

68-5 - MAGMA-DEFORMATION INTERACTIONS IN THE SOUTHERN CALIFORNIA BATHOLITH DURING LATE CRETACEOUS ONSET OF THE LARAMIDE OROGENY, SAN GABRIEL MOUNTAINS, CALIFORNIA



Sunday, 15 October 2023



2:45 PM - 3:00 PM



326 (3, David L Lawrence Convention Center)

Abstract

The Southern California Batholith is a ~500-km-wide segment of the Mesozoic California arc that lies between the northern Peninsular Ranges and the southern Sierra Nevada mountains. We use structural data and U-Pb zircon analyses from the eastern San Gabriel mountains to examine how the batholith responded to the onset of the Laramide orogeny during the Late Cretaceous.

Zircon analyses show that the middle and lower crust of the batholith was hot and records a magmatic flareup from 90-77 Ma. From 90 to 86 Ma, tonalite of the San Seivaine Lookout intruded a thick package of metasedimentary rock that records a history of reverse displacements, crustal imbrication, and granulite metamorphism prior to tonalite intrusion. During the early stages of the magmatic flare-up, granodiorite dikes were emplaced and soon became tightly folded and disaggregated as younger sheets of comagmatic tonalite intruded. Deformation accompanied the magmatism, forming two parallel shear zones several 100 m thick. These two shear zones, which include the Black Belt Mylonite, are composed of thin (≤ 10 m) high-strain zones spaced several tens of meters apart. Each discrete high-strain zone contains subparallel layers of mylonite, ultramylonite, cataclasite and pseudotachylite, all recording oblique sinistral-reverse displacements on gently and moderately dipping surfaces. This architecture, whereby individual high-strain zones are widely spaced and parallel the margins of intruding tonalite sheets, reveals the influence of magma emplacement on shear zone structure. U-Pb zircon geochronology on syn-tectonic dikes indicate that these different styles of deformation all formed within the same 89-85 Ma interval, suggesting that they reflect non-steady flow on deep seismogenic faults. Widespread (garnet) granulite-facies metamorphism and partial melting accompanied intrusion of the tonalites and sinistral-reverse displacements. The ages of undeformed dikes indicate that the deformation was over by 77-75 Ma.

Together, these data show that arc magmatism and transpression within the Mesozoic California arc occurred from ~90 until ~75 Ma, implying that flat-slab subduction and the migration of the Laramide orogenic front into the North America interior occurred after ~75 Ma.

Geological Society of America Abstracts with Programs. Vol. 55, No. 6, 2023
doi: 10.1130/abs/2023AM-394141

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