Permafrost Temperature Data from a Deep Borehole Array on the Arctic Slope of Alaska, Version 1

USER GUIDE

How to Cite These Data

As a condition of using these data, you must include a citation:

Clow, G. 2015. *Permafrost Temperature Data from a Deep Borehole Array on the Arctic Slope of Alaska, Version 1.* [Indicate subset used]. Boulder, Colorado USA. NSIDC: National Snow and Ice Data Center. https://doi.org/10.5065/D6N014HK. [Date Accessed].

FOR QUESTIONS ABOUT THESE DATA, CONTACT NSIDC@NSIDC.ORG

FOR CURRENT INFORMATION, VISIT https://nsidc.org/data/G10015

National Snow and Ice Data Center

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1 OVERVIEW

The 24-element array is located on the Arctic Slope of Alaska, a region of cold continuous permafrost. Most of the monitoring wells are situated on the Arctic coastal plain between the Brooks Range and the Arctic Ocean, while others are in the foothills to the south. The data represent the true temperatures in the wellbores and surrounding rocks at the time of the measurements; they have not been corrected to remove the thermal disturbance caused by drilling the wells. With a few exceptions, the drilling disturbance is estimated to have been on the order of 0.1 K or less by 1989. Thus, most of the temperature measurements acquired during the last 25 years are little affected by the drilling disturbance. The data contribute to ongoing efforts to monitor changes in the thermal state of permafrost in both hemispheres by the GTNG-P, one of the primary subnetworks of the Global Terrestrial Observing System (GTOS). The data will also be useful for refining our basic understanding of the physical conditions in permafrost in Arctic Alaska, as well as providing important information for validating predictive models used for climate impact assessments (Clow 2014).

2 DETAILED DATA DESCRIPTION

2.1 Format

The data are in ASCII text format and contain a 23 line header followed by two columns of data: depth (m) and temperature (°C). All the data files are zipped into a single zip file for distribution.

2.2 File Naming Convention

Generic File Name: LLL_YYMMMDD[n].txt

Example File Name: AWU_81AUG22.txt

Where:

Table 1. File Naming Convention

Variable	Description
LLL	3-character location abbreviation. See borehole_locations.pdf for a list of the abbreviations.
YY	2-digit year
MMM	3-character month abbreviation
DD	2-digit day of month
n	Optional alphabetical counter used only when there is more than one data file per day.

2.3 Spatial Coverage and Resolution

The 24-element borehole array is located on the Arctic Slope of Alaska within the following bounding region: N: 71.2, S: 68.5, E: -148.3, W: -161.1.

The spatial resolution of the arrays is variable; see the borehole_locations.pdf document for a map and locations of the boreholes. Prior to 1984, temperature measurements were taken at fixed depth intervals; after this, temperature measurements are taken as the probe is lowered continuously down the borehole.

2.4 Temporal Coverage and Resolution

The first date of available data are from 26 September 1973 and the most recent sampling occurred on 04 July 2014. The temporal resolution of the samples varies; see the borehole_locations.pdf document for a list of borehole sites and the dates data were acquired at those sites.

2.5 File Size and Volume

The data set contains 184 data files that range in size from 2 KB to 72 KB.

3 DATA ACQUISITION AND PROCESSING

3.1 Data Acquisition Methods

Prior to 1984, temperatures were measured at fixed depths, typically every 1.5 or 3.0 m, and the logging cable disconnected from the resistance readout when moving from one measurement depth to the next. At each depth, measurements were made until the sensor approached thermal

equilibrium with the surrounding environment. In 1984, a high-quality slip-ring connector was introduced to the system, allowing measurements to be acquired while the sensor was moving continuously down the borehole; a circuit triggered the system to acquire a measurement every 30 cm. The depth and sensor resistance measurements were automatically recorded on magnetic tape. A logging speed of ~10 cm s-1 was used with this system. For complete details on the processing of these data, see Clow (2014).

3.2 Sensor or Instrument Description

The borehole temperature logging system used by the USGS to measure temperatures in the DOI/GTN-P boreholes consists of a custom temperature sensor whose resistance is determined by a resistance readout (digital multimeter) using a 4-wire Kelvin circuit. This circuit effectively compensates for the resistance of the logging cable and various connectors that provide the electrical path between the downhole temperature sensor and the resistance readout located on the surface. The temperature sensor consists of a parallel-series network of negative-temperature coefficient (NTC) thermistors hermetically sealed in glass. These in turn are enclosed in a thin (4 mm diameter) stainless steel shell to isolate the thermistors from pressure effects and corrosive chemicals. The resulting probe design has proved to be rugged and stable, and provides a high temperature sensitivity (Sass et al., 1971; Clow, 2008). For complete details on the instrument used to collect these data, see Clow (2014).

4 REFERENCES AND RELATED PUBLICATIONS

Clow, G. D. 2014. Temperature data acquired from the DOI/GTN-P Deep Borehole Array on the Arctic Slope of Alaska, 1973-2013. Earth Syst. Sci. Data, 6: 201-218. doi:10.5194/essd-6-201-2014.

Clow, G. D. 2008. USGS Polar Temperature Logging System, Description and Measurement Uncertainties. US Geological Survey, Reston, Virginia USA, Techniques and Methods 2-E3. Accessed from http://pubs.usgs.gov/tm/02e03 on January 2014, 24 pp.

Sass, J. H., A. H. Lachenbruch, R. J. Munroe, G. W. Greene, and T. H. Moses Jr. 1971. Heat flow in the western United States. J. Geophys. Res., 76: 6376-6413.

4.1 Related Data Collections

- IPA-IPY Thermal State of Permafrost (TSP) Snapshot Borehole Inventory
- Soil Temperature Station Data from Permafrost Regions of Russia (Selection of Five Stations), 1880s - 2000
- Circumpolar Active-Layer Permafrost System (CAPS)

5 CONTACTS AND ACKNOWLEDGMENTS

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6 DOCUMENT INFORMATION

6.1 Document Author

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