

Occurrence of De Geer moraines in Finland based on LiDAR DEM

A.E.K. OJALA^{1*}, J.-P. PALMU¹, N. PUTKINEN² AND K. NENONEN¹

¹*Geological Survey of Finland, P.O. Box 96, 02151, Espoo, FINLAND (*correspondence: antti.ojala@gtk.fi)*

²*Geological Survey of Finland, P.O. Box 97, 67101 Kokkola, FINLAND*

LiDAR digital elevation models (DEMs) from Finland were investigated to map and discriminate features of De Geer moraines, more scattered end moraines, and larger end moraines features. We showed that LiDARs are able to record small moraine ridges very sensitively and accurately with regards to their length, width, height, orientation and interdistances. De Geer moraines were found to be typically 50-300 m long, 10-20 m wide, 0.5-2 m high, with considerable inter- and intrasite variability. Comparisons of the measured variables of De Geer moraines with their deposition environment suggest that their dimensions are less dependent on the depositional environment compared to ridge morphological features and interdistances.

The results indicate that the occurrence and distribution De Geer moraines and scattered end moraine ridges in Finland are more widespread than previously suggested. This is probably attributed to the ease of detecting and mapping these features with high-resolution DEMs, indicating the efficiency of LiDAR applications in geological and geomorphological studies.

The variable appearance and distribution of moraine ridges in Finland indicate that no single model is likely to be appropriate for the genesis of De Geer moraines at all localities and for all types of ridges. De Geer moraine interdistances are suggested to be due to a combination of the rapidity of ice margin recession, proglacial water depth and terrain topography. The correlation between the varved clay-based rate of deglaciation and interdistances of distinct and regularly-spaced De Geer moraines indicates that the rate of deglaciation is probably involved in the ridge-forming process, but more thorough comparisons are needed to understand the extent to which De Geer interdistances represent an annual rate of ice-margin decay and the rapidity of regional deglaciation.

References:

Ojala, A.E.K., Putkinen, N., Palmu, J.-P. and Nenonen, K., 2015. Characterization of De Geer moraines in Finland based on LiDAR DEM mapping. GFF, DOI: 10.1080/11035897.2015.1050449