

climate change initiative

→ PERMAFROST

ESA CCI+ Permafrost - Validation Using International and National Permafrost Monitoring Networks

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permafrost
cci

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Permafrost_cci validation



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CCI project rule: independent validation
by use of

GCOS GTN-P & PERMOS (CH)

+ national & thematic monitoring network

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managed by the International
Permafrost Association (IPA)

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PERMOS Partners



The measurements, site maintenance, and data processing for the permafrost monitoring network are carried out by six partner institutes (in alphabetical order):

- Institute for Geotechnical Engineering, ETH Zurich (IGT-ETH)
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- Department of Geosciences, Geography Institute, University of Fribourg (IGUF)
Contact: [Prof. Dr. Reynald Delaloye](#), [Prof. Dr. Christian Hauck](#), [Prof. Dr. Martin Hölzle](#), [Dr. Céclie Pellet](#)
- Institute of Earth Surface Dynamics, University of Lausanne (IDYST)
Contact: [Dr. Christophe Lambiel](#)
- Institute of Earth Sciences, University of Applied Sciences and Arts of Southern Switzerland (SUPSI)
Contact: [Dr. Cristian Scapozza](#)
- Department of Geography, University of Zurich (GIUZ)
Contact: [Prof. Dr. Andreas Viel](#), [Dr. Isabelle Gärtner-Roer](#), [Dr. Tobias Bolch](#)
- WSL Institute for Snow and Avalanche Research Davos (SLF)
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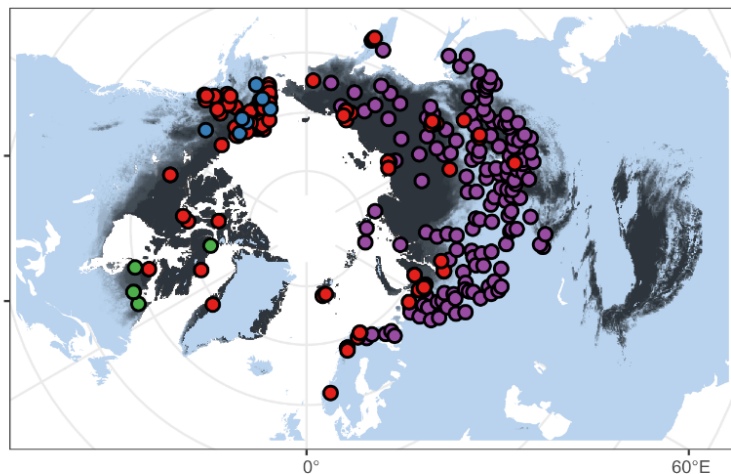
Permafrost_cci validation data



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- Mean Annual Ground Temperature MAGT per Depth (GTD)
- annual Permafrost FRaction PFR derived from GTD
- annual Active Layer Thickness (ALT)



Source of sites for GT Match-up

- GTN-P & USGS
- NASA ABoVe
- Nordicana-D
- RHM

in situ MAGT:

at depths [m] : 0, 0.25, 0.5, 0.75, 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 10, 20

Permafrost_cci MAGT:

- raster product
- at depths [m]: 0, 1, 2, 5, 10
- interpolated



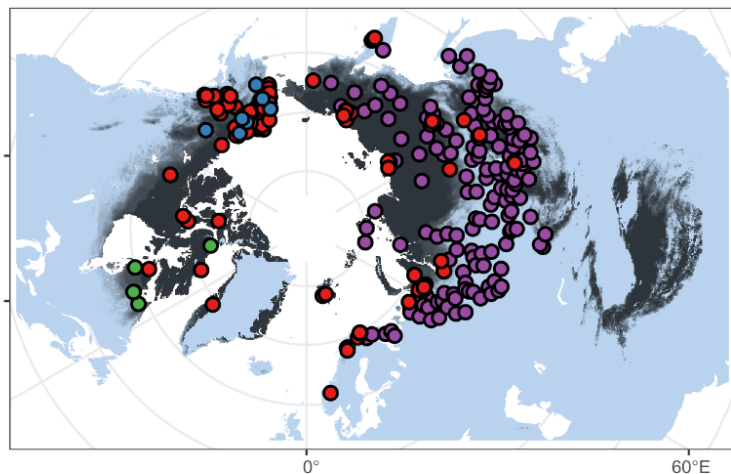
Permafrost_cci validation data



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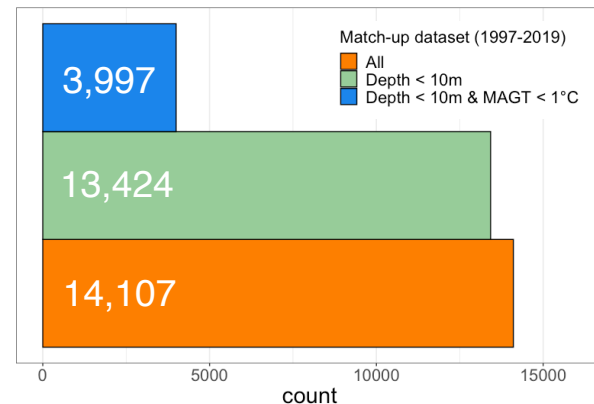
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Corrected MAGT Match-up dataset:
Artefacts, inaccurate coordinates, landscape anomalies



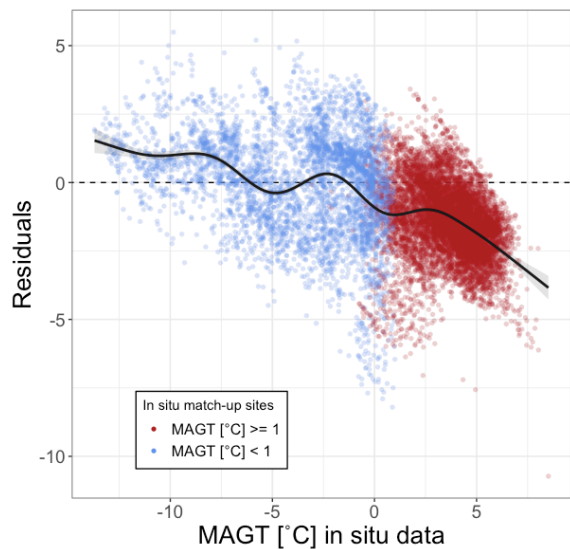
Permafrost_cci validation results



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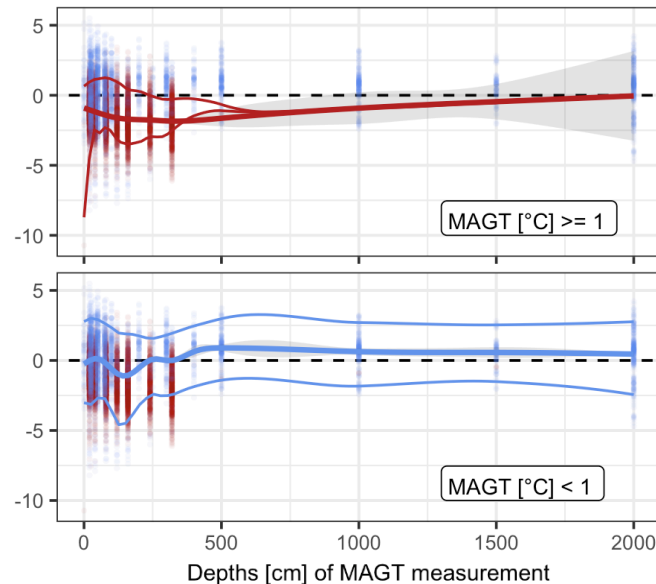
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95% 1.82°C
Median -1.12°C
5% -3.53°C

95% 2.81°C
Median 0.20°C
5% -3.14°C

95% 0.71°C
Median -1.46°C
5% -3.62°C



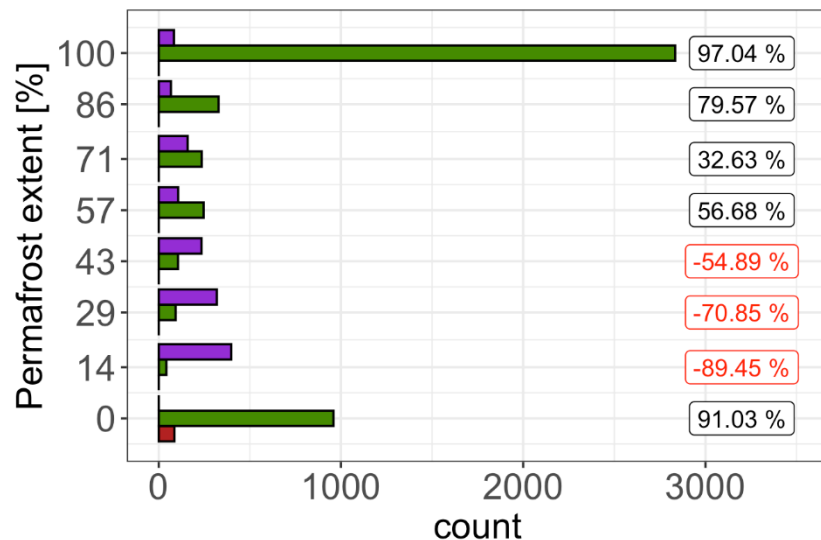
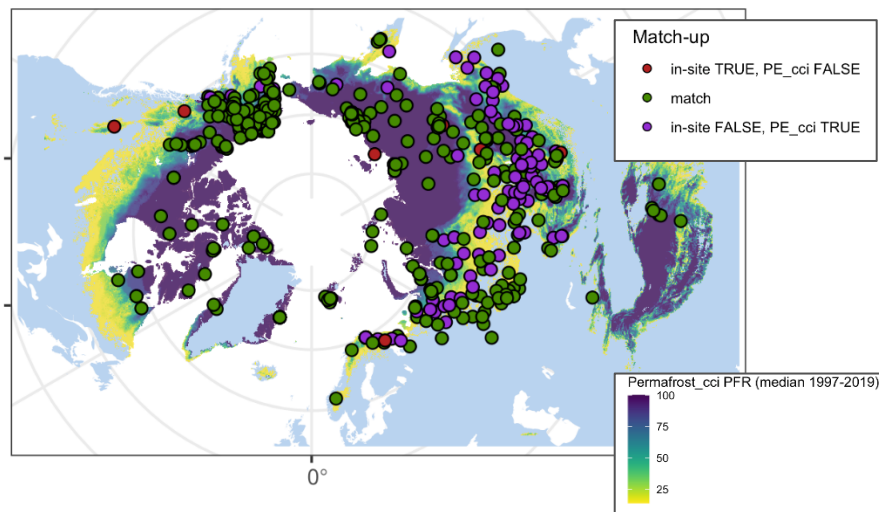
Permafrost_cci validation results

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- Mean Annual Ground Temperature MAGT per Depth (GTD)
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Permafrost == TRUE: In situ MAGT (<0.5°C) | ALT



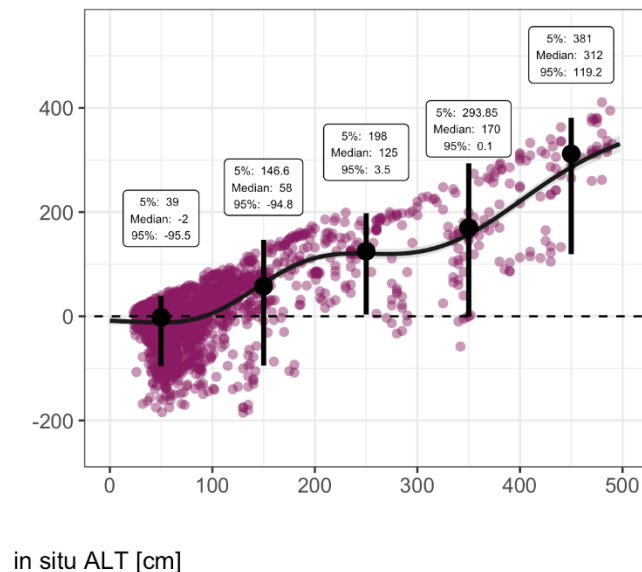
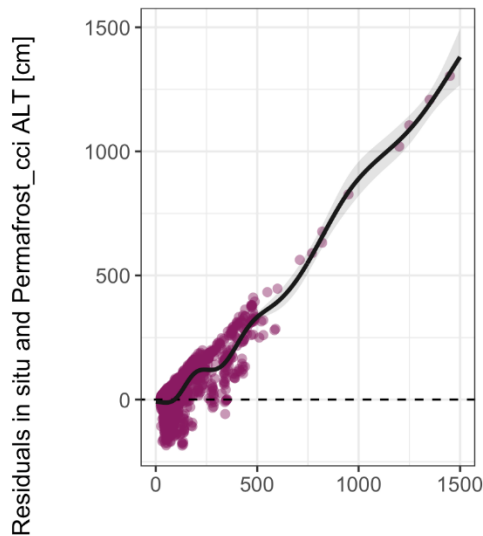
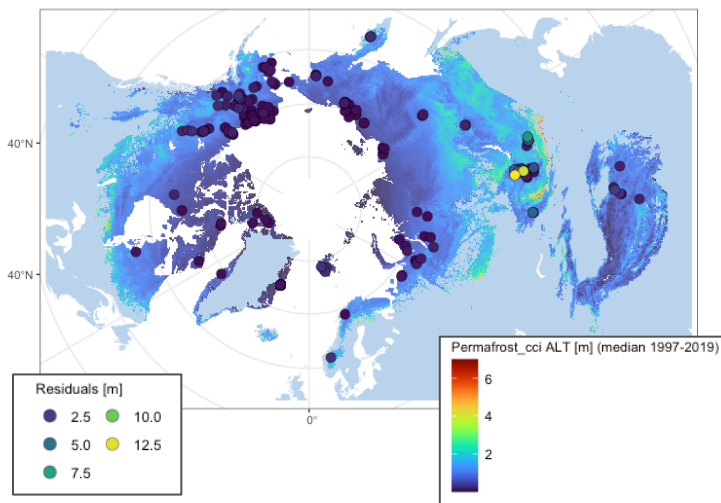
Permafrost_cci validation results



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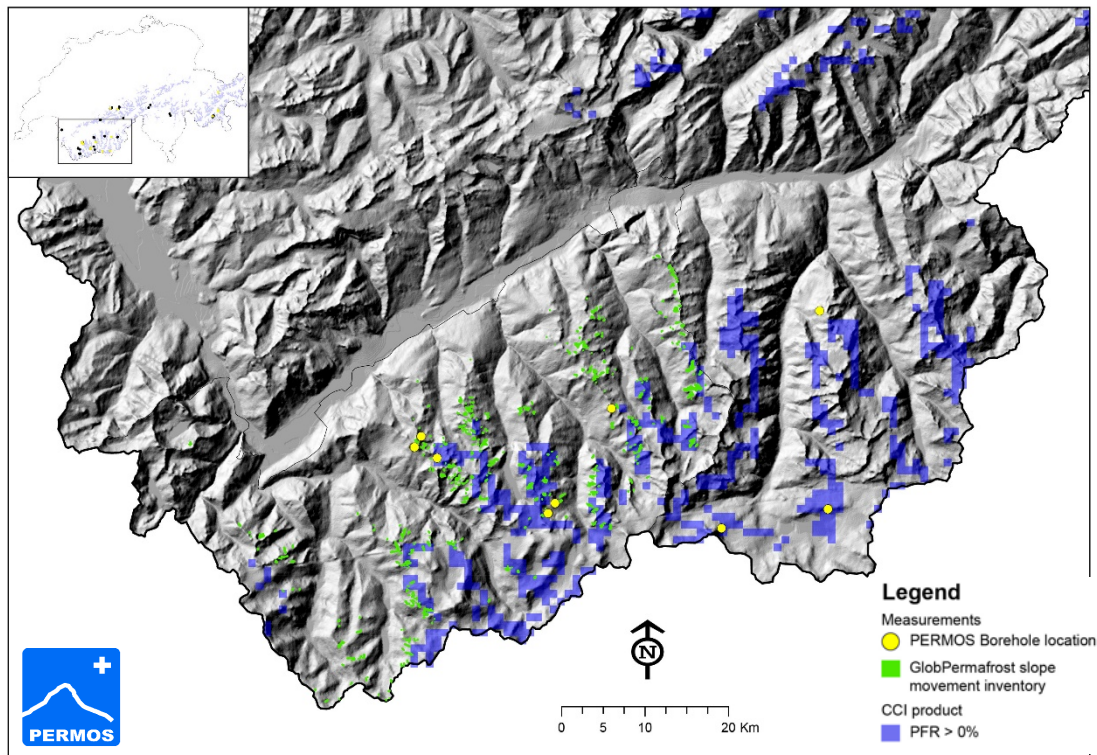
→ PERMAFROST

- Mean Annual Ground Temperature MAGT per Depth (GTD)
- annual Permafrost FRaction PFR derived from GTD
- **annual Active Layer Thickness (ALT)**



GTD and PFR validation results:

- warm GTD_cci bias
- PFR_cci permafrost limit down to 3000 m is underestimated: in situ mountain permafrost limit occurs at 2600 m;
- majority of GlobPermafrost slope movement products outside of Permafrost PFR_cci



Permafrost_cci PFR compared to GlobPermafrost SAR-derived slope movement inventory and PERMOS permafrost monitoring borehole locations

Permafrost_cci validation results

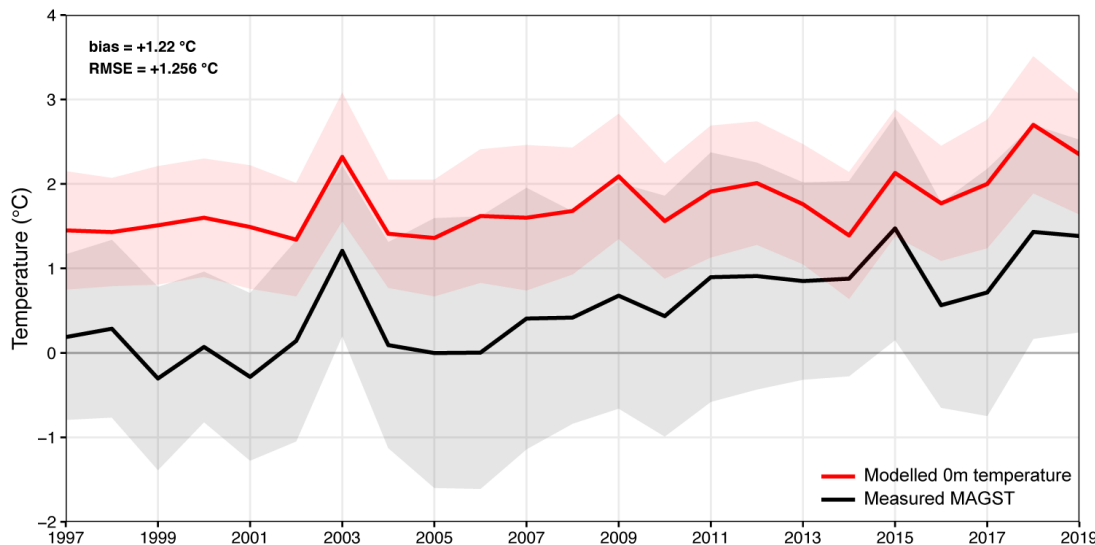


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Permafrost_cci GTD warm bias year
GTD dynamics captured

MAGT
C°



Permafrost_cci MAGST (0m)
vs. PERMOS in situ MAGST
averaged entire Swiss Alps
between 2500-3000 m

