

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](#).

Mauna Loa Volcano, southwest rift zone (Class B) No. 2605c

Last Review Date: 2006-09-16

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Synopsis

General: Mauna Loa last erupted in 1984 and is swelling toward its next eruption (D.A. Swanson, written commun., 2005). Faults associated with Mauna Loa include the Kealakekua fault system [2603], Kahuku fault system [2604], Moku'aweoweo caldera [2605a], northeast rift zone of Mauna Loa [2605b], southwest rift zone of Mauna Loa [2605c], the Ka'oiki seismic zone [2606], and the Ka'oiki-Honu'apo fault system [2607]. The Kealakekua and Kahuku fault systems, the Ka'oiki seismic zone, and the Ka'Miki-Honu'apo fault systems are described separately. In addition, several historic eruptions have occurred on Mauna Loa's flanks from radial vents oriented radially to the summit (Trusdell, 1995 #6975). The radial vents represent rock-breaking events and their broad distribution on Mauna Loa is not confined to rift zone locations. Plate 1 shows the radial vents based on Wolfe and Morris (1996 #6977). Refer to Trusdell (1995 #6975) for

	<p>additional information on volcanic hazards associated with radial vents.</p> <p>Sections: This fault has 3 sections. The sections designated for Mauna Loa Volcano include Moku'aweoweo caldera [2605a], the northeast rift zone [2605b], and the southwest rift zone [2605c].</p>
Name comments	<p>General: Mona Loa Volcano is located on sheets 1-3 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).</p> <p>Section: The southwest rift zone is located on sheet 3 of 3 of the 1:100,000-scale geologic map compiled by Wolfe and Morris (1996 #6977).</p>
County(s) and State(s)	HAWAII COUNTY, HAWAII
Physiographic province(s)	HAWAIIAN-EMPEROR ISLAND-SEAMOUNT CHAIN
Reliability of location	<p>Good Compiled at 1:100,000 scale.</p> <p><i>Comments:</i> Based on the 1:100,000-scale geologic map compiled by Wolfe and Morris (1996 #6977). Location of fault generalized from Trusdell and others (2006 #6976).</p>
Geologic setting	<p>Mauna Loa is an active shield-stage volcano (Wolfe and Morris, 1996 #6977). The most recent eruption occurred in 1984. Surficial volcanic rocks on Mauna Loa include the Holocene and Pleistocene Ka'u Basalt (historic eruptions to 10-31 ka), and the Pleistocene Kahuku (>31 ka) and Ninole (100-300 ka) Basalts (see Wolfe and Morris, 1996 #6977). For a detailed history of Holocene eruptions on Mauna Loa, see Lockwood and Lipman (1987 #6955). Observations from geodetic networks on Mauna Loa show deformation related to inflation and deflation of the magma reservoir, and southeast motion of the southeast flank (Miklius and others, 1995 #6957). The deep canyons of the Ninole Hills located on the southeast flank may result from rapid incision into headwall landslide scarps related to movement offshore of the Punalu'u slump (Lipman and others, 1990 #6954; Moore and Chadwick, 1995 #6959).</p>

Length (km)	This section is 39 km of a total fault length of 59 km.
Average strike	N. 30° E. (for section) versus N. 33° E. (for whole fault)
Sense of movement	Normal <i>Comments:</i> Unknown, presumably normal due to extension.
Dip Direction	NW; SE; W; E <i>Comments:</i> Unknown, presumably near vertical to vertical.
Paleoseismology studies	
Geomorphic expression	The southwest rift zone forms a linear topographic high that separates the southeastern and northwestern flanks of Mauna Loa. On the southwestern flank of Mauna Loa, the southwest rift zone trends south and then shifts approximately 5 km east to the northern end of the Kahuku fault system [2604]. The distal end of the southwest rift zone and the Kahuku fault system are located at Ka Lae (South Point). Garcia and others (1995 #6986) interpret the southwest rift zone axis as located 2-3 km west of the submarine ridge.
Age of faulted surficial deposits	The majority of the southwest rift zone is in historic lava flows dating from as early as 1868. The most recent faulted lava flows are from the 1950 eruption. The oldest lava flows with fissure vents identified by Wolfe and Morris (1996 #6977) are 1.5-3.0 ka
Historic earthquake	Ka'u earthquake 1868
Most recent prehistoric deformation	latest Quaternary (<15 ka) <i>Comments:</i> Several historic eruptions (1868-1984) and lava flows show fracturing and faulting.
Recurrence interval	
Slip-rate category	Greater than 5.0 mm/yr <i>Comments:</i> Miklius and others (1995 #6957) report southeast flank motion of 2-4 cm/yr and greater horizontal motion away from a summit station, based on global positioning system (GPS)

	surveys carried out between 1993 and 1994-1995. While the GPS network did not extend to the distal part of the southwest rift zone, the observed deformation rates are used to estimate the greater than 5 mm/yr slip rate for the southwest rift zone.
Date and Compiler(s)	2006 Eric C. Cannon, none Roland Burgmann, University of California at Berkeley
References	<p>#6986 Garcia, M.O., Hulsebosch, T.P., and Rhodes, J.M., 1995, Olivine-rich submarine basalts from the southwest rift zone of Mauna Loa Volcano—Implications for magmatic processes and geochemical evolution, <i>in</i> Rhodes, J.M., and Lockwood, J.P., eds., Mauna Loa revealed—Structure, composition, history, and hazards: American Geophysical Union Geophysical Monograph, v. 92, p. 219-239</p> <p>#6954 Lipman, P.W., Rhodes, J.M., and Dalrymple, G.B., 1990, The Ninole Basalt—Implications for the structural evolution of Mauna Loa Volcano, Hawaii: <i>Bulletin of Volcanology</i>, v. 53, no. 1, p. 1-19.</p> <p>#6955 Lockwood, J.P., and Lipman, P.W., 1987, Holocene eruptive history of Mauna Loa Volcano, <i>in</i> Decker, R.W., Wright, T.L., and Stauffer, P.H., eds., <i>Volcanism in Hawaii: U.S. Geological Survey Professional Paper 1350</i>, v. 1, p. 509-535.</p> <p>#6957 Miklius, A., Lisowski, M., Delaney, P.T., Denlinger, R.P., Dvorak, J.J., Okamura, R.T., and Sako, M.K., 1995, Recent inflation and flank movement of Mauna Loa Volcano, <i>in</i> Rhodes, J.M., and Lockwood, J.P., eds., Mauna Loa revealed. Structure, composition, history, and hazards: American Geophysical Union Geophysical Monograph, v. 92, p. 199-205.</p> <p>#6959 Moore, J.G., and Chadwick, W.W., Jr., 1995, Offshore geology of Mauna Loa and adjacent areas, Hawaii <i>in</i> 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.</p> <p>#6975 Trusdell, F.A., 1995, Lava flow hazards and risk assessment on Mauna Loa Volcano, Hawaii, <i>in</i> Rhodes, J.M., and Lockwood, J.P., eds., Mauna Loa revealed. Structure, composition, history, and hazards: American Geophysical Union Geophysical Monograph, v. 92, p. 327-336.</p>

#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.

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