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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.

Kilauea Volcano, Kilauea's caldera (Class B) No. 2608a

Last Review Date: 2006-09-16

citation for this record: **Cannon, E.C., and Burgmann, R., compilers, 2006, Fault number 2608a, Kilauea Volcano, Kilauea's caldera, 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 02:54 PM.**

Synopsis	**General:** Kilauea Volcano is the youngest subaerial volcano in Hawai'i. Kilauea's extensional structures include Kilauea's caldera [2608a], the east rift zone [2608b], and the southwest rift zone [2608c]. Two additional fault systems are located to the southeast of Kilauea's caldera: the Koa'e fault system [2609], and the Hilina fault system [2610]. The Koa'e and Hilina fault systems are assigned their own fault numbers rather than grouping these faults into a single extensional feature for Kilauea. Another categorization scheme by Delaney and others (1998 #6939) subdivides Kilauea Volcano into four geographic regions: (1) western south flank and lower southwest rift zone, (2) summit and upper rift zones, (3) middle east rift zone, and (4) central and eastern south flank. Along the coast and offshore of Kilauea's south flank to the southeast, the Hilina fault system [2610] may define the headscarps to the submarine Hilina slump and

	subsequent Papa'u sand-rubble flow (see Moore and others, 1989 #6961; Moore and Chadwick, 1995 #6959). **Sections:** This fault has 3 sections. The sections designated for Kilauea Volcano are Kilauea's caldera [2608a], the east rift zone [2608b], and the southwest rift zone [2608c].
Name comments	**General:** Neal and Lockwood (2003 #6966) present a 1:24,000-scale geologic map of the Kilauea summit region. Kilauea Volcano is also located on sheets 2 and 3 of 3 of the 1:100,000-scale geologic map compiled by Wolfe and Morris (1996 #6977), available in digital format from Trusdell and others (2006 #6976).
County(s) and State(s)	HAWAII COUNTY, HAWAII
Physiographic province(s)	HAWAIIAN-EMPEROR ISLAND-SEAMOUNT CHAIN
Reliability of location	Good Compiled at 1:24,000 scale. *Comments:* Location of fault based on 1:24,000-scale geologic mapping of surficial and concealed faults by Dutton and others (2007 #7948); features shown as cracks are omitted form this compilation.
Geologic setting	Kilauea Volcano is an active shield-stage volcano (Wolfe and Morris, 1996 #6977) situated on the southeast flank of older Mauna Loa Volcano [2605].
Length (km)	This section is 7 km of a total fault length of 76 km.
Average strike	N. 51° E. (for section) versus N. 51 E. (for whole fault)
Sense of movement	Normal *Comments:* Neal and Lockwood (2003 #6966) show surficial and concealed normal faults located around and crossing Kilauea's caldera.
Dip	 *Comments:* Faults dip in various directions due to variable strike of caldera-concentric faults (Neal and Lockwood, 2003 #6966).

Paleoseismology studies	
Geomorphic expression	Kilauea's caldera is approximately 7 km long in the east-west direction by 5 km wide in the north-south direction at the summit of Kilauea Volcano. The major craters contained within this region include Kilauea Crater, Halema'uma'u Crater, Kilauea Iki Crater, and Keanakako'i Crater. The maximum relief of Kilauea's caldera is approximately 210 m (about 700 feet). Many of the steep walls of Kilauea's caldera are interpreted as concealed normal faults (Neal and Lockwood, 2003 #6966). Additionally, several concealed and some surficial caldera-concentric normal faults are located distally away from the crater rims (Neal and Lockwood, 2003 #6966).
Age of faulted surficial deposits	Neal and Lockwood (2003 #6966) state that most caldera-concentric faults are buried or draped by lava flows dating from 1790 and younger, or by the 1790 Keanakako'i Ash Member. Pre-1790 basalts exposed at the surface range in age from around 200 yr B.P. to possibly 3,000 yr B.P. Additional resources for lava flow ages include Holcomb (1987 #6944) and Wolfe and Morris (1996 #6977).
Historic earthquake	Ka'u earthquake 1868
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* With most of the caldera-concentric faults buried or draped by lava flows (dating from 1790 and younger) or by the 1790 Keanakako'i Ash Member, Neal and Lockwood (2003 #6966) attribute caldera-concentric normal faulting to caldera collapse sometime between approximately 200 and 500 years ago. The present caldera formed in approximately 1490 with evidence of at least 500 m of vertical displacement (D.A. Swanson, written commun., 2005). Induced ground shaking caused by the November 16, 1983, ML6.6 Ka'oiki earthquake produced ground failures on steep slopes and movement on preexisting fractures (Buchanan-Banks, 1987 #6933; Wyss and Koyanagi, 1992 #6981), but did not produce faulting on the caldera-concentric faults.
Recurrence interval	
Slip-rate	Greater than 5.0 mm/yr

category	*Comments:* While the caldera-concentric faults have remained inactive over approximately the last 200-500 yr, modern geodetic baselines recording extension and contraction adjacent to and within Kilauea's caldera show deformation that results from magma reservoir inflation and deflation as well as seaward displacement of Kilauea's south flank. For example, benchmark HVO34 located in the southwestern part of Kilauea's caldera had approximately 2 m of uplift over the time period from 1965 to the 1975 Kalapana earthquake. After the earthquake, HVO34 displayed subsidence at approximately 8 cm/yr through 1996 (Delaney and others, 1998 #6939). See Delaney and others (1998 #6939) for a discussion of deformation and deformation rates for Kilauea Volcano from 1976-1996. The estimated slip rate of greater than 5 mm/yr for caldera-concentric faults is based on modern geodetic baseline deformation rates.
Date and Compiler(s)	2006 Eric C. Cannon, none Roland Burgmann, University of California at Berkeley
References	#6933 Buchanan-Banks, J.M., 1987, Structural damage and ground failures from the November 16, 1983, Kaoiki earthquake, Island of Hawaii, *in* Decker, R.W., Wright, T.L., and Stauffer, P.H., eds., Volcanism in Hawaii: U.S. Geological Survey Professional Paper 1350, v. 2, p. 1187-1220. #6939 Delaney, P.T., Denlinger, R.P., Lisowski, M., Miklius, A., Okubo, P.G., Okamura, A.T., and Sako, M.K., 1998, Volcanic spreading at Kilauea, 1976-1996: Journal of Geophysical Research, v. 103, no. B8, p. 18,003-18,023. #7948 Dutton, D.R., Ramsey, D.W., Bruggman, P.E., Felger, T.J., Lougee, E., Margriter, S., Showalter, P., Neal, C.A., and Lockwood, J.P., 2007, Database for the geologic map of the summit region of Kilauea Volcano, Hawaii: U.S. Geological Survey Data Series 293, http://pubs.usgs.gov/ds/2007/293/. #6944 Holcomb, R.T., 1987, Eruptive history and long-term behavior of Kilauea Volcano, *in* Decker, R.W., Wright, T.L., and Stauffer, P.H., eds. Volcanism in Hawaii: U.S. Geological Survey Professional Paper 1350, v. 1, p. 261-350. #6959 Moore, J.G., and Chadwick, W.W., Jr., 1995, Offshore geology of Mauna Loa and adjacent areas, Hawaii in Rhodes,

	J.M., and Lockwood, J.P., eds., Mauna Loa revealed-Structure, composition, history, and hazards: American Geophysical Union Geophysical Monograph, v. 92, p. 21-44. #6961 Moore, J.G., Clague, D.A., Holcomb, R.T., Lipman, P.W., Normark, W.R., Torresan, M.E., 1989, Prodigious submarine landslides on the Hawaiian Ridge: Journal of Geophysical Research, v. 94, no. B12, p. 17,465-17,484. #6966 Neal, C.A. and Lockwood, J.P., 2003, Geologic map of the summit region of Kilauea Volcano, Hawaii: U.S. Geological Survey Geologic Investigations Series I-2759, 14 p., 1 sheet, scale 1:24,000. #6976 Trusdell, F.A., Wolfe, E.W., and Morris, J., 2006, Digital database of the geologic map of the island of Hawai'i: U.S. Geological Survey Data Series 144 supplement to Miscellaneous Investigations Series Map I-2524-A, 18 p, 1 sheet, scale 1:100,000. #6977 Wolfe, E.W., and Morris, J., 1996, Geologic map of the island of Hawaii: U.S. Geological Survey Miscellaneous Investigations Series Map I-2524-A, 18 p., 3 sheets, scale 1:100,000. #6981 Wyss, M., and Koyanagi, R.Y., 1992, Isoseismal maps, macroseismic epicenters, and estimated magnitudes of historic earthquakes in the Hawaiian Islands: U.S. Geological Survey Bulletin 2006, 93 p.