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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.

San Mateo-San Onofre-Carlsbad fault zone, San Onofre-Oceanside section (Class A) No. 294b

Last Review Date: 2012-01-19

citation for this record: **Ryan, H.F., and Bryant, W.A., compilers, 2012, Fault number 294b, San Mateo-San Onofre-Carlsbad fault zone, San Onofre-Oceanside section, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, https://earthquakes.usgs.gov/hazards/qfaults, accessed 12/14/2020 02:52 PM.**

Synopsis	**General:** Clarke and others (1983) and Greene and Kennedy (1986) show a discontinuous zone of unnamed active faults that occur along the base of the continental slope (about 600 m water depth) from just south of Dana Point to the La Jolla fan valley. The faults along the base of the slope include, from north to south, the San Mateo fault zone, San Onofre fault zone, and the Carlsbad fault zone (Ryan and others, 2009). Fisher and Mills (1991) suggest that the San Onofre fault zone (their San Onofre-Oceanside fault) may be a reactivated extension of the Cristiantitos fault, which has been offset to the northwest along the Newport-Inglewood/Rose Canyon fault zone [127c]. The San Onofre fault zone lies between compressional structures, which

	are also imaged along the base of the continental slope: the San Mateo fault zone (San Mateo fold and thrust belt of Fischer and Mills, 1991) and the Carlsbad fault zone. The San Mateo fault zone is composed of an inner and outer belt (Fischer and Mills, 1991), with the outer belt composed of folds imaged above a blind thrust (Fisher and Mills, 1991; Crouch and Suppe, 1993; Rivero and others, 2000). Less is known about the Carlsbad fault zone, but it has been described in Fisher and Mills (1991) and Rivero and others (2000). **Sections:** This fault has 3 sections. In this compilation, the San Mateo-San Onofre-Carlsbad fault zone is separated into sections based on differing styles of displacement. The northernmost is the San Mateo thrust section, which lies offshore of San Mateo Point and is underlain by the Oceanside fault [187]. The central San Onofre section is a high-angle fault that is modified from the San Onofre-Oceanside fault of Fischer and Mills (1991). The southernmost Carlsbad section is offshore of Carlsbad, California and is generally a high angle fault that shows reverse sense of motion.
Name comments	**General:** This structure previously was unnamed. It includes the San Mateo fold and thrust belt, San Onofre-Oceanside fault and the Carlsbad thrust of Fischer and Mills (1991). Fault names that will be used in this compilation, from north to south, are: San Mateo fault zone, San Onofre fault zone, and Carlsbad fault zone (Ryan and others 2009). Ryan and others (2009) renamed the San Onofre-Oceanside fault of Fischer and Mills (1991) as the San Onofre fault zone to avoid any confusion with the Oceanside fault [187]. The Carlsbad thrust of Fischer and Mills (1991) generally is characterized by dips greater than 60°, so Ryan and others (2009) prefer to rename this fault the Carlsbad fault zone. **Section:** The San Onofre-Oceanside section consists of the San Onofre fault zone, a high angle strike-slip fault (San Onofre-Oceanside fault zone of Fischer and Mills, 1991). The northern end of the section is along the shelf near San Mateo Point and extends southeastward to about 5 km north of Carlsbad Canyon.
County(s) and State(s)	SAN DIEGO COUNTY, CALIFORNIA
Physiographic province(s)	PACIFIC BORDER
Reliability of	

location	Compiled at 1:unspecified 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 1:250,000-scale map by Ryan and others (2009 #8244). The San Onofre fault zone was mapped using seismic reflection data including deep penetration industry multichannel seismic reflection profiles with a nominal trackline spacing of about 3 km that are available for the offshore region (USGS, 2005). These data were supplemented by both high-resolution mutlcihannel reflection profiles with a trackline spacing of about 4 km that have a vertical resolution of 2–4 m (Normark and others, 1999). The oblique orientation of the fault zone combined with high along strike variability in fault character result in difficulty in determining fault location, especially at its northwest extension.
Geologic setting	The San Mateo-San Onofre-Carlsbad fault zone lies beneath the continental margin between two major northwest trending strike-slip fault zones: the Newport-Inglewood-Rose Canyon [127] and the Coronado Bank [131] fault zones in the inner California continental borderland.
Length (km)	km.
Average strike	
Sense of movement	Right lateral *Comments:* Sense of movement is unknown, but inferred to be dextral strike slip (Fischer and Mills, 1991).
Dip Direction	V *Comments:* Dip is constrained by marine seismic reflection profiles. Bohannon and Geist (1998) show the fault as a near vertical fault zone that cuts through the entire stratigraphic sequence (however in their paper they call the fault the Newport-Inglewood fault [127c], which is actually located farther to the east).
Paleoseismology studies	
Geomorphic	The fault has little geomorphic expression, although it is mapped

expression	along the base of the continental slope.
Age of faulted surficial deposits	unknown, but inferred to be Quaternary
Historic earthquake	
Most recent prehistoric deformation	undifferentiated Quaternary (<1.6 Ma) *Comments:* There is a lack of high quality high-resolution profiles across this fault zone. In places, the fault zone is buried beneath inferred Holocene deposits (acoustically transparent unit) and thus Ryan and others (2009) assign a Quaternary age for most recent offset.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* A low slip rate is assigned for lack of information on this section of the fault.
Date and Compiler(s)	2012 Holly F. Ryan, U.S. Geological Survey William A. Bryant, California Geological Survey
References	#8517 Clarke, S.H., Greene, H.G, Field, M.E., and Lee, W.H.K., 1983, Reconnaissance geology and geologic hazards of selected areas of the southern California continental borderland: U.S. Geological Survey Open-File Report 83-62, 78 p. #7886 Crouch, J.K., and Suppe, J., 1993, Late Cenozoic tectonic evolution of the Los Angeles basin and inner California borderland—A model for core complex-like crustal extension: Geological Society of America, v. 105, p. 1415–1434. #8518 Fischer, P.J., and Mills, G.I., 1991, The offshore Newport-Inglewood-Rose Canyon fault zone, California—Structure, segmentation and tectonics, *in* Abbott, P.L., and Elliott, W.J., eds., Environmental perils San Diego region: San Diego, California, San Diego Association of Geologists for the Geological Society of America Meeting, p. 17–36.

	#8397 Greene, H.G., and Kennedy, M.P., 1986, Geology of the inner-southern California continental margin: California Division of Mines and Geology, Geologic Map Series of the California Continental Margin, scale 1:250,000. #8403 Normark, W.R., Reid, J.A., Sliter, R.W., Holton, D., Gutmacher, C.E., Fisher, M.A., and Childs, J.R., 1999, Cruise report for O1-99-SC Southern California Earthquake Hazards project: U. S. Geological Survey Open-File Report No. 99-560, 60 p. #8486 Rivero, C., Shaw, J.H., and Mueller, K., 2000, Oceanside and Thirtymile Bank blind thrusts—Implications for earthquake hazards in coastal southern California: Geology, v. 28, p. 891-894. #8244 Ryan, H.F., Legg, M.R., Conrad, J.E., and Slitter, R.W., 2009, Recent faulting in the Gulf of Santa Catalina—San Diego to Dana Point, Chapter 4.5, *in* Lee, H.J., and Normark, W.R., eds., Earth science in the urban ocean—The southern California continental borderland: Geological Society of America Special Paper 454, p. 291–316, https://dx.doi.org/10.1130/SPE454. #8405 USGS, 2005, NAMSS: National Archive of Marine Seismic Surveys, http://walrus.wr.usgs.gov/NAMSS/