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Seismic tomography of the Arctic region: Inferences for the thermal structure and evolution of the lithosphere

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New waveform tomography with very large datasets yields improved resolution in the upper mantle of the Arctic region. Computational petrology enables quantitative estimation of temperature from tomography in the lithosphere-asthenosphere depth range. Most boundaries of the mantle roots of cratons in the Arctic are coincident with their geological boundaries at the surface. The thick lithospheres of the Greenland and North American cratons are separated by a thin-lithosphere corridor beneath Baffin Bay and through the middle of the Canadian Arctic Archipelago; the southern archipelago is a part of the North American Craton. The mantle root of the cratonic block beneath northern Greenland may extend westward as far as central Ellesmere Island. The Barents and Kara seas show high velocities indicative of thick lithosphere, similar to cratons. Locations of intraplate basaltic volcanism attributed to the High Arctic Large Igneous Province are all on thin, non-cratonic lithosphere. The lithosphere beneath the central part of the Siberian Traps is warmer than elsewhere beneath the Siberian Craton. This observation is consistent with lithospheric erosion associated with the Large-Igneous-Province volcanism. A corridor of relatively low seismic velocities cuts east-west across central Greenland. This indicates lithospheric thinning that appears to delineate the track of the Iceland Hotspot.