

# ICE FLOW DIRECTIONS AND DEM IN CENTRAL LAPLAND: EVIDENCE OF MIDDLE WEICHSELIAN DEPOSITS IN SODANKYLÄ

by

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Till observations connected to Middle Weichselian stadial (71–57 ka), in Central Lapland in northern Finland, have been distinguished in west, in Kittilä and Kolari area (Aalto *et al.* 1992, Sutinen 1992, Salonen *et al.* 2014, Sarala *et al.* 2015) or in east, in Savukoski area (Johansson 1995, Helmens 2014). These areas are separated by the Kitinen valley lowlands in Sodankylä, where confirmed Middle Weichselian deposits are missing (Sarala *et al.* 2015). Remains of glacial erosion are rare and till fabric observations are diverse (Hirvas 1991) indicating varying ice flows from SE to NNE. Here, we present the first evidence of a till bed in Kitinen valley Kärvasniemi, Sodankylä that is tentatively related to MIS4 glacial event. The Kärvasniemi record is connected to the Weichselian history of Central Lapland.

Ice flow directions from fabric measurements and esker chains from previous studies were collected in a GIS format in order to trace ice flow patterns. A hill-shaded LiDAR DEM and DEM with 32 m resolution were applied for inspection of glacial landforms. In addition, a set of OSL-age determinations were performed.

The till fabric of middle till indicates an ice flow direction from NNE-NE. Additionally, age determinations from below the till ( $75\pm15$  and  $67\pm13$ , Åberg *et al.* 2017) above (pending) suggest a Mid-Weichselian age for the till.

The average ice flow direction, during the Middle Weichselian in eastern Lapland, is from NNE towards SSW that corresponds to the till fabric obtained from the middle till of Savukoski area (Johansson ~~et al.~~ 1995). It is likely that scattered Middle Weichselian deposits were preserved in the valley of the Kitinen river. When compared studies of Sutinen (1992) and Johansson ~~et al.~~ (1995) there were two ice lobes in Central Lapland: one in Kittilä and other in Savukoski. Likely, the latter extended to Kärvasniemi depositing the middle till. The absence of streamlined landforms in the valley of the Kitinen river indicates cold-based ice flow during the last glaciation depositing till with various flow directions.

We suggest that the major streamlined corridor in Kittilä seen in DEM 32 m represents a Middle Weichselian landform since the presumed late Weichselian tills (Hirvas 1991, Salonen *et al.* 2014) have often flow direction from SE. Also, the esker chains related to Late Weichselian are the opposite direction to the northernmost part of the streamlined corridor of Kittilä. Our

study suggests stronger erosion and warm-based ice in western Lapland and ice stream that continued to Ostrobothnia.

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