Quaternary Fault and Fold Database of the United States

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Mendocino fault zone (Class A) No. 18

Last Review Date: 2001-08-10

Compiled in cooperation with the California Geological Survey

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Synopsis	Major offshore west-striking dextral transform fault that extends westward from the Punta Gorda area of northern California. First recognized as a geomorphic feature by Murray (1939 #4885) and associated with the possible northwestward extension of the San Andreas fault zone [1] by Shepard and Emery (1941 #4887). The fault zone is historically active, but specific data on slip rate, recurrence, and most recent paleoevent are not known.
Name comments	First recognized as a geomorphic feature by Murray (1939 #4885) based on bathymetry studies offshore from Cape Mendocino. Murray (1939 #4885) referred to the feature as the "submarine scarp of Mendocino, CA." Shepard and Emery (1941 #4887) and

	Shepard (1957 #4886) referred to this feature as the Gorda scarp and related it to the northwestward continuation of the San Andreas fault [1]. The Mendocino fault zone has also been referred to as the Mendocino escarpment (Menard and Dietz, 1952 #4882; Bolt and others, 1968 #4872), Mendocino fracture zone (Kelsey and Carver, 1988 #4094), and Mendocino fault zone (Jennings, 1975 #4876; Clarke and Field, 1989 #4137; 1994 #2878). Modern usage varies between Mendocino fault zone and Mendocino fracture zone. In this compilation the name Mendocino fault zone is used for the dextral transform fault that extends westward from the Punta Gorda area of northern California to the Gorda Ridge. West of the Gorda Ridge, where slip is not expected, the name Mendocino fracture zone is appropriate. **Fault ID:** Refers to numbers 83 (Mendocino fault zone) and 84 (unnamed fault along Mattole Canyon) of Jennings (1994 #2878).
County(s) and State(s)	HUMBOLDT COUNTY, CALIFORNIA (offshore)
Physiographic province(s)	PACIFIC BORDER (offshore)
Reliability of location	Poor Compiled at 1:250,000 scale. *Comments:* Geologic mapping offshore is based on sparse trackline crossings. Offshore escarpment forms a linear westerly trend; mapped trace is based on offshore investigation by Clarke and Field (1989 #4137) at 1:250,000 scale.
Geologic setting	Mendocino fault zone is a 260-km-long east-west striking fundamental structure that forms the transform boundary between the Pacific plate to the south and the Juan de Fuca plate to the north (Dengler and others, 1995 #4873). To the east, the Mendocino fault zone forms one limb of the Mendocino triple junction, a structurally complex region where the Juan de Fuca, North American, and Pacific plates meet. The Mendocino fault zone can be traced from the Gorda Ridge at about longitude 127.5? W eastward to near the intersection between the offshore extensions of Mendocino Canyon and Mattole Canyon at about longitude 124.6? W, where it may continue as an east-southeast striking unnamed fault along Mattole Canyon (Clarke, 1992 #4092). McLaughlin and others (1994 #4881) suggested that slip

	from the San Andreas fault [1] may transfer to the Mendocino fault zone [18] along a reactivated Cooskie shear zone on the northern border of the obducted King Range terrane. The total amount of dextral strike-slip displacement along the Mendocino fault zone is unknown.
Length (km)	174 km.
Average strike	N79°W
Sense of movement	Right lateral *Comments:* Fault zone predominantly characterized by dextral displacement along near vertical fault indicated by earthquake focal mechanisms (Eaton, 1989 #4874; McPherson, 1989 #4883; Wilson, 1989 #4888). The eastern end of the fault zone may exhibit a component of reverse slip, based on earthquake focal mechanisms (McPherson, 1989 #4883) and a high rate of onshore surface uplift (Merritts, 1996 #4884).
Dip Direction	V; N *Comments:* Focal mechanisms indicate predominantly near vertical fault plane, changing to steeply north-dipping near eastern end of fault zone (McPherson, 1989 #4883).
Paleoseismology studies	
Geomorphic expression	The fault zone is delineated by a pronounced west-striking offshore linear escarpment on the sea floor. Shepard and Emery (1941 #4887) described a north-facing linear escarpment as much as 1,800 m high with maximum slope angle of about 15?. Shepard and Emery (1941 #4887) termed this feature the Gorda scarp and mapped it as extending from Punta Gorda westward for about 120 km. West of this point, the scarp changes to a south-facing escarpment. Shepard and Emery (1941 #4887) and Shepard (1957 #4886) described a beheaded drainage (Delgada submarine canyon) and linear rift valleys, and Shepard (1957 #4886) suggested possibly significant dextral displacement of the 1,000-fathom (ca. 2,000 m) bathymetric contour off Punta Gorda.
Age of faulted surficial deposits	There is insufficient data to constrain the youngest age of faulted deposits. The fault zone, within about 50 km of shore, juxtaposes Eel River basin strata to the north against Point Arena basin strata

	on the south (Clarke, 1987 #4087). Basement rocks of the Eel River basin consists of accreted late Mesozoic to early Tertiary Franciscan Complex rocks that are unconformably overlain by Miocene to mid-Pleistocene, generally marine sedimentary rocks (Clarke, 1987 #4087). Point Arena basin consists of unnamed Mesozoic basement rocks (metasedimentary rocks, graywacke, andesite, and tholeiitic basalt) that are unconformably overlain by Eocene to mid-Pleistocene marine strata (McCulloch, 1987 #4880).
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Timing of the most recent paleoevent is poorly constrained. The fault zone is historically active and is located in the coastal area of northern California, one of the most seismically active areas in the contiguous United States. Lajoie and others (1982 #4877) and Merritts (1996 #4884) reported uplifted marine terraces to the north and south of the Mendocino fault zone that may have resulted from coseismic uplift events. North of the Mendocino fault zone, the most recent terrace uplift event occurred about 800 yrs B.P., whereas south of the Mendocino fault zone the most recent terrace uplift event occurred about 500 yrs. B.P. (Merritts, 1996 #4884). It is not known if these uplift events correspond to paleoevents along the Mendocino fault zone, some other structure such as the southern portion of the Cascadia subduction zone [781], or some combination of structures.
Recurrence interval	
Slip-rate category	Greater than 5.0 mm/yr *Comments:* A geologically determined slip rate does not exist for the Mendocino fault zone. Slip rate estimates of as much as 35 mm/yr are based on kinematic models for the Juan de Fuca, Pacific, and North America plates (McCrory and others, 1995 #4879; McCrory, 1996 #1217; Freymueller and others, 1999 #4875; McCrory, 2000 #4878). The southern Juan de Fuca plate is deforming internally, and it is not known what portion of plate motion is taken up in the Gorda deformation zone. Merritts (1996 #4884) reported Holocene uplift rates of 1.5 to 3.0 mm/yr onshore

	north of the Mendocino fault zone and 1.4 to 4.1 mm/yr onshore south of the Mendocino fault zone. It is not known if these uplift rates relate to deformation along the Mendocino fault zone.
Date and Compiler(s)	2001 William A. Bryant, California Geological Survey
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