

Interstadial stratigraphies in Jämtland – dating of newly discovered localities and connection to a MIS 3 ice margin

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Pre-Late Weichselian ice sheets and intervening periods between them have left geomorphic and stratigraphic evidence. In Jämtland, west-central Sweden, such evidence, in the form of interstadial sediments and glacial landforms, was preserved during subsequent frozen-bed conditions of the last ice sheet. Data from these sediments and landforms help us understand the timing and geometry of the pre-Late Weichselian ice sheets, which are essential to validating numerical ice-sheet models. Furthermore, this knowledge is vital to developing geological frameworks for the subsurface, which is helpful for sustainable land use planning.

We recently discovered a ‘new’ ice-marginal moraine, forming a discontinuous connection with the Veiki-moraines (ice-walled lake plains) in the north of Sweden with the Idre moraine 600 km south. Based on this spatial relationship and cross-cutting glacial landforms, this moraine was hypothesized to have formed during Marine Isotope Stage (MIS) 3 by the retreating MIS 4 ice sheet. The mapped ice margin is marked by distinct end-moraines only in a few places and is mainly comprised of landforms indicative of an ice-marginal dead-ice environment, such as dead-ice depressions and ice-walled lake plains. In a few places, however, the ice-marginal moraine appears to be a push moraine, sometimes in conjunction with crevasse-squeeze ridges, suggesting an active ice margin.

Two of these dead-ice depressions in eastern Jämtland, connected to the hypothesized ice margin, were cored using a Cobra Combi to retrieve cores for stratigraphic description and to sample for OSL dating. In both depressions, we found fine-grained sorted sediments covered by till. Based on preliminary OSL results, these stratigraphic sequences appear to date to MIS 3, although further work is needed to refine the results. In addition, some unpublished OSL and ¹⁴C results from SGU’s archives indicate MIS 3 ages for one more dead-ice depression along the hypothesized ice margin in southern Jämtland.

During recent surficial deposits mapping in the region in 2020-2023, five new localities were investigated and, where suitable, dated by OSL. These results also yield MIS 3 ages, which agree with our other preliminary results and previous studies. Finally, the westernmost site, located just east of Åre, indicates that the maximum extent of the ice sheet during MIS 3 was constrained to well inside the mountains.