Terrain influence on soil organic carbon and total nitrogen sorage in soils of Herschel Island

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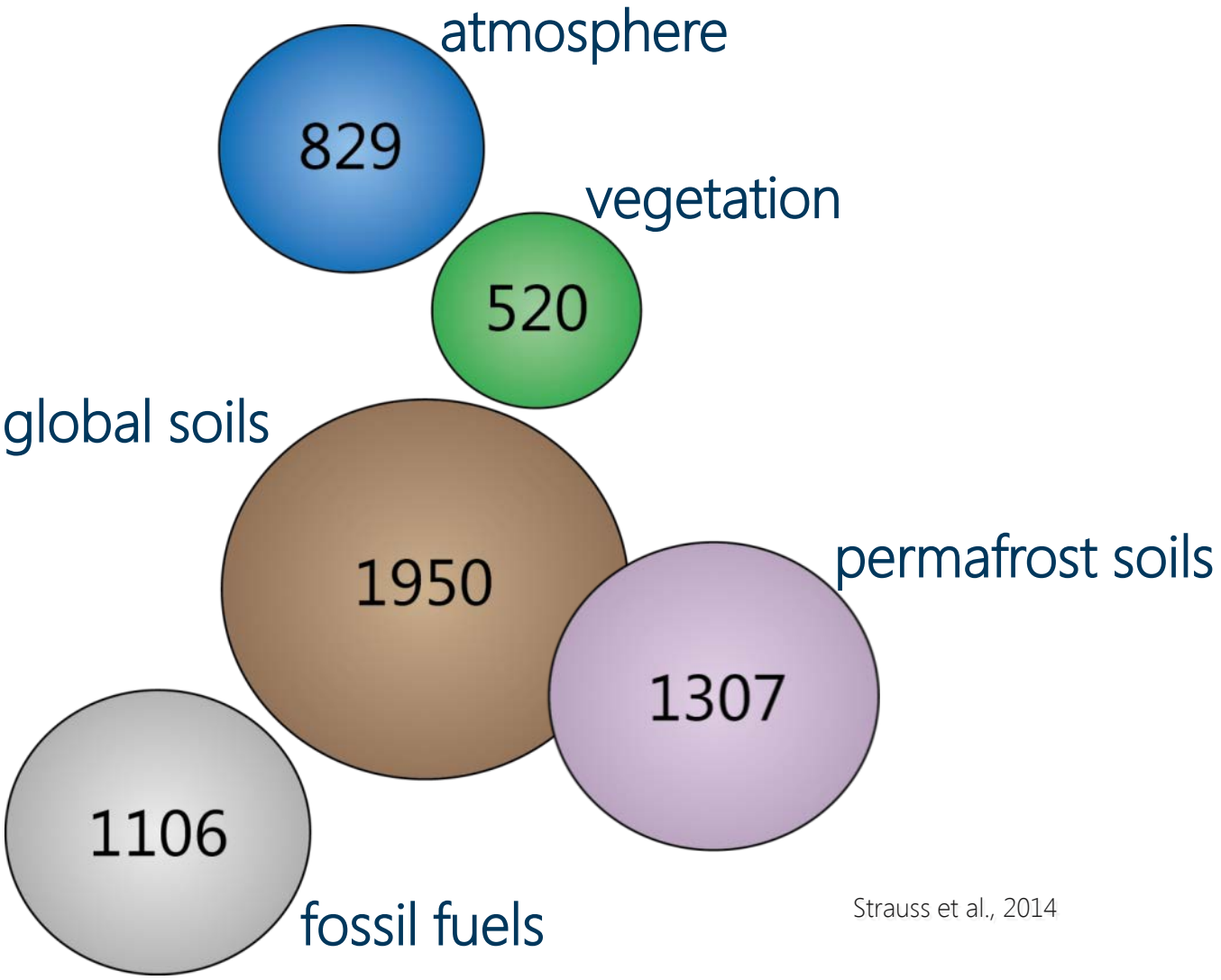
Motivation

Terrestrial carbon stocks in Gt

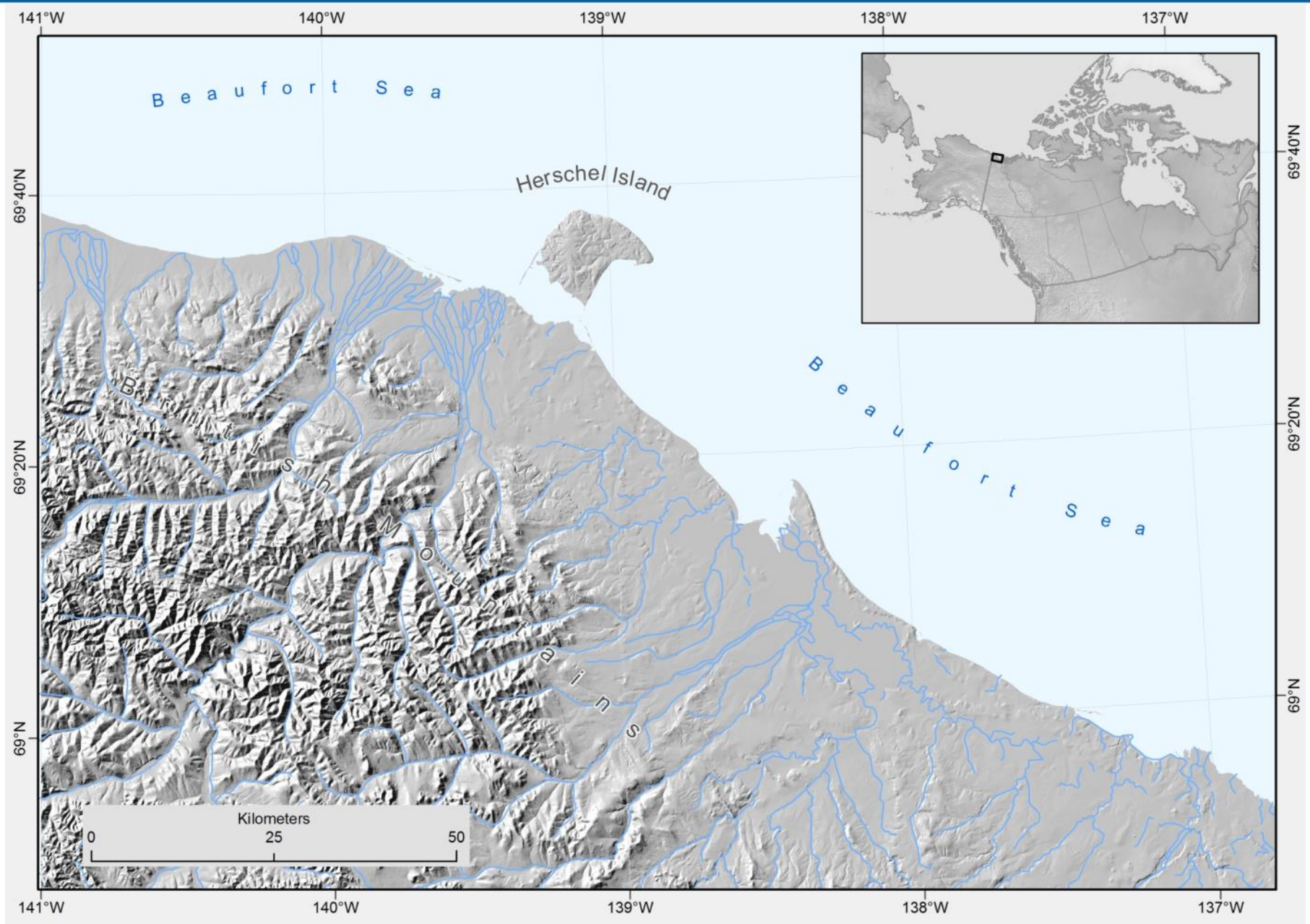


Strauss et al., 2014

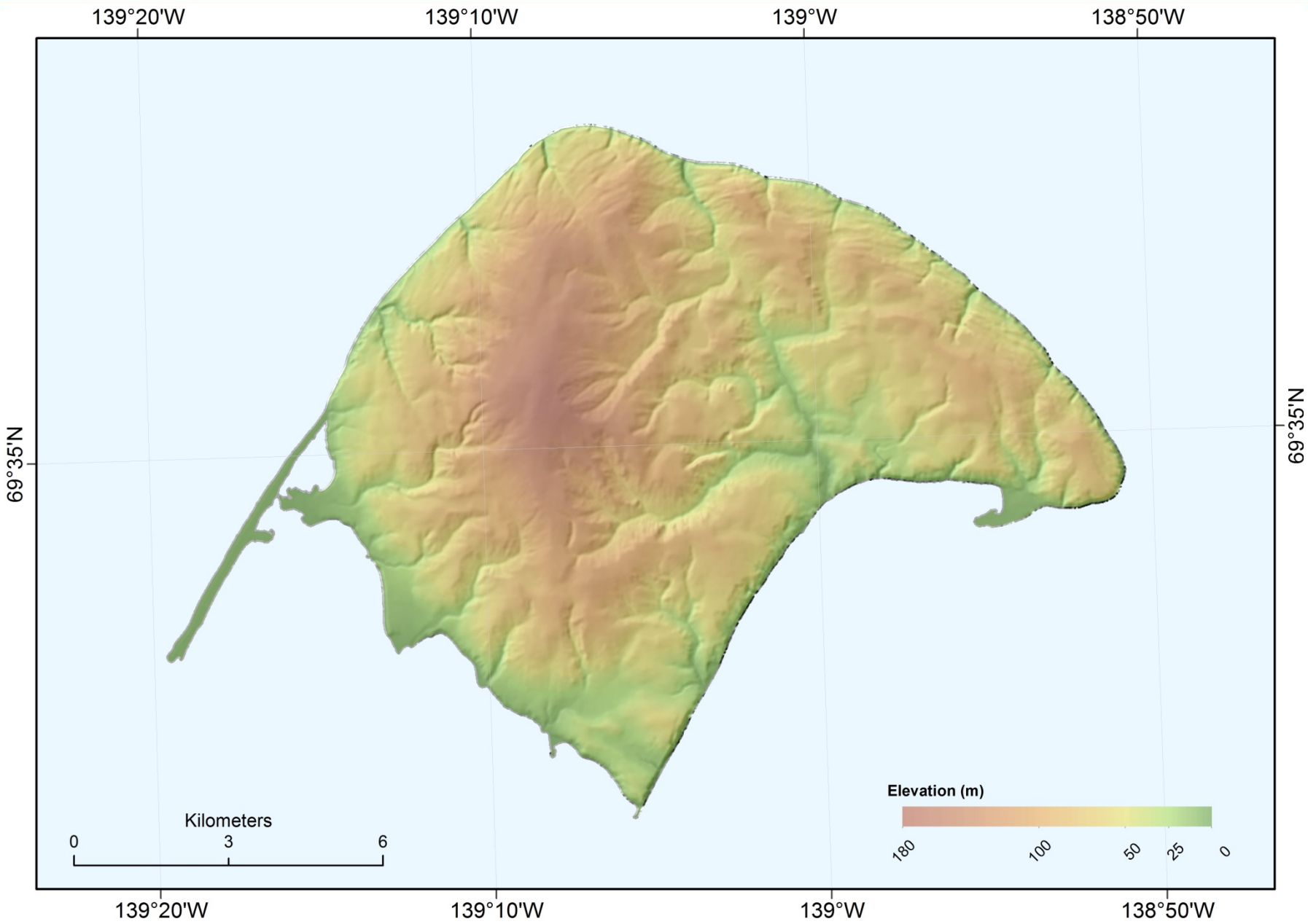
Research questions

- How terrain infuences SOC and TN storage
- What is the role of different geomorphic disturbances

Study area


141°W
140°W
139°W
138°W
137°W
69°40'N
69°20'N
69°N
Beaufort Sea
Herschel Island
Richardson Mountains
Kilometers
0
25
50

Herschel Island



Undisturbed

Geomorphoic disturbance

- Mass wasting

Solifluction

Active-layer detachments

Active-layer detachments

Gullying

Massive ice

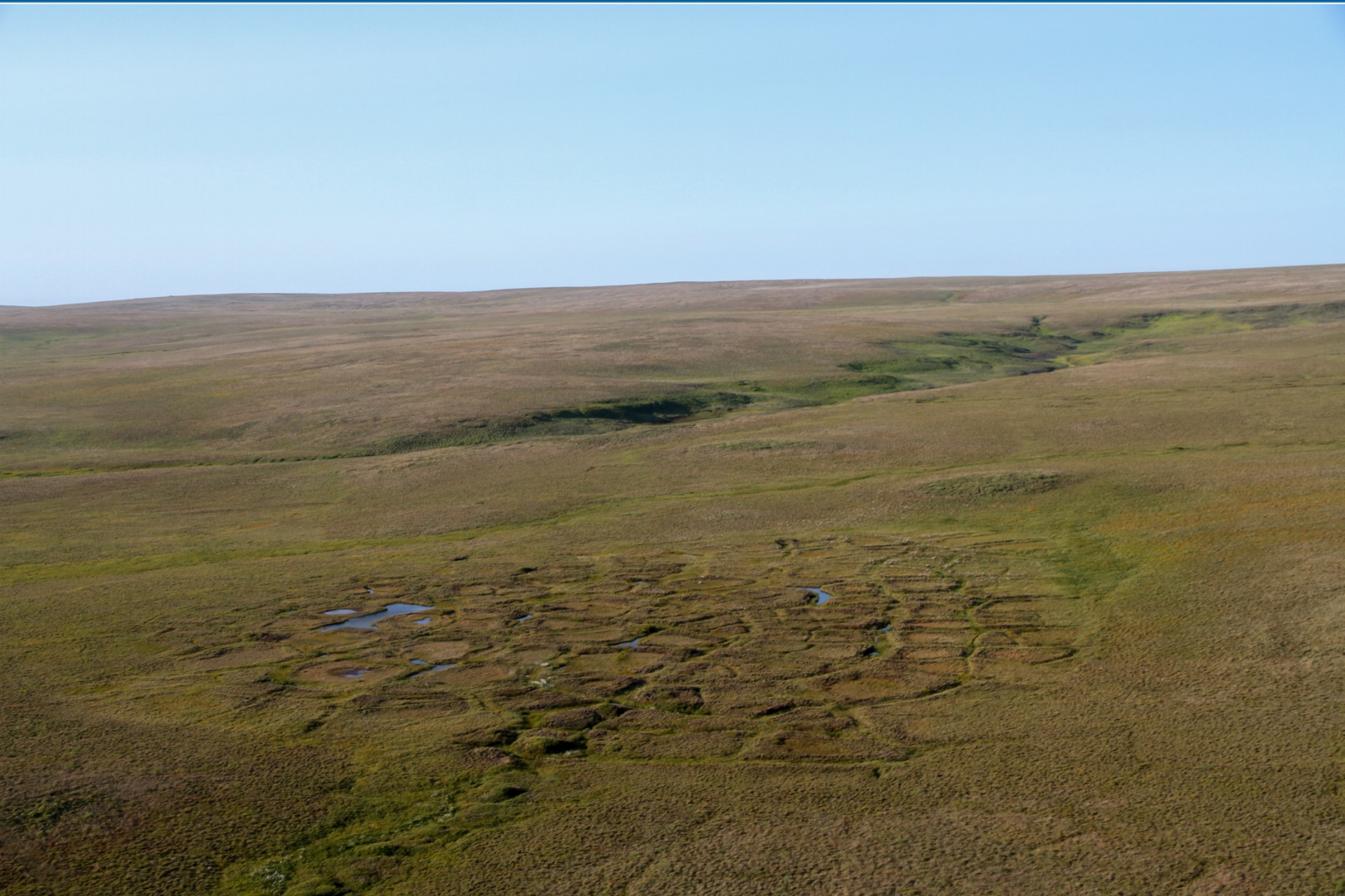
Photo: M. Fritz

Slumping

Geomorphoic disturbance

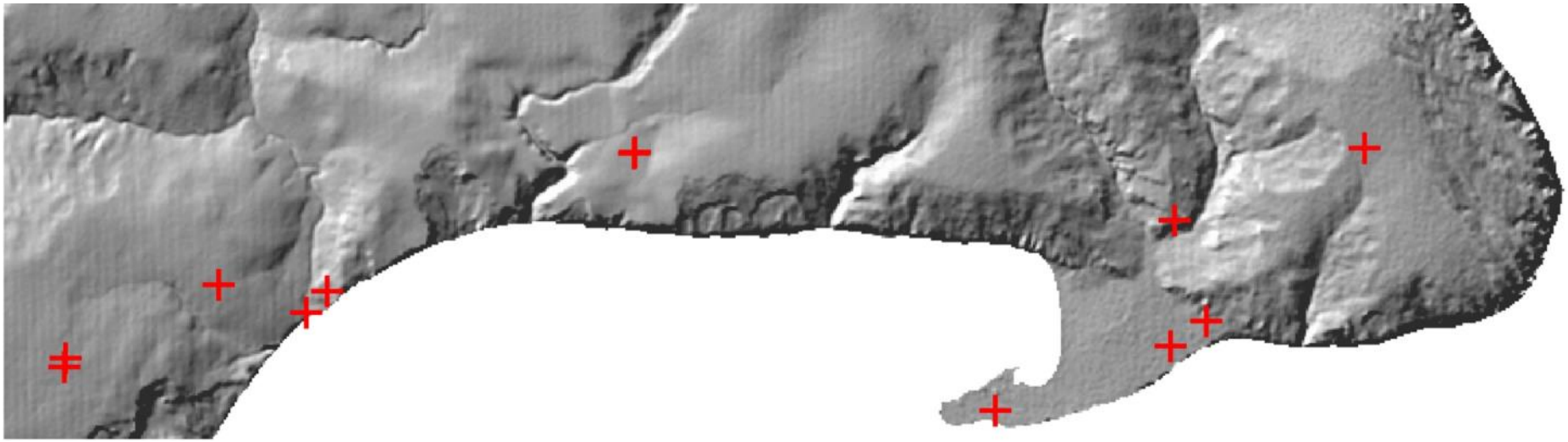
- Accumulation

Peatlands



Alluvial fans

Coring sites

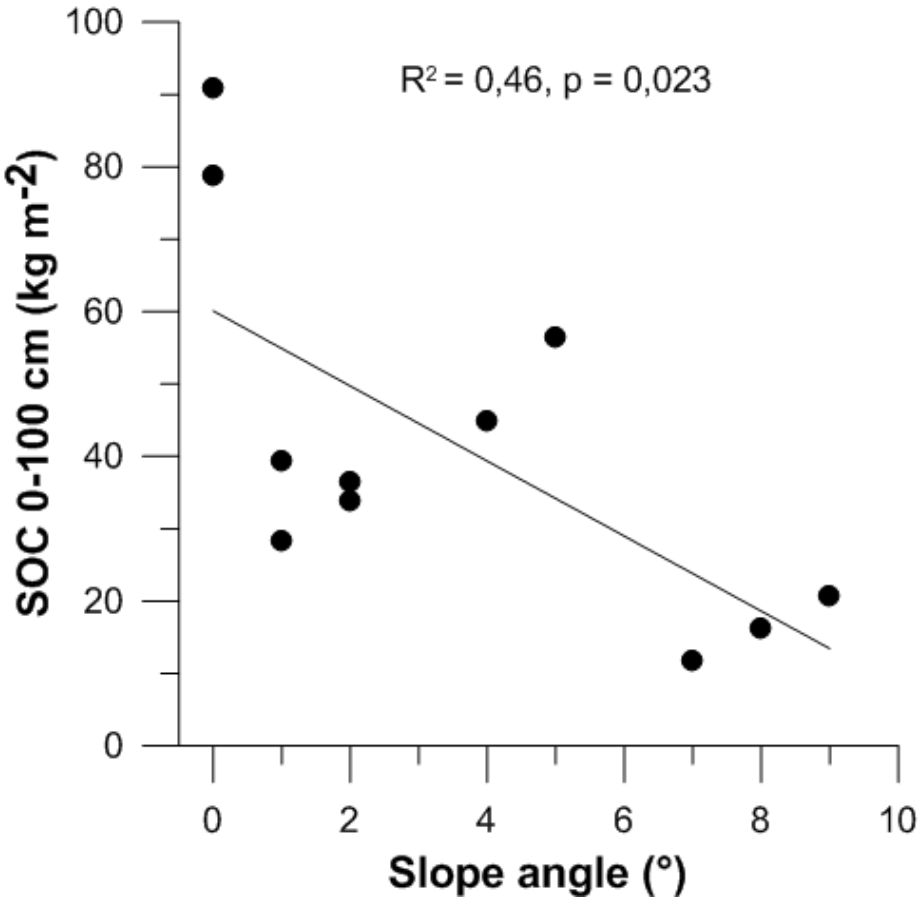


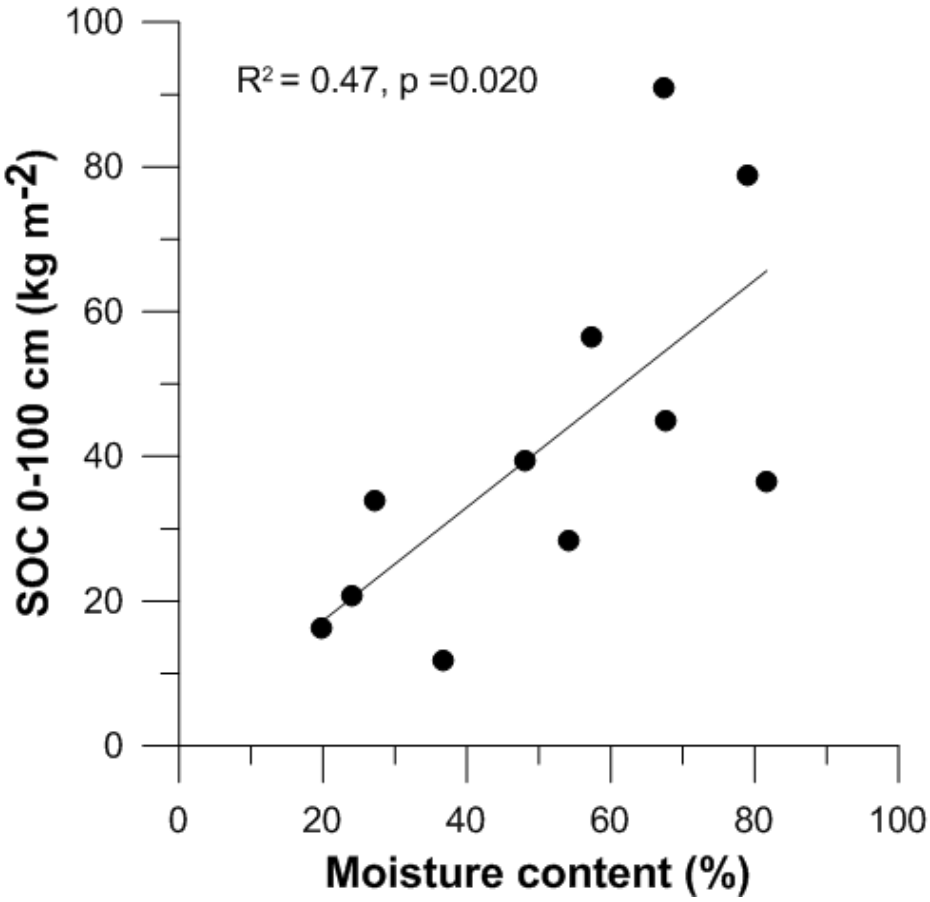
Coring

Soil organic carbon and nitrogen storage

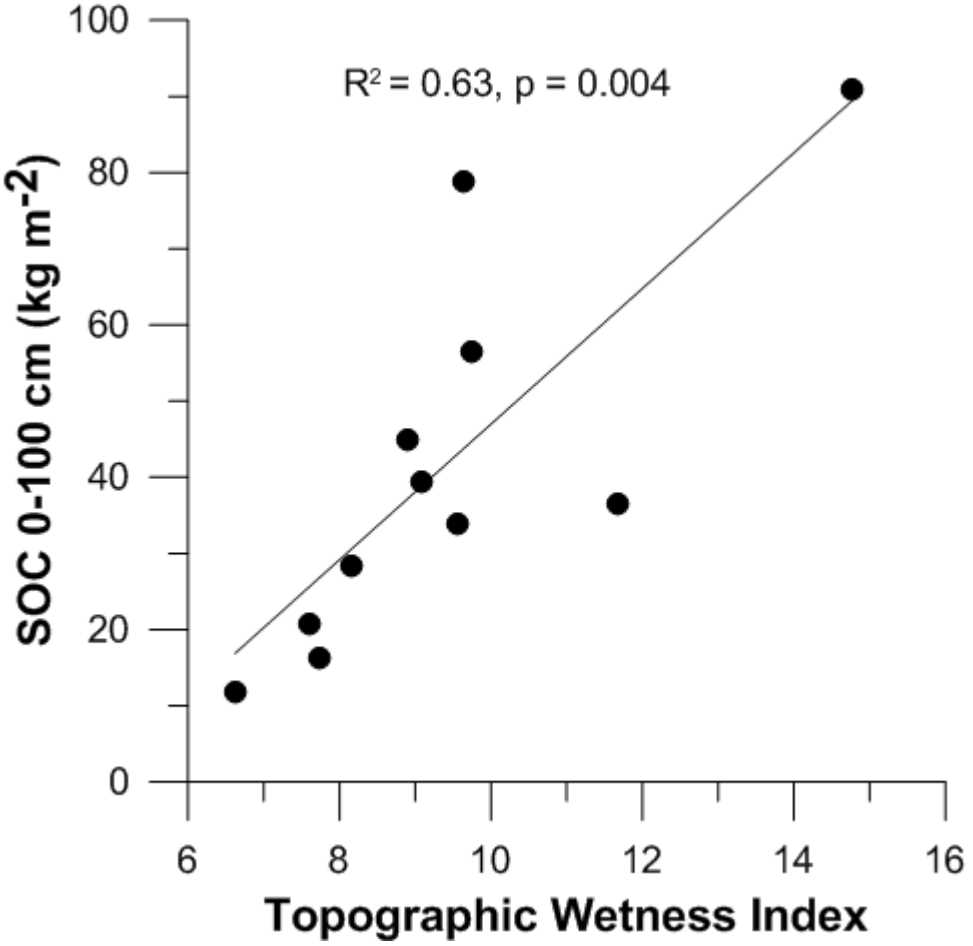
- SOC storage for 1 m depth is 34.8 kg C m^{-2} (15 - 85 kg C m^{-2})
- TN storage for 1 m depth 3.4 kg N m^{-2} (2 – 4.6 kg N m^{-2})

Correlations



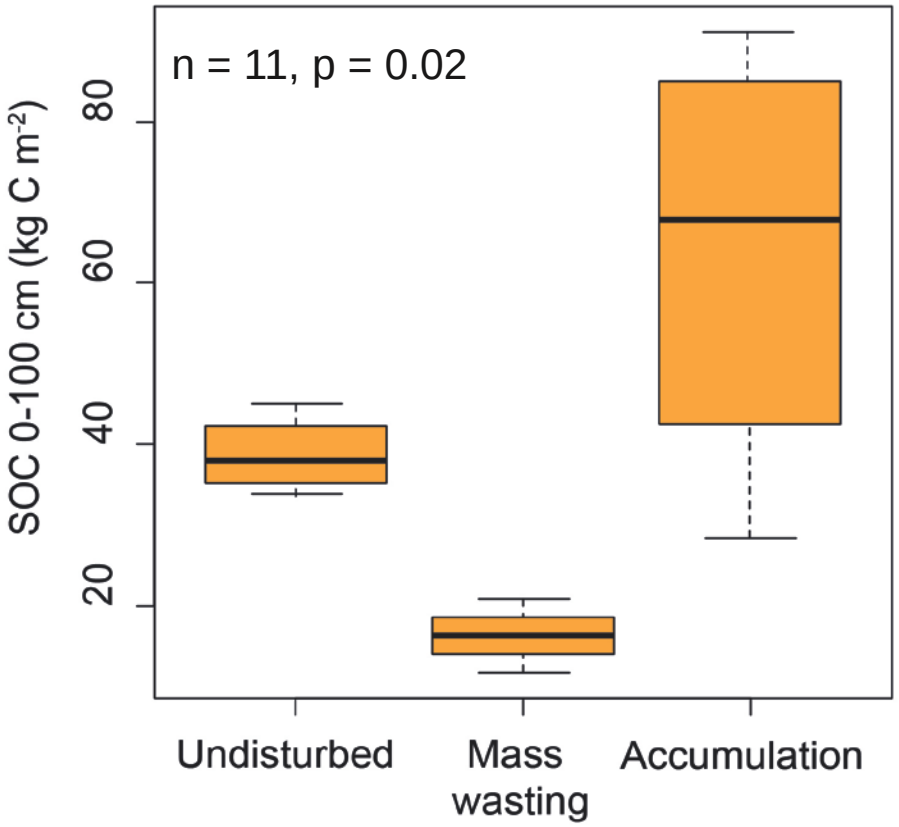


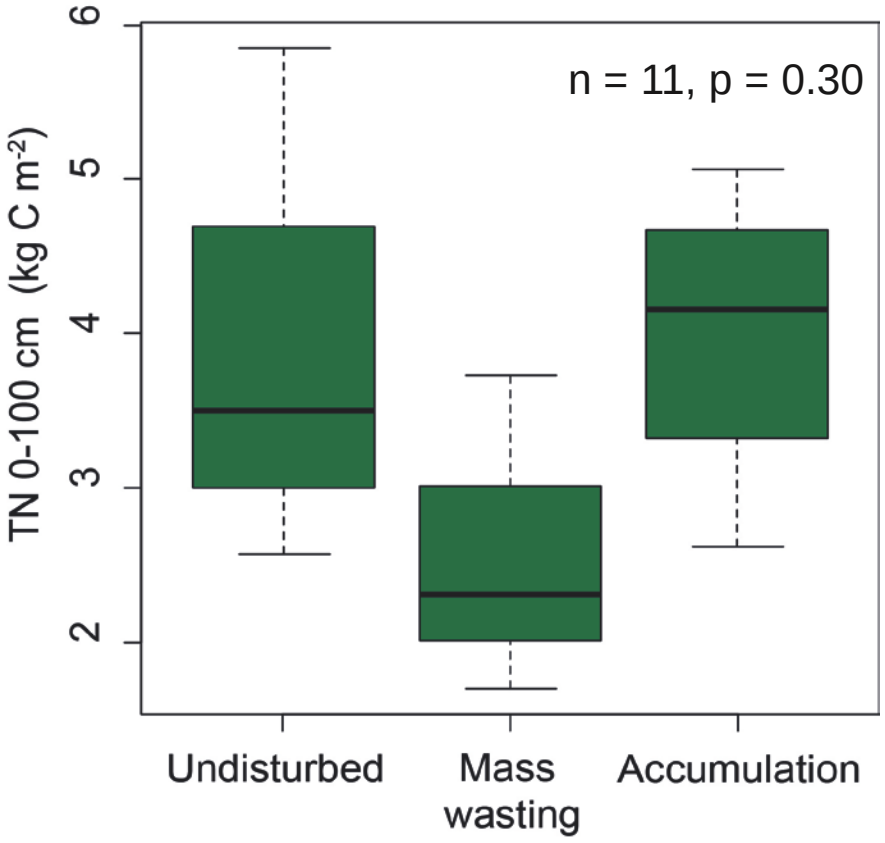
Topographic wetness index



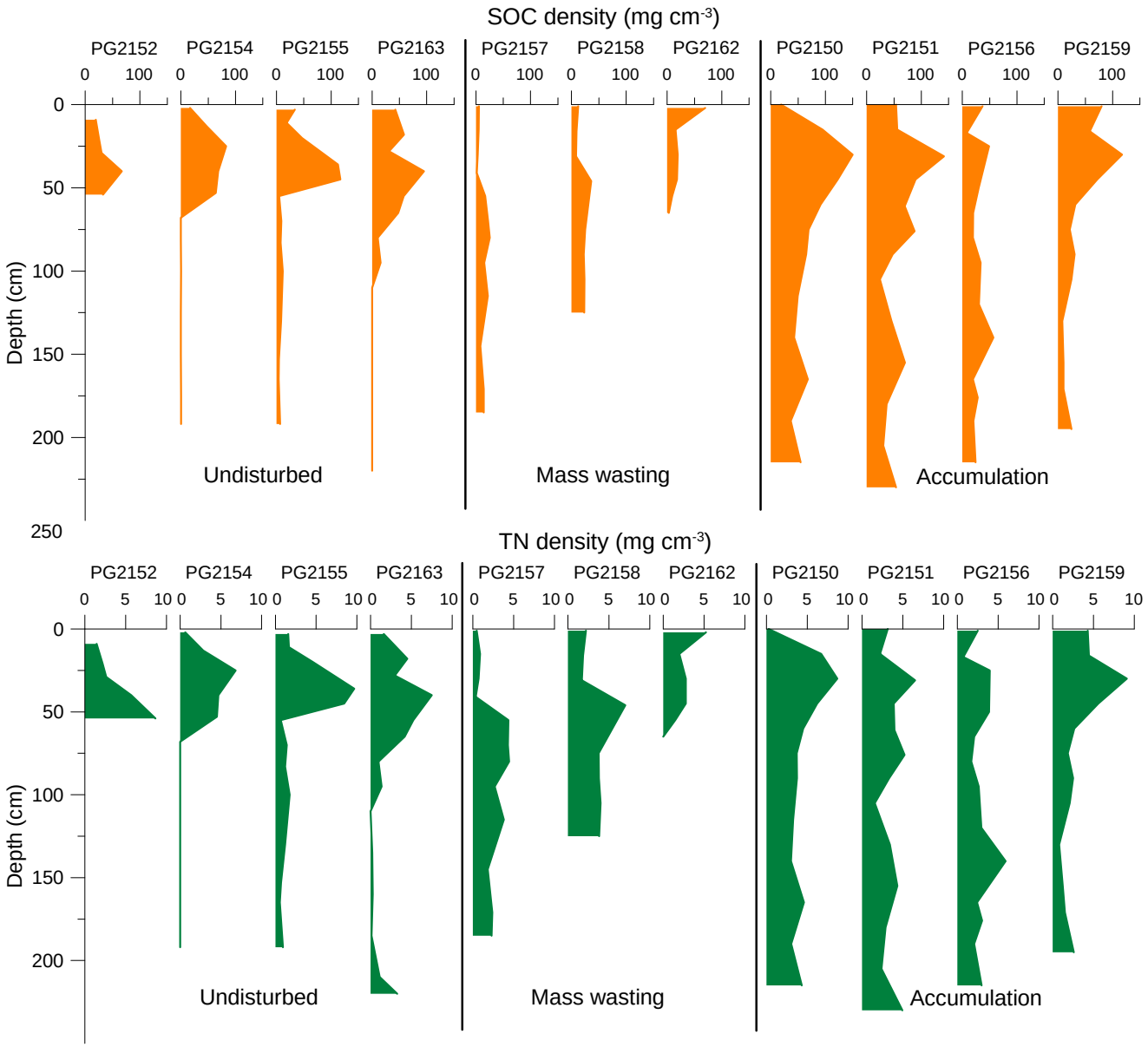
$$\ln \frac{a}{tanb}$$

Geomorphic disturbance groups





Down-core trends

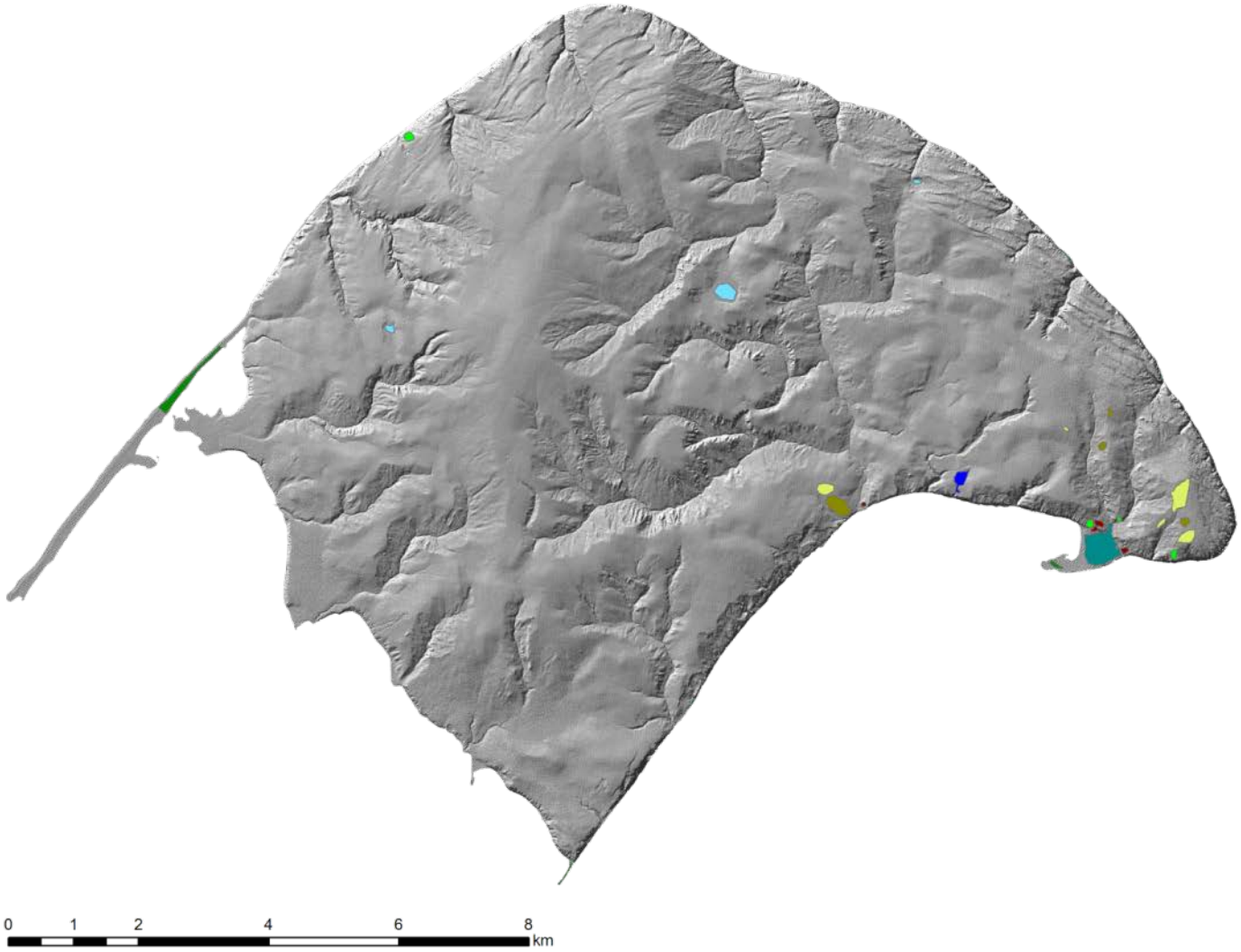


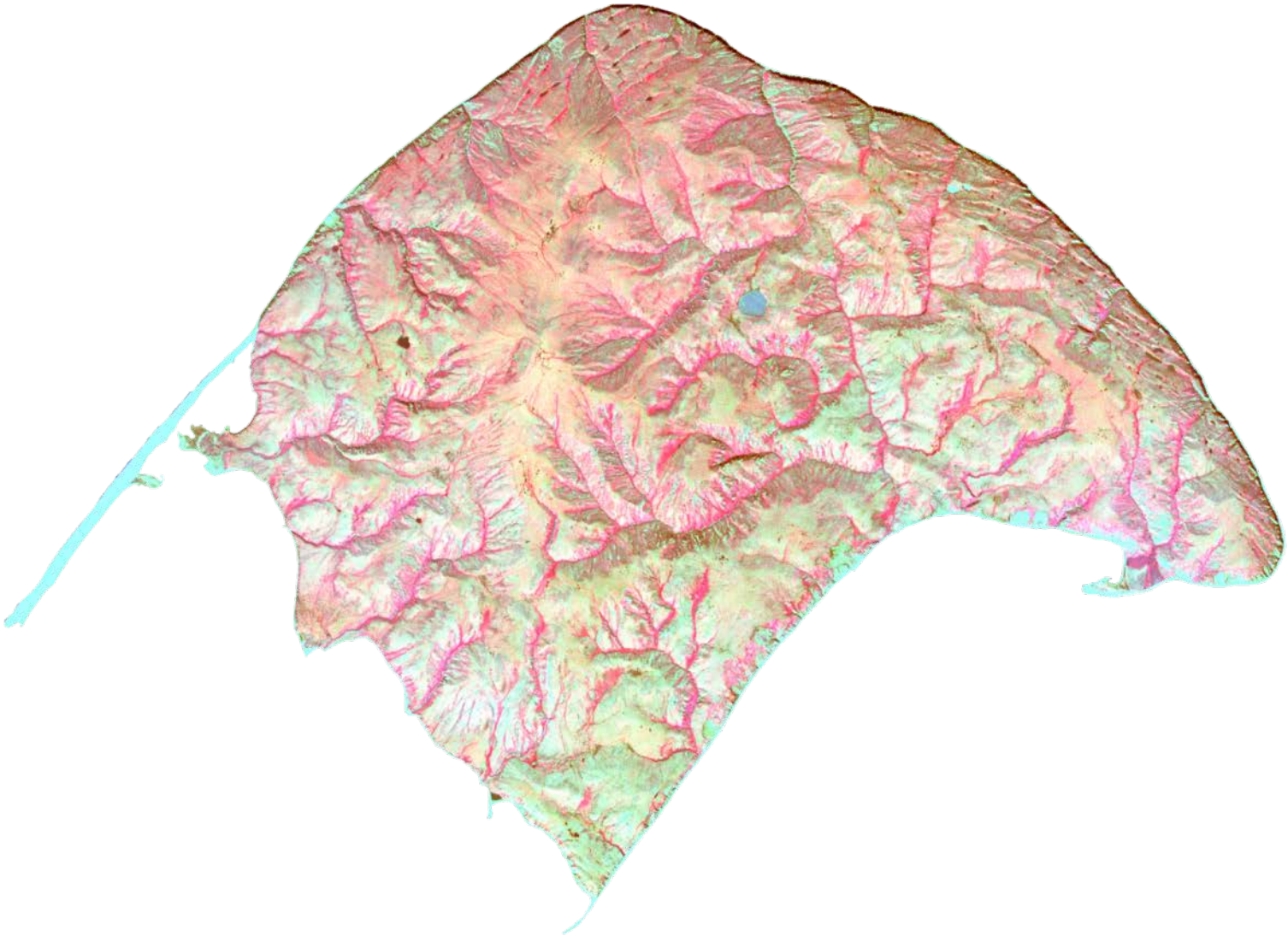
Conclusions

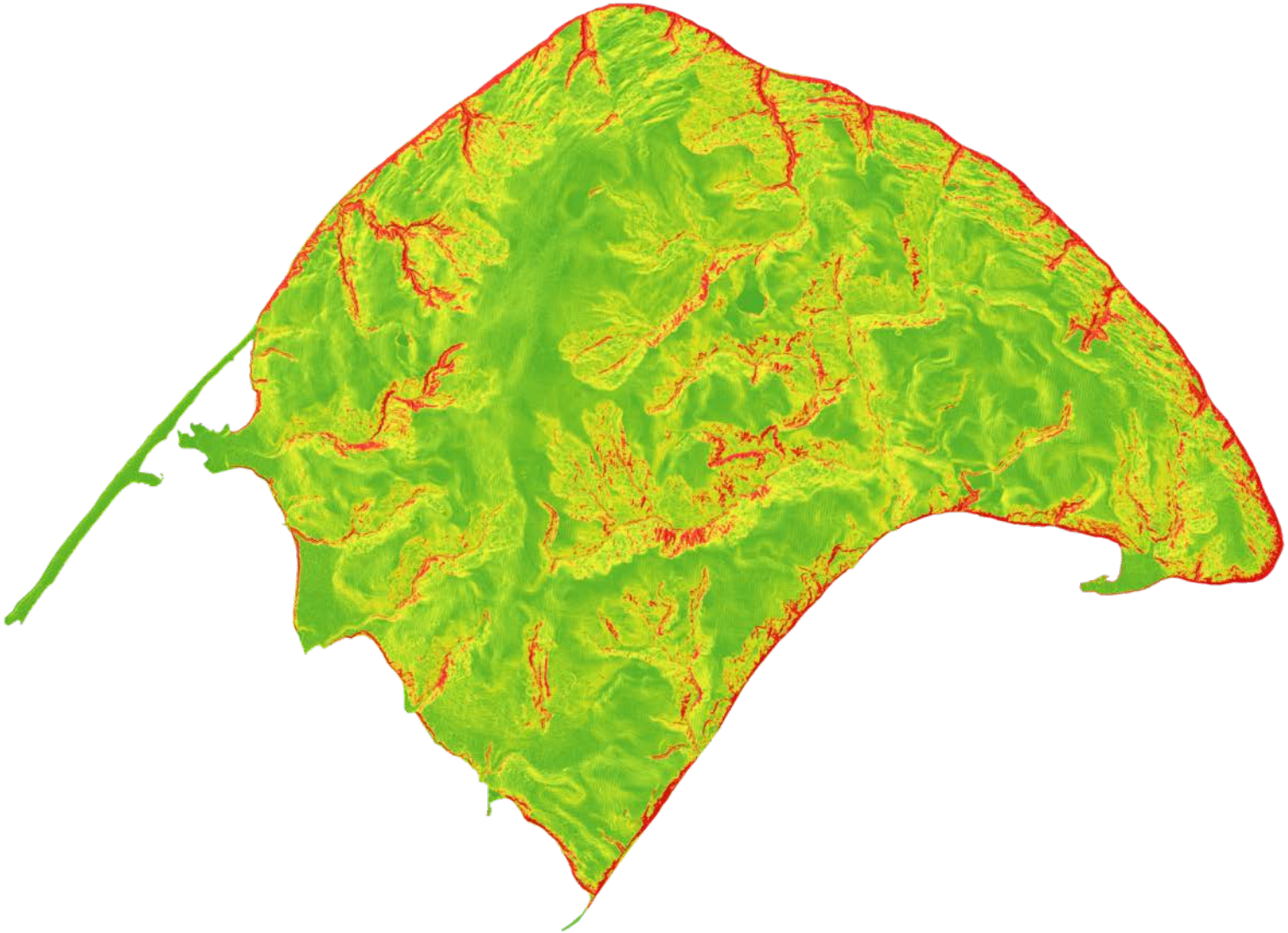
- SOC storage is significantly influenced by terrain
- Mass wasting can decrease SOC storage
- Increased microbial activity and leaching
- Exact effect of slow and continuous mass wasting as solifluction needs to be studied

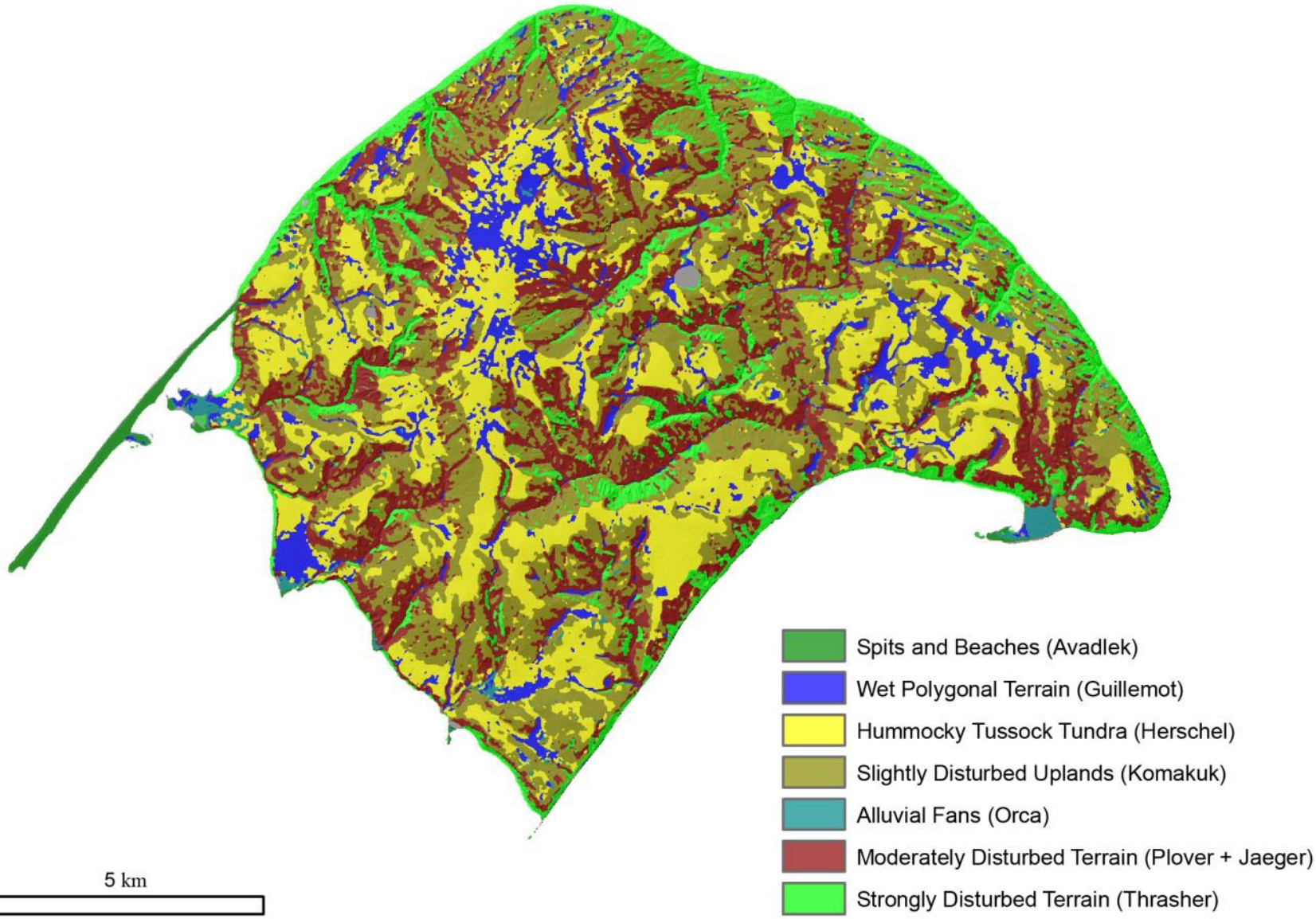
Obu, J., Lantuit, H., Myers-Smith, I., Heim. B, Wolter J., and Fritz M., 2015. Effect of terrain characteristics on soil organic carbon and total nitrogen stocks in soils of Herschel Island, western Canadian Arctic. Permafrost and Periglacial Processes, in press.

Thank you for your attention


0
1
2
4
6
8
km






Spits and Beaches (Avadlek)
Wet Polygonal Terrain (Guillemot)
Hummocky Tussock Tundra (Herschel)
Slightly Disturbed Uplands (Komakuk)
Alluvial Fans (Orca)
Moderately Disturbed Terrain (Plover + Jaeger)
Strongly Disturbed Terrain (Thrasher)
N
5 km