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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.

unnamed fault set offshore of mouth of Willapa Bay (Class A) No. 590

Last Review Date: 2003-07-03

citation for this record: **McCrory, P.A., compiler, 2003, Fault number 590, unnamed fault set offshore of mouth of Willapa Bay, 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 03:04 PM.**

Synopsis	The unnamed fault set offshore of mouth of Willapa Bay consists of four short fault traces on the inner shelf near Willapa Bay. Multi-channel, seismic reflection profiles depict disruption of inferred late Miocene to Quaternary strata along faults of this unnamed fault set (McNeill and others, 1998 #4089). McNeill and others (1998 #4089) interpret the two southern strands as either an east-west oriented thrust fault (north side up) or an eastern extension of the left-lateral, strike-slip South Ninitat fault. The 70-km gap between the easternmost Ninitat strand and these faults makes the latter interpretation highly speculative. In addition, more recent mapping by McCrory and others (2002 #5864), based on high-resolution seismic reflection data, indicates a more northwesterly trend, similar to faults mapped in the adjacent Willapa Bay.

Name comments	Wolf and others (1997 #6305) mapped a short fault and anticlinal fold on the continental shelf, 12 km west of the mouth of Willapa Bay, Washington based on sparse seismic reflection data collected by the USGS on cruises in 1976 and 1977. McNeill and others (1998 #4089) also mapped a short thrust fault on the continental shelf in the same vicinity based on industry multi-channel, seismic reflection data. McCrory and others (2002 #5864) mapped two fault traces in this same location, but with their strike differing from either of the two previous studies based primarily on new USGS seismic reflection profiles collected in 1997 (Cross and others, 1998 #6303). McNeill and others (1998 #4089) mapped a number of anticlinal folds in the same vicinity, but provided no data to suggest that these folds are cored by faults, so their fold axes are not included in this compilation. North-northwest-striking faults of this set extend from offshore of the mouth of Willapa Bay, northward toward offshore of the mouth of Grays Harbor.
County(s) and State(s)	GRAYS HARBOR COUNTY, WASHINGTON (offshore) PACIFIC COUNTY, WASHINGTON (offshore)
Physiographic province(s)	PACIFIC BORDER (offshore)
Reliability of location	Good Compiled at 1:250,000 scale. *Comments:* The fault-trace locations are based on mapping of McCrory and others (2002 #5864) primarily using high-resolution 1997 USGS seismic reflection profiles that have a 5-km grid spacing (Cross and others, 1998 #6303).
Geologic setting	The unnamed fault set offshore of mouth of Willapa Bay is located a few kilometers west of a major forearc block boundary between the Oregon Coast Range block to the east and the Olympic subduction complex block to the west (McCrory and others, 2002 #5864). Relative motion between these two blocks in coastal Washington is estimated at 6-8 mm/y based on modeling of geodetic observations (Mazzotti and others, 2002 #6304). The orientation of faults of this fault set with respect to the boundary favors transpressional motion. Dip-slip motion is observed on the strands, strike slip motion is not. However, strike-slip faulting is not precluded, as is it difficult to document using seismic reflection profiles. Observed faulting and associated folding involves subduction-complex basement rocks, late Neogene

	overlap strata, and Quaternary sediments.
Length (km)	26 km.
Average strike	N14°W
Sense of movement	Thrust *Comments:* Dip-slip offset is depicted in seismic reflection profiles; strike-slip offset, if any, is not resolvable with available data (McCrory and others, 2002 #5864). These faults are inferred to be, at least in part, reverse faults based on their apparent dip-slip offsets and their association with offshore anticlines or with thrust and reverse faults mapped onshore. However, the tectonic setting of this region suggests that these faults might also have components of strike-slip. The actual fault planes of these offshore faults cannot be resolved with available seismic reflection data.
Dip Direction	NE; SW *Comments:* Two strands of this fault set show down-to-the-west, vertical displacement of seismic stratigraphic reflectors (Plates 1A and 2H in McCrory and others, 2002 #5864); a short southern strand shows down-to-the-northeast displacement (McNeill and others, 1998 #4089). The western strand has no offset specified (McCrory and others, 2002 #5864). These offshore fault strands are inferred to be, at least in part, reverse faults that dip to the west and northeast, respectively, perhaps at moderate to steep angles if these faults also have components of strike-slip. The vertical exaggeration of seismic reflection data, however, precludes accurate determination of fault dip (all strands with dips >30? appear to have vertical dips).
Paleoseismology studies	
Geomorphic expression	
Age of faulted surficial deposits	Seafloor deposits are not faulted.
Historic earthquake	

Most recent prehistoric deformation	late Quaternary (<130 ka) *Comments:* McNeill and others (1998 #4089) suggest a Holocene age for faults of this fault set based on seafloor evidence for fluid venting in the vicinity of the short eastern strand at south end of fault set. However, the submersible dive provided no evidence for seafloor offset along this strand, and the profile presented in McNeill and others (1998 #4089) does not depict disruption of the shallowest strata. McCrory and others (2002 #5864) assign a late Quaternary age (<150 ka) to the short western strand at south end of fault set based on 8 m vertical offset of a buried erosional unconformity inferred to have been cut between 150 and 20 ka. The long central strand is also late Quaternary; the western strand is Quaternary (<1.8 Ma). Quaternary fault activity is possible, but not documented for short eastern strand at south end of fault set (McCrory and others, 2002 #5864) based on available seismic reflection profiles. Herein these strands are also assigned, respectively, to late Quaternary, Quaternary, and Quaternary(?) age categories. However, the upper age limits of these categories as shown herein are younger than 130 ka, 1.6 Ma, and 1.6 Ma(?), respectively.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* If erosional surface is approximately 140 ka, then vertical displacement rate for the short western strand at south end of fault set is 0.06 mm/yr (McCrory and others, 2002 #5864), within slip category less than 0.2 mm/yr; an approximately 130 ka age for the surface would also yield a similar slip rate.
Date and Compiler(s)	2003 Patricia A. McCrory, U.S. Geological Survey
References	#6303 Cross, V.A., Twichell, D.C., Parolski, K.F., and Harrison, S.E., 1998, Archive of boomer seismic-reflection data collected aboard RV CORLISS cruise CRLS97007 off Northern Oregon and Southern Washington inner continental shelf: U.S. Geological Survey Open-File Report 98-351, 2 CD-ROM set. #6304 Mazzotti, S., Dragert, H., Hyndman, R.D., Miller, M.M., and Henton, J.A., 2002, GPS deformation in a region of high crustal seismicity—N. Cascadia forearc: Earth and Planetary

	Science Letters, v. 198, p. 41-48. #5864 McCrory, P.A., Foster, D.S., Danforth, W.W., and Hamer, M.R., 2002, Crustal deformation at the leading edge of the Oregon Coast Range block, offshore Washington (Columbia River to Hoh River): U.S. Geological Survey Professional Paper 1661-A, 47 p., 2 pls. #4089 McNeill, L.C., Goldfinger, C., Yeats, R.S., and Kulm, L.D., 1998, The effects of upper pl. deformation on records of prehistoric Cascadia subduction zone earthquakes, *in* Stewart, I.S., and Vita-Finzi, C., eds., Coastal tectonics: Geological Society Special Publication No. 146, p. 321-342. #6305 Wolf, S.C., Hamer, M.R., and McCrory, P.A., 1997, Quaternary geologic investigations on the inner shelf offshore northern Oregon-southern Washington: U.S. Geological Survey Open-File Report 97-677, 4 sheets, scale 1:500,000.