Lithosphere stabilization ages beneath SW Greenland

N. WITTIG[1], M. WEBB[1], D.G. PEARSON[1], C.W. DALE[1], C.J. OTTLEY[1], A. LUGUET[2] AND S.M. JENSEN[3]

[1]Department of Earth Sciences, Durham University, Durham, DH1 3LE, UK
[2]Mineralogisch-Petrologisches Institut, Universität Bonn, Poppelsdorfer Schloss, 53115 Bonn, Germany
[3]Intex Resources ASA, Munkedamsvej 45A, 0250 Oslo, NO

Kimberlite-borne garnet- and spinel-facies peridotite xenoliths (n = 55) were sampled across the North Atlantic Craton (~700km, NAC), West Greenland at ca. 600 and 200 Ma. These dunitic to harzburgitic peridotites have major and trace element systematics that record melt extraction in excess of 30% in a shallow setting (< 3Gpa), similar to modern subduction zones. Samples from the northern NAC have Os isotopes systematics that generally preserve T_{RD} model ages >2.5Gyr indicating that melt depletion/SCLM stabilization occurred during the Archean. Their very low P-PGE abundances and low $[Pd/Ir]_N$ and $[Pd/Pt]_N$ ratios are also characteristic of Archean peridotites and are best reconciled with the consumption of base metal sulphides during melt extraction. A sub-set of these peridotites yield post-Archean T_{RD} model ages and PGE systematics that require less depletion and/or secondary introduction of PGEs after mantle melting. Dunites from the southern NAC have Paleo-Proterozoic T_{RD} model ages whereas their constituent olivines provide Neoarchean ages. These samples are generally most depleted in Pt and Pd abundances often appear elevated compared to other PGEs and Re.

Overall, $[Pd/Ir]_N$ ratios of NAC peridotites do not correlate with other, lithophile indicators of melt depletion (e.g. Al_2O_3, MgO). Unradiogenic Os isotopes ($\gamma Os \leq -11$) are preserved over a large range of very low $[Pd/Ir]_N$ ratios (0.001 – ca. 0.1) and Os abundances (0.17 – 5.02ppb, average 2.59ppb). These samples have T_{RD} model ages clustering at ~2.8Gyr. In constrast, samples with "elevated" $[Pd/Ir]_N$ (≥ 0.1) exhibit more radiogenic Os isotopes ($\gamma Os \geq -11$) and have elevated modal grt- and cpx-abundance and high FeO (≥ 8wt%), Cu and Zn concentrations (≥ 12 and ≥ 54ppm, respectively). T_{RD} model ages in this group cluster around 1.8Gyr. The older 2.8Gyr model ages correlate with the TTG crust formation across the NAC whereas the younger ages coincide with the formation of circum-cratonic continental crust. Importantly, Kaapvaal and Slave Craton sulphide and whole rock T_{RD} model ages also cumulate at 2.8Gyr seemingly linking a major episode of SCLM formation globally.

Characteristics of two opposing continental margin successions in northeast Laurentia

N. WODICKA*, M.R. ST-ONGE AND J.B. WHALEN

Geological Survey of Canada, Ottawa, Ontario Canada K1A 0E8 (*correspondence: nwodicka@nrcan.gc.ca)

U-Pb dating coupled with available geochemical and Nd isotope data from two opposing, but penecontemporaneous continental margin successions in NE Canada document basin evolution (opening and closing) and sediment provenance. The Piling Group in central Baffin Island records the development of a south-facing passive margin along the southern Archean Rae cratonic margin after ca. 2160 Ma, followed by rift-related mafic-ultramafic volcanism and associated sedimentation at ca. <1980 to 1935 Ma. Subsequent subsidence of the rifted shelf margin resulted in rapid foredeep (turbiditic) sedimentation between 1915±8 Ma and 1897+7/-4 Ma. South of the Baffin suture, a heterogeneous volcanic-bearing supracrustal assemblage (Schooner Harbour sequence) of mainly alkaline basaltic composition potentially records initial rifting of the Archean to Paleoproterozoic Meta Incognita microcontinent after ca. 2055 Ma. The Lake Harbour Group marks the establishment of a north-facing platform-type continental margin along the microcontinent after ca. 2010 Ma, followed by foredeep sedimentation between 1915±8 Ma and ca. 1880 Ma.

Both sedimentary basins show changes in provenance through time from proximal sources to a combination of local and more distal sources, but have contrasting source components in terms of age (dominantly Archean to middle Paleoproterozoic in the Piling Group vs. dominantly early Paleoproterozoic in the Schooner Harbour sequence/Lake Harbour Group) and geochemistry. Basin closure and deposition of foredeep sediments along both margins appear to be related to the ca. 1.9 Ga Snowbird collisional orogen during early amalgamation of Laurentia.