

TSP: an 'electrical socket' for ground temperature data

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This toolkit makes it possible for permafrost scientists to easily share and re-use ground temperature datasets and workflows. Much like an electrical socket, it provides a standardized interface that can power more complex tools. This is important because the heterogeneity of ground temperature data (from different instruments, databases, or simulations) impedes cleaning, publication, and re-use—essential activities for understanding and mitigating permafrost thaw. For example, tsp could be used to load observational data into a database for permafrost monitoring. Alternatively, it could be used to write a program for data cleaning that works regardless of sensor make and model.

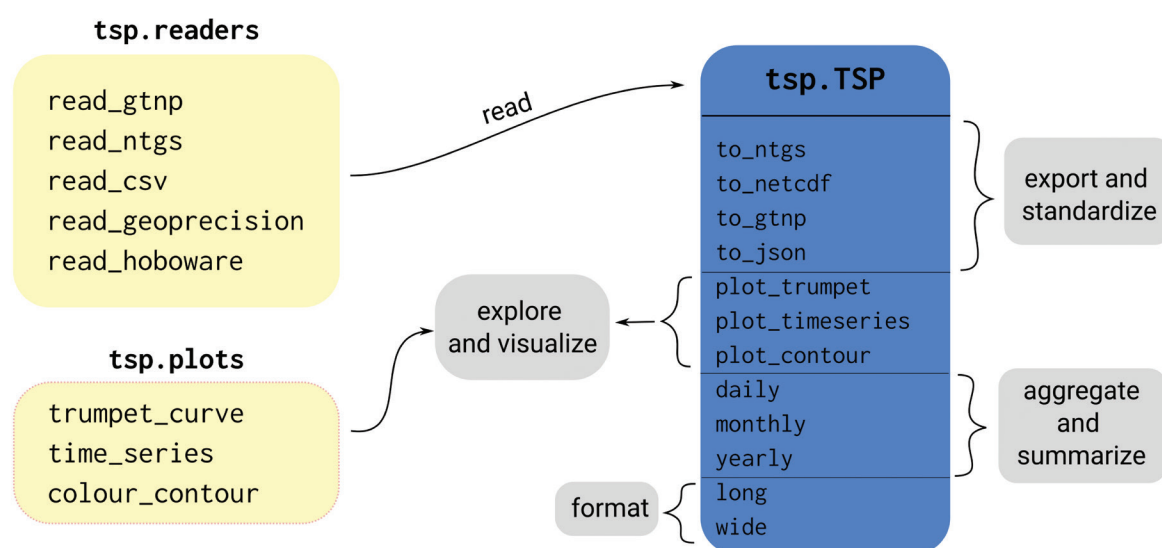


Figure 1. The TSP (or teaspoon) software library provides tools for reading, visualizing, exploring, and standardizing ground temperature time series data from a variety of sources.

Research summary

Ground temperature time series data are used to understand and predict permafrost thaw. Unfortunately, these data are extremely heterogeneous. Consequently, few shared resources exist for cleaning, analysing, and integrating them; we are constantly 'reinventing the wheel' for many common

tasks. I addressed this challenge by developing a software library to read some of the most common data formats. A collection of example files and a suite of automated tests ensure that functionality is maintained as the project evolves. And because the work is open-source, others can add to it to increase the utility.

Currently, the tsp software reads data from four datalogger manufacturers, two permafrost databases, and output from two models. It provides functions to perform many of the most common visualizations and analyses conducted on permafrost data; and it improves permafrost data interoperability by providing methods to output data in common file formats used by the permafrost community.

Connections to other projects

- 2 3 4 The tsp library is used by NSERC PermafrostNet researchers conducting projects in themes 2, 3, and 4 as well as by partner organizations.

Partners, team members and support

This project used test data provided by: Alex Bevington (British Columbia Ministry of Forests, Lands, Natural Resource Operations and Rural Development), Ryan Parker (Geological Survey of Canada), and Louis-Philippe Roy (Yukon University). Additional support for RBR loggers provided by Ryan Parker (Geological Survey of Canada).

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References

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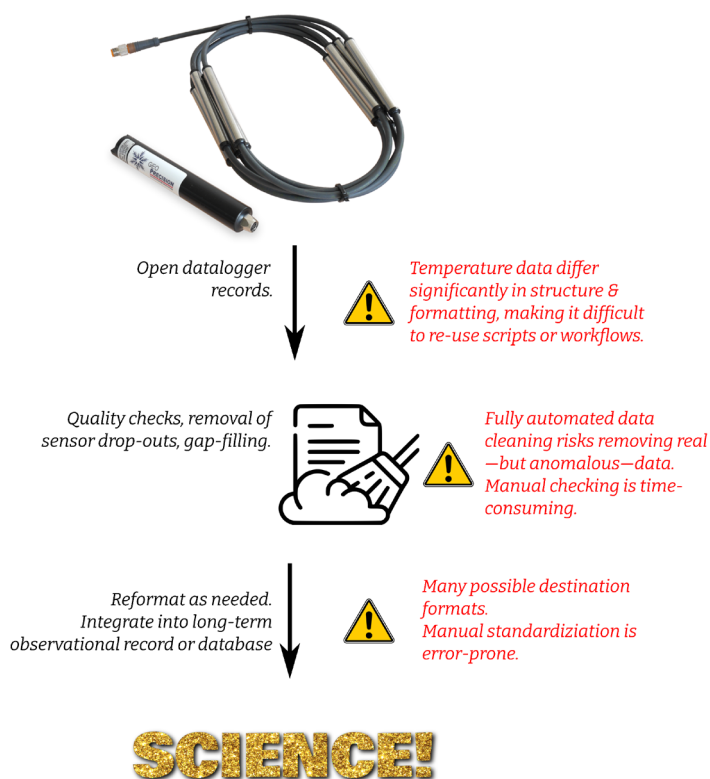


Figure 2. An illustration of some of the challenges working with ground temperature data described as part of a typical workflow starting with sensor-based observations and ending with a clean dataset usable for research or to inform decisions. The tsp library alleviates challenges at each of these steps.

Taking action

The tsp library is meant to be used! Members of the permafrost community are encouraged to contribute to the project by adding new modules to support reading-in their data loggers or model outputs. Individuals can also develop and share workflows that use tsp that transform raw observations into clean, publishable data.

