Collecting and sharing permafrost data: current initiatives in Europe and perspectives at global level

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Workshop
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Collecting and sharing data
PF Databases in Europe
Alpine Permafrost Database (APD)
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Conclusions

Background
Motivations

1. Collecting and sharing data

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Collecting and Share data...
a common custom in many scientific communities

WGMS - World Glaciers Monitoring Service

GLIMS - Global Land Ice Measurements from Space

PHENOCAM - Network of WebCams for canopy phenology

FLUXNET - Worldwide eddy-covariance flux measurements

...

Services/Activities:
- Data accessibility and traceability (Digital Object Identifier)
- Coordination and promotion of synthesis reports or advanced analysis
- Data processing services or web-tools
- ...through web sites

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Why collecting and sharing data?

Just 1 reason...

CREATE <u>BIG DATASETS</u> FOR ANALYSIS!

Benefits:

- Address hypothesis that could not be addressed with data from single or few sites
- Provide a consistent database for synthesis and modeling
- Facilitate spatial and temporal analysis
- Facilitate intercomparisons among sites
- ...
- Back-up and security of data
- Long-term accessibility of data
- Traceability of data
- ...
- Connect researchers
- ...

2. PF Databases in Europe

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Arctic and Antarctica
European Alps

Exchange between PF research communities in EU

Arctic, Antarctic and Alpine

- Scarce interactions between these communities (conferences)
- ...often also inside the single community (trans-national projects)
- Studies (datasets) have mainly local or regional focus

Researchers are facing similar
scientific, technical and operational challenges.

Sharing and centralization of Data usually help to
increase collaborations and reduce duplication of efforts

COST Action EUPERM failed in 2013

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Initiatives in the (EU) ARCTIC community
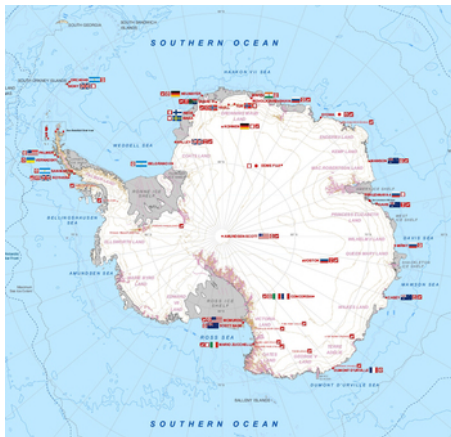

Geographical foci of Nordregio

Norway

NORPERM database (since 2009):
- National database on permafrost
- Funded by the Research Council of Norway
- Borehole and GST data

All EU nordic countries

Project Perma-Nordnet (2011-2014):
- Nordic permafrost collaboration network
- Funded by NordForsk, Nordic Council of Ministers
- NORPERM database expanded

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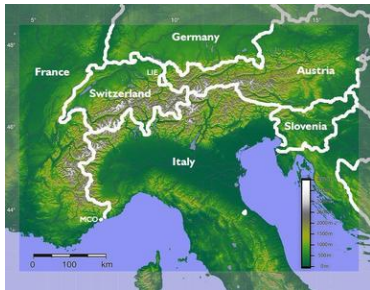# Initiatives in the (EU) ANTARCTIC community

ANTPAS

- IPA working group (2005)
- Objectives: to develop an internationally coordinated, **web-accessible, database and monitoring system** on Antarctic permafrost
- Borehole and soil data - ...still under construction...

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Arctic and Antarctica
European Alps

Initiatives in the (EU) ALPINE community

Switzerland

PERMOS (2000):
- National permafrost observation network
- Funded by Federal Office of Environment
- Borehole, GST, ice-content, creep velocity
- Central Database under Construction

All EU alpine countries

Project PermaNET (2008-2011):
- Alpine PF Long-Term Monitoring Network
- European Regional Development Funds
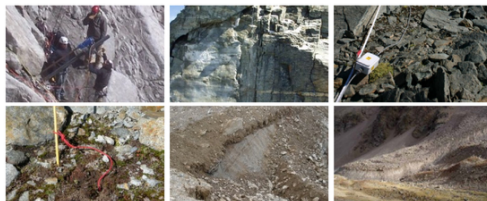- Inventory of PF evidences
- APD website (2013)

3. Alpine Permafrost Database

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Alpine Space Project PermaNET (2008-2011)

- Main objectives: monitoring network, **PF maps whole Alps**, ...
- Data needs for map modeling!
- **Standardized collection of <u>PF Evidence</u> at alpine scale**

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What's a Permafrost Evidence?

A permafrost evidence is a direct or indirect
proof of permafrost <u>presence or absence</u>
in a specific location obtained by field measures and observations.

Collection designed by SLF (Marcia) and UZH (Stephan)
then managed by ARPA VdA (Edo & Paolo)

www.alpine-permafrostdata.eu

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APD contains the following types of data

- borehole temperature (BH)

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- ground surface temperature (GST)

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APD contains the following types of data

photo by: Lucio Trucco

- borehole temperature (BH)
- ground surface temperature (GST)
- rock fall scars (SC)

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APD contains the following types of data

- borehole temperature (BH)
- ground surface temperature (GST)
- rock fall scars (SC)
- trenches or construction sites (TR)

photo by U. Morra di Cella

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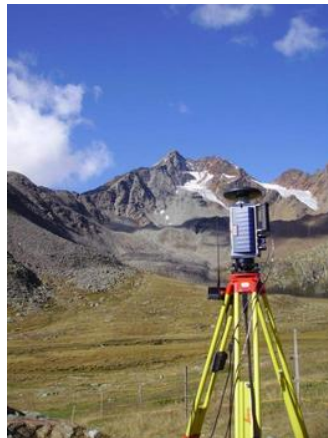Database administration
Current and upcoming challenges

APD contains the following types of data

- borehole temperature (BH)
- ground surface temperature (GST)
- rock fall scars (SC)
- trench or construction sites (TR)
- surface movement (SM)

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- ground surface temperature (GST)
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- trench or construction sites (TR)
- surface movement (SM)
- geophysical prospecting (GP)

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- trench or construction sites (TR)
- surface movement (SM)
- geophysical prospecting (GP)
- rock glaciers (RG)

RG inventories are supplied as a collection of polygons. Individual RG are classified as intact (i.e. active or inactive landform with permafrost) or relict (i.e. without permafrost)

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Design principles of the database

1. the database has to be **simple** in structure

2. a **small number of metadata** must be requested in order to allow a **fast and user-friendly** data insertion

3. both **instantaneous observations** (e.g. SC, TR, ...) and **monitoring data** (i.e. BH, GST, SM) must be included

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Basic metadata

1. evidence type
2. country
3. evidence ID
4. site name
5. responsible (PI)
6. lat/lon
7. elevation/aspect/slope (c)
8. vegetation/surface type/terrain (c)
9. **permafrost occurence** (y/n)
10. **permafrost certainty** (c,h,m,l)
11. **presence of ice** (y,n)

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Boreholes and GST monitoring data

- BH (GST) depth
- min-mean-max annual ground temperature (MAGT) at each depth
- yearly max Active Layer Depth (ALT) and date

Choose the year to plot:

2013 ▾

Temperature Data

BoreHole Temperature 2013

■ Tmin
■ Tmean
■ Tmax

Active Layer Data

Year	ALT (m)	Date
2008	3.94	2008-09-25
2009	4.93	2009-10-20
2010	3.86	2010-10-08
2011	5.13	2011-10-23
2012	5.42	2012-10-04
2013	4.6	2013-10-13

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Surface Movements monitoring data

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current dataset

APD consists now of more than 400 point evidence and 7 regional rock glacier inventories (4795 rock glaciers)

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The Wall of Contributors

Many researchers, institutes, national and regional monitoring programmes from Alpine countries contribute to the APD with observations and monitoring data.

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Data access and data policy

- APD data provider can choose between 2 data policy

  1. free
  2. inform when download occurs

- download is allowed only to registered users

- who download the dataset (data user) must provides the intended use and publication plans

- data provider willing to be included as authors in publication, need to contact data user and is assumed that an agreement on such matter will be reached.

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Database administration tasks

1. users's registrations

2. check of uploaded data and publication

3. periodic "call for data" (yearly)

4. website maintenance

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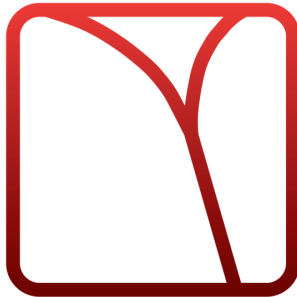Database administration
Current and upcoming challenges

Current and upcoming challenges

- keep people motivated and engage others

- publish the first version of APD-datasets (BH,GST,SM,RG,...)

- homogenize data and permafrost presence assessment criteria

- webtool for standardized data processing

- data policy

- promote data use/analysis (e.g. meta-analysis, model validations, rock glacier, ...)

- alpine permafrost state report

4. PF DB: perspective at Global Level

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GTN-P database

Globally the long-term survey of permafrost
is organized within the Global Terrestrial Network for Permafrost
GTN-P

Building of **GTN-P database**: repeated attempts since late 90's

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GTN-P database

* EU-FP7 Project (2011-2015, €9.3MM, 11 countries)
* Vulnerability of Arctic PF to CC and implications for GHG emissions
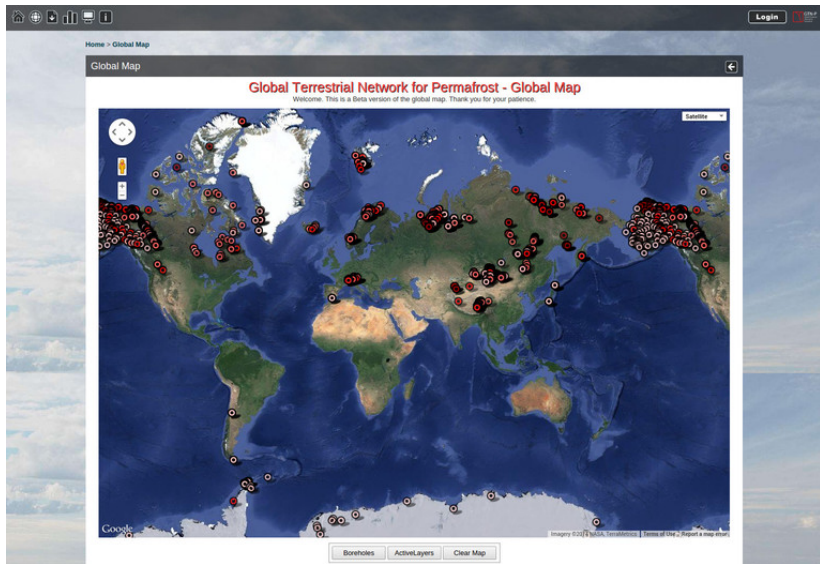
WP8 - Data mining, data management and data dissemination

Money and Human Resources for building the GTN-P database!!

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GTN-P database

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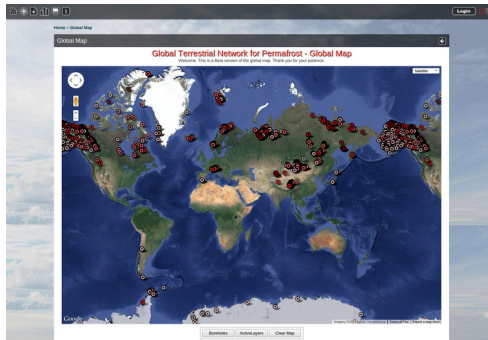Conclusions

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GTN-P database

- Contents: borehole, ALT & CALM
- Hosted by Arctic Portal (long-term hosting ensured)
- Very cool and powerful platform (expert IT guys)
- First official "call for data" was in June 2014 (EUCOP)

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GTN-P database

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GTN-P database

- The largest part of borehole/calm **metadata** are already collected
- A **careful check** of existing (meta)data is needed (completeness, positioning, duplicates...)
- The collection of **numerical data** is still difficult (role of NCP, selection criteria,...)
- ...a **dataset for analysis** still not available

5. Conclusions

Conclusions

- Create big homogeneous dataset is fundamental for improving analysis and addressing new hypothesis
- Data collection must not be restricted to temperature data only (APD and PERMOS are good examples)
- A number of PF research groups are centralizing their data
- The GTN-P database is powerful (although limited to BH and ALT) and must be exploited
- The real "take-off" of GTN-P database depends only by the **Awareness and Determination of the PF community**
- ...this will not be easy

Collecting and sharing data is difficult

Long-term maintenance of a DB (fundings,human resources,time)

...due to people:

- Willingness of data provider to share data publicly
- Agreement on Data Policy
- Response time to a "call-for-data"
- Carefulness in providing data
- ...
- Mobility of researchers
- Research funds
- ...

...due to data:

- Inhomogeneity of data collection and processing
- Reliability of data
- Verification criteria
- Correction criteria
- ...

...perspectives

- **Crossing PF data** with data from other disciplines (hydrology, instabilities, snow, meteo, ...)
- **Improve collaborations** with neighbor experts (hydro., geo., eng., bio., ...)
  - **Address further data collection** on well defined and specific problems/processes
  - maybe **define standard experiments** which can be replicated in differing mountain ranges
    - ...

...we are working in this direction

Thanks for your attention.