Insights into the formation of Archean crust from statistical geochemistry of the Archean-Proterozoic transition

BRENHIN KELLER* AND BLAIR SCHOENE

Department of Geosciences, Princeton University, Princeton, NJ 08544, USA
(*correspondence: cbkeller@princeton.edu)

Over geologic time, changes in average crustal composition reflect secular variation in factors such as the style of mantle melt generation, mantle potential temperature, and the tectonics of crust formation. Increasing availability of compiled geochemical data has allowed us to see through the heterogeneity of crustal geochemistry and construct increasingly representative average compositional estimates for preserved igneous additions to the continental crust through time. Computational statistical analysis of such datasets has revealed systematic changes in major and trace element geochemistry over Earth history, especially near the time of the 2.5 Ga Archean-Proterozoic boundary[1]. However, it is not immediately clear whether the observed discontinuities in the geochemistry of continental crust circa 2.5 Ga suggest or require a major shift in the tectonics of crust formation.

Our analysis of the major and trace element trends of mafic and felsic continental crust through time, along with geochemical modelling, suggests that the observed changes in crustal geochemistry at the end of the Archean may be parsimoniously explained by mantle melting systematics without requiring a major shift in the style or tectonics of mafic melt generation. However, compositional divergence between juvenile mafic and felsic crust before 2.5 Ga may suggest more dramatic changes in the style of crustal differentiation in the Archean.

[1] Keller & Schoene (2012). *Nature* **485**, 490-493