

# Climatic implications of the mechanical collapse of the Laurentide Ice Sheet

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## Abstract

Although it is well-established that the Laurentide Ice Sheet collapsed over Hudson Bay *ca.* 8500 <sup>14</sup>C yrs bp, the role of climate in this event remains ambiguous. We use a finite-element glaciological model to test the hypothesis that the ice sheet would have survived throughout the Holocene via mass-balance feedbacks if its marine-based core had not disintegrated mechanically. Experiments that incorporate a parameterization of the Weertman (1974) marine instability mechanism show a complete Laurentide deglaciation in good accord with geologic data. When the instability is suppressed, the ice sheet contracts from its late Wisconsin maximum, but then stabilizes over Hudson Bay where it remains for the duration of the Holocene. The latter simulation uses a mass-balance scheme based on NCEP2 Reanalysis data; thus, ice-sheet changes are driven by modern environmental conditions. Our results place emphasis on the role of glacio-isostatic feedbacks in glacial terminations. Moreover, the possibility that the Laurentide Ice Sheet could still exist over Canada raises important questions about what glacial cycles are.