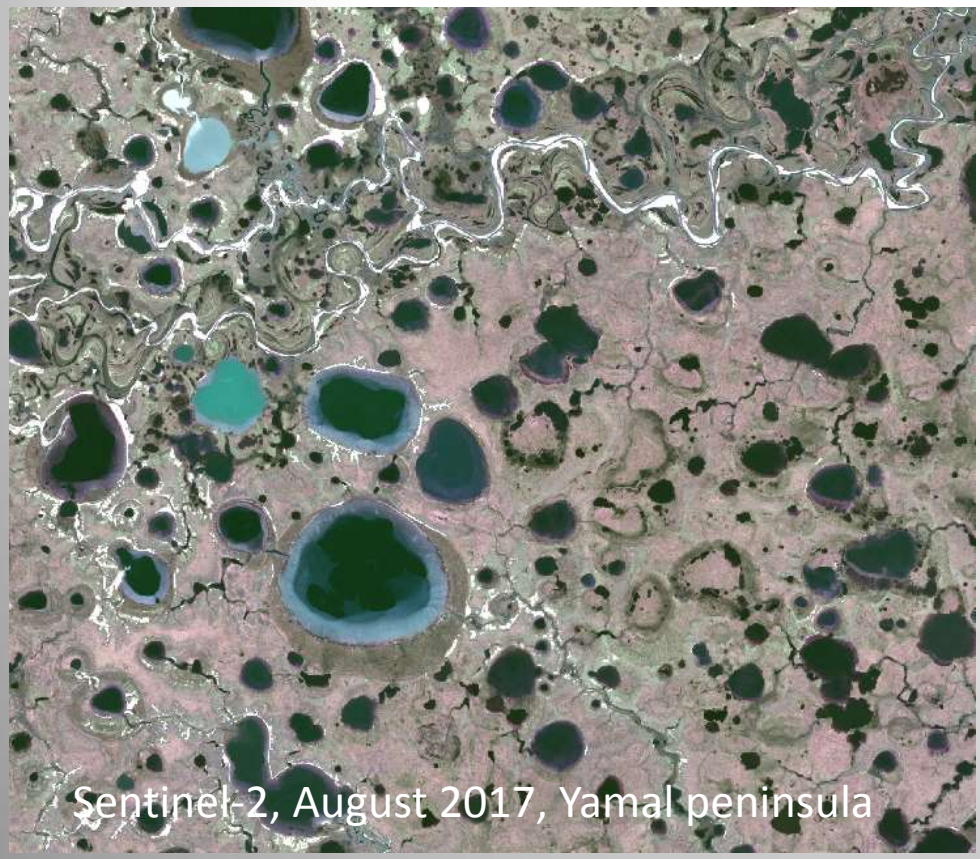


permafrost cci

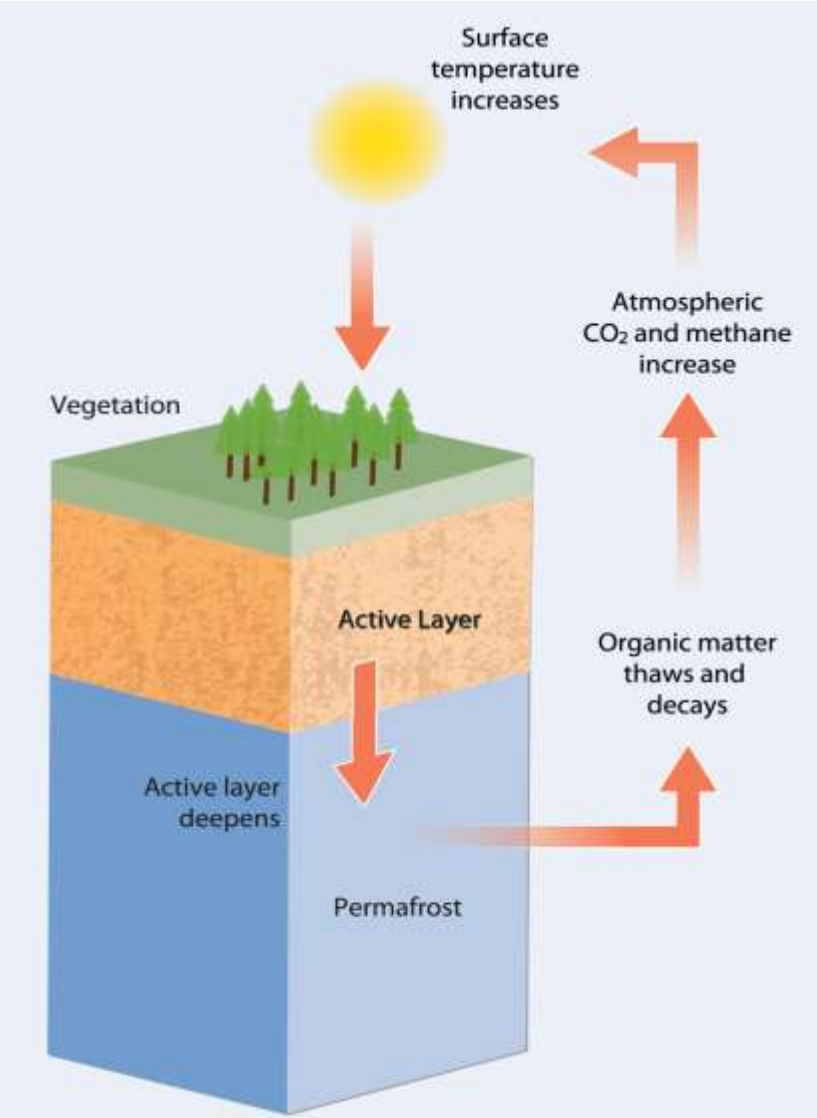
Annett Bartsch, b.geos

Tazio Strozzi, Gamma Remote Sensing

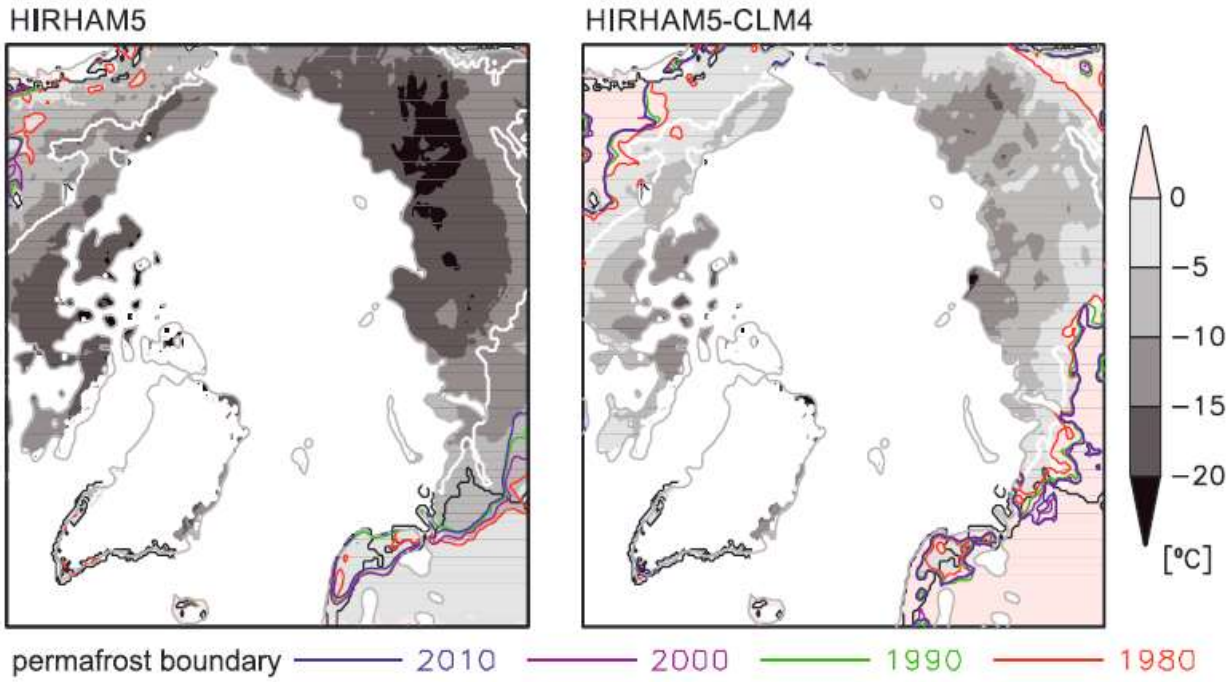
ESA CCI 8th Collocation Meeting 2018, Oxford, UK, 20-22 March 2018

GAMMA REMOTE SENSING b·geos UiO : AWI ALFRED WEGENER INSTITUT Stockholms universitet UNI FR

CCI+ Permafrost



Schaefer, K., Lantuit, H., Romanovsky, V.E., Schuur, E.A.G and R. Witt (2014): The impact of the permafrost carbon feedback on global climate. Environ. Res. Lett. 9 085003



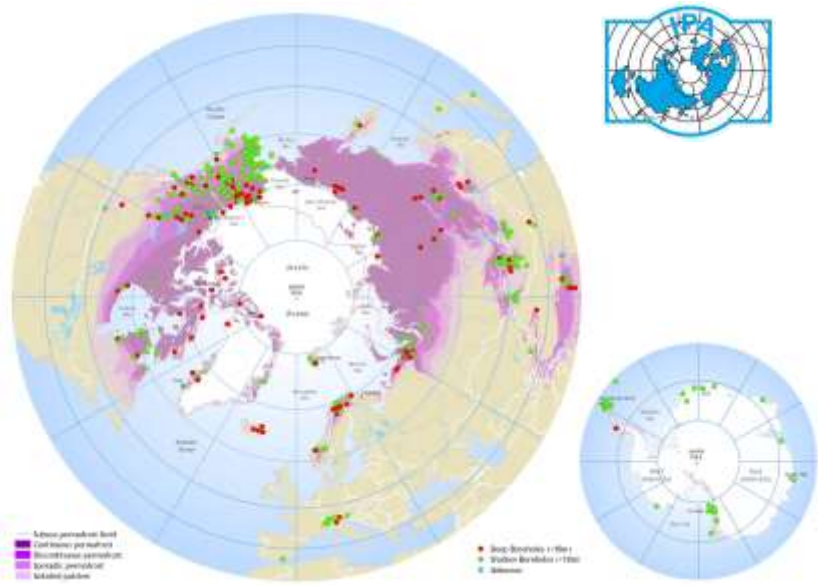
Model comparison with **Brown et al. 1997 permafrost zones** (white line- continuous permafrost zone, black line – discontinuous permafrost zone) by Matthes et al. 2017.

Soil temperature initialization fields of (left) HIRHAM5 and (right) HIRHAM5-CLM4 represented by the mean January 1979 soil temperature (grey shading). Soil temperatures above 0°C are shaded in pink. Coloured lines indicate the permafrost boundaries computed from modelled soil temperature for the start of each decade covered by the model runs.

CCI+ Permafrost

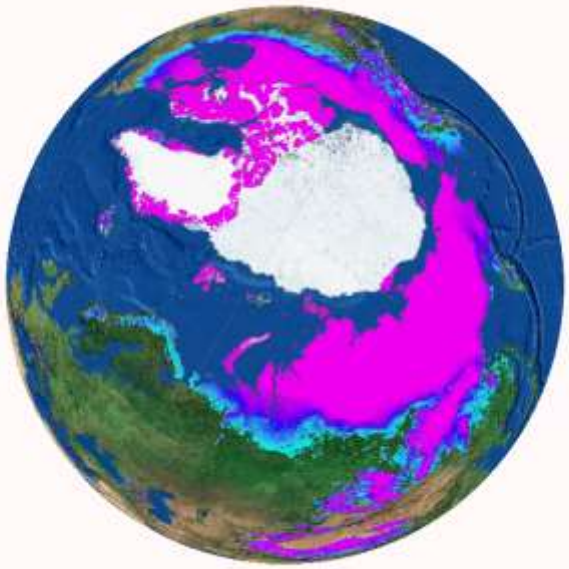
There is currently no consistent global map of the parameters **permafrost temperature and active layer thickness** as required by GCOS based on Earth Observation records.

CCI+ Permafrost will for the first time provide such information for different epochs and meet the requirements for the production of a climate data record (CDR).



Brown et al. 1997, based on mappings in the 1970s and 1080s

Heritage DUE GlobPermafrost



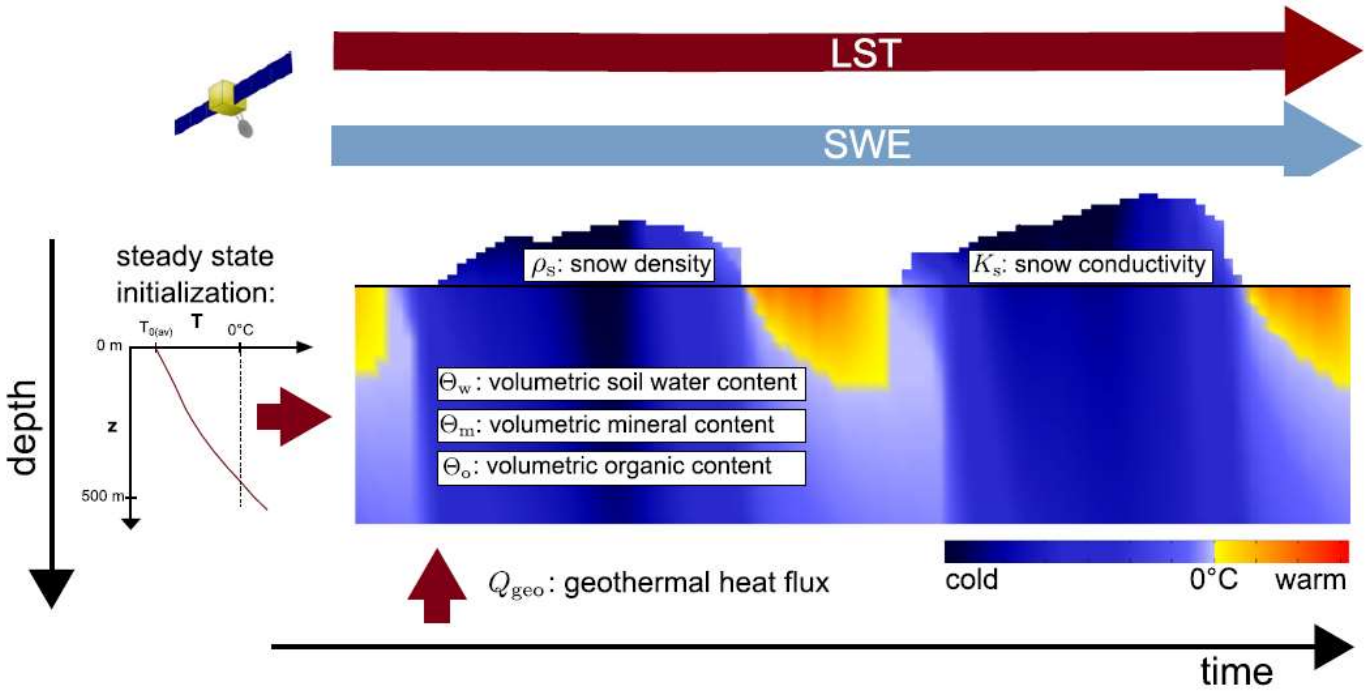
GlobPermafrost:

Equilibrium model (CryoGrid by University of Oslo) using MODIS LST and GlobSnow SWE as well as landcover information; representing 2000-2015

CCI+ Permafrost:

Transient modelling is required to produce time slices – need of longterm records of LST and SWE, suitable soil parameterization

Transient modelling



Permafrost Temperature

Active Layer Thickness

time slices:

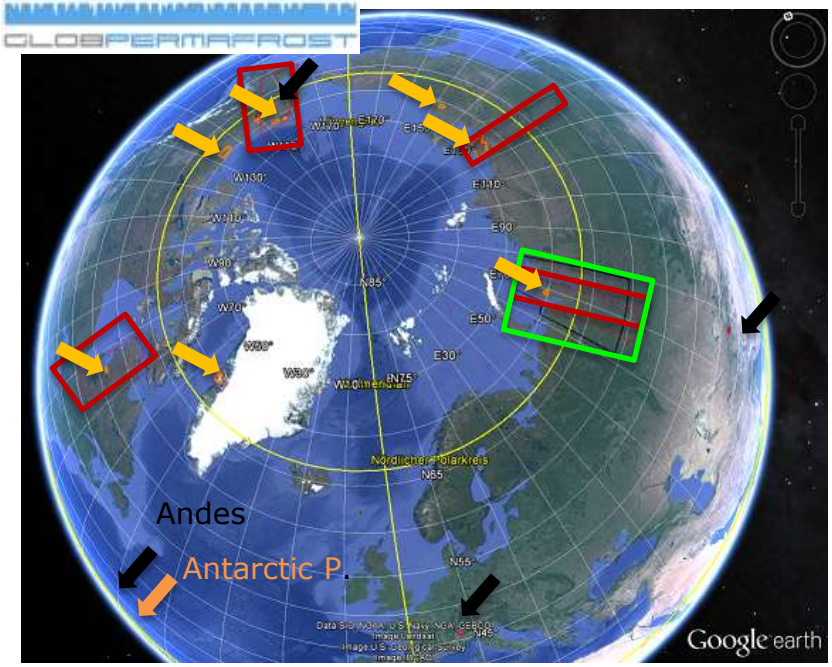
1997/98

2007/08

2017/18

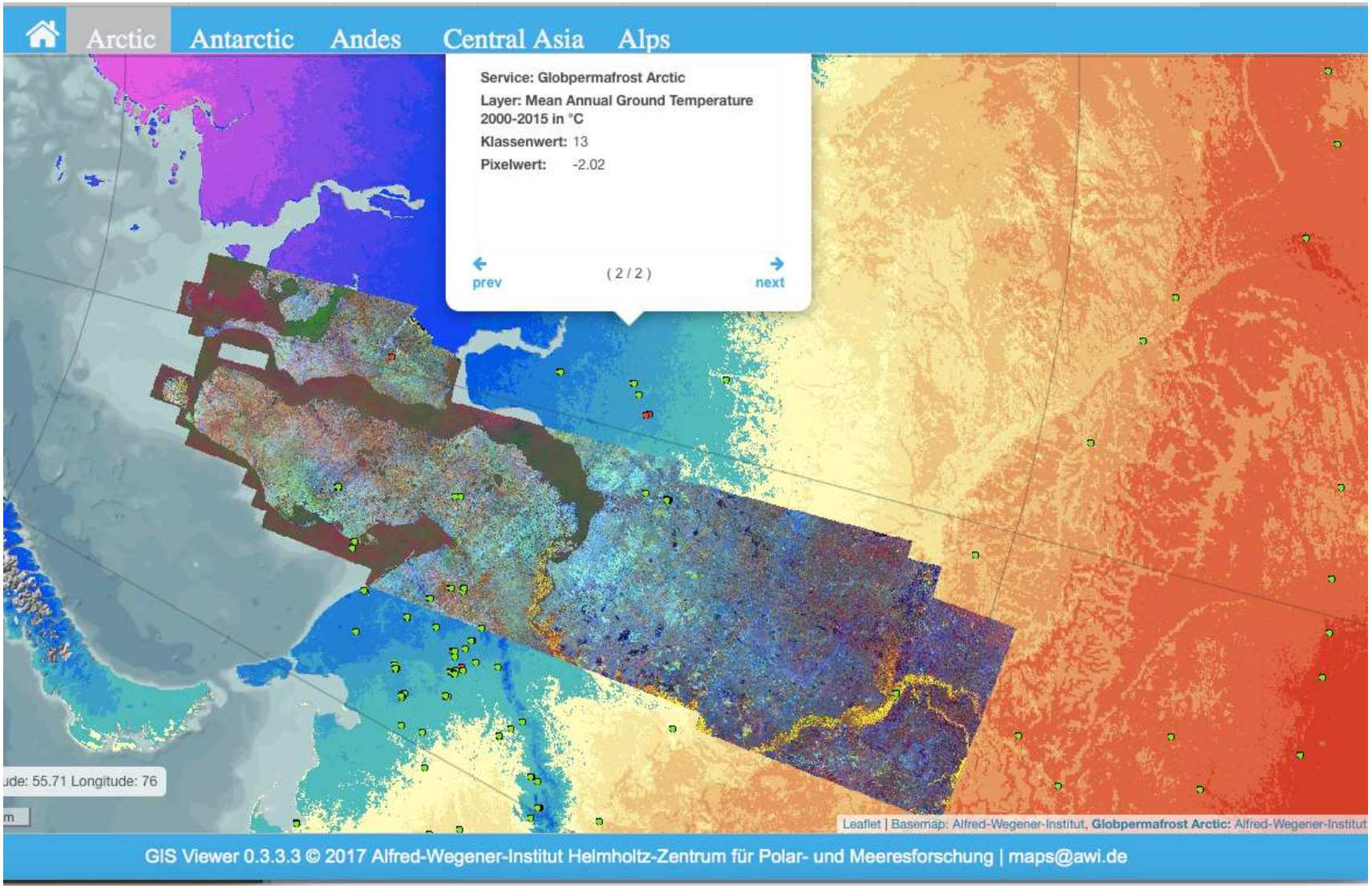
Schematic description of transient permafrost modelling driven by EO data (from Langer et al., 2013).

Heritage DUE GlobPermafrost

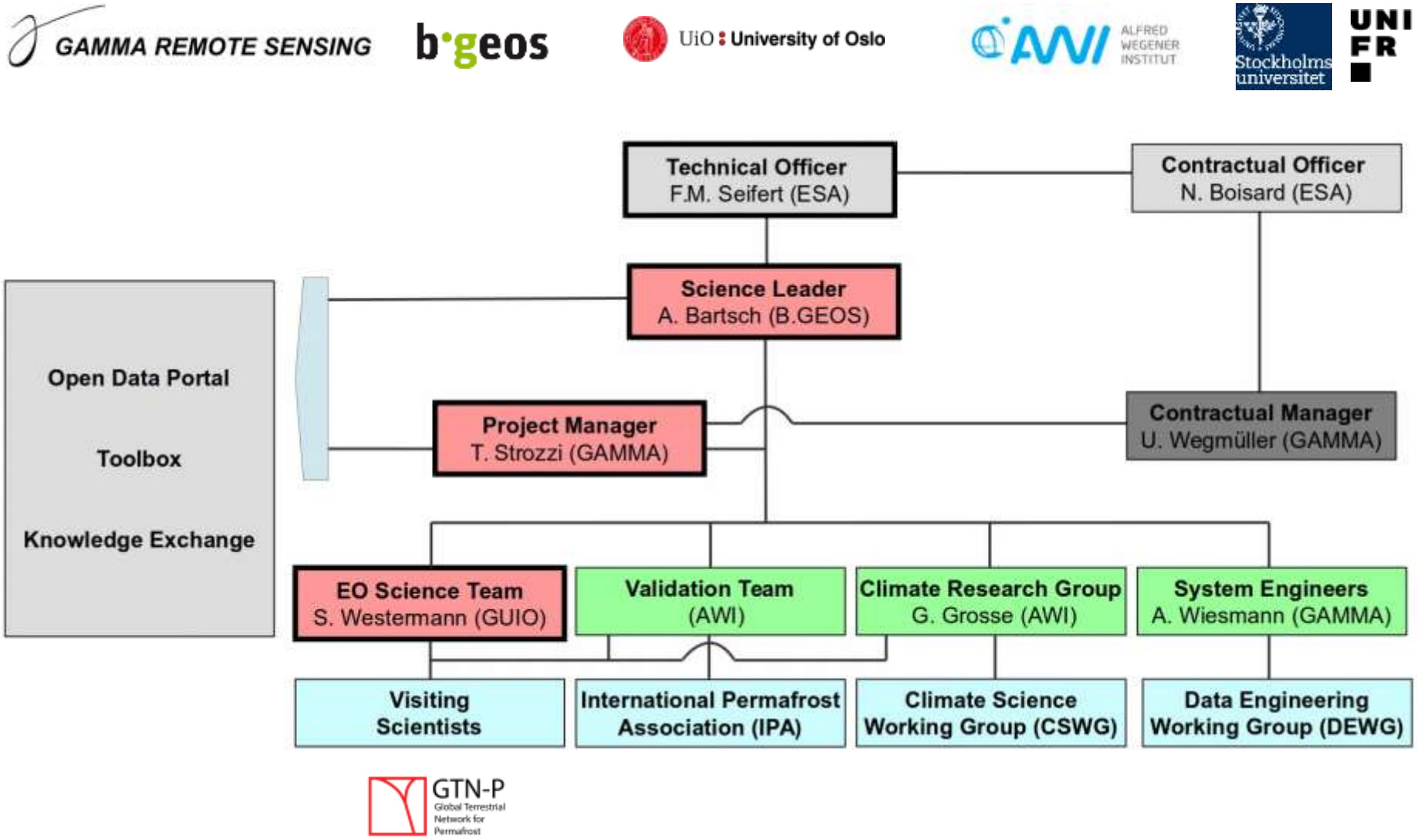


1. Land cover prototype → Definition of needs from landcover CCI+
2. Regional scale trend analyses → User case
3. Local scale lowland permafrost (subsidence, ground-fast ice, mass movements) → User case
4. Mountain Permafrost (rock glaciers) → Validation User case

Landsat Tassled cap trend 1999-2014
Mean Annual Ground Temperature (equilibrium model)



CCI+ Permafrost team



CCI+ Permafrost team

EO Science team	Validation team	Climate Research Group	System Engineers
Sebastian Westermann (GIUO)	Polar Terrestrial RG AWI: **Birgit Heim** Boris Biskaborn	Periglacial RG, AWI: **Guido Grosse [CSWG rep]** Ingmar Nitze Hugues Lantuit	**Andreas Wiesmann** (Gamma) [**DEWG rep**]
Annett Bartsch (b.geos)	Reynald Delaloye (UNIFR), PERMOS office	Atmospheric Physics, AWI: **Heidrun Matthes [CMUG rep]** Annette Rinke (co-chair WCRP Arctic CORDEX)	GIUO Team member
Gustaf Hugelius (Stockholm University)		Andreas Kääb (GUIO; lead author of the IPCC special report “Oceans and Cryosphere in a Changing Climate”)	
		Tazio Strozzi (Gamma)	

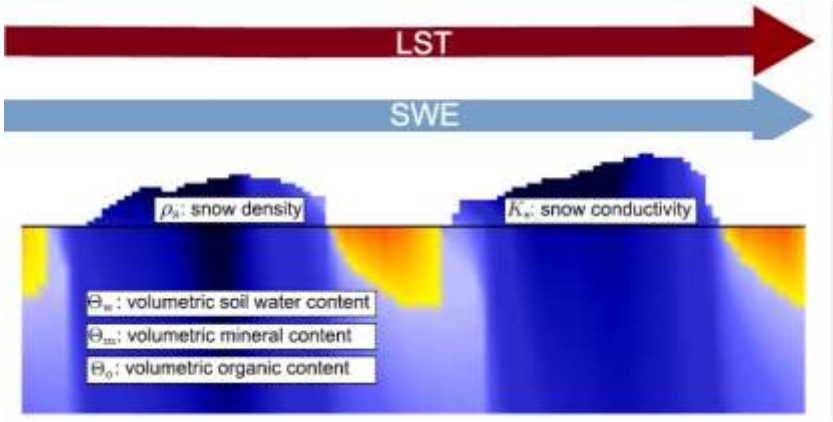
CCI+ Permafrost user cases

- **Evaluation and assessment of Team Climate Models** (Section Atmospheric Physics at AWI Climate Science; University of Exeter). ESMValTool will be tested for the regional model HIRHAM-CLM.
- **Initialization of Team Climate Models** using the CCI Permafrost Extent Product and investigation of resulting impacts on atmosphere physics and dynamics (Section Atmospheric Physics at AWI Climate Science)
- Evaluation and validation of MAGT in the CCI Permafrost Extent Product and in simulations from Team **Climate Models adapting GTN-P ground data** (Section Atmospheric Physics at AWI Climate Science, GTN-P office).
- Assessment of **linkages between carbon pools, land surface changes, and permafrost** using GlobPermafrost products (AWI GeoScience).
- Validation and **assessment for mountain permafrost regions** with in-situ observations of ground temperatures, changes in subsurface ice and unfrozen water content and velocities of permafrost creep from PERMOS and **satellite derived rock glaciers inventories** as well as trends from GlobPermafrost and Options.
- Evaluation of Arctic **climate change in coastal permafrost regions (**HORIZON2020 Nunataryuk)

CCI/CCI+ exchange opportunities

CCI+ Temperature

➡formulation of user requirements towards CCI+ temperature, evaluation and use if appropriate at later stage

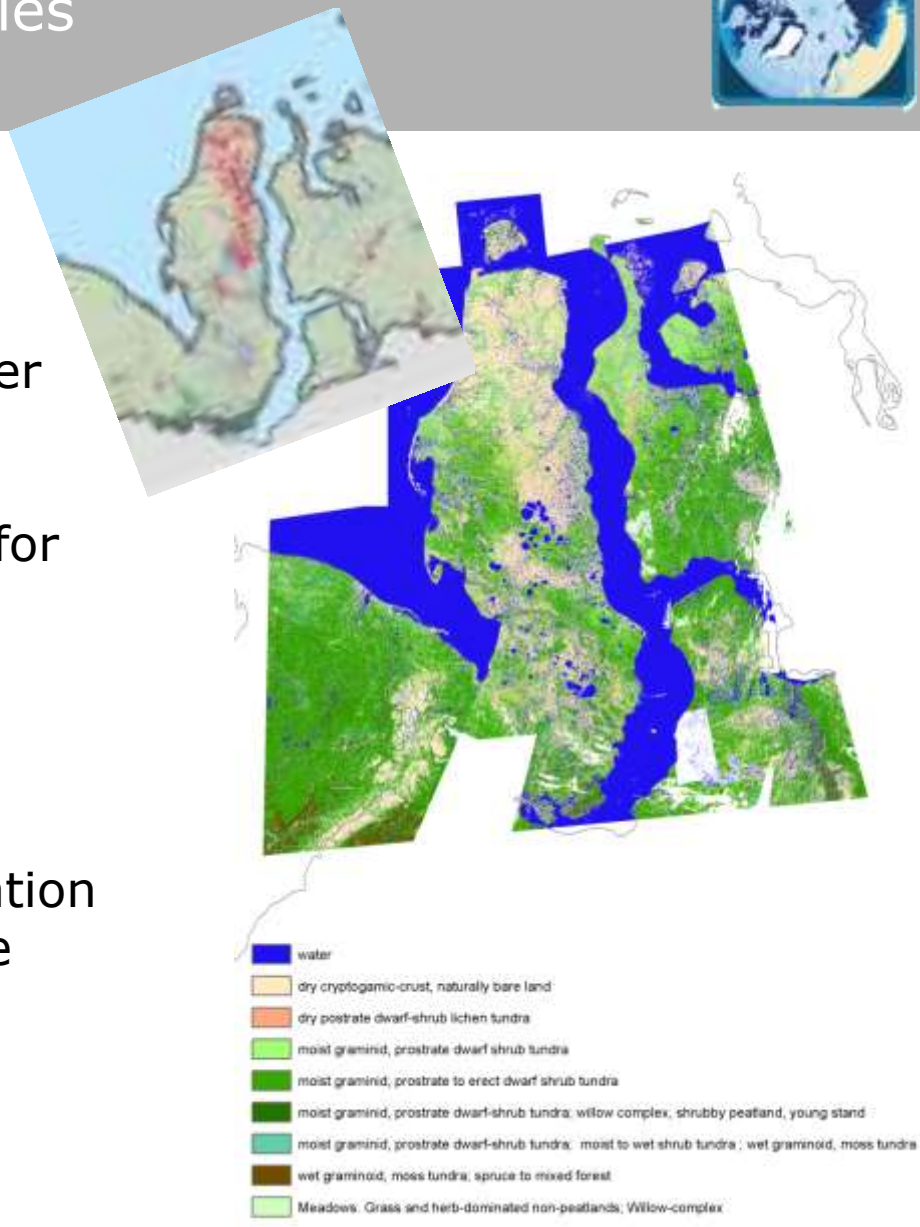


CCI+ Snow

➡formulation of user requirements towards CCI+ Snow, evaluation and use if appropriate at later stage

CCI/CCI+ exchange opportunities

CCI Landcover and CCI+ HR landcover



➡ post processing of CCI Landcover for permafrost modeling based on GlobPermafrost prototype for initial setup

➡ formulation of user requirements towards CCI+ HR landcover, evaluation and use if appropriate at later stage

➡ use of CCI+ HR landcover in permafrost region?

CCI/CCI+ exchange opportunities

CCI+ lakes

- selected lakes in Permafrost areas according to SoW

➡ coordination selection of lakes with GlobPermafrost and Permafrost CCI+

➡ consideration of CCI+ lakes results for application of CDR