

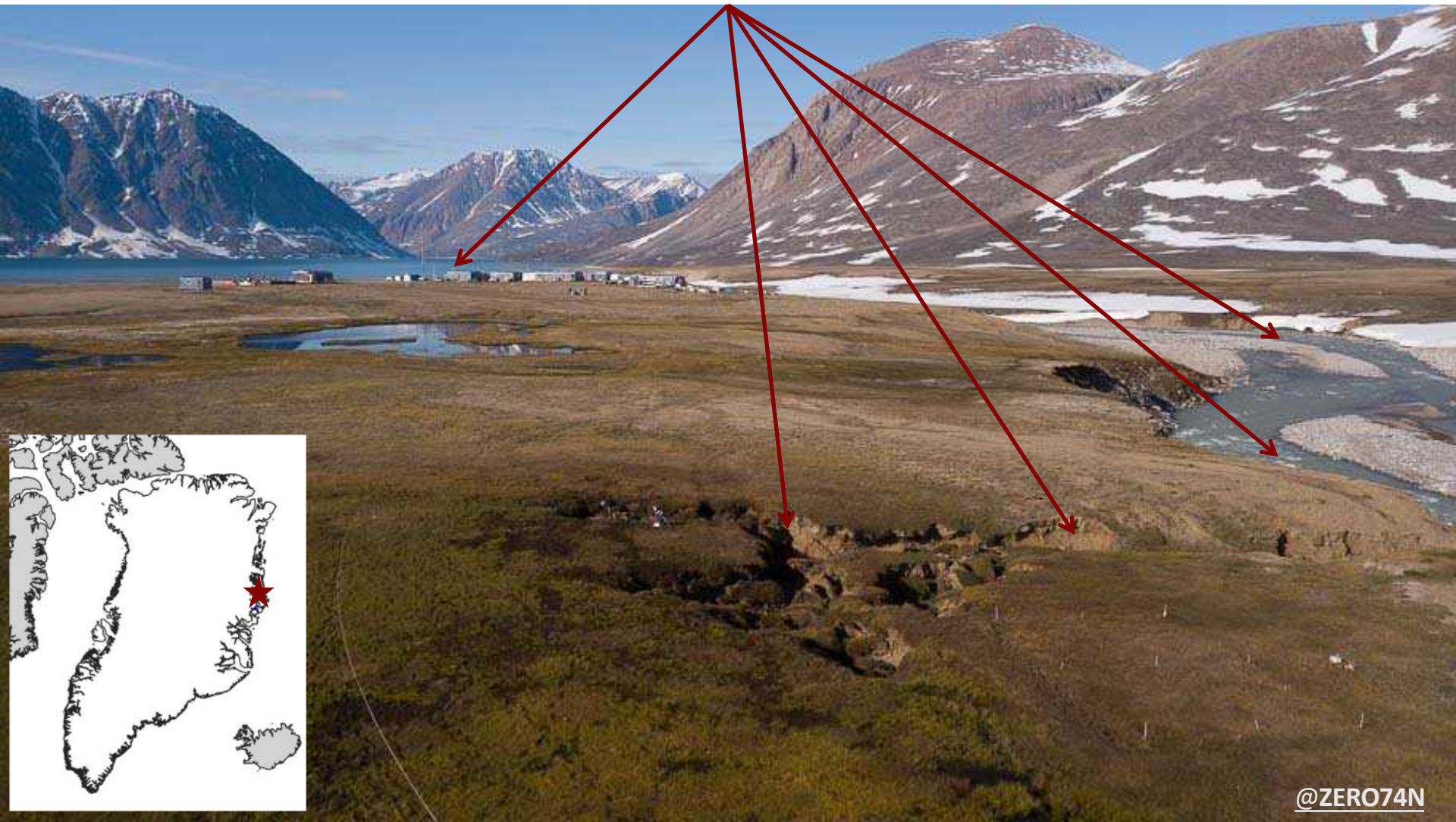


Mobilization of particulate organic matter and minerals in Zackenbergl valley, Greenland

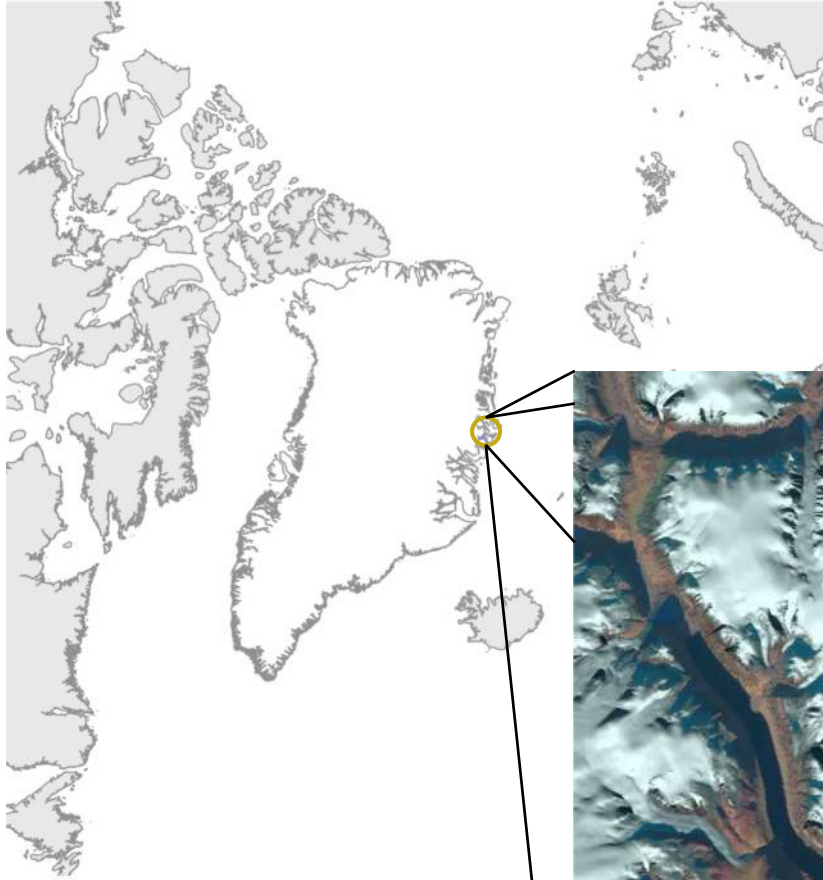
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and Julien Fouché*

Field site: Zackenberg Ecological Research Operation (ZERO)

Transect: Permafrost disturbances → streams draining permafrost soils
→ glacial-fed river → marine environment



Field site: Zackenberg Ecological Research Operation (ZERO)



Study area

High Arctic tundra

Mean Annual Temperature: -9.2°C

Precipitation: 261 mm (10 % falls as rain)

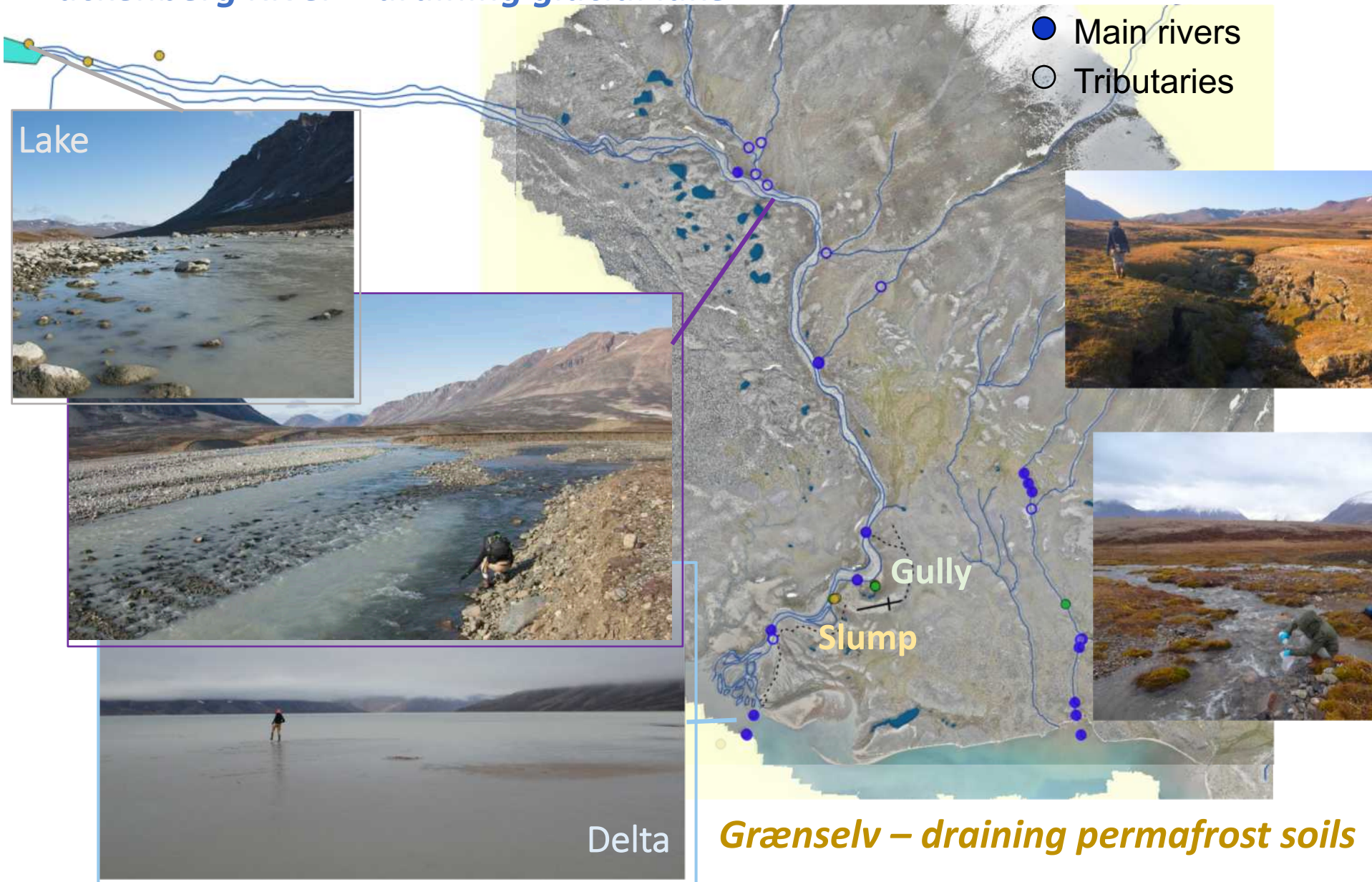
Deep continuous permafrost

Active layer thickness: 30-100 cm



Fluvial transport: glacial river and permafrost streams

Zackenbergl River – draining glacial lake



Fluvial transport: **glacial river** and **permafrost streams**



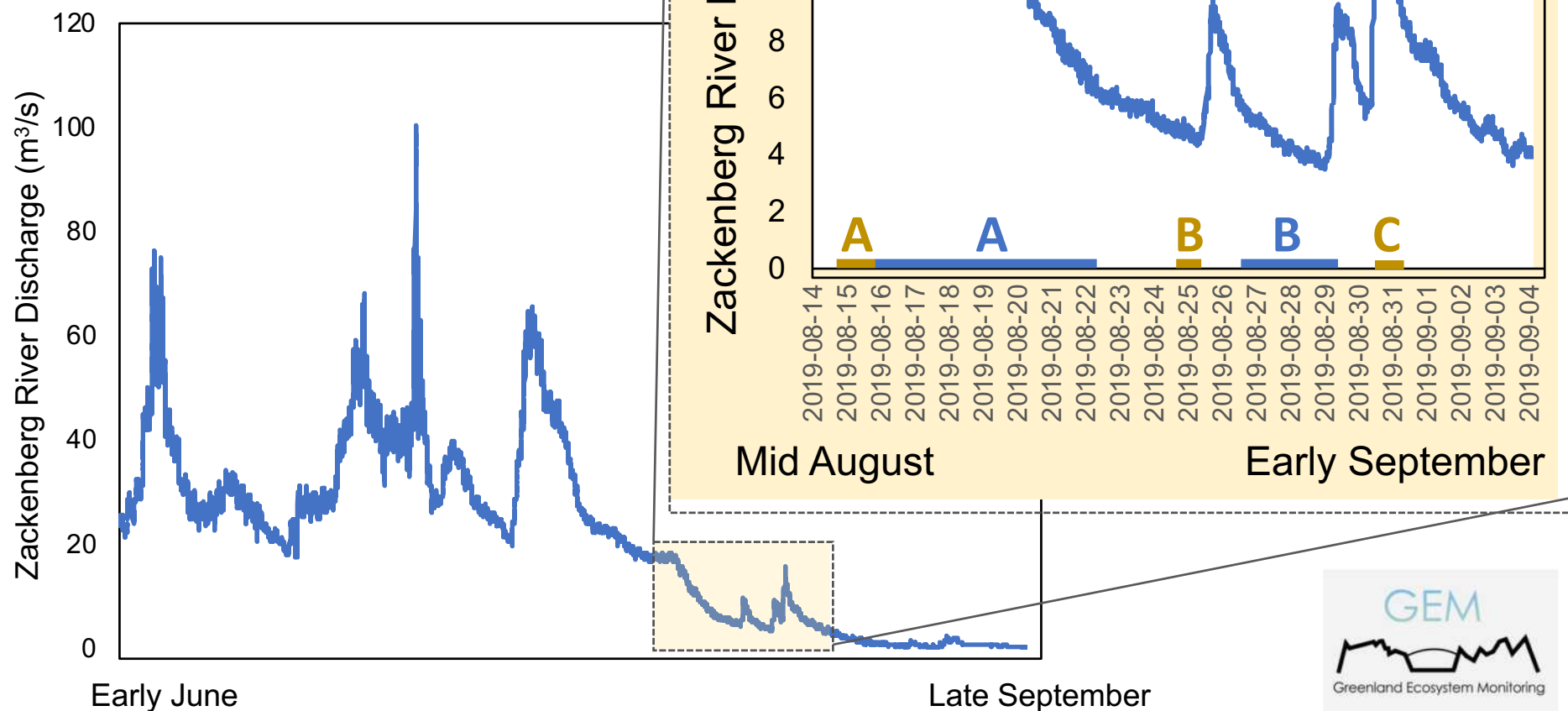
Lake

Delta

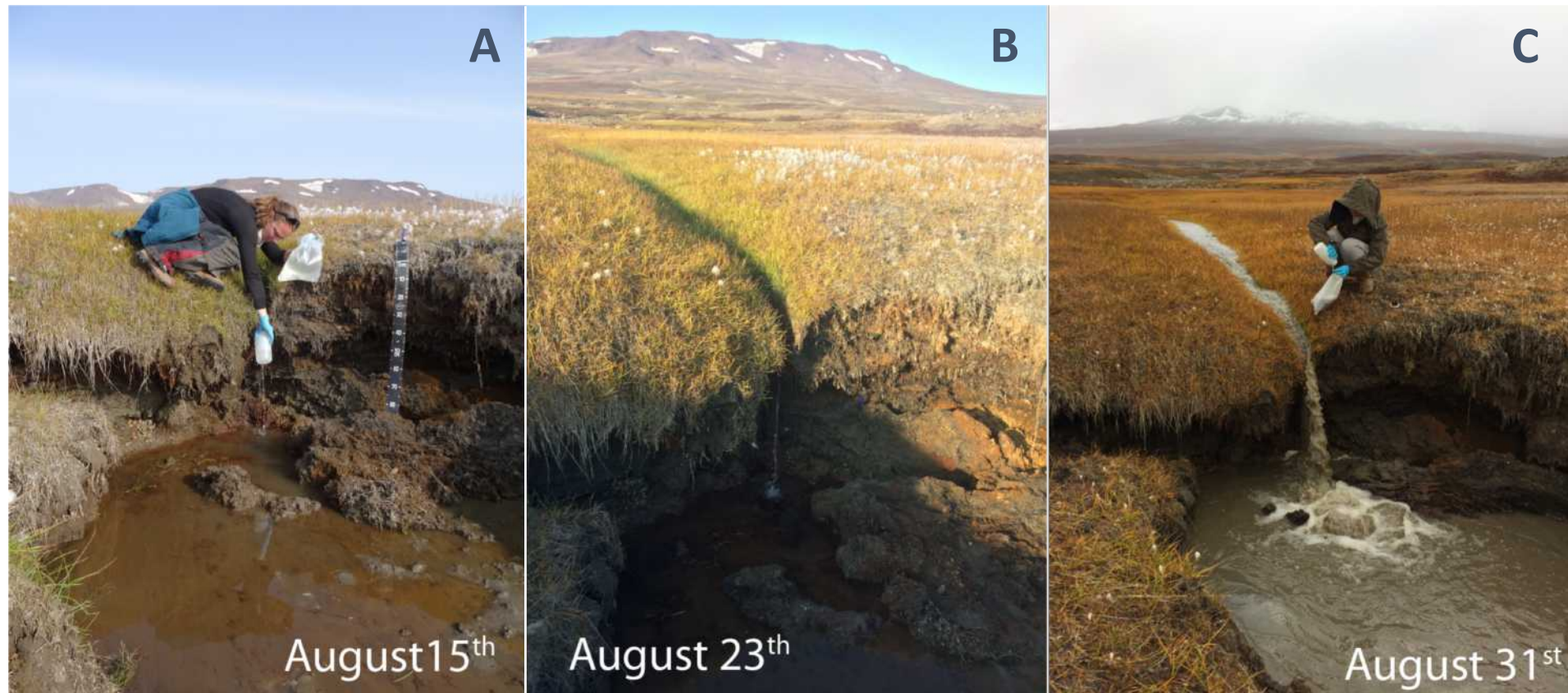
Hydrologic conditions during the sampling period:

Zackenbergl River

Discharge

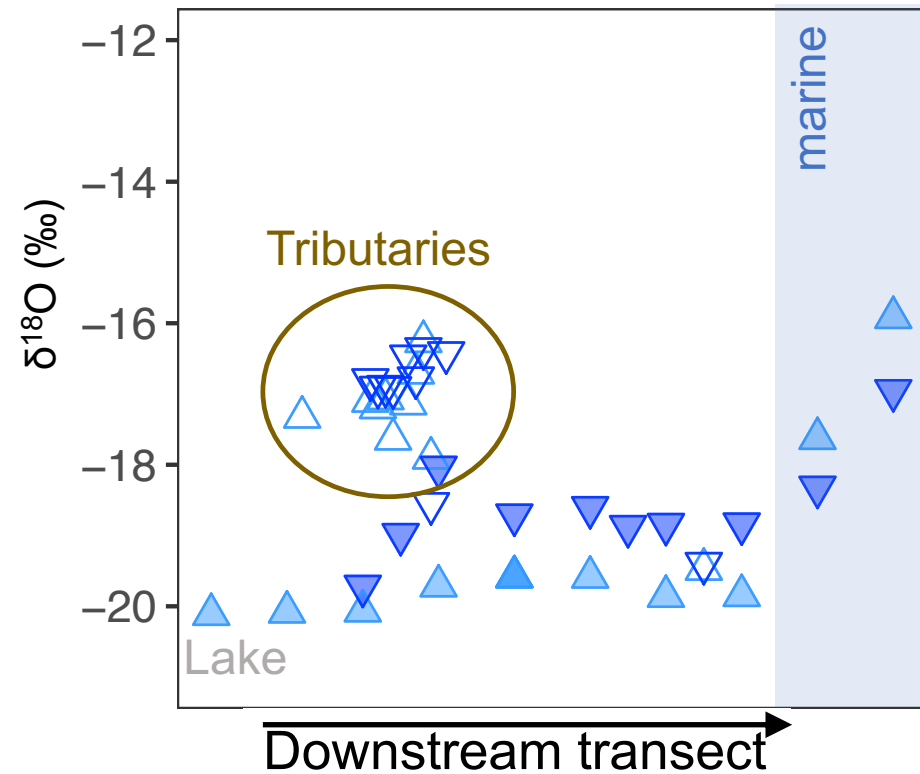


Contrasting hydrologic conditions: Grænselv upstream

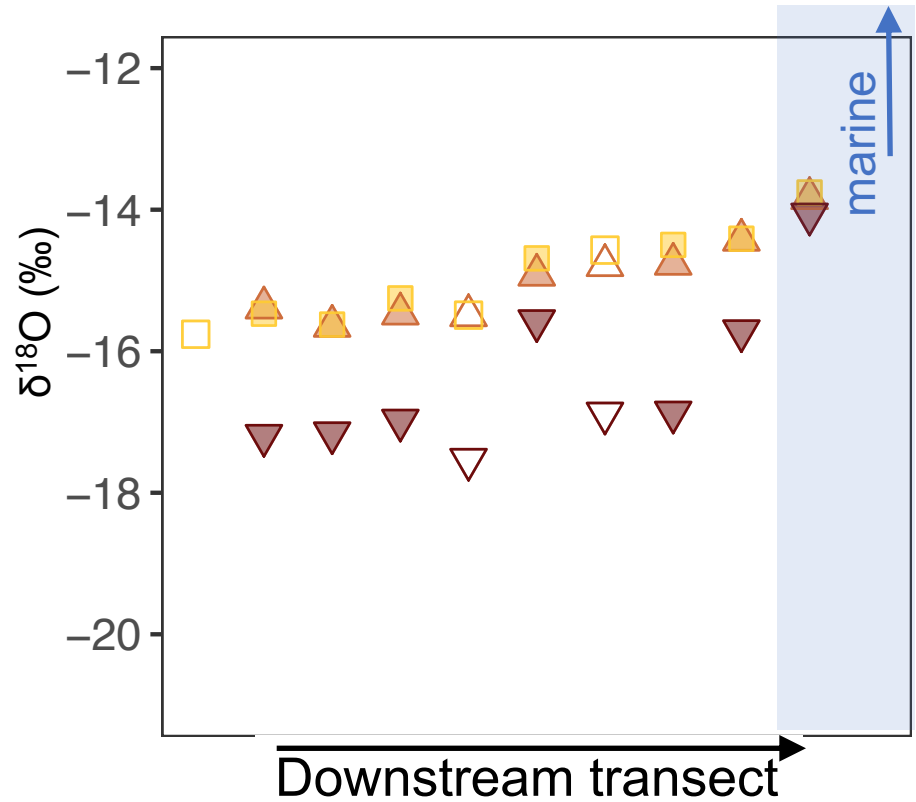


Results – Water isotopes indicate water sources

Zackenbergr River ▲ A ▼ B

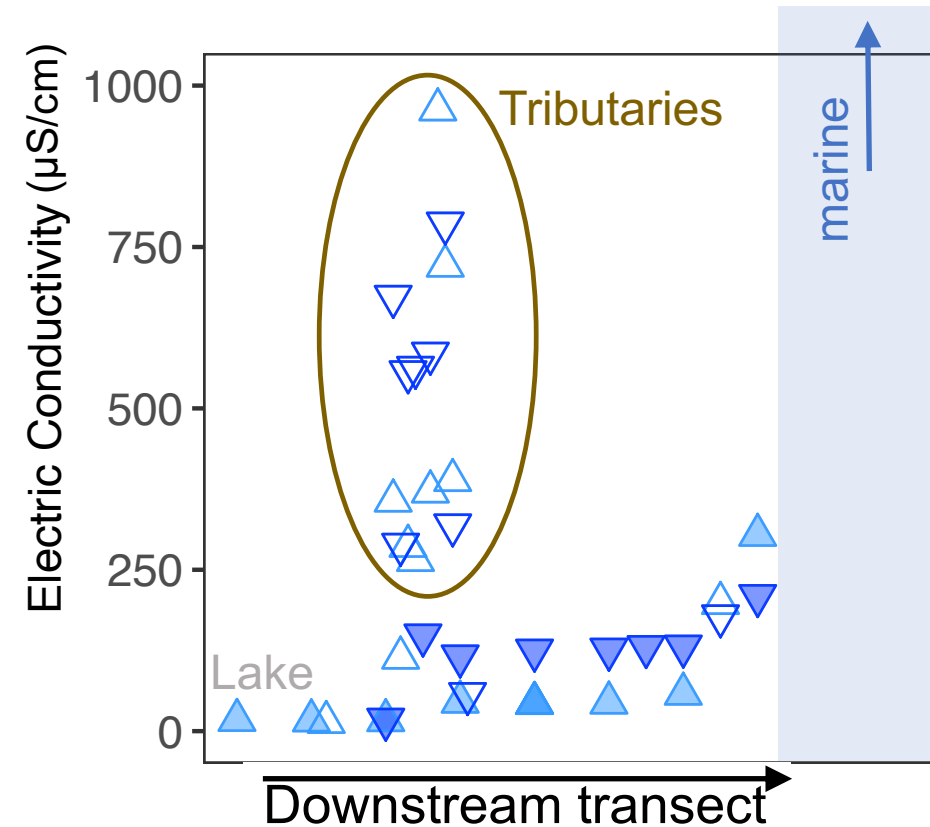


Grænselv ▲ A ■ B ▼ C

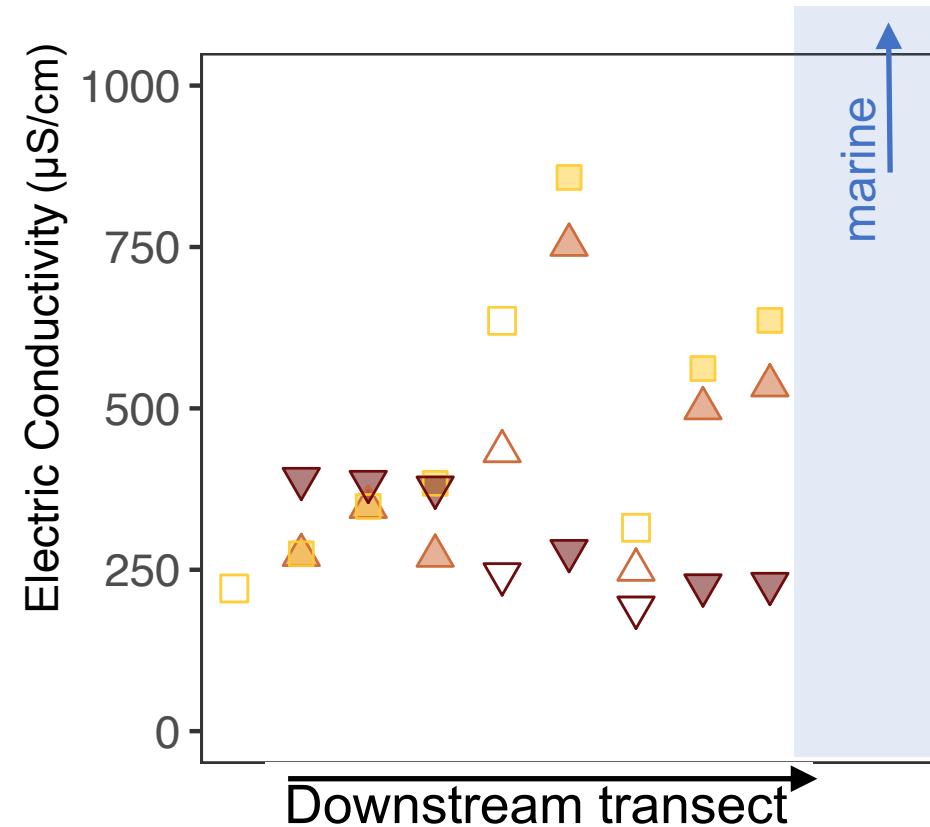


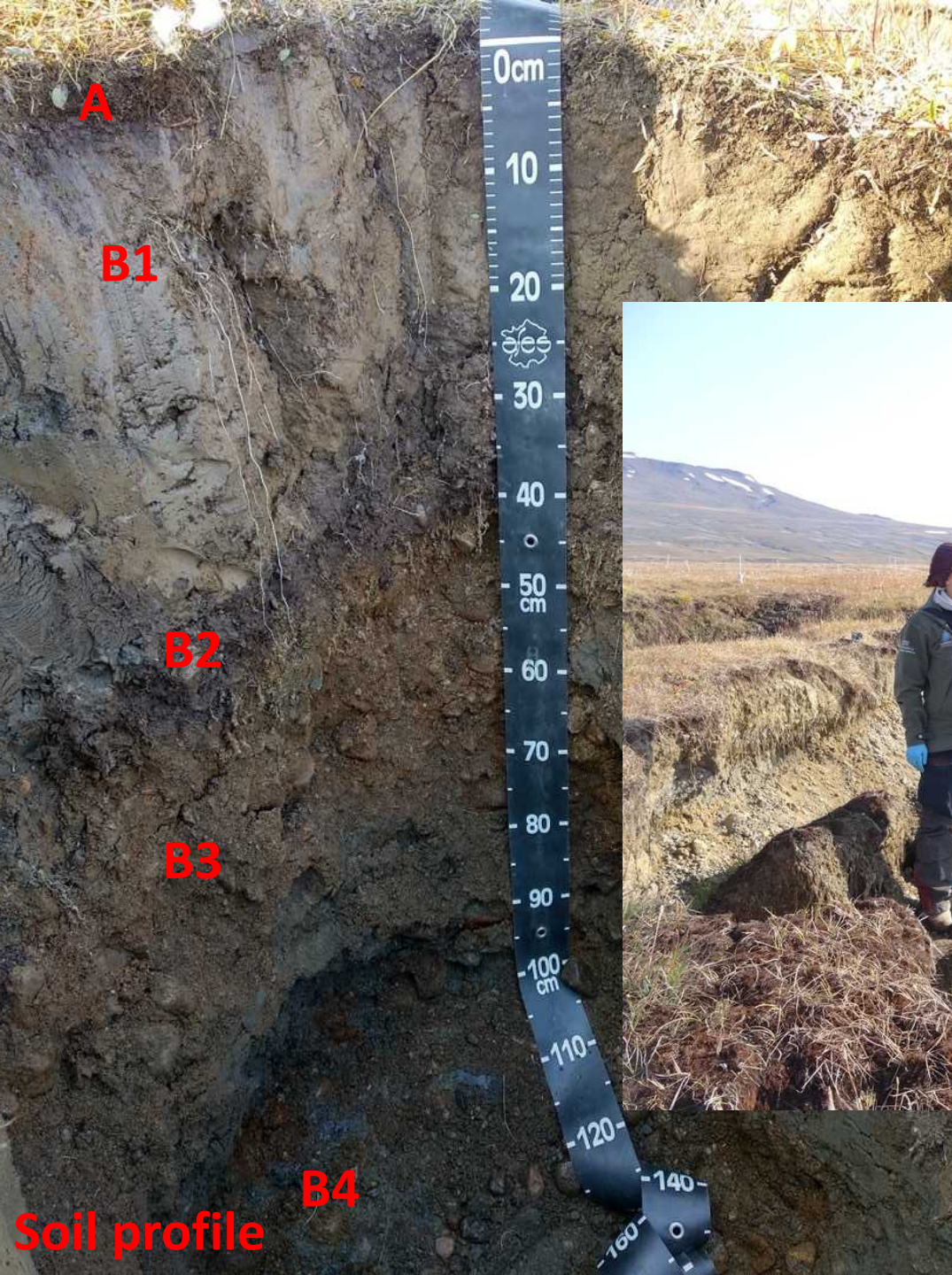
Results – Electric conductivity downstream

Zackenberget River ▲ A ▼ B



Grænselv ▲ A ■ B ▼ C





Permafrost disturbance: Thermo-erosion gully



Soil profile B4

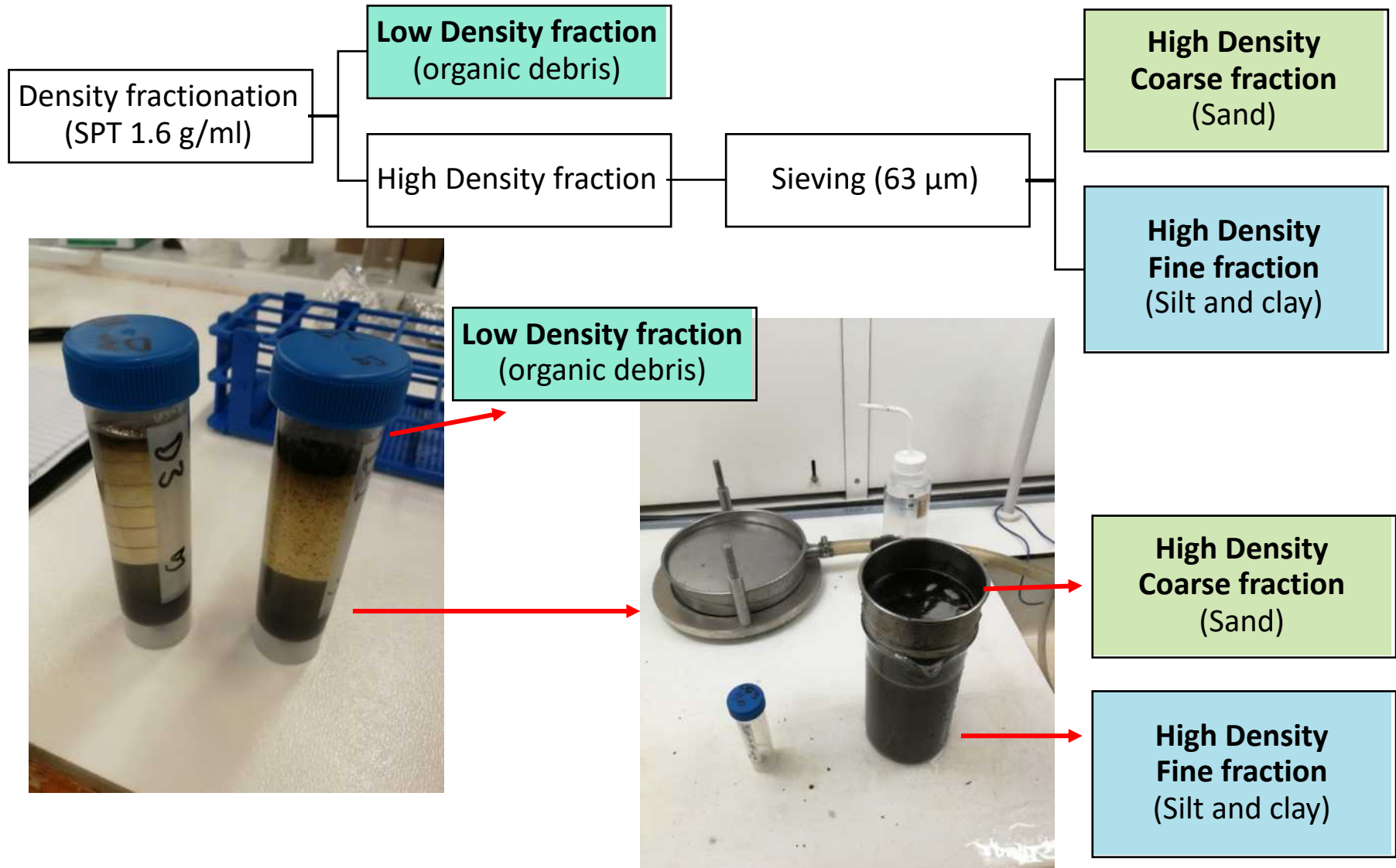
Permafrost disturbance: Retrogressive thaw slump



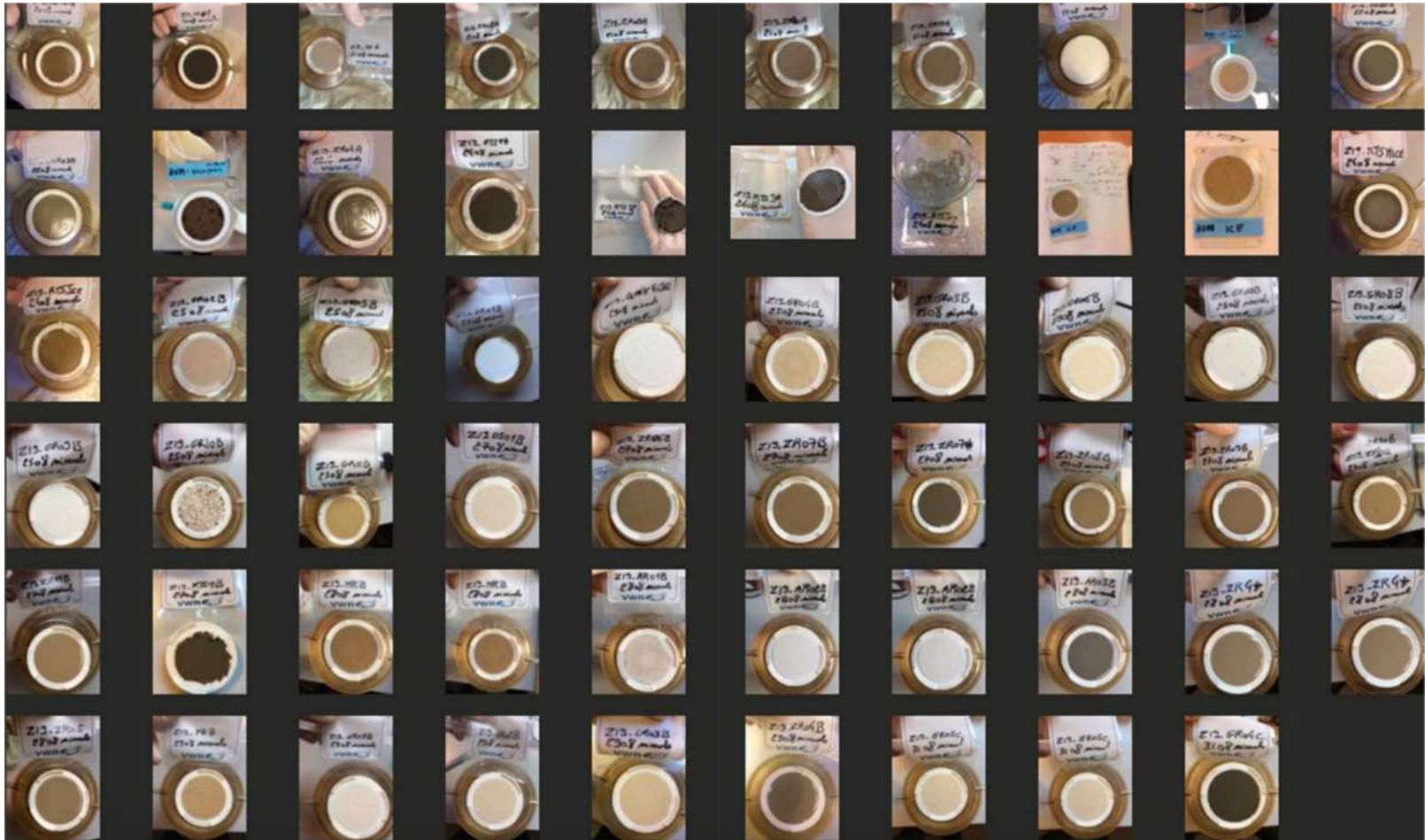
Pure ice!



Work in progress: Density and grain size fractionation



Work in progress: Particulate mineral element composition



Work in progress: Specific molecular biomarker analyses on soils, sediments and particulate organic matter



Plant wax lipids: tracers for organic matter derived from vascular plants

brGDGTs: tracers for soil-derived organic matter (microbial?)

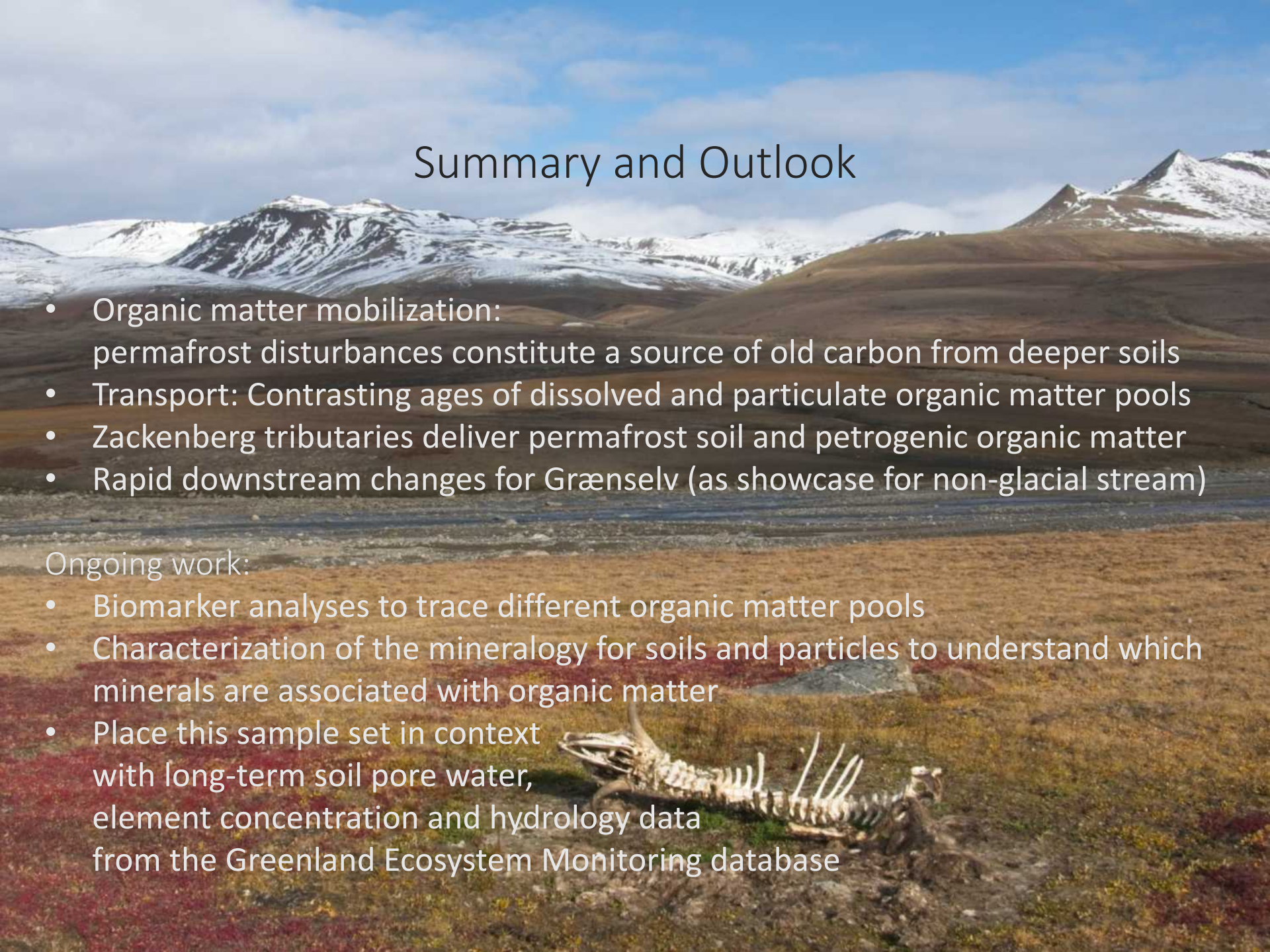
*Additional information:
Degradation indices*

Summary and Outlook

- Organic matter mobilization: permafrost disturbances constitute a source of old carbon from deeper soils
- Transport: Contrasting ages of dissolved and particulate organic matter pools
- Zackenberg tributaries deliver permafrost soil and petrogenic organic matter
- Rapid downstream changes for Grænselv (as showcase for non-glacial stream)

Ongoing work:

- Biomarker analyses to trace different organic matter pools
- Characterization of the mineralogy for soils and particles to understand which minerals are associated with organic matter
- Place this sample set in context with long-term soil pore water, element concentration and hydrology data from the Greenland Ecosystem Monitoring database



ZERO



ZACKENBERG ECOLOGICAL RESEARCH OPERATIONS

INTER⇌ACT



Questions?

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