CCI+ Permafrost

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HELMHOLTZ

What CCI+ Permafrost is about

- Permafrost cannot be directly detected from space.
- but many surface variables relevant for characterizing the state of permafrost (LST, SWE, land cover) can be observed with space-based Earth Observation.
- Permafrost_cci will provide for different epochs consistent global maps of the parameters permafrost temperature and active layer thickness based on Earth Observation records ingested into a permafrost model scheme.
- Validation and evaluation efforts comprise comparison to in-situ measurements of subsurface properties(active layer depth,active layer and permafrost temperatures,organic layer thickness, liquid water content in the active layer and permafrost) and surface properties (vegetation cover, snow depth, surface and air temperatures) as well as rock glacier inventories, local permafrost maps and geophysical survey measurements.

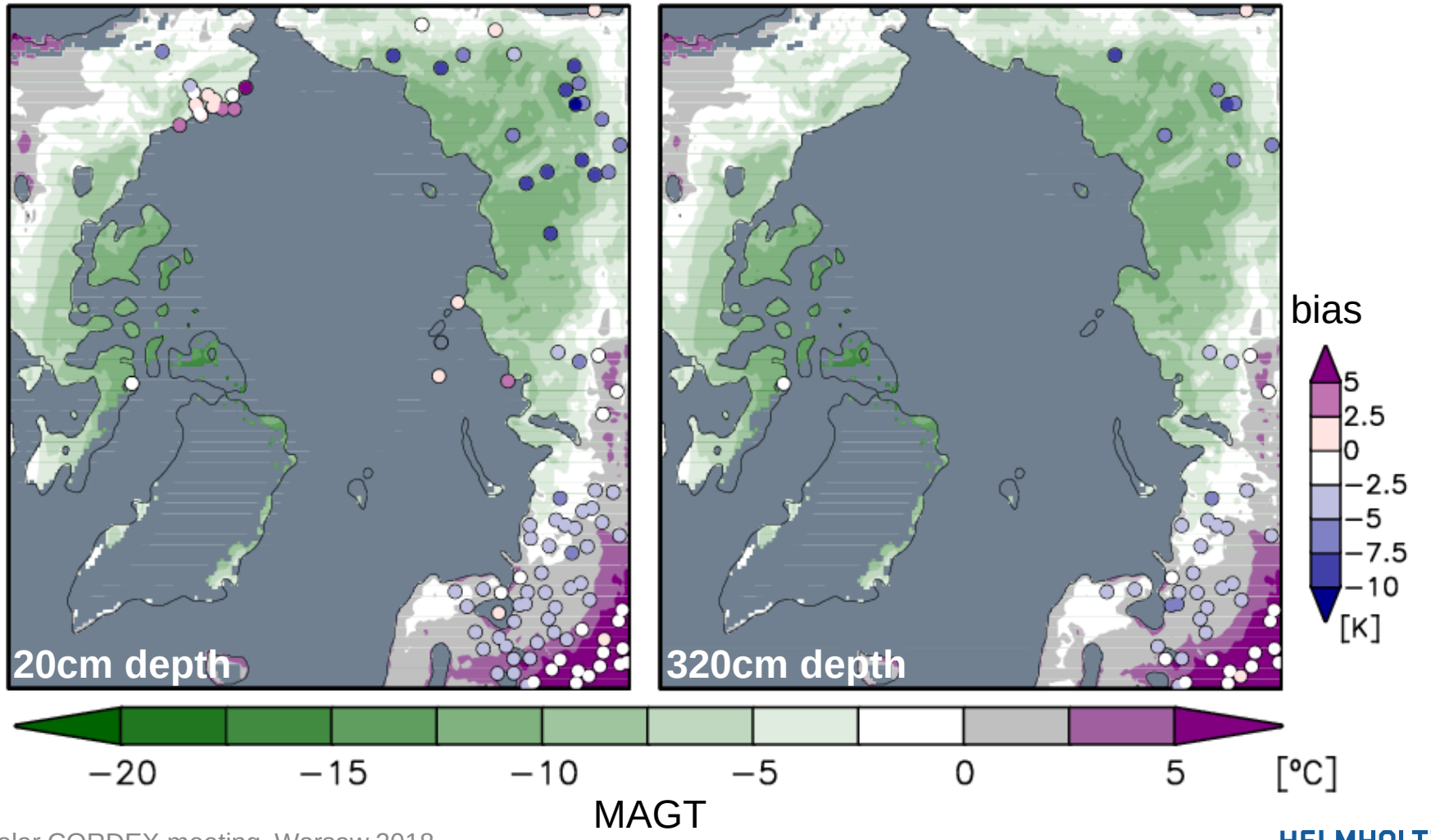
What we can do with existing data

- station borehole data from various sources (PL, GTN-P, RosHydroMet, Nordicana D)

- usual drawbacks of comparing with point data
- difficult to access
- time period and depth coverage very variable among data sets -> difficult to make comparison to models on climate time scale

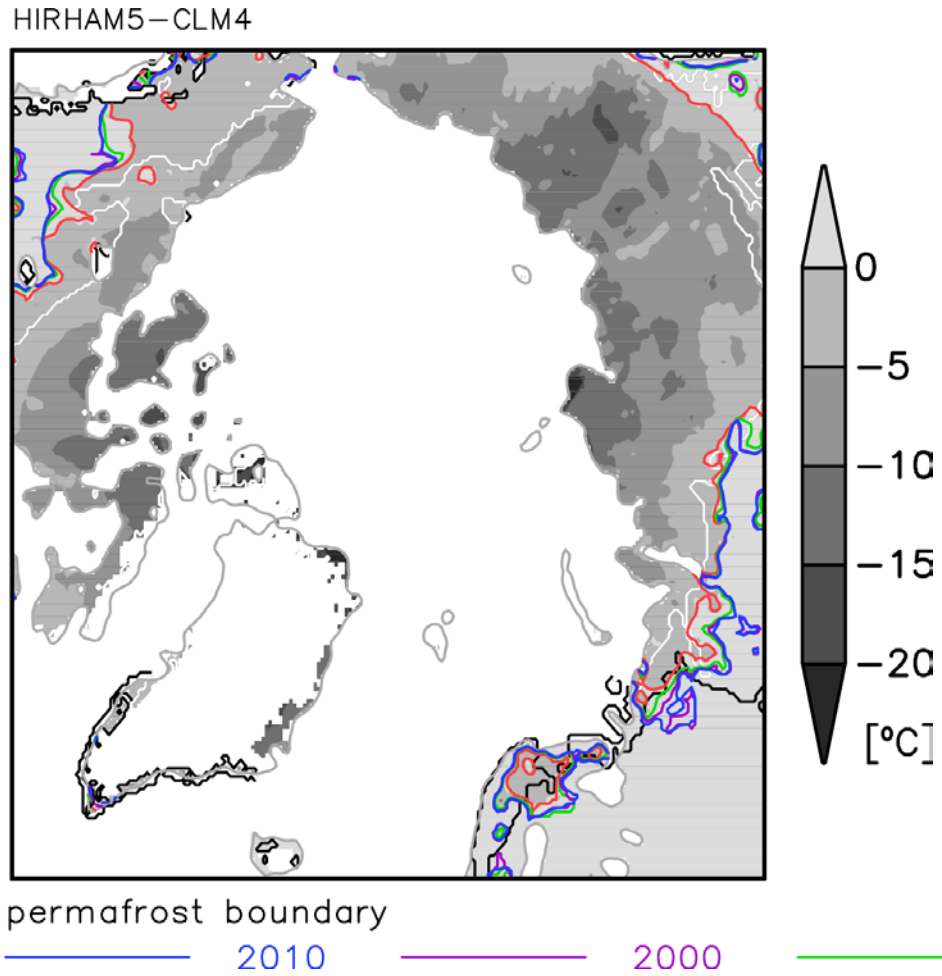
What we can do with existing data

- station borehole data - MAGT



What we can do with existing data

- IPA map by Brown et al., 1997



- grey shading: initial soil temperature at 320cm depth
- colored lines: permafrost boundary at different years
- black line: Brown et al discontinuous permafrost boundary
- white line: Brown et al continuous permafrost boundary

- permafrost boundary in the model is not stationary

What we can do with existing data

- ESA GlobPermafrost Project

https://www.globpermafrost.info

- covers Northern Hemisphere in 1km resolution
- variables: permafrost zonation and probability, MAGT at TTOP, standard deviation of MAGT at TTOP
- uses an equlibrium model, 200 ensemble runs to account for uncertainties
- delivers one map each for time slice 2000-2016

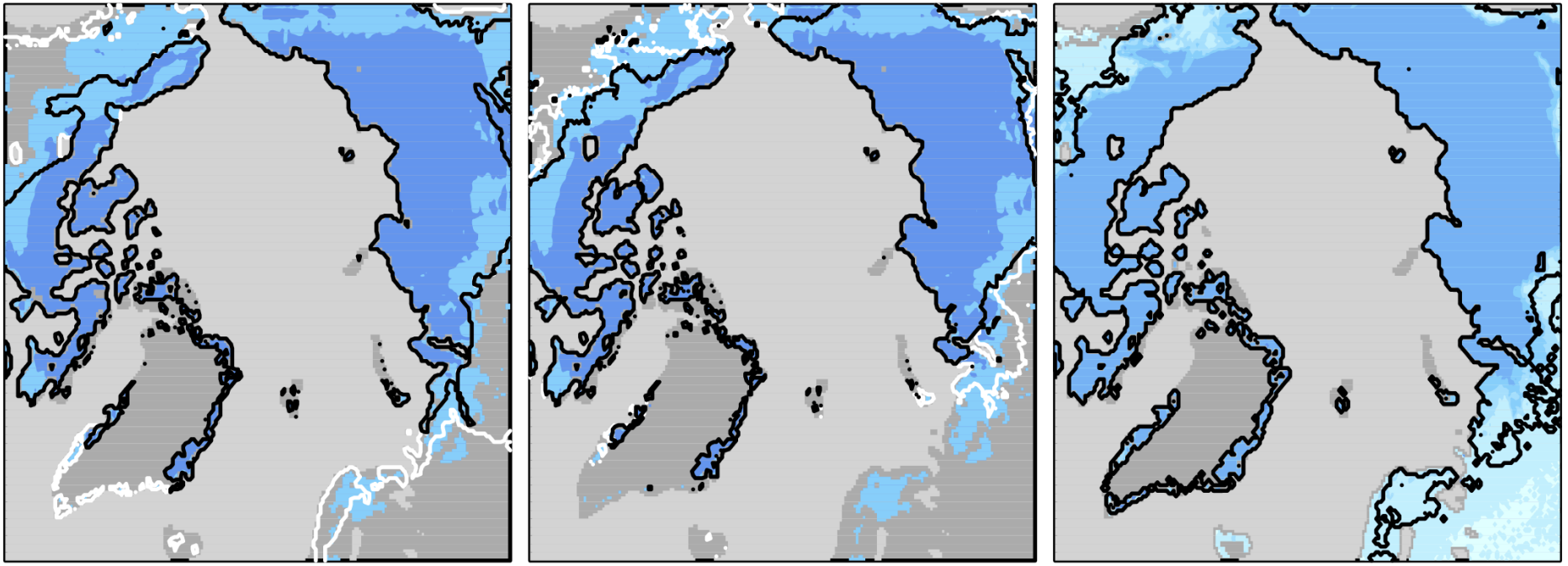
What we can do with existing data

- ESA GlobPermafrost Project

model versus Brown et al. map

model versus GlobPermafrost map

model versus GlobPermafrost perc.



model based on 2000-2014

268 MAGT at 320cm [K]

0 0.25 0.5 0.75 1 [prob.]

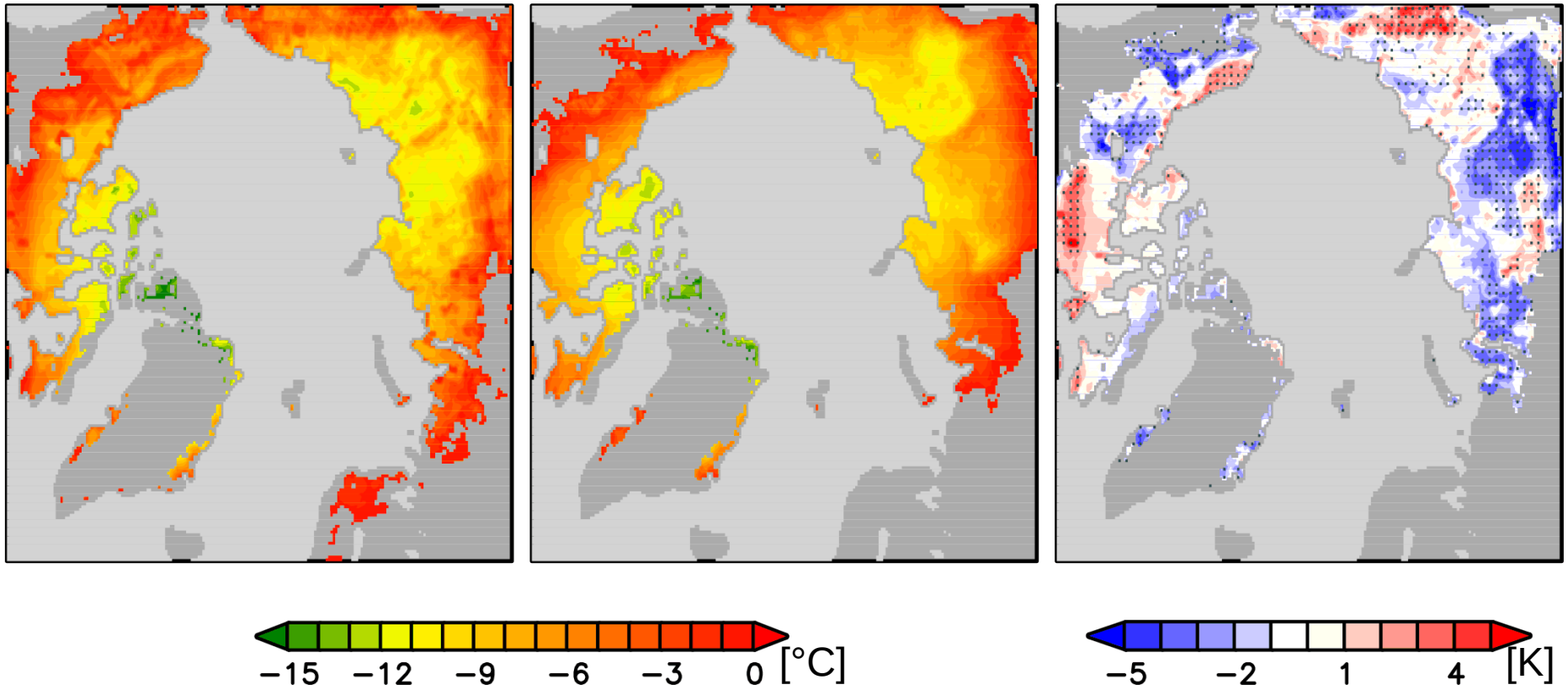
What we can do with existing data

- ESA GlobPermafrost Project

modelled MAGT at TTOP

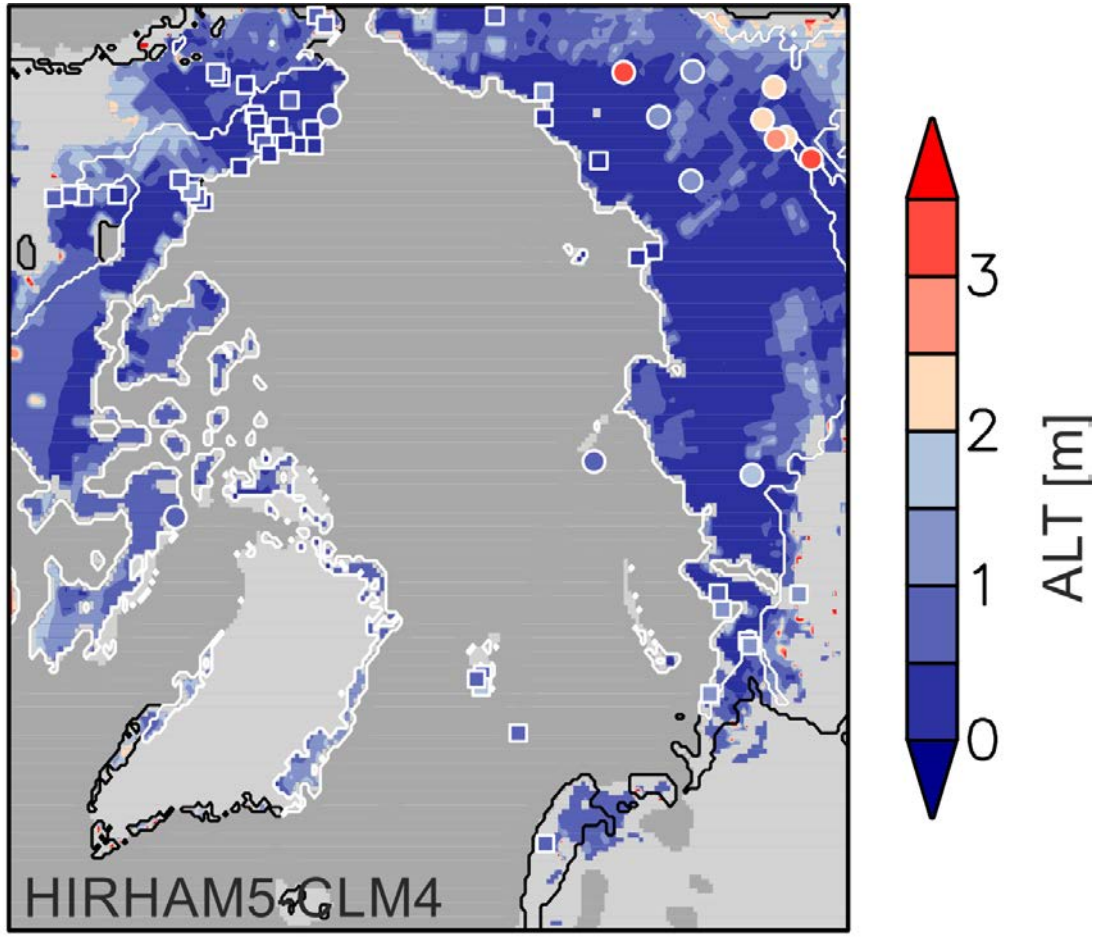
GlobPermafrost MAGT at TTOP

model minus GlobPermafrost



What we would like to have

- **spatial** active layer thickness (ALT)

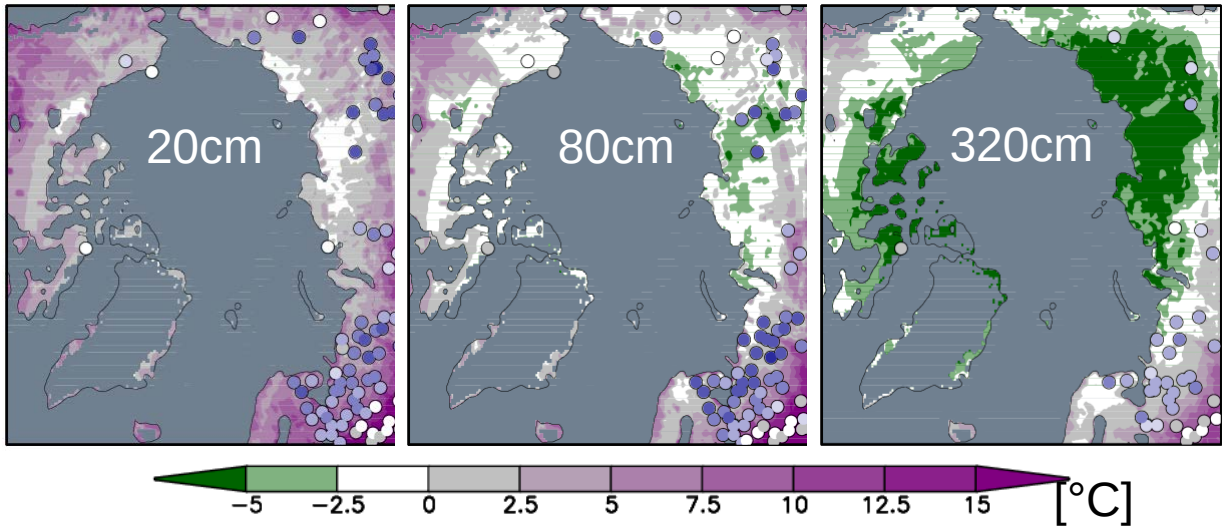


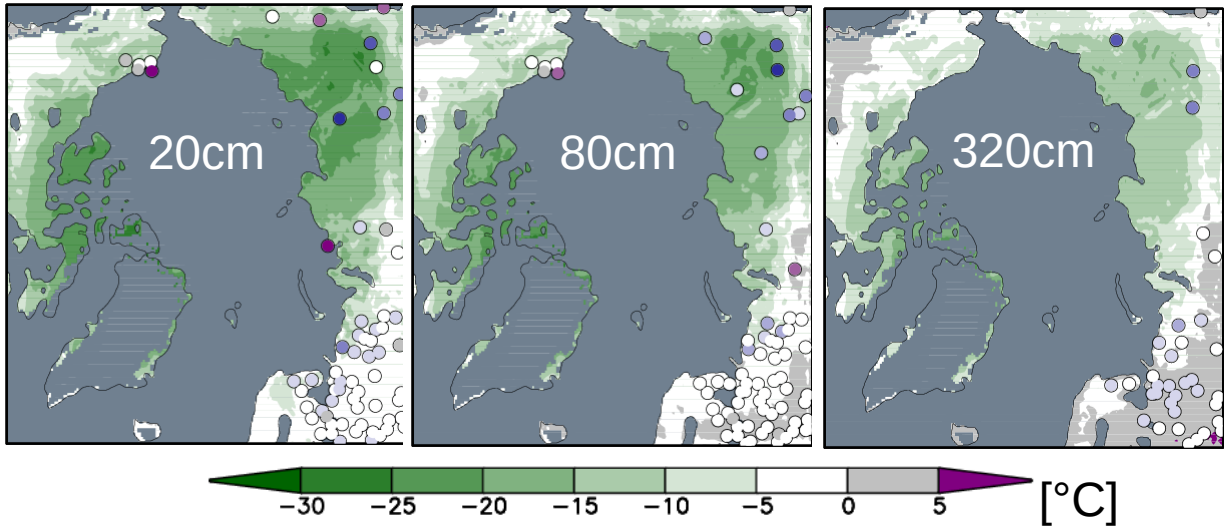
- shading: modelled ALT (average 2000-2011)
- colored squares: measured ALT from CALM sites
- colored circles: ALT computed from temperature profiles in boreholes

- methods for deprival of measured ALT are not consistent
- on climate time scales, there are very few measurements available

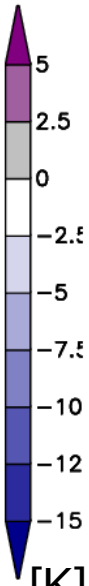
What we would like to have

- **monthly** temperature at **different** depths





August



February

- shading: modelled ground temperature (average 2000-2011)
- colored circles: measured ground temperature (average 2000-2011)
- biases strongly depend on depth and month

What CCI+ Permafrost can provide

- global maps in 1km resolution
- variables: ground temperature in different depths, maximum active layer thickness
- other specifications are determined by a user survey:
  - time resolution
  - depth resolution
  - uncertainty estimates

What CCI+ Permafrost can provide

PLEASE HELP US BY FILLING THE USER SURVEY!

HERE at the meeting or at
https://goo.gl/forms/tgjR8nXaPd8HogkF3