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A LiDAR-based glacial landform map of the Kebnekaise massif, northern Sweden

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In the face of global climate change, and the associated melting of the modern-day ice sheets, the understanding and reconstruction of the dynamics and retreats of former ice sheets has become an increasingly valuable tool and indicator of the future behaviour of present-day ice masses. The deglacial period that followed the Last Glacial Maximum (~22-9 thousand years ago) represents the most recent major warming event, and final ice sheet decay, in Earth history, and is an important analogue for the threat of present-day ice sheet collapse. The recent availability of the 2m-resolution Swedish LiDAR based terrain model provides the opportunity to map glacial landforms and landscapes over large areas with greater accuracy than was previously possible through satellite images or aerial photographs. In combination with field observation-based ground-truthing, this LiDAR resource is employed to map the geomorphology of the Kebnekaise region of the northern Swedish mountains with the principal aim of producing a landform-driven reconstruction of the deglaciation of the remnant Scandinavian Ice Sheet during its final stage of retreat. The complex 'palimpsest' landscape is delineated and interpreted through the classification of landforms according to their relative age and respective origin. In particular, attention will be given to the segregation of glacial (e.g., terminal moraines, lineations), deglacial (e.g., eskers, lateral meltwater channels, glacial lake shorelines) and 'relict' (i.e., pre-glacial palaeosurfaces) landform assemblages, in order to demarcate those formed during the final deglaciation. The resulting landform selections are used to delineate high-resolution ice retreat patterns, giving indication to the nature of the basal thermal regime, topographic response and final remnant location of the ice sheet. Additionally, this assay serves as an evaluation of the use of the Swedish LiDAR database as a means of efficiently and accurately mapping previously-glaciated landscapes. Our deglaciation reconstruction will finally be tested against formerly produced regional reconstructions.