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MOSES

Modular Observation Solutions for Earth Systems

Events and Trends: Impact of Disturbances on Earth Systems

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Scientific Case

Overarching Research Question

Interactions of short-term EVENTS and long-term TRENDS

Events

- Heatwaves
- Hydrologic Extremes
- Ocean Eddies
- Thaw Events Permafrost

Event-driven Observation Concept

Captures processes and impacts by an “event chain” approach

Evaluation Concept EVENTS & TRENDS

Integrates MOSES event data into large-scale and long-term monitoring networks which serve as reference systems

THAW EVENTS: BATAGAIKA CRATER



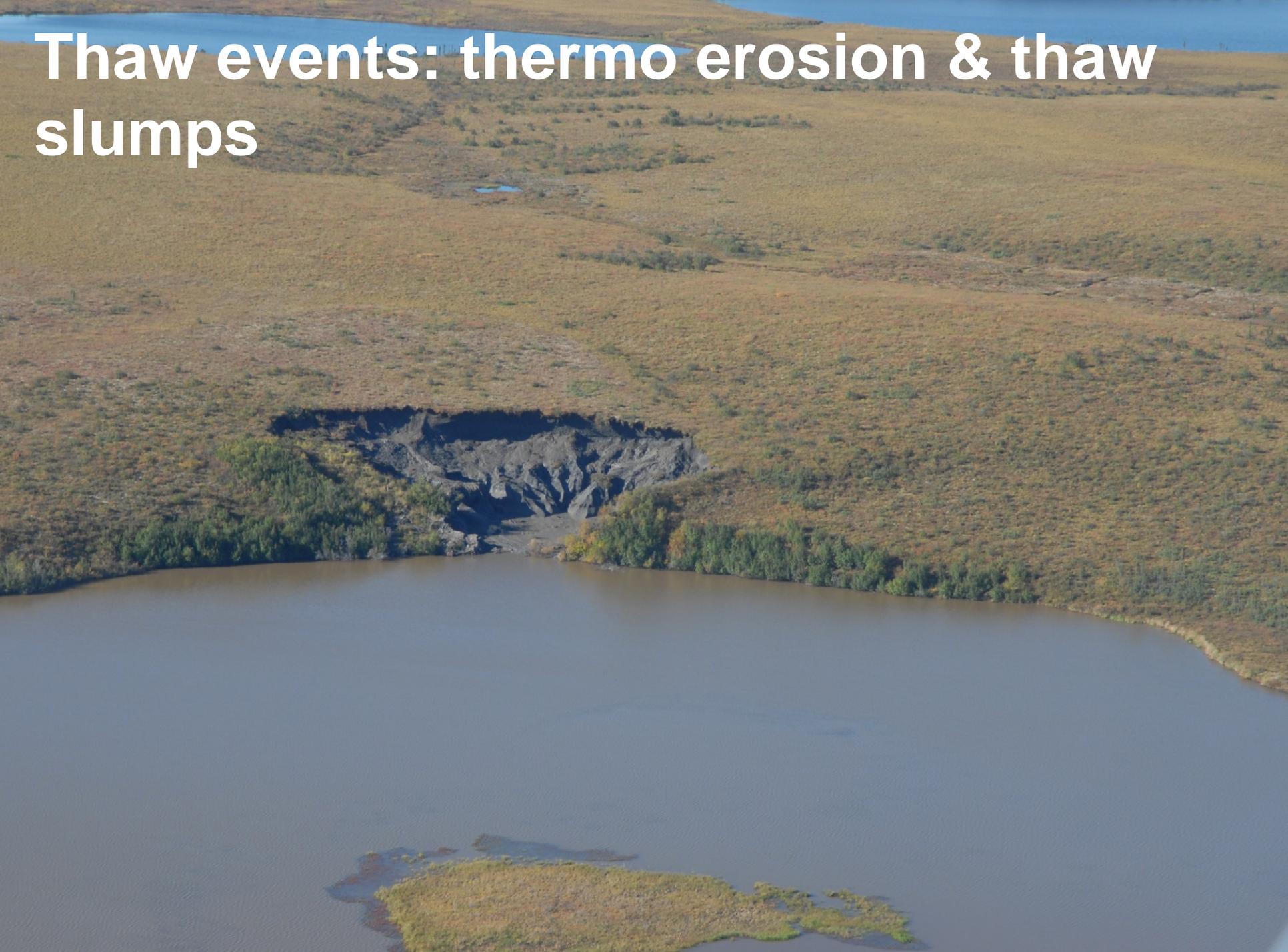
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<http://www.bbc.com/earth/story/20170223-in-siberia-there-is-a-huge-crater-and-it-is-getting-bigger>

Thaw events: thermo erosion & thaw slumps



Thaw events: thermo erosion & thaw slumps



MOSES Reference Systems

Helmholtz Observatories: Cape Verde, COSYNA, Lena River Delta, TERENO

- **Central sites for MOSES implementation phase**
- **Target areas for MOSES operation phase**

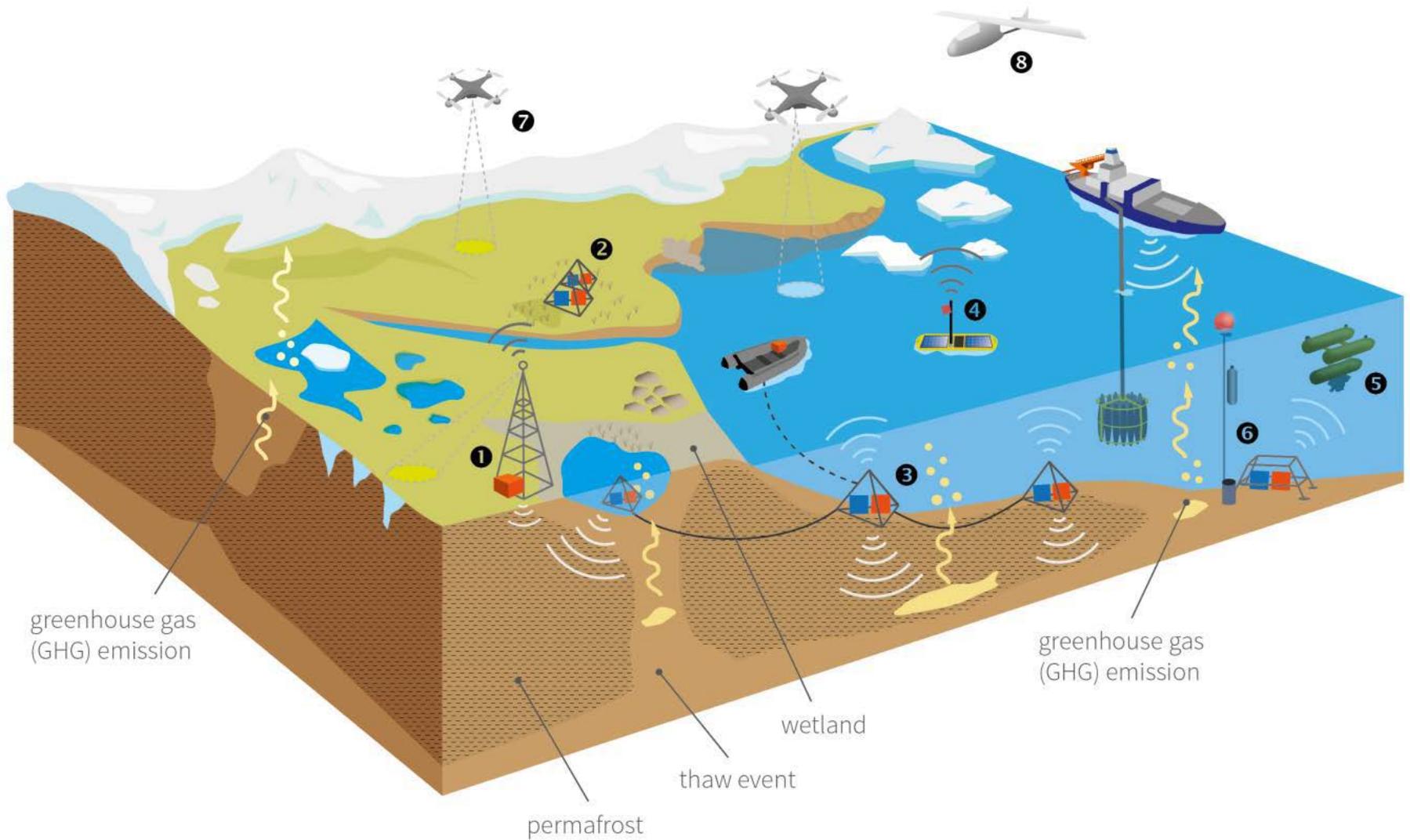
International Monitoring Networks: ICOS, FLUXNET, LTER, EuroGOOS, ...

- **Long-term monitoring data**
- **Target areas for MOSES operation phase**
- **MOSES extends and complements the existing observation capabilities by event-oriented observation systems**

Satellite Missions: MODIS, Sentinels, EnMAP, GRACE-FO, TANDEM-L, ...

- **Large scale monitoring data**
- **Multi-parameter monitoring data**
- **ACROSS + HGF Alliance “Remote Sensing” link in-situ with satellite data**

MOSES infrastructure- Permafrost thaw events



MOBILE INSTRUMENTS

- **GFZ-1:** GHG flux measurements using UAV
- **GFZ-2:** Development of mobile autonomous passive seismic sensor platform (aquatic and land)
- **GEOMAR:** WaveGlider, AUVs
- **FZ Jülich:**
 - GHG : 2 x Picarro G2508 N₂O, CH₄, CO₂, NH₃, H₂O Analyzer, N₂O
 - Isotopes: Aerodyne N₂O Isotopic Monitor or Picarro G5131
 - Miniaturization of N₂O & CH₄ isotopic analyzers
 - Trailer for mobile terrestrial system measurements
- **AWI:** GPS subsidence units, drone for aerial imaging (SfM), terrestrial and aquatic sensors (physical state, permafrost subsidence, GHG concentrations)

Total Funding

- 28 Mio.€, 8 centres + DLR, 5 years for implementation
- ~ 1 Mio.€, AWI permafrost

MOSES Goals

societal

- Improve early warning and direct actions
- Improve forecasts and scenarios on Global Change

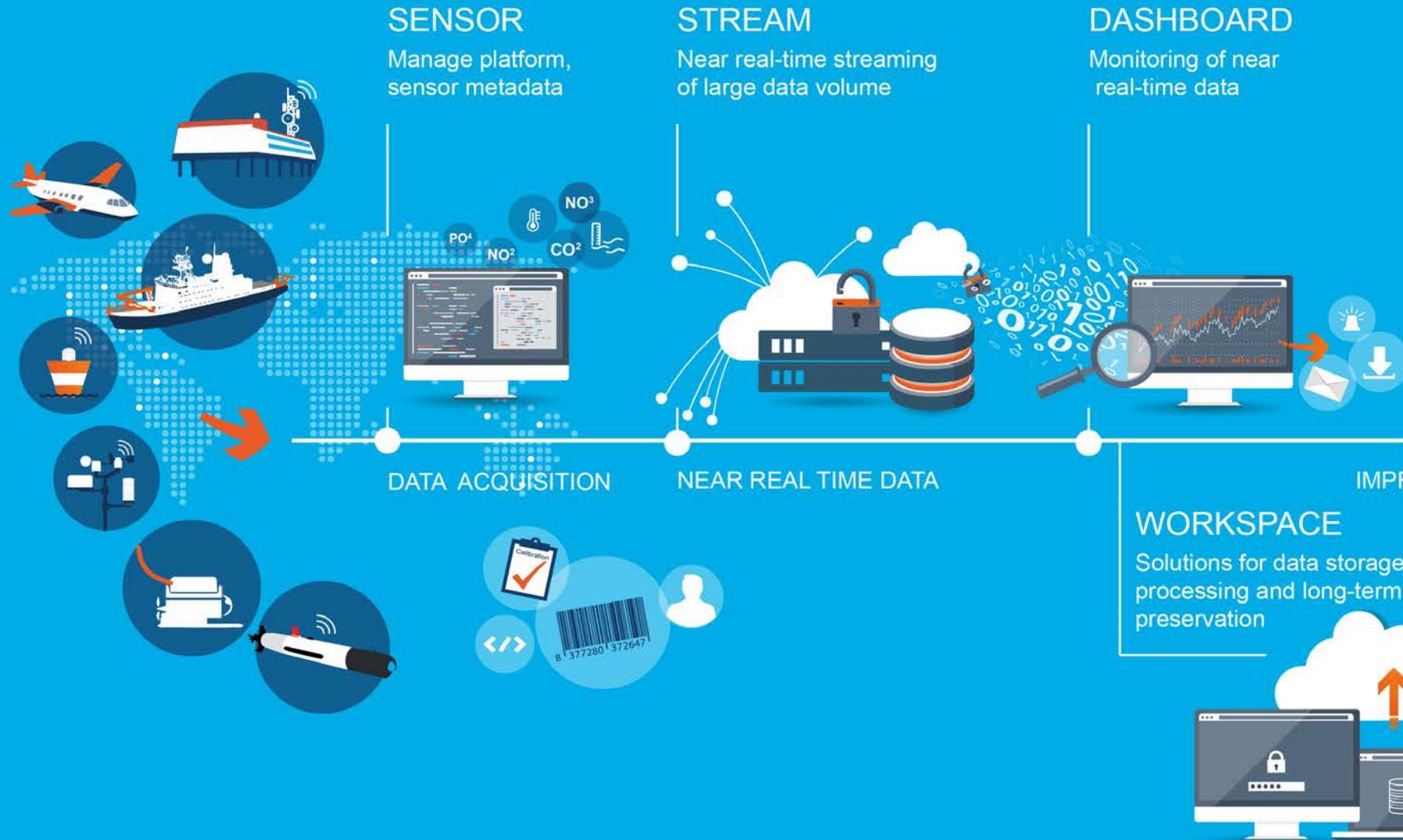
building capacity

- Offer a transdisciplinary and cutting edge research infrastructure

technical and scientific

- Implement a novel observation system for dynamic events:
highly mobile, flexible, high resolution, along and across compartments
- Complement and extend the existing international monitoring networks
- **Improve process knowledge: Impacts auf distinct events on regional to global Earth- and Environment development**
- **Improve models and forecasts: Integration of highly dynamic events and their feedbacks in Earth System Modelling**

DATA FLOW FRAMEWORK



DATA FLOW FRAMEWORK



DASHBOARD

Monitoring of near real-time data

ANALYSIS

Data viewing and analysis solutions;
Map-based visualization services

PORTAL

One-stop-shop framework
Interoperability services



IMPROVE DATA → ★★★★★

WORKSPACE

Solutions for data storage,
processing and long-term
preservation

STORAGE ARCHIVE



REPOSITORIES

Data and data products
Publications, presentations,
field reports



Timetable

Project duration: 2017-2021

2018: Expedition NWT/Mackenzie; use new road (Inuvik → Tuktoyaktuk) for access to areas and testing of sensors

2020: Lena River Expedition

Challenge: Finding money for research on the data!

