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Geochronological Constraints on the Volcanic and Topographic Evolution of Central Baja California, Mexico

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Central Baja California (BC) experienced tectonism and volcanism that shaped the landscape from the Miocene to Recent. One important feature is the San Ignacio trough (SIT) that hosted a marine seaway or embayment and acted as a physical barrier to animal and plant migration. This barrier may be responsible for a well-known break in the DNA, N and S of this region. Central BC has also hosted contemporary voluminous and chemically diverse volcanism. Radiometric ages provide important constraints on the origins and longevity of critical topographic features. The Baja GeoGenomics research group is investigating the nature and timing of Pliocene marine and tidal deposits in the NE-oriented, low-lying SIT, located W of the peninsular divide.

These new data reveal that the Sierra San Francisco, a highland volcanic area immediately N of the SIT, is a series of volcanoes constructed of dacitic and andesitic Peleean domes with voluminous lahar and pyroclastic flow deposits. These calcalkaline rocks were previously thought to be subduction-related magmatism and part of the early to middle Miocene (~24–12 Ma) Comondú Group. However, zircon U-Pb and $^{40}\text{Ar}/^{39}\text{Ar}$ dates yield ages of 11–9 Ma. These data indicate the Sierra San Francisco erupted post-subduction and is not part of the lithologically similar but older Comondú Group.

Within the SIT, 12km NE of San Ignacio at 200 m asl, newly mapped marine tidal deposits, informally called the San Regis beds, indicate that the SIT has been significantly uplifted. Mafic scoria interbedded in tidal deposits yield a groundmass $^{40}\text{Ar}/^{39}\text{Ar}$ age of about 4.2 ± 0.1 Ma.

San Regis tidal beds are unconformably overlain by a rhyolite ash-flow tuff from the Quaternary La Reforma caldera situated to the E, on the Gulf of California coast. The highly mobile ash cloud flowed W into the SIT at least as far as the San Regis beds locality NE of San Ignacio. The tuff yielded a preliminary U-Pb zircon age of 1.09 ± 0.04 Ma and an $^{40}\text{Ar}/^{39}\text{Ar}$ anorthoclase age of 1.11 ± 0.01 Ma. These dates indicate that the ash-flow was one of the latest erupted from the caldera and its distribution was in part controlled by the SIT.

In BC genetic diversity along the peninsula appears to change at the latitude of the SIT. Tidal and volcanic deposits suggest this topographic low persisted for over 4Ma and remains a distinctive feature in the topography today.