Glacial geomorphology of northwest Saskatchewan: inferring deglacial dynamics of the Laurentide Ice Sheet

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Previous field-based reconstructions have established the significance of northeastern Alberta and northwestern Saskatchewan in our understanding of the Late Wisconsinan deglaciation of the Laurentide Ice Sheet. The spatial and temporal patterns of deglaciation in this region are also intrinsically linked to the timing of meltwater fluxes from glacial Lake Agassiz. Geological studies of glacial Lake Agassiz outlets have been pivotal in determining the effects of catastrophic drainage of glacial meltwater on regional environments and global climate change. However, the palaeoglaciological dynamics, with which these studies base their inferences, are still poorly understood.

This study provides the first detailed synthesis from the Last Glacial Maximum through to deglaciation (~21-9.5 cal ka BP) based on new geomorphological mapping and pre-existing radiocarbon-constrained ice sheet margin chronology. Over 24,000 bedforms, including glacial lineations, eskers, moraines and palaeo channels, have been mapped. These data permit the identification and classification of 50 discrete ice flow events (flow sets), which are integrated with the ice margin configuration to allow identification of palaeo ice sheet dynamics. We present a multi-stage model of ice sheet evolution in the form of palaeo-geographic maps. This reconstruction reveals major changes in ice sheet configuration during the Late Wisconsinan deglaciation and indicates that margin retreat was complex and dominated by the dynamic spatial and temporal evolution of ice streams.

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