Supplementary materials related to the manuscript:

**The collapse of the Laurentide-Cordilleran ice saddle and early opening of the Mackenzie Valley, Northwest Territories, constrained by 10Be exposure dating**

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Map

Description automatically generatedFigure S1. A comparison of the elevation change over time for each site according to the three main models of GIA for North America. The ‘Norman Range and Mackenzie Valley’ sites, and the ‘Cap Mountain, Cap Mountain lower, and the Smith Ridge’ sites were grouped together as they were all located on a single pixel within the GIA models and so display the same GIA history. All figures were plotted within Octave v.6.4.0 using the Expage-201912 calculator.



Figure S2. Photographs of the sampled boulders. (A) NWT-MM-01 in red dashed circle with a person pointing to it, perched on the sandstone bedrock. (B) Close-up of NWT-MM-01 (the longer axis of the notebook is 184 mm). (C) Samples NWT-MM-02 (in the front, notebook for scale) and -03 (in the background, chisel for scale). (D) Close-up of NWT-MM-02. (E) Close-up of NWT-MM-03. (F) Sample NWT-MM-04. (G) Sample NWT-MM-05 with a chisel on top of it. (H) Sample NWT-MM-06; chisel for scale. (I) Sample NWT-MM-07 (large pinkish boulder in the centre). (J) Sample NWT-MM-08. (K) Sample NWT-MM-09 resting on the limestone bedrock. (L) Sample NWT-MM-10 on the limestone bedrock. (M) Samples NWT-MM-11 (in the front) and -12 (in the background). (N) Sample NWT-MM-12. (O) Sample NWT-MM-13. (P) Sample NWT MM-14. (Q) Sample NWT-18-07. (R) Sample NWT-18-09. (S) Sample NWT-18-10. (T) Sample NWT-18-11. (U) Sample NWT-18-12. (V) Sample NWT-18-15. (T) Sample NWT-18-16. (X) Sample NWT-18-17. (Y) Sample NWT-18-18. (Z) Sample NWT-18-19. (AA) Sample NWT-18-20. (AB) Sample NWT-18-21. (AC) Sample NWT-18-22.

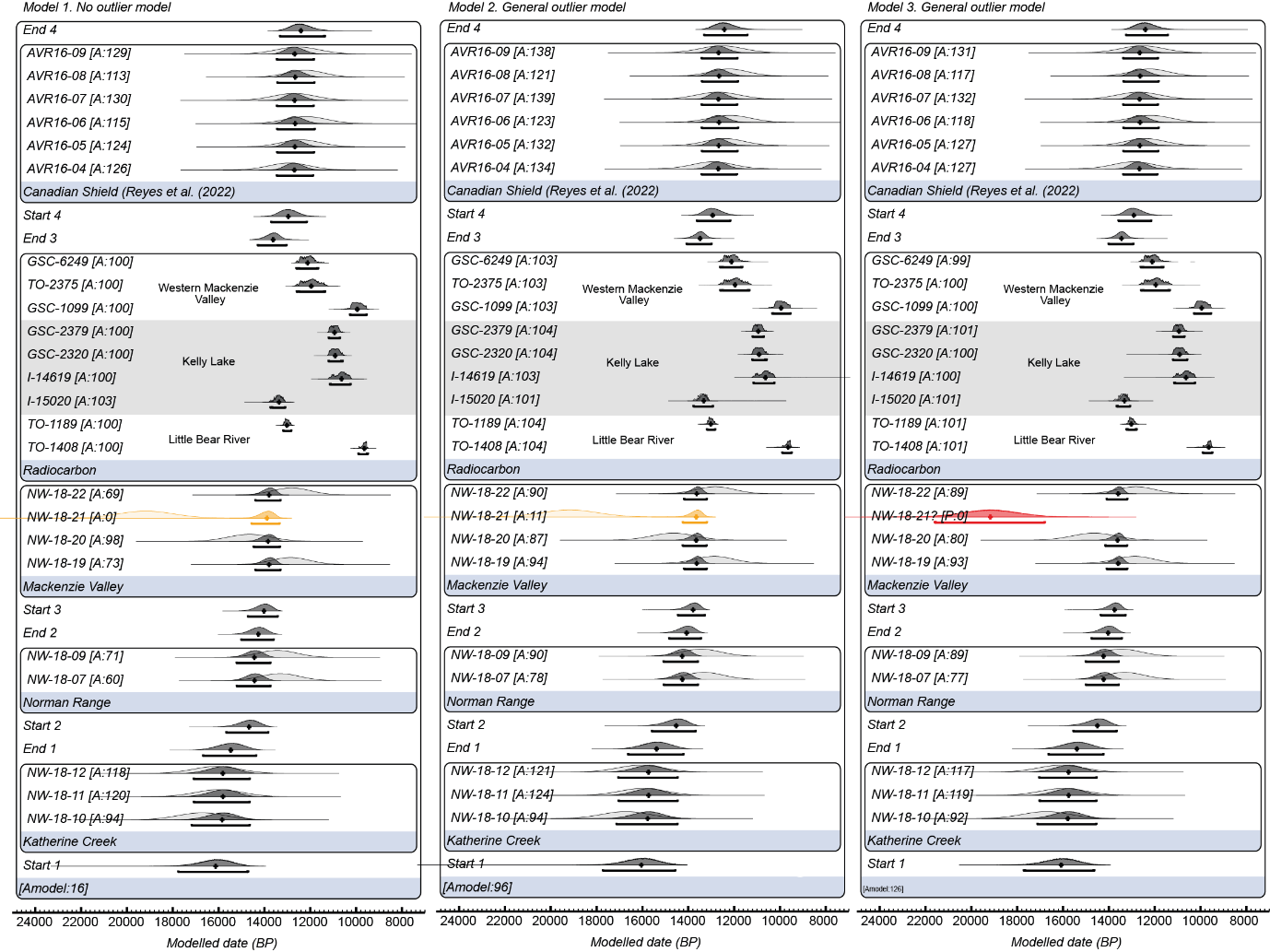


Figure S3. Outputs from Oxcal sequence models from northern study sites (Katherine Creek, Norman Range and the Mackenzie Valley) (Bronk Ramsey, 2017). Model 1 was run with no outlier model. Model 2 was run using a General outlier model. Model 3 was run using a General outlier, excluding TCN dates with <60% agreement indices in model 1. Modelled dates are reported at 2 σ uncertainty. Exposure ages were calculated using the ‘primary’ production rate dataset (Borchers et al., 2015).

Graphical user interface

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Figure S4. Outputs from Oxcal sequence models from southern study sites (Cap Mountain summit and Lower Franklin Mountains) (Bronk Ramsey, 2017). Model 1 was run with no outlier model. Model 2 was run using a General outlier model. Model 3 was run using a General outlier, excluding TCN dates with <60% agreement indices in model 1. Modelled dates are reported at 2 σ uncertainty. Exposure ages were calculated using the ‘primary’ production rate dataset (Borchers et al., 2015).



Figure S5. Outputs from Oxcal sequence models 13, 14 and 15, from northern study sites (Katherine Creek, Norman Range and the Mackenzie Valley) (Bronk Ramsey, 2017). Model 13 was run with no outlier model. Model 14 was run using a General outlier model. Model 15 was run using a General outlier, excluding TCN dates with <60% agreement indices in model 1. Modelled dates are reported at 2 σ uncertainty. Exposure ages were calculated using the Arctic production rate (Young et al., 2013) and Lal/Stone scaling method.



Figure S6. Outputs from Oxcal sequence models 16, 17 and 18, from southern study sites (Cap Mountain summit and Lower Franklin Mountains) (Bronk Ramsey, 2017). Model 16 was run with no outlier model. Model 17 was run using a General outlier model. Model 18 was run using a General outlier, excluding TCN dates with <60% agreement indices in model 1. Modelled dates are reported at 2 σ uncertainty. Exposure ages were calculated using the Arctic production rate (Young et al., 2013) and Lal/Stone scaling method.

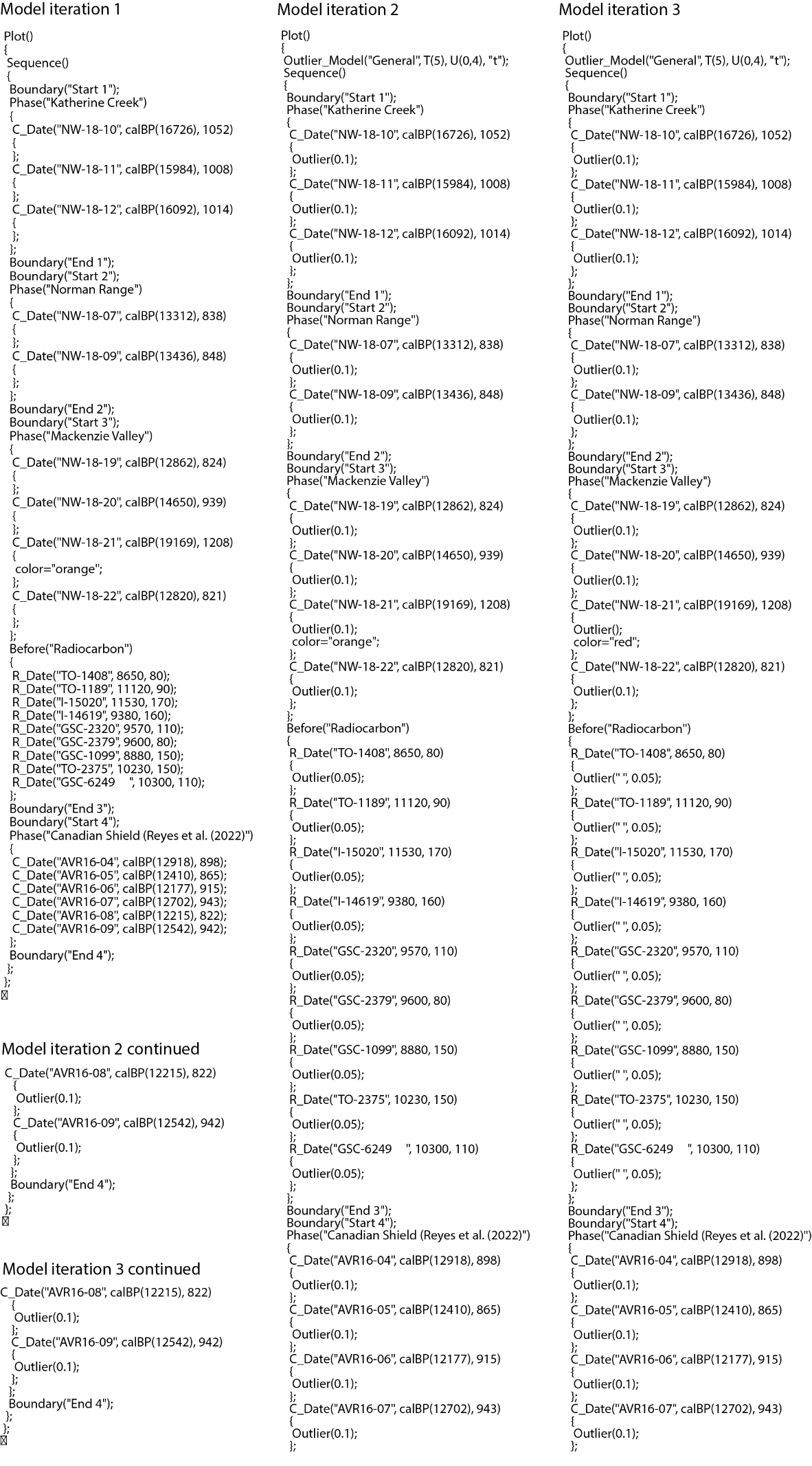


Figure S7. Inputs from Oxcal sequence models from northern study sites (Katherine Creek, Norman Range and the Mackenzie Valley) (Bronk Ramsey, 2017)

Shape

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Figure S8. Inputs from Oxcal sequence models from southern study sites (Cap Mountain summit and Lower Franklin Mountains) (Bronk Ramsey, 2017)