# ANALYSIS OF QUATERNARY FAULTS AND ASSOCIATED DEFORMATION OF SEDIMENTARY BASIN FILL: INNER CONTINENTAL BORDERLAND OF CALIFORNIA

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ABSTRACT:

The San Andreas fault system is distributed across hundreds of kilometers in southern California. This transform system includes offshore faults along the shelf, slope and across the Gulf of Santa Catalina basin (GSCB) — comprising part of the Inner California Continental Borderland. Previously, offshore faults have been interpreted as being discontinuous and striking parallel to the coast between Long Beach and San Diego. Our work, based on several thousand kilometers of deep-penetration industry multi-channel seismic reflection data (MCS) as well as high resolution U.S. Geological Survey MCS, indicates that many of the offshore faults are more geometrically continuous than previously reported including Newport-Inglewood (NI)-San Mateo-Carlsbad(SMC), and Coronado Bank Detachment(CBD)-Descanso faults. We interpret a ~18 km wide step over from the NI-SMC positive flower structure in the north to the CBD-Descanso negative flower structure in the south adjacent to San Diego. These faults and stratigraphic interpretations were gridded and depth converted for modeling slip amounts and orientation on the San Mateo-Carlsbad fault.

Stratigraphic interpretations of MCS profiles included the ca. 1.8 Ma Top Lower Pico (TLP), which was correlated from wells located offshore Long Beach (Sorlien et al 2010). Based on this age constraint, four younger (Late) Quaternary unconformities (Q1,Q2,Q3,Q4) are interpreted through much of GSCB. We correlate the Q horizons to core hole data in Los Angeles harbor and constrain their ages: Q1 is 160-300; ka Q2 is 300 ka; Q3 300-450 ka; and Q4 ~600 ka. These ages are an order of magnitude older than interpretations published by Covault and Romans (2009).

Assuming the ages that were used to calculate slip are correct, we estimate an average slip rate of ~0.44mm/yr on the San Mateo-Carlsbad with an average azimuth direction of 169˚ which is significantly less than when calculated with younger interpreted ages and indicates that the SMC fault is a right-lateral strike-slip fault. Our modeling also indicates that the SMC fault is kinematically continuous with a right step-over at its southern extent. This change in SMC strike marks a boundary between transpression in the north and transtension in the south and is significant to understanding future tectonic episodes.