

# 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](#).

## Furnace Creek fault zone (Class A) No. 144

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### Compiled in cooperation with the California Geological Survey

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#### Synopsis

The Furnace Creek fault zone extends from near Salt Springs at the southern end of the Northern Death Valley fault zone [141]) southeast along the eastern margin of Park Village Ridge to and along the Funeral Mountains, where it forms the southwestern margin of the range. The fault juxtaposes Funeral Formation gravels (late Pliocene to Quaternary) against sedimentary rocks of the Furnace Creek and older Tertiary formations. The fault zone generally controls the upper reach of Furnace Creek Wash where it is entrenched into late Tertiary and Quaternary sediment. At several locations along the fault's trace, middle(?) to early Pleistocene (>700 ka) surfaces are undeformed. Evidence for Quaternary movement on the fault is sparse and discontinuous in

this region, but the most southeastward evidence for Quaternary surface ruptures (scarps) is about 5 km east of the Death Valley/Amargosa Valley drainage, north of U.S. Highway 190 along the piedmont on the south face of the Funeral Mountains. No detailed studies have been made of the fault zones Quaternary history, nor have the reported scarps been studied from a morphometric perspective. The most recent movement is considered to be Quaternary (probably early), and the slip rate is inferred to be <0.2 mm/yr based on the general lack of young fault traces.

**Name  
comments**

The Furnace Creek fault zone is used in a restricted sense here, following the suggestions of Machette and others (2001 #4773). The main problem with previous usage of the name is that it has been used in conjunction with the Northern Death Valley fault zone [141], which is clearly active. The Furnace Creek fault zone (as used herein) has limited evidence of Quaternary activity, and thus no longer appears to be an integral part of the main Death Valley fault system, which includes the Fish Springs [49], Northern Death Valley fault zone [141], Black Mountains fault zone [142], and Southern Death Valley fault zone [143]. Noble and Wright (1954 #1536) first used the name Furnace Creek fault zone for this structure, as did, Hunt and Mabey (1966 #1551) for this fault and its northwestward extension (the Northern Death Valley fault zone [141]). Wright and Troxel (1967 #1698) included it as part of their Death Valley-Furnace Creek fault zone as did Stewart and others (1967 #1652), Reynolds (1969 #1613), Wright and Troxel (1970 #1699). Jennings (1992 #473) used the name Northern Death Valley-Furnace Creek fault zone for the main range-bounding faults (north of Furnace Creek) in Death Valley, but restricted the name "Furnace Creek" to the fault zone that bounds the Funeral Mountains and extends southeast along the upper part of Furnace Creek Wash. As used herein and by Machette and others (2001 #4773), the Furnace Creek fault zone extends from near Salt Springs (which is the southern end of the Northern Death Valley fault zone [141]) southeast along the eastern margin of Park Village Ridge (Hunt and Mabey, 1966 #1551) to and along the southwestern margin of the Funeral Mountains. The fault zone generally controls the upper reach of Furnace Creek Wash (its namesake), which is entrenched into late Tertiary and Quaternary sediment. Evidence for Quaternary movement on the fault is sparse and discontinuous in this region, but Reheis and Noller [, 1991 #1195] show the most southeastward evidence for Quaternary surface ruptures to be

about 5 km east of the drainage divide between Death Valley and Amargosa Valley (and National Park boundary), north of U.S. Highway 190 along the piedmont on the south face of the Funeral Mountains. In terms of pre-Quaternary extent of the Furnace Creek fault zone, Wright and Troxel (p. 947 1967 #1698) extended it southeastward across the Amargosa Desert where they suggested that it may connect with a northwest-striking fault that extends into the Resting Spring Range or that it may splay to the south into normal faults in the Amargosa Valley (part of the Ash Meadows fault zone [1077] of this compilation) and terminate against the northwest-striking Sheephead fault (not shown herein). Noble and Wright (pl. 7, 1954 #1536), Cemen and others (p. 128, 1985 #1478), and Stewart (1983 #1653) also extended the Furnace Creek fault zone to the southeast into the Amargosa Valley.

**Fault ID:** Refers to the southeastern part of fault 211 of Jennings (1992 #473) and fault FC of Piety (1995 #915).

<b>County(s) and State(s)</b>	INYO COUNTY, CALIFORNIA
<b>Physiographic province(s)</b>	BASIN AND RANGE
<b>Reliability of location</b>	<p>Good Compiled at 1:100,000 scale.</p> <p><i>Comments:</i> The fault zone has been mapped primarily on bedrock maps that include the east-central part of Death Valley or the Funeral Mountains. Maps that show an interest in or emphasis on the Quaternary faulting include Wright and Troxel (1993 #1701) and Brogan and others (1991 #298) at 1:62,500 scale, Hunt and Mabey (1966 #1551) at 1:96,000 scale, Reheis and Noller [, 1991 #1195] at 1:100,000 scale, and Piety (1995 #915) at 1:250,000 scale. The traces used herein come from Reheis and Noller [, 1991 #1195], with modifications from Wright and Troxel (1993 #1701) north of 36° 30' N.</p>
<b>Geologic setting</b>	<p>This Death Valley fault system is comprised of major strike-slip fault zones on the north and south, and an intervening (linking) primarily normal-slip fault zone. The fault system forms the strongly uplifted eastern margin of Death Valley and the western margin of Fish Lake Valley; it marks a highly extended portion of the western Basin and Range Province. The Northern Death</p>

Valley fault zone [141] forms the western margin of the Grapevine Mountains, and the Furnace Creek fault zone, which forms the western margin of the Funeral Mountains [144], is its older extension to the southeast. Structural studies by Stewart (1983 #1653) and Wernicke and others (1988 #1686) reported >80 km of northwestward extension across Death Valley, and proposed that much of the adjacent Panamint Range to the west has moved to its present location from atop the Black Mountains since late Miocene time. Likewise, the Grapevine Mountains are considered to be the upper plate of a detachment that moved northwest off of the Funeral Mountains [Hamilton, 1988 #593]. In the late Cenozoic, the Northern Death Valley and Furnace Creek fault zones together formed a nearly continuous, linear feature that appeared to have been one of the major lateral-slip zones that accommodated northwest extension in the region. However, the Furnace Creek fault zone [144] appears to have become much less active in the Quaternary owing to evolving structural integration of the Northern Death Valley [141] and Black Mountains fault zones [142] through an intervening fault transition zone [142a]. The northern part of the Furnace Creek fault zone bisects and uplifts Tertiary basin-fill deposits that occupied a structural basin in the Miocene and Pliocene, whereas the central and southern part of the fault zone forms the strongly uplifted southwestern margin of the Paleozoic- and Precambrian-cored Funeral Mountains.

Although many geologists have projected the southern part of the Furnace Creek fault zone southeastward into the Amargosa Valley, McAllister (1970 #1572) suggested that fault zone may curve southward adjacent to Furnace Creek Wash about 10 km southeast of Furnace Creek Wash and merge into the Cross Valley fault [183], an active southwest-striking fault that crosses Furnace Creek Wash. (McAllister, 1970 #1572) speculated that the Cross Valley fault might connect the Furnace Creek fault zone to the northwest-striking (pre-Quaternary) Grand View fault along the southwest side of the upper part of the late Tertiary Furnace Creek basin.

<b>Length (km)</b>	39 km.
<b>Average strike</b>	N50°W
<b>Sense of movement</b>	Right lateral <i>Comments:</i> Most of the evidence cited for right-lateral (dextral)

displacement on the Furnace Creek fault zone comes from the Northern Death Valley fault zone, which has often been included. Virtually no measurements of Quaternary dextral or normal offset have been recorded on the Furnace Creek fault zone, probably owing to a dearth of activity. Right-lateral displacement has been recognized on the Furnace Creek fault zone by McKee (1968 #1574), Wright and Troxel (1970 #1699), Stewart (1967 #1652), Cemen and others (1985 #1478), Oakes (1987 #1594), and Snow (1988 #1648). Estimates of cumulative right-lateral displacements on the fault zone range between 24 km and 128 km, based on a variety of stratigraphic and structural markers, as summarized by Piety (1995 #915) and discussed in order of decreasing unit age. Many of the displacements range from 40-80 km and are based on offset on a variety of stratigraphic and structural markers in Precambrian to Paleozoic rocks. Cemen and others (1985 #1478) noted that the clast composition of the Pliocene Furnace Creek Formation as observed by McAllister (1970 #1572) suggests that in addition to dextral movement, vertical displacement has occurred on the fault zone along Furnace Creek Wash southeast of the Furnace Creek Inn.

**Dip**

45° to 70° SW

*Comments:* Commonly assumed to be nearly vertical based on its predominant dextral sense of slip. However, dip measurements of 45° to 70° are shown by Wright and Troxel (1993 #1701) and McAllister (1970 #1572) on their geologic maps of the northern part of the fault zone (the non range-bounding portion).

**Paleoseismology studies**

**Geomorphic expression**

Most of the mapped traces of the fault zone are show as either range-bounding fault escarpments (as along the Funeral Mountains) or as normal or reverse fault line escarpments where sedimentary rocks of differing resistance are juxtaposed (as in Park Village Ridge and the Three Bare Hills area, at the northern end of the fault zone). Reheis and Noller [, 1991 #1195] and Piety (1995 #915). show scattered discontinuous scarps along the southeastern portion of the fault zone, but there have been no detailed studies of these scarps. Aerial photo analysis of the fault zone along the front of the Funeral Mountains by Klinger and Piety (1996 #3873) showed no bona fide scarps on alluvial surfaces, thus they precluded late Quaternary movement on this

	portion of the fault zone.
<b>Age of faulted surficial deposits</b>	The main mapped portion of the fault zone (along the front of the Funeral Mountains) juxtaposes Funeral Formation gravels (late Pliocene to Quaternary) against sedimentary rocks of the Furnace Creek and older Tertiary formations (McAllister, 1970 #1572). Highly dissected alluvial surfaces and their associated deposits near Navel Spring are not displaced by any of the faults in this zone according to McAllister (1970 #1572). Klinger and Piety (1996 #3873) estimated an early Quaternary (>700 ka) age for this surface.
<b>Historic earthquake</b>	
<b>Most recent prehistoric deformation</b>	undifferentiated Quaternary (<1.6 Ma)  <i>Comments:</i> The map by Jennings (1992 #473) shows most of his Furnace Creek fault zone (our Northern Death Valley fault zone [141]) in Death Valley as Holocene (<10 ka). However, the part of Furnace Creek fault zone along Furnace Creek Wash is portrayed by Jennings (1992 #473) as either undifferentiated Quaternary (defined by him as <1.6 Ma) or as concealed (e.g., the portion of the fault zone east of Ryan, California). Klinger and Piety (1996 #3873) found no bona fide scarps on alluvial surfaces, thus they precluded late Quaternary movement on this portion of the fault zone. Highly dissected alluvial surfaces and their associated deposits of early(?) Quaternary age near Navel Spring are not displaced by any of the faults in this zone according to McAllister (1970 #1572). Thus, it appears that there is no evidence of late Quaternary movement along the fault zone, and only sketchy suggestions (i.e., reported scarps near the south end) of Quaternary movement along the fault zone. This observation was one of the reasons Machette and others separated the Furnace Creek fault zone from the active portion of the Death Valley fault system.
<b>Recurrence interval</b>	
<b>Slip-rate category</b>	Less than 0.2 mm/yr  <i>Comments:</i> Most of the evidence cited for Quaternary right-lateral (dextral) displacement on the "Furnace Creek fault zone" comes from the Northern Death Valley fault zone [141] according to our

nomenclature. Virtually no measurements of the amount of Quaternary dextral or normal offset have been recorded on the Furnace Creek fault zone, probably owing to a dearth of activity. Since Klinger and Piety (1996 #3873) found no bona fide scarps on alluvial surfaces, they precluded late Quaternary movement on this portion of the fault zone. This observation leads us to infer a very slow (<0.2 mm/yr) slip rate for the fault zone.

**Date and Compiler(s)**

2002  
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