

Making permafrost data easier to distribute and access online

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This project demonstrates next practice to support the distribution of interoperable permafrost data and provides a framework for permafrost data handling from field to publication. This is important because permafrost data are still not easy to access and integrate—despite their importance—because of the effort required to produce them, and because existing data collections do not share a common standard. Our prototype data system could be used by researchers collecting permafrost data to streamline and centralize their observations, or by organizations wanting to publish their data in a way that makes it findable, accessible, interoperable, and reuseable.

Challenge	Requirement
<i>Volume</i> —Existing field data collection and management strategies don't scale well	Simplify permafrost data management with many sensors, locations, or people involved, or when data collection takes place over many years.
<i>Variety</i> —Permafrost data is broad in scope	Provide flexibility to accommodate the many kinds of data used in permafrost research; most importantly ground temperature active layer thickness, borehole logs, and site characteristics
<i>User Diversity</i> —Data users have different skills and needs	Provide a machine-accessible API for automated data access to support other services, or facilitate repeated analyses as more data become available.
	Provide interactive web interface that can be used to search for data
	Provide a way to organize subsets of data
<i>Lacking Resources</i> —Little support for permafrost data management	Minimize the operational requirements to run and maintain the system
	Build on existing services, software, and standards where possible and contribute to, or adapt them when necessary (adopt and adapt)
<i>Interoperability</i> —Existing permafrost data are hard to integrate	Utilize one or more existing data transport and/or metadata standards to ensure data is interoperable with other systems and scientific communities
	Complement, rather than replace, existing data systems to connect data from multiple providers

Figure 1. Challenges that ultimately reduce the availability of permafrost data and the corresponding design requirements for permafrost data systems to help overcome them.

Research summary

Despite their importance, permafrost data are hard to come by. It is expensive to measure at remote locations and much of the data that has been collected already is largely unusable due to fragmented standardization efforts and a scarcity of shared tools for data management and publication.

In this work, we describe five essential challenges for permafrost data management—from collection to publication—focusing on ground temperature, site characterization, and borehole profile data. We reframe these challenges as requirements for a comprehensive permafrost data system and present a prototype of such a system. In addition to a custom

database, we take an adopt-and-adapt approach by reusing existing software (ERDDAP) and standards.

Our results demonstrate an approach to distributing a variety of permafrost data in a way that is accessible to many stakeholders and integrates with international data standards, and provides a set of criteria against which future improvements can be benchmarked.

access consistent data for modelling, hazard mitigation, and adaptation.

Partners, team members and support

This work benefited from conversations with members of the Canadian Consortium for Arctic Data Interoperability (CCADI).

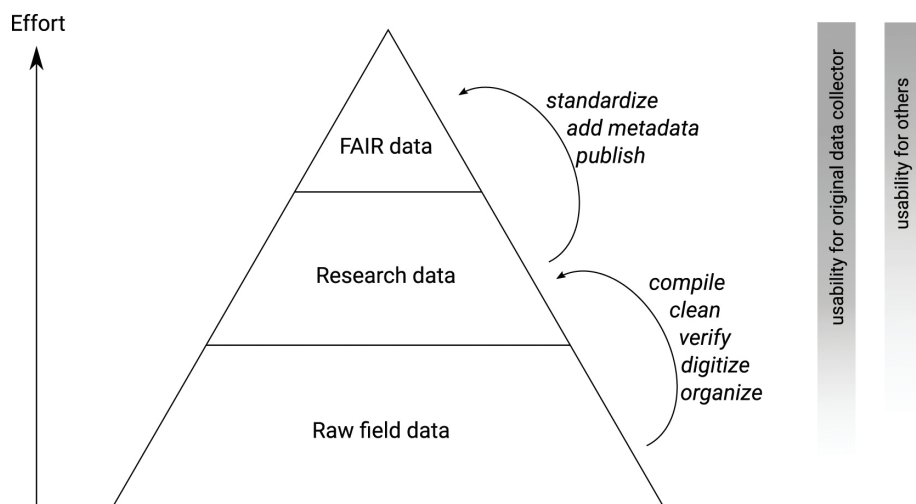


Figure 2. Conceptual model of a 2-step data transformation process. In the first step, raw field data are processed until they can be used productively by the data collector. In the second step, data are further standardized, and metadata is added to make it available in a more reusable, standardized format. Reducing the effort required at any step increases the likelihood that the entire process will be completed.

Taking action

Access to permafrost data is essential for prediction and planning. Researchers and organizations can use the prototype data system to manage and distribute their observations. Because our data server uses well-established interoperability standards, further action can include the development of visualizations and services that make data more accessible to non-technical stakeholders.

Connections to other projects

1 **2** **3** **4** **5** Data connects all themes within the network. The results from this work can be used to manage and share observations from characterization and monitoring efforts, and the adoption of standardized interfaces makes it easier for researchers to

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References

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