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Insights into Secular Changes in Archean Crustal Formation Processes: The necessity for representative databases

ERIC D. VANDENBURG[1], OLIVER NEBEL[1], MARC-ALBAN MILLET[2], EMILIE BRUAND[3], DR. ALEX J MCCOY-WEST, PHD[4], PETER A CAWOOD[1], HUGH SMITHIES[5], JEAN-FRANÇOIS MOYEN[6,7,8,9,10,11] AND YONA NEBEL-JACOBSEN[1]

[1]Monash University
[2]Cardiff University
[3]Laboratoire Magmas et Volcans
[4]James Cook University
[5]Geological Survey of Western Australia
[6]Université de Lyon
[7]Jean Monnet University
[8]Université Claude-Bernard Lyon 1
[9]école normale supérieure de Lyon
[10]Centre National de la Recherche Scientifique
[11]Laboratoire de géologie de Lyon: Terre, planètes, environnement

Presenting Author: Eric.Vandenburg@Monash.edu

The necessity of internally consistent representative databases in constraining the evolution and elemental budget of evolved crust during the Archean is of vital importance to elucidate the detailed history of Earth's early crustal evolution. The chemical and isotopic characterization of granitoid suites and their evolution through the Archean has been hindered by the lack of reference sample suites that can be measured for all geochemical tracers. Furthermore, there has been limited consideration of "unconventional" trace element compositions of TTGs (e.g., Sn, Sb, W, Mo, Te, S)[1,2,3]. These issues leave key unresolved questions about the elemental composition and evolution of the Archean craton formation: (i) including the composition of TTG source protoliths, (ii) the chalcophile element composition of the TTG magmas and the Archean crust as a whole, and (iii) the changes in crustal magmatic processes during craton assembly that may reflect a change in tectonic styles.

We present preliminary results from a high-precision >50-element database of 228 granitoid samples of various affinities, ranging in age from ca. 3.6 Ga to ca. 2.6 Ga and representative of the crust-building histories of the Yilgarn and Pilbara cratons of Western Australia (YiPi) and the Kaapvaal and Limpopo cratons of southern Africa (SWASA). Geochemical variations within this database reflect differences in source composition, melting conditions, magmatic crystallization processes and mineralogy. Some of the geochemical trends observed also highlight intra- and intercratonic heterogeneity. The wide range of sample ages provides important constraints on the temporal changes in magmatic processes and the evolution of the continental crust across the Archean during craton assembly.

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