Remote Sensing of Arctic Coasts
past, present, future

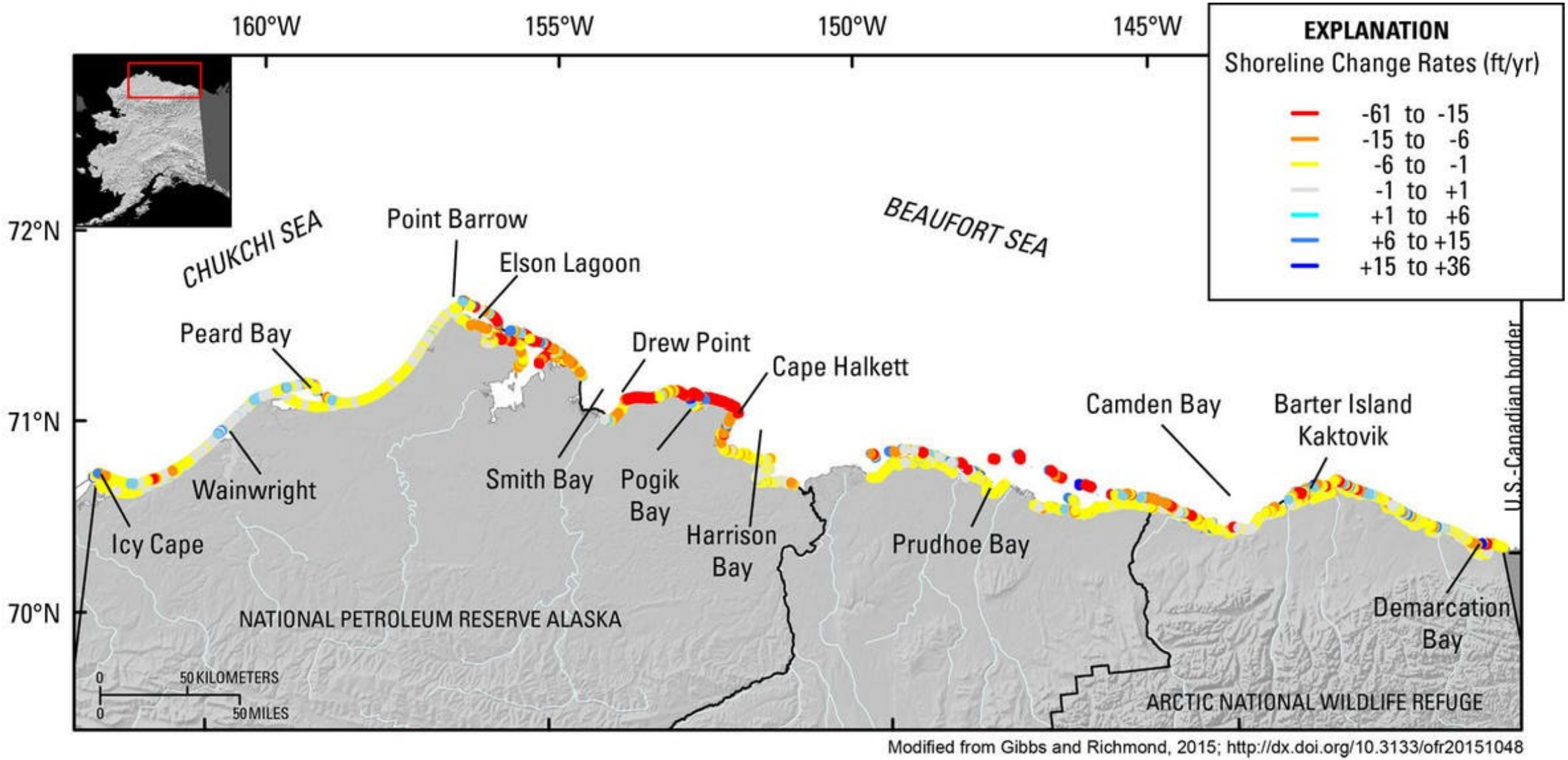
2022-10-20- Arctic Coastal Network Retreat
Ingmar Nitze and many more

Past Work – Coastal Observations

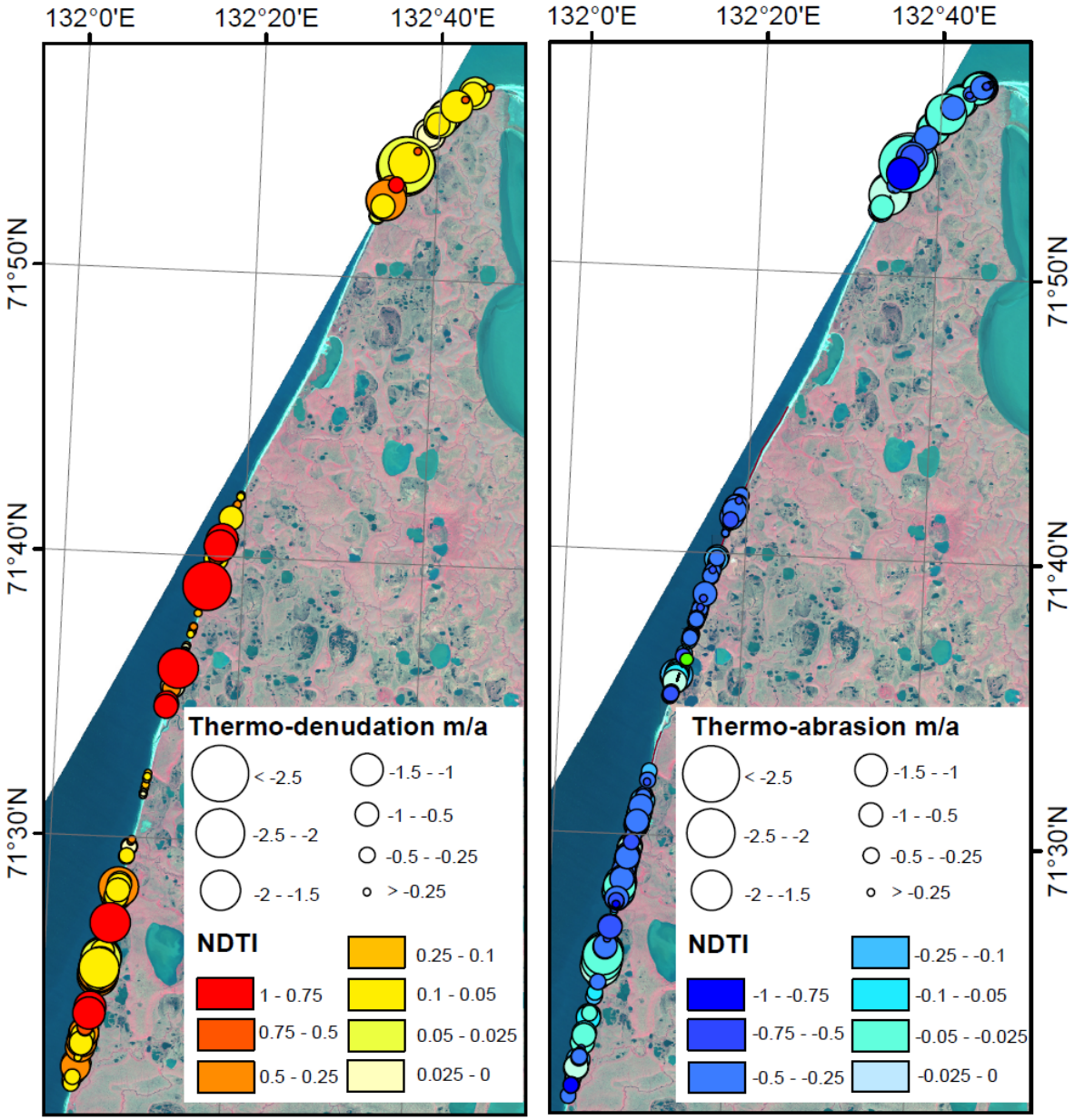
- Expert <u>estimates</u>
- Segment approach
- 10 years old
- Target audience?
- Are rocky coasts that boring?

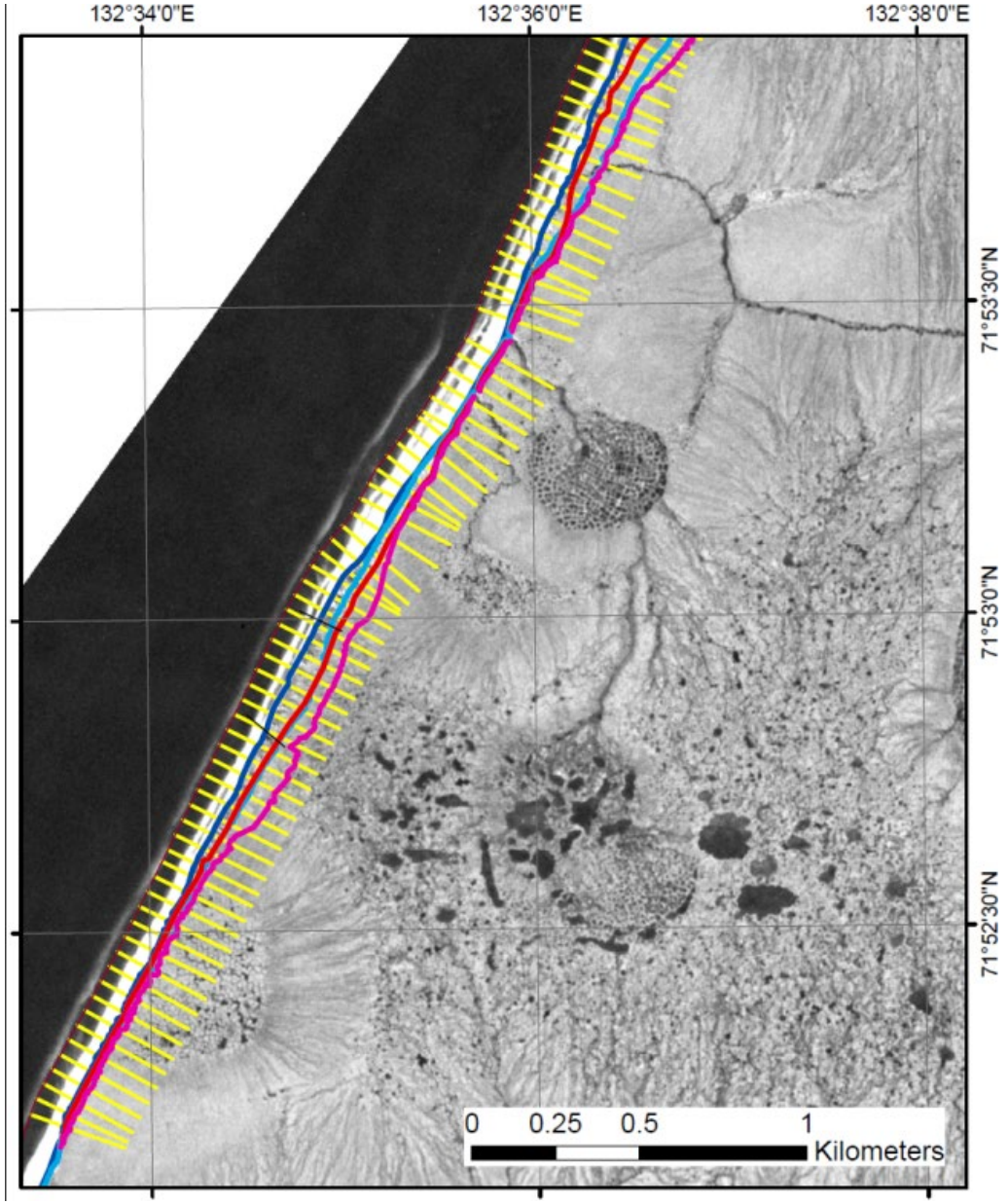
ACD, Lantuit et al, 2012

From estimates to measurements



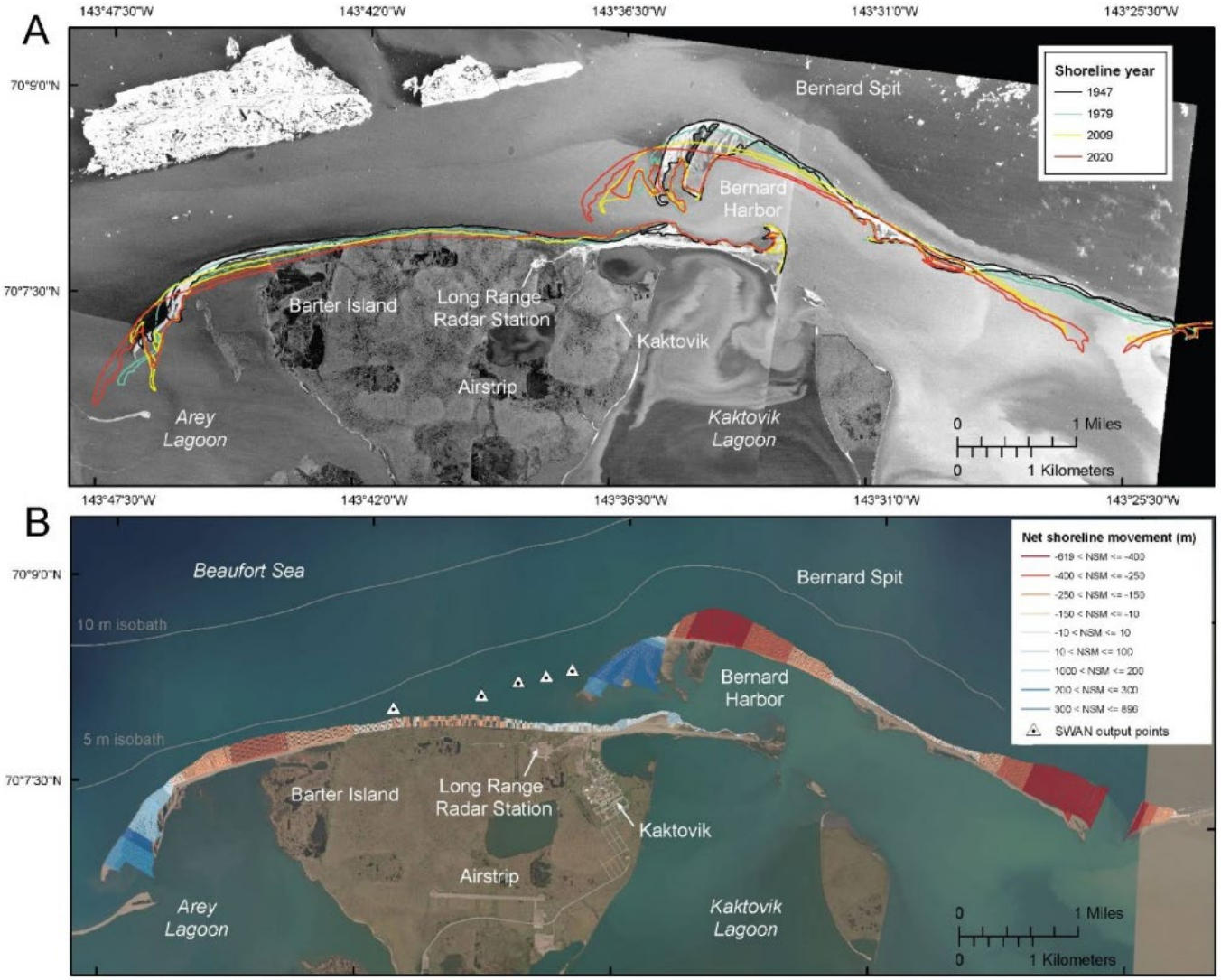
Modified from Gibbs and Richmond, 2015; http://dx.doi.org/10.3133/ofr20151048





Günther et al 2013

From estimations to measurements



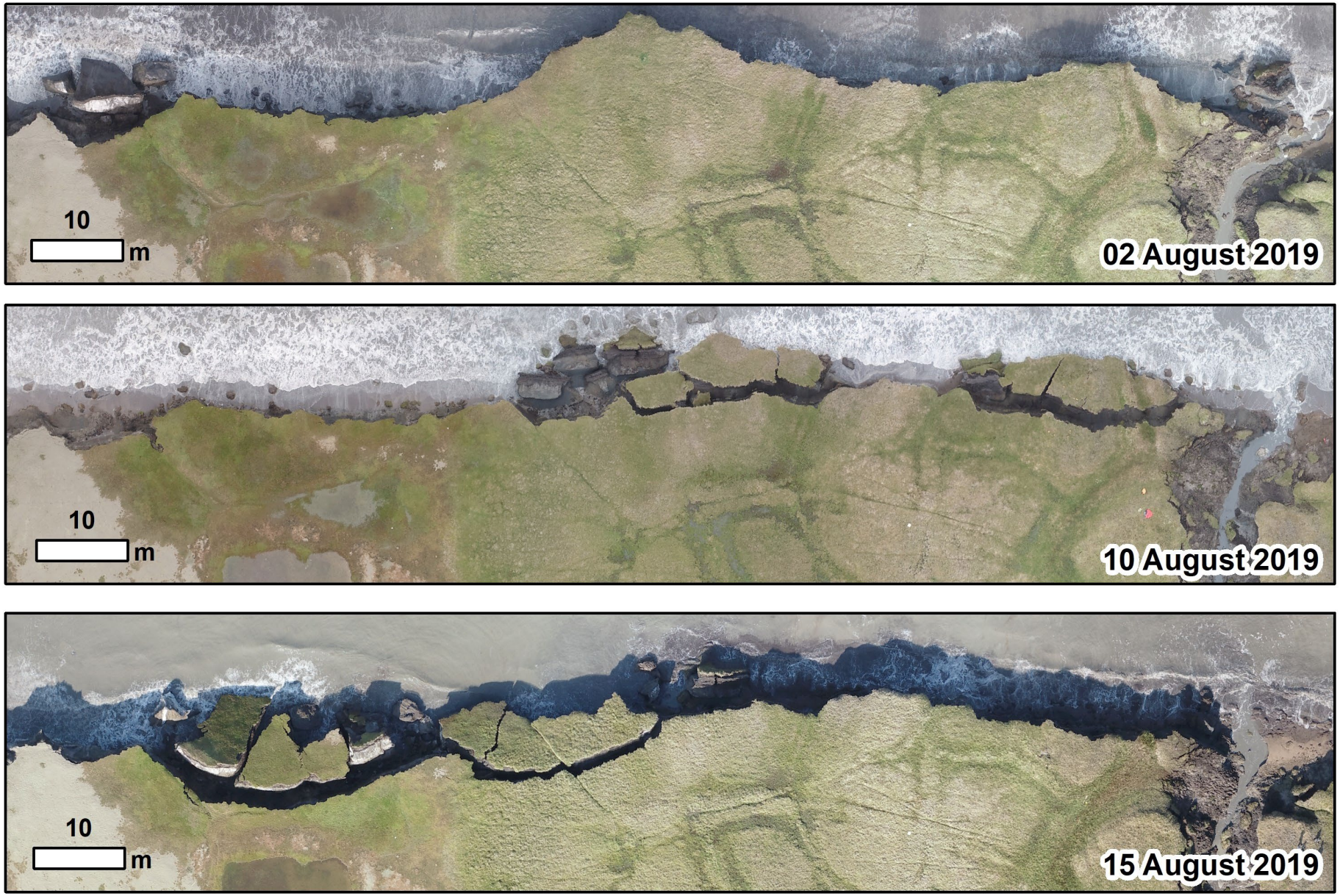
- Long term analysis
- Very high resolution/detail
- Local to regional scale
- Labor intensive
- → hard to scale

Gibbs et al, 2022

Current trends in arctic coastal RS

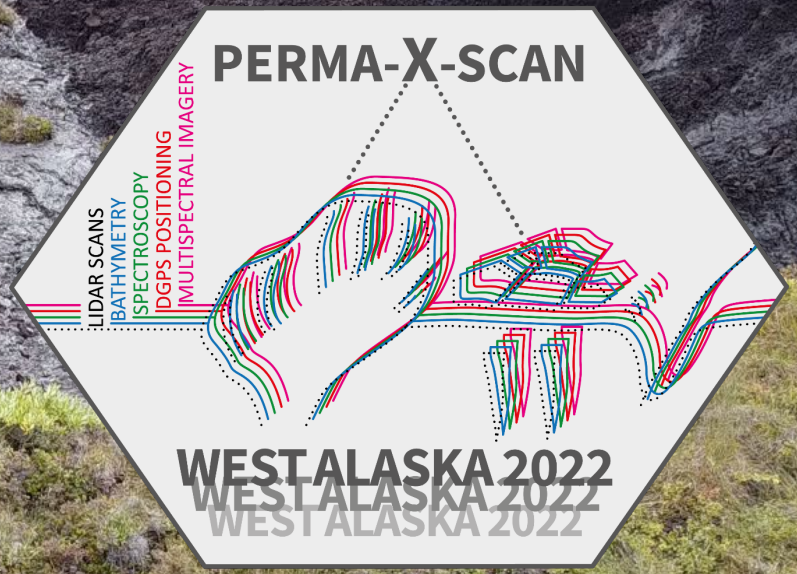
Current t stal RS

Example of Bluff Erosion During 2019 Surveys



Ward Jones et al., in prep

Projects:
PhD Cornelia Inauen, Tabea Rettelbach
EU Arctic Passion
Perma-X airborne campaigns

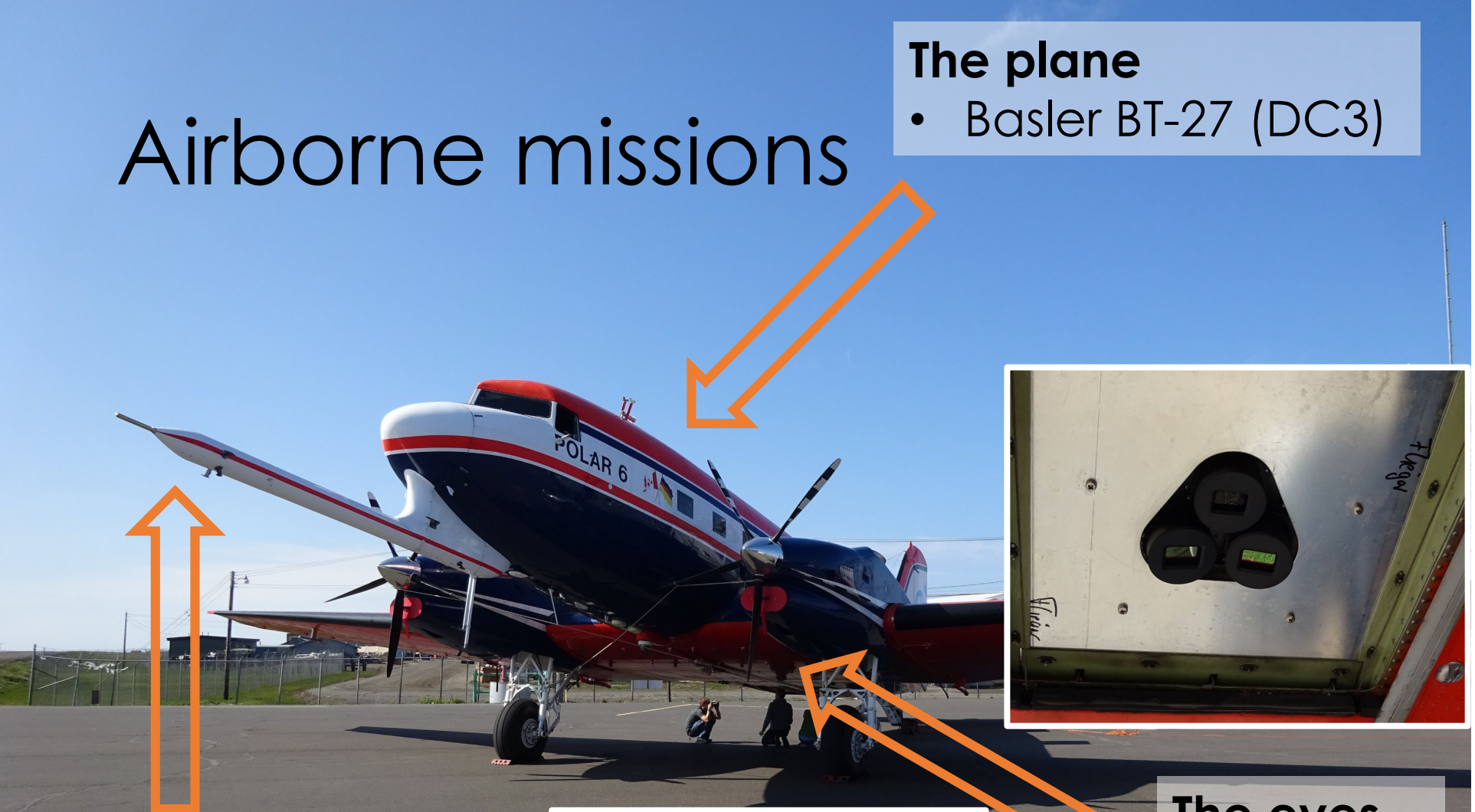


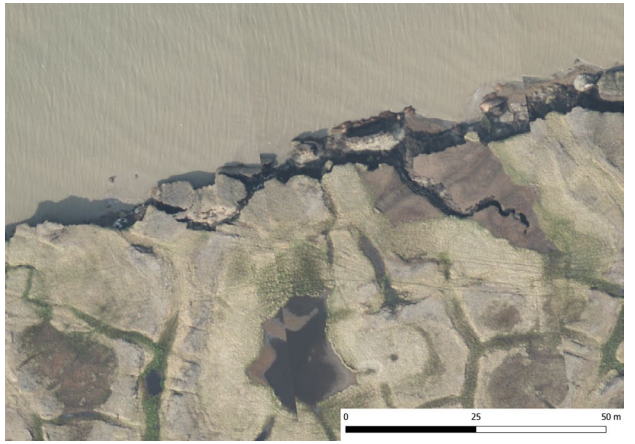
Perma-X-Scan
Western Alaska, USA
July 28 – August 23, 2022

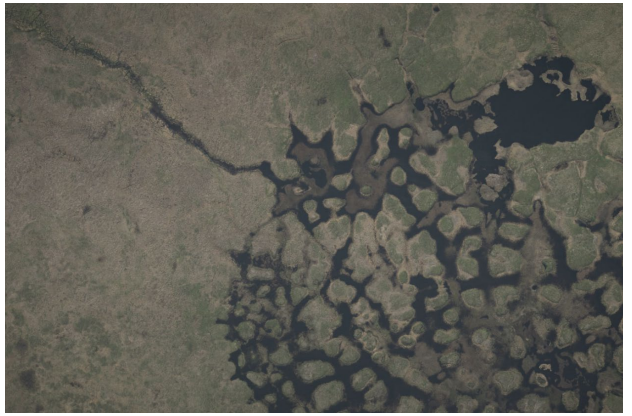
'We will quantify the extent of permafrost thaw by surveying terrestrial permafrost thaw landscape features which indicate near-surface permafrost loss, impacting ecosystems, hydrological systems, coasts and shores, and greenhouse gas emissions.'

Airborne missions

The plane
- Basler BT-27 (DC3)

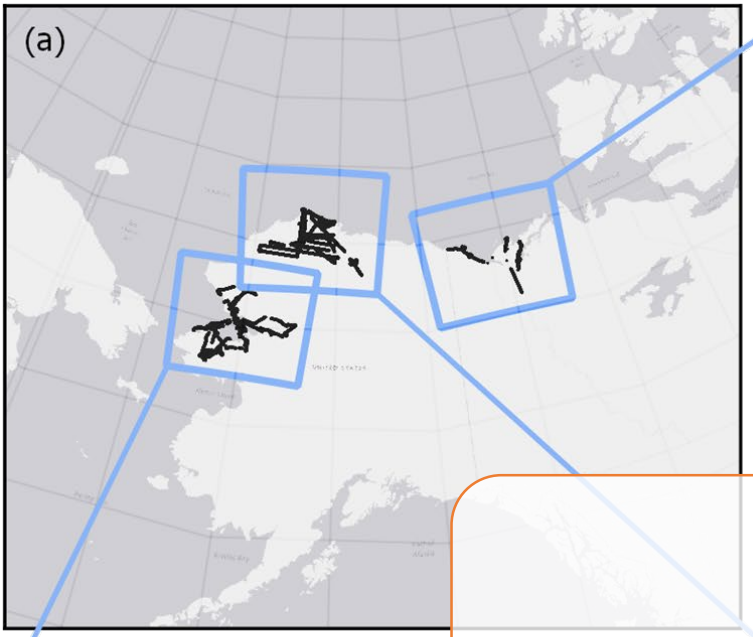






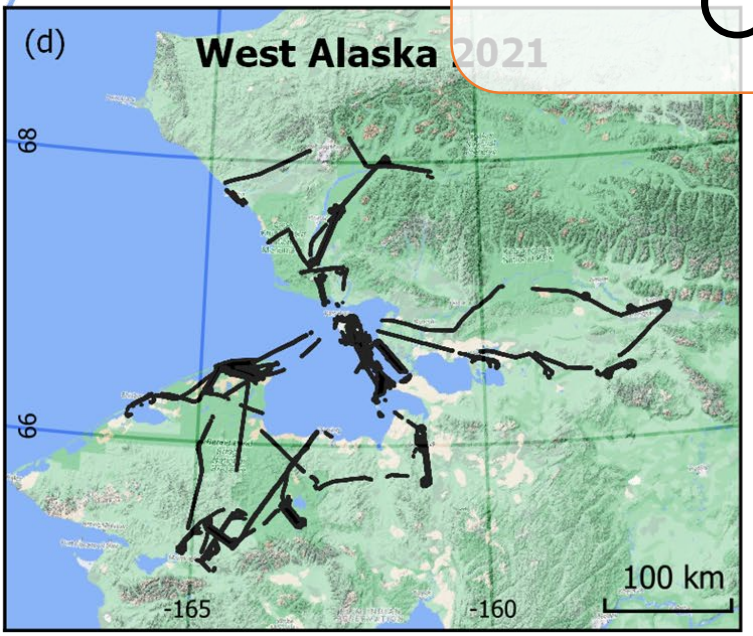
The nose
- Methane
- CO2
- Water vapour

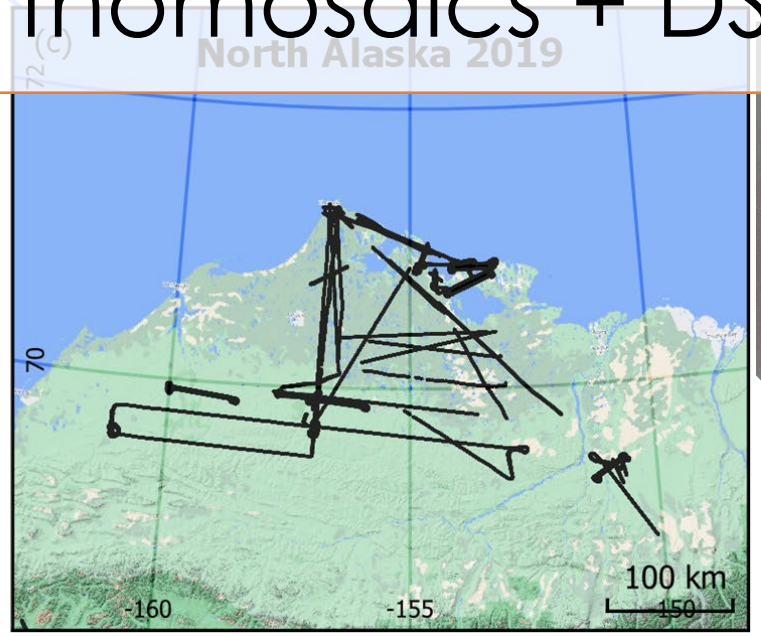
The eyes
- MACS
- Lidar

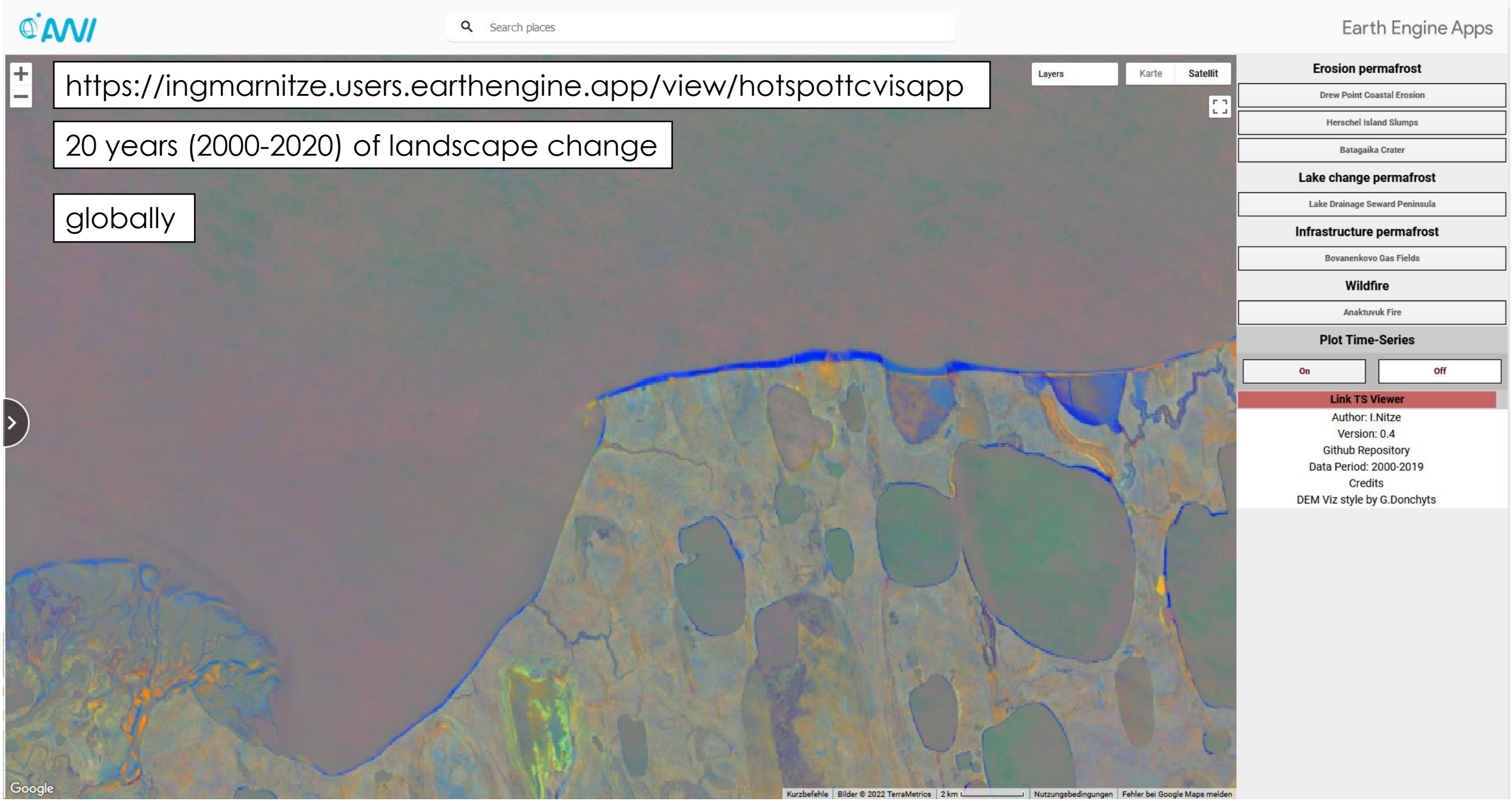


Coming Soon!

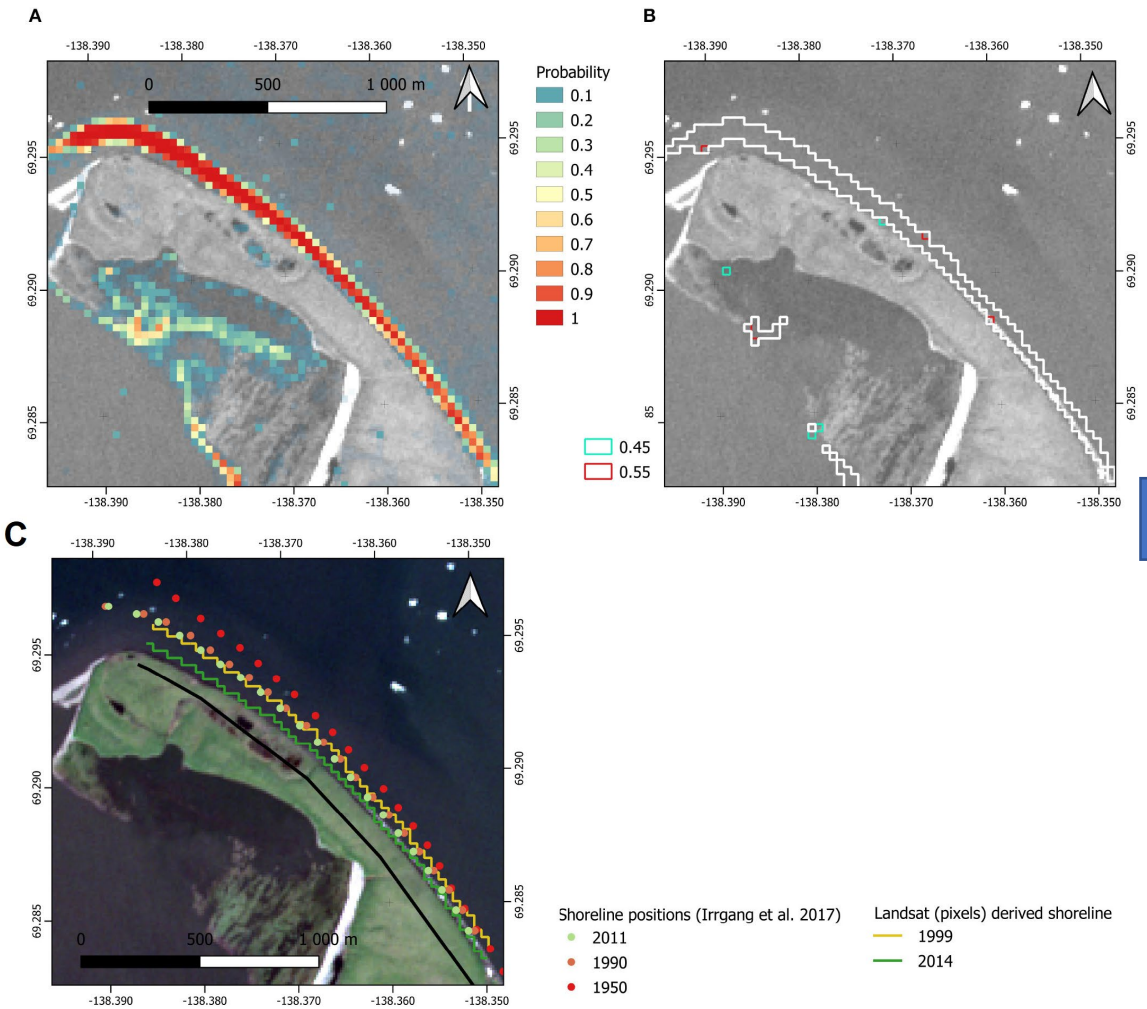
Orthomosaics + DSM



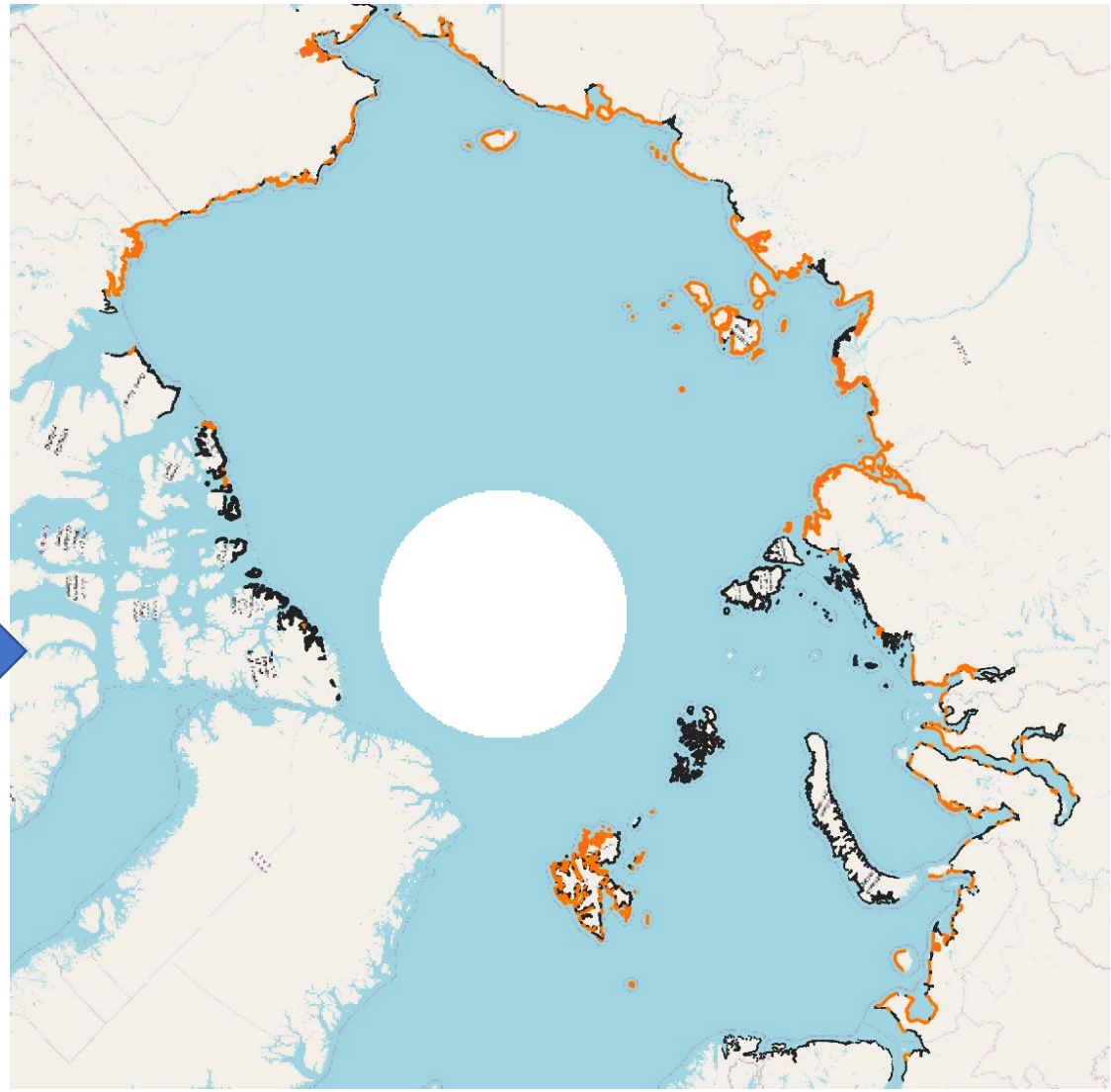



Search places
Earth Engine Apps
https://ingmarnitze.users.earthengine.app/view/hotspottcvisapp
20 years (2000-2020) of landscape change
globally
Layers
Karte
Satellit
Erosion permafrost
Drew Point Coastal Erosion
Herschel Island Slumps
Batagaika Crater
Lake change permafrost
Lake Drainage Seward Peninsula
Infrastructure permafrost
Bovanenkovo Gas Fields
Wildfire
Anaktuvuk Fire
Plot Time-Series
On
Off
Link TS Viewer
Author: I.Nitze
Version: 0.4
Github Repository
Data Period: 2000-2019
Credits
DEM Viz style by G.Donchyts
Google
Kurzbefehle
Bilder © 2022 TerraMetrics
2 km
Nutzungsbedingungen
Fehler bei Google Maps melden

Pan – Arctic Scale



Bartsch et al., 2020



Bartsch et al., in prep

Bridging the scales

Local Scale

- High detail
  - Spatio-temporal
- Auxilliary Data
- Local observations

Machine/Deep-Learning

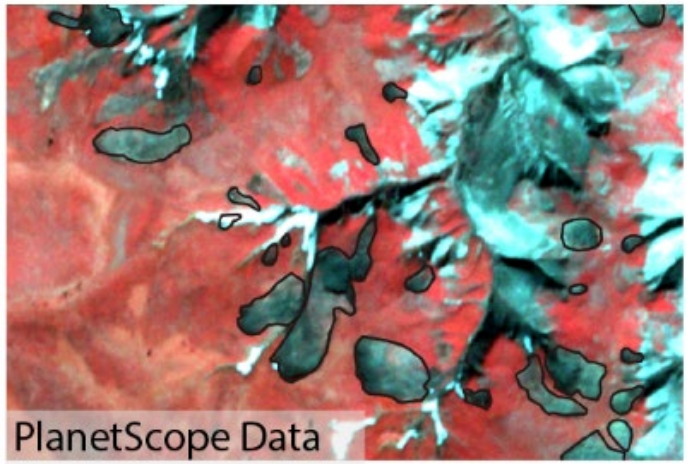
Automation

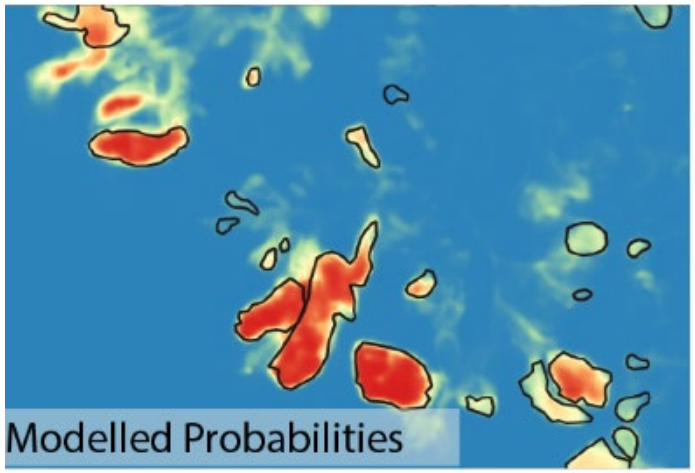
Cloud Processing

Global Scale

- Pan-Arctic Extent
- A lot of data
- Often lower resolution

IWP: Witharana, in prep





Adapted after Nitze et al., 2021

Current and future trends of Arctic coastal RS

Topics

- Coastline Change
- Infrastructure / Vulnerability
- Citizen Science / Involvement of communities
- Geohazards
- Biogeoch. Cycles (H_20, C, N)

Sensors

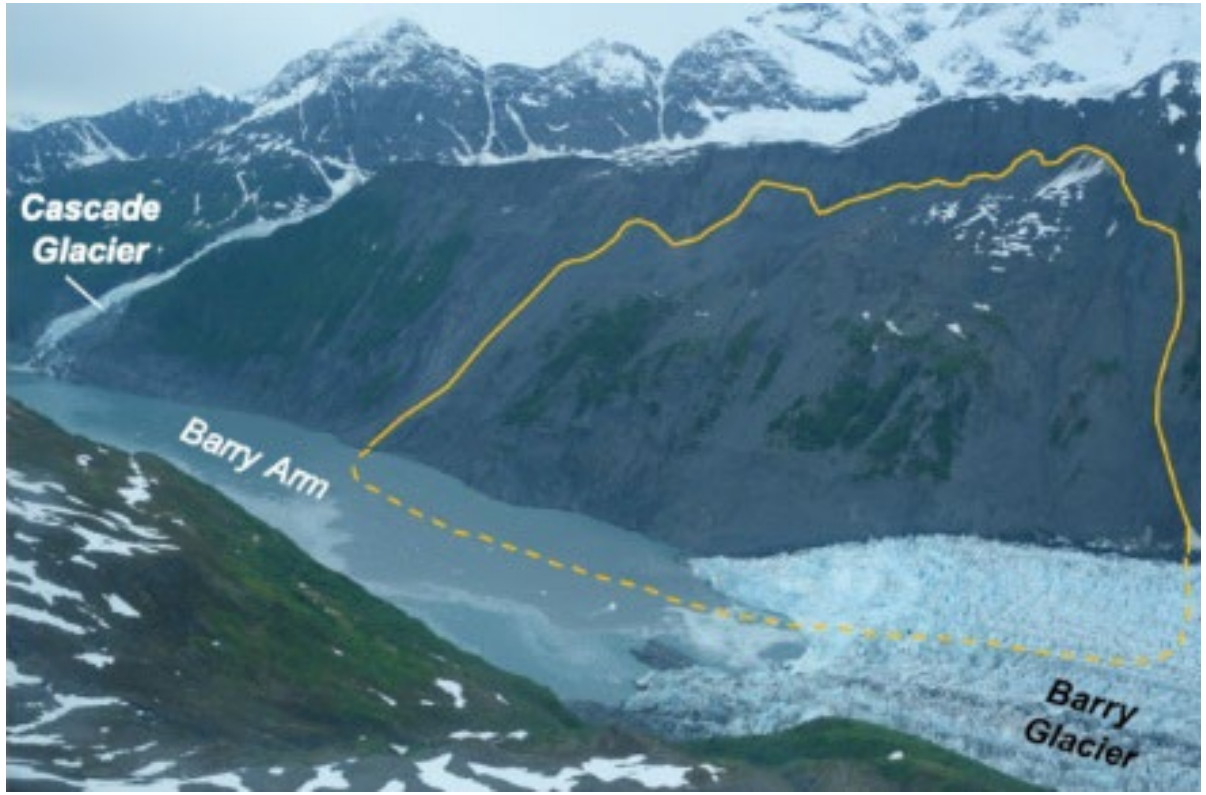
- More drones
- More SAR

Processing

- Pan-Arctic
- Continuous monitoring
- Deep-Learning / AI

Are Rocky Coasts boring?

Alaska



https://dggs.alaska.gov/hazards/barry-arm-faq.html
Photo: G. Wolken, 2020

Greenland

Nat. Hazards Earth Syst. Sci., 20, 2521–2534, 2020
https://doi.org/10.5194/nhess-20-2521-2020

Natural Hazards and Earth System Sciences
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Arctic tsunamis threaten coastal landscapes and communities – survey of Karrat Isfjord 2017 tsunami effects in Nuugaatsiaq, western Greenland

Mateusz C. Strzelecki[1,2] and Marek W. Jaskólski[1,3,4]

[1]Institute of Geography and Regional Development, University of Wrocław, pl. Uniwersytecki 1, 50-137 Wrocław, Poland
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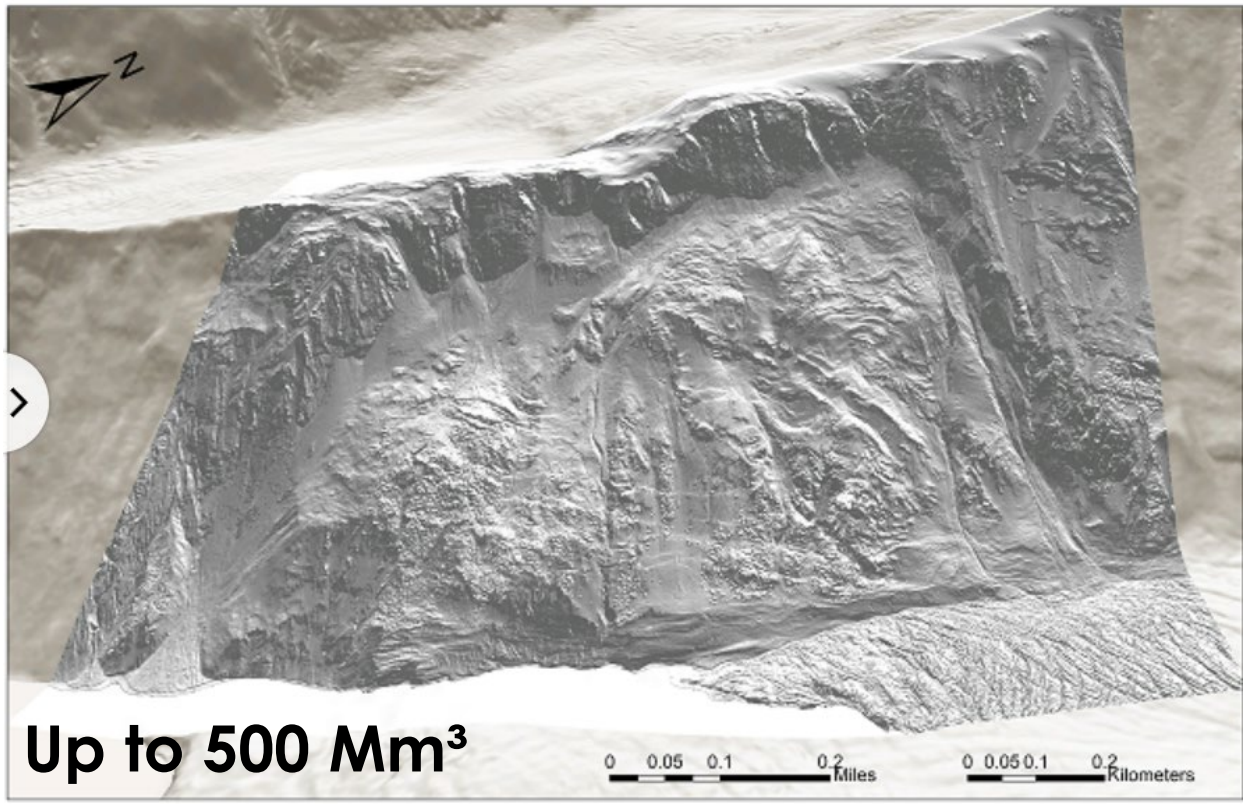

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