

# Sediment exposed in murtoos at Väckjö, southern Sweden, shows evidence of over-pressurized subglacial water during formation

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V-shaped or triangular-shaped hummocks that are referred to as murtoos were discovered in Finland and Sweden in 2017 (Mäkinen et al. 2017; Peterson, Johnson & Smith 2017). The initial publications and subsequent literature interpret these forms to have formed subglacially around 50 km or so from the ice margin during times of rapid ice retreat. Eskers are found on top of murtoos, and murtoos occur in places in corridors parallel to regional ice flow. Rapid retreat would have delivered large amount of supraglacial meltwater to the bed, and the diamictons and sorted sediment found in murtoos have been interpreted as having been affected by this increased meltwater causing remobilization of existing sediment, fluvial deposition, and fluvial erosion (Peterson Becher & Johnson 2021).

An exposure at Väckjö in a murtoo field reveals sediment that generally supports this model. The exposure contains interbedded diamicton and sorted sediment of varying character. The sorted sediments range from silt and fine sand to gravelly, and the diamictons vary as to clast content and friability. In thin section, the sorted sediments reveal deformation structures including deformed bedding, faults, and sandy sediment that we interpret to be fluidized sediment. Isolated intact sediment ‘rafts’ occur within this sandy sediment. None of the thin sections reveal sorted sediment that appears to be in original position. Cross-cutting relationships indicate several generations of deformation and/or injection events. Brittle deformation (micro faults) post-date fluidized features. Long axes of elongate grains cluster in up-ice dipping patterns. Finally, silt caps are present on some clasts seen in thin section, and we think these are associated with permafrost following deglaciation.

The murtoo field at Väckjö was deglaciated during the Bölling-Alleröd, which was a time a rapid ice retreat in southern Sweden. The observations in the outcrop and in thin sections of the Väckjö murtoo support the idea that murtoos were created during times of rapid ice retreat and that increased water pressure at the bed created the features we describe. Eskers overtopping murtoos indicate a later time when efficient bed drainage had been achieved.

## References

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