

Thoughts on Research Infrastructure Needs: Arctic Studies Stephan Gruber



photo: Noe Flum

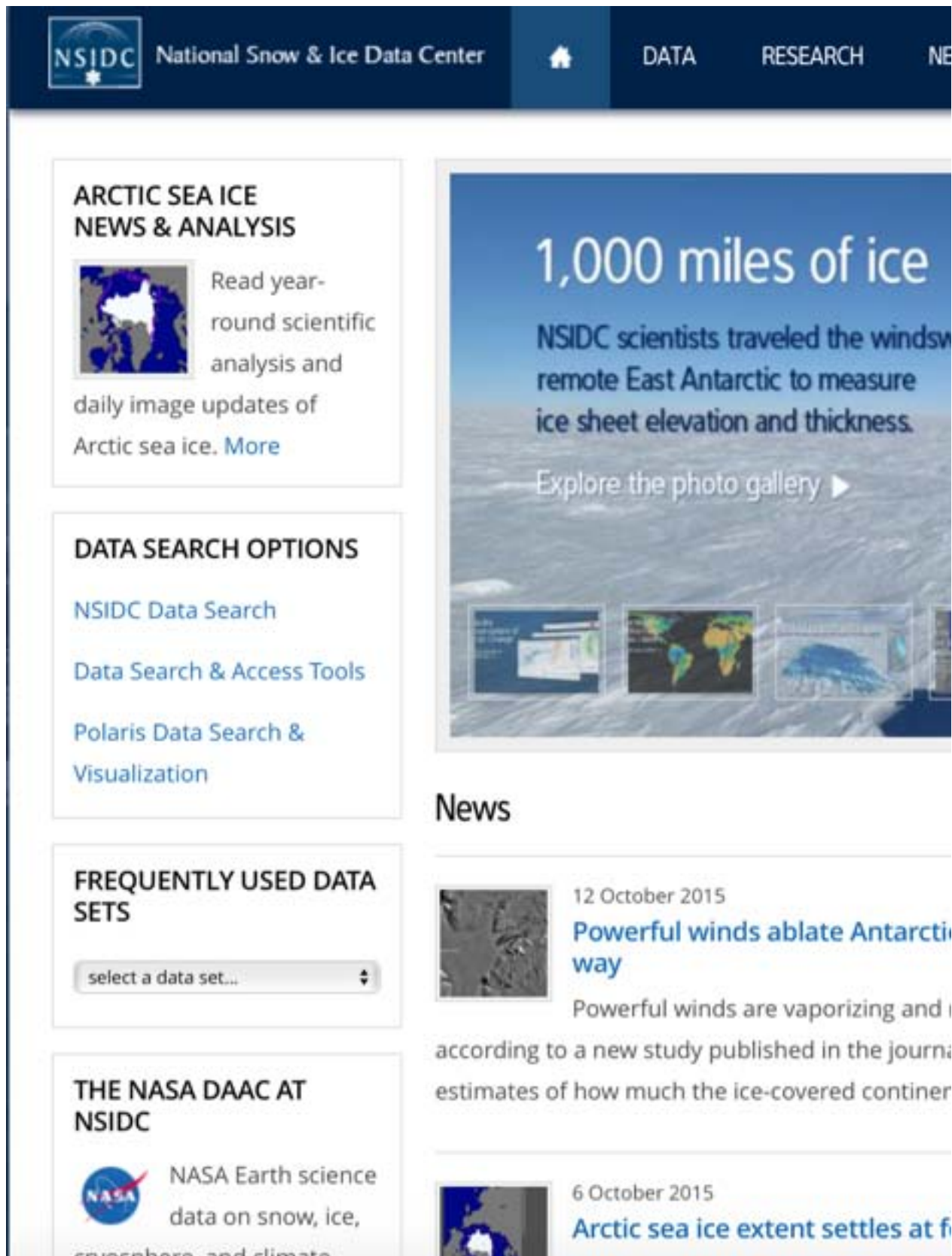
Arctic Centre, Rovaniemi, Finland



ITC, Enschede, the Netherlands



NSIDC



The screenshot shows the NSIDC (National Snow & Ice Data Center) website. The header includes the NSIDC logo and navigation links for DATA, RESEARCH, and NEWS. The main content area features several sections:

- ARCTIC SEA ICE NEWS & ANALYSIS:** Includes a small map of the Arctic and text about year-round scientific analysis and daily image updates of Arctic sea ice, with a "More" link.
- DATA SEARCH OPTIONS:** Lists links for "NSIDC Data Search", "Data Search & Access Tools", and "Polaris Data Search & Visualization".
- FREQUENTLY USED DATA SETS:** Features a dropdown menu labeled "select a data set..." with a downward arrow.
- THE NASA DAAC AT NSIDC:** Includes the NASA logo and text about NASA Earth science data on snow, ice, cryosphere, and climate.

A large central banner features the text "1,000 miles of ice" and describes NSIDC scientists traveling to the remote East Antarctic to measure ice sheet elevation and thickness, with a link to "Explore the photo gallery". Below this, a "News" section displays two articles:

- 12 October 2015:** "Powerful winds ablate Antarctic way" - Powerful winds are vaporizing and... according to a new study published in the journal... estimates of how much the ice-covered continent...
- 6 October 2015:** "Arctic sea ice extent settles at f..."

Munich Re



NatCatSERVICE

Downloadcenter for statistics on natural catastrophes

Comprising some 37,000 data records, NatCatSERVICE is the most comprehensive natural catastrophe loss database in the world. Approximately 1,000 events are recorded and analysed every year. The information collated can be used to document and perform risk and trend analyses on the extent and intensity of individual natural hazard events in various parts of the world. A selection of analyses can be accessed here. You can find annual statistics from 2004 onwards, informative maps, Focus Analyses and comprehensive basic knowledge in Touch Natural Hazards. Registration is free of charge.

Swiss Experiment and Permasense

Category:About

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Experiment Platform

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Search metadata and data by:

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About

Category:About

About SwissEx

A quote from ESA's 'The Changing Earth' elegantly describes the motivation behind SwissEx:

The latter half of the twentieth century saw full emergence of the concept that the behaviour of planet Earth can only be understood in terms of the coupling between the dynamic processes in the atmosphere, the solid Earth, the hydrosphere, the cryosphere, the biosphere and the anthroposphere. All of these components are interlinked by a network of forcing and feedback mechanisms that affect the other components. Global-scale effects can arise from regional processes, and global-scale behaviour can have widely different regional manifestations. In addition, processes acting at one time scale can have consequences across a wide range of other time scales. The Changing Earth, ESA, 2006

i.e. the driving motivation behind SwissEx is to provide a common, **cross-disciplinary platform where data and metadata from all disciplines at a variety of temporal and spatial resolutions are accessible**. New technologies allowing high spatial and temporal resolution measurements are also actively developed within the project such that small areas can be intensely monitored where the cost of such measurements has previously been prohibitive. SwissEx will demonstrate the use of this infrastructure to discover new processes and to exploit the combination of new, high spatial/temporal resolution sensor networks with the 'traditional' low resolution, widespread networks.

Introduction

The Swiss Experiment (SwissEx) is an initiative of the [Competence Centre Environment and Sustainability \(CCES\)](#). SwissEx has been created to provide a platform for large scale sensor network deployment and information retrieval and exploitation.

The original SwissEx proposal combined both examples of technology development whilst allowing the scientific section of the proposal to use these tools to receive and process the data and discover new processes through this cross-disciplinary work. This structure was split into two by CCES, to provide the SwissEx technology project (previously called SwissEx) and the the SwissEx science project, which were both funded. This wiki hosts both projects and is structured in a way that maintains their definition.


[The SwissEx Platform](#)



In the environmental science domain.




Data Science at Carleton University



DATA SCIENCE

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The Capital Advantage

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Research

Current Students

Program Details

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Data science is the next frontier of information technology. Carleton's new collaborative master's in this area is geared toward graduate students and high-tech professionals who are interested in understanding how to analyze and use 'big data' sets collected by governments, industry, NGOs etc.

Students will earn their degree in one of six academic disciplines at Carleton with a specialization in Data Science or a concentration in Business Analytics for the MBA. Participants will pursue a thesis, coursework-only or project option that is directly related to Data Science, as per their original degree. Business students are also required to complete an internship. Depending on availability, students in other fields may also gain real-world experience through internships.

Participating Master's Programs

- **Biology*** (thesis)
- **Biomedical Engineering*** (thesis)
- **Business** (concentration)
- **Computer Science*** (thesis)
- **Economics** (thesis or coursework)
- **Electrical and Computer Engineering*** (thesis, project or coursework)
- **Geography** (MSc thesis)

Sensor networks are nice, and at the same time...



...they produce more data than we know to handle.

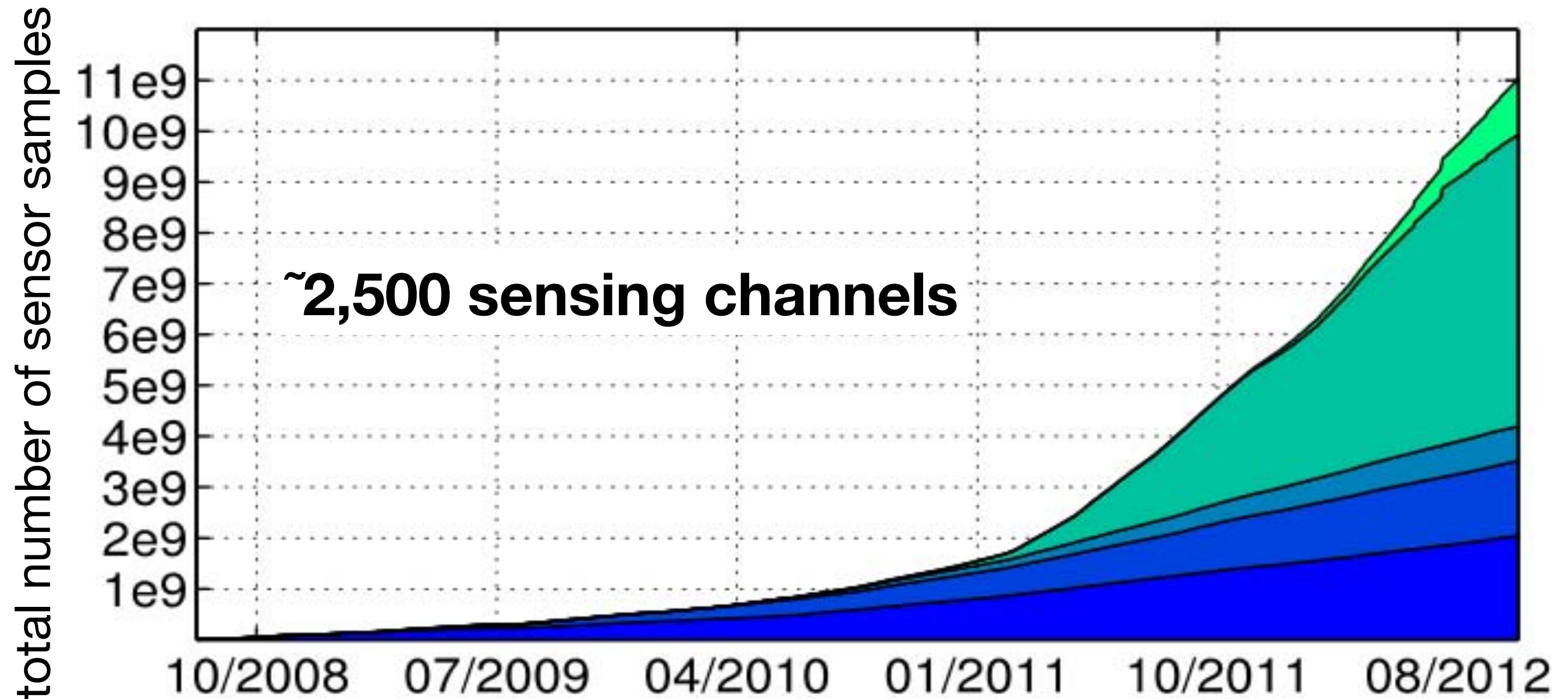
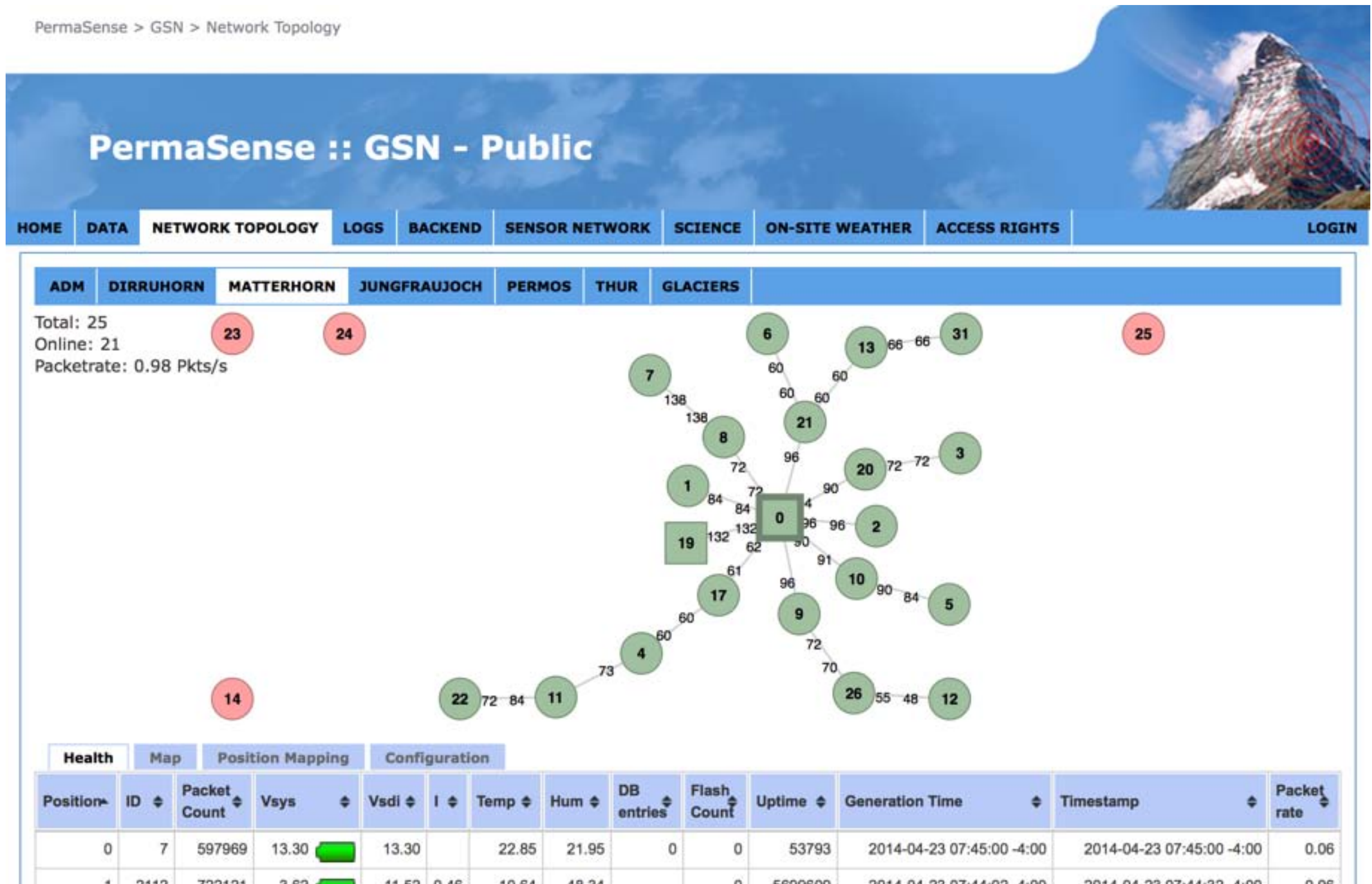


figure: J. Beutel

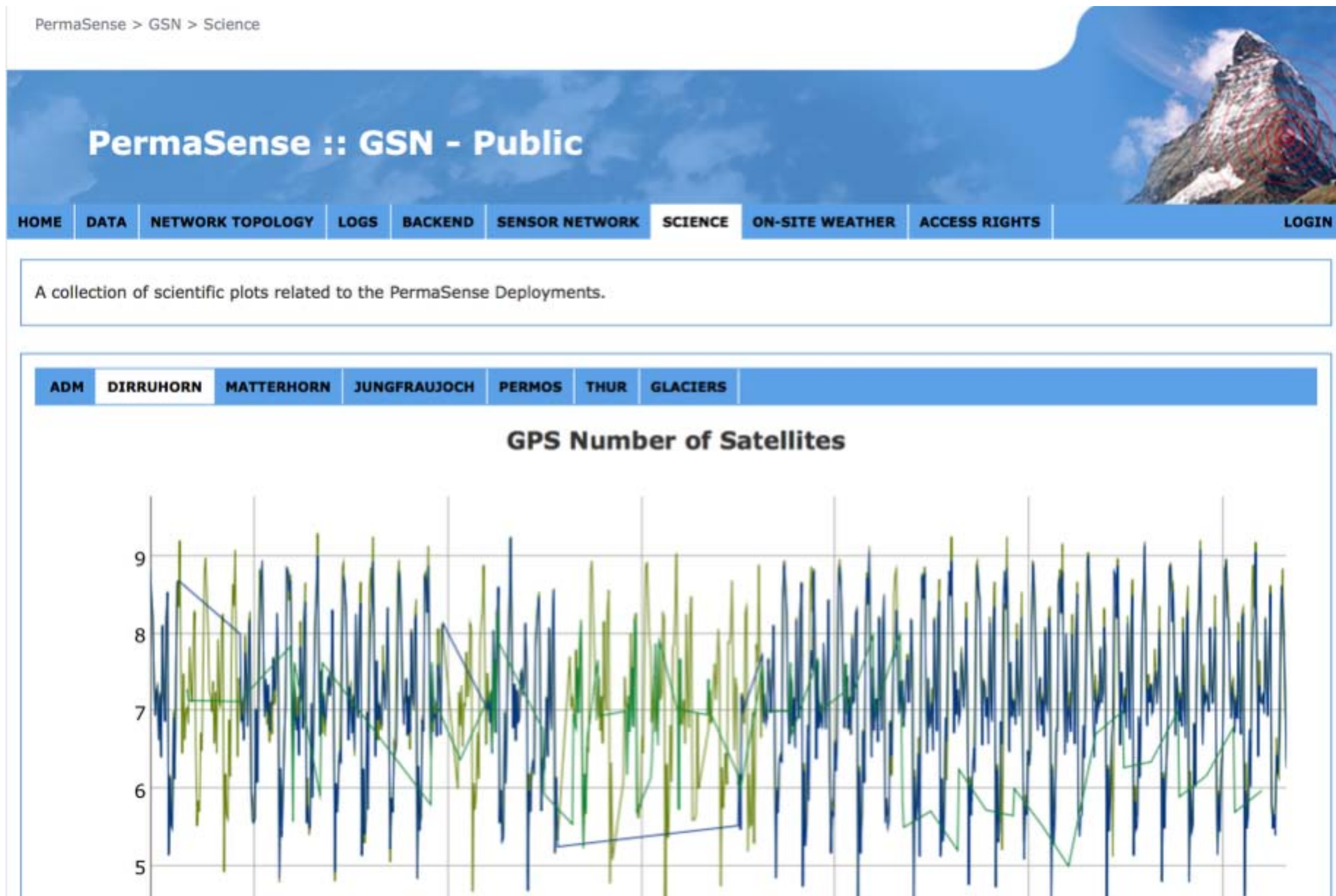
Data organization and access



Mapping locations of devices and sensors over time



Visual and interactive exploration



Efficient access for geo-scientists



```

78 #
79 # QUERY GSN (GENERIC FUNCTION)
80 #
81 #
82 # Generic Function to read data from a GSN table.
83 # GSN syntax: http://sourceforge.net/apps/trac/gsn/wiki/web-interfacev1-server
84 #
85 # INPUT
86 # - virtual_sensor (example: "dirruhorn_dozer_adccomdiff_mapped")
87 # - position (example: 1)
88 # - fields (default: "All", example: "position,device_id,generation_time")
89 # - server (default: "http://data.permasense.ch")
90 # - time_beg (default: "01/01/2010+12:00")
91 # - time_end (default: "01/01/2050+13:00")
92 # - aggregation [h] (default: 0, i.e. no aggregation)
93 #
94 # OUTPUT: data frame of results, generation_time (etc.) converted to POSIXct
95 # if exists
96 #
97 gsn.query<-function(virtual_sensor, position, fields="All",
98 server="http://data.permasense.ch", aggregation=0,
99 time_beg="01/01/2010+00:00:00", time_end="02/01/2050+00:00:00",
100 verbose=TRUE) {
101
102 #aggregation by time in hours
103 if (aggregation > 0) {
104 aggregation<-"&agg_function=avg&agg_unit=3600000&agg_period="&aggregation
105 } else {
106 aggregation<=""
107 }
108 #print(time_beg)
109 #print(time_end)
110
111 #make request-----
112 request<-server&"/multidata?"&
113 #table/virtual sensor
114 "&vs[0]="&virtual_sensor&
115 #fields
116 "&field[0]="&fields&
117 #aggregation
118 aggregation&
119 #select position
120 "&c_vs[0]="&virtual_sensor&"&c_field[0]=position"&
121 "&c_join[0]=and&c_min[0]="&position-1&"&c_max[0]="&position&
122 #restrict time
123 "&from="&time_beg&"&to="&time_end&"&":59"&
124 #sorting and format
125 "&timeline=generation_time&download_format=csv&time_format=unix"
126

```

- data and metadata
- common format and organization
- publicly available (reproducibility)
- query data base via http request
- simple interfaces in R, Matlab, etc.
- (gates to hell open, temporarily)

Pan-Alpine permafrost database

alpine permafrost data

Home About Evidence Map Rock Glaciers Map Contributors Contacts Login

Welcome

The **Alpine Permafrost Data (APD)** is an on-line service for collecting and sharing permafrost data in the European Alps. The main goal of the database is to provide periodic, consistent and homogenized datasets on permafrost state and evolution. This website is addressed to all researchers, technicians and permafrost lovers working in the Alps. **Registration, data submission and updating of permafrost evidence is encouraged as well as the active participation in open discussions and database development.**

Background

The APD is based on an alpine-wide standardized collection of permafrost evidence, realized in the framework of the Alpine Space PermaNET project between 2008 and 2011. The APD was used for the development of the **Alpine Permafrost Index Map**. 35 contributors from Austria, Germany, France, Italy and Switzerland provided valuable data sharing permafrost knowledge and monitoring data. The development of the APD was a collaborative effort of ARPA Valle d'Aosta (IT), University of Zurich and SLF-WSL (CH).

Open discussions **News**

permanet

Login

User Name

Password

Remember Me

Add a new permafrost evidence

See some examples:

- > Borehole
- > Ground Surface Temperature
- > Surface Movement

The Cryosphere
An interactive open-access journal of the European Geosciences Union

Volume 5, Issue 3
22 Aug 2011

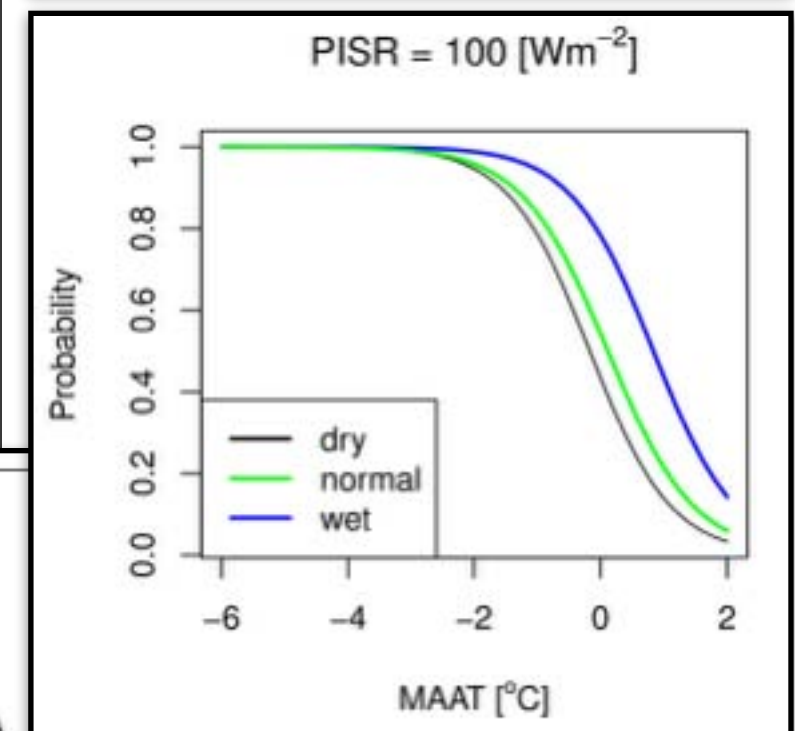
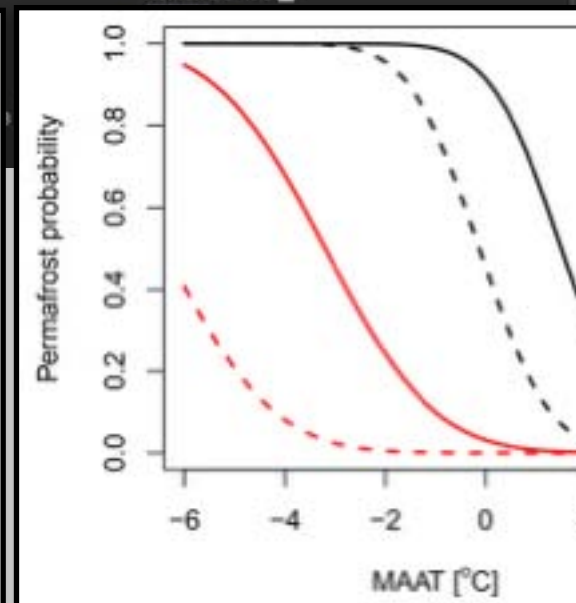
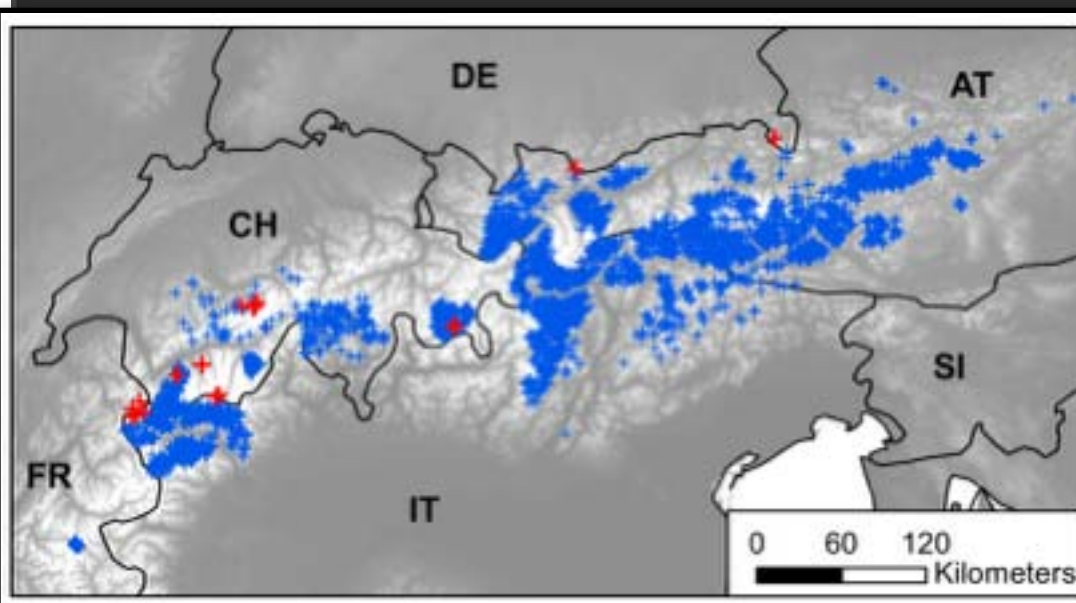
Brief communication

Brief Communication: "An Inventory of permafrost evidence for the European Alps"

E. Cremonese¹, S. Gruber², H. Phillips³, P. Fugliotti⁴, L. Boeckli⁵, J. Noetli⁶, C. Suter⁷, X. Budin⁸, A. Crepas⁹, A. Kallauer-Pirkibauer¹⁰, K. Lang¹¹, S. Letey¹², V. Hahn¹³, U. Herra di Cella¹⁴, L. Ravanel¹⁵, C. Scapozza¹⁶, B. Seppel¹⁷, and A. Ziehe¹⁸

¹Environmental Protection Agency of Aosta Valley, ARPA Valle d'Aosta, Saint Christophe, Italy
²Geoscience, Geomorphodynamics and Geochronology, Department of Geography, University of Zurich, Zurich, Switzerland
³WSL Institute for Snow and Avalanche Research SLF, Davos, Switzerland
⁴Laboratoire EDYTEM, CNRS, Université de Savoie, Le Bourget du Lac, France
⁵Nordis Avalanche Center, Environmental Protection Agency of Veneto, ARPA, Avio di Livinalonga, Italy
⁶Department of Geography and Regional Science, University of Graz, Graz, Austria
⁷Institute of Remote Sensing and Photogrammetry, Graz University of Technology, Graz, Austria
⁸Municipal Province of Bolzano, Geological Service, Bolzano, Italy
⁹Institute of Geography, University of Lausanne, Lausanne, Switzerland
¹⁰Earth Science Department, University of Pavia, Pavia, Italy
¹¹Albania Agnoscant 94, Bormio/Bolzano, Italy

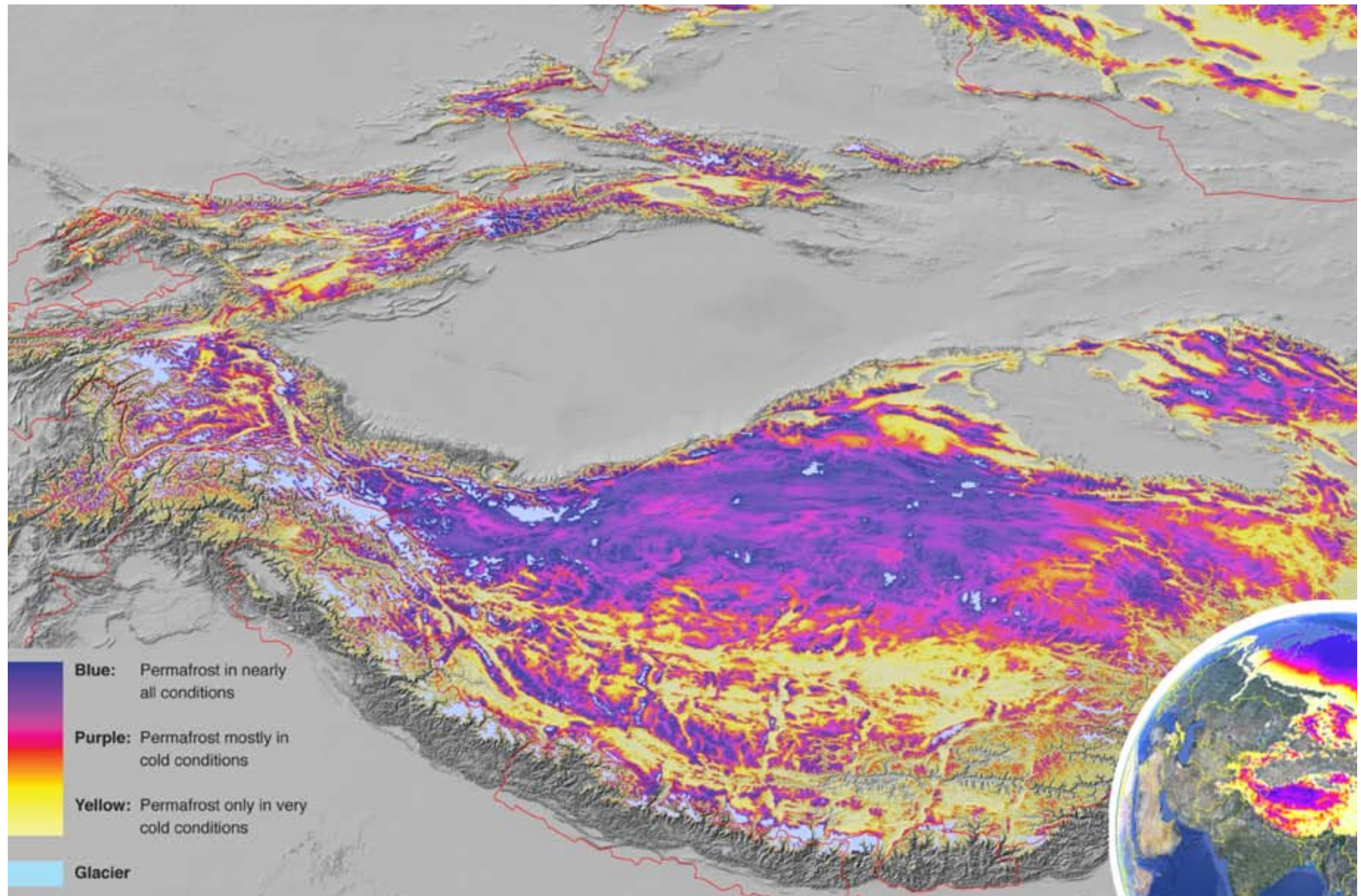
Received: 28 Mar 2011 – Published in The Cryosphere Discuss.: 18 Apr 2011
 Revised: 03 Aug 2011 – Accepted: 04 Aug 2011 – Published: 22 Aug 2011



Alpine map, 30m, WMS and Google Earth



Global map, 1km, WMS and Google Earth



Thesis project vs. monitoring

- Researchers makes measurements to learn specific things, usually on a time scale of 1–5 years.
- Monitoring (traditionally) is aimed at long-term baselines enabling recognition and warning of change
- Selected variables deemed worthy of long-term funding
- Complementary interests, agility, and roles of:
 - researchers
 - libraries
 - governmental & inter-governmental organizations
- As more data becomes available more easily, new modes of data sharing are possible and attractive

Inventorying of meta data

Polar Data Catalogue Geospatial Search

Home | Help Manual | PDCLite Low-bandwidth

Arctic Antarctic

PDC Search Results Metadata Data

Metadata search results

Hide A

Title	Start Date	Show/Hide
Landscape and Coastal Hazard Mappi...	2014-07-21	Show
All-sky Camera Imagery in Baffin Ba...	2014-07-15	Show
Atmospheric Profiling Radiometer; 2...	2014-07-15	Show
Cloud base height in Baffin Bay, the ...	2014-07-15	Show
Rawindsonde atmospheric profiles in ...	2014-07-15	Show
Ship-Based Eddy Covariance Data, 2...	2014-07-12	Show
Ship-Based Incoming Solar, Longway...	2014-07-12	Show
Ship-Based Meteorological Data, 201...	2014-07-12	Show
Production, biomass, abundance and...	2014-07-11	Show
Optical properties and carbon fluxes...	2014-07-08	Show
Development of Blood Screening Val...	2014-04-01	Show
Heavy Metal Contaminants in Caribo...	2014-04-01	Show
Temporal and Spatial Trends of Lega...	2014-04-01	Show
Understandings of the Risks and Ben...	2014-04-01	Show
Understanding Scientist and Decision...	2013-10-01	Show
Tlicho Aquatic Ecosystem Monitoring ...	2013-09-23	Show
Indicators of wellness in the Hamlet ...	2013-08-15	Show

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Displaying

Access to individual data sets

Nordicana D

The Nordicana D collection | Home | Contact us | Français

Available data | List of publications | Advanced search | Map | Term of use

Quick links

- List of publications
- Map of available data

Recent publications

May 20, 2015 Allard, M., Samazin, D., L'Hérault, E. 2015. Borehole and near-surface ground temperatures in northeastern Canada, v. 1.3 (1988-2014). Nordicana D8, doi: 10.5885/452918L-34F28A9491014AFD.

January 7, 2015 Gauthier, G. 2015. Lemming monitoring on Bylot Island, Nunavut, Canada, v. 1.0 (2004-2014). Nordicana D22, doi: 10.5885/45400AW-9891BD76704C4CE2.

December 4, 2014 ADAPT (Arctic Development and Adaptation to Permafrost in Transition) 2014. Carbon, nitrogen and water content of the active layer from sites

Nordicana D - Mission

Published by the CEN - Centre for Northern Studies since 1964, the results such as northern symposia, lexicons, monographs, essays, etc.

The CEN Network yields a wealth of data and the demands from external users for subsets of these data are increasing. Consequently, the CEN has decided to implement the collection Nordicana D.

Nordicana series D is a formatted, online data report series archive in electronic form and is freely and openly accessible to CEN researchers. Nordicana D has been conceived to aid the management of data, to facilitate the exchange and accessibility of relevant data for the different stakeholders and to ensure the lasting legacy of CEN monitoring and research activities.

Earth System Science Data
The Data Publishing Journal

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Chief editors: David Carlson & Hans Pfeiffenberger

Earth System Science Data (ESSD) is an international, interdisciplinary journal for the publication of articles on original research data (sets), furthering the high-quality data of benefit to Earth system sciences. The editors encourage submissions on original data or data collections which are of sufficient quality to have potential to contribute to these aims. The journal maintains a focus on regular-length articles, brief communications (e.g. on additions to data sets), commentaries, as well as review articles and special issues.

News

New library and payment concept for ESSD
From January 2016 onwards, ESSD will see changes to the way papers are archived and paid for. »

ESSD awarded DOAJ Seal
Earth System Science Data (ESSD) has received the new DOAJ Seal which recognizes journals with an exceptionally high level of publishing standards and best practice. »

Journal metrics

IF Indexed
SNIP 2,459

PANGAEA®
Data Publisher for Earth & Environmental Science

About / Imprint

The information system PANGAEA is operated as an Open Access library aimed at archiving, publishing and distributing research. The system guarantees long-term availability of its content through a commitment of the operating institution.

Most of the data are freely available and can be used under the terms of the license mentioned on the data set description. The description of each data set is always visible and includes the principal data collection. Citations are available through the portal of the German National Library of Science and Technology.

Each dataset can be identified, shared, published and cited by using a Digital Object Identifier (DOI). Data are archived in the PANGAEA data library. Archiving follows the Recommendations of the Commission on Professional Self Regulation in Science (pdf, 200 kB).

The system is operated in the sense of the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities.

PANGAEA is a member of the ICSU World Data System. The policy of data management and archiving follows the OECD Principles and Guidelines for Access to Research Data from Public Funding.

Authors submitting data to the Pangaea data library for archiving agree that all data are provided under a creative commons license.

PANGAEA is open to any project or individual scientist to archive and publish data. Start a data submission here.

The system is hosted by

- Alfred Wegener Institute, Helmholtz Center for Polar and Marine Research (AWI), 27515 Bremerhaven, Germany
- Center for Marine Environmental Sciences (MARUM), University of Bremen, 28359 Bremen, Germany

supported with funding by

- The European Commission, Research
- Federal Ministry of Education and Research (BMBF)
- Deutsche Forschungsgemeinschaft (DFG)
- International Ocean Discovery Program (IODP)

Access to individual data sets

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Volume 6, Issue 5

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IF 5.516

The Cryosphere, 6, 1127–1139, 2012

www.the-cryosphere.net/6/1127/2012/

doi:10.5194/tc-6-1127-2012

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Research article

15 Oct 2012

Inferring snowpack ripening and melt-out from distributed measurements of near-surface ground temperatures

M.-O. Schmid, S. Gubler, J. Fiddes, and S. Gruber

Department of Geography, University of Zürich, Switzerland

Received: 13 Jan 2012 – Published in The Cryosphere Discuss.: 10 Feb 2012

Revised: 25 Aug 2012 – Accepted: 10 Sep 2012 – Published: 15 Oct 2012

Abstract. Seasonal snow cover and its melt regime are heterogeneous both in time and space. Describing and modelling this variability is important because it affects diverse phenomena such as runoff, ground temperatures or slope movements. This study presents the derivation of melting characteristics based on spatial clusters of ground surface temperature (GST) measurements. Results are based on data from Switzerland where ground surface temperatures were measured with miniature loggers (iButtons) at 40 locations referred to as footprints. At each footprint, up to ten iButtons have been distributed randomly over an area of 10 m × 10 m, placed a few cm below the ground surface. Footprints span elevations of 2100–3300 m a.s.l. and slope angles of 0–55°, as well as diverse slope expositions and types of surface cover and ground material. Based on two years of temperature data, the basal ripening date and the melt-out date are determined for each iButton, aggregated to the footprint level and further analysed. The melt-out date could be derived for nearly all iButtons; the ripening date could be extracted for only approximately half of them because its detection based on GST requires ground freezing below the snowpack. The variability within a footprint is often c

points in one footprint is not uncommon and melt-out date is moderate, suggest

Citation: Schmid, M.-O., Gubler, S., Fiddes, J., and Gruber, S.: Inferring snowpack ripening and melt-out from distributed measurements of near-surface ground temperatures, *The Cryosphere*, 6, 1127–1139, 2012.

Final revised paper

PDF XML

Supplement (1854 KB)

Citation

BibTeX

EndNote

Discussion paper

Published on 10 Feb 2012

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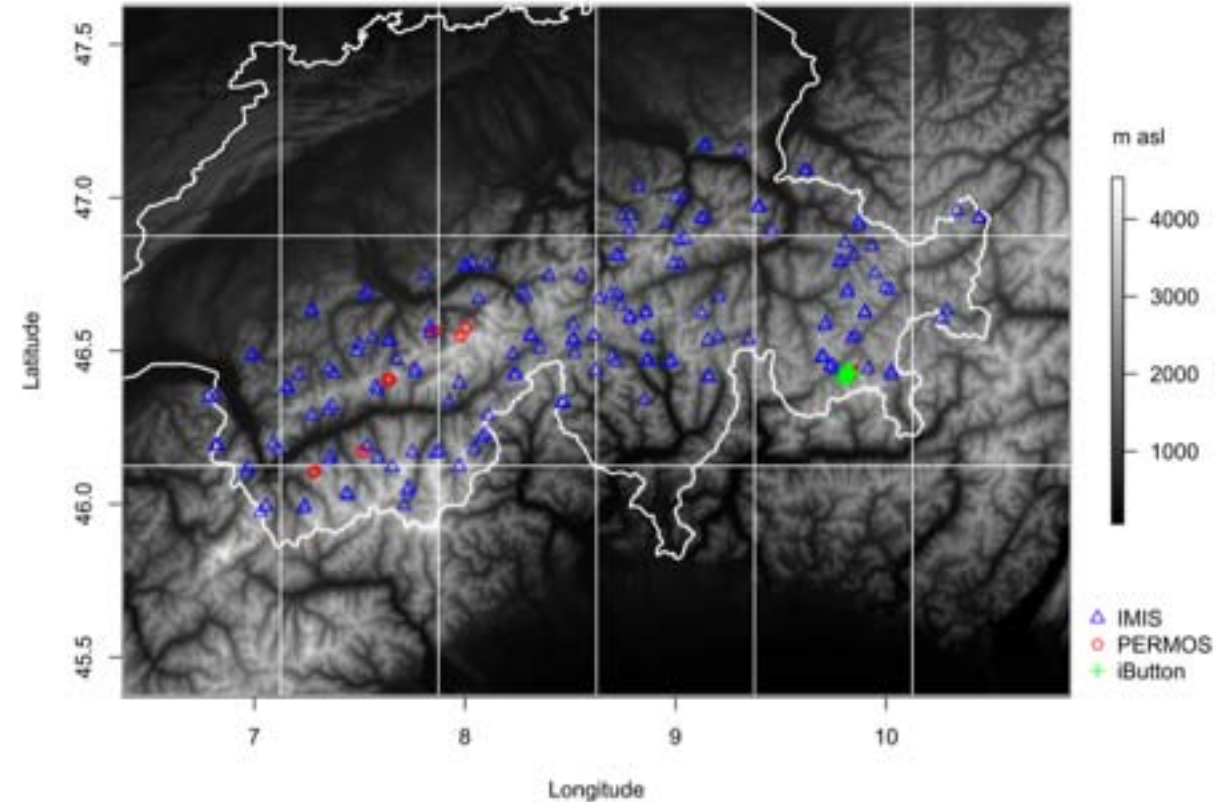
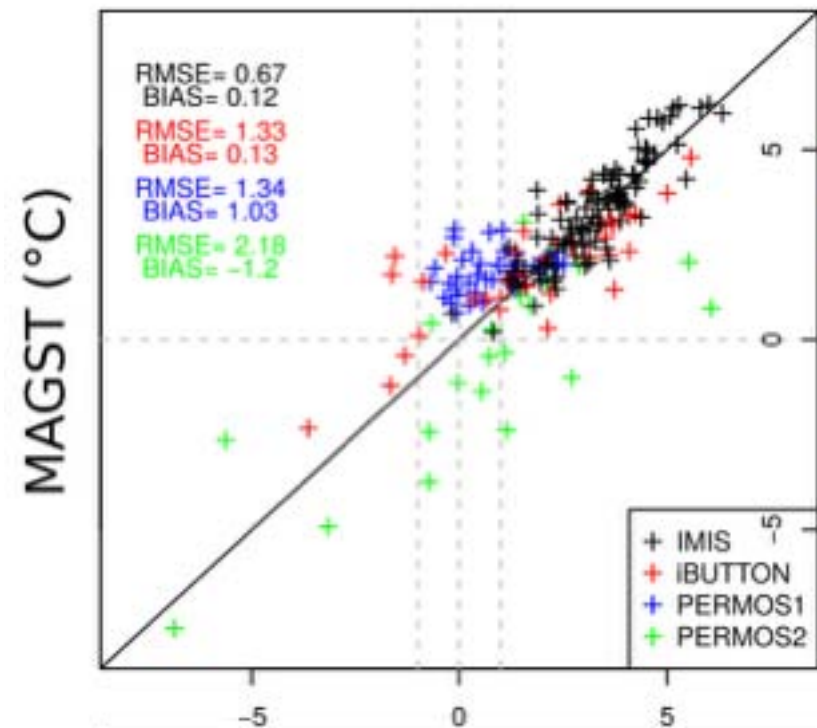
Favorites

- stgruber
- Publications
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- iCloud Drive

Name

- Supplements
 - iButton_function.R
 - data.2010.csv
 - data.2011.csv

Coherent large data sets are valuable



- Efficiency (not possibility) of access is relevant
- Suitable for testing simulation (credibility & cherrypicking)
- Maximize value of data collected
- Motivation: input efficiency, added value, legal framework

Help researchers to work with information

Provide infrastructure (tested and future proof):

- Working disks, backup, archiving (whole lifecycle)
- Technology to interact with data
- Revision control (Git, SVN,...)
- Document & citation management (Mendeley, Zotero...)
- Documentation of methods (wiki...)
- Virtual machine and historic software archive
- Reproducible research repositories

Provide training:

- Generating relevant and small data
- Using technology
- Strategy for research campaign (data management, publishing, making products available)

Reproducible Research

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Raking Echoes in the Time Domain

Robin Scheibler & Ivan Dokmanic & Martin Vetterli

Proceedings of IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)

The geometry of room acoustics is such that the reverberant signal can be seen as the same waveform emitted from multiple locations. In analogy with the rake receiver from wireless communications, we propose several beamforming strategies that exploit, rather than suppress, this additional spatio-temporal diversity. Unlike earlier work in the frequency domain, time domain designs allow to shape the impulse response of the beamformer. In particular, we can control perceptually relevant parameters, such as the amount of early echoes or the length of the beamformer response. Relying on the knowledge of the image sources position, we derive different optimal beamformers. Leveraging perceptual cues, we show how to improve interference and noise reduction without degrading the perceptual quality. The designs are validated through simulation. Using early echoes is shown to strictly improve the signal to interference and noise ratio. Code and speech samples are available online at http://lcap.epfl.ch/Robin_Scheibler.

Supplementary Materials

Time Domain Acoustic Rake Receiver

This repository contains all the code to reproduce the results of the paper *Raking Echoes in the Time Domain*. Using the simple python room acoustics framework created for the *Acoustic Rake Receiver*, we demonstrate two time domain beamformer designs that use echoes constructively to improve the signal to interference and noise ratio. These designs are explained in details in the paper *Raking Echoes in the Time Domain*. All the figures of the paper can be recreated by calling simple scripts leveraging this framework. In addition to the results of the paper, we include spectrograms and samples of speech samples. We strongly hope that this code will be useful beyond the scope of this paper and plan to develop it into a standalone python package in the future.

We are available for any question or request relating to either the code or the theory behind it. Just ask!

2015

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Code

Rate the code

Easy to reproduce figs
★★★★★

Well-commented code
★★★★★

Download Data

Cite this paper

Bug in code?

Google Scholar Follow

martin vetterli
Professor of computer and communication science, Ecole Polytechnique Federale Lausanne
signal processing, communications, information theory
Verified email at epfl.ch - Homepage

Citation Indices

	All	Since 2010
Citations	51491	19777
h-index	95	62
i10-index	352	224

Co-authors View all...
Minh N. Do, Jelena Kovacevic, Pier Luigi Dragotti

Title	1-20	Cited by	Year
Wavelets and Subband Coding M Vetterli, J Kovacevic Prentice Hall, Englewood Cliffs, NJ	4077	1995	
The contourlet transform: an efficient directional multiresolution image representation MN Do, M Vetterli Image Processing, IEEE Transactions on 14 (12), 2091-2106	3507	2005	

Recreate the figures and sound samples

In a UNIX terminal, run the following script.

```
./make_all_figures.sh
```

Alternatively, type in the following commands in an ipython shell.

```
run figure_beampatterns.py
run figure_SINR_sim.py
run figure_SINR_plot.py
```

The figures and sound samples generated are collected in `figures` and `output_samples`, respectively.

The SINR simulation can be very long. For that reason, we split the simulation loop and the plotting routine into two files. We recommend to first modify the value of the `loops` variable in `figure_SINR_sim.py` to 10 and time the simulation to have an estimate of the total time required to run the simulation. The output of the simulation is saved in `data/SINR_data.npy`. The data can be plotted using `figure_SINR_plot.py`.

Simulation Data

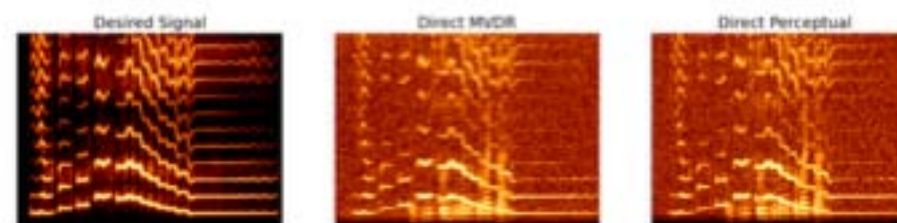
The simulation data from the paper is available in `data/SINR_data_1g30ms_d20ms_20141008.npy` and can be processed with `figure_SINR_plot.py`.

Sound Samples and Spectrograms

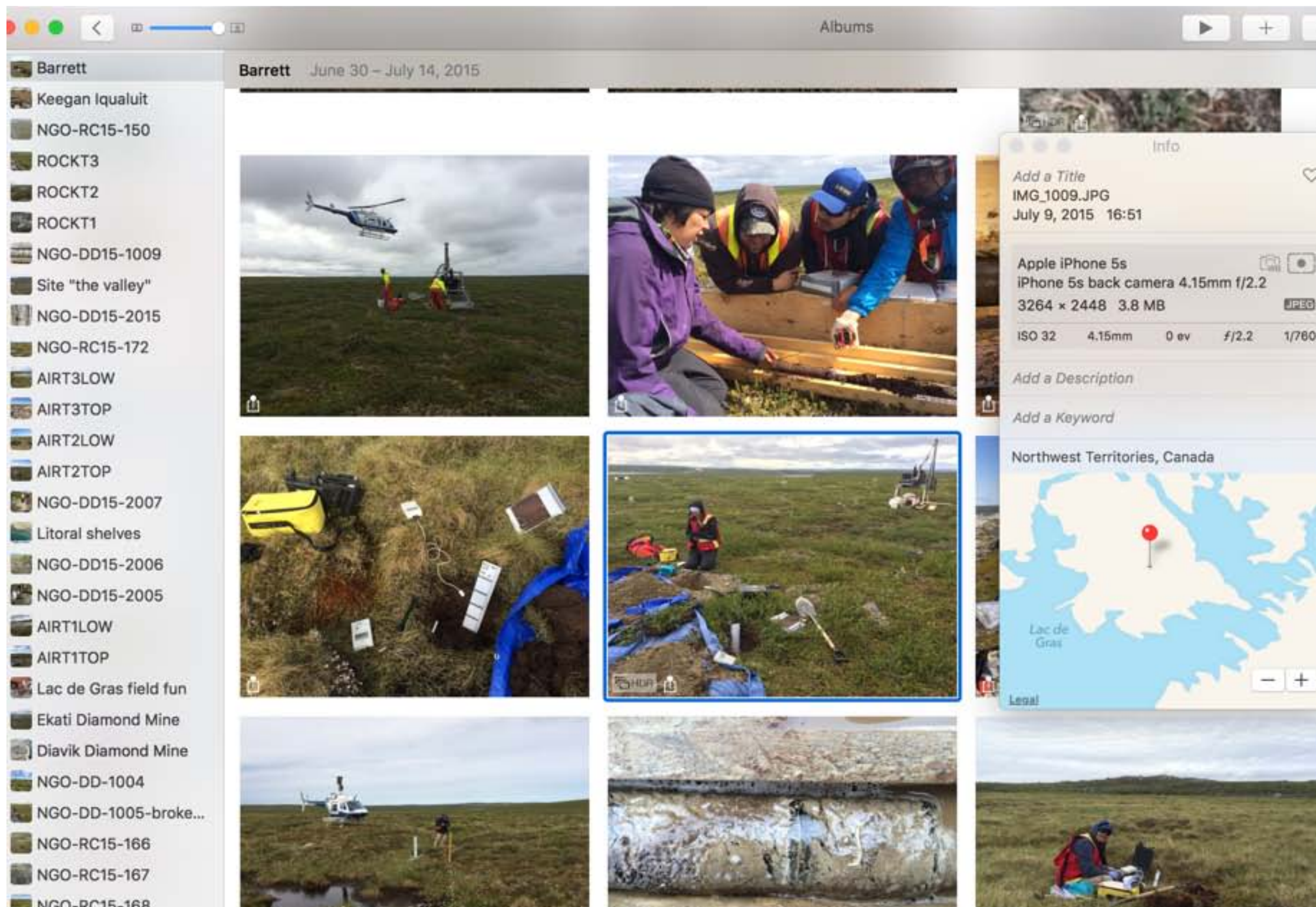
While it was omitted in the paper for space reasons, we provide here simulation results for speech samples.

- `sample1` Simulated microphone input signal.
- `sample2` Output of MVDR using the direct sound only.
- `sample3` Output of Rake MVDR using the direct sound and 1st order echoes.
- `sample4` Output of Perceptual beamformer using the direct sound only.
- `sample5` Output of Rake Perceptual using the direct sound and 1st order echoes.

The spectrogram of all samples as well as the desired sound are provided.



Handling field photographs



Technology to interact with data



Thank you

