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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.

Compton thrust fault (Class A) No. 133

Last Review Date: 2017-07-01

citation for this record: **Fisher, M.A., and Bryant, W.A., compilers, 2017, Fault number 133, Compton thrust fault, 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 02:15 PM.**

Synopsis	The Compton thrust fault (blind) extends below the western Los Angeles Basin, lying entirely within Mesozoic metamorphic basement (Catalina Schist) (Shaw and Suppe, 1996). Most of the thrust fault is a ramp that rises to the southwest from depths as great as 10 km up to 5 km. The ramp connects the Central Basin Decollement, a thrust flat below the Los Angeles Basin, with shallower parts of the thrust fault near its tip below the Palos Verdes Peninsula. Leon and others (2009) identified 6 events in the past 14 ka, established event dates, and estimated a thrust fault slip rate of 1.2+0.5, -0.3 mm/yr.
Name comments	Variously referred to as the Compton Thrust, Compton ramp, Compton thrust ramp, and Compton thrust system by Shaw and Suppe (1996). Also referred to as the Compton-Los Alamitos trend in reference to the growth fold above the Compton ramp.
County(s) and	

County(s) and State(s)	LOS ANGELES COUNTY, CALIFORNIA
Physiographic province(s)	PACIFIC BORDER
Reliability of location	Compiled at 1: 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) based on geometric representation of Compton Thrust Fault ramp is from Community Fault Model (Plesch and others 2007).
Geologic setting	The Compton thrust fault is one several blind thrust faults that pose an earthquake hazard to urban Los Angeles. Miocene through Quaternary sedimentary rocks within the Los Angeles Basin and the upper part of their Mesozoic basement are transported upward and southwestward along the Compton thrust fault.
Length (km)	km.
Average strike	
Sense of movement	Thrust
Dip	0–28° NE. *Comments:* Fault is flat lying beneath offshore and coastal areas and dips 22˚ NE. east of the coastal zone (Shaw and Suppe, 1996; Leon and others 2009).
Paleoseismology studies	Site 133-1 – Stanford Avenue site by Leon and others (2009) involved the interpretation of high resolution seismic reflection lines and the excavation of ten 25–35 m deep, continuously cored boreholes along Stanford Avenue, Los Angeles. Leon and others (2009) identified as many as 6 discrete fold scarps associated with displacement along the Compton thrust fault ramp, and estimated a slip rate (thrust) of 1.2+0.5, -0.3 mm/yr.
Geomorphic expression	
Age of faulted	The fault does not extend to the ground surface, but Quaternary

surficial deposits	sediment apparently is flexed upward in the kink band associated with the Compton thrust ramp, indicating Quaternary activity (Shaw and Suppe, 1996). Leon and others (2009) identified Holocene fluvial deposits deformed within back-limb fold structure during uplift events associated with displacement along the Compton thrust fault ramp. Ages, based on calibrated radiocarbon dates from 30 humic, charcoal, and bulk soil samples indicate sediment accumulation over the past 14 ka.
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Possibly inactive during the late Quaternary (since about 1.5 Ma, Foxall, 1997); however, the Palos Verdes fault [128] is kinematically related to the Compton thrust fault and the Holocene activity along the Palos Verdes fault could suggest the underlying Compton thrust fault was active in the Holocene as well.
Recurrence interval	Leon and others (2009) identified six paleoseismic events at the Stanford Avenue [133-1] site: Event 1: 0.7–1.75 ka Event 2: 1.9–3.4 ka Event 3: 5.6–7.2 ka Event 4: 5.4–8.4 ka Event 5: 10.3–12.5 ka Event 6: 10.3–13.7 ka
Slip-rate category	Between 0.2 and 1.0 mm/yr *Comments:* Shaw and Suppe (1996) estimated long term slip rate of 1.4±0.4 mm/yr. Leon and others (2009) calculated average Holocene (past 14 ka) slip rate of 1.2+0.5/-0.3 mm/yr using cumulative thrust displacement of 16.9+7.5/-6.9 m derived from dip of 28±3° dip of Compton thrust fault ramp.
Date and Compiler(s)	2017 Michael A. Fisher, U.S. Geological Survey William A. Bryant, California Geological Survey
References	#8409 Foxall, W., 1997, Uncertainty in earthquake source characteristics for the Los Angeles Basin: http://www.scec.org/research/97research/97foxall.html. #8406 Leon, L.A., Dolan, J.F., Shaw, J.H., and Pratt, T.L., 2009, Evidence for large Holocene earthquakes on the Compton thrust fault, Los Angeles, California: Journal of Geophysical Research, v. 114, no. B12305, doi:10.1029/2008JB006129.

	#8407 Plesch, A., Shaw, J.H., Benson, C., Bryant, W.A., Carena, S., Cooke, M., Dolan, J., Fuis, G., Gath, E., Grant, L., Hauksson, E., Jordan, T., Kamerling, M., Legg, M., Lindvall, S., Magistrale, H., Nicholson, C., Niemi, N., Oskin, M., Perry, S., Planansky, G., Rockwell, T., Shearer, P., Sorlien, C., Süss, M.P., Suppe, J., Treiman, J., and Yeats, R., 2007, Community Fault Model (CFM) for southern California: Bulletin of the Seismological Society of America, v. 97, p. 1793–1802. #8408 Shaw, J., and Suppe, J., 1996, Earthquake hazards of active blind-thrust faults under the central Los Angeles basin, California: Journal Geophysical Research, v. 101, p. 8623–8642.