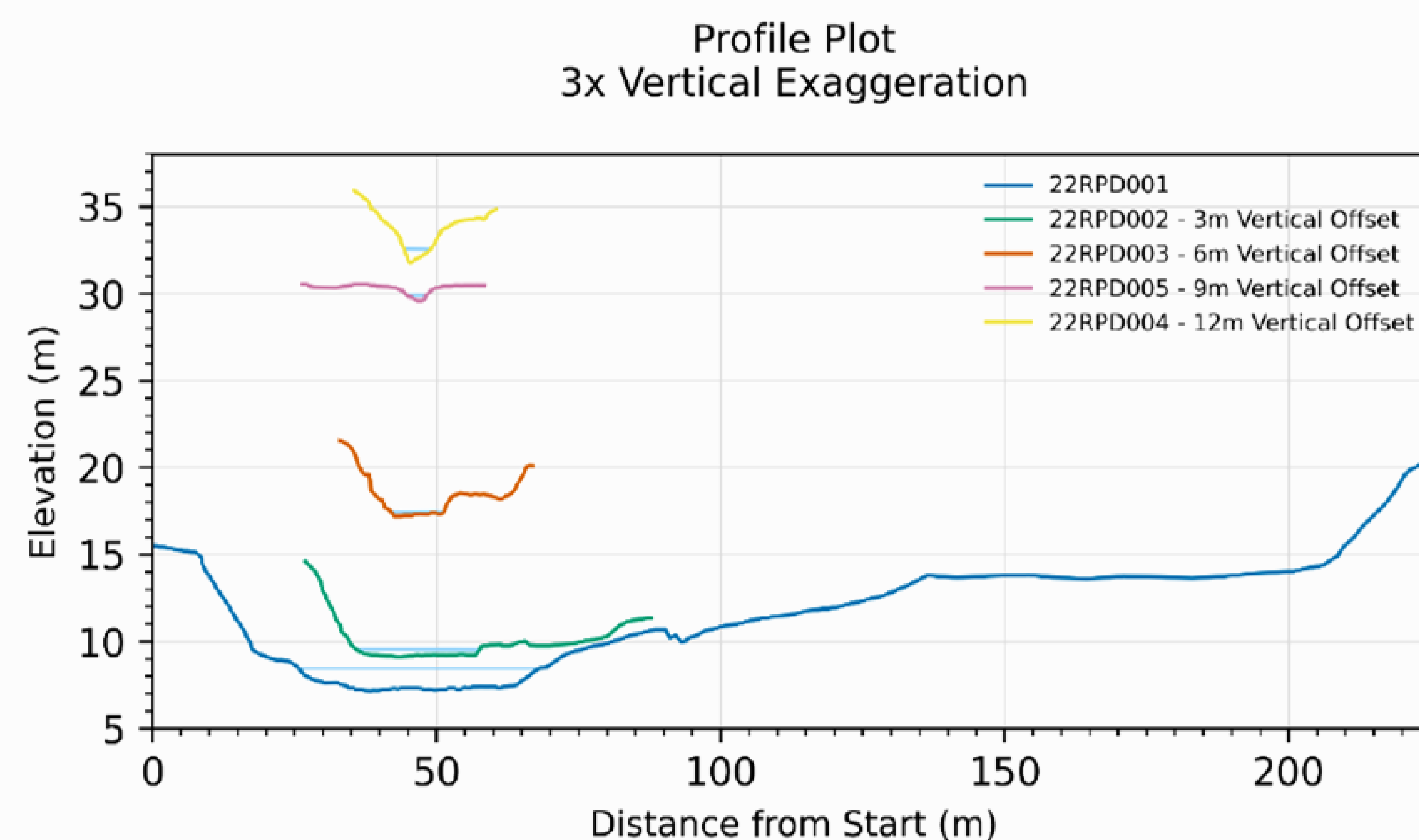


Figure 3. Stream profile measurements collected during installation of stream gage. A 2x vertical exaggerating is applied as well as an offset applied to stations 22RPD002-005 to avoid overlaps.

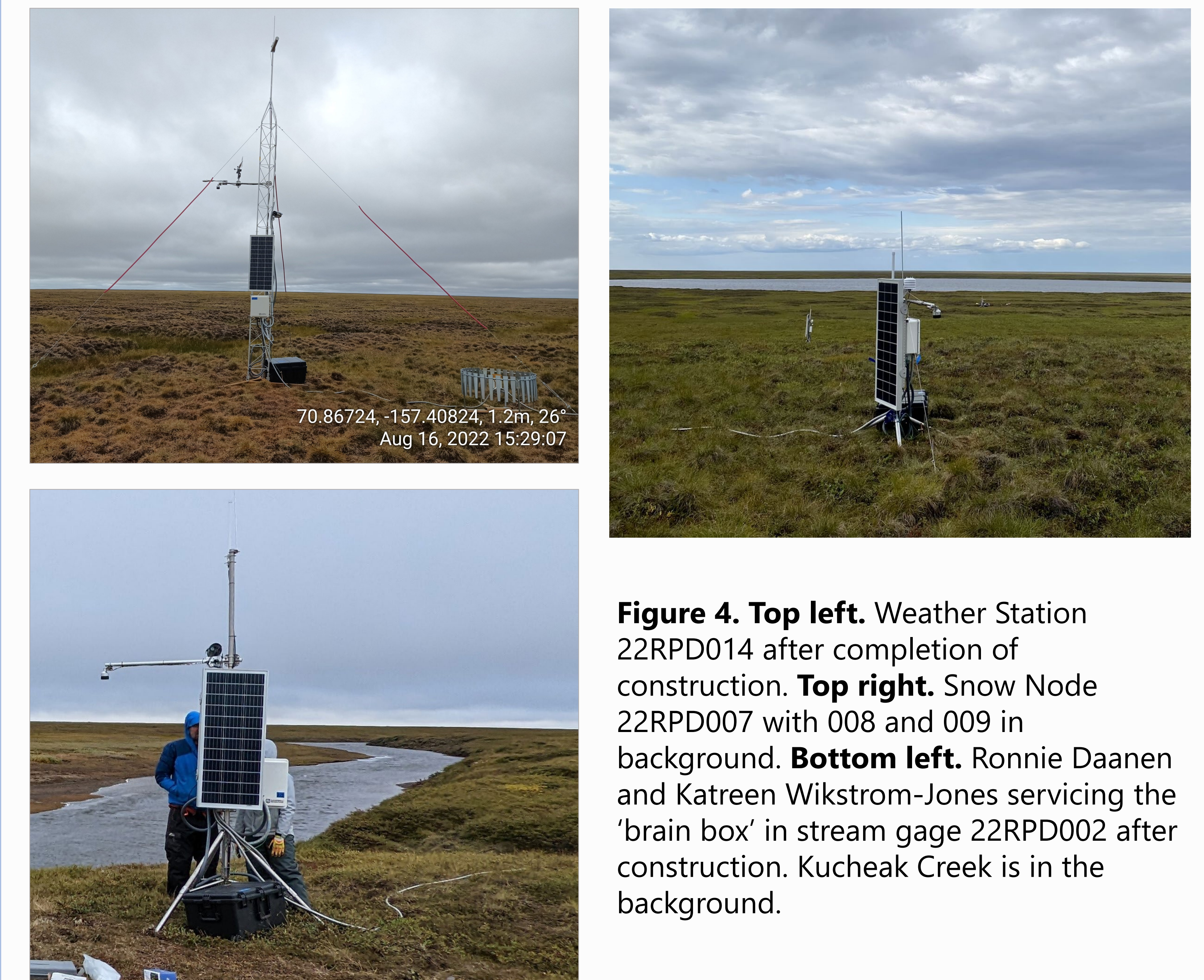


Figure 4. Top left. Weather Station 22RPD014 after completion of construction. **Top right.** Snow Node 22RPD007 with 008 and 009 in background. **Bottom left.** Ronnie Daanen and Katreen Wikstrom-Jones servicing the 'brain box' in stream gage 22RPD002 after construction. Kucehak Creek is in the background.

Future Work

In April 2023, DGGS staff will be back in the field conducting maintenance at each station and installing radio repeaters. During the summer of 2023 staff will return to the study area to install 3–4 more stream gauges focusing on areas on the Kugrua River and its tributaries, and further North, between weather station 22RPD014 and Utqiagvik. We plan to have real-time data, hosted by the DGGS website, available to the public by the end of 2023.

Acknowledgments

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References

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