

climate change initiative

→ PERMAFROST

User workshop

June 4, 2025



permafrost
cci

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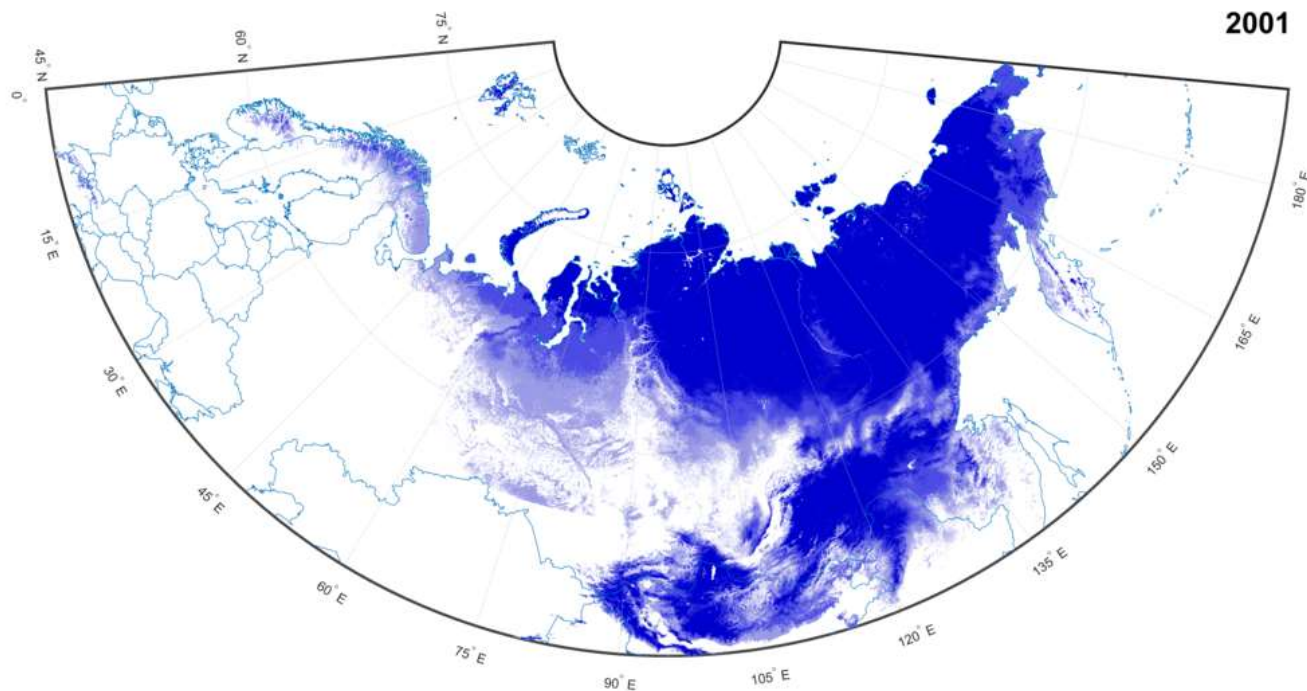
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Visualizations of version 4.0 products (2023)



Permafrost_cci:
Annual products for
ground
temperature,
permafrost extent
and active layer
thickness since
1997



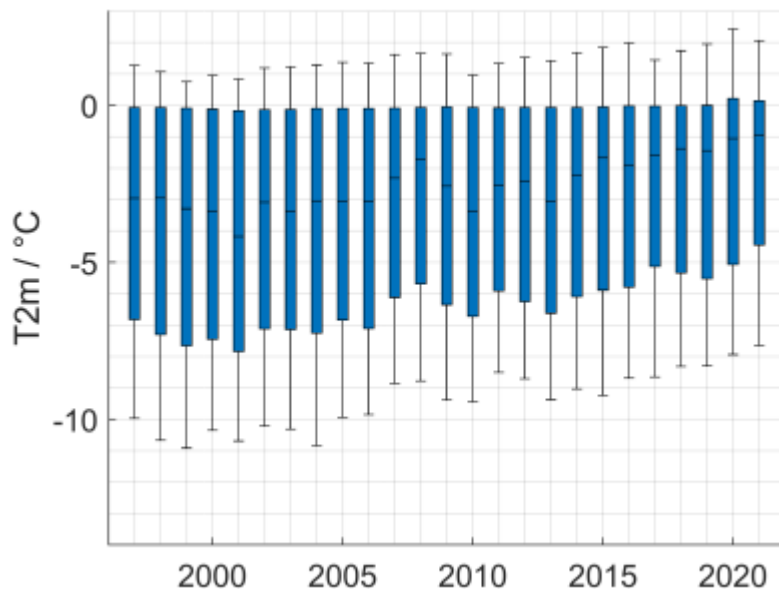
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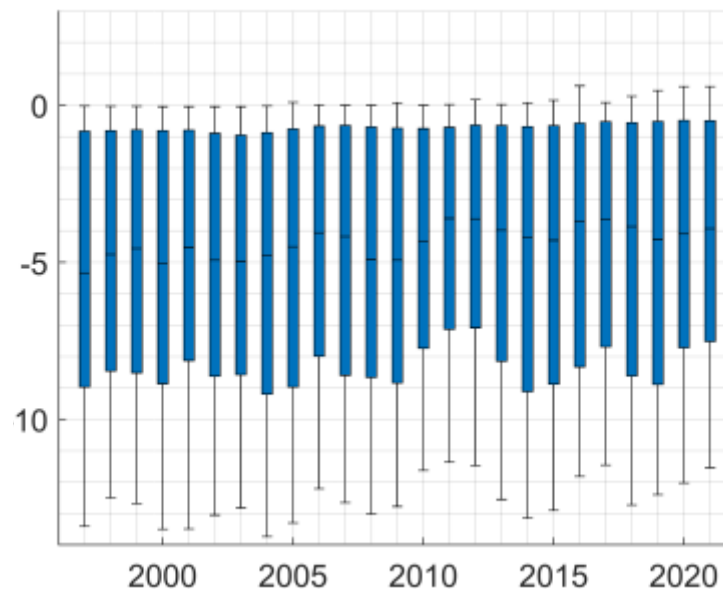
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Visualizations of version 4.0 products (2023)



Eurasia



N America



CryoGrid permafrost model adapted for Permafrost_cci

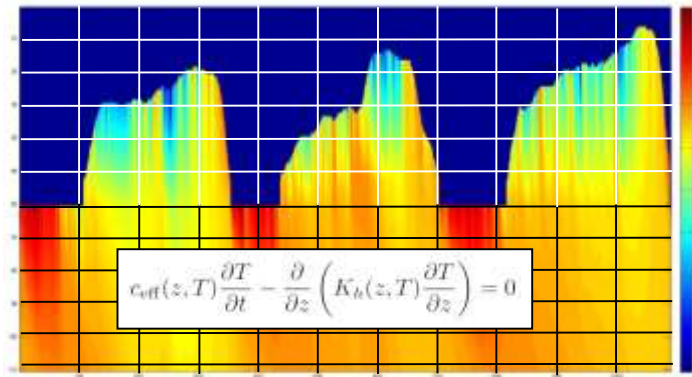


MODIS LST + ERA-5

Downscaled ERA-5

Landcover CCI +
snow model,
based on
CROCUS

Landcover CCI
In-situ
stratigraphies



geothermal heat flux

Langer et al. 2013, Westermann et al., 2017

-1km resolution

-(1980)1997-2021

-ground temperatures at
defined depths

-active layer thickness

-permafrost extent due to
subpixel representation of
snow and
landcover/subsurface
properties



Updates on version 5.0 products

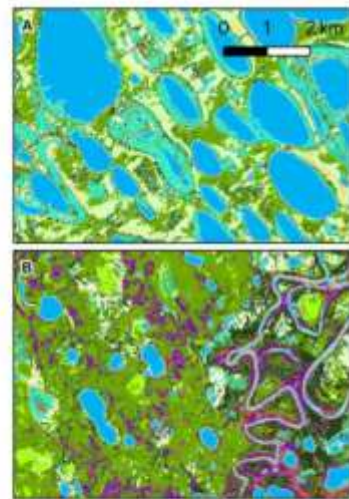
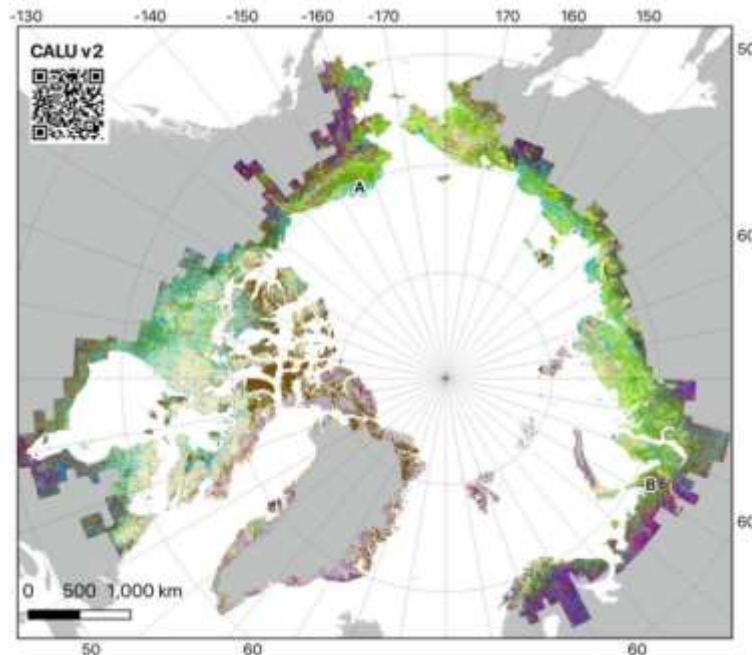


Permafrost_cci 10m landcover products implemented

- several new classes, e.g. “dry tundra”, “moist tundra”, “wet tundra”
- significant improvement in spatial detail,

but difficult to mask the transition between high-resolution area and the Landcover_cci used further south

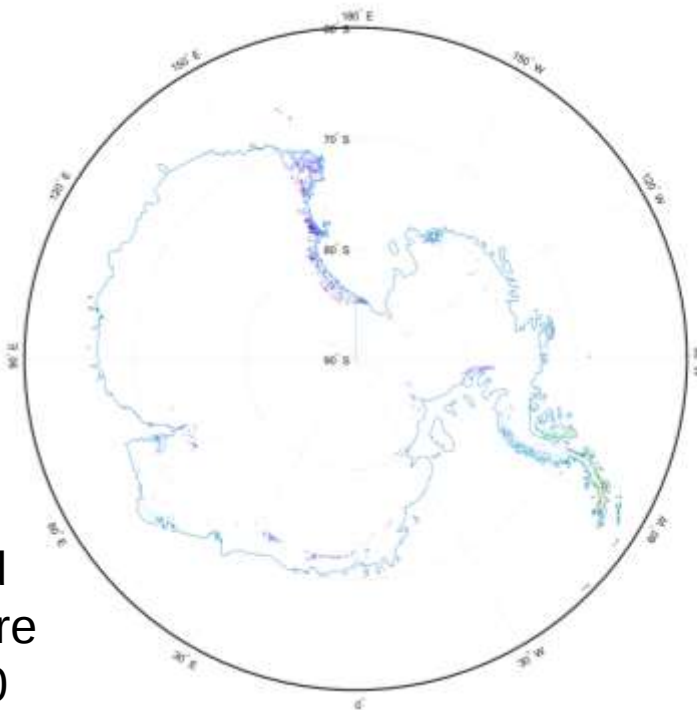
Improvement of snow model and other model parts



Bartsch, A., Khairullin, R., Efremova, A., Widhalm, B., Mui, X., von Baeckmann, C., Bergstedt, H., Ermokhina, K., Hugelius, G., Hein, B., Leibmann, M., Gruber, C. (2024). Circumartic Landcover Units (2.0) Zenodo. <https://doi.org/10.5281/zenodo.14235736>



Version 5.0 products (2025) - Antarctica



2m ground
temperature
2001-2010



Prototype
product with
large
uncertainties

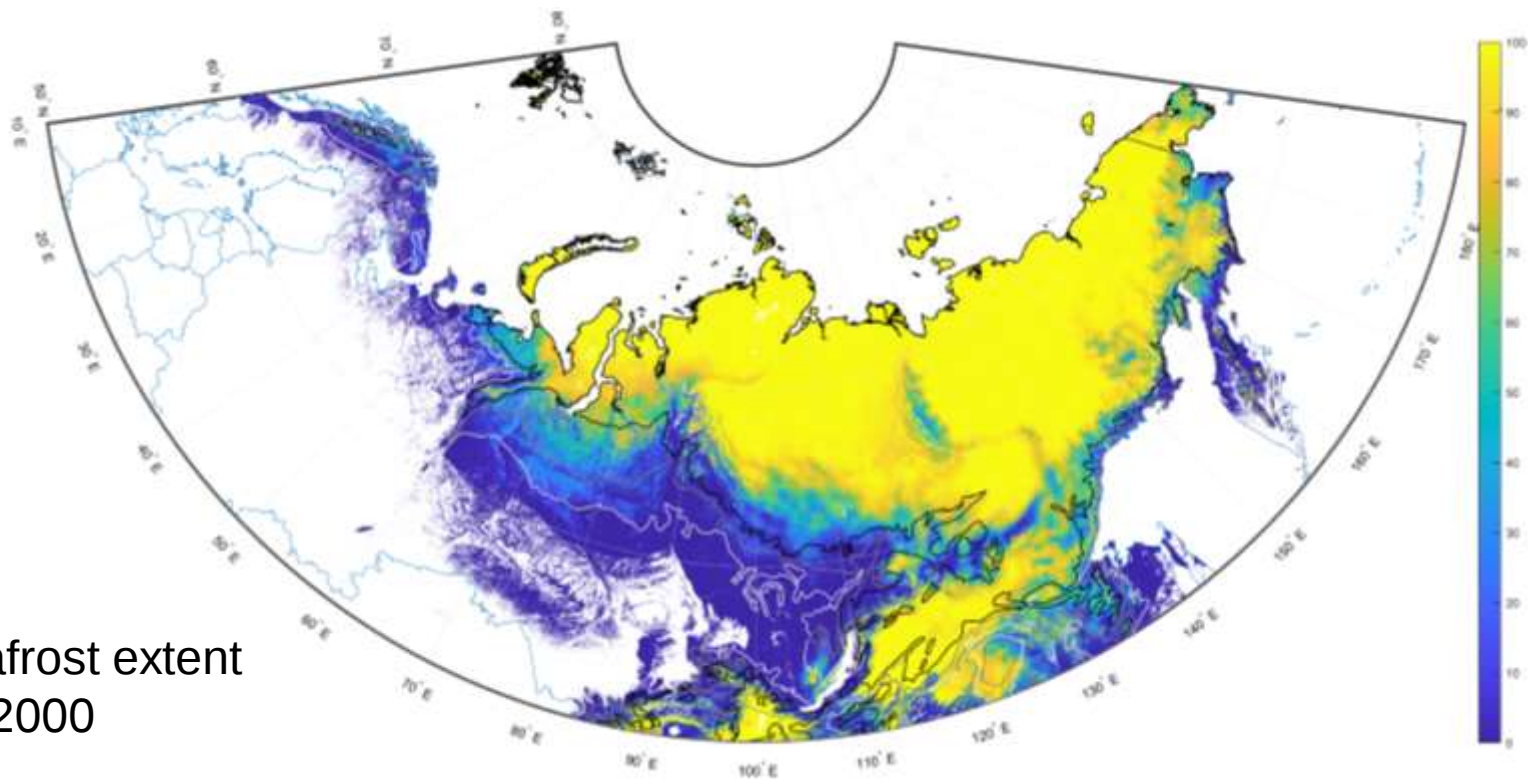
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Version 5.0 products (2025) – Northern Hemisphere



Permafrost extent
1997-2000

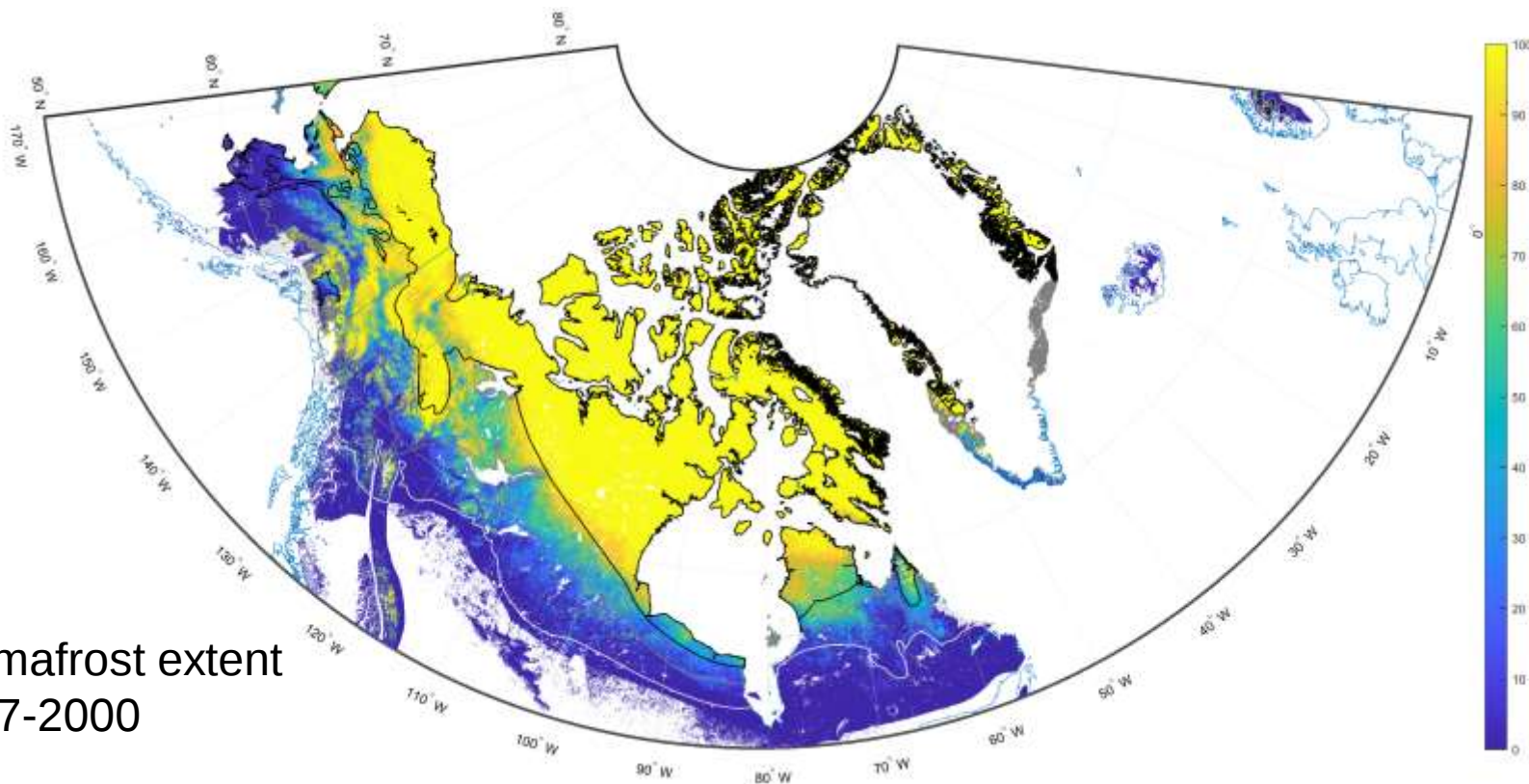
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Version 5.0 products (2025) – Northern Hemisphere



Permafrost extent
1997-2000

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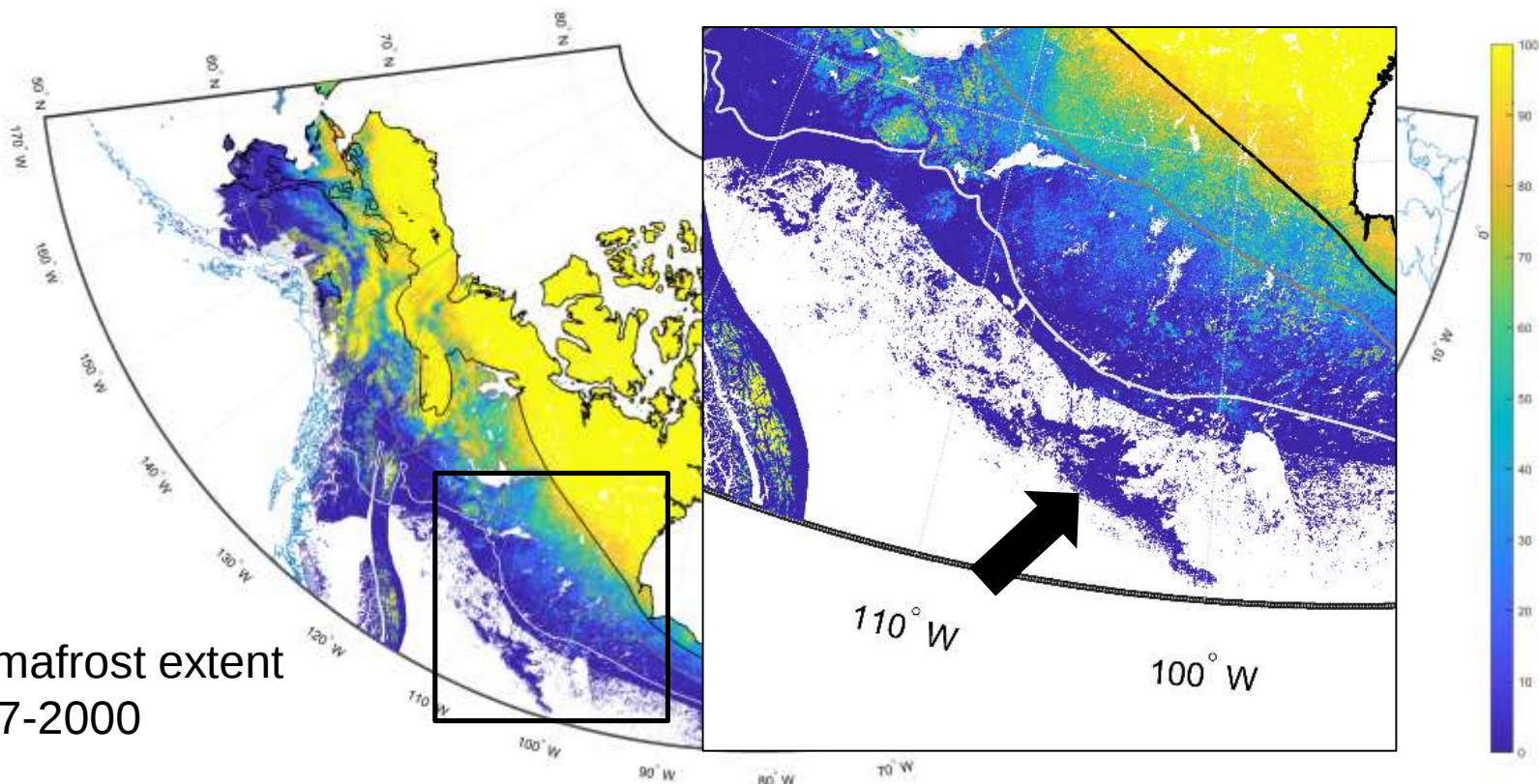


Version 5.0 products (2025) – Northern Hemisphere



Some
known
issues
fixed!

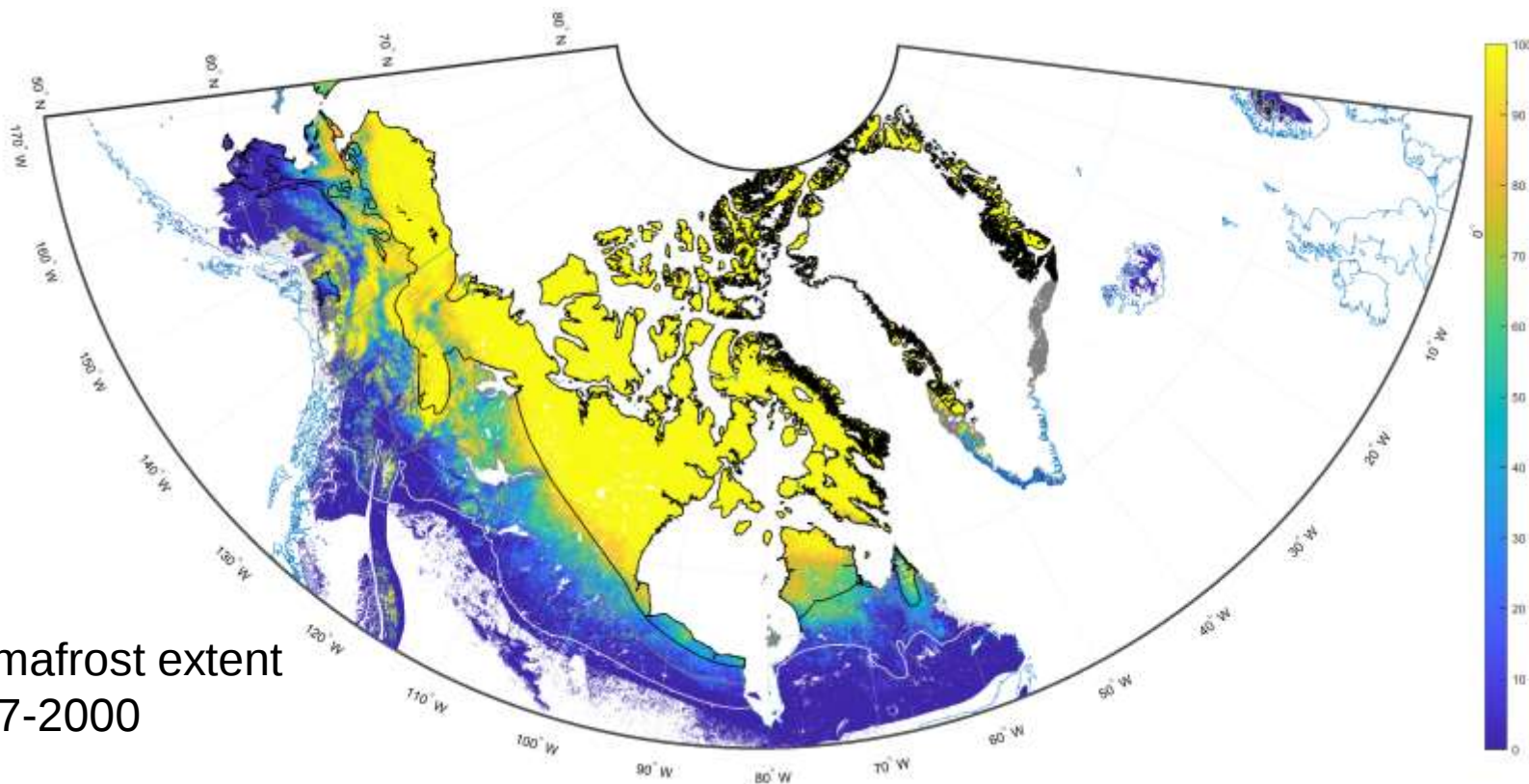
Permafrost extent
1997-2000



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Version 5.0 products (2025) – Northern Hemisphere



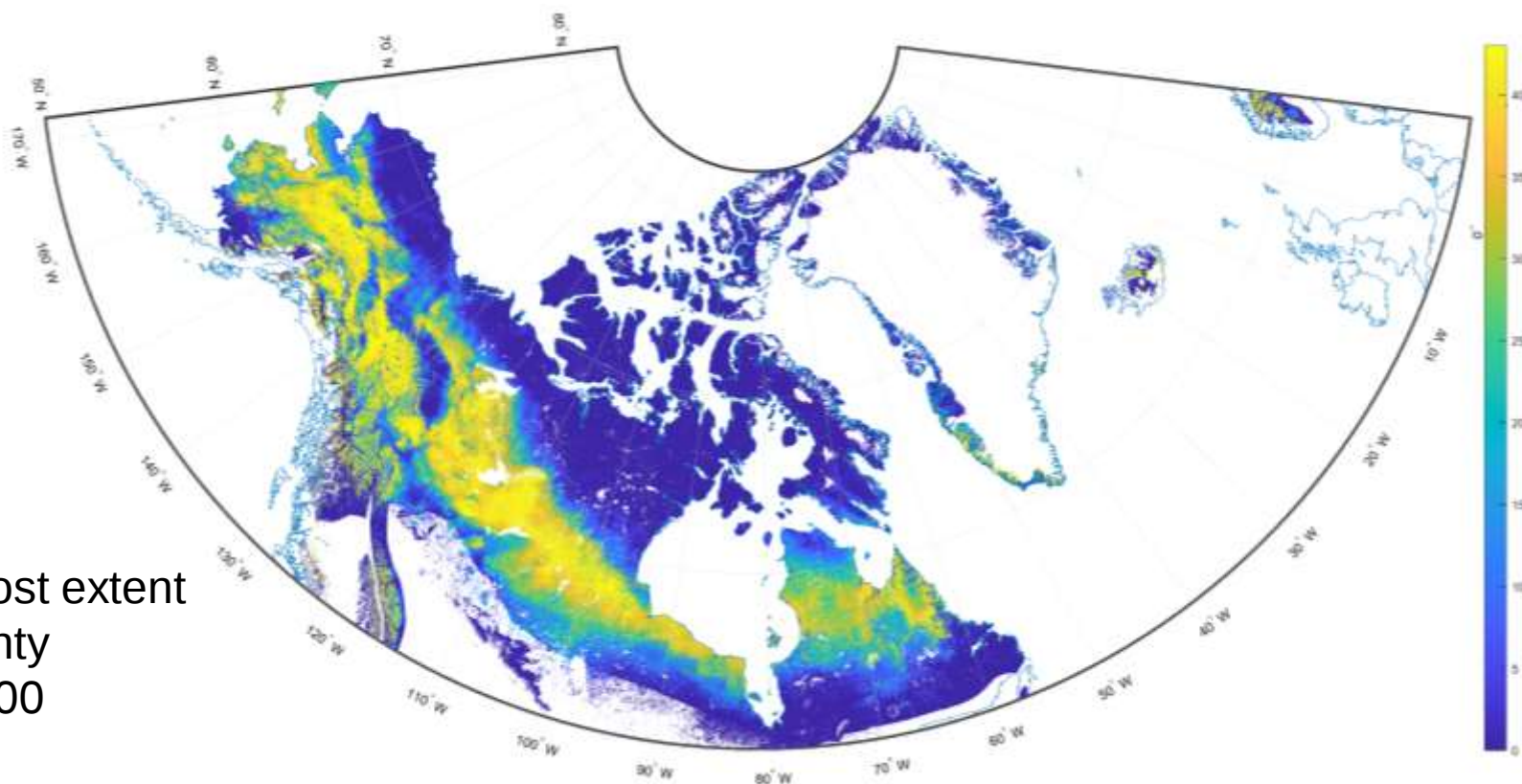
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Version 5.0 products (2025) – Northern Hemisphere

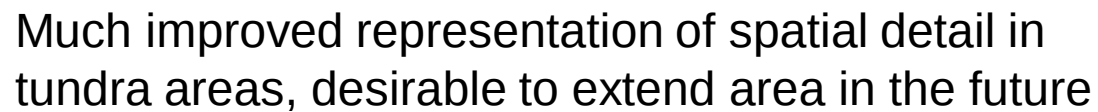


Permafrost extent
uncertainty
1997-2000

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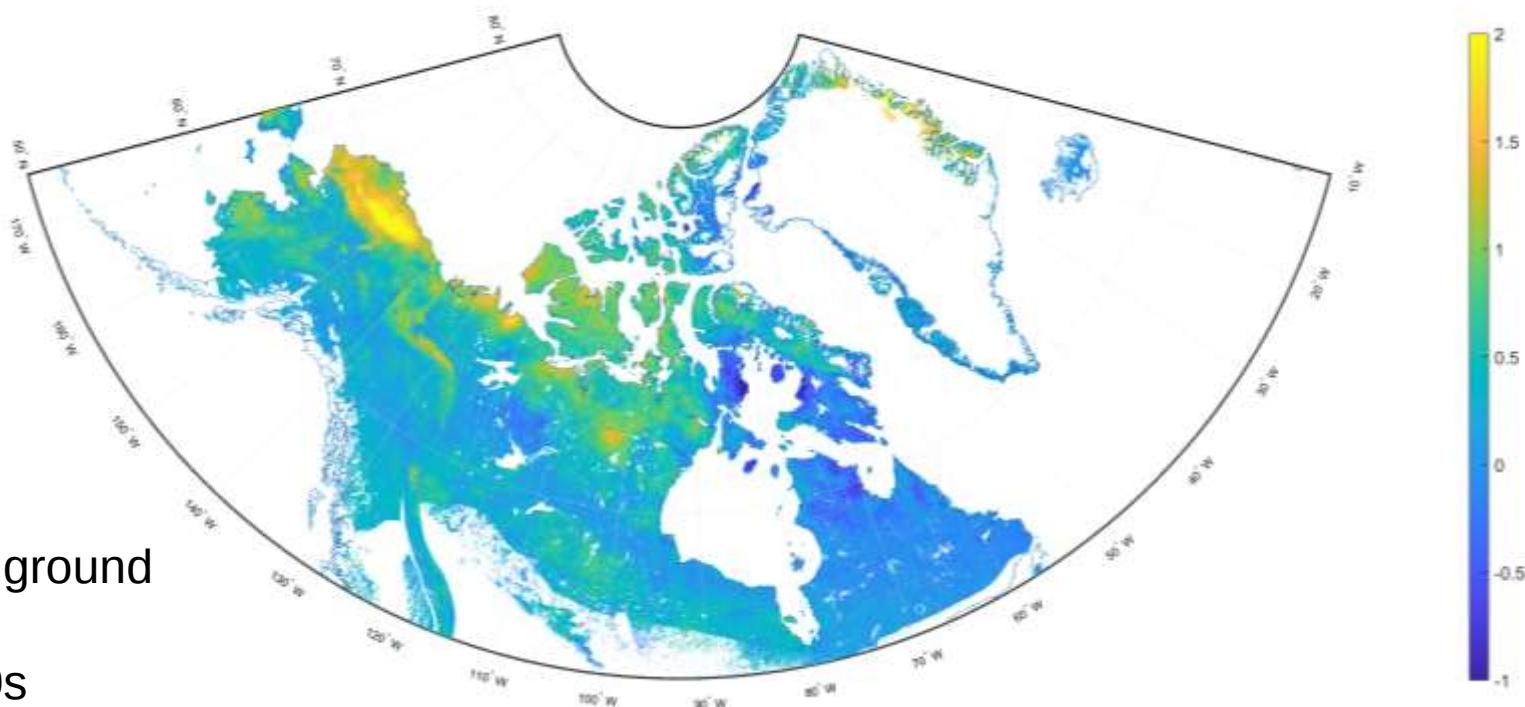


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Version 5.0 products (2025) – Northern Hemisphere



Change in 2m ground
temperature
2000s vs 2010s

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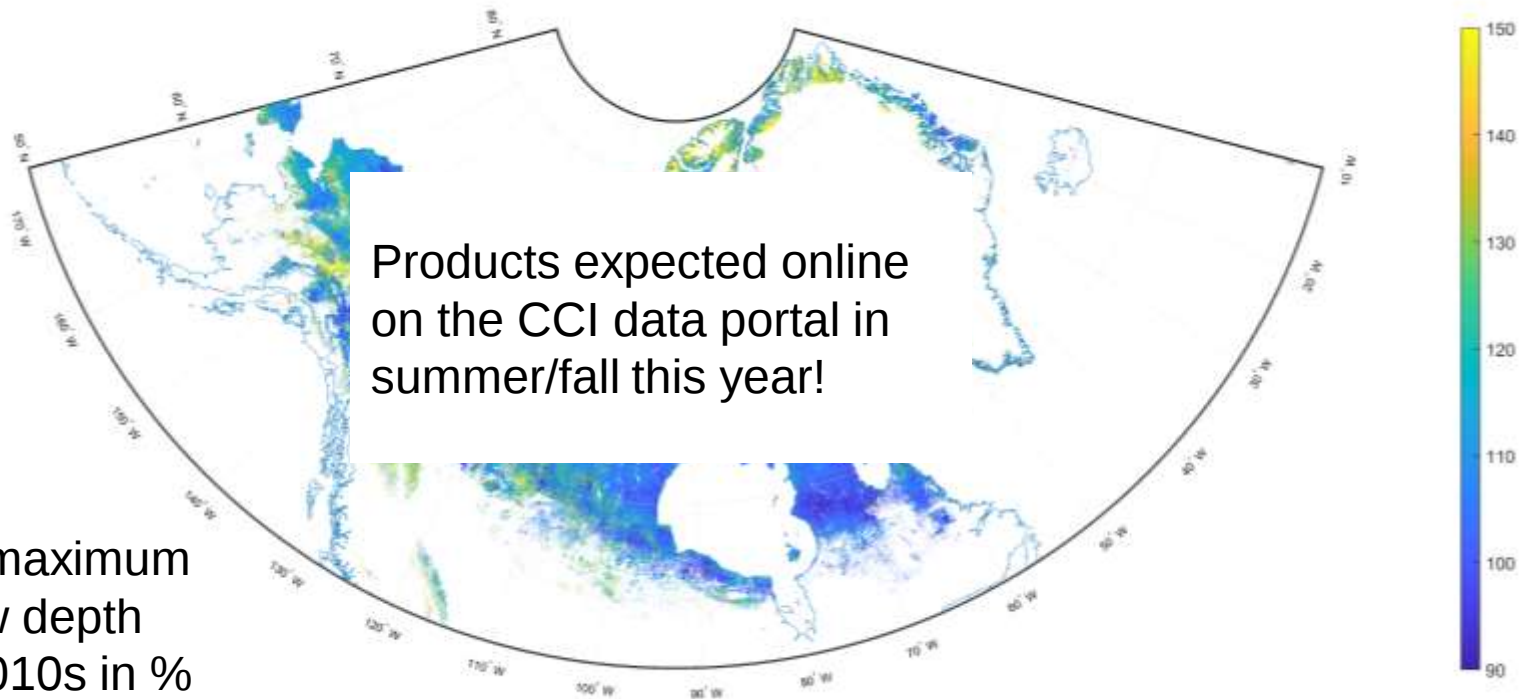
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Version 5.0 products (2025) – Northern Hemisphere



Change in maximum
annual thaw depth
2000s vs 2010s in %

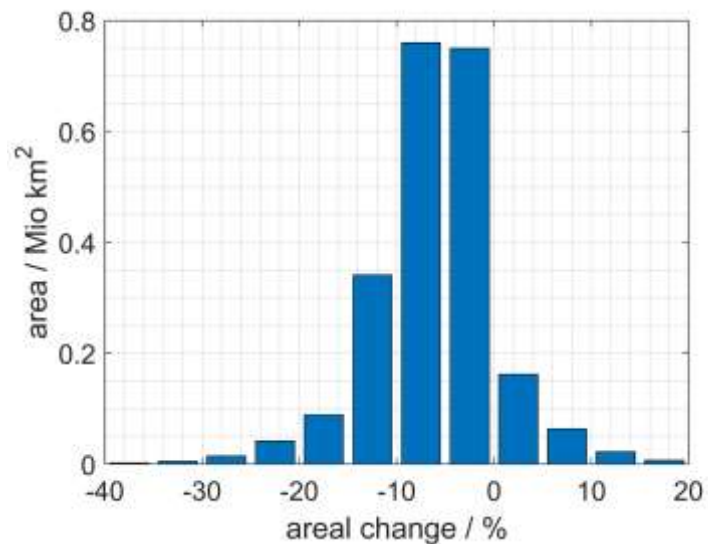


Visualizations of version 4.0 products (2023)

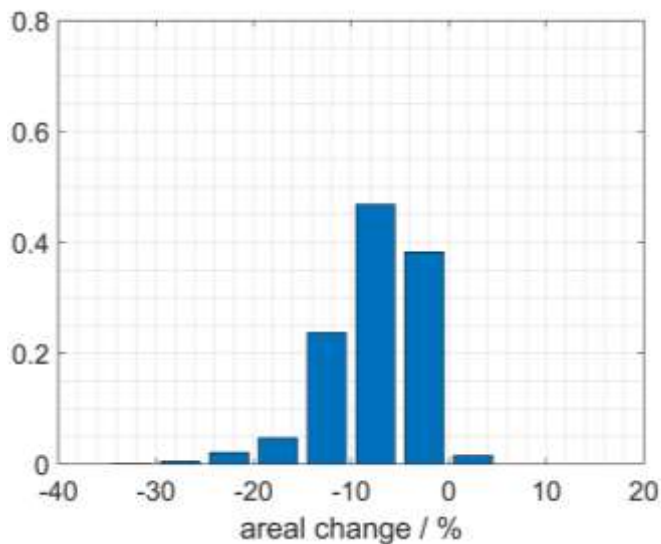




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N America

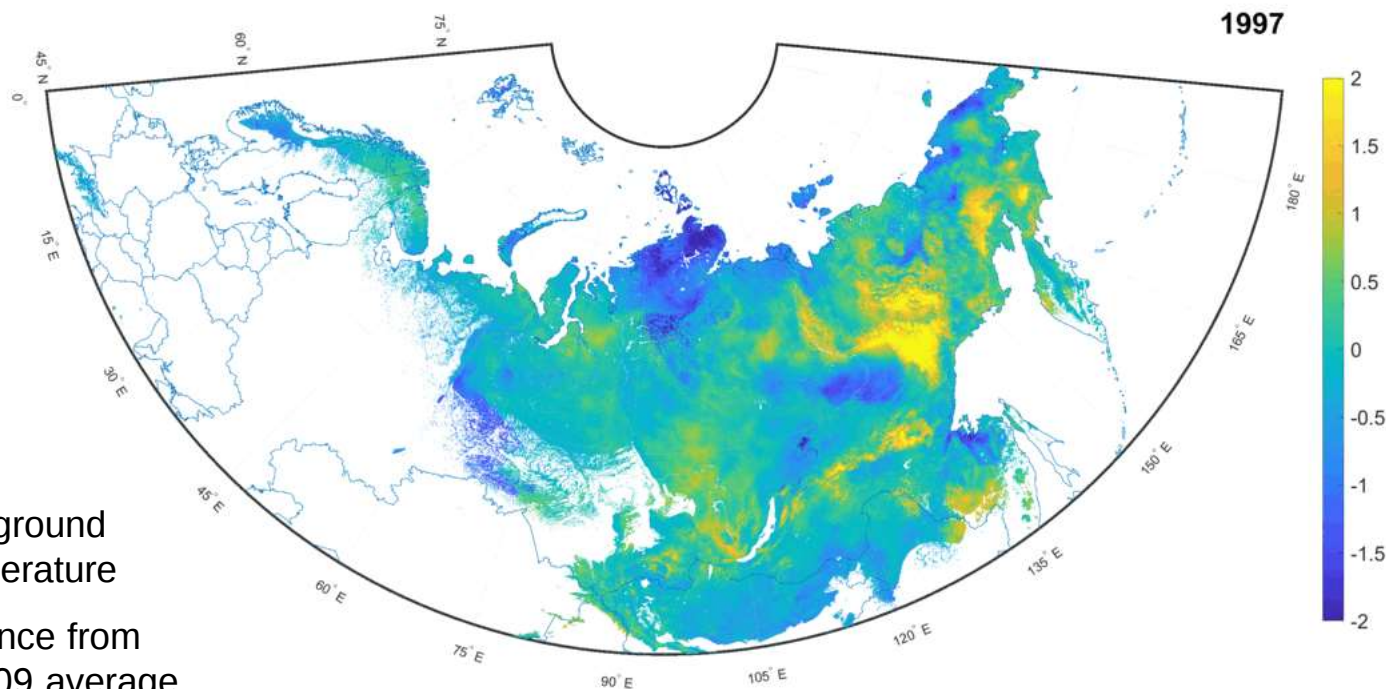


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2m ground
temperature
difference from
2000-2009 average



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