TIMESCALE OF PETROGENETIC PROCESSES RECORDED IN THE MOUNT PERKINS MAGMA SYSTEM, NORTHERN COLORADO RIVER EXTENSIONAL CORRIDOR, ARIZONA

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The Miocene Mt. Perkins Pluton is a small composite intrusive body emplaced in the shallow crust as four separate phases during the earliest stages of crustal extension. Phase 1 (oldest) consists of isotropic hornblende gabbro and a layered cumulate sequence. Phase 2 consists of quartz monzonite to quartz monzodiorite hosting mafic microgranitoid enclaves. Phase 3 is composed of quartz monzonite and is subdivided into mafic enclave-rich zones and enclave-free zones. Phase 4 consists of aphanitic dikes of mafic, intermediate and felsic compositions hosting mafic enclaves.

Phases 2-4 enclaves record significant isotopic disequilibrium with surrounding granitoid host rocks, but collectively enclaves and host rocks form a cogenetic suite exhibiting systematic variations in Nd-Sr-Pb isotopes that correlate with major and trace elements. Phases 2-4 record multiple episodes of magma mingling among cogenetic hybrid magmas that formed via magma mixing and fractional crystallization at a deeper crustal. The mafic end-member was alkali basalt similar to nearby 6-4 Ma basalt with enriched OIB-like trace elements and Nd-Sr-Pb isotopes. The felsic end-member was a subalkaline crustal-derived magma.

Phase 1 isotropic gabbro exhibits elemental and isotopic compositional variations at relatively constant SiO_2, suggesting generation of isotropic gabbro by an open-system process involving two mafic end-members. One end-member is similar in composition to the OIB-like mafic end-member for phases 2-4; the second is similar to nearby 11-8 Ma tholeiite basalt exhibiting low ε_{Nd}, and depleted incompatible trace elements. Phase 1 cumulates record *in situ* fractional crystallization of an OIB-like mafic magma with isotopic evidence of crustal contamination by partial melts generated in adjacent Proterozoic gneiss.

The Mt Perkins pluton records a complex history in a lithospheric scale magma system involving two distinct mantle-derived mafic magmas and felsic magma sourced in the crust. Mixing and fractional crystallization of these magmas at various levels in the crust generated a suite of intermediate composition magmas. U-Pb zircon SHRIMP ages of phase 1 (15.7 ± 0.2 Ma), phase 3 (15.8 ± 0.2 Ma) and phase 4 (15.4 ± 0.3 Ma) document a 100-300k year timescale for petrogenetic processes recorded in the Mt Perkins magma system.