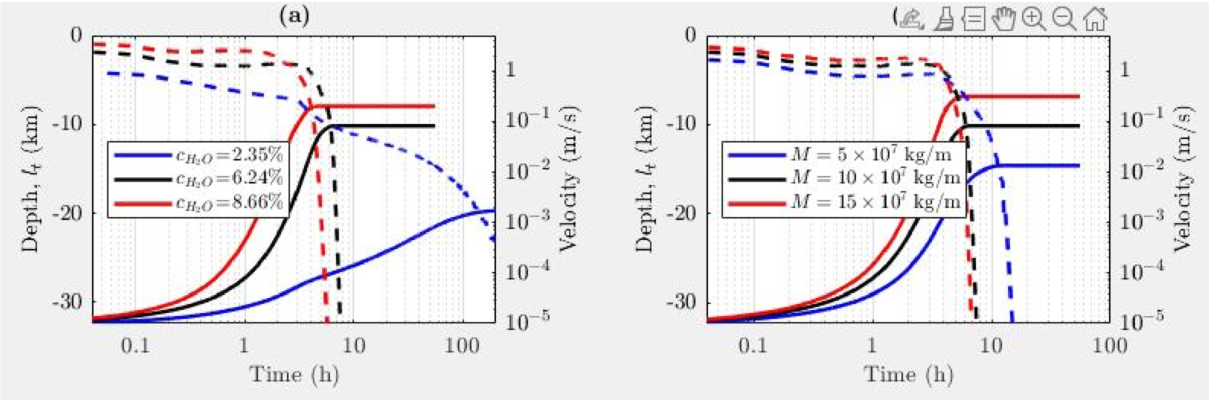
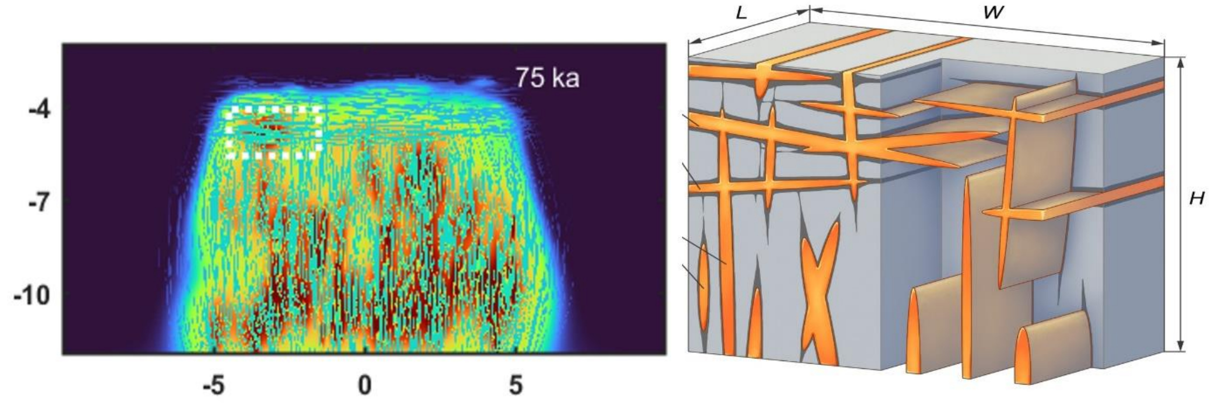
The model applied to Elbrus volcano allowed reconstruction of the evolution of its plumbing system during 600 ka of activity. Presence of a wide range of zircon ages together with large erupted volume can occur in a narrow range of governing parameters.





Magma processes in the Tuolumne intrusive complex, Kuna Crest lobe, and the Jackass Lakes pluton, Sierra Nevada batholith, CA: Size, longevity, and magma focusing matter

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Poster, Thursday 14th September, 17:00 - 19:00 and Friday 15th September, 14:00 - 15:15

Arc magma plumbing systems may develop thick magma columns as they mature. Magmas may stall at different crustal levels to form varying size magma storage sites that are active up to a few myr. The 1,100 km^2, 95-85 Ma Tuolumne intrusive complex (TIC) represents such a site. It is composed of four nested, extensive granodiorite units of irregular shape that are largely separated by gradational contacts and wide hybrid zones. Local sharp contacts often coincide with structural truncations and age gaps consistent with magmatic erosion. Mineral and whole rock geochemistry and geochronology indicate that magma mixing, recycling of older magma into younger, and melt loss were important. However, TIC initiation was distinct, which is preserved in a < 1 km wide sheeted complex that lines the 95-93 Ma, 70-80 km2 Kuna Crest lobe (KCL). It is composed of cm-m thin gabbroic to granodioritic sheets that did not interact. They crystallized within <<500ka, indicating more punctuated, low volume, and compositionally heterogeneous magma pulses before they increasingly amalgamated to form bigger magma bodies, first in the KCL interior, later in the TIC interior. How long-lived and prevalent were sheeting and magma-magma interactions before 95 Ma? Did large-scale magma mixing, homogenization, and erosion (MHE) occur outside the magma focusing zone?

The ~175 km^2, 98-97 Ma Jackass Lakes pluton (JLP) south of the TIC is about one sixth of the TIC size and longevity and twice as large as the KCL but same longevity. It is trapezoidal in shape and is interpreted to be sheeted. It is composed of the main porphyritic JLP granodiorite (Kj) that was injected by younger, irregular shaped, more mafic granodiorites. LA-ICPMS U-Pb zircon ages indicate all granodiorites are approximately contemporaneous. In the NW JLP, the younger granodiorites and diorites grade into one another indicating magma interconnectivity and hybridization along contacts only, while they are reportedly discreet sheets in the SE. Whole rock element geochemistry and petrography indicate crystal accumulation/melt loss from the Kj only, which is preserved as leucogranite porphyry and felsic volcanics. Hf isotope ratios of zircon from the JLP granodiorites indicate the same range as the entire TIC. Hf isotope homogeneity in the KCL and heterogeneity in the JLP, and lithologic heterogeneity in both likely represent original magma pulses while major MHE processes like in the TIC failed due to faster cooling and location outside a regional magma focusing zone. Melt loss, however, occurred in all plutons.

Mid to upper crustal formation, evolution, transport, emplacement, and eruption of silicic magma within a transcrustal magmatic system: Miocene Colorado River Extensional Corridor, Nevada, USA

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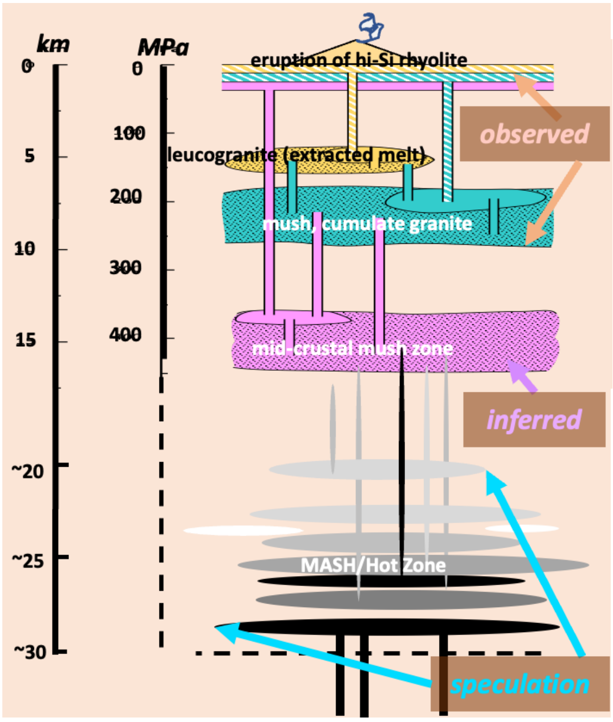
Transcrustal magmatic systems are now widely proposed: magmatism initiating in the mantle propagates upward through the crust, yielding a mushy, compositionally diverse column with transient melt-rich lenses, some of which erupt. However, details of how such systems work remain hazy – in dispute and/or highly variable. We investigate the silicic magma that constructed plutons and erupted during the Miocene in the Colorado River Extensional Corridor (CREC). These granites and rhyolites, exposed to paleodepths of as much as ~13 km in steep tilt blocks, provide insights into where and how silicic magmas were generated, modified, and transported in the upper part of this system.

Silicic rocks dominate either all or the younger parts of the CREC plutons, and the younger portion of the coeval volcanic sequence. Slightly older intermediate rocks are abundant in volcanic sections (trachyandesite-trachydacite) and locally in plutons (quartz monzonite). Sparse to abundant mafic magma (basaltic trachyandesite) mingled with and postdated granite and rhyolite. Isotopic data (Nd, Sr, Hf, O) suggest that mafic magma was derived from ancient, enriched lithospheric mantle and demonstrate that both intermediate and silicic magmas were hybrids that included large Proterozoic crustal components.



Most of the granite is coarse grained and reveals evidence for crystal accumulation and/or melt extraction. We focus here on the fine-grained rocks (low-silica granite dikes, sills, quenched margins) that appear to document compositions of crystal-poor magmas that fed the plutons. Their uniform compositions (73+1 wt% SiO_2) are consistent with being parental to the cumulates and extracted melts that formed CREC granites and rhyolites, and these putative feeders are isotopically indistinguishable from other granites and rhyolites. We infer that crust-mantle hybridization to form CREC silicic magmas occurred beneath the deepest exposed level of crust, and that evident compositional variation is mostly a consequence of closed-system fractional crystallization.

Rhyolite-MELTS barometry indicates that the crystal-poor magmas parental to CREC granites and rhyolites were extracted from qtz+feldspar-bearing mush at ~400 MPa (~15 km)(Gualda et al, this meeting). Barometry reveals that common leucogranites and erupted rhyolites (76-78% SiO_2) represent melt extracted from mush within the plutons at ~4-8 km depth. The CREC transcrustal system appears to have included a lower crustal "hot zone" where mantle-derived magma interacted with ancient crust to form an intermediate hybrid; a mid-crustal mush zone where interstitial silicic melt formed and was extracted; and upper crustal lenses where the extracted granitic melt formed cumulates and fractionated, eruptible melts.