Cordilleran Section - 119th Annual Meeting - 2023

Paper No. 26-3
Presentation Time: 2:45 PM

MAGMATIC SURGE REQUIRES TWO-STAGE MODEL FOR THE LARAMIDE OROGENY

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The beginning of the Laramide orogeny is a pivotal time in the geological development of the western United States, but the driving mechanism responsible for mountain building, basin formation and ore mineralization is controversial. Most prominent models suggest this event was caused by the collision of an oceanic plateau with the Southern California Batholith sector of western North America at ca. 88 Ma which caused the angle of subduction beneath the continent to shallow. This subhorizontal (flat) subduction is thought to have led to shut-down of the arc, crustal cooling, and the formation of deep, basement-involved thrust faults that penetrated far into the continental interior. In contrast to these predictions, we show that the Southern California Batholith experienced a magmatic surge from 90 to 70 Ma, the lower crust was hot (835-750°C) and partially molten, and cooling occurred after 75 Ma. These data contradict plateau underthrusting as the driving mechanism for early Laramide deformation at 90-80 Ma; therefore, the Laramide orogeny cannot have been initiated by flat-slab subduction. We propose that the Laramide orogeny is best explained as a two-stage orogeny consisting of: 1) an arc magmatic 'flare-up' phase associated with sinistral-reverse ductile shearing in the Southern California Batholith from at 90-75 Ma and coeval dextral-transpression north of the Garlock fault, and 2) a widespread mountain building phase in the Laramide foreland belt from 75-50 Ma. Only that latter phase is linked to flat-slab subduction beneath the Southern California Batholith.

Session No. 26

S1. Late Jurassic to Eocene Tectonics of the North America Cordillera II: Evolving and Emerging Models
Thursday, 18 May 2023: 1:30 PM-4:00 PM

Whitney Peak Ballroom 1 (The Whitney Peak Hotel)

Geological Society of America *Abstracts with Programs.* Vol. 55, No. 4
doi: 10.1130/abs/2023CD-387633

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