

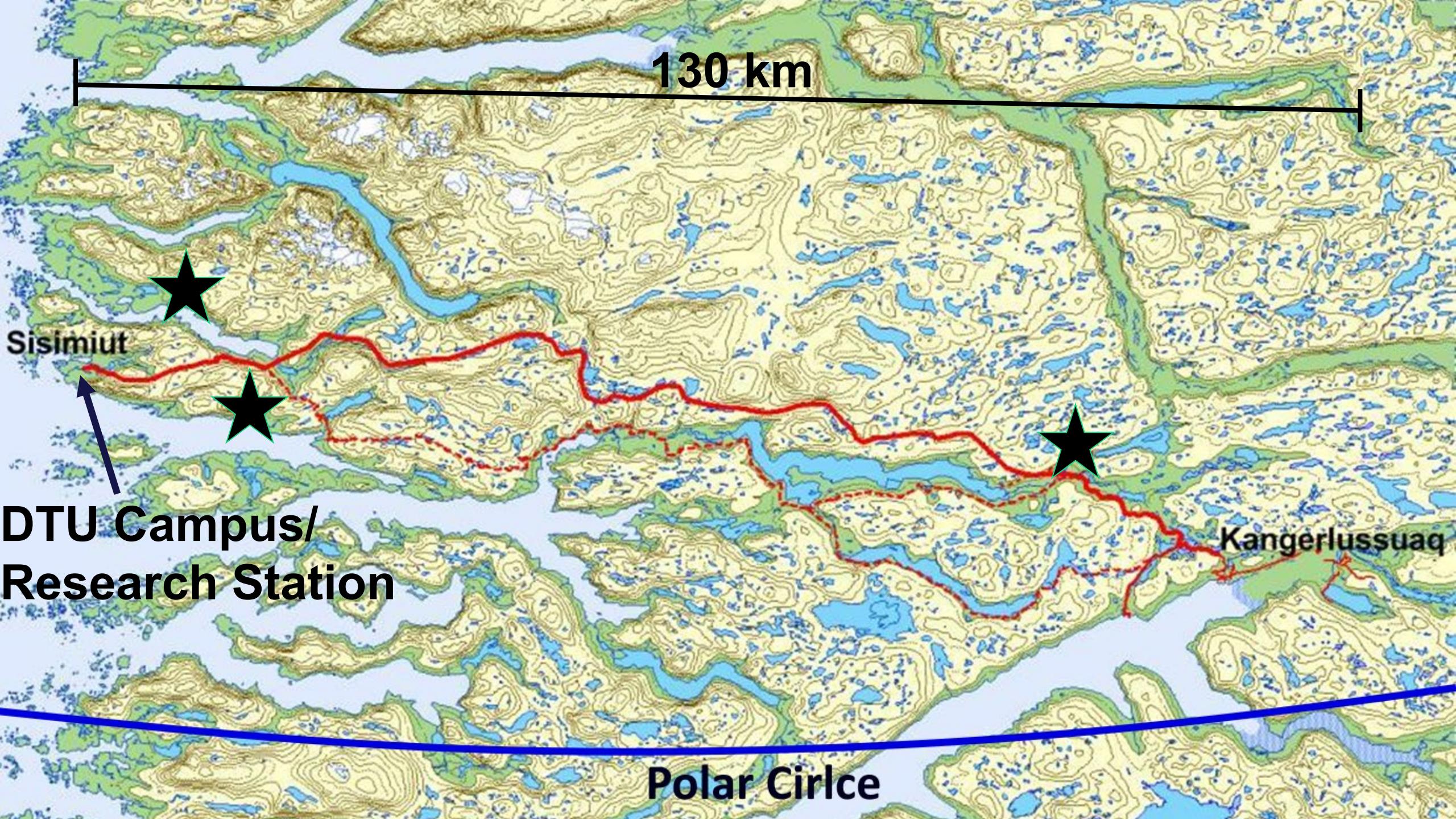
Investigating Landslides and Permafrost from Kangerlussuaq to Sisimiut

Steffen Ringsø Nielsen – PhD student

Arctic DTU – DTU Sustain

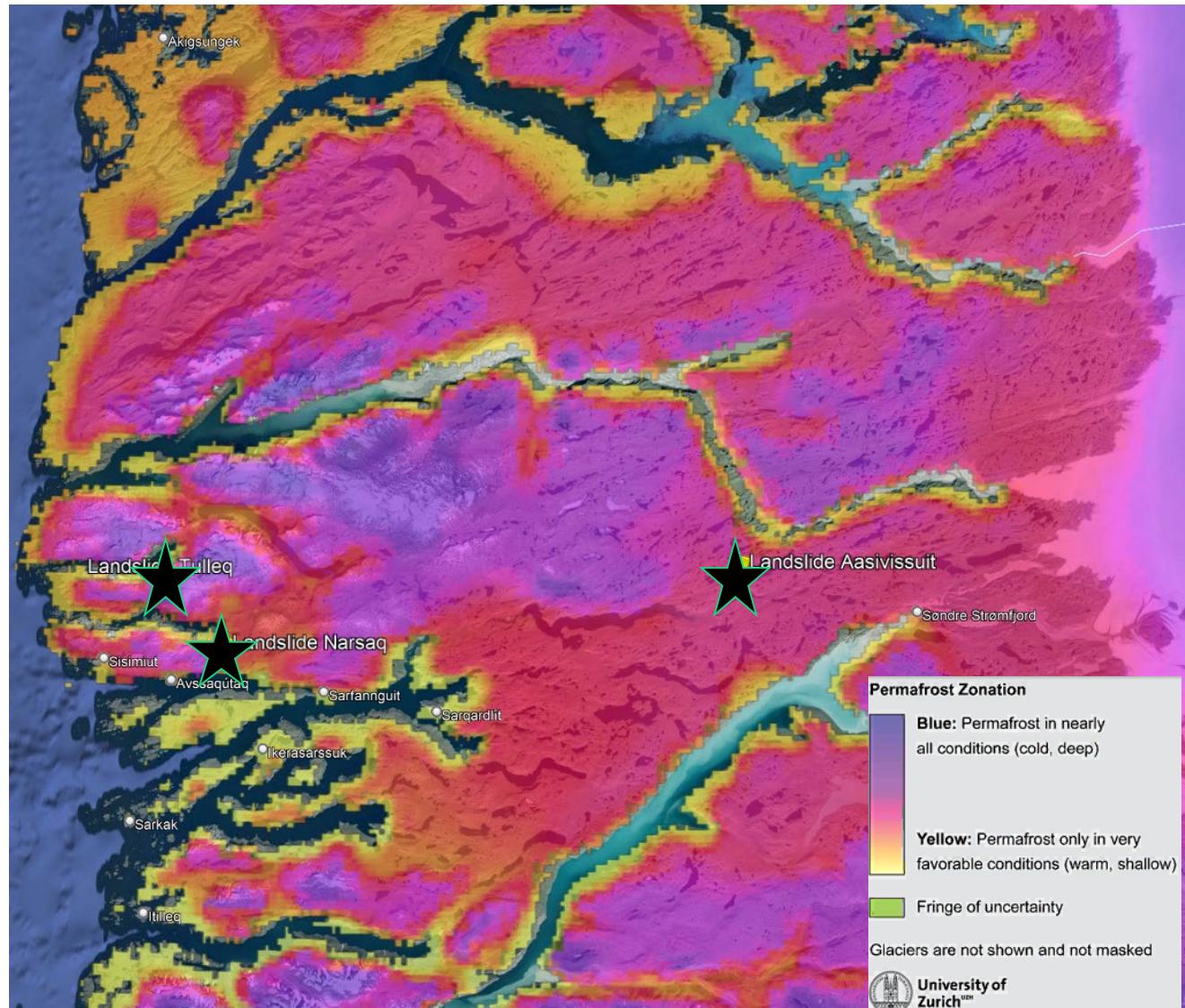
Funded by Greenland Research Council





Permafrost Extent

- Active layer (depth to permafrost)
0.5 meter to 1.5 meters¹
- Perma-frozen soil is not rapidly sliding!



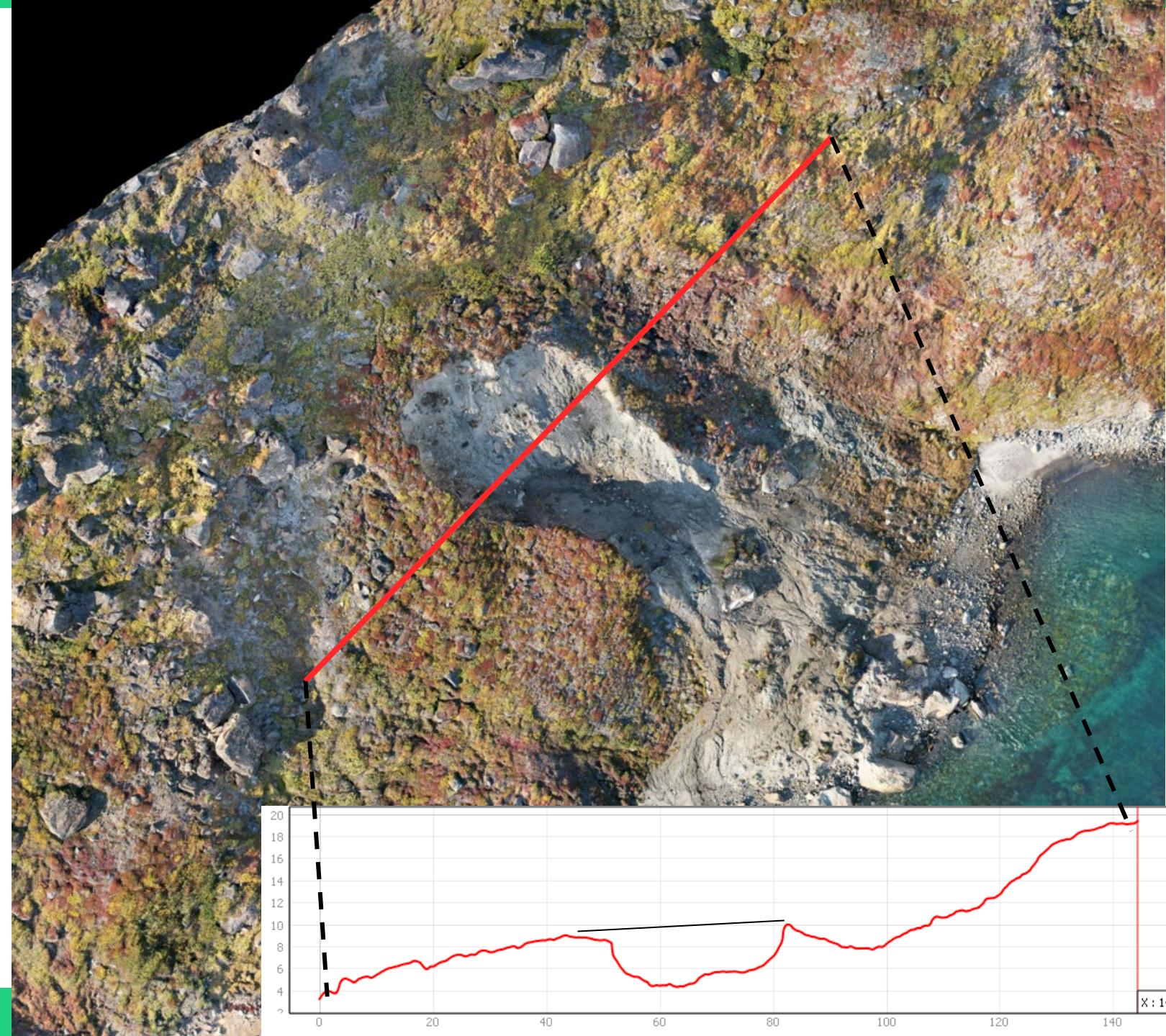
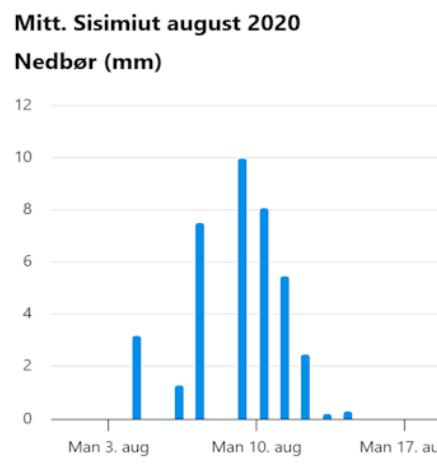
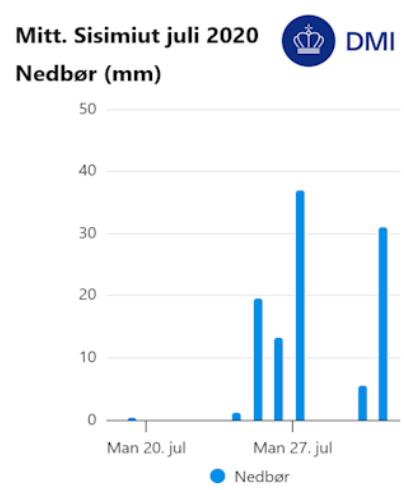
¹) Olesen et. Al, 2003. Active-Layer and Permafrost Temperatures, Sisimiut (Holsteinsborg)

Methodology of landslide investigation

- In-situ AUV for Digital Elevation models (DEM)
- Geotechnical investigations
- Geophysical investigation: ERT, TEM and seismic

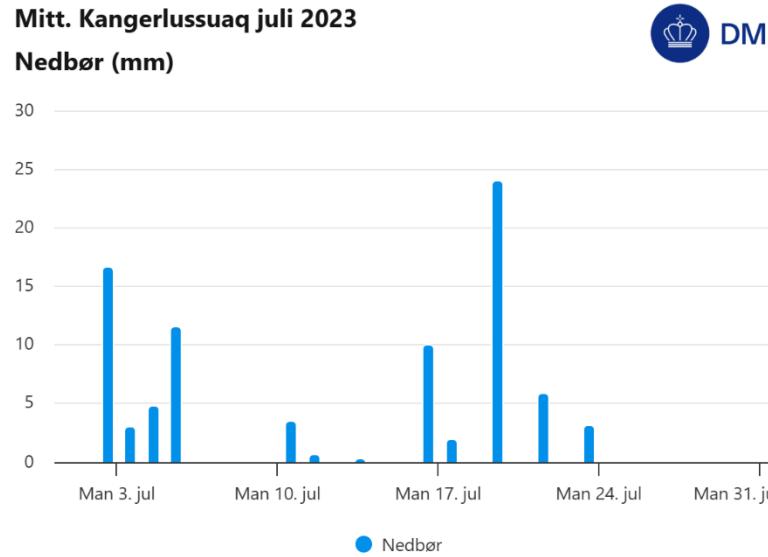
Narsaq

- Slide: 23 juli – 16. August 2020
- Glacial Till:
32% fine grained sediments ($< 63\mu\text{m}$)
- 5 meter deep

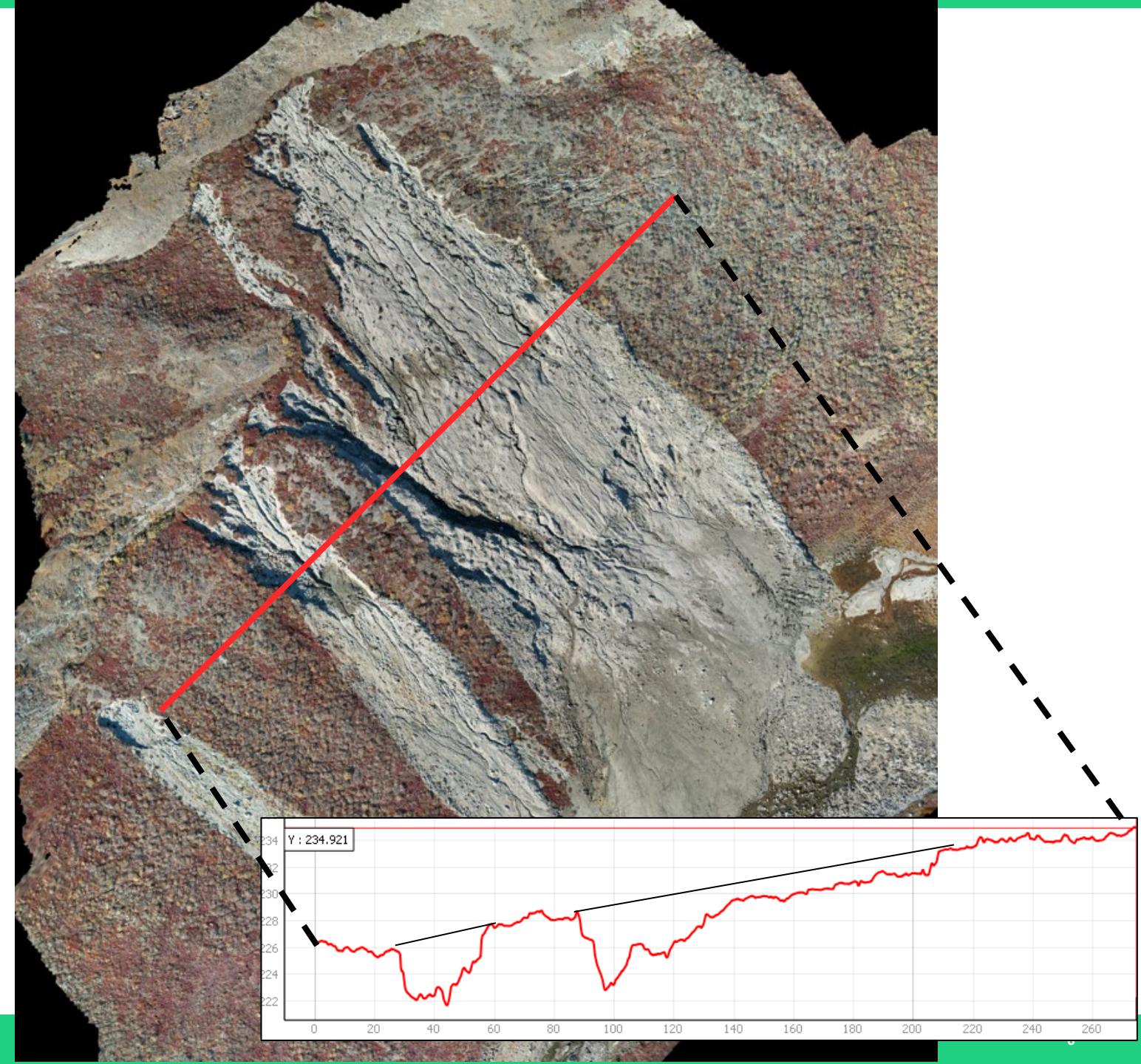


Aasivissuit

- Slide: 15th – 20th July 2023
- Glacial Till:
40% fine grained sediments (< 63µm)
- 5 – 6 meters deep

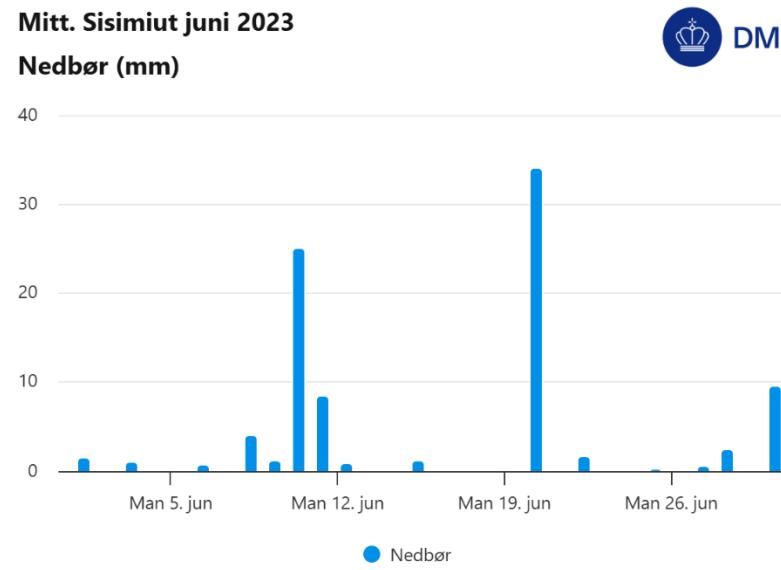


DMI

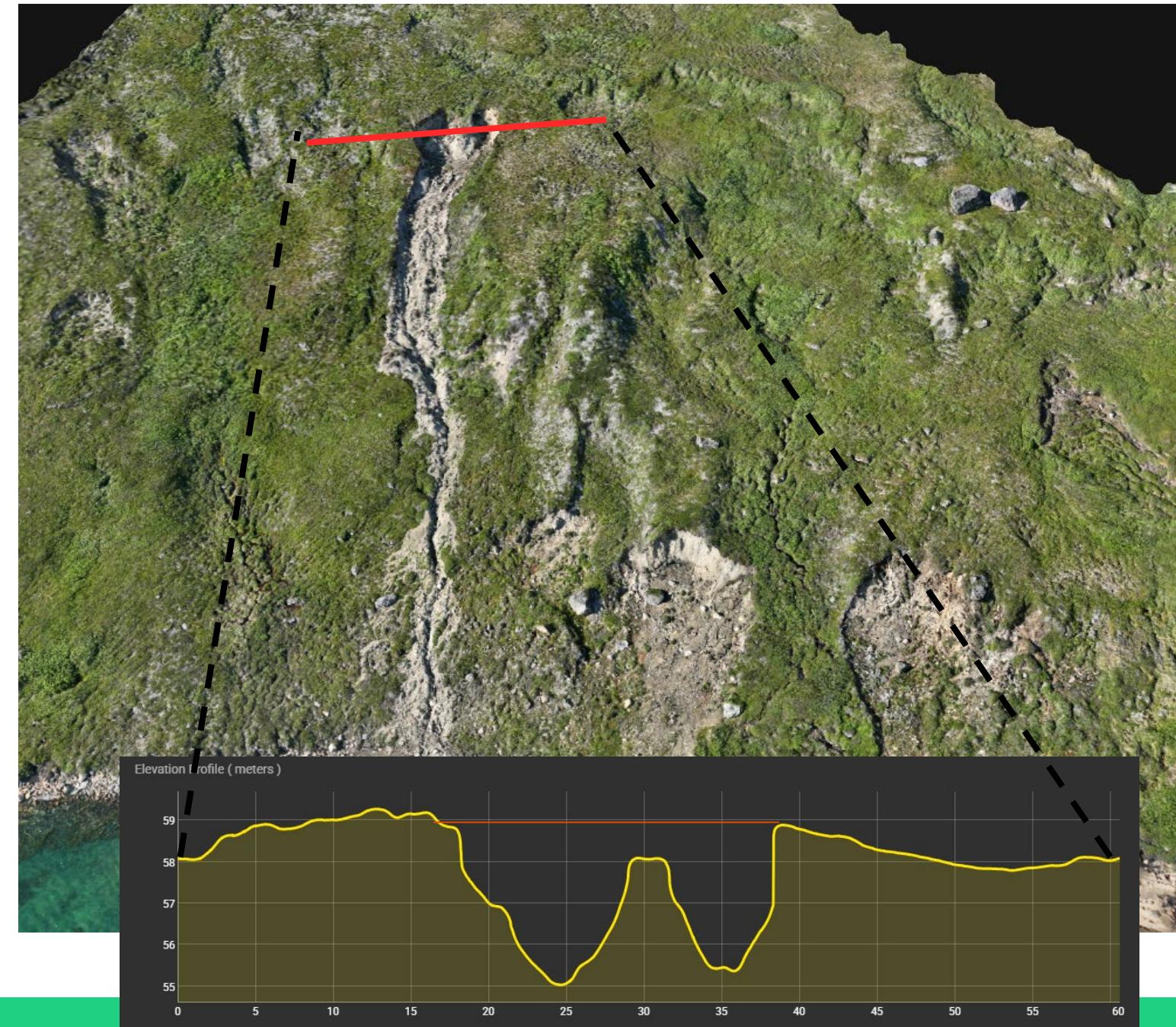


Tulleq

- 25 Juni – 2. July 2023
- Glacial till:
31% fine grained sediments (< 63µm)
- 4.5 meters deep

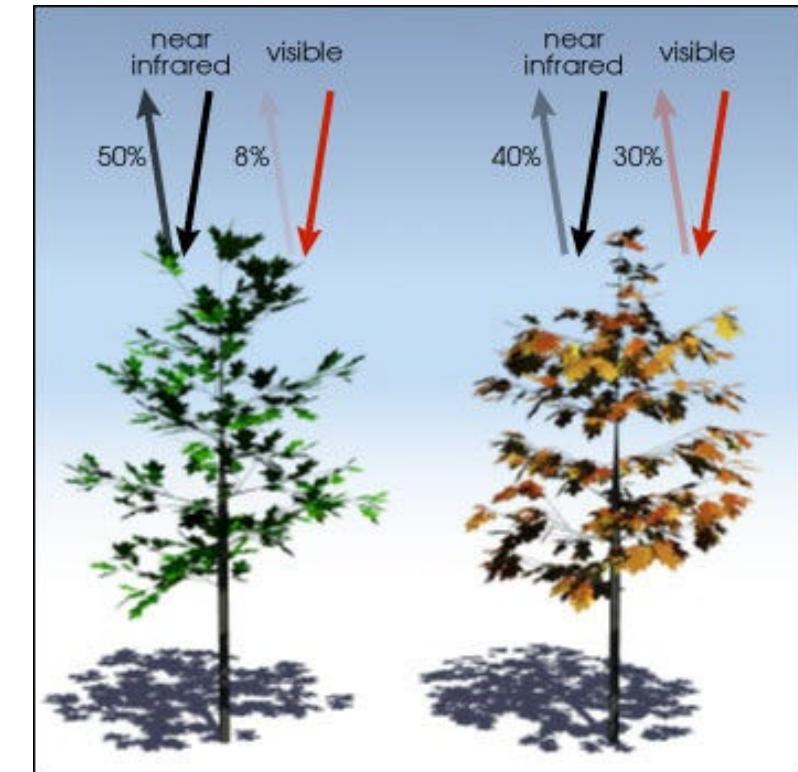
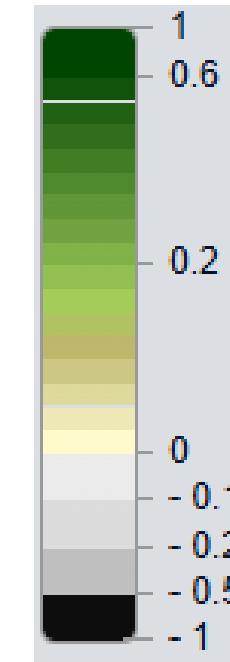
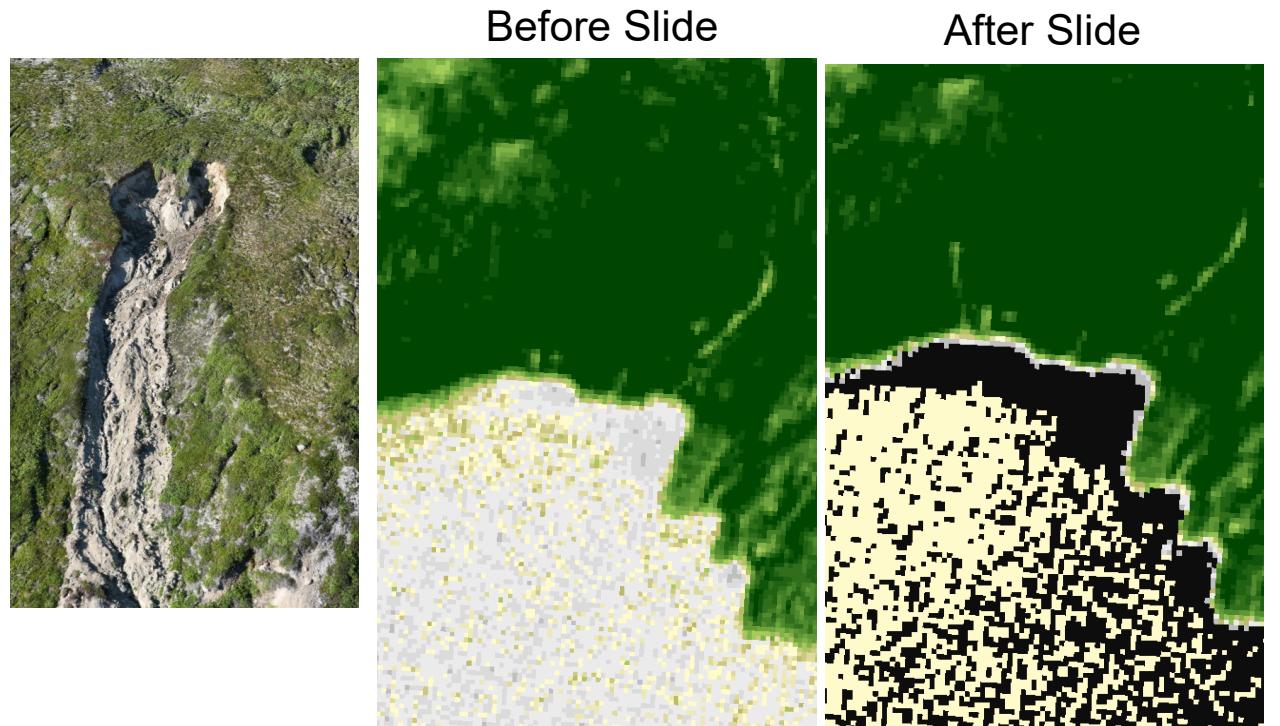


DMI



Broader investigation

- Normalized Difference Vegetation Index
- Differences in color with Multi spectral imagery



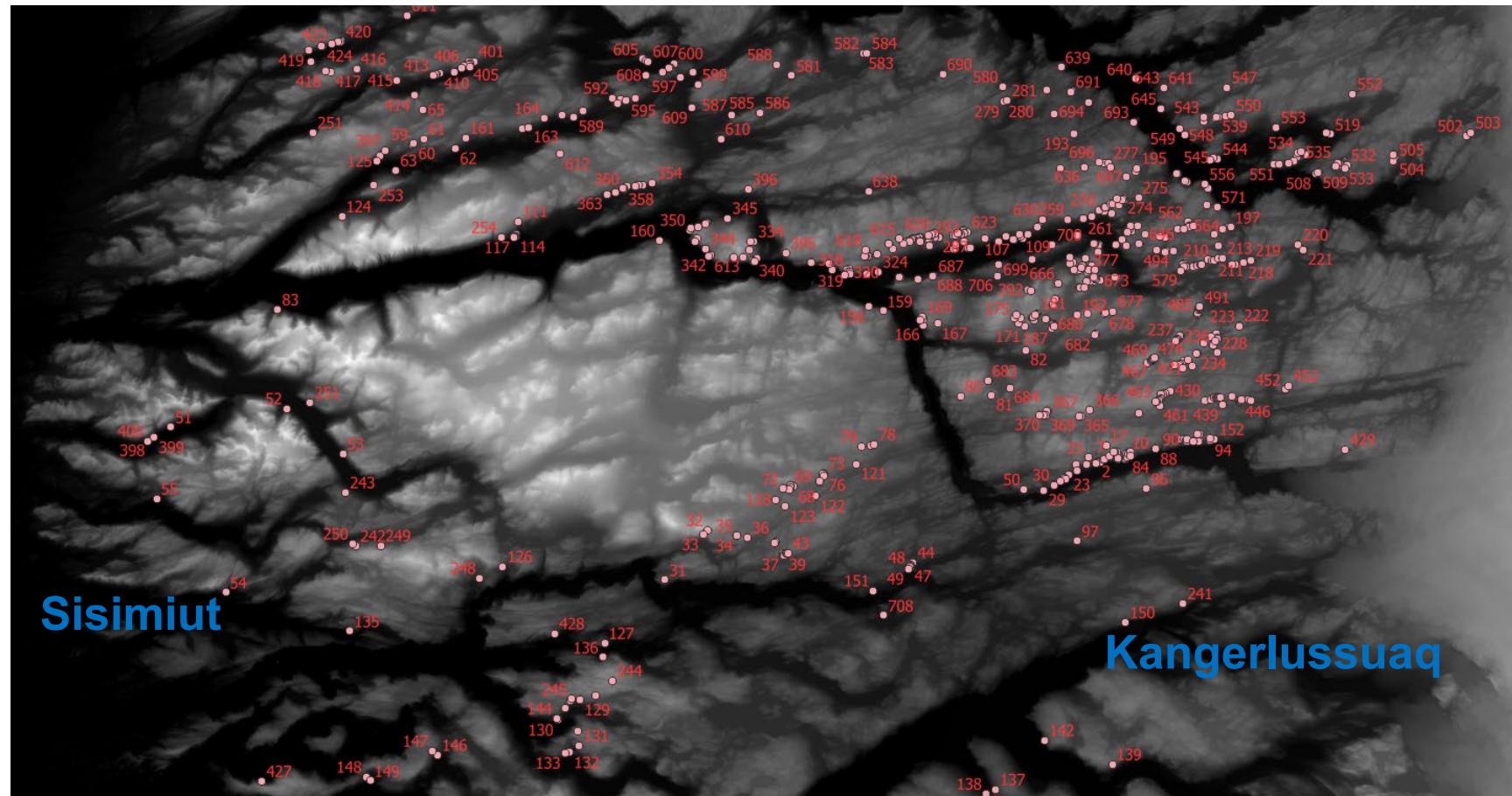
$$\frac{(0.50 - 0.08)}{(0.50 + 0.08)} = 0.72$$

$$\frac{(0.4 - 0.30)}{(0.4 + 0.30)} = 0.14$$

Haggag, Wafaa & Ali, Rafat & Al-Ansary, Noran. (2023). *Geographic information systems and remote sensing: Innovative tools for plant health*. 19. 2449-2464.

Landslides

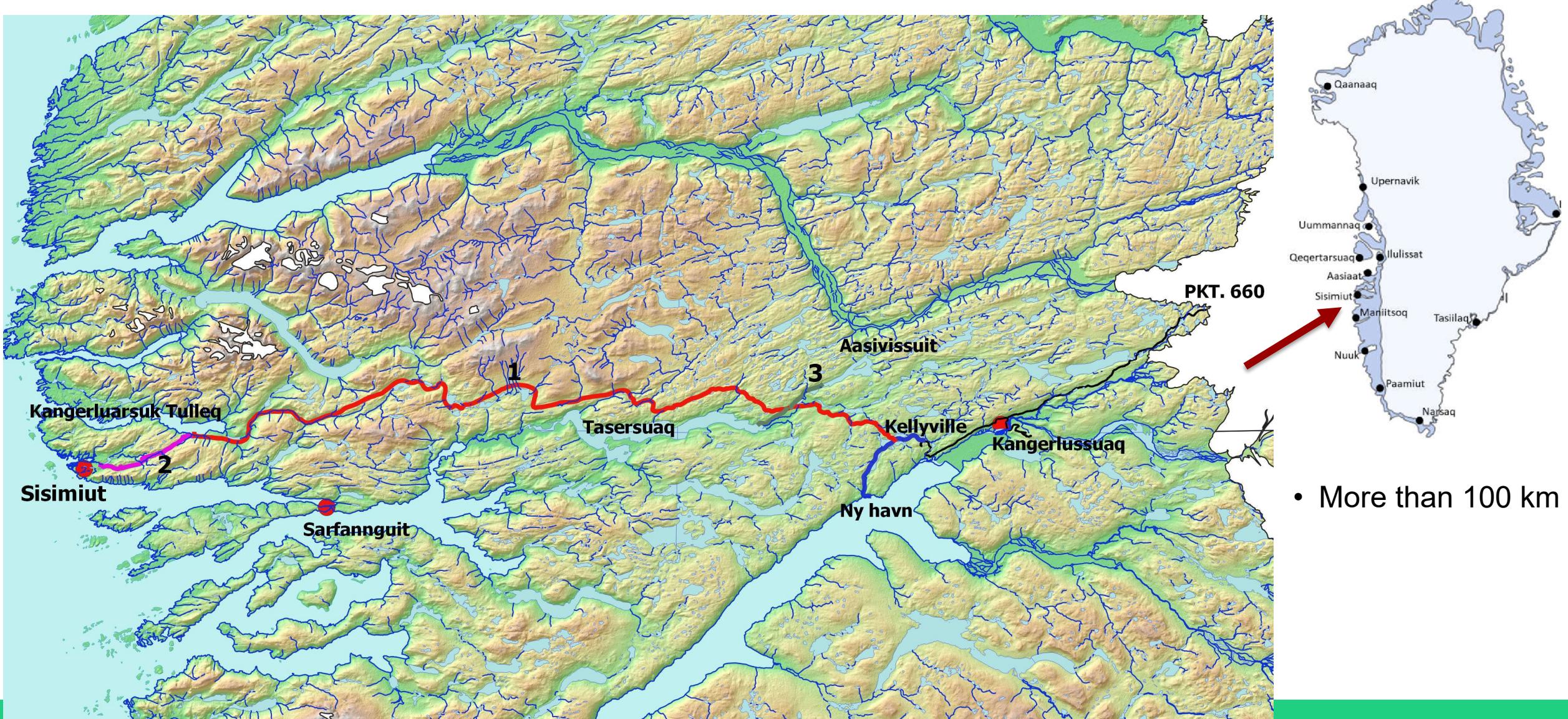
- 700 new landslides between 2019-2024 years!



NDVI differences 2019-2024



Field Work – Summer 2025



TEM2Go

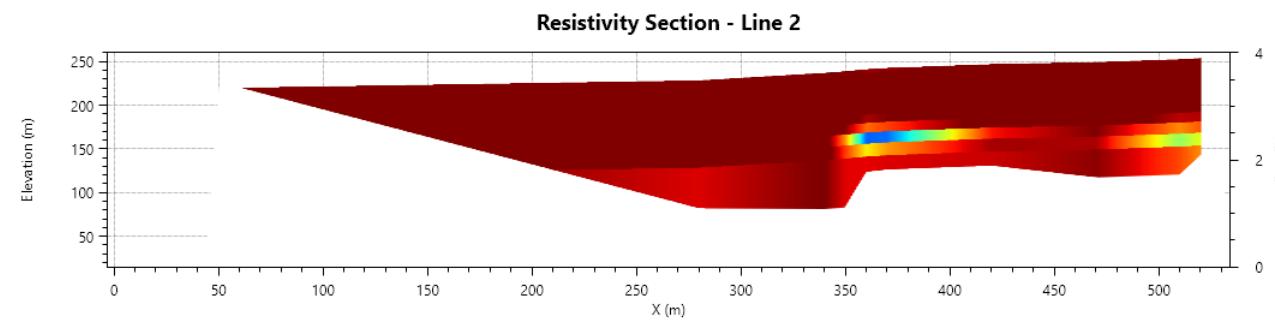
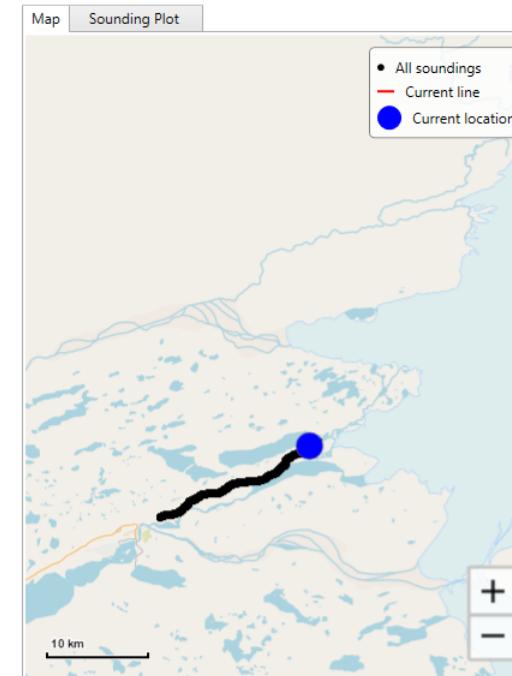
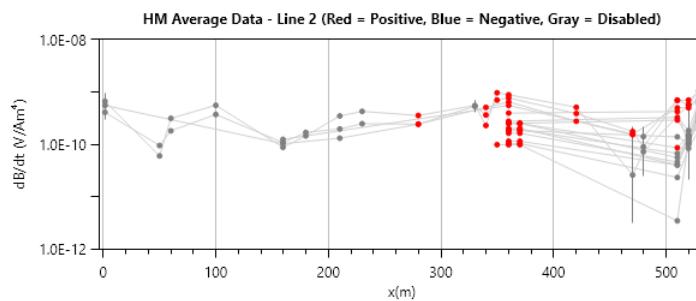
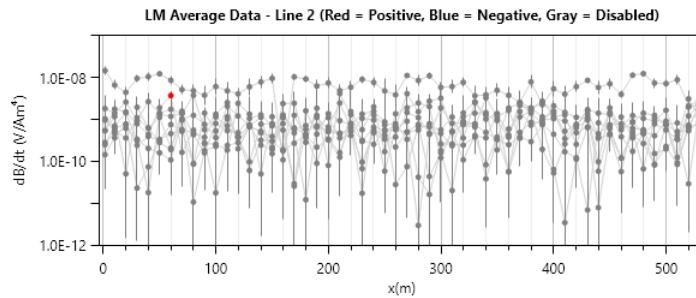
- Measures continuously while walking
- Many 1D measurements



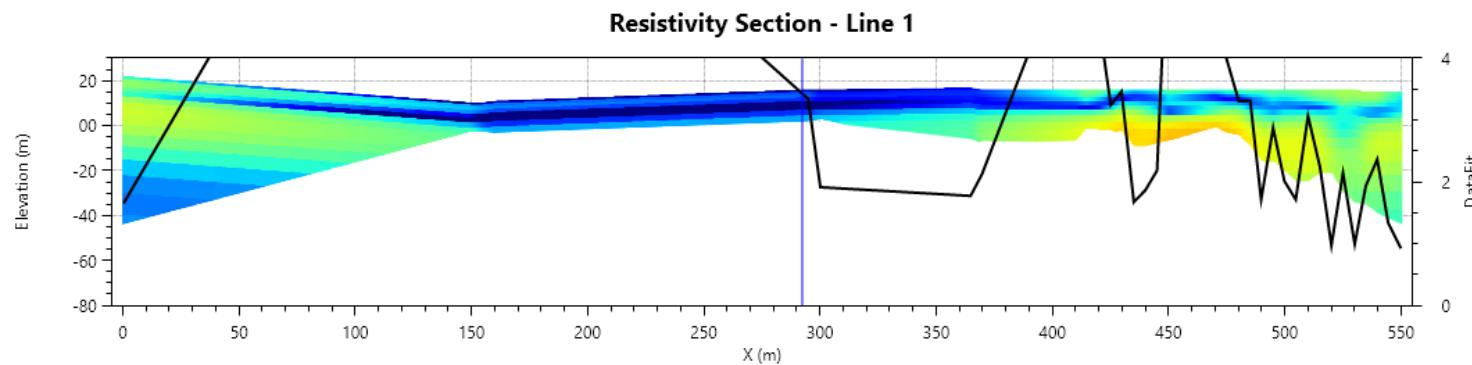
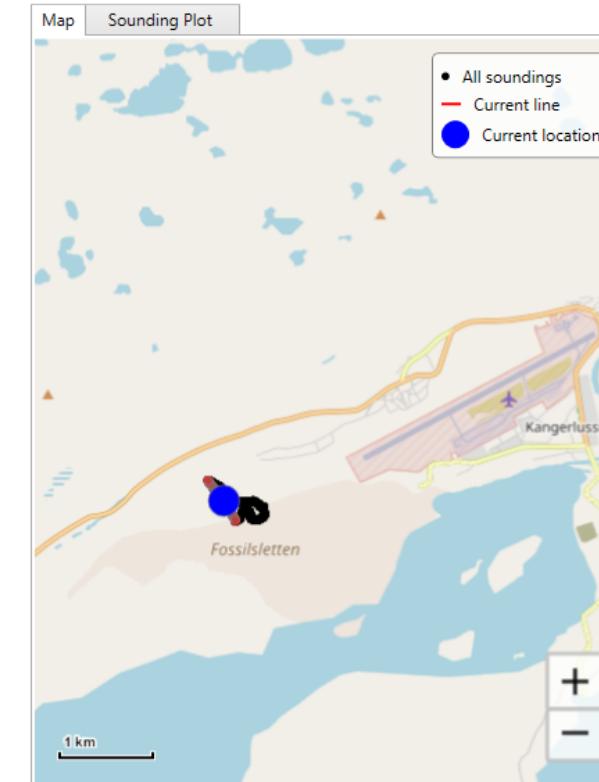
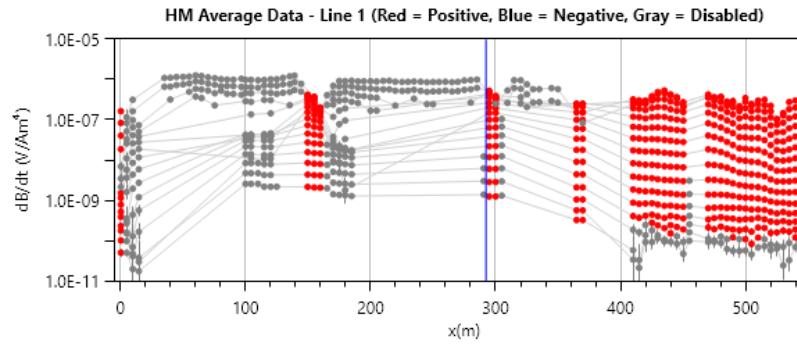
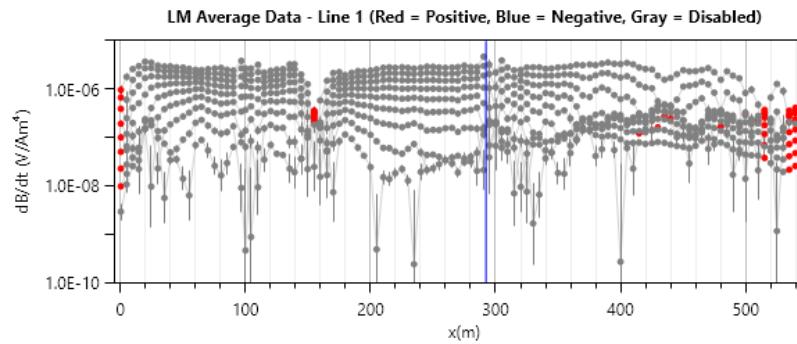
TEM2Go



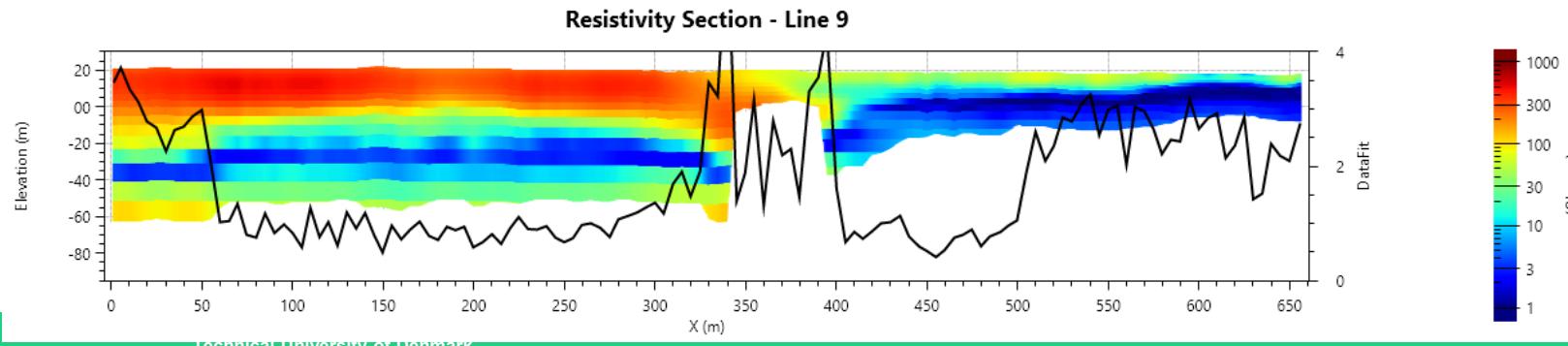
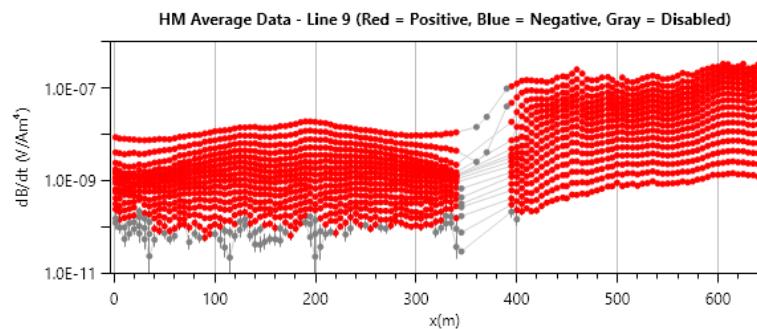
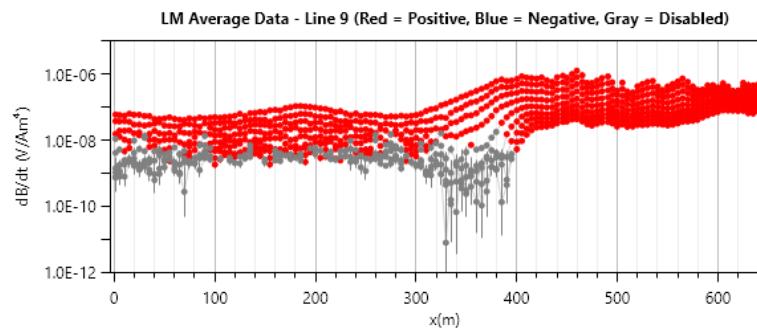
Icecap



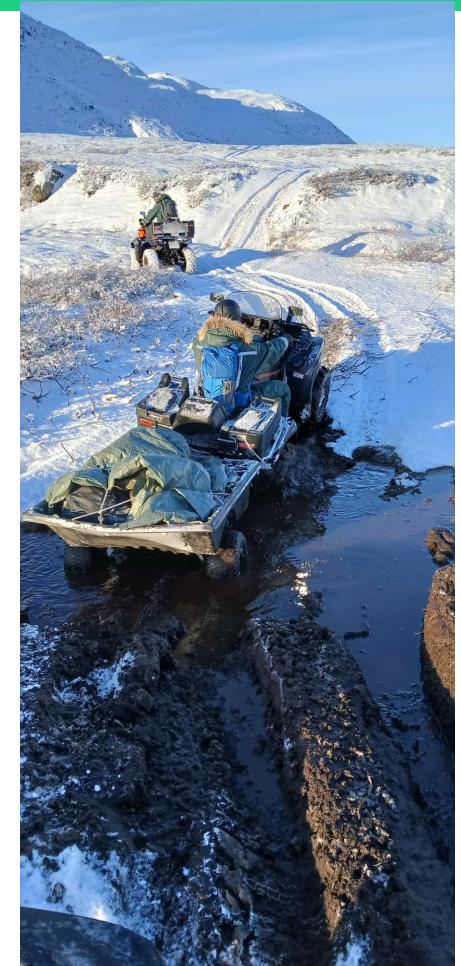
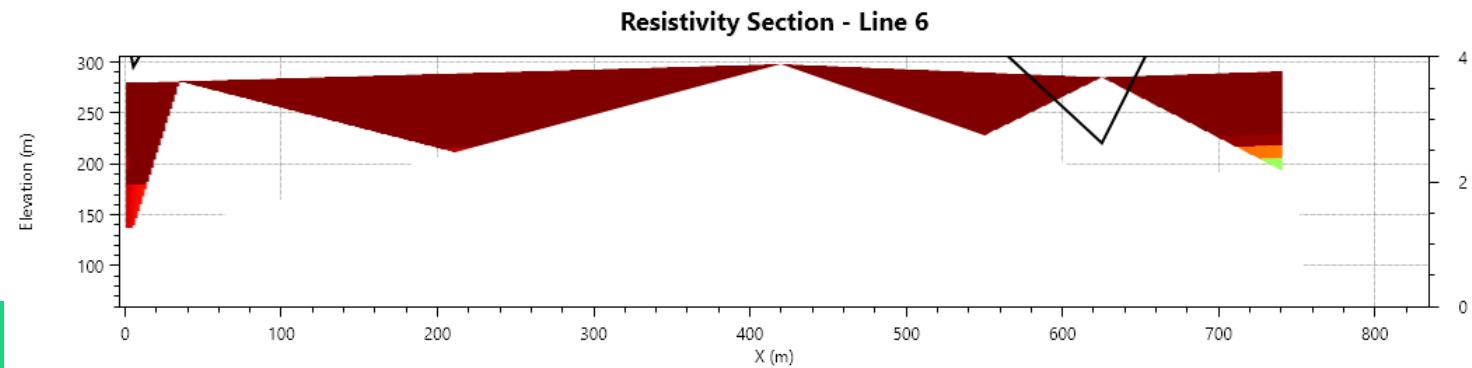
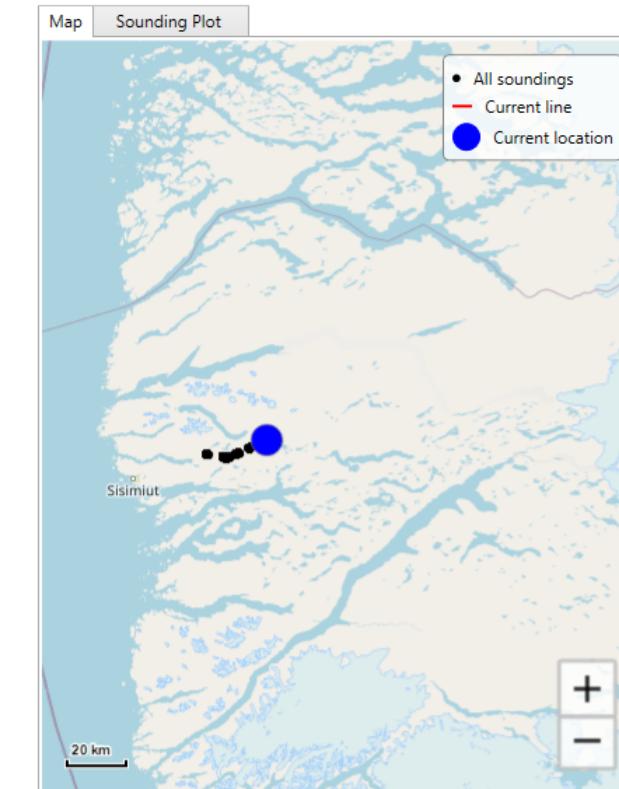
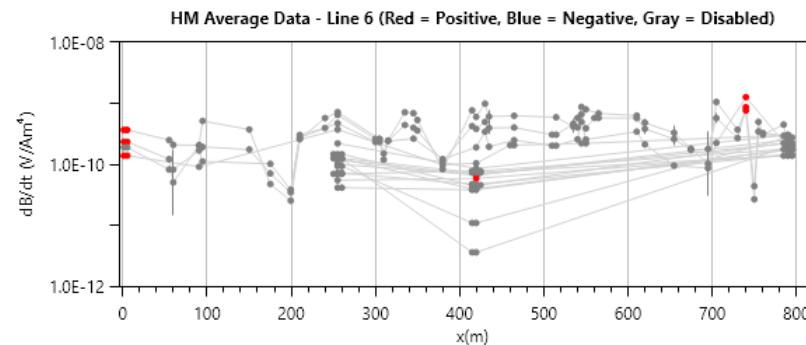
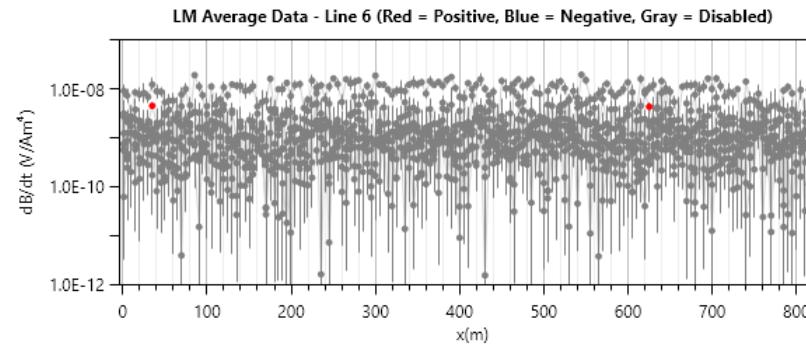
Kangerlussuaq (Marine Sediments)



Itinnea (Marine sediments)



Luxury hut – High altitude 270m



Sisimiut

