



Seismic tomography of the Arctic region: new insights into the thermal structure and evolution of the lithosphere

Sergei Lebedev (1), Andrew Schaeffer (2), Javier Fulla (1), and Victoria Pease (3)

(1) Dublin Institute for Advanced Studies, Dublin, Ireland, (2) University of Ottawa, Ottawa, ON, Canada, (3) Stockholm University, Stockholm, Sweden

Waveform tomography with very large datasets reveals the upper-mantle structure of the Arctic in unprecedented detail. Using tomography jointly with computational petrology, we estimate temperature in the lithosphere–asthenosphere depth range and infer lithospheric structure and evolution. Most of the 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 corridor of thin lithosphere 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 westwards as far as central Ellesmere Island. The Barents and Kara seas show high velocities indicative of thick lithosphere, similar to cratons. The 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, with the corridor likely to delineate the track of the Iceland hotspot.

Reference:

Lebedev, S., A. J. Schaeffer, J. Fulla, V. Pease, Seismic tomography of the Arctic region: Inferences for the thermal structure and evolution of the lithosphere. In Pease, V. & Coakley, B. (eds.) *Circum-Arctic Lithosphere Evolution*. Geological Society, London, Special Publications, 460, 419–440. <https://doi.org/10.1144/SP460.10>, 2018.