



The Laurentide Ice Sheet from the last interglacial to the LGM - a reconstruction based on integration of geospatial and stratigraphical data

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North America was repeatedly covered by Antarctic-sized ice sheets during the Quaternary, with growth phases typically lasting ~ 90 kyr and full reversal to interglacial conditions in 10-15 kyr. The last glacial maximum (LGM) outline and subsequent retreat pattern (21-7 kyr) are reasonably well established. However, the evolution of the Laurentide Ice Sheet and its precursors during the 100-kyr pre-LGM growth phase has remained elusive, leaving numerical ice sheet models unverifiable for this time interval. We here use the glacial geomorphological record to arrive at a graphical time-slice reconstruction of Laurentide Ice Sheet evolution through the last glacial cycle (last 120 kyr). We mapped the entire Laurentide Ice Sheet (LIS) area in Landsat MSS images and approximately 40% of the LIS area in higher resolution Landsat ETM+ images. Mapping in aerial photographs added further detail primarily in Quebec-Labrador and on Baffin Island. Our analysis includes the recognition of approximately 500 relative age relationships from crosscutting lineations, which together with previously published striae and till fabric data comprise a set of around 700 crosscutting sites that were used for relative-age assignment of regional flow patterns. For reconstruction of the most probable ice-sheet evolution sequence we employ a stepwise inversion scheme with a clearly defined strategy for delineating coherent landform swarms (reflecting flow direction and configuration), and linking these to constraints on relative and absolute chronology. Our results clearly reveal the ice domes in Keewatin

and Quebec were dynamically independent for most of pre-LGM time and that a massive Quebec dome, rivaling the LGM extent, existed at times when the southwestern part of the ice sheet had not yet developed. The oldest flow (Marine isotope stage 5) system in Quebec had an ice divide closer to the Labrador coast than any other later configuration.