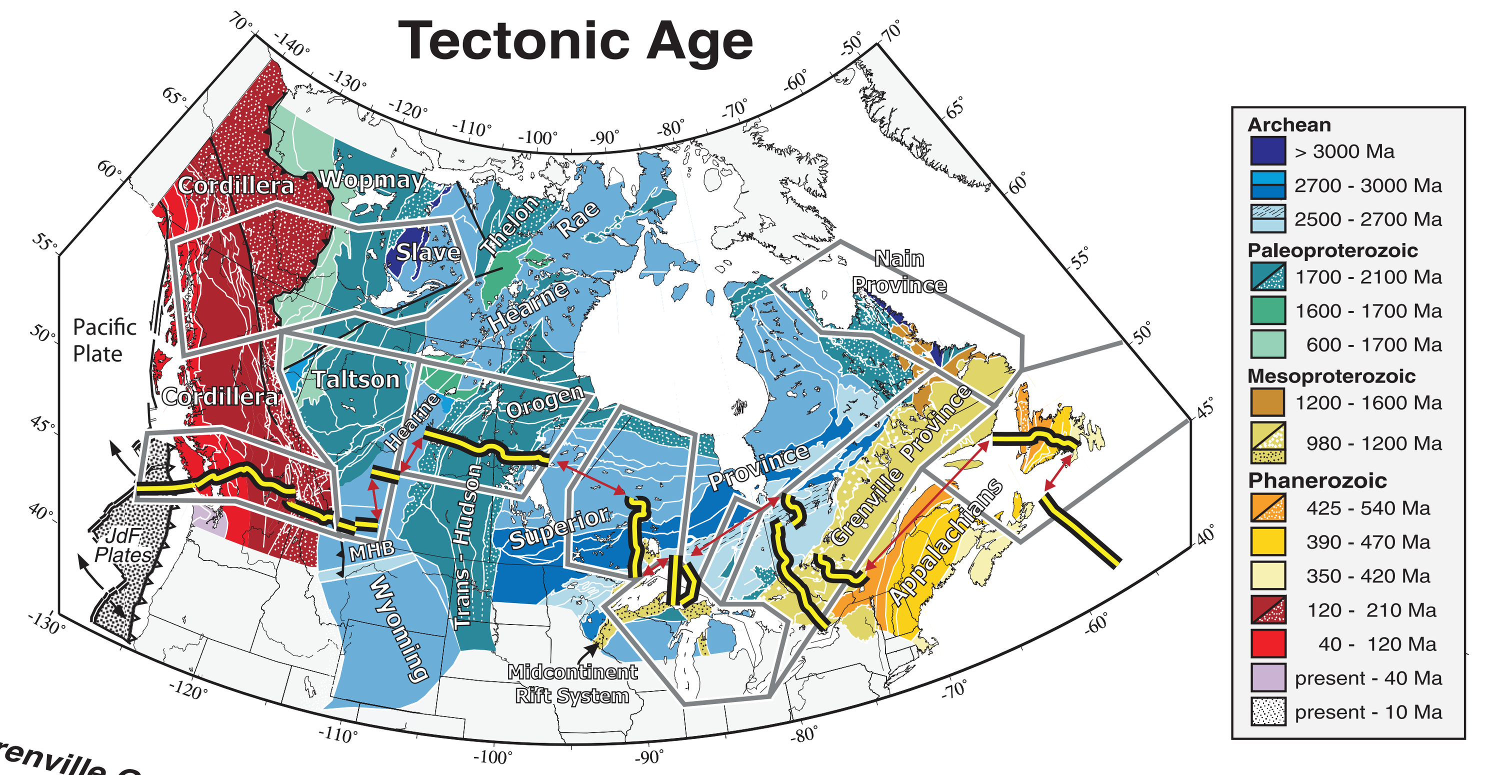
Trans-Continental Profile: The lithospheric cross section provides a continental-scale synthesis of more than two decades of multidisciplinary research carried out by LITHOPROBE and complementary projects. This plate-scale perspective emphasizes the relationships between orogens and permits visual comparisons regarding structure and tectonic development. The cross section includes merged interpretations, near-vertical incidence seismic reflection profiles, and P-velocity structure models. The trans-continental profile spans 6000 km. Earth curvature is incorporated. See text for details.

The interpreted lithospheric structure is displayed in conjunction with seismic reflection and seismic P-wave velocity compilations; no vertical exaggeration. Transect (or experiment name if not part of a Lithoprobe transect) and seismic line names are given for each segment. Direction headings note changes in the general orientation of the profile segments. In general, the reflection fabric and velocity models are coincident; offsets are noted where present. In the migrated reflection profiles, thin red lines represent the most prominent reflections and denote fabrics and faults. The composite P-wave velocity model panels are presented using a common color scale. Velocities are also shown using numbers (km/s) and thin, dashed contour lines. Black lines represent interpreted wide-angle reflector locations. Interpretation panels represent a current synthesis of published work. Colors indicate tectonic age (see map and text). Heavy black lines represent major reflective or compositional boundaries inferred from seismic data. Anisotropic and/or heterogeneous structure in the lithospheric mantle is noted by short dashed zones. In the Western Superior transect segment, teleseismic velocity and resistivity anomalies in the lithospheric mantle are denoted by shaded ovals and corresponding annotation for average velocity (AV), high velocity (HV), low velocity (LV), and high resistivity (HR) regions (Percival et al., 2006). The teleseismic dataset revealed lateral compositional changes in the lithospheric mantle that corresponded closely with the orogenic boundary and possible subduction and delamination that were inferred from the active-source dataset (Musacchio et al., 2004; White et al., 2003). Estimates of lithospheric thickness are based on the work of Shapiro and Ritzwoller (2002) and Artemieva (2009).

The many references used in the compilation of the interpreted cross section and the two data panels are included in the data repository accompanying this article (Appendix DR2; see text footnote 1).

Trans-Continental Profile

Map: Location of trans-continental corridor (yellow lines) on a simplified tectonic age map of northern North America. To emphasize comparative structure and collisional sequence, tectonic elements are grouped by tectonic age—defined as the most recent episode of major tectonic deformation in an orogen. Thin white lines identify terranes and other domains within the major tectonic units. Grey polygons mark the 10 study regions. The southern eight transects (and their internal components) were designed so they could be linked directly or by projecting along strike, providing near-continuous coverage. Double-headed red arrows show the along-strike offsets. JdF—Juan de Fuca; MHB—Medicine Hat Block.



(A) **Inset Figure A:** Results from the Cascadia subduction zone. Heterogeneous structure along strike complicates interpretation and resolution of discrepancies between the active source seismic and teleseismic studies. **(a)** Simplified tectonic map locating seismic profiles. Navy and turquoise lines—near-vertical incidence (NVI) seismic reflection profiles; green lines—refraction/wide-angle reflection (R/WAR) profile; pink line—teleseismic profile. CB—Coast belt; CR—Crescent; BR—Bridge; HA—Harrison; OL—Olympic; PR—Pacific Rim; WR—Wrangellia. **(b)** Schematic interpretation based on multidisciplinary studies. **(c)** P-wave velocity models based on R/WAR data (adapted from Drew and Clowes, 1990; Ramachandran et al., 2006; Zelt et al., 1993). Thick black lines—wide-angle reflections. **(d)** Offshore and onshore seismic reflection crossing central Vancouver Island (Clowes et al., 1987a). C and E— strongly reflective bands. Blue dotted line (F reflector)—interpreted top of oceanic crust; blue dashed line—Moho of subducting oceanic plate (OM_R). **(e)** Offshore seismic reflection projected onto a line crossing Vancouver Island (Calvert et al., 2006). Pink dashed line—low-velocity zone defined from an overlapping teleseismic profile (see f). The base of this zone is interpreted as representing the teleseismic Moho of the subducting oceanic plate (OM_T). **(f)** Migrated teleseismic image using the scattered P-p-s phase (Nicholson et al., 2005). Broad dipping red band—low-velocity zone interpreted as dehydrating oceanic crust (the base of which is the OM_T). Dotted black line—E-zone, defined by active source reflectivity; dashed blue line—Moho defined by seismic reflection.

(B) **Inset Figure B:** Results from the Western Superior transect. **(a)** Simplified tectonic map of the current sub-provinces crossed by Lithoprobe profiles. ER—English River terrane; KI—Keweenawan intrusives; WRT—Winnipeg River terrane. **(b)** Simplified interpretation along Line 2 (adapted from White et al., 2003; Musacchio et al., 2004). Numbers in mantle are P-wave velocities in km/s. **(c)** Migrated reflection seismic section for line 2. **(d)** Refraction velocity model superimposed on the reflection section. The lower crust and upper mantle are strongly anisotropic, consistent with relic oceanic lithosphere tectonically accreted at the base of the crust. **(e)** Location map of teleseismic results from Frederiksen et al. (2007). Red—active source corridor; map in (a) noted by the black box. 100 km-depth slice through P-wave tomographic model is displayed. **(f)** A–A′ slice through Frederiksen et al. (2007) P-wave model shown in (e). Downgoing lithospheric slabs are not visible in the teleseismic model but may contribute to the overall high velocity of the western Superior province. The slow velocity region is attributed to the Nipigon Embayment (a branch of the 1.1 Ga Mid-Continent Rift).

(C) **Inset Figure C:** Results from Abitibi-Grenville transect, line 48. **(a)** Geological map showing the location of the line. The part of the line shown in red is the location of the seismic section in b. CBTZ—Casa Beradi tectonic zone; NRSZ—Nottaway River shear zone. **(b)** Migrated near-vertical incidence seismic reflection profile with interpretation (adapted from Calvert et al., 1995). This profile provides one of the best images of relict subduction and convincing evidence for modern-style plate tectonics back to 2.69 Ga. Geometry of synformal reflections (R) and subducted slab are consistent with geodynamic models that show two oppositely vergent belts of deformation above the subduction (e.g., Beaumont and Quinlan, 1994).

Supplement to GSA Today, *v. 21, doi: 10.1130/G95A.1*
The big picture: A lithospheric cross section of the North American continent
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