

GSA Data Repository 2019046

Supplemental Information

Title: Was the Laurentide Ice Sheet significantly reduced during Marine Isotope Stage 3?

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Contains three items:

(1) Table DR1 A&B (Excel file): Inventory of geochronological data (n=735) dating to Marine Isotope Stage 3 (MIS 3; ca. 57,000 to ca. 29,000 yr BP) that are located in the Last Glacial Maximum (LGM) ice extent of the Laurentide Ice Sheet.

(2) Note regarding the collation of geochronological data

The intention of this dataset is to present all MIS 3 data in order to lay out the groundwork for future more detailed studies. As such, no analyses or evaluation of these data has taken place here. All dates spanning the MIS 3 interval are included here, regardless of the author's original interpretation or whether age discrepancies exist at the site. Sites were identified based on extensive literature search (using terms such as "MIS 3" and "mid-Wisconsinan"), examination of previous literature reviews, and author knowledge of the region. Latitude and longitude coordinates are provided at two decimal points for consistency among the wide variety of publications. Any user requiring high-resolution coordinates is referred to the original publication. The majority of collated sites show unequivocal evidence of ice over-riding (e.g. they are sub-till). However, some shell and cosmogenic ages are sub-aerial. In the case of shells, these reflect raised marine beds. In the case of cosmogenic ages, these reflect the total time

that the particular feature has been exposed sub-aerially. Cosmogenic exposure ages are included in this synthesis because they are still valuable for delineating the ice sheet, although interpretation of these data should factor burial history into account. Details on the calculation of cosmogenic ages can be found in the original publication. Future work on this dataset will include quality assessment of these ages (Small et al., 2017) as well as the development of ice-margin chronologies for the MIS 3 interval (Hughes et al., 2016).

3) Description of the geophysical model

Geophysical simulations adopt the ice history ICE-PC2 (Pico et al., 2017), characterized by a mid-MIS 3 relative sea-level highstand at 44 ka with a GMSL value of -38 m, and peak sea levels of -15 m and -10 m during MIS 5a and 5c, respectively (Creveling et al., 2017). These simulations are characterized by an ice-free eastern sector of the Laurentide Ice Sheet from MIS 5a to MIS 3, consistent with mid-MIS 3 dates on non-glacial deposits in the Hudson Bay Lowlands (Pico et al., 2017). From LGM to present-day, the ice history adopts the ICE-5G model (Peltier, 2004). The calculations are based on the theory and pseudo-spectral algorithm described by Kendall et al. (2005) with a spherical harmonic truncation at degree and order 256. These calculations include the impact of load-induced Earth rotation changes on sea level (Milne et al., 1999), evolving shorelines and the migration of grounded, marine-based ice (Johnston, 1993; Kendall et al., 2005; Lambeck et al., 2003; Milne et al., 1999). Our predictions require a model for Earth's viscoelastic structure and we adopt the viscosity profile VM2 (Peltier, 2004), which is designed to be paired with ICE-5G, and is constrained, in part, by observations in the Hudson Bay (Peltier and Fairbanks, 2006).

References

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