



Geophysical evidence for Neoproterozoic subduction and lithospheric growth, Superior Province, Canada

J.A. Craven (1), I.J. Ferguson (2) and T. Skulski (3)

(1) Geological Survey of Canada, 615 Booth St., Ottawa, ON, K1A 0E9, (2) Department of Geological Sciences, 233 Wallace Bldg, University of Manitoba, Winnipeg, MB, R3T 2N2, (3) Geological Survey of Canada, 601 Booth St., Ottawa, ON, K1A 0E8 (Contact craven@NRCan.gc.ca/FAX:613-943-9285)

Deep magnetotelluric profiles providing an unprecedented lithospheric-scale cross-section extending 900 km across the Superior Province image a paleo-subduction zone and support an accretionary growth model for this Archean craton. Assembled between 2.72 and 2.68 Ga, the western Superior Province comprises an ancient collage of tectonically bound, microcontinental and oceanic crustal blocks. Field-based, geochemical and isotopic studies including U/Pb dating of zircon, Sm/Nd whole rock and Lu/Hf zircon tracer analysis constrain the age and growth of crustal blocks, history of magmatism, timing of collision and sedimentary provenance. The isotopic record of volcanism and plutonism in the western Superior Province reflects periodic crustal growth by the addition of juvenile mantle-derived magma, and variable amounts of crustal recycling during periods of arc magmatism. Net crustal growth was largely driven by the outward tectonic accretion of crust to a central microcontinental nucleus represented by the ca. 3 Ga North Caribou terrane (NCT). Seismic reflection and refraction surveys provide a crustal-wide perspective on the architecture of the western Superior accretionary collage and image paleo-sutures that offset the Moho beneath terrane boundaries mapped at surface. Teleseismic, refraction and reflection data show evidence of accretion of high velocity, likely oceanic crust. New magnetotelluric data extending to the base of the lithosphere (200 km) demonstrate the presence of a subducted slab that is coincident with offset of the Moho imaged in seismic reflection, and provides compelling evidence for Neoproterozoic plate tectonics and growth of a lithospheric mantle root during accretionary orogeny.