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Quaternary Fault and Fold Database of the United States

As of January 12, 2017, the USGS maintains a limited number of metadata fields that characterize the Quaternary faults and folds of the United States. For the most up-to-date information, please refer to the interactive fault map.

Santa Monica fault (Class A) No. 101

Last Review Date: 2000-05-01

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Synopsis	Onshore fault is identified in the subsurface (oil wells) and at the surface (geomorphology) (Wright, 1991 #5950; Dolan and others, 2000 #5964). Offshore fault is poorly known from limited marine geophysical lines (Junger and Wagner, 1977 #5945; Vedder and others, 1986 #5971). Late-Quaternary fault history is interpreted from one exposure (McGill, 1989 #5968) and one trenching site (site 101-1) (Dolan and others, 2000 #5964). Dolan and others (2000 #5964) reported 2–3 rupture events in the past 16–17 k.y. and at least 6 rupture events in the past 50 k.y. Dolan and others (1995 #5965) estimated a slip rate of 1.0–1.5 mm/yr and Dolan and others (2000 #5964) calculated a dip-slip rate of 0.5–0.6 mm/yr. Clark and others (1984 #2876) estimated a 0.27–0.30 mm/yr slip rate for the Potrero Canyon fault based on vertical separation only.
Name	Recognition of a fault zone in this vicinity was first published by

comments	Lawson and others (1908 #5925); Waring (1914 #5972) was the first to use the name "Santa Monica fault"; Hill (1928 #4959) described the "Santa Monica segment" of the "Anacapa Lineament", the lineament extending from south of San Miguel Island eastward to the Colorado River; Barbat (1958 #5953) described what he called the "Santa Monica fault system" coinciding roughly with the portion of the Anacapa lineament west of the San Andreas fault; Lang and Dreessen (1975 #5967) refer to the "Santa Monica zone of deformation". The western part of the fault was considered part of the Malibu Coast fault [99] by Lamar (1961 #5924), branching eastward into the Benedict Canyon fault and the Hollywood fault [102]. "Santa Monica fault" sometimes still includes the Hollywood fault [102] (e.g. Yerkes and others, 1965 #5930); however, the faults are described separately in this database. Sometimes referred to as north strand of the Santa Monica fault, along with a south strand, but south strand appears to be an older blind fault and has no surface expression (Dolan and Pratt, 1997 #5963; Pratt and others, 1998 #5969; Dolan and others, 2000 #5964). The first trace specifically mapped was at Potrero Canyon (Hoots, 1931 #5921) and was called "Potrero fault" by H.R. Johnson in 1932 and "Potrero Canyon fault" in 1959 by Moran and others (unpublished consulting reports cited by Hill, 1979 #5973); McGill (1989 #5968) recognized the Potrero Canyon fault as part of the Santa Monica fault. A surface trace (other than at Potrero Canyon) was not depicted until the work of Dolan and Sieh (1992 #5917). Fault extends westward from the "west Beverly Hills lineament" (Dolan and others, 2000 #5964) to Potrero Canyon and probably offshore to possible connection with Malibu Coast fault [99] and/or Anacapa-Dume fault [100]. **Fault ID:** Refers to numbers 390 (Malibu Coast offshore) and 391 (Santa Monica fault) of Jennings (1994 #2878) and number 80 (Santa Monica fault) of Ziony and Yerkes (1985 #5931).
County(s) and State(s)	LOS ANGELES COUNTY, CALIFORNIA
Physiographic province(s)	PACIFIC BORDER
Reliability of location	Good Compiled at 1:4,800; 1:80,000; 1:250,000; and 1:500,000 scale. *Comments:* Location of fault from Qt_flt_ver_3-0_Final_WGS84_polyline.shp (Bryant, W.A., written

	communication to K.Haller, August 15, 2017) attributed to 1;4,800-scale map by McGill (1989 #5968); 1:80,000-scale maps by Pratt and others (1998 #5969) and Dolan and others (2000 #5964); 1:250,000-scale map by Junger and Wagner (1977 #5945); and 1;500,000-scale map by Sorlien and others (2006 #7946).
Geologic setting	North-dipping, generally high-angle surface fault (shallower at depth) is part of east-west frontal fault system (also including Anacapa-Dume [100], Malibu Coast [99], Hollywood [102] and Raymond [103] faults) that has accommodated 80° of clockwise rotation of the western Transverse Ranges and perhaps as much as 60 km left slip displacement since early Miocene (Hornafius and others, 1986 #5922); modern activity is combination of continued strike-slip movement and compression (Dolan and others, 1995 #5965; Dolan and others, 2000 #5964).
Length (km)	35 km.
Average strike	N86°E
Sense of movement	Reverse *Comments:* Sense of movement reported by Dolan and others (2000 #5964); slickensides and other features indicate last movement at Potrero Canyon was reverse (Hill, 1979 #5973).
Dip	30°–70° N. *Comments:* Various dips are reported in the literature. A dip of approximately 45° is reported at Potrero Canyon (Hill, 1979 #5973); 30–35° ? in upper 300 m (Pratt and others, 1998 #5969) and 60–70° at depth (Tsutsumi and others, 1994 #5970); 40–45° in Sawtelle oil field (Wright, 1991 #5950).
Paleoseismology studies	Site 101-1, Veterans Hospital: Two trenches across 5-m-high scarp exposed faulted and deformed late-Pleistocene fan sediments and colluvial wedges attributed to late-Pleistocene and Holocene surface rupture/deformation events; 14C dating of deformed and undeformed sediment allowed interpretation of fault history, including at least 6 possible surface-rupturing events (Dolan and others, 2000 #5964).
Geomorphic	Subdued, left-stepping, 7- to 12-m-high, echelon scarps (fold

expression	scarps ?) across alluvial fans and Pleistocene terrace deposits and springs (Dolan and others, 2000 #5964).
Age of faulted surficial deposits	Latest-Pleistocene/Holocene paleosols (Dolan and others, 2000 #5964); late-Pleistocene alluvial fans, marine (stage 5e) and overlying non-marine terrace deposits (McGill, 1989 #5968; Dolan and others, 2000 #5964).
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* The most recent event probably occurred between 1 and 3 ka and an earlier event occurred 10–7 k.y. ago (Dolan and others, 2000 #5964).
Recurrence interval	7–8 k.y. (<17 ka) *Comments:* Recurrence interval estimated by Dolan and others (2000 #5964) based on 2–3 rupture events in past 16–17 k.y. and at least 6 rupture events in past 50 k.y.
Slip-rate category	Between 1.0 and 5.0 mm/yr *Comments:* Dolan and others (1995 #5965) assign 1.0–1.5 mm/yr; 0.5–0.6 mm/yr for the dip-slip component. Clark and others (1984 #2876) estimated 0.27–0.39 mm/yr for the Potrero Canyon fault based on vertical separation only; Petersen and Wesnousky (1994 #5962) report 3–5 mm/yr late-Pleistocene/Holocene slip rate from unpublished work by Molnar (1991, report to Southern California Earthquake Center) but the estimates by Molnar are poorly constrained. Slip rate assigned to the fault by Petersen and others (1996 #4860) for probabilistic seismic hazard assessment for the State of California was 1.0 mm/yr (with minimum and maximum assigned slip rates of 0.5 mm/yr and 1.5 mm/yr, respectively assuming 1:1/H:V and that Potrero Canyon fault carries half of slip.
Date and Compiler(s)	2000 Jerome A. Treiman, California Geological Survey William A. Bryant, California Geological Survey
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