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**GEOLOGICAL SURVEY OF CANADA  
OPEN FILE 8243**

**National database of MOHO depth estimates from seismic  
refraction and teleseismic surveys**

**E.M. Schetselaar and D.B. Snyder**

**2017**



**Canada**



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## INTRODUCTION

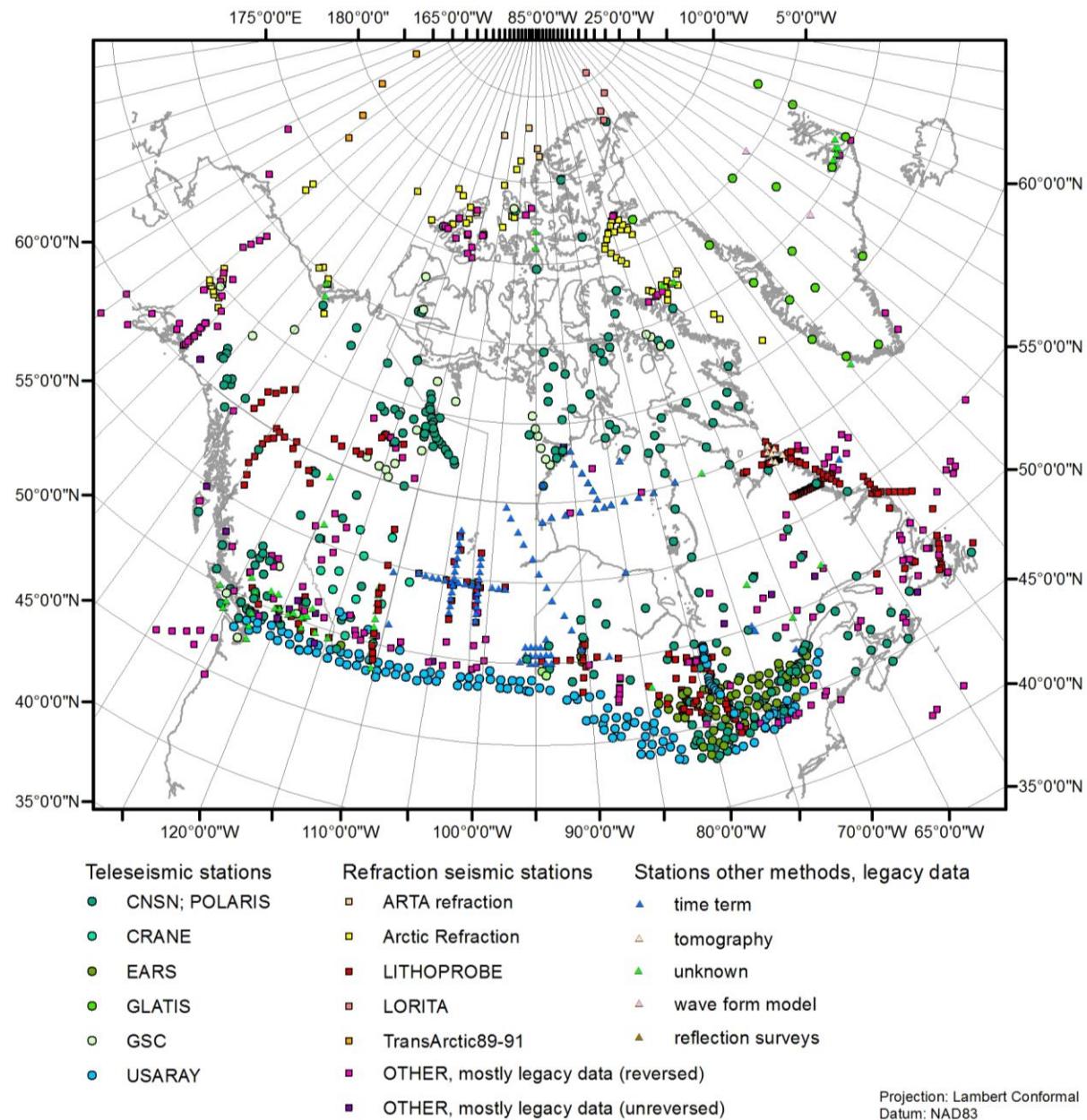
In cooperation with provincial and territorial geological surveys, the Geological Survey of Canada's Open Geoscience Program has embarked on the Canada-in-3D initiative in order to develop a national 3D geological model of Canada's landmass and offshore regions. Towards this objective, a 3D modelling effort was undertaken to represent the Mohorovičić discontinuity (MOHO) as a triangulated 3D surface, as well as a depth-attributed 2D grid. This Open File report presents MOHO depth estimates at point locations as derived from numerous seismic refraction and teleseismic surveys that provide data constraints for this 3D modelling effort.

| Data source   | Acquisition period | Coverage                              | Survey      | No. of depth estimates |
|---|--------------------|---------------------------------------|-------------|------------------------|
| <b>LITHOPROBE</b>   | 1984-2005          | Canada, National                      | Refraction  | 265                    |
| <b>Earthscope Automated Receiver Survey (EARS)</b>              | 2000-Recent        | Canada, National                      | Teleseismic | 112                    |
| <b>POLARIS/Canadian National Seismic Network (CNSN)</b>         | 2000-2014          | Canada, National                      | Teleseismic | 279                    |
| <b>Geological Survey of Canada (GSC, other)</b>                 | 2000-2014          | Canada, National                      | Teleseismic | 23                     |
| <b>Canadian Rockies and Alberta Network (CRANE)</b>             | 2011-Recent        | Canada; Alberta, British Columbia     | Teleseismic | 11                     |
| <b>USAArray seismic network of continental United States</b>    | 2006-Recent        | USA                                   | Teleseismic | 169                    |
| <b>USGS, Seismic Properties of North America</b>                | 1954-2000          | Canada, USA, Greenland, International | Various     | 441                    |
| <b>Greenland Lithosphere Analysed Teleseismically (GLATIS)</b>  | 2000-Recent        | Greenland                             | Teleseismic | 16                     |
| <b>Arctic Ocean Refraction Catalogue</b>                        | 1957-1991          | Canada, USA, Greenland, International | Refraction  | 81                     |
| <b>TransArctic refraction surveys</b>                           | 1989-1991          | International                         | Refraction  | 6                      |
| <b>ARTA Refraction (Alpha Ridge Test of Appurtunance)</b>       | 2000-2010          | International                         | Refraction  | 4                      |
| <b>LORITA Refraction (Lomonosov Ridge Test of Appurtunance)</b> | 2006               | Canada, Greenland                     | Refraction  | 4                      |
| <b>Total</b>  |                    |                                       |             | 1408                   |

**Table 1:** Teleseismic and refraction seismic surveys for modelling the MOHO in Canada.

## DATA SOURCES

A total of 1408 MOHO depth estimates (including 94 duplicates) are archived in the MS Excel<sup>©</sup> spreadsheet accompanying this report. These estimates were derived from seismic refraction and teleseismic surveys, conducted from 1954 to 2016 (Figure 1). In addition to records covering Canada's national onshore and off-shore territory, it also includes publicly-available data from areas beneath international waters and neighbouring nations, including the USA, Greenland (Denmark) and Russia. The various data sources from which the MOHO depth estimates were compiled are listed in Table 1. The publications in which these MOHO depth estimates were reported are provided in the reference list.



**Figure 1** MOHO depth estimates from Canada and its periphery (USA and Greenland)

## METHODS

The MOHO depths archived in this open file publication are based on seismic refraction and teleseismic surveys. The MOHO was historically discovered and defined by so-called controlled source refraction surveys that use so-called diving (Pg) and refracted (Pn) seismic waves propagating sub-horizontally within the crust (Abbot et al., 2014 and references therein). The MOHO depth estimates from these seismic refraction surveys are based on the velocity difference between seismic waves refracted at the MOHO (Pn) and seismic waves travelling entirely within the crust (Pg) from a controlled source (e.g. dynamite charge) to the geophone on the surface. Traditionally, the MOHO depth estimate is graphically inferred from the intersection of linearly-fitted trends by plotting arrival times of first breaks as a function of distance to the seismic source; specifically the intersection of the trends associated with the upper layer of the mantle and the basal layer of the crust assuming a layered earth model. Although alternative interpretation guidelines may have been used in the oldest analyses of refraction surveys, the MOHO is today usually defined as the strongest gradient in seismic velocity occurring between 6.8 and 8.0 km/s.

The MOHO depth estimates from teleseismic surveys are also based on analyzing the differences in velocity of seismic waves, but in contrast to the controlled sources of refraction surveys, these waves originate from earthquakes. The velocity differences in seismic wave propagation here arise from P waves travelling directly from the mantle to the geophone and those that are converted to S waves across the mantle-crust interfaces (MOHO). The seismic wave record of a single teleseismic station monitored over a certain period usually includes seismic events from several earthquakes, yielding a receiver function analysis with an average depth estimate and standard deviation. In addition to the records with average depth and standard deviation values, there are 95 records with duplicate MOHO depth estimates (i.e. multiple estimates of MOHO depth from the same location) including estimates derived from co-located refraction surveys.

The MOHO depth estimates were georeferenced on geographic coordinates using GPS positioning or map referencing procedures for the older records. The GPS-positioned data are based on the NAD83 datum, while the map datum of some of the older data records are unknown, although most likely registered to the NAD27 datum. If so, this potentially leads to a maximum deviation in latitude of approximately 200 m, which is considered insignificant for the regional scope of the modelling objective. The elevation of the MOHO depth estimate is derived from topographic, bathymetric and/or GPS positioning. Records that lacked topographic or bathymetric elevation values were attributed with elevations by sampling the grid value at the corresponding XY coordinates from Canada's national digital elevation model.

## DATABASE STRUCTURE

The database of MOHO depth estimates has a flat-file table structure and is stored in Excel and comma-delimited ASCII text file formats. Full descriptions of the database fields are provided in Appendix 1.

## LIMITATIONS OF THE DATABASE

The MOHO depth estimates were compiled from a variety of sources some of which date back to the early 1950s. Some of the MOHO depth estimates obtained from the older refraction surveys likely have high uncertainties due to limitations in the methods and guidelines used for interpreting the seismic refraction data (unreversed vs. reversed refraction).<sup>6</sup>

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## REFERENCES

- Abbott, D.H., Mooney, W.D. and VanTongeren, J.A. 2013, The character of the Moho and lower crust within Archean cratons and the tectonic implications. *Tectonophysics* v. 609, p. 690–705, doi:[10.1016/j.tecto.2013.09.014](https://doi.org/10.1016/j.tecto.2013.09.014)
- Baggeroer, A.B. and Falconer, R. 1982, Array refraction profiles and crustal models of the Canada Basin. *Journal of Geophysical Research* v. 87, p. 5461-5476, doi:[10.1029/JB087iB07p05461](https://doi.org/10.1029/JB087iB07p05461)
- Bank, C.G., Bostock, M.G., Ellis, R.M. and Cassidy, J.F. 2000, A reconnaissance teleseismic study of the upper mantle and transition zone beneath the Archean Slave craton in NW Canada. *Tectonophysics* v. 319, p. 151-166, doi:[10.1016/S0040-1951\(00\)00034-2](https://doi.org/10.1016/S0040-1951(00)00034-2)
- Barr, K.G. 1971. Crustal refraction experiment: Yellowknife 1966. *Journal of Geophysical Research*, v. 76, no. 8, p.1929-1947, doi:[10.1029/JB076i008p01929](https://doi.org/10.1029/JB076i008p01929)
- Beaudoin, B.C. 1992, Seismic investigations of the Earth's crust: velocity structure and tectonics, Yukon-Tanana Terrane, Alaska and near surface effect on wave propagation, Ross Ice Shelf, Antarctica. PhD thesis, August 1992, Stanford University, 224p.
- Beaudoin, B.C., Fuis, G.S., Lutter, G.S., Mooney, W.J. and Moore, T.E. 1994, Crustal structure of the northern Yukon-Tanana Upland, central Alaska: Results from TACT refraction/wide-angle reflection data. *Geological Society of America Bulletin*, v. 106, p. 981-1001, doi:[10.1130/0016-7606\(1994\)106<981:CVSOTN>2.3.CO;2](https://doi.org/10.1130/0016-7606(1994)106<981:CVSOTN>2.3.CO;2)
- Bent, A.L. 1994, The 1989 (MS 6.3) Ungava, Quebec earthquake, a complex intraplate event. *Bulletin of the Seismological Society of America*, v. 84, no. 4, p. 1075-1088.
- Berg, E., Kubota, S., Kienle, J. 1967, Preliminary determination of crustal structure in the Katmai National Monument, Alaska. *Bulletin of the Seismological Society of America*, v. 57, no. 6, p. 1367-1392.

- Berg, E. 1973, Crustal structure in Alaska. *Tectonophysics*, v. 20, p. 165-182, doi:[10.1016/0040-1951\(73\)90106-6](https://doi.org/10.1016/0040-1951(73)90106-6)
- Berry, M.J. 1973, Structure of the crust and upper mantle in Canada. *Tectonophysics*, v. 20, p. 183-201, doi:[10.1016/0040-1951\(73\)90107-8](https://doi.org/10.1016/0040-1951(73)90107-8)
- Berry, M.J. and Forsyth, D.A. 1975, Structure of the Canadian Cordillera from seismic refraction and other data. *Canadian Journal of Earth Sciences*, v. 12, no. 2, p. 182-208, doi:[10.1139/e75-018](https://doi.org/10.1139/e75-018)
- Berry, M.J. and Fuchs, K. 1973, Crustal structure of the Superior and Grenville provinces of the Northeastern Canadian Shield. *Seismological Society of America Bulletin*, v. 63, no. 4, p. 1393-1432.
- Burianyk, M.J.A. and Kanasewich, E.R. 1995, Crustal velocity structure of the Omineca and Intermontane Belts, southeastern Canadian Cordillera. *Journal of Geophysical Research*, v. 100, p. 15303-15316, doi:[10.1029/95JB00719](https://doi.org/10.1029/95JB00719)
- Chandra N.N. and Cumming, G.L. 1972, Seismic Refraction Studies in Western Canada. *Canadian Journal of Earth Sciences*, v. 9, no. 9, p. 1099-1109, doi:[10.1139/e72-095](https://doi.org/10.1139/e72-095)
- Chian, D. and Louden, K. 1992, The structure of Archean-Ketilidian crust along the continental shelf of southwestern Greenland from a seismic refraction profile. *Canadian Journal of Earth Sciences*, v. 29, p. 301-313, doi:[10.1139/e92-027](https://doi.org/10.1139/e92-027)
- Clee, T.E., Barr, K.G. and Berry, M.J. 1974, Fine structure of the crust near Yellowknife. *Canadian Journal of Earth Sciences*, v. 11, no. 11, p. 1534-1549, doi:[10.1139/e74-153](https://doi.org/10.1139/e74-153)
- Clowes, R.M., Zelt, C.A., Amor, J.R., and Ellis, R.M. 1995, Lithospheric structure in the southern Canadian Cordillera from a network of seismic refraction lines. *Canadian Journal of Earth Sciences*, v. 32, p. 1485-1513, doi:[10.1139/e95-122](https://doi.org/10.1139/e95-122)
- Creaser and Spence, 2005, Crustal structure across the northern Cordillera, Yukon Territory, from seismic wide-angle studies: Omineca Belt to Intermontane Belt. *Canadian Journal of Earth Sciences* v. 42, no. 6, p. 1463-1478, doi:[10.1139/e04-093](https://doi.org/10.1139/e04-093)
- Cumming, G.I. Garland, G.D. and Vozoff, K. 1962, Seismological measurements in southern Alberta. Final report 1, Contract AF19 (604)-8470, 31 p.
- Cumming, G.I. and Chandra, N.N. 1975, Further studies of reflections from the deep crust in southern Alberta. *Canadian Journal of Earth Sciences*, v. 12, no. 4, p. 539-557, doi:[10.1139/e75-049](https://doi.org/10.1139/e75-049)
- Dahl-Jensen, T., Larsen, T.B., Woelbern, I., Bach, T., Hanka, W., Kind, R., Gregersen, S., Mosegaard, K., Voss, P. and Gudmundsson, O. 2003, Depth to Moho in Greenland: receiver-function analysis suggests two Proterozoic blocks in Greenland. *Earth and Planetary Science Letters*, v. 205, p. 379-393, doi:[10.1016/S0012-821X\(02\)01080-4](https://doi.org/10.1016/S0012-821X(02)01080-4)
- Dainty, A.M., Keen, C.E., Keen, M.J. and Blanchard, J.E. 1966, Review of geophysical evidence on crust and upper-mantle structure on the eastern seaboard of Canada, in *The Earth Beneath the Continents* (eds J. S. Steinhart and T. J. Smith), American Geophysical Union, Washington, D. C. p.349-369, doi:[10.1029/GM010p0349](https://doi.org/10.1029/GM010p0349)
- Delandro, W. and Moon, W. 1982, Seismic structure of Superior-Churchill Precambrian Boundary Zone. *Journal of Geophysical Research*, v. 87, p. 6884-6888, doi:[10.1029/JB087iB08p06884](https://doi.org/10.1029/JB087iB08p06884).

- Ellis, R.M., Hajnal, Z. and Bostock, M.G. 1996, Seismic studies on the Trans-Hudson Orogen of Western Canada. *Tectonophysics*, v. 262, no: 1-4, p. 35-50, doi:[10.1016/0040-1951\(96\)00011-X](https://doi.org/10.1016/0040-1951(96)00011-X)
- Epili, D. and Mereu, R.F. 1991, The Grenville Front tectonic zone: results from the 1986 Great Lakes onshore seismic wide-angle reflection and refraction experiment. *Journal of Geophysical Research*, v. 96 no. B10, p. 16335-16348, doi:[10.1029/91JB01258](https://doi.org/10.1029/91JB01258)
- Ewing, G.N., Dainty, A.M., Blanchard, J.E. and Keen, M.J. 1996, Seismic studies on the eastern seaboard of Canada (pt1) the Appalachian system. *Canadian Journal of Earth Sciences*, v. 3, no. 1, p. 89-109, doi:[10.1139/e66-007](https://doi.org/10.1139/e66-007)
- Fechner, N., 1994, Reports on Polar Research: Detailed refraction seismic investigations in the inner Scoresby Sund / East Greenland. *Berichte zur Polarforschung* 143, Alfred-Wegener-Institut fuer Polar- und Meeresforschung, Dissertation.
- Fechner, N. and Jokat, W. 1996, Seismic refraction investigation on the crustal structure of the western Jameson Land Basin, East Greenland. *Journal of Geophysical Research*, v. 101, no.7, p. 15867-15882, doi:[10.1029/96JB00808](https://doi.org/10.1029/96JB00808)
- Fenwick, D.K.B., Keen, M.J., Keen, C. and Lambert, A. 1968, Geophysical studies of the continental margin northeast of New Foundland. *Canadian Journal of Earth Sciences*, v. 5, no. 3, p. 483-500, doi:[10.1139/e68-044](https://doi.org/10.1139/e68-044)
- Fernandex-Viejo, G., Clowes, R.M. and Welford, K.M. 2005, Constraints on composition of the crust. *Canadian Journal of Earth Sciences*, v. 42, no. 6, p. 1205-1222, doi:[10.1139/e05-028](https://doi.org/10.1139/e05-028)
- Forsyth, D.A., Berry, M.J. and Ellis, R.M. 1974, A refraction survey across the Canadian Cordillera at 54 degrees N. *Canadian Journal of Earth Sciences*, v. 11, no. 4, p. 533-548, doi:[10.1139/e74-048](https://doi.org/10.1139/e74-048)
- Forsyth, D.A. and Mair, J. A. 1984, Crustal structure of the Lomonosov ridge and the Fram and Makarov basins near the North Pole. *Journal of Geophysical Research*, v. 89, p. 473-481, doi:[10.1029/JB089iB01p00473](https://doi.org/10.1029/JB089iB01p00473)
- Fountain, D. M., Salisbury, M. H. and Percival, J., 1990, Seismic structure of the continental crust based on rock velocity measurements from the Kapuskasing Uplift. *Journal of Geophysical Research*, v. 95, no. B2, p. 1167-1186, doi:[10.1029/JB095iB02p01167](https://doi.org/10.1029/JB095iB02p01167)
- Fuis, G.S., Ambos, E.L., Mooney, W.D., Christensen, I. and Geist, E. 1991, Crustal structure of accreted terranes in southern Alaska, Chugach Mountains and Copper River Basin, from seismic refraction results. *Journal of Geophysical Research*, v. 96, no. B3, p. 4187-4227, doi:[10.1029/90JB02316](https://doi.org/10.1029/90JB02316)
- Fuis, G.S., Alan, R. Levander, W.J., Wissinger, E.S., Moore, T.E. and Cistensen, I., 1995, Seismic images of the Brooks Range, Arctic Alaska, reveal crustal-scale duplexing. *Geology* v. 23, no. 1, p. 65-68, doi:[10.1130/0091-7613\(1995\)023<0065:SIOTBR>2.3.CO;2](https://doi.org/10.1130/0091-7613(1995)023<0065:SIOTBR>2.3.CO;2)
- Funck, T., Louden, K.E., Wardle, R.J., Hall, J., Hobro, J.W., Salisbury, M.H. and Muzzatti, A.M. 2000, Three-dimensional structure of the Torngat Orogen (NE Canada) from active seismic tomography. *Journal of Geophysical Research*, v. 105, no. 23, p. 403-420, doi:[10.1029/2000JB900228](https://doi.org/10.1029/2000JB900228)
- Funck, T., Jackson, H.R. and Shimeld, J. 2011, The crustal structure of the Alpha Ridge at the transition to the Canadian Polar Margin: Results from a seismic refraction experiment. *Journal of Geophysical Research*, v. 116, no. B12, p. 2156-2202, doi:[10.1029/2011JB008411](https://doi.org/10.1029/2011JB008411)

- Funck, T., Louden, K.E. and Reid, I.D. 2001, Crustal structure of the Grenville Province in southeastern Labrador from refraction seismic data: evidence for a high-velocity lower crustal wedge. Canadian Journal of Earth Sciences, v. 38, no. 10, p. 1463-1478, doi:[10.1139/e01-026](https://doi.org/10.1139/e01-026)
- Funck, T., Louden, K.E., Wardle, R.J., Hall, J., Hobro, J.W., Salisbury, M.H. and Muzzatti, A.M. 2011, Three-dimensional structure of the Torngat Orogen (NE Canada) from active seismic tomography. Journal of Geophysical Research, v. 105, no. 23, p. 403-420, doi:[10.1029/2000JB900228](https://doi.org/10.1029/2000JB900228)
- Gorman, A.R., Clowes, R.M., Ellis, R.M., Henstock, T.J., Spence, G.D., Keller, G.R., Levander, A., Snelson, C.M., Burianyk, M.J.A., Kanasewich, E.R., Asudeh, I., Hajnal, Z. and Miller, K.C. 2002, Deep Probe: imaging the roots of western North America, Canadian Journal of Earth Sciences v. 39, p. 375-398, doi: [10.1139/e01-064](https://doi.org/10.1139/e01-064)
- Grandjean, G., Wu, H., White, D. Mareschal, M. and Claude, H. 1995, Crustal velocity models for the Archean Abitibi greenstone belt from seismic refraction data, Canadian Journal of Earth Sciences v. 32, no. 2, p. 149-166, doi:[10.1139/e95-013](https://doi.org/10.1139/e95-013)
- Green, A.G., Stephenson, O.G., Mann, G.D., Kanasewich, E.R., Cummin, G.L., Hainal, Z., Mair, J.A. and West, G.F. 1980, Cooperative seismic surveys across the Superior-Churchill boundary zone in southern Canada, Canadian Journal of Earth Sciences v. 17, no. 5, p. 617-632, doi:[10.1139/e80-059](https://doi.org/10.1139/e80-059)
- Gregersen, S. 1971, Surface Wave Dispersion and Crust Structure in Greenland, Geophysical Journal of the Royal Astronomical Society, v 22, no. 1, p. 29-39, doi:[10.1111/j.1365-246X.1971.tb03581.x](https://doi.org/10.1111/j.1365-246X.1971.tb03581.x)
- Gu, Y.J., Okeler, A., Shen, L. and Contenti, S. 2011, The Canadian Rockies and Alberta Network (CRANE): new constraints on the Rockies and Western Canada Sedimentary Basin., Seismological Research letter, v. 82, no. 4, p. 575-588, doi:[10.1785/gssrl.82.4.575](https://doi.org/10.1785/gssrl.82.4.575)
- Gurbuz, B. M. 1970, A study of the Earth's crust and upper mantle using travel times and spectrum characteristics of body waves, Seismological Society of America Bulletin, v. 60, no. 6, p. 1921-1935.
- Hajnal, Z., Fowler, C.M.R., Mereu, R.F., Kanasewich, E.R., Cumming, G.L., Green, A.G. and Mair, A. 1984, An initial analysis of the Earth's crust under the Williston Basin, Journal of Geophysical Research, v. 89, no. B11, p. 9381-9400, doi:[10.1029/JB089iB11p09381](https://doi.org/10.1029/JB089iB11p09381)
- Hajnal, Z. 1992, Nature of the Canadian polar margin northwest of Axel Heiberg Island, Tectonophysics, v. 201, n0. 3, p. 255-275, doi:[10.1016/0040-1951\(92\)90236-Y](https://doi.org/10.1016/0040-1951(92)90236-Y)
- Halchuk, S.C. and Mereu, R.F. 1990, A seismic investigation of the crust and Moho underlying the Peace River Arch, Canada. Tectonophysics, no. 1-2, v. 185, p. 1-19, doi:[10.1016/0040-1951\(90\)90401-S](https://doi.org/10.1016/0040-1951(90)90401-S)
- Hales A.L. and Nation, J.B. 1973, A seismic refraction survey in the Northern Rocky Mountains, more evidence for an Intermediate crustal layer, R. Astron. Soc. Geophys. Journal, v. 35, no. 4, p. 381-399, doi:[10.1111/j.1365-246X.1973.tb00606.x](https://doi.org/10.1111/j.1365-246X.1973.tb00606.x)
- Hall, D.H. and Brisbin, W.C. 1965, Crustal structure from converted head waves in central Manitoba, Geophysics, v. 30, no. 6, p. 1053-1067, doi:[10.1190/1.1439688](https://doi.org/10.1190/1.1439688)
- Hall, D.H. and Hajnal, Z. 1969, Crustal structure of northwestern Ontario, refraction seismology, Canadian Journal of Earth Sciences, v. 6, no. 1, p. 81-99, doi: <https://doi.org/10.1139/e69-009>

- Hamilton, R.M. 1970, Time-Term analysis of explosion data from the vicinity of the Borrego mountain, California, Earthquake of 9 April 1968, Bulletin of the Seismological Society of America, v. 60, no. 2, p. 367-381.
- Hamilton, R.A. and Mereu, R.F. 1993, 2-D tomographic imaging across the North American Midcontinent Rift System, Geophys. J. Int., v. 112, no. 3, p. 344-358.
- Hanson, K., Berg, E. and Gedney, L., 1968, A seismic refraction profile and crustal structure in central interior Alaska, Bulletin of the Seismological Society of America, v 59, no. 5, p. 1657-1665.
- Hobson, G.D., Overton, A., Clay, D.N. and Tatcher, W. 1967, Crustal structure under Hudson Bay, Canadian Journal of Earth Sciences, v. 4, no. 5, p. 929-947, doi:[10.1139/e67-064](https://doi.org/10.1139/e67-064)
- Holbrooke, W.S., Reiter, E.C., Purdy, G.M., Sawyer, D., Stoffa, P.L., Austin jr, J.A. and Makris, J.O. 1994, Deep structure of the U.S. Atlantic continental margin, offshore South Carolina, from coincident ocean bottom and multichannel seismic data, Journal of Geophysical Research, v. 99, no. B5, p. 9155-9178, doi:[10.1029/93JB01821](https://doi.org/10.1029/93JB01821)
- Houtz, R.E. and Ewing J.I. 1964, Detailed sedimentary velocities from seismic refraction profiles in the Western North Atlantic, Bulletin of the Seismological Society of America, v. 54, no. 3, p. 867-895.
- Hughes, S., Hall, J. and Luetgert, J.H. 1994, Seismic velocity structure of the Newfoundland Appalachian orogeny, Journal of Geophysical Research, v. 99, no. B2, p. 13633-13653, doi:[10.1029/94JB00653](https://doi.org/10.1029/94JB00653)
- Hughes, S and Luetgert, J.H., 1992, Crustal structure of the south-eastern Grenville Province, northern New York State and eastern Ontario, Journal of Geophysical Research, v. 97, no. B12, p. 17455-17479, doi:[10.1029/92JB01793](https://doi.org/10.1029/92JB01793)
- Hunkins, K. 1966, The Arctic continental shelf north of Alaska. IN: Continental Margins and Island Arcs, Geological Survey of Canada Paper, v. 66, no. 15, p.197-205, doi:[10.4095/103420](https://doi.org/10.4095/103420)
- Hunter J.A. and Mereu, R.F. 1967, The Crust of the Earth under Hudson Bay (data: Hudson Bay Experiment (1965H3)), Canadian Journal of Earth Sciences, v. 4, no. 5, p. 949-960, doi:[10.1139/e67-065](https://doi.org/10.1139/e67-065)
- Jackson, H.R., Keen, C.E. and Barrett, D.L. 1977, Geophysical studies on the eastern continental margin of Baffin Bay and in Lancaster Sound, Canadian Journal of Earth Sciences, v. 14, no. 9, p. 1991-2001, doi:[10.1139/e77-170](https://doi.org/10.1139/e77-170)
- Jackson, H.R 1979, Keen, C.E., Falsconer, R.K.H. and Appleton, K.P. 1979, New Geophysical Evidence for Sea Floor Spreading in central Baffin Bay, Canadian Journal of Earth Sciences, v. 16, no. 11, p. 2122-2135, doi:[10.1139/e79-200](https://doi.org/10.1139/e79-200)
- Jackson, H.R., Johnson, G.L., Sundvor, E. and Myhre, A.M. 1984, The Yermak Plateau: formed at a triple junction. Journal of Geophysical Research, v. 89, no. B5, p. 3223-3232, doi:[10.1029/JB089iB05p03223](https://doi.org/10.1029/JB089iB05p03223)
- Jackson, H.R. and Reid, I. 1994, Crustal thickness variations between the Greenland and Ellesmere Island margins determined from seismic refraction, Canadian Journal of Earth Sciences, v. 31, no. 9, p. 1407-1418, doi:[10.1139/e94-124](https://doi.org/10.1139/e94-124)
- Johnson, S.H. and Couch, R.W. 1970, Crustal structure in the North Cascade Mountains of Washington and British Columbia from seismic refraction measurements, Bulletin of the Seismological Society of America, v. 60, no. 4, p. 1259-1269

- Johnson, S.H., Couch, R.W., Gemperle, M. and Banks, E.R. 1972, Seismic Refraction measurements in Southeast Alaska and Western British Columbia, Canadian Journal of Earth Sciences, v. 9, no. 12, p. 1756-1765, doi:[10.1139/e72-154](https://doi.org/10.1139/e72-154)
- Jones, A. 2002, Snyder, D., Hanmer, S. Asudeh, I., White, D., Eaton, D. and Clarke, G. 2002, Magnetotelluric and teleseismic study across the Snowbird Tectonic Zone, Canadian Shield - a Neoarchean mantle suture? Geophysical Research Letters v. 29, no. 17, p. 101-104, doi:[10.1029/2002GL015359](https://doi.org/10.1029/2002GL015359)
- Kanasewich, E.R. and Cumming, G.L., 1965, Near-vertical-Incidence seismic reflections from the Conrad Discontinuity, Journal of Geophysical Research, v. 70, no. 14, p. 3441-3446, doi:[10.1029/JZ070i014p03441](https://doi.org/10.1029/JZ070i014p03441)
- Keen, C.E. and Barrett, D.L. 1972, Seismic refraction studies in Baffin Bay: An example of a developing ocean basin Geophys. J. R. Astron. Soc., v. 30, no. 3, p. 253-271, doi:[10.1111/j.1365-246X.1972.tb05812.x](https://doi.org/10.1111/j.1365-246X.1972.tb05812.x)
- Lebedova-Ivanova, N.N., Langinen A.Y. and Zamansky Yu. Ya. et al 2004, A seismic model of the Earth's crust along the transarctic 1989-1991 (East-Siberian continental margin - Podvodnikov basin - Arlis rise-Makarov basin, NGF Abstracts and Proceedings, v. 2, p. 93-94.
- Louden, K.E. and Fan, J. 1998, Crustal structures of Grenville, Makkovik, and southern Nain provinces along the Lithoprobe ECSOOT Transect: Regional seismic refraction and gravity models and their tectonic implications, Canadian Journal of Earth Sciences, v. 35, no. 5, p. 583-601, doi:[10.1139/e98-005](https://doi.org/10.1139/e98-005)
- Lowe C. and Cassidy, J.F. 1995, Geophysical evidence for crustal thickness variations between the Denali and Tintina fault systems in west central Yukon, Tectonics, v. 14, no. 4, p. 909-917, doi:[10.1029/95TC00087](https://doi.org/10.1029/95TC00087)
- Luetgert, J.H., 1991, The 1988 Grenville-Appalachian Seismic Refraction Experiment in Ontario, New York and New England, USGS Open File Report #90-426.91L.
- Mereu R.F. and Hunter, J.A. 1969, Crustal and upper mantle structure under the Canadian Shield from project early rise data. Crustal and upper mantle structure under Canadian Shield from project early rise data, Bulletin of the Seismological Society of America February, v. 59, no. 1, p. 147-165.
- Mereu R.F. and Jobidon, G. 1971, A seismic investigation of the crust and Moho on a line perpendicular to the Grenville Front, Canadian Journal of Earth Sciences, v. 8, no. 12, p. 1553-1583, doi:[10.1139/e71-144](https://doi.org/10.1139/e71-144)
- Mereu, R.F. 1977, Majumdar, S.C. and White, R.E. 1977, The structure of the crust and upper mantle under the highest ranges of the Canadian Rockies from a seismic refraction survey, Canadian Journal of Earth Sciences, v. 14, no. 2, p. 196-208, doi:[10.1139/e77-022](https://doi.org/10.1139/e77-022)
- Morel-à-l'Huissier, P., Green A.G., Pike C.J. 1987, Crustal refraction surveys across the Trans-Hudson Orogen/Williston Basin of south central Canada, Journal of Geophysical Research, v. 92, no. B7, p. 6403-6420, doi:[10.1029/JB092iB07p06403](https://doi.org/10.1029/JB092iB07p06403)
- Musacchio, G., White, D.J., Asudeh, I. and Thomson, C.J. 2004, Lithospheric structure and composition of the Archean western Superior Province from seismic refraction/wide-angle reflection and gravity modeling, Journal of Geophysical Research. B, Solid Earth v. 109, no. B3, p. 1-28, doi:[10.1029/2003JB002427](https://doi.org/10.1029/2003JB002427)
- Nemeth, B., Hajnal, Z. and Lucas, S.B., 1996, Moho signature from wide-angle reflections; preliminary results of the 1993 Trans-Hudson Orogen refraction experiment, Tectonophysics, v. 264, no. 1, p. 111-121, doi:[10.1016/S0040-1951\(96\)00121-7](https://doi.org/10.1016/S0040-1951(96)00121-7)

- Nemeth, B., Clowes, R. and Hajnal, Z. 2005, Lithospheric structure of the Trans-Hudson orogen from seismic refraction-wide-angle reflection studies, Canadian Journal of Earth Sciences, v. 42, no. 4, p. 435-456, doi:[10.1139/e05-032](https://doi.org/10.1139/e05-032)
- Overton, A. 1970, Seismic refraction surveys, western Queen Elizabeth Islands and Polar continental margin, Canadian Journal of Earth Sciences, v. 7, p. 346-365, doi:[10.1139/e70-032](https://doi.org/10.1139/e70-032)
- Postlethwaite, B., Bostock, M.G., Christensen, N.I., and Snyder, D.B. 2014, Seismic velocities and composition of the Canadian crust, Tectonophysics, v. 633, p. 246-267, doi:[10.1016/j.tecto.2014.07.024](https://doi.org/10.1016/j.tecto.2014.07.024)
- Richards, T.C. and Walker, D.J. 1959, Measurement of the thickness of the Earth's crust in the Albertan Plains of Western Canada, Geophysics, v. 24, no. 2, p. 262-284, doi [10.1190/1.1438581](https://doi.org/10.1190/1.1438581)
- Ruffman, A. and Keen, M. J. 1967, A time-term analysis of the first arrival data from the seismic experiment in Hudson Bay, 1965, Canadian Journal of Earth Sciences, v. 4, no. 5, p. 901-928.
- Sander, G.W. and Overton, A. 1965, Deep seismic refraction investigation in the Canadian Arctic Archipelago, Geophysics, v. 30, no. 1, p. 87-96, doi:[10.1190/1.1439548](https://doi.org/10.1190/1.1439548)
- Searcy, C.K., Christensen, D.H. and Zandt, G. 1996, Velocity structure beneath College Station Alaska from receiver functions, Bulletin of the Seismological Society of America, v. 86, no. 1A, p. 232-241.
- Shay, J. and Trehu, A. 1993, Crustal structure of the central graben of the Midcontinent Rift beneath Lake Superior, Tectonophysics, v. 225, no. 4, p. 301-335, doi:[10.1016/0040-1951\(93\)90303-2](https://doi.org/10.1016/0040-1951(93)90303-2)
- Shor, G.G., Dehlinger, P., Kirk, H.H. and French, W.S. 1968, Seismic refraction studies off Oregon and northern California, Journal of Geophysical Research, v. 73, no. 6, p. 2175-2194, doi:[10.1029/JB073i006p02175](https://doi.org/10.1029/JB073i006p02175)
- Smith, T.J., Steinhart, J.S. and Aldrich, L.T. 1966, Lake Superior crustal structure, v. 71, No. 4, p. 1141-1172, doi:[10.1029/JZ071i004p01141](https://doi.org/10.1029/JZ071i004p01141)
- Snelson, C. M., Henstock, T. J., Keller, G. R., Miller, K. C. and Levander A. 1998, Crustal and uppermost mantle structure along the Deep Probe seismic profile, Rocky Mt Geol., v. 33, p. 181–198, doi: [10.2113/33.2.181](https://doi.org/10.2113/33.2.181)
- Snyder, D. 2003, Teleseismic investigations of the lithosphere beneath central Baffin Island, Nunavut, Current Research 2003-C14, 8 p, doi:[10.4095/214196](https://doi.org/10.4095/214196)
- Snyder, D. B. 2014, Report of activities for teleseismic study of Banks island on the western Arctic margin of the Northwest Territories, GEM2 Western Arctic Margin project, Geological Survey of Canada, Open File 7691, 10 p, doi:[10.4095/295538](https://doi.org/10.4095/295538)
- Snyder, D. B., Hillier, M. J., Kjarsgaard, B. A., de Kemp, E. A. and Craven, J. A. 2014, Lithospheric architecture of the Slave craton, northwest Canada, as determined from an interdisciplinary 3-D model. Snyder, D B; Hillier, M J; Kjarsgaard, B A; de Kemp, E A; Craven, J A; Geochemistry, Geophysics, Geosystems (G3) v. 15, No. 65, p. 1-16, doi:[10.1002/2013GC005168](https://doi.org/10.1002/2013GC005168)
- Sobczak, L.W. and Overton, A. 1984, Shallow and deep crustal structure of the western Sverdrup Basin, arctic Canada, Canadian Journal of Earth Sciences, v. 21, No. 8, p. 902-919, doi:[10.1139/e84-096](https://doi.org/10.1139/e84-096)

- Steinhart, J. S. and Meyer, R.P. 1961, Explosion Studies of Continental Structure, Carnegie Institute Publication No. 622, 1961, pp. 409, doi:[j.1365-246X.1962.tb03003.x](https://doi.org/10.1365-246X.1962.tb03003.x)
- Stephenson, R. A., Coflin, K. C., Lane, L. S. and Dietrich, J. R. 1994, Crustal structure and tectonics of the southeastern Beaufort Sea continental margin, Tectonics, v. 13, No. 2, p. 389-400, doi:[10.1029/93TC02251](https://doi.org/10.1029/93TC02251)
- Tatel, H. E. and Tuye, M. A. 1956, Seismic crustal measurements *in* Alaska in The earth's crust, seismic studies: Carnegie Institute, Washington, Year Book 1955-1956, p. 81-85.
- Trabant, C., Hutko, A. R., Bahavar, M., Karstens, R., Ahern, T. and Aster, R. 2012, Data products at the IRIS DMC: stepping stones for research and other applications. Seismological Research Letters, v. 83, No. 5, p. 846-854, doi:[10.1785/0220120032](https://doi.org/10.1785/0220120032)
- Tréhu, A. Morel-à-l'Huissier, P., Meyer, R., Hajnal, Z., Karl, J., Mereu, R., Sexton, J., Shay, J., Chan, W. K., Epili, D., Jefferson, T., Shih, X. R., Wendling, S., Milkereit, B., Green, A., Hutchinson, D. 1991, Imaging the Midcontinent Rift beneath Lake Superior using large aperture seismic data, Geophysical Research Letters, v. 18, No. 4, p. 625-628, doi:[10.1029/91GL00826](https://doi.org/10.1029/91GL00826)
- USGS Seismic properties of North America and surrounding oceanic basins <http://earthquake.usgs.gov/data/crust/nam.php>
- Van der Linden, W. J. M. 1975, Crustal attenuation and sea-floor spreading in the Labrador Sea, Earth and Planetary Science Letters, v. 27, No. 3, p. 409-423, doi:[10.1016/0012-821X\(75\)90060-6](https://doi.org/10.1016/0012-821X(75)90060-6)
- White, W. R. H. and Savage, J. C. 1965, A seismic refraction and gravity study of the earth's crust in British Columbia, Bulletin of the Seismological Society of America v. 55 No. 2, p. 463-486.
- White, W. R. H., Bone, M. N. and Mine, W. G. 1968, Seismic refraction surveys in British Columbia, 1941-1966: A preliminary interpretation *in*: L. Knopoff, C. L. Drake, and P. J. Hart (eds.), The crust and upper mantle of the Pacific area, American Geophysical Union (A.G.U.), Geophysical Monograph, v.12, p.81-93, doi:[10.1029/GM012p0081](https://doi.org/10.1029/GM012p0081)
- Wickens, A. J. 1977, The upper mantle of southern British Columbia, Canadian Journal of Earth Sciences, v. 14, No. 5, p. 1100-1115, doi:[10.1139/e77-101](https://doi.org/10.1139/e77-101)
- Winardhi, S. and Mereu, R. F. 1997, Crustal velocity structure of the Superior and Grenville provinces of the southeastern Canadian Shield, Canadian Journal of Earth Sciences, v. 34, No. 8, p. 1167-1184, doi:[10.1139/e17-094](https://doi.org/10.1139/e17-094)
- Woppard, G. P., Ostenso, N. A., Thiel, E. and Bonini, W. E. 1960, Gravity anomalies, crustal structure, and geology in Alaska, Journal of Geophysical Research, v. 65, No. 3, p.1021-1037, doi:[10.1029/JZ065i003p01021](https://doi.org/10.1029/JZ065i003p01021)
- Wu, J. and Mereu, R. F. 1990, The nature of the Kapuskasing Structural zone: results from the 1984 seismic refraction experiment, *in*: Exposed cross-sections of the continental crust. Salisbury & Fountain (eds.) Kluwer Academic Publishers Group, Dordrecht, the Netherlands, p. 563-586.
- Ye, S., Flueh, E. R., Klaeschen, D., von Huene, R. 1997, Crustal structure along the EDGE transect beneath the Kodiak shelf off Alaska derived from OBH seismic refraction data, Geophysical Journal International, v. 130, No. 2, p. 283–302, doi:[10.1111/j.1365-246X.1997.tb05648.x](https://doi.org/10.1111/j.1365-246X.1997.tb05648.x)
- Zelt, B. C., Ellis, R. M. and Clowes, R. M. 1993, Crustal velocity structure in the eastern Insular and southernmost Coast belts, Canadian Cordillera, Canadian Journal of Earth Sciences, v. 30, No. 5, p. 1014-1027, doi:[10.1139/e93-085](https://doi.org/10.1139/e93-085)

## **Appendix 1: Database structure**

**STATION** -Unique ID for MOHO depth estimate referring to stand-alone point location or site along a seismic survey line

**LON** – Longitude coordinate in decimal degrees (NAD83 or NAD27 datum)

**LAT** – Latitude coordinate in decimal degrees (NAD83 or NAD27 datum)

**Z** - Z elevation coordinate in metres computed from GPS survey or sampled from digital elevation model

**MOHODEPTH** – Estimated depth of the MOHO in km from the surface

**STDDEV** – Standard deviation for MOHO depth estimate in km

**DUPLICATE** – Binary field to indicate if the station has a duplicate ('0', 'no' or 'faux': no duplicate, '-1', 'yes' or 'vrai':duplicate)

**METHOD** – Seismic surveying method used for obtaining MOHO depth estimate (e.g. refraction, telesismic)

**SOURCE** – Project or research program that funded seismic data acquisition

**LOCATION** – Geographic or geological terrane name to indicate the location of the MOHO depth estimate

**AUTHORS** – First author of journal publication in which the acquisition, processing and interpretation of seismic data used to derive MOHO depth estimates were published

**TITLE** – Title of journal publication in which the acquisition, processing and interpretation of seismic data used to derive MOHO depth estimates were published

**JOURNAL** – Journal in which the publication that describe the acquisition, processing and interpretation of seismic data used to derive MOHO depth estimates was published