Global magmatism and changing tectonics at the Archean-Proterozoic boundary: Insights from O isotopes in zircon

*J.L. PAYNE[1], K. M. BAROVICH[1], N.J. PEARSON[2] AND M. HAND[1]

[1]TRAX, University of Adelaide, Adelaide, Australia
[2]CCFS/GEMOC, Macquarie University, Sydney, Australia
(*correspondence: justin.payne@adelaide.edu.au)

Analytical developments allowing for the rapid analysis of U-Pb age and Hf and O isotopes in single zircons have enabled collection of large datasets that have enabled insight into igneous rock generation on a global scale. The global compilation of Valley *et al* [1] demonstrates a restricted clustering of zircon O isotope values in the Archean that expands in range from the Paleoproterozoic onwards. This was suggested to indicate the increased role of supracrustal material (sedimentary rocks) in the generation of post-Archean magmatic rocks. We present a new compilation of 6203 zircon O isotope data from sedimentary and igneous rocks. This new dataset shows a similar pattern to the Valley *et al* dataset but with 3.8% of the data falling above the maximum envelope defined by Valley *et al* Data that fall above the maximum envelope largely do so at times associated with supercontinent amalgamation (e.g. ca. 2700-2500 Ma, ca. 2000-1800 Ma, ca. 1000 Ma and ca. 600-500 Ma). This is perhaps consistent with increased incorporation of recycled sedimentary rocks into magmatism during higher rates of collision and crustal thickening during supercontinent amalgamation as opposed to an alternate setting such as an island arc.

To assess whether there has been a significant change in the proportion of mantle and crustal melts into global magmatism over time we use a reduced O isotope dataset of 4227 data. This is done so as to avoid biasing the interpretation towards studies which collect multiple datapoints from a single magmatic rock (i.e. 1911 analyses from 120 igneous rocks). Stochastic modelling of this dataset is used to demonstrate that there does not need to be significant changes in the proportion of mantle-derived melts into igneous rocks throughout Earth history. Variation in parameters such as the proportion of 'mantle-like' zircons can largely be achieved simply through the changing composition of crustal reservoirs over time.

[1] Valley *et al* (2005), Contributions to *Mineralogy and Petrology*, **150**, 561-580.