

# ERC Starting Grant PETA-CARB

## Rapid Permafrost Thaw in a Warming Arctic and Impacts on the Soil Organic Carbon Pool

Guido Grosse\*, Josefine Lenz, Matthias Fuchs, Ingmar Nitze & Frank Günther  
\*guido.grosse@awi.de

Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Potsdam, Germany



ALFRED-WEGENER-INSTITUT  
HELMHOLTZ-ZENTRUM FÜR POLAR-  
UND MEERESFORSCHUNG

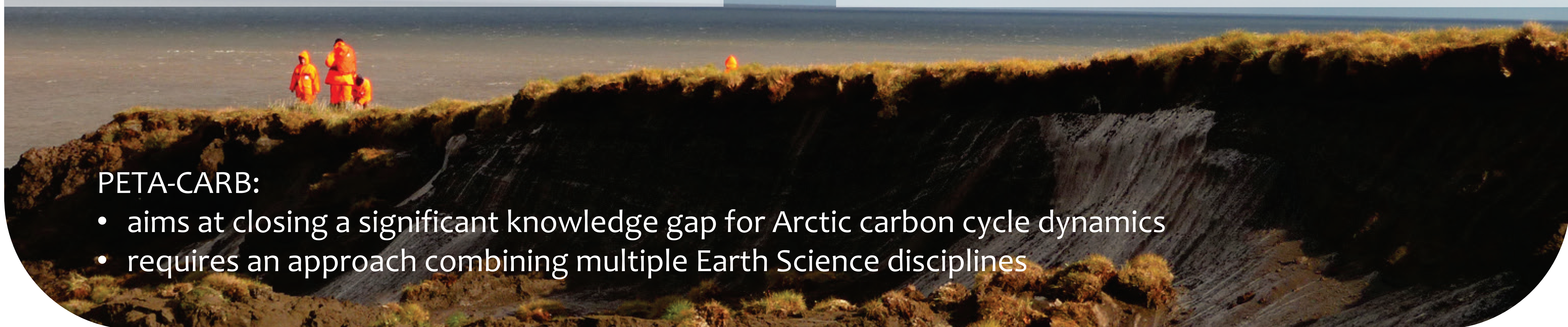


### Motivation

- 1600 Pg soil organic carbon (SOC) in permafrost
  - Twice the carbon in the atmosphere, high uncertainties
- Arctic warms rapidly
  - Mobilization of permafrost SOC, greenhouse gas release causes positive climate feedback
- Thermokarst and thermo-erosion
  - Substantially speed up SOC mobilization, not considered in Earth System Models
- Quantification of thermokarst dynamics
  - Requires remote sensing-based upscaling
  - Vulnerability assessments

### Research Questions & Objectives

- Can rapid permafrost thaw release significant amounts of SOC on decadal time scales?
  - Systematic measurement of rapid permafrost thaw
- Can carbon sequestration in thermokarst land-forms offset its release? Are past thermokarst rates and carbon dynamics representative for the current warming?
  - Determining deep permafrost SOC stocks and carbon accumulation rates
- How large are the deep permafrost SOC pools and how vulnerable are they to thaw?
  - Quantification and vulnerability assessment



#### PETA-CARB:

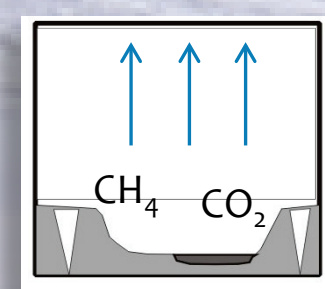
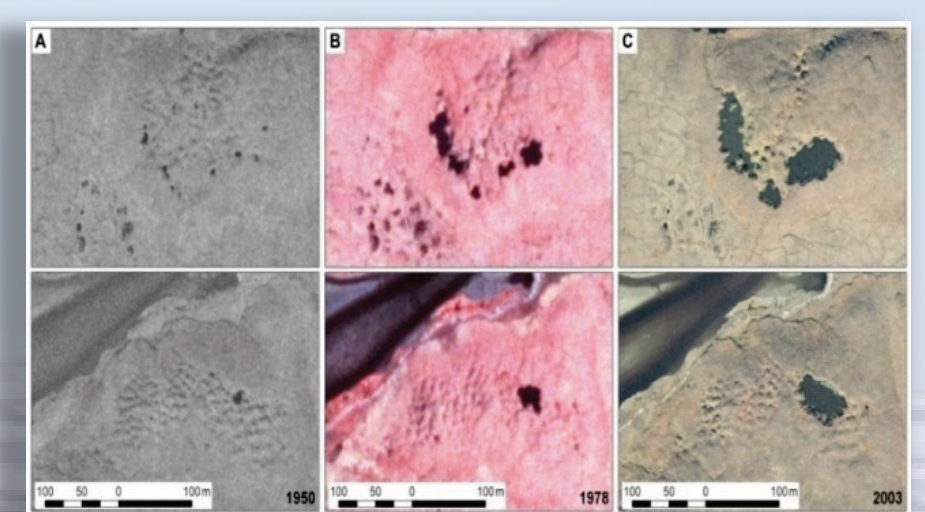
- aims at closing a significant knowledge gap for Arctic carbon cycle dynamics
- requires an approach combining multiple Earth Science disciplines

### Work Packages

#### Landscape Dynamics of Rapid Thaw

High spatial resolution remote sensing of thermokarst features

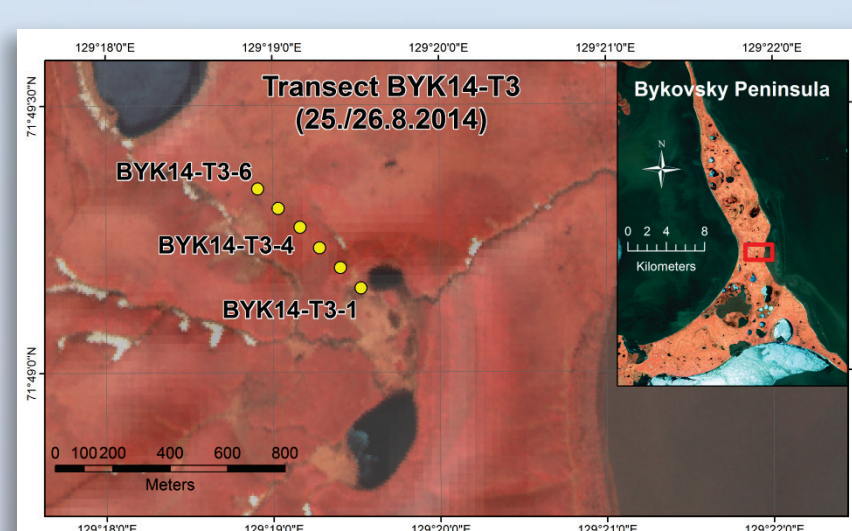
Landscape-scale modeling of thermokarst and SOC mobilization



#### Deep Soil Carbon Stocks

Field and lab studies of SOC stocks

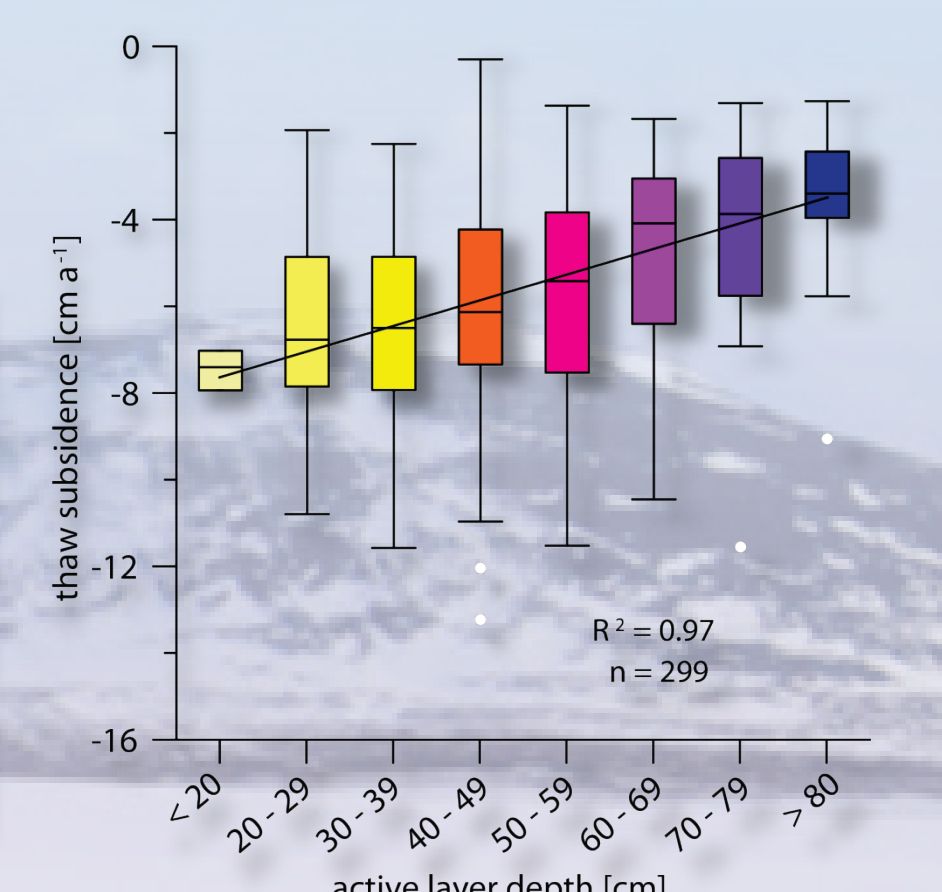
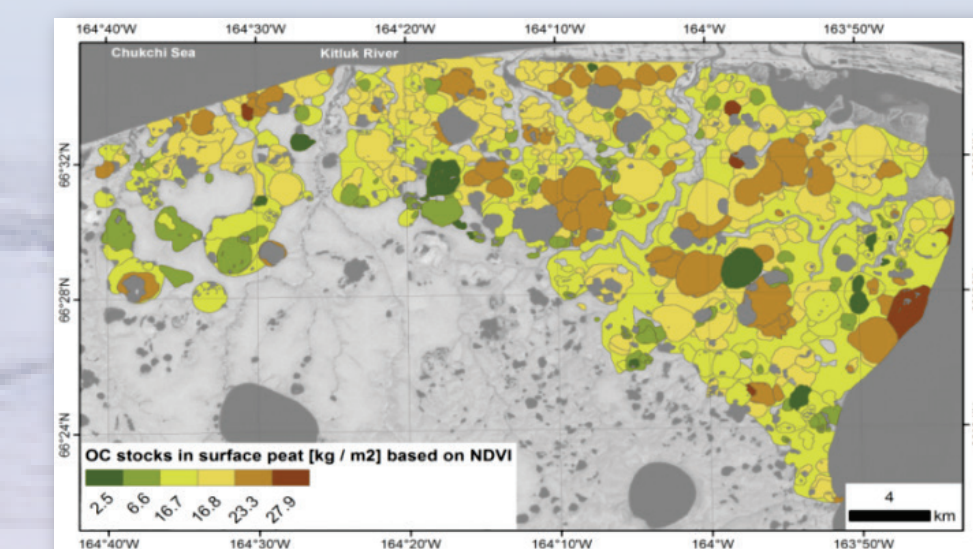
SOC accumulation and thermokarst chronology



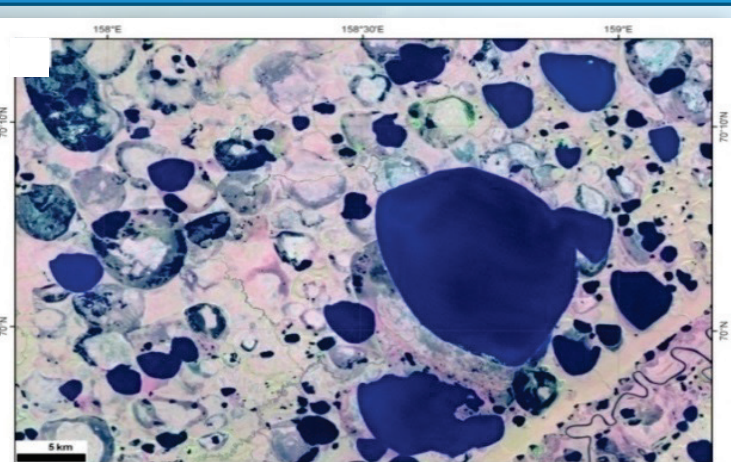
#### Distribution and Vulnerability of Deep Soil Carbon Pools

Spatial extent of lakes, basins, river deltas, and Yedoma + upscaling of SOC

Vulnerability of SOC pools to thermokarst



### APGC - Arctic Permafrost Geospatial Centre



Remote sensing and GIS data processing and automation, recovery of historical geospatial data, spatial data management, data archival and serving / distribution

