Electronic Appendix C for the article: "High-resolution LiDAR mapping of glacial landforms and ice stream lobes in Finland" by Putkinen et al. (2017), Bulletin of the Geological Society of Finland, vol. 89, issue 2.

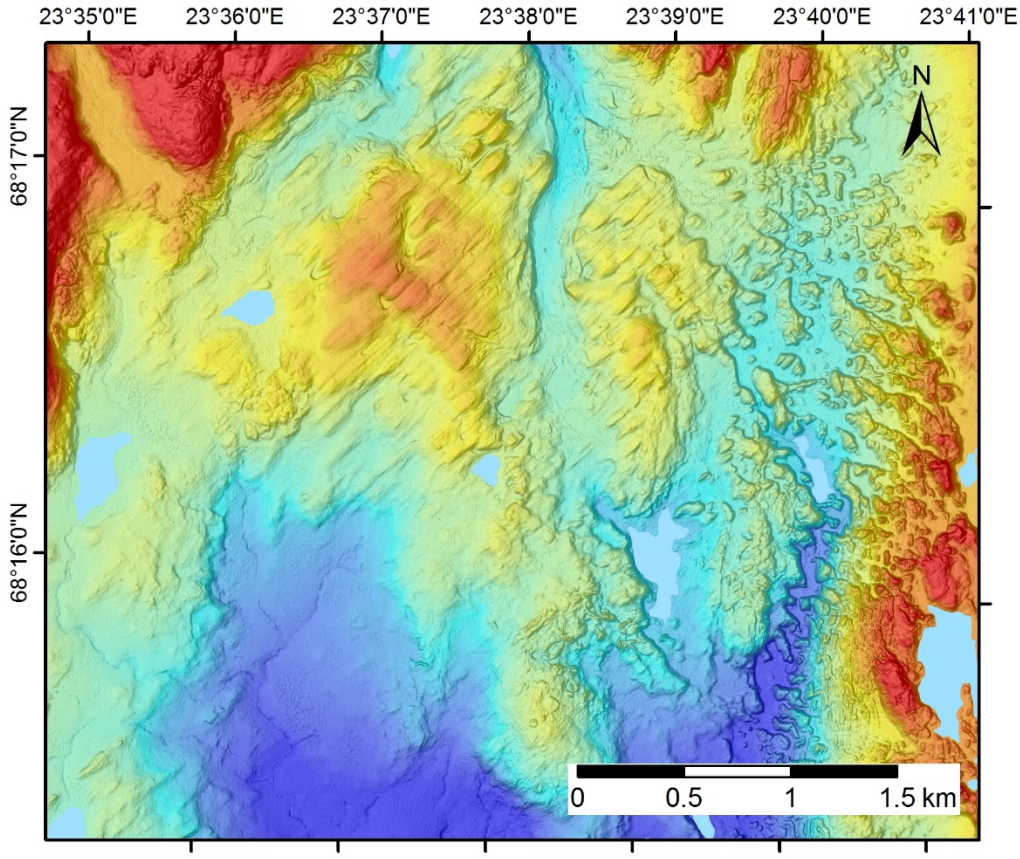

Figure 1.Ice stream subglacial flow set at Sammalvaara, Enontekiö composed of drumlins and more elongated megaflutings (Mega Scale Glacial Lineations MSGL) on buried sediment.

CLASSES IN THE DATABASE: 3.1, 3.4, 3.5

COORDINATES (EUREF-FIN): 361059 / 7578250

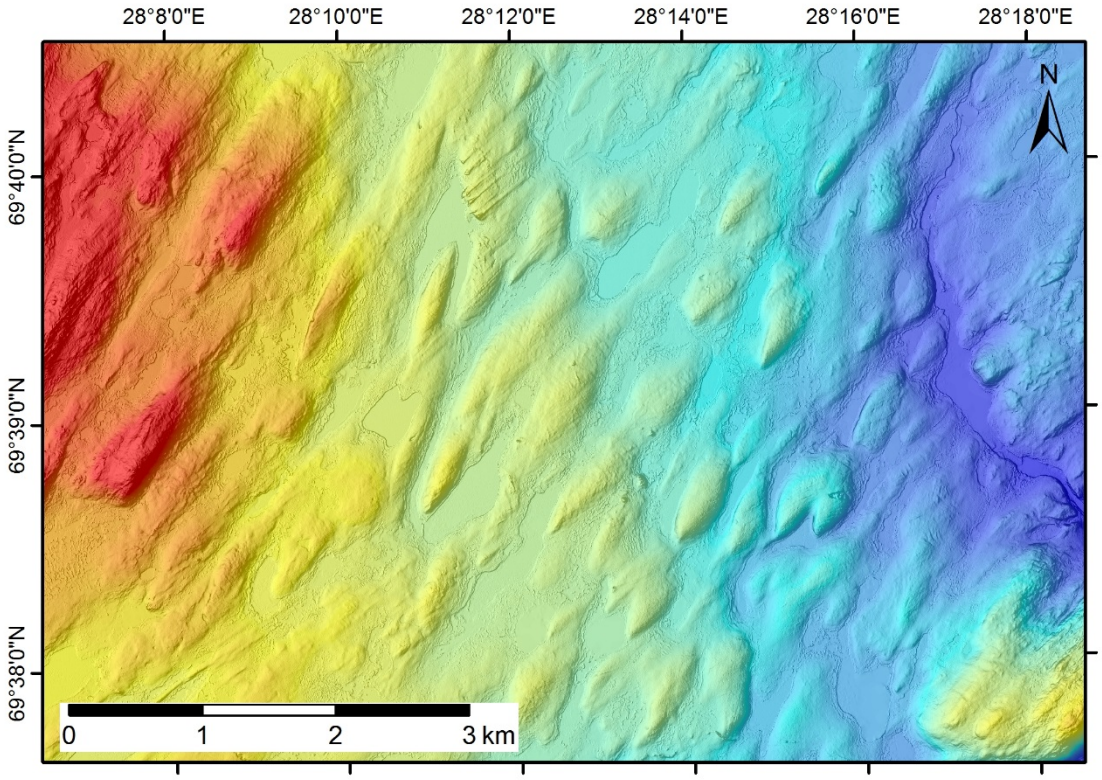

Figure 2. Crossing drumlins at Nuorgam, Utsjoki resulting from late stage flow switching.

CLASSES IN THE DATABASE: 3.1

COORDINATES (EUREF-FIN): 546960 / 7727434

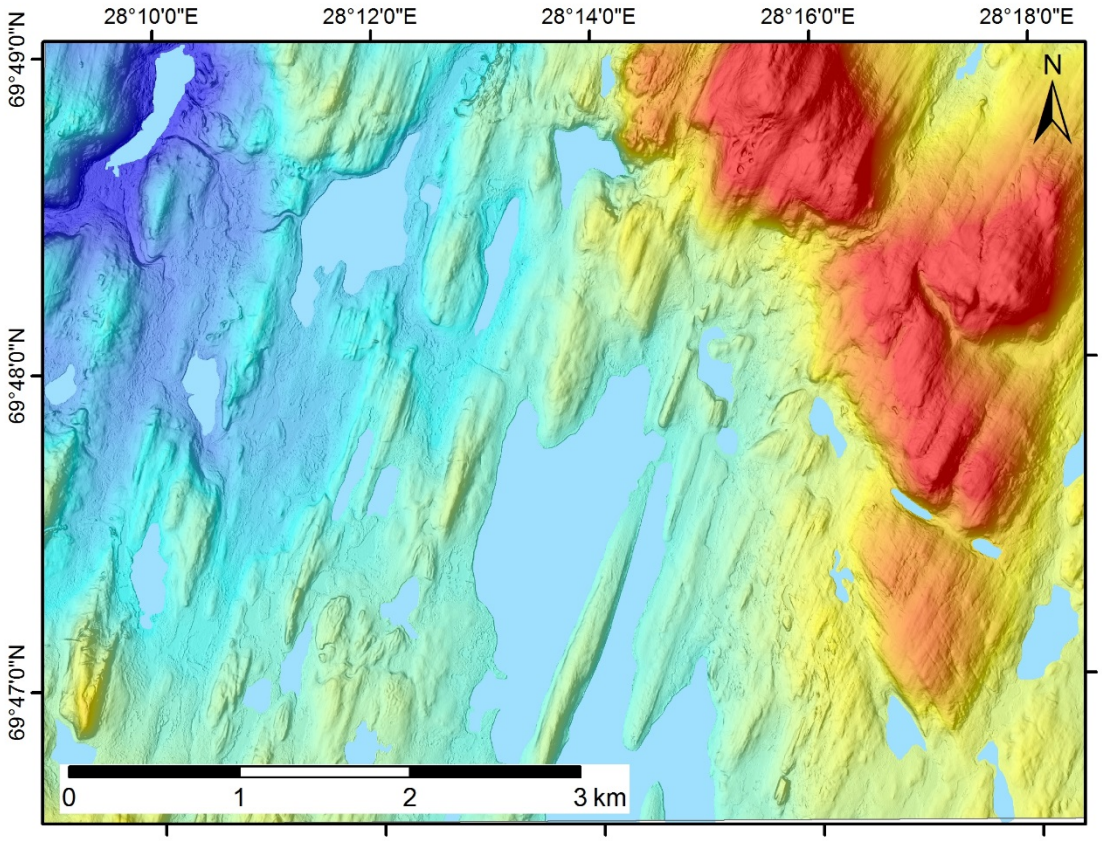

Figure 3. Flutings, drumlins and elongated megaflutings at Nuorgam, Utsjoki left by the Inari ice stream lobe ice in northern Finland.

CLASSES IN THE DATABASE: 3.1, 3.4, 3.5

COORDINATES (EUREF-FIN): 547288 / 7743654

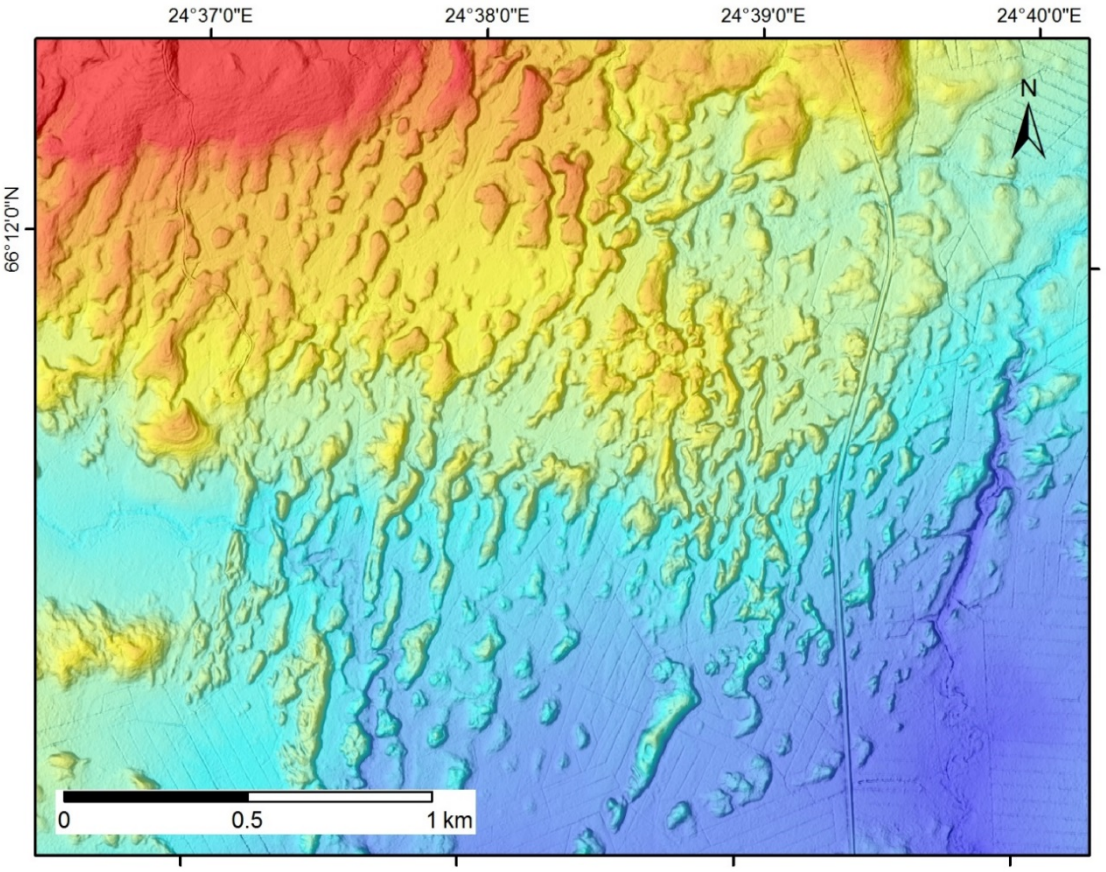

Figure 4. Ribbed moraine at Sihtuuna, Tervola.

CLASS IN THE DATABASE: 4.4.3

COORDINATES: EUREF-FIN: 394400 / 7343600

References:

Aario, R., Peuraniemi, V. & Sarala, P. 1997. The Sihtuuna moraine at Tervola, southern Lapland. Sedimentary Geology 111, 135-145.

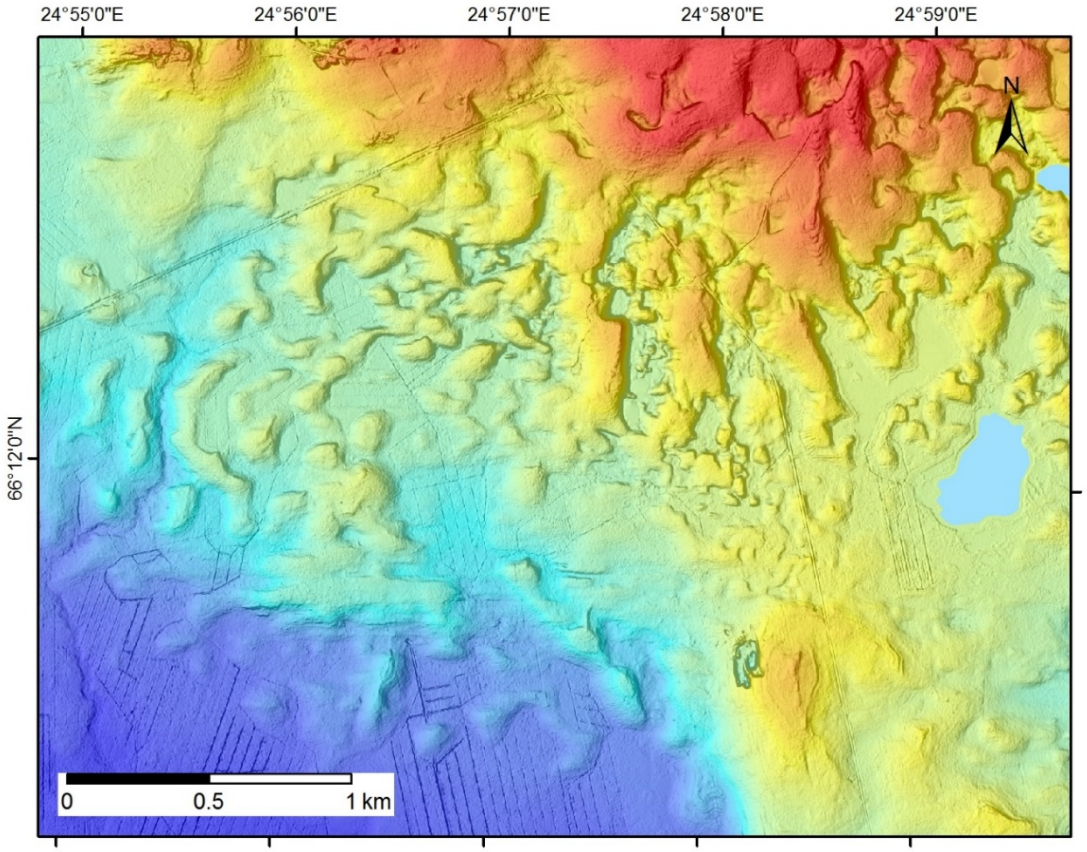

Figure 5. Complex transition from Rogen moraine type morphology (to the west) to hummocky moraine topography (at centre and east) in Louepalo, Tervola. Ice flow from west to east.

CLASSES IN THE DATABASE: 4.4.1, 4.4.2

COORDINATES: EUREF-FIN: 407650 / 7344000

References:

Sarala, P. 2003. Ribbed-moreenit - jäätikön liikesuunnan poikittaiset indikaattorit. Summary: moraines - transverse indicators of the ice flow direction. Geologi 55:9-10, 250-253.

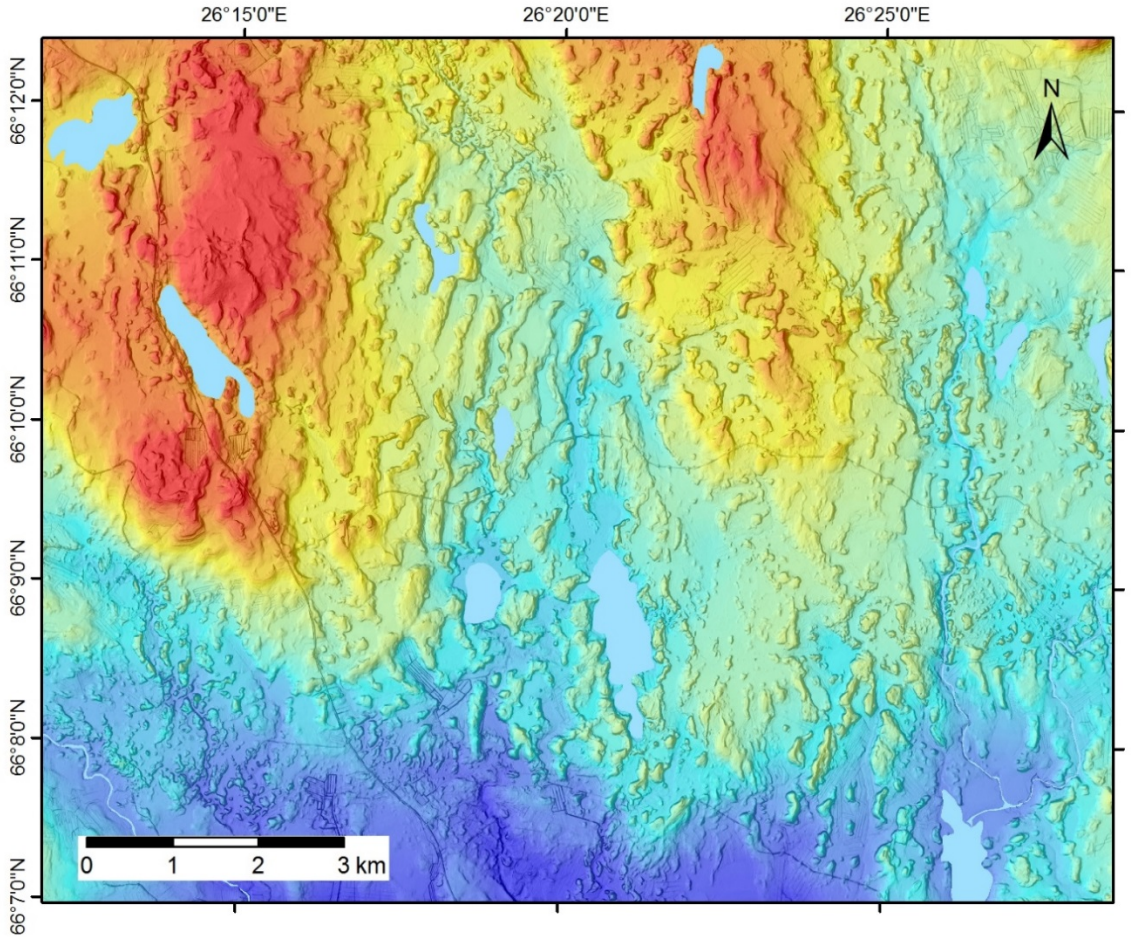

Figure 6. Classic Rogen moraine at Portimojärvi, Ranua. Ridges are generally 100–1000 m in length, 50–200 m wide and 2–10 m high. The distance between individual ridges is between 100–300 m.

CLASS IN THE DATABASE: 4.4

COORDINATES (EUREF-FIN) 469330 / 7338000

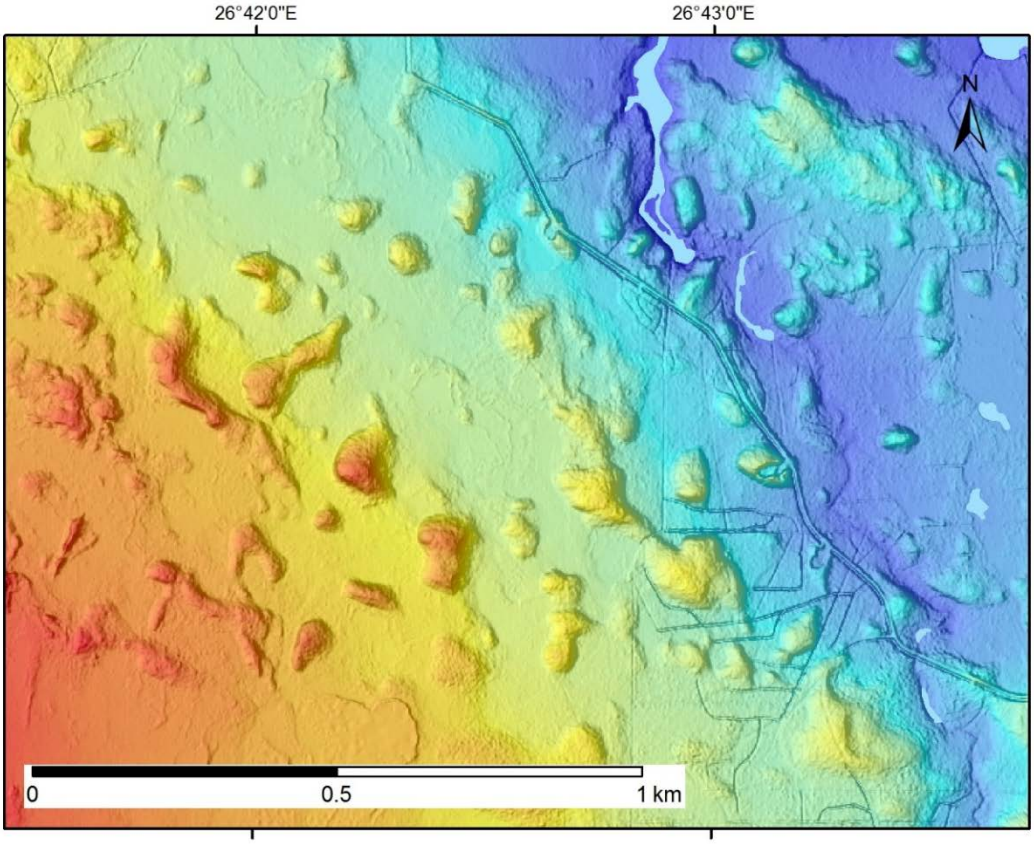

Figure 7. Ribbed moraine ridges in near Näskäjärvi Lake, on the south-eastern side of Rovaniemi City; some have a poorly defined crescent shape similar to those described from Blattnick in Sweden.

CLASS IN THE DATABASE: 4.4

COORDINATES: EUREF-FIN: 487200 / 7341400

References:

Hättestrand, C. 1997. Ribbed moraines in Sweden – distribution pattern and paleoglaciological implications. Sedimentary Geology 111, 41–56

Sarala, P. 2003. Ribbed-moreenit - jäätikön liikesuunnan poikittaiset indikaattorit. Summary: moraines - transverse indicators of the ice flow direction. Geologi 55, 250-253.

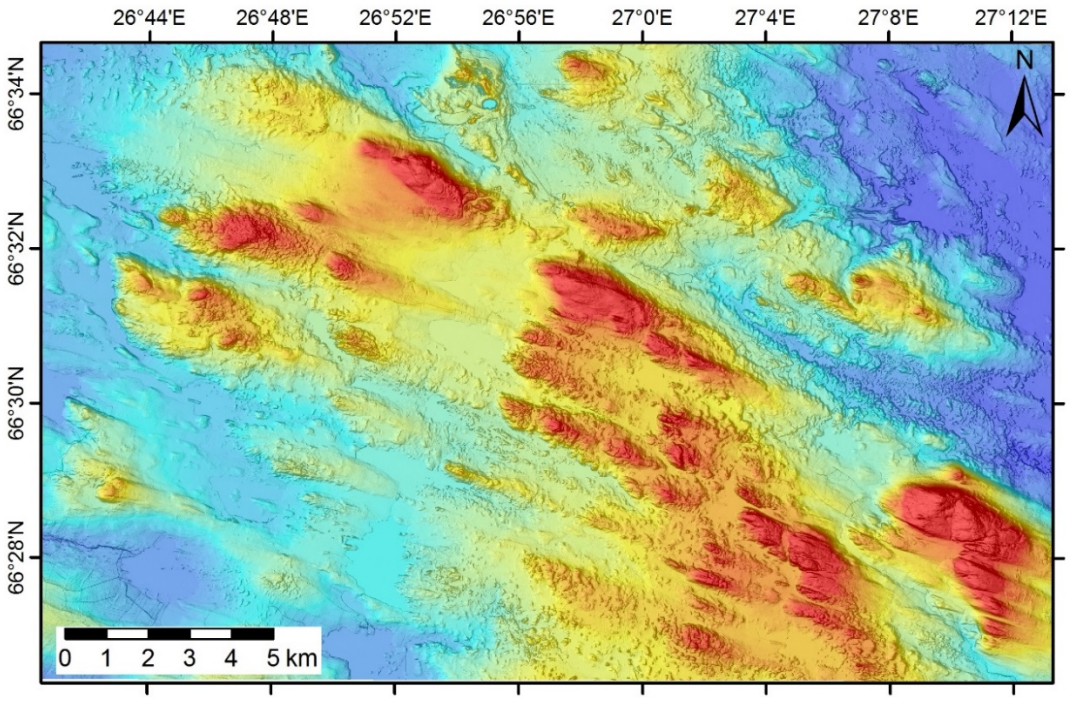

Figure 8. Megaflutings on the bed of the Kuusamo ice stream lobe near Katisko-Saarijärvi, 30 km SW from Kemijärvi.

CLASSES IN THE DATABASE: 3.5, 4.3

COORDINATES: EUREF-FIN: 497151 / 7376687

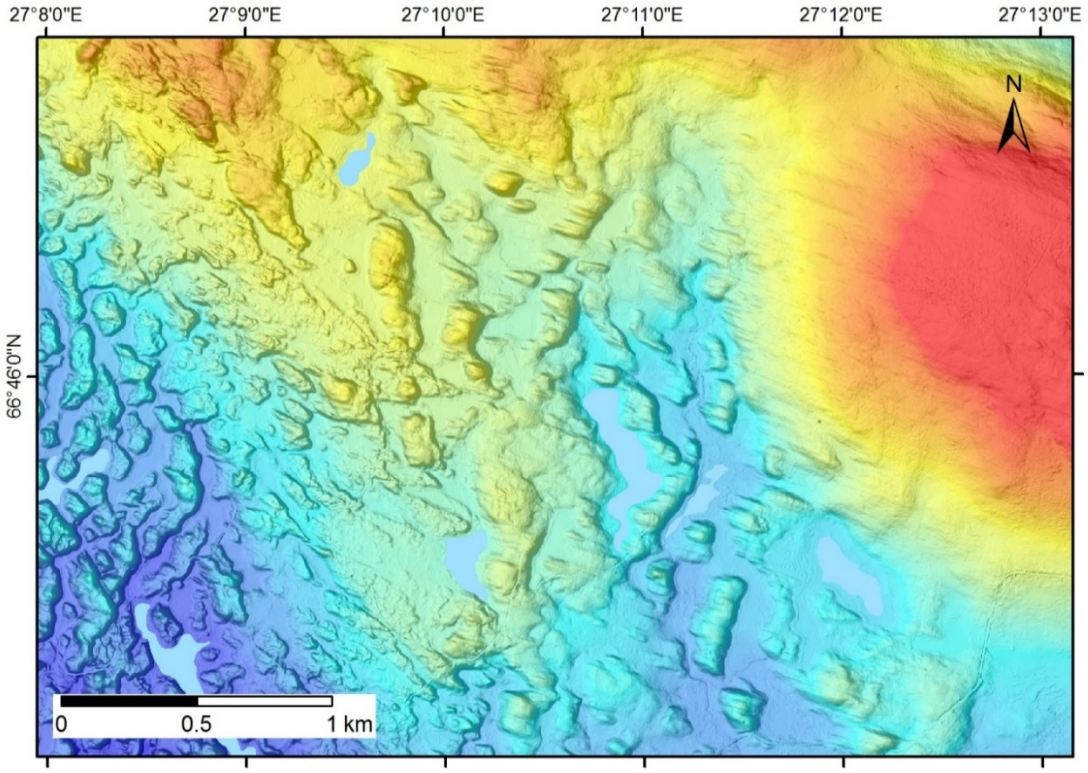

Figure 9. Ribbed moraine formed under cold-based ice; some have poorly-defined streamlined ridges on their surface, caused by partial or total reworking caused by faster southeast flowing ice during later warm-based conditions.

CLASSES IN THE DATABASE: 3, 4.3, 4.4.1, 4.4.2,

COORDINATES: EUREF-FIN: 507500 / 7405300

References:

Aario, R. 1977. Classification and terminology of morainic landforms in Finland. Boreas 6, 87-100; Sarala, P. 2005. Weichselian stratigraphy, geomorphology and glacial dynamics in southern Finnish Lapland. Bulletin of the Geological Society of Finland 77:2, 71-104.

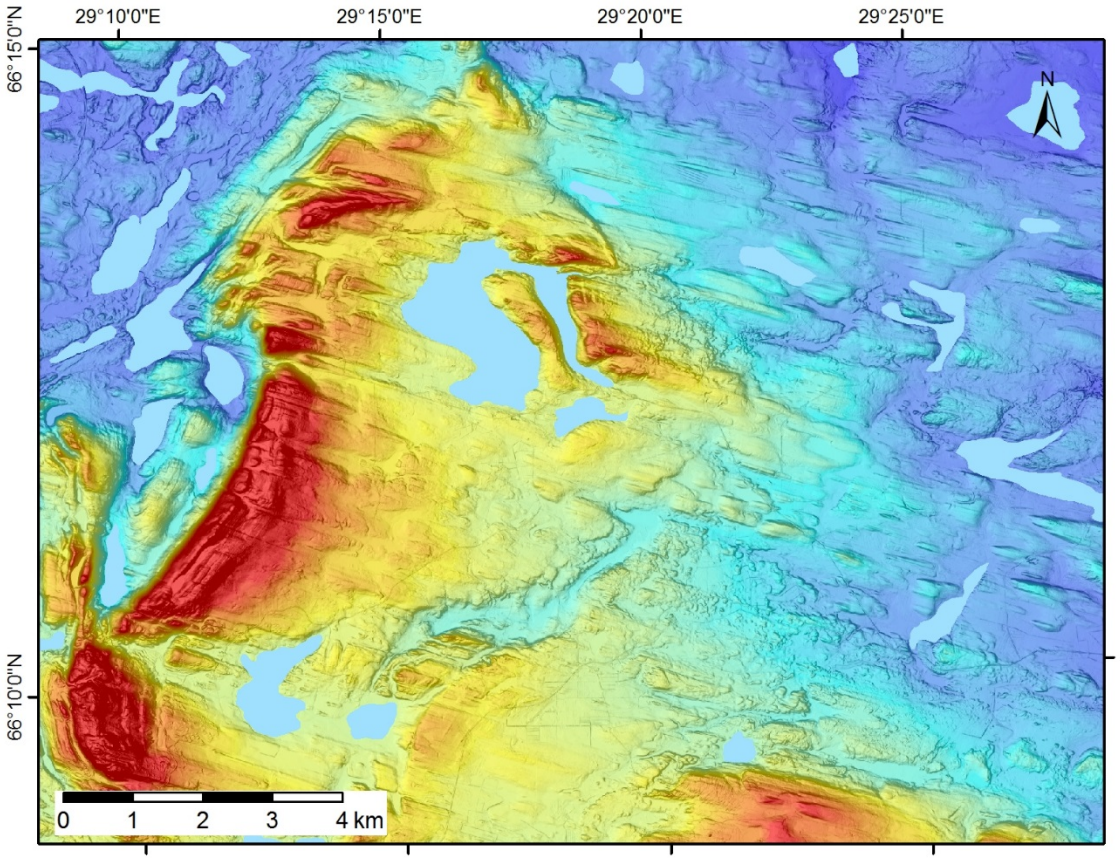

Figure 10. Streamlined landscape of drumlins, crag and tails and megaflutings in Valtavaara, Kuusamo left by the Kuusamo ice stream lobe. Note streamlined bedrock structures on prominent bedrock escarpment shown in red.

CLASS IN THE DATABASE: 2.1, 3.1, 3.3, 3,4, 3.5, 4,3

COORDINATES (EUREF-FIN): 598718 / 7342450

References:

Räisänen et al., 2012. Ruka-Oulanka. Geologinen retkeilykartta. Opaskirja. Geologian tutkimuskeskus. 51 s.

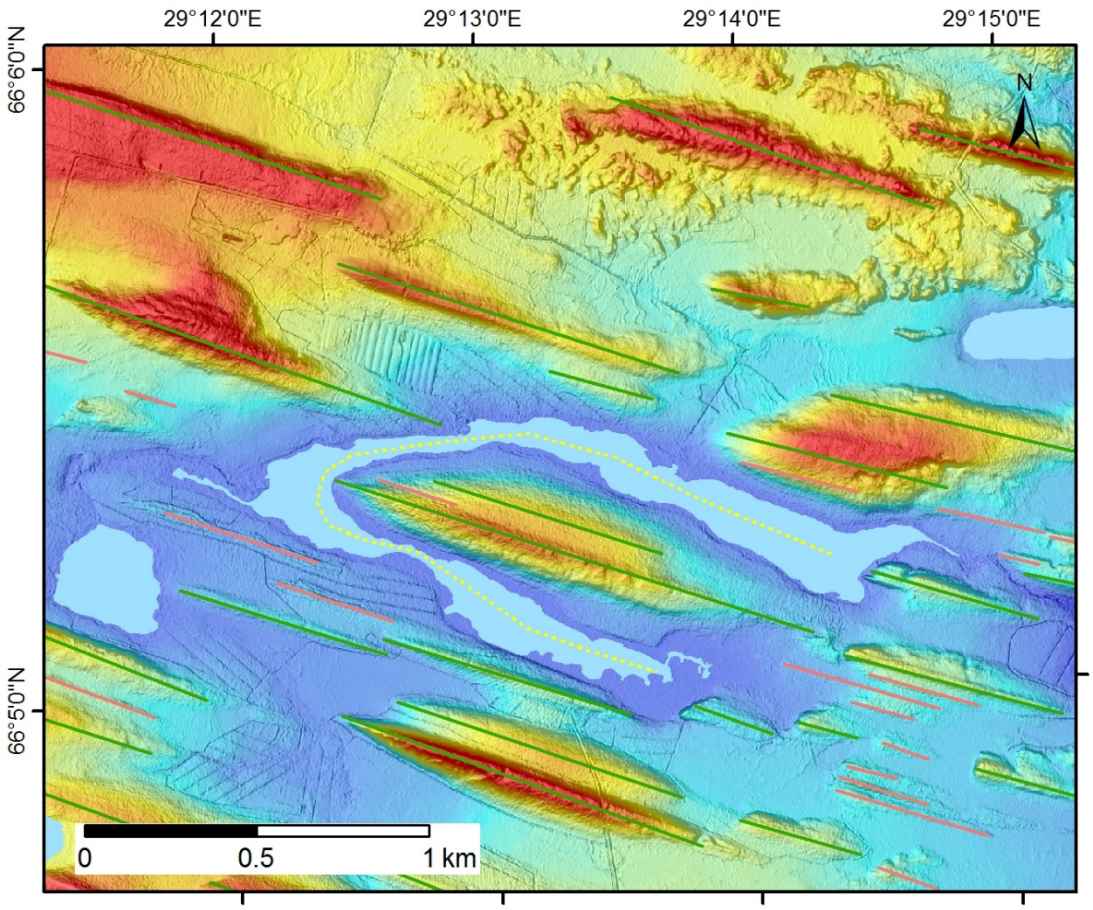

Figure 11. Drumlin (green lines) and narrower flutes (pink) at Ruukinvaara, Kuusamo. Flutes appear to result from subdivision (cloning) of larger drumlins such as seen in the centre of the image.

CLASSES IN THE DATABASE: 3.1, 3.3, 4.3

COORDINATES: 600573 / 7331566

References:

Sarala, P. & Räisänen, J. 2017. Evolution of the eastern part of Kuusamo Ice lobe based on the LiDAR geomorphologic interpretation. The Geological Society of Finland, This volume

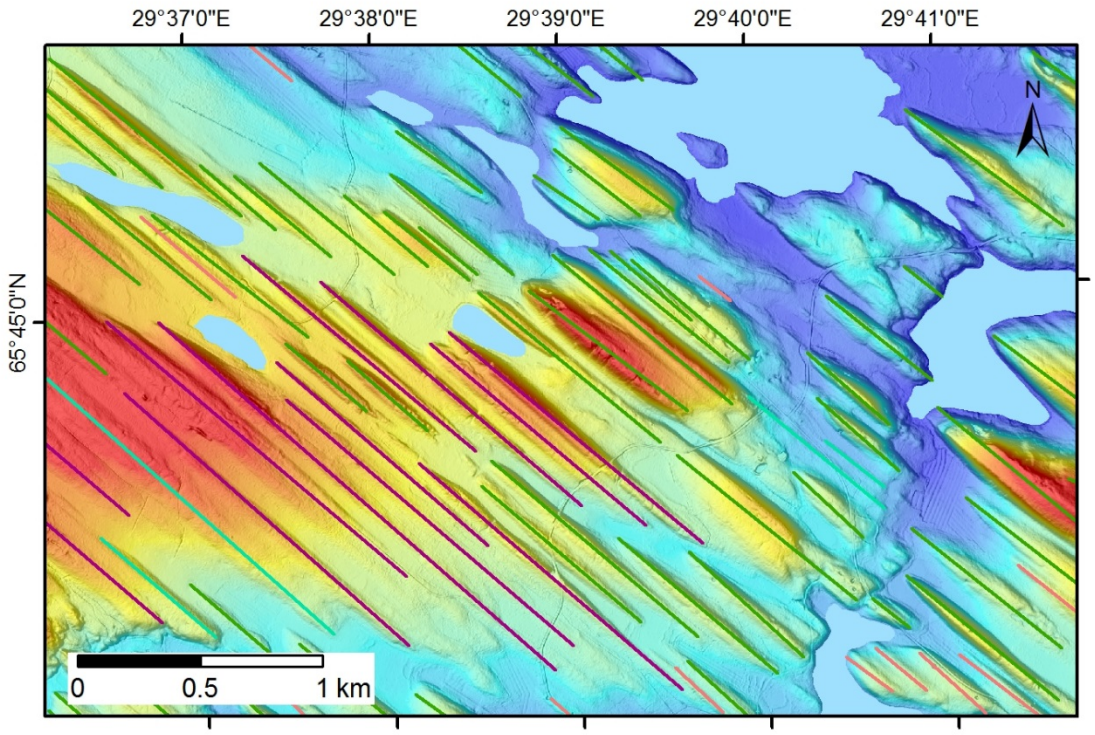

Figure 12. Classical megafluted bed of Kuusamo Ice stream Lobe.

CLASSES IN THE DATABASE: 3.1, 3.4, 3.5

COORDINATES (EUREF-FIN): 621394 / 7294292

References:

Aario, R. 1977. Classification and terminology of morainic landforms in Finland. Boreas 6, 87-100

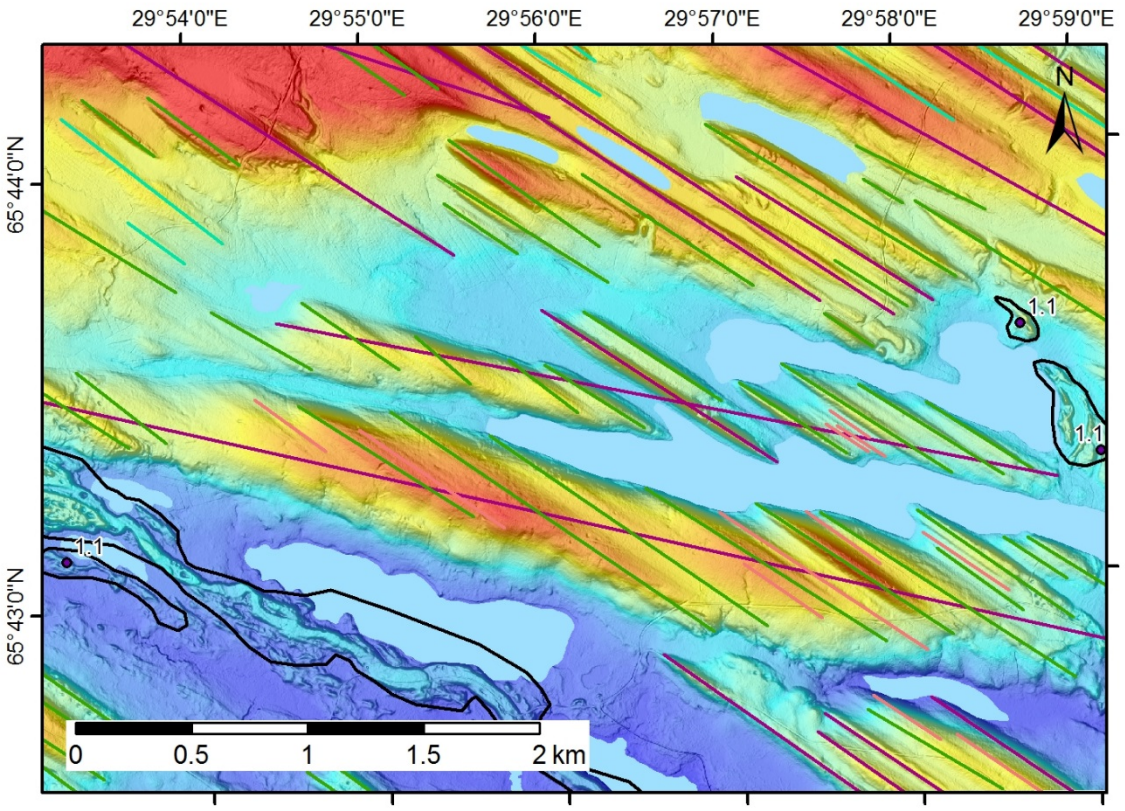

Figure 13. Palimpsest megafluted landscape in the Kuusamo ice stream lobe terminus zone in the Russian border zone of IIvaara. Older more western ice flow direction (purple line) is replaced by NW flow of drumlins (green lines), flutings (pink) and megaflutings (purple) toward the Pääjärvi end moraine.

CLASSES IN THE DATABASE: 1.1, 3.1, 3.4, 3.5

COORDINATES (EUREF-FIN): 634608 / 7291951

References:

Sarala, P. & Räisänen, J. 2017. Evolution of the eastern part of Kuusamo Ice lobe based on the LiDAR geomorphologic interpretation. The Geological Society of Finland, Bulletin; in this volume.

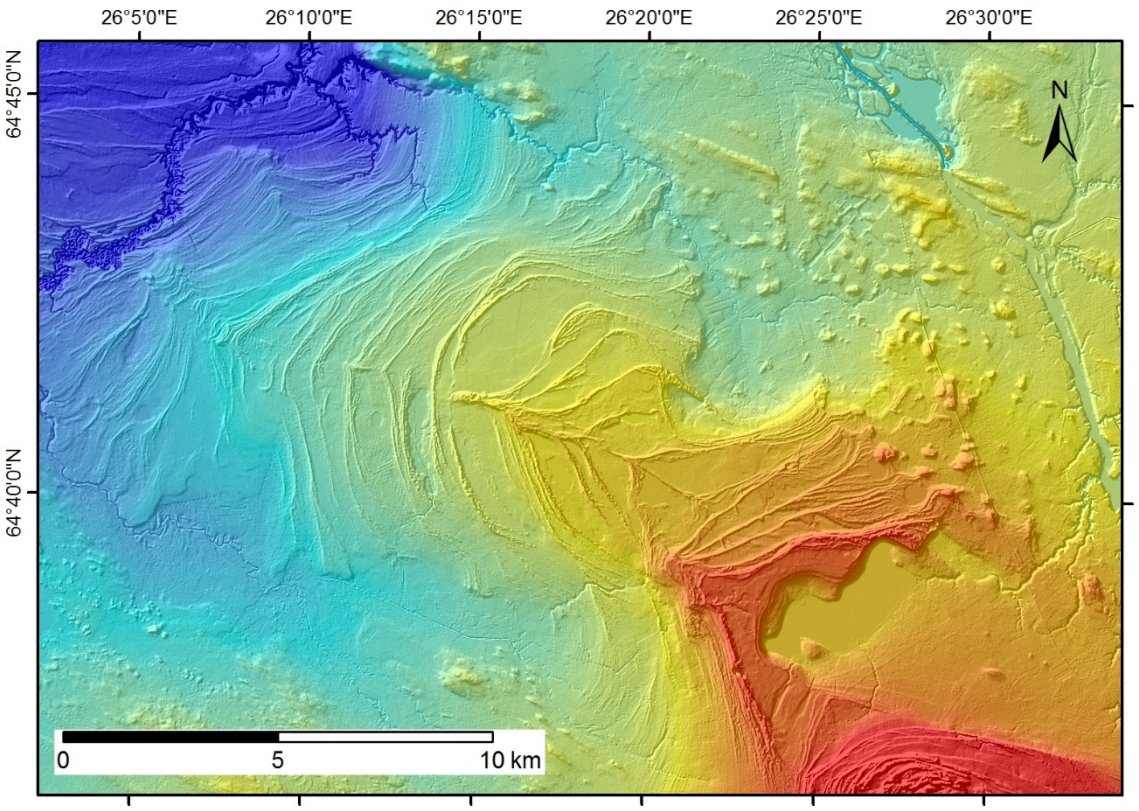

Figure 14. Beach ridges at Hirsijärvi, Utajärvi with drumlins of Northern Karelian Ice Stream at top of image.

CLASSES IN THE DATABASE: 1.1, 1.5, 3.1

COORDINATES (EUREF-FIN): 465955 / 7173663

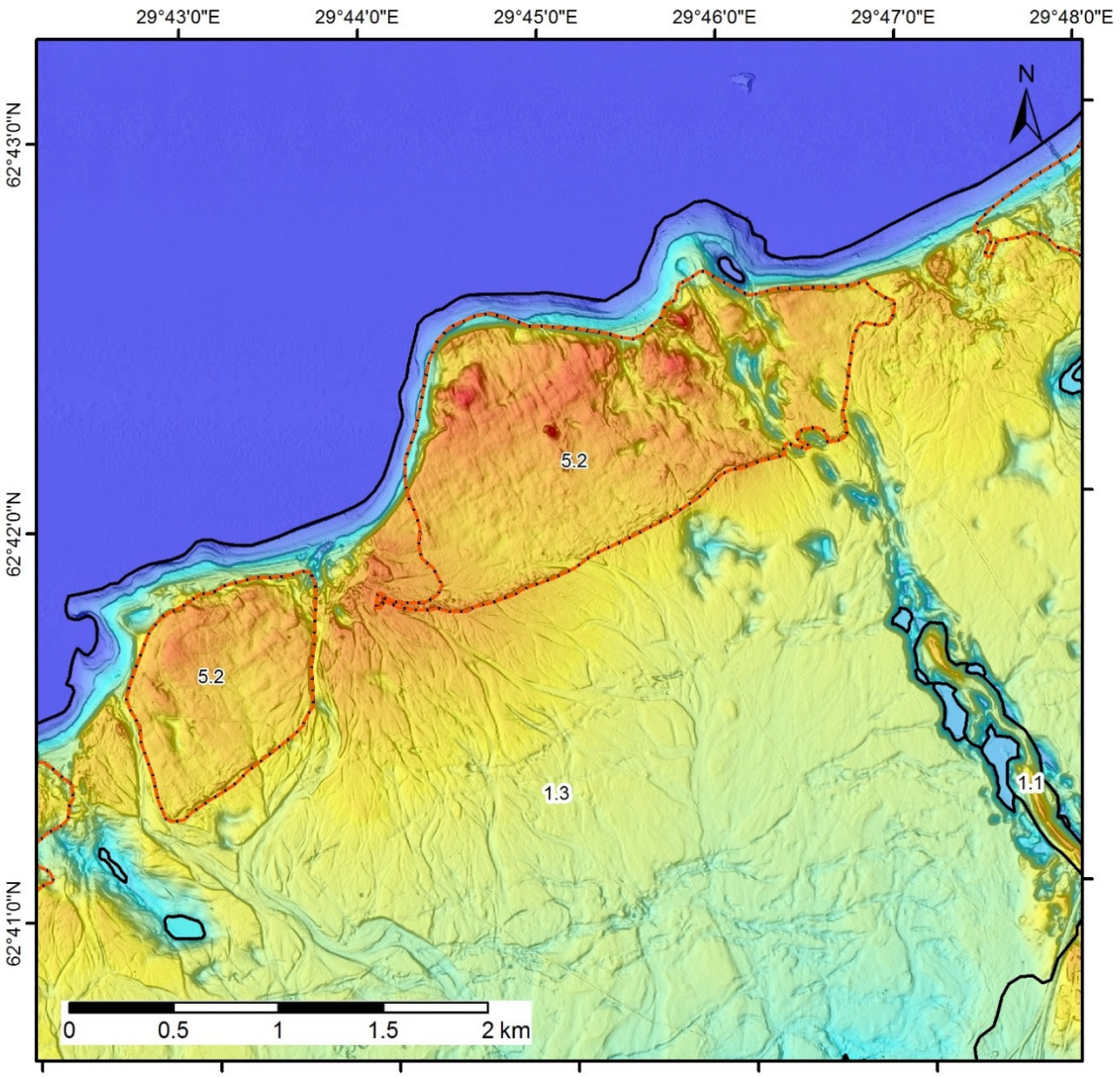

Figure 15. A large southeastward sloping delta surface of the large end moraine and relatively thin (>4m) till (outlined by dashed line) at Jaamankangas, Joensuu.

CLASSES IN THE DATABASE: 1.1, 1.3, 5.2, 7

COORDINATES (EUREF-FIN): 639806 / 6953434