Cooling and uplift history of the Long Range Inlier, Newfoundland, using fission track thermochronometry

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Apatite fission-track (FT) ages and track-length data were obtained for three samples on a NNW to SSW profile across the Long Range Inlier (LRI). Two came from near sea level on the northwestern (A) and southeastern (C) flanks of the inlier respectively, whereas sample B was collected on the plateau of the LRI. Lower samples A and C give FT ages of 196 Ma and 187 Ma respectively. The higher sample (B) has a 100 Ma older FT age, about 295 Ma. Assuming a normal geothermal gradient (20°C/km), this indicates that the flank samples have not been buried at depths >5 km since early to mid-Jurassic, while the central Long Range has not been buried >5 km since Late Carboniferous. It appears that the LRI cooled below the closure temperature of apatite during the Jurassic. Cooling histories obtained from preliminary track-length data indicate slow cooling of all three samples since they passed through the 100°C closure temperature. This suggests that cooling and exposure of the LRI was controlled by slow uplift related to erosion. $^{40}Ar/^{39}Ar$ in biotite and hornblende on these same samples indicate that the western LRI has not been reheated above 300°C since 880 Ma and in the central LRI above 500°C since 981 Ma. New samples from the Cat Arm Dam road and Western Brook Pond produce apatite apparent age profiles that give linear cooling and uplift rates from the Late Carboniferous to Early Jurassic consistent with cooling rates obtained from track-length data. An anomalous early Cretaceous apatite FT age from the Daniel's Harbour area may record a thermal event that requires further investigation.