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Post-orogenic evolution of the Northeast Greenland Caledonides

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We present new apatite fission track (AFT) data from our study area in Northeast Greenland, between 75.8-81^{o}N. These data contain information on the spatial and temporal distribution of exhumation in this remote area. We exploit this information by inverting for time-temperature paths for each of our 31 samples, using AFT ages, fission track length distributions, and measurements of weight percent chlorine.

In the onshore part of Northeast Greenland, between 75.8-81^{o}N, accelerated cooling occurred from Late Carboniferous – Triassic, followed by prolonged slow cooling toward the present day. This could imply that late Paleozoic collapse and rifting in the Caledonide mountain range focused in the now offshore Northeast Greenland shelf, leaving the onshore crystalline basement relatively unaffected since Triassic.

We investigate how these thermal histories convert to exhumation paths by solving the steady-state heat-conduction equation in 1D, estimating the depth of each sample back in time, continuously correcting crustal thickness (and hereby allowing for changes in heat production). The resulting families of exhumation solutions reflect the imposed uncertainties in the present day crustal thickness, average heat production rate, present-day surface heat flow, and crustal thermal conductivity.

The exhumation patterns from this area provide new information on the evolution of passive margins in general. In particular our results show that the onshore regions of some passive margins contain a record of exhumation over timescales much longer than the most recent rifting episode.