How mafic was the Archean upper continental crust?

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The concentrations of Cu and Ag, both insoluble chalcophile elements, can be used to place tight constraints on the proportion of basalts in the upper continental crust (UCC) through time via analyses of fine-grained terrigenous sedimentary rocks. Copper and Ag concentrations in magmas are largely controlled by sulfide dissolution during melting and sulfide fractionation during differentiation. We show that Cu is high in basalts but low in komatiites and felsic rocks, making Cu useful for constraining the proportion of basalts in the UCC. Furthermore, Cu/Ag ratios are high in basalts and komatiites, but decrease with differentiation. The fine-grained matrix of ancient glacial diamictites show dramatic declines in both Cu concentrations and Cu/Ag ratios at 3.0-2.4 Ga, after which diamictite Cu concentrations and Cu/Ag ratios remain roughly constant. Mass-balance calculations using average Cu concentrations of Archean komatiites, basalts and felsic rocks require a high proportion basalt (65-75%) was present in the UCC at ~3.0 Ga, and this crust transitioned to a felsic-rocks-dominated crust at the Archean-Proterozoic boundary and has remained basically unchanged since then. This conclusion is supported by the consistence between the Cu/Ag ratios in our diamictites and the weighted average Cu/Ag ratios based on the lithological proportions obtained using Cu mass-balance calculations. Our observations document the emergence of felsic continental crust in the late Archean, which, in turn, indicates a fundamental change in Earth's dynamic regime at that time.