Augmentation of USArray sites with temperature profilers

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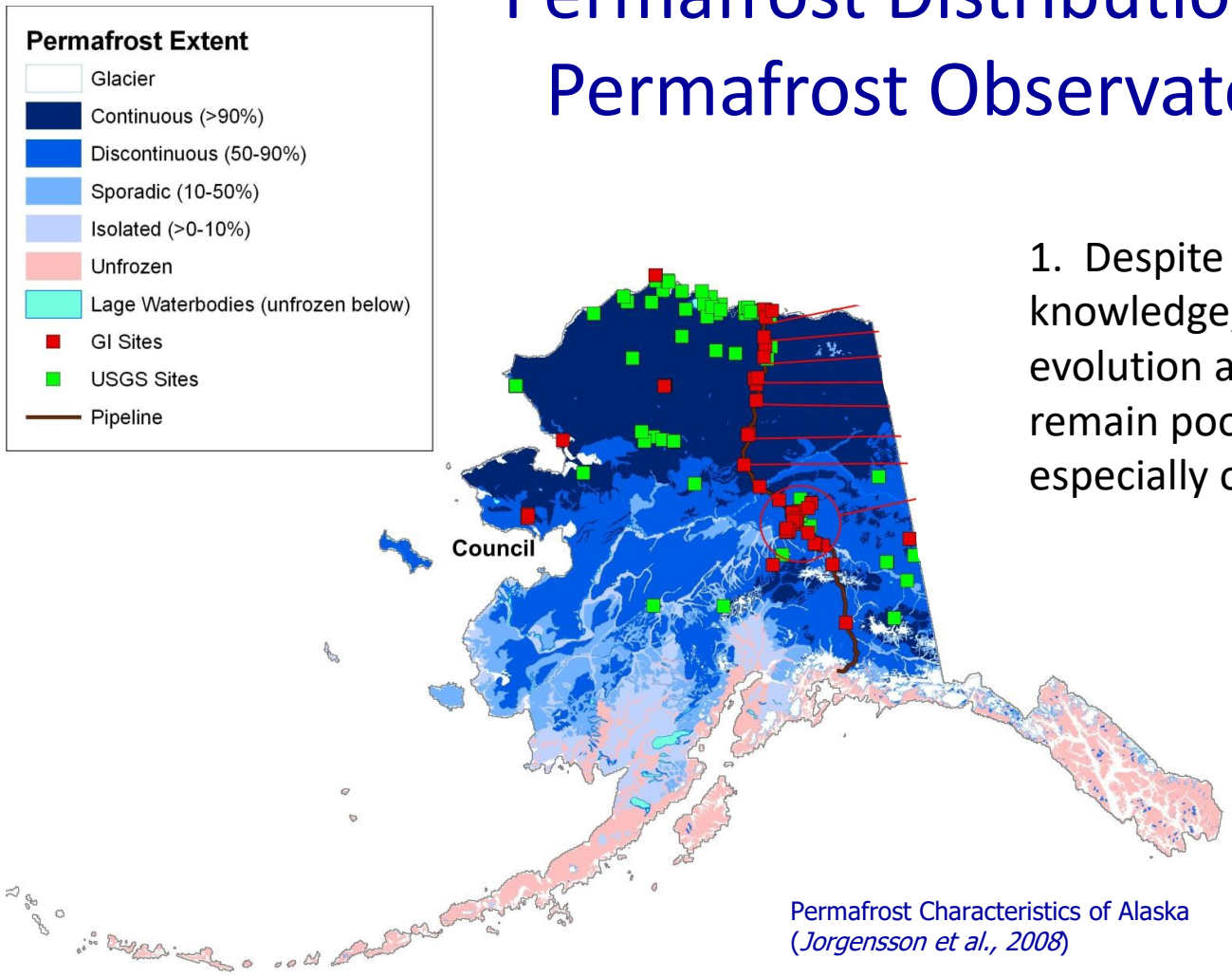
Permafrost Distribution in Alaska and Permafrost Observatories Location



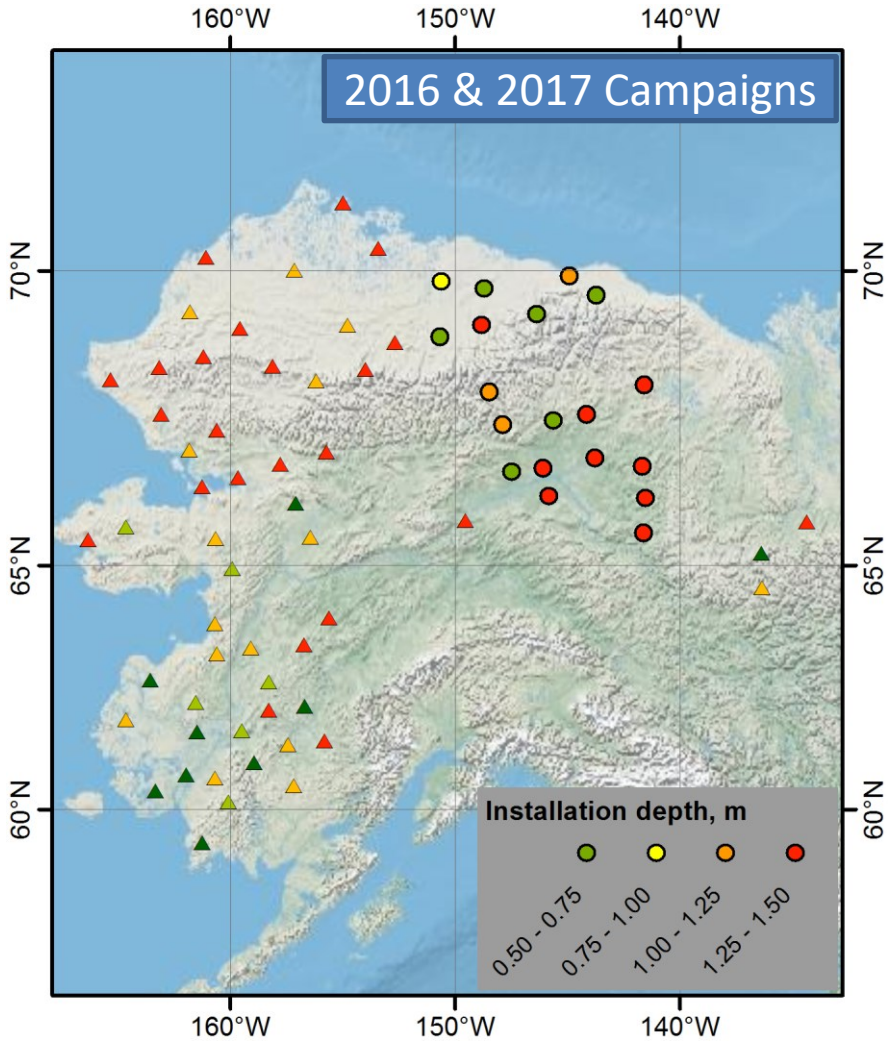
Permafrost Characteristics of Alaska (*Jorgensson et al., 2008*)

1. Despite our accumulating knowledge, future permafrost evolution and its impacts remain poorly quantified especially on local scales

2. USArray sites, distributed across Alaska, capture heterogeneity across the landscape and compliment existing data collection efforts

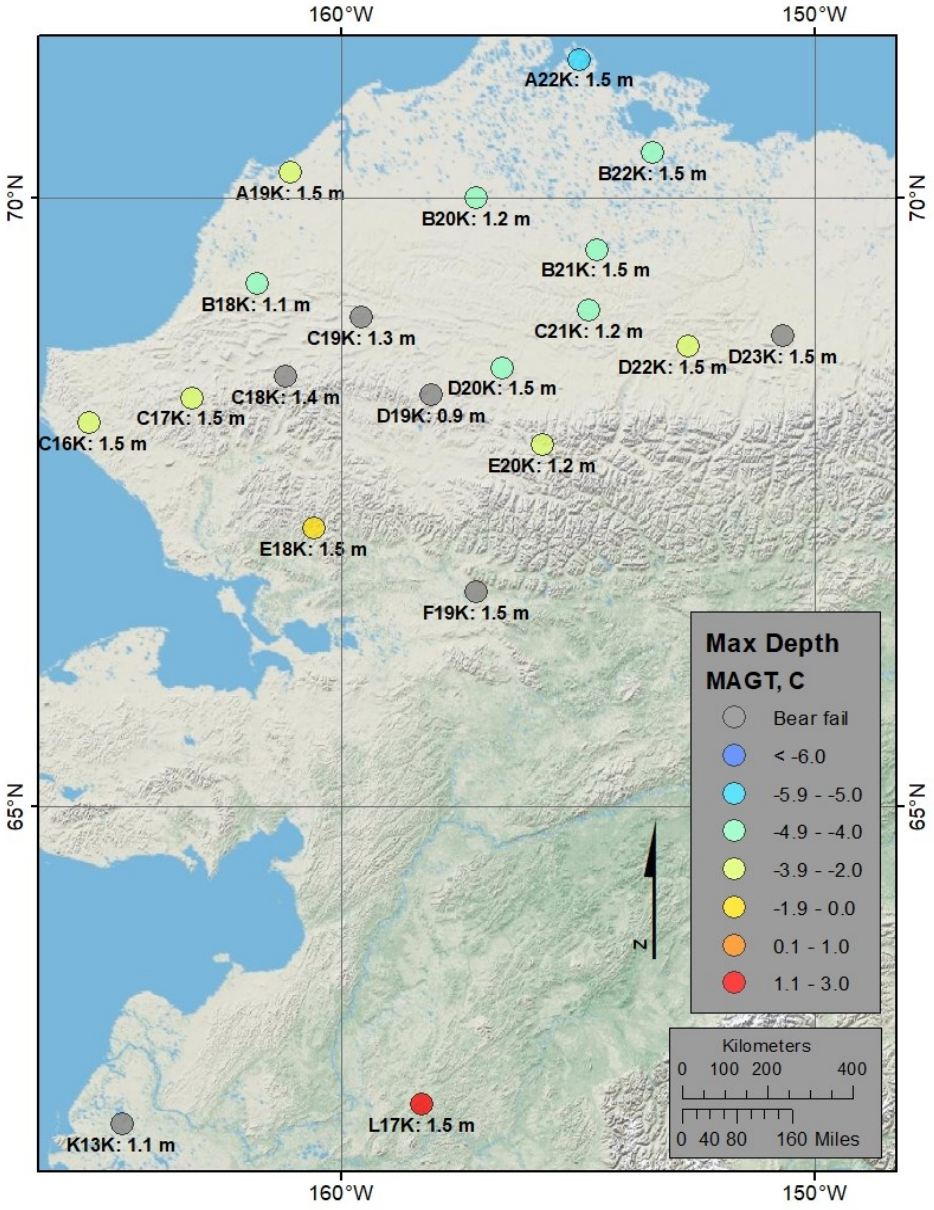
Project Goal: To measure ground temperature distribution and dynamics across the ABoVE domain

Augmentation of the USArray sites with temperature profilers



- During 2016 campaign - **19 USArray sites**
- During 2017 campaign - **55 USArray sites**
- Currently the plan is to upload temperature data and distribute it to the public
- 4-8 sensors to measure temperature at and below the ground surface

Ground temperature collection, 2018

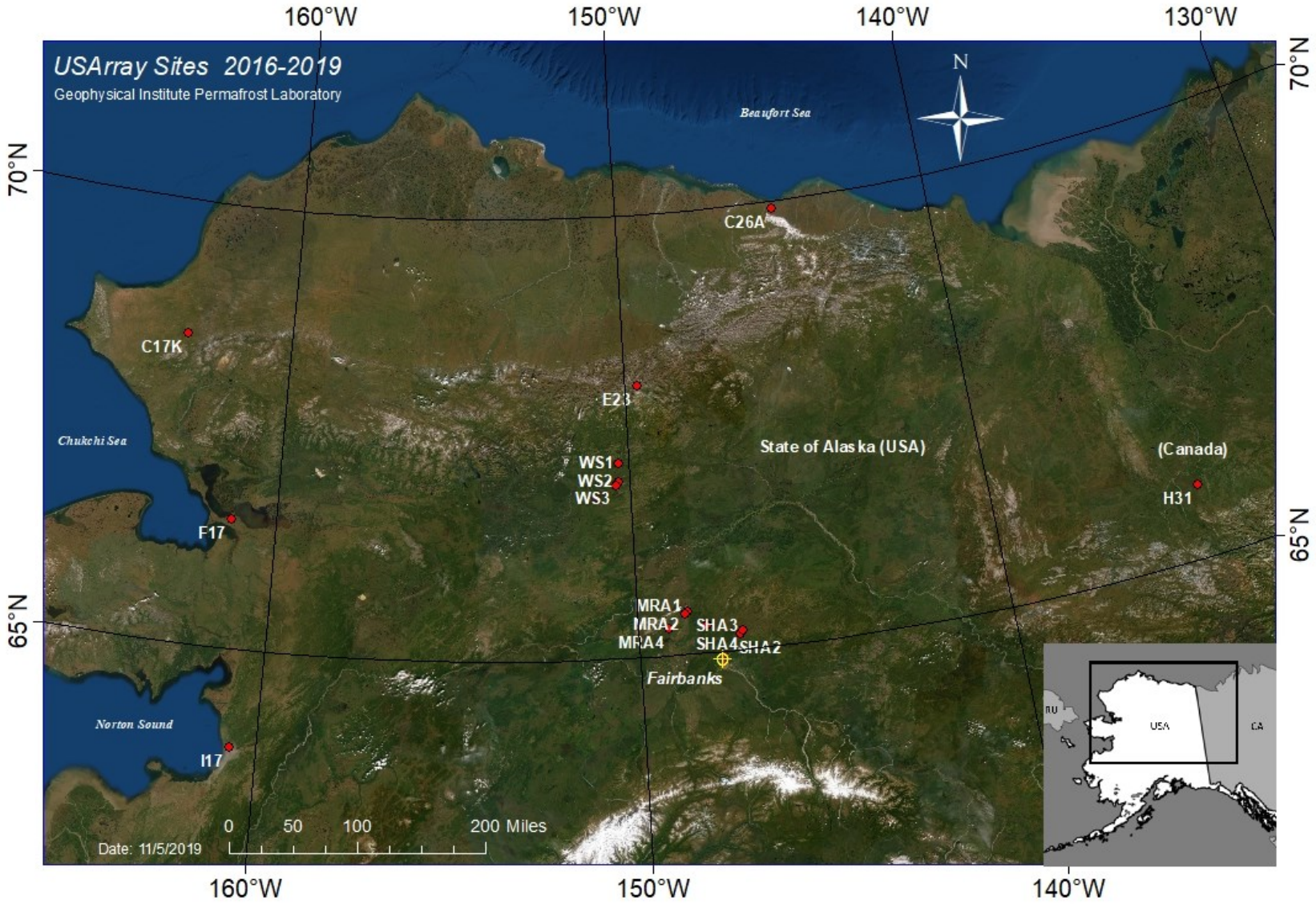


Alaskan USArray 2018 Season

- Collected data from 20 sites in the late Summer of 2018.
- Installed 13 sites in the Interior
- Submitted data to ORNL DAAC
- 6 Stations destroyed by bears

- Rumors: the USArray seems to have an extra year of life
- Some stations will be likely adopted by some organizations

Ground temperature collection, 2019



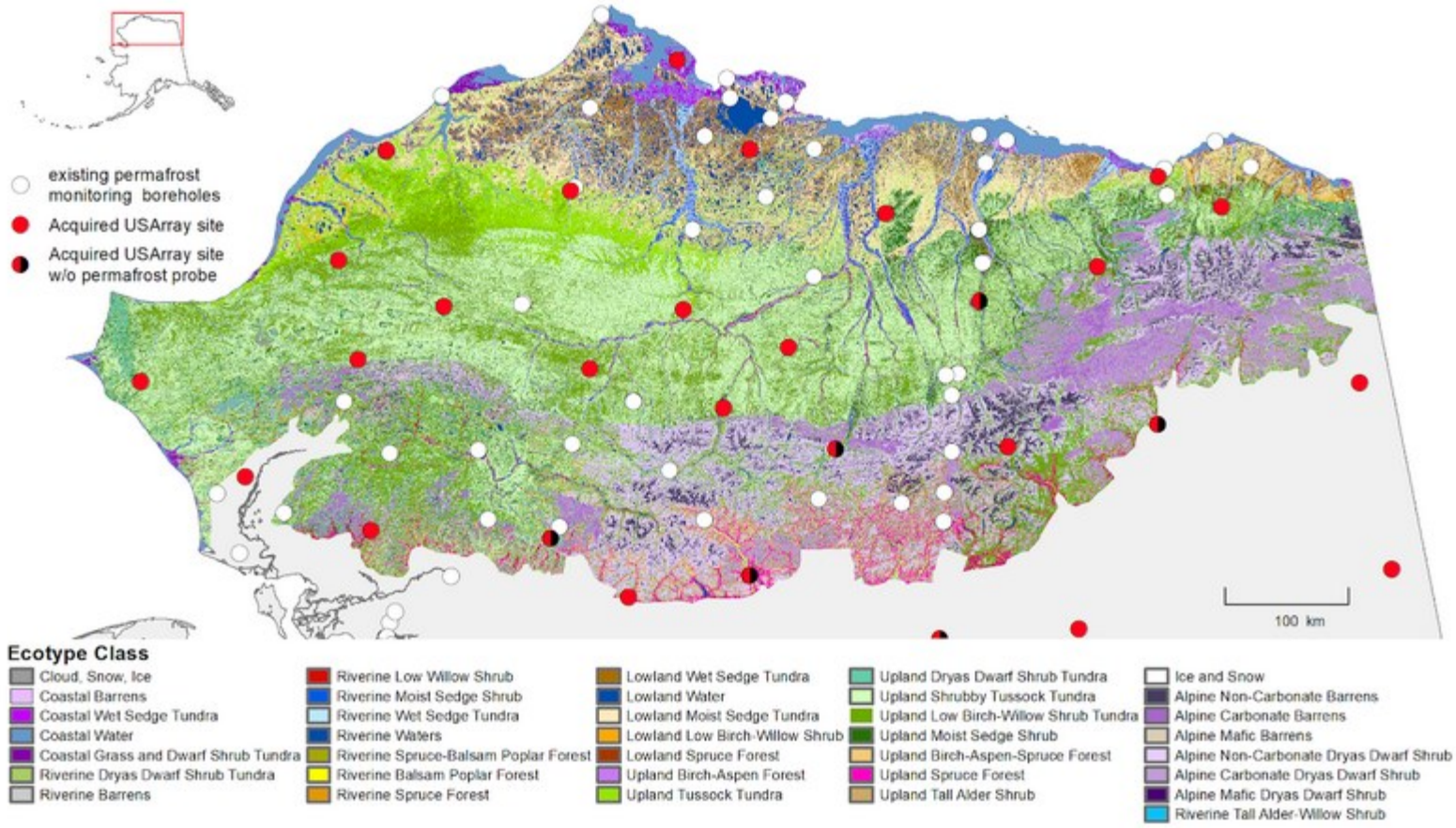
This was a year when the USArray was supposed to be rolling back, and temperature data was supposed to collected. But the NSF extended the life of USArray.

Very limited site visitations.

Ground temperature collection, 2020 – COVID-19

A few essential site visits

Great news, some USArray stations will be adopted by the Alaska Earthquake Center



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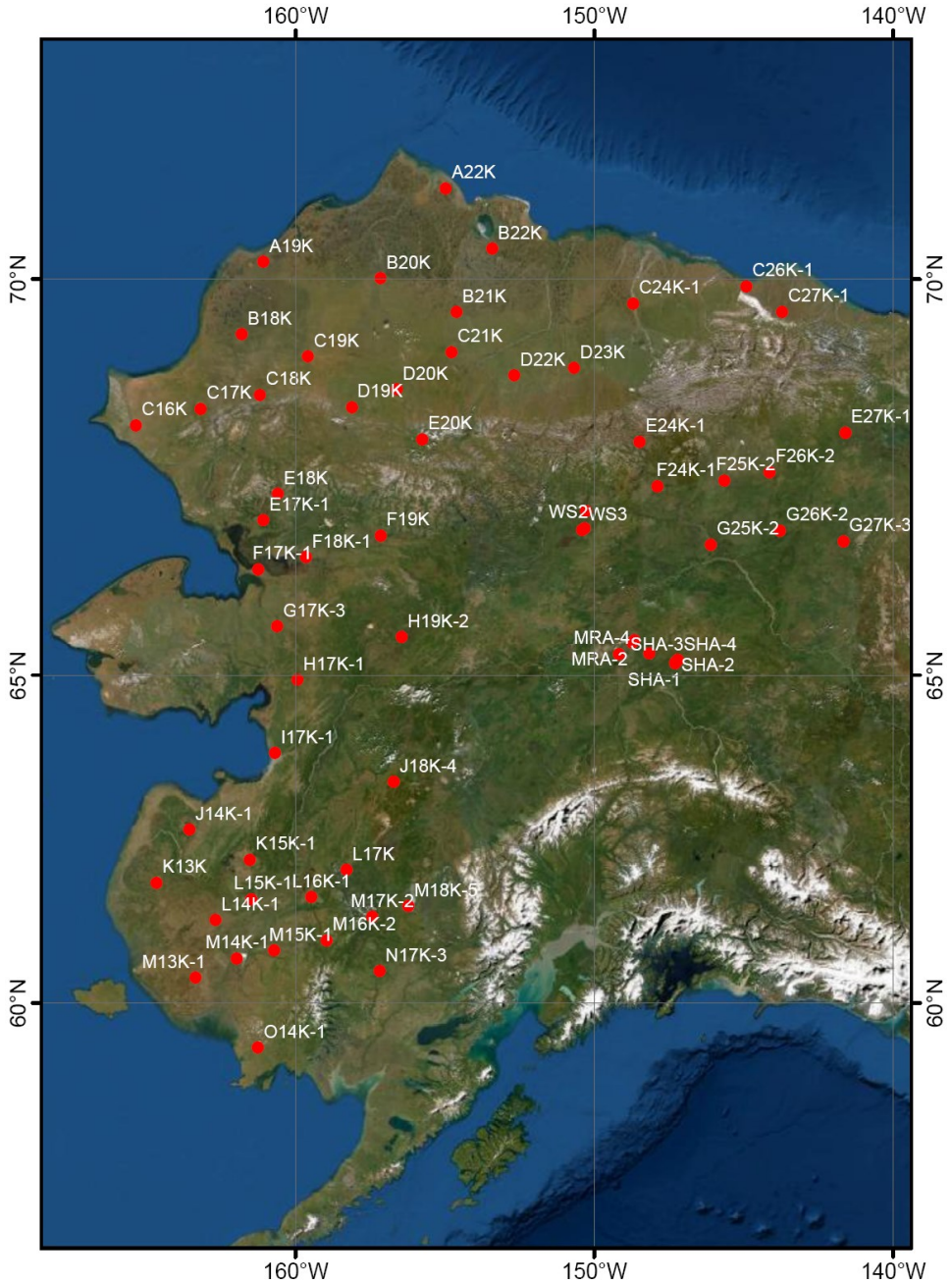
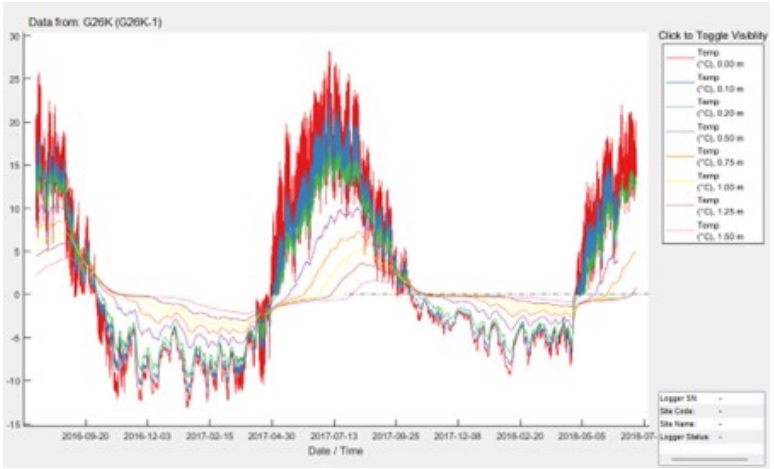
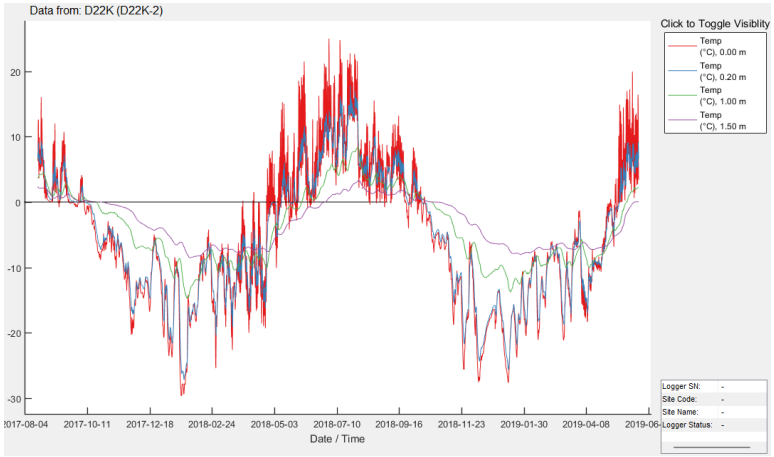
Ground temperature collection, 2021



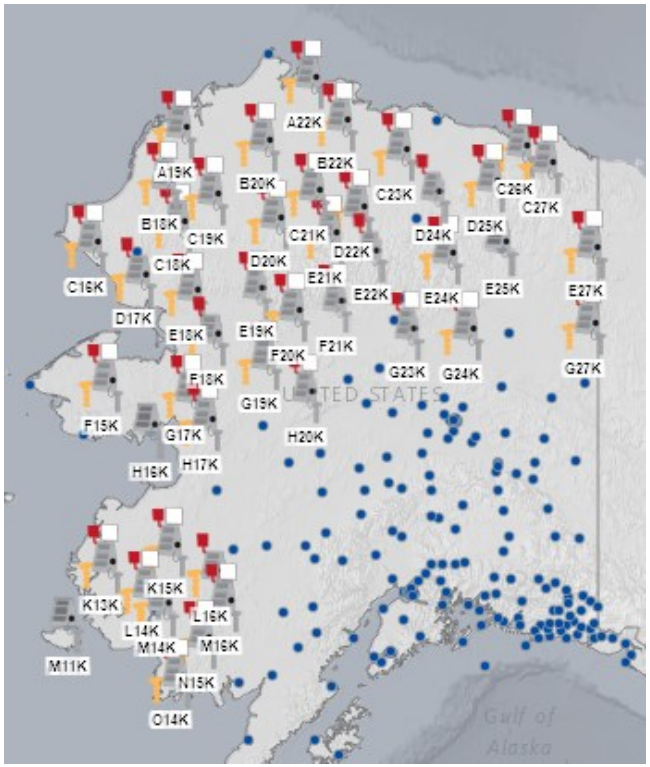
Examples of collected ground temperature data at sites G26 and D22





Contributions and future directions

Next years



1. Ground temperature measurements are available at 64 sites out of the 86 installed in AK. The primary reason for failure of 22 sites was wildlife, while the secondary was the water damage.

2. Currently, there are two published datasets:
   https://doi.org/10.3334/ORNLDAAC/1680
   https://doi.org/10.3334/ORNLDAAC/1767

3. Data from Canadian sites are available at
   https://service.yukon.ca/permafrost/Temperature.html

USArray sites capture heterogeneity across the landscape and compliment existing data collection efforts

Including observations of permafrost temperatures in the EarthScope instrumentations improves our ability to monitor and to predict near-term changes in permafrost

Many thanks to the USArray teams for the installation and data collection efforts!