

Southern California and NW Mexico: Tectonic Evolution after subduction ended

In southwestern North America, progressive post-Oligocene separation of the Rivera and Mendocino Triple Junctions lengthened the contact zone accommodating transtension or transpression between the Pacific and North America plates. This talk examines the crustal architecture, and fault and basin evolution adjacent to the plate boundary in Southern California and NW Mexico and compares this to the history of cessation of subduction at different locations along the margin. I use newly calculated (but similar to previous) plate motion trajectories for Pacific-North America motion since Oligocene time. The summed strike-slip displacement on known faults in the plate boundary region is less than the plate motion totals if subduction stopped by 12 Ma. Thus we still need to find an additional location of plate boundary fault slip between 12 and 6 Ma. There are ongoing arguments regarding how much of the slip occurred west of the Baja California peninsula vs. east of the Baja California Peninsula (in the Gulf of California or in mainland Mexico to the east of the Gulf). An 8 Ma time of cessation of slip along the ocean-continent boundary west of southern Baja California has been proposed by some authors but does not remove this discrepancy.

The location, amount and timing of lithospheric extension and its regional geodynamic effects show that early Miocene Basin and Range extension was temporally and spatially distinct from the later Gulf of California transtension in the northern Gulf of California, even though it merges with it in the southern Gulf. Post-subduction volcanism, although volumetrically minor away from the modern plate boundary, provides clues to lithospheric/asthenospheric evolution. Lithospheric modification occurred by sedimentation, first along the eastern margin of the southern Gulf of California, and then since late Miocene time strongly centered on the Salton Trough and northern Gulf of California. “New” crust and mantle lithosphere at the plate boundary in the Salton Trough and the non-oceanic part of the northern Gulf of California formed by sedimentation and magmatism accompanied by inferred lower crustal or mantle lithospheric flow from the adjacent continental regions.