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Early and abrupt retreat of the Laurentide Ice Sheet margin from the Mackenzie River valley, southern Northwest Territories

Martin Margold (1,2), Duane G. Froese (1), John C. Gosse (3), Guang Yang (3), Jillian McKenna (3), and Alan J. Hidy (4)

(1) Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, Canada, (2) Stockholm University, Department of Physical Geography, Stockholm, Sweden (martin.margold@natgeo.su.se), (3) Department of Earth Sciences, Dalhousie University, Halifax, Canada, (4) Centre for Accelerator Mass Spectrometry, Lawrence Livermore National Laboratory, Livermore, USA

The detachment of the Laurentide Ice Sheet margin from the Canadian Cordillera opened the present-day drainage route of the Mackenzie River to the Arctic Ocean and an ice-free corridor that allowed for migration of species between Beringia and the mid-latitudes of North America. The existing ice-margin chronology depicts the southern reach of the Mackenzie River between 61 and 63° N as glaciated until about 13 ka, representing the last portion of the Laurentide Ice Sheet margin abutting the eastern foot of the Cordillera. A substantial retreat of the ice sheet margin in this region has been suggested to have occurred during the subsequent Younger Dryas cold period, despite the fact that in many other regions ice masses stabilised or even re-grew at this time. However, until now, deglacial chronometry for this region and the western LIS margin is sparse and consists mostly of minimum-limiting macrofossil and bulk C-14 ages from organics materials overlying glacial sediment. With the aim to bring new data on the deglaciation history of the Mackenzie River valley, we collected samples for Be-10 exposure dating from glacial erratic boulders in the southern Franklin Mountains that bound the Mackenzie River valley from the east. The sampling elevations ranged between 1480 and 800 m a.s.l., however, the measured ages show only a weak correlation with elevation. Instead, 10 out of 12 measured samples cluster tightly around 15 ka, with the remaining two samples likely containing Be-10 inherited from previous periods of exposure. Our results thus indicate a pre-Younger Dryas rapid down-wasting of the ice sheet surface, which we infer was accompanied by an ice margin retreat to the southeast. The southern reach of the Mackenzie River valley at the eastern foot of the Cordillera was, according to our results, ice free shortly after 15 ka, with the prospect that the ice-free corridor might have opened significantly earlier than hitherto anticipated. Further research is required in the region south of our study area to establish a firm chronological control on the separation of the Cordilleran and Laurentide ice sheets and the opening of the ice free corridor.