167-11 - WHAT TWO DIFFERENT SIZED PLUTONS IN THE SIERRA NEVADA TELL US ABOUT MAGMA PROCESSES DURING THE CONSTRUCTION AND MATURATION OF MAGMA PLUMBING SYSTEMS

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11:00 AM - 11:15 AM

207B (Anaheim Convention Center)

Abstract

Arc magma plumbing systems may develop thick magma columns as they mature. Magmas may stall at different crustal levels to form prolonged, variable-size magma storage sites. The 1,100 km^2, 95-85 Ma Tuolumne intrusive complex (TIC) represents such site. It is composed of four nested, extensive granodiorite units of irregular shape and 10s of km extent that are largely separated by gradational contacts and wide hybrid zones. Magmatic erosion created local sharp contacts coincident with structural truncations and age gaps. Mineral and whole rock geochemistry and geochronology indicate that magma mixing, recycling of older magma into younger, and melt loss were important. Defrosting textures are rather scarce. However, TIC initiation was distinct. It is preserved in a < 1 km wide sheeted complex that lines the 95-93 Ma, 70-80 km^2 Kuna Crest lobe (KCL). It is composed of cm to few m gabbroic to granitic sheets. They crystallized within <<500ka, indicating more punctuated, low volume, and lithologically heterogeneous magma pulses. These gradually amalgamated to form bigger, prolonged hypersolidus magma bodies (main TIC), indicating an established magma focusing zone and thicker, magma column where large-scale magma mixing, homogenization, and erosion (MHE) occurred.

In contrast, the ~175 km^2, 98-97 Ma Jackass Lakes pluton (JLP) S of the TIC is about 1/6 of the TIC size and longevity and twice as large as the KCL but same longevity. It is composed of the main porphyritic JLP granodiorite (Kj) that was injected by younger, irregular shaped, smaller, and more mafic granodiorites. In the NW JLP, the younger granodiorites and diorites grade into one another indicating magma mixing/mingling along contacts only, while discreet sheets occur in the SE. Defrosting textures from magma recharge are common. Whole rock element geochemistry and petrography indicate crystal accumulation/melt loss from the Kj only, which locally froze into leucogranites and erupted as felsic volcanics. Zircon Hf isotopes from the JLP have the same range of values as the entire TIC. Lithologic heterogeneity in both the JLP and KCL likely represent original, largely unmixed magma pulses, while major, TIC-like MHE processes failed due to lower volume magmatism, faster cooling in a poorly established and insulated magma column outside a regional focusing zone.

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