

Geochemical and Isotopic Evidence for Paleoproterozoic Recycling of Archean Crust and Mantle Lithosphere along the SW Laurentian Margin

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The Farmington Canyon Complex (FCC) of northeastern Utah is located along the southwestern margin of the Archean Wyoming province. U-Pb zircon geochronology of metaplutonic rocks indicates the FCC is at least in part Early Paleoproterozoic (2.45 Ga). It comprises metaplutonic quartzofeldspathic gneisses and migmatites associated with amphibolites and metasedimentary rocks in an extensive metasupracrustal assemblage. Zircons found within a metasupracrustal rock yield U-Pb crystallization ages of ~2.4 Ga and metamorphic ages of ~1.8 Ga. Common Pb isotopic data plot coherently well above the Pb evolution curve for average continental crust indicating an Archean, presumably Wyoming province, source for the sediment. The amphibolites within the metasupracrustal sequence are characterized by high field strength element depletion, negative Eu anomalies, and Archean (2.9-3.8 Ga) Sm-Nd model ages. These data, in conjunction with Late Archean-Early Paleoproterozoic crystallization ages for the amphibolites (U-Pb zircon), indicate remobilization of Archean mantle lithosphere during the 2.4 Ga rifting event and this lithosphere imparted its Archean, arc-like signature to the amphibolite protoliths. We interpret these data to indicate that the FCC formed in 4 stages: 1) rifting in latest Archean/earliest Proterozoic time initiated accumulation of an extensive sedimentary sequence derived from Wyoming province crust; 2) continuing extension resulted in melting of ancient sub-lithospheric mantle to produce the protoliths of the amphibolites intercalated within the sedimentary sequence; 3) extension-related heating reached crustal levels to produce the granitic plutons; 4) Precambrian evolution of the FCC and much of the SW Laurentian margin concluded with a widespread tectonothermal event at ~1.8 Ga.