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LATE CRETACEOUS ARC FLARE UP AND SINISTRAL INTRA-ARC DUCTILE DEFORMATION IN THE SOUTHERN CALIFORNIA BATHOLITH

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We present >90 new igneous and metamorphic zircon and titanite petrochronology ages from the eastern Transverse Ranges of the Southern California Batholith (SCB) to investigate magmatic and tectonic processes in the frontal arc during postulated initiation of Late Cretaceous shallow-slab subduction. Our data cover >4000 km^2 in the eastern Transverse Ranges and include data from Mesozoic plutons in the Mt. Pinos, Alamo Mountain, San Gabriel Mountain blocks, and the Eastern Peninsular mylonite zone. Igneous zircon data reveal 4 discrete pulses of magmatism at 258-220 Ma, 160-142 Ma, 120-118 Ma, and 90-66 Ma. The latter pulse involved a widespread magmatic surge in the SCB and coincided with garnet-granulite to upper amphibolite-facies metamorphism and partial melting in the lower crust (Cucamonga terrane, eastern San Gabriel Mountains). In this region, metamorphic zircons in gneisses, migmatites and calc-silicates record high-temperature metamorphism from 91 to 74 Ma at 9–7 kbars and 800–730°C.

The Late Cretaceous arc flare-up was temporally and spatially associated with the development of a regionally extensive oblique sinistral-reverse shear system that includes from north to south (present-day) the Tumamait shear zone (Mt. Pinos), the Alamo Mountain-Piru Creek shear zone, the Black Belt shear zone (Cucamonga terrane), and the Eastern Peninsular Ranges shear zone. Syn-kinematic, metamorphic titanite ages in the Tumamait shear zone range from 77–74 Ma at 720–700°C, titanites in the Black Belt mylonite zone give an age of 83 Ma, and those in the eastern Peninsular Ranges mylonite zone give ages of 89–86 Ma at 680–670°C. These data suggest a progressive northward younging of ductile shearing at amphibolite- to upper-amphibolite-facies conditions from 88 to 74 Ma, which overlaps with the timing of the Late Cretaceous arc flare-up event. Collectively, these data indicate that arc magmatism, high-temperature metamorphism, and intra-arc contraction were active in the SCB throughout the Late Cretaceous. These observations appear to contradict existing models for the termination of magmatism and refrigeration of the arc due to underthrusting of the conjugate Shatsky rise starting at ca. 88 Ma. We suggest that shallow-slab subduction likely postdates ca. 74 Ma when high-temperature metamorphism ceased in the SCB.

Session No. 147

T29. Structural Analysis of Polyphase Deformation from Orogen to Thin Section I: A Special Session in Honor of Sharon Mosher
Tuesday, 11 October 2022: 8:00 AM-12:00 PM

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Back to: T29. Structural Analysis of Polyphase Deformation from Orogen to Thin Section I: A Special Session in Honor of Sharon Mosher

<< Previous Abstract | Next Abstract >>