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Volcano-Tectonic Evolution of Central Baja California Peninsula, Mexico: Implications for Speciation and Barriers to Gene Flow

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Late Cenozoic evolution of the Baja California (BC) peninsula governs its species diversity, with changes to terrestrial habitats and shorelines driven by volcanic and tectonic processes. New geologic mapping and geochronology in central BC help assess if recent landscape evolution created a barrier to gene flow. The NW-trending topographic divide of the BC peninsula near San Ignacio-Santa Rosalia (27.4N) is a low (400500 m asl), broad (2030 km-wide) pass. At the pass, ~2022-Ma volcaniclastic strata, mafic lavas, fluvial conglomerate, cross-bedded eolian sandstone, and a felsic tuff dip ~515 SW. Similar lithology and chronology suggest these strata correlate to the lower Comondu Group (CG). They are overlain by middle Miocene (~1114 Ma) mafic lavas with similar SW dips that overlap in age with the upper CG. NW of the pass, upper Miocene (~9.511 Ma) post-CG volcaniclastic strata and mafic lava flows are exposed in the Sierra San Francisco and dip ~10 SE on its SE flank, inclined differently than older SW-dipping CG at the pass. The basalt of Esperanza (~10 Ma) unconformably overlies the CG at and west of the pass. Its ~1 regional dip suggests that ~515 of SW tilting occurred prior to ~10 Ma in the footwall of the NW-striking Campamento fault, located at the base of the ~150 m-high rift escarpment. The N-striking Arroyo Yaqui fault, ~10 km E of the Campamento fault in a low-relief region capped by Quaternary marine strata, exposes crystalline basement in its footwall and may be a major rift margin structure. Thus the location, orientation, and age of the divide may be controlled by rift-related faulting and tilting plus beveling and lateral retreat of the escarpment. Pliocene tidal sediments occur up to ~200 m asl ~20 km west of the low pass similar to Pliocene marine strata east of the pass at ~300 m asl, indicating late Miocene to Pliocene subsidence was followed by >200 m of post-4 Ma uplift. Uplift was likely driven by transtensional faulting and possibly magmatic inflation by ~7090 km-wavelength domes. Further mapping will constrain the timing of vertical crustal motions and test whether the tidal embayment crossed the peninsula through this low pass, isolated species, and prevented terrestrial gene flow. Integration of geologic and genetic data will determine how volcano-tectonic processes shaped genetic diversity.

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