Funded by:

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and Partners

NSERC PermafrostNet

Advancing interoperable and open permafrost data

Hosted by:

Carleton University

Nick Brown[1], Stephan Gruber[1,2]

1. NSERC PermafrostNet CRSNG, Carleton Univeristy, Ottawa, Canada
2. Department of Geography and Environmental Studies, Carleton University, Ottawa,

Background

PermafrostNet is a **multi-sectoral** research network comprised of researchers from **11 universities** and **more than 40 partnering organizations**.

The NSERC Permafrost Partnership Network for Canada (PermafrostNet) is a research network established in 2019 which aims to boost Canada's ability to monitor, predict and adapt to large-scale permafrost thaw.

PermafrostNet is funded by the Natural Sciences and Engineering Research Council (NSERC) Strategic Partnership Grants for Networks with in-kind and cash contributions from partners and participating institutions.

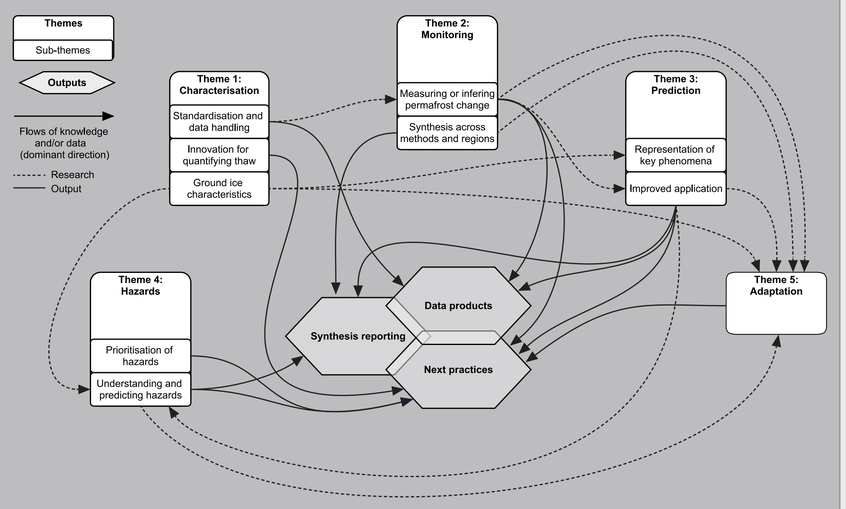

Figure 1: Schematic of research themes in PermafrostNet. Arrows show the predominant direction in which data or knowledge flow

Our partner organizations come from industry, Indigenous and Northern communities and government agencies both nationally and internationally.

Interoperability for permafrost data

PermafrostNet is connecting **researchers, practitioners and stakeholders** to determine the needs for permafrost data.

Several network partners have developed, or are developing, data systems for permafrost. However, these are not yet interoperable, and many use inconsistent controlled vocabularies for key variables (Figure 4).

In partnernship with CCADI and other partners, the network will adopt and adapt standards for permafrost data, and develop a shared set of tools for working with permafrost data.

In May 2020, PermafrostNet will host a data workshop to discuss standards and needs for permafrost data. PermafrostNet researchers will use these data sources to create pan-Canadian data products and predictions for permafrost change.

Variable		Database						
		NTGS	GTN-P	GSC	YGS	PERMOS	NorPerm	Carleton
Drilling type		●	●	●	○		●	
Data type			●					
Measurement Frequency			●				●	
Sampling method		●	●		○			
Sampling medium			●	●	○		●	
Quality Control			●					
Vegetation	Type	●	●		○		●	
	Height	●						
	Density	●						
Topography			●		○		●	
Accessibility			●			●	●	
Permafrost Zone			●			●	●	
Disturbance	Type	●	●		○		●	
Plasticity				●				
Ice	Description			●	○			
	Presence	●						
Project Purpose		●					●	
Calibration Status		●						
Drainage		●			○			●
Surface cover		●				●		
Surficial Geology	Material	●			○		●	
	Landform					●		●
Snow		●					●	●

● Strict controlled vocabulary ○: Suggested values but not restricted

Figure 4: A comparison of existing controlled vocabularies for data and metadata in permafrost databases provided by Canadian and International organizations conducting permafrost research.

Identifying priority data types

Data for many important variables are **not yet readily available** despite their importance for permafrost research.

We conducted a survey of six existing permafrost databases to identify which data and metadata types are currently available (Figure 2).

Each variable was given a measure of relative importance for permafrost research using simple bibliometric statistic: the number of search hits in Google Scholar for "permafrost" plus the variable name (Figure 3).

Certain variables, like ground temperature and some site-level metadata, are both widely available and highly relevant to permafrost research. More commonly, data for important variables are not yet readily available to the research community. These are priority data types that will be needed to support the next generation of Canadian permafrost research.

As part of developing 'next practices', the network will identify the variables that are missing altogether from the landscape of available permafrost data.

Observation	Class	GSC	YGS	NTGS
liquid limit	geotech	LIQ_LIMIT	LL	
moisture content	geotech	PR_OPT_MC		
salinity	geotech		SALINITY	
soil type	geotech	SOIL_TYPE, soil_type_2, USC, DESCRIPT	USC, SOIL_DESCR, CLASS	
solid core recovery	geotech		SOLID_CORE	
specific gravity	geotech	SPEC_GRAV	GS	
stratigraphic contact	geotech		BOUNDARY	
TCR	geotech		RECOVERY	
ALT / thaw depth	permafrost	ALT_PROBE, ALT_GROUNDTEMP	SURFACE_THAW	
measurement frequency	permafrost			MeasurementInterval
organic thickness	permafrost		ORGANIC_THICKNESS	OrganicLayer
unfrozen water content	permafrost		UNFROZEN_WATER	
vegetation density	permafrost		VEG_DENSITY	VegetationDensity
vegetation height	permafrost		VEG_HEIGHT	VegetationHeight
drainage	site		DRAINAGE	SurfaceDrainage
location	site	LAT, LON, ELEVATION	ELEVATION, UTMZONE, NORTHING, EASTING, LATITUDE, LONGITUDE	Latitude, Longitude, GeodeticDatum, SiteElevation
overburden thickness	site			OverburdenThickness
slope angle	site		SLOPE_ANGLE	SlopeAngle
slope aspect	site		SLOPE_ASPECT	SlopeAspect
surface cover	site			SurfaceCoverMaterial
topography	site		TOPOGRAPHY	LocalRelief

Figure 2: Comparing the variables present in existing databases. Only a subset of the entire table is shown.

PermafrostNet and CCADI will help ensure Canada remains a **leader in permafrost** research by leveraging **innnovative data management** capabilities.

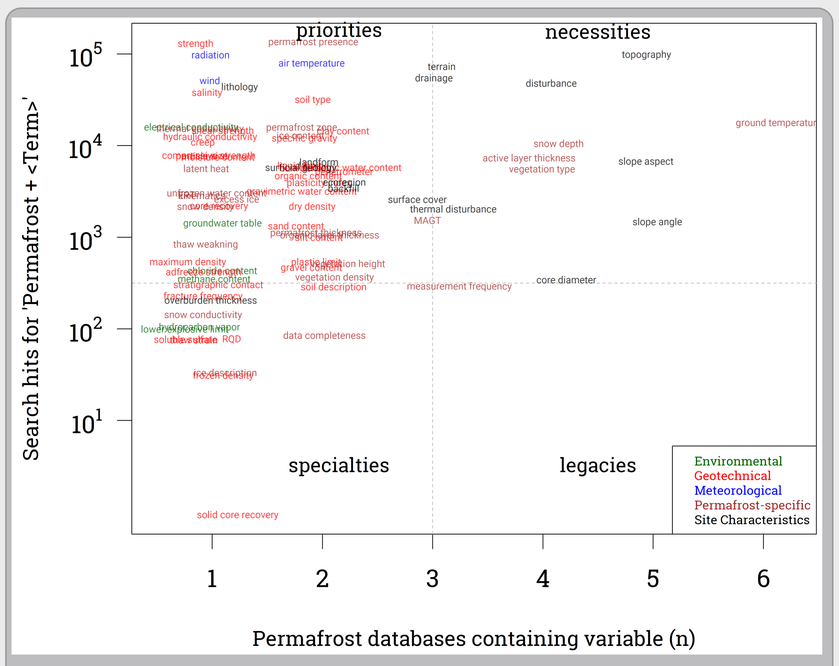

Figure 3: Identifying priority data types for interoperability efforts based on how common each one is, and how relevent it is to permafrost research. **Necessities** are widely available and relevant for permafrost - these will be useful to support early on to demonstrate the value of interoperability to stakeholders. **Priorities** are variables that are important but aren't yet available, these will also be important to support early but may require more effort to make interoperable. **Legacies** are variables that are widely available, but may be collected for historic reasons rather than targeted for permafrost research. Finally, **Specialties** are less common and may be only relevent to a small subset of research. These will be a lower priority for interoperability.

Network Partners

Aurora College & Aurora Research Institute
BGC Engineering Inc.
b.geos
BC Ministry of Forest, Lands, Natural Resource Operations and Rural Development
Canada Centre for Mapping and Earth Observation
Canada-Nunavut Geoscience Office
Canadian Permafrost Association
Canadian Consortium for Arctic Data Interoperability
Cooperative Institute for Research in Environmental Sciences
Churchill Northern Studies Centre
Crown-Indigenous Relations and Northern Affairs Canada
ECCC, Atmospheric Science and Technology Directorate
ECCC, Canadian Centre for Climate Services
Fort Severn First Nation
Federation of Canadian Municipalities
Geological Survey of Canada
Government of Nunavut, Climate Change Secretariat
Government of the Northwest Territories, Environment and Natural Resources
Gwich'in Renewable Resources Board
Inuvialuit Game Council
Lunds University
MDA Ltd
Ministère des Transports du Québec
National Research Council
National Snow and Ice Data Cente
Natural Resources Canada
Northwest Territories Department of Infrastructure
Northwest Territories Geological Survey
Nunataryuk: EU Horizon 2020
Ontario Ministry of Natural Resources and Forestry
Polar Knowledge Canada
SRK Consulting Inc.
Standards Council of Canada
Swiss Permafrost Monitoring Network PERMOS
Tr'ondëk Hwëch'in Government
Transport Canada
Yukon Government: Department of Environment
Yukon Government: Transportation Engineering Branch
Yukon Geological Survey
Yukon Parks and Tombstone National Park
Yukon College

PermafrostNet.ca
@PermafrostNet
PermafrostNet@carleton.ca

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