Seismicity, Faulting and Tectonics of Inner Continental Borderland Offshore Northern Baja California, Mexico

Mark R. Legg
University of California at Santa Barbara
Santa Barbara, California

Victor Wong O
Centros de Investigacion Cientifica
y Educacion Superior de Ensenada
San Ysidro, California

Using recently collected high resolution seismic reflection data and existing bathymetric, geomagnetic, and seismological data, we find that the inner continental borderland of northern Baja California, Mexico, is extensively deformed and tectonically active. The region is crossed by three major wrench fault zones typified by one or more relatively continuous main fault(s), numerous smaller, subparallel, en echelon and oblique conjugate faults, and transversely oriented folds. These three fault zones are the southward continuations of the Santa Cruz-San Clemente-San Isidro, San Pedro-San Diego Trough-Maximinos, and Palos Verdes Hills-Coronado Bank-Agua Blanca fault zones, mapped in the southern California continental borderland. Each of the fault zones shows evidence of Quaternary activity, such as sea-floor displacement and faulted Quaternary sediments. Earthquake epicenters roughly delineate the major fault zones, with the most significant activity occurring along the Santa Cruz-San Clemente-San Isidro fault zone. Strike-slip is suggested for the main faults by offset submarine canyons, and sea-floor scarps that reverse along strike. Large scarps and vertical separations also suggest significant dip-slip in some areas. Earthquake focal mechanisms show that present-day movements along the major fault zones is predominantly dextral strike-slip, with a significant component of dip-slip in some cases, consistent with the motion of the San Andreas fault system and Pacific-North American plate boundary tectonics. Complexity in the regional tectonics is demonstrated by earthquakes in the San Clemente Island-Fortymile Bank area, which are observed to have focal mechanisms opposite to those predicted by the rigid plate theory.