

Quaternary Fault and Fold Database of the United States

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Brawley Seismic Zone (Class A) No. 124

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Synopsis	The Brawley Seismic Zone is a linear zone of seismicity (up to 10 km wide) associated with the right-step between the Imperial [132] and San Andreas [1] faults. Faulting reaches the surface within the Brawley fault zone, a zone of left-stepping, en echelon, principally normal, faults at the southern end of the Seismic Zone. There have been no slip-rate studies based on geologic data, but geodetic and survey data document dextral displacement.
Name comments	Seismic zone as defined here includes Brawley and Rico faults. Brawley Seismic Zone was named by Johnson (1979 #6361); Rico fault was named by Hart (1981 #6360). The name "Brawley fault" was originally applied to a northwest-striking fault, north of Brawley, that was inferred based on regional resistivity survey data (Meidav, 1968 #6365; Elders and others, 1972 #6356; Teilman and others, 1977 #6371). Sharp (1976 #6369) applied the name to a zone of 1975 surface rupture along the east margin of

the Mesquite Basin. He noted that this rupture was a possible south-trending extension of the previously inferred fault to the north, although he recognized that the two faults may be unrelated. Keller (1979 #6364) also showed the Brawley fault roughly following what was later called the Brawley Seismic Zone. Following more extensive ground rupture associated with the Brawley fault (1975 rupture segment) during the 1979 Mw 6.5 Imperial Valley earthquake, Sharp and others (1982 #6370) felt that "Brawley fault zone" might be a more appropriate name for this zone of surface rupture. Since 1982 "Brawley fault" (or fault zone) is usually restricted to that portion of the Brawley Seismic Zone that has had surface rupture. The Brawley Seismic Zone encompasses a zone of seismicity extending from Bombay Beach (at the southern end of the San Andreas fault [1j]) to its intersection with the Imperial [132] fault, east of El Centro.

Fault ID: Refers to numbers 502 (Brawley Seismic Zone), 507 (Brawley fault zone) and 508 (Rico fault) of Jennings (1994 #2878).

County(s) and State(s)	IMPERIAL COUNTY, CALIFORNIA
Physiographic province(s)	BASIN AND RANGE
Reliability of location	<p>Poor Compiled at 1:24,000 scale.</p> <p><i>Comments:</i> The boundaries of the zone are not strictly defined in the literature; the zone refers to the elongate concentration of earthquake epicenters which links the southern San Andreas fault [1j] to the Imperial fault [132]. Traces of the Brawley fault zone were digitized from Official Earthquake Fault Zone maps by California Geological Survey (Division of Mines and Geology, 1990 #6357; 1990 #6358).</p>
Geologic setting	<p>The NNW-trending Brawley Seismic Zone overlies an inferred short spreading center segment between the San Andreas [1] and Imperial [132] (transform) faults in the southern Salton Trough (Fuis and Kohler, 1984 #6359). Detailed studies of earthquake swarms show NE and NW trending, stepping zones of seismicity within the boundary of the broader seismic zone (Nicholson and others, 1985 #6366). A 1975 earthquake swarm was associated with ground rupture and discovery of the north-trending Brawley</p>

	<p>fault (later Brawley fault zone) which forms the eastern margin of the subsiding Mesquite Basin. Although Reilinger (1984 #6367) considered the Brawley fault to be a right stepping en echelon branch of the Imperial fault [132], the change in trend and association with the 1975 earthquake swarm (Sharp, 1976 #6369; Johnson and Hill, 1982 #6363) justify linking this fault with the Brawley Seismic Zone.</p> <p>The Rico fault lies east of the southern end of the Brawley fault zone with a similar orientation and sense of displacement (Sharp and others, 1982 #6370).</p>
Length (km)	68 km.
Average strike	N17°W
Sense of movement	<p>Right lateral</p> <p><i>Comments:</i> Focal mechanisms indicate principally dextral strike-slip displacement, sometimes with a vertical component (Johnson and Hadley, 1976 #6362; Keller, 1979 #6364; Nicholson and others, 1985 #6366). Geodetic data (Savage and others, 1974 #6368) also indicates dextral displacement across this zone. The north-trending Brawley fault zone, as eastern boundary of Mesquite Basin, is ND at about 1:1 ratio; Rico fault is similar sense to Brawley fault zone.</p>
Dip Direction	<p>V; W</p> <p><i>Comments:</i> The fault dips vertically based on focal mechanisms and hypocenter distribution (Johnson and Hadley, 1976 #6362).</p>
Paleoseismology studies	
Geomorphic expression	The only surface expression is along the Brawley fault zone, expressed by low west-facing scarps on alluvium adjacent to the Mesquite Basin.
Age of faulted surficial deposits	Holocene alluvial (surface) deposits
Historic earthquake	

Most recent prehistoric deformation	<p>latest Quaternary (<15 ka)</p> <p><i>Comments:</i> Most recent paleoevent is not known, other than the co-seismic surface rupture on Brawley fault zone associated with the 1975 and 1979 earthquakes.</p>
Recurrence interval	
Slip-rate category	<p>Greater than 5.0 mm/yr</p> <p><i>Comments:</i> The fault was assigned a slip rate of 25 mm/yr by the Working Group on California Earthquake Probabilities(1995 #4945). Geodetic data for the period 1934-1972 indicated a dextral displacement rate of about 5 mm/yr across a portion of the zone (Savage and others, 1974 #6368); GPS data indicate 23±2 mm/yr fault parallel strain rate and 12±1 mm/yr fault-normal extension (Bennett and others, 1996 #6355).</p>
Date and Compiler(s)	<p>1999</p> <p>Jerome A. Treiman, California Geological Survey</p>
References	<p>#6355 Bennett, R.A., Rodi, W., and Reilinger, R.E., 1996, Global positioning system constraints on fault slip rates in Southern California and northern Baja, Mexico: <i>Journal of Geophysical Research</i>, v. 101, no. B10, p. 21,943-21,960.</p> <p>#6357 Division of Mines and Geology, 1990, Official map of earthquake fault zones, Alamo quadrangle: California Department of Conservation, Division of Mines and Geology, scale 1:24,000.</p> <p>#6358 Division of Mines and Geology, 1990, Official map of earthquake fault zones, Holtville West quadrangle: California Department of Conservation, Division of Mines and Geology, scale 1:24,000.</p> <p>#6356 Elders, W.A., Rex, R.W., Meidav, T., Robinson, P.T., and Biehler, S., 1972, Crustal spreading in southern California: <i>Science</i>, v. 178, p. 15-24.</p> <p>#6359 Fuis, G.S., and Kohler, W.M., 1984, Crustal structure and tectonics of the Imperial Valley region, California, <i>in</i> Rigsby, C.A., ed., <i>The Imperial Basin—Tectonics, sedimentation and thermal aspects</i>: Society of Economic Paleontologists and</p>

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