115-7 - Booth No. 192: USING ZIRCON GEOCHRONOLOGY AND GEOCHEMISTRY TO INVESTIGATE THE EVOLUTION OF THE TUOLUMNE INTRUSIVE SUITE, SIERRA NEVADA BATHOLITH, CA

Monday, September 23, 2024

8:00 AM - 5:30 PM

Hall D (Anaheim Convention Center)

Booth No. 192

Abstract

The evolution and emplacement of granitic rocks in convergent margin magmatic arcs have broad implication for the formation of continental crust and the dynamics of ignimbrite-forming volcanic eruptions. In the Sierra Nevada batholith, the Late Cretaceous Tuolumne Intrusive Suite (TIS) formed over 10 million years and consists of geochemically and temporally zoned granitic bodies that are younger and more felsic toward the interior of the body, and which display a variety of magmatic structures. Competing models for the formation of the TIS alternately call for the intrusion of 3–4 multi-km-scale pulses of magma that were periodically capable of mixing in the upper crust, or alternatively, the sequential emplacement of numerous sub-km-scale sills that had previously been differentiated in the lower crust and were not capable of physical or chemical mixing in the upper crust.

To test these models, we are studying zircon geochronology and geochemistry from a suite of samples collected across the Cathedral Peak granodiorite along a southern transect from its outer contact with the older portions of the TIS to its interior contact with the younger units of the TIS, as well as from its northernmost extent where the Cathedral Peak cuts across all older TIS units and is in direct contact with Triassic–Early Cretaceous metavolcanics rocks. Our preliminary results reveal zircon rims that display moderate Hf and anomalously elevated U/Yb in all samples, as well as the presence of a minor population of primitive zircon cores with low Hf, low U/Yb and high Ti. Samples from the margin of the Cathedral Peak in the southern transect are slightly older and yield geochemistry distinct from zircon derived from samples closer to the interior, whereas samples from the northernmost Cathedral Peak are younger and contain significantly greater volumes of xenocrystic zircon. Zircon from layered granitic rocks are temporally and geochemically indistinguishable from zircon from adjacent granodiorite, and suggests that these layered granitic rocks formed as locally sourced dikes that cut static upper crustal granitic rocks or magma mushes, and do not represent sites of mixing with adjacent TIS units. Ongoing work will focus on expanding the spatial range of samples to characterize zircon populations from outer portions of the TIS, and to better constrain models for TIS magmatic evolution and emplacement.

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