Temporal and spatial constraints on suturing of the Cretaceous Alisitos island arc to North America, Peninsular Ranges batholith, Baja California

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The Alisitos arc, located in the western zone of the Jura-Cretaceous Peninsular Ranges batholith and extending from the ancestral Agua Blanca fault (aABF) south to at least the 30th parallel, collided with North America in the mid-Cretaceous. The aABF and Main Martir thrust (MMT) define northern and eastern boundaries of the arc, respectively. The northern end of the arc is characterized by subhorizontal tight to isoclinal folds and reverse faults that define a NW-trending, SW-vergent fold-thrust belt parallel to the aABF, which shows a component of sinistral transpression related to suturing against an oblique, NW-trending continental margin. To the south, in the Sierra San Pedro Martir, where the margin was nearly perpendicular to the direction of convergence, structures showing east over west shear sense dominate and oblique sinistral shear is insignificant. Overall contraction may be greater than to the north as indicated by a major metamorphic gradient across the MMT and steeply plunging fold hinges that rotated towards parallelism with the transport direction. Farther south, in the Sierra Calamajue, arc deformation is confined to <10 km. Here, tight, shallowly plunging folds and S to SW vergent brittle-ductile thrust faults define a fold-thrust belt with strain magnitudes similar to areas to the north.

Accretion-related deformation in the Alisitos arc is constrained to between 115 and 100 Ma. Deformed, 115 Ma volcanogenic strata are intruded by 108 to 105 Ma plutons that deflect and truncate regional structures. After development of a broad zone of deformation with a strong strain gradient towards the suture zone, late accretion-related shear becomes more localized as both the aABF and MMT truncate and/or deform plutons as young as 103 Ma.

Arc accretion requires closure of an interarc basin. This basin, preserved along the northeastern and eastern sides of the Alisitos arc, is represented by a mid-Cretaceous sequence of limestone, volcanogenic sandstone, and shale. A preliminary detrital zircon study of these strata tracks the approach of the Alisitos arc towards the North American continental margin. The oldest analyzed samples (~115 Ma) yield dominantly arc-derived zircons, whereas samples of younger strata (~105-103 Ma) yield progressively larger proportions of zircons with Proterozoic and Archean ages.

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