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Quaternary Fault and Fold Database of the United States

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Meers fault, northwestern section (Class A) No. 1031a

Last Review Date: 1994-03-03

citation for this record: **Crone, A.J., compiler, 1994, Fault number 1031a, Meers fault, northwestern section, 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 02:21 PM.**

Synopsis	**General:** Fault originally mapped in about the late 1930s, and scarp was considered to be an erosionally exhumed fault-line scarp. The scarp, formed on late Quaternary deposits, was first recognized by M. Charles Gilbert in the early 1980's during field studies of the igneous rocks exposed in the nearby Wichita Mountains (Gilbert, 1983 #671; 1983 #672). Paleoseismic studies of the fault indicate a temporal clustering of events in the late Quaternary. These studies have established the occurrence of two well-dated, late Holocene events, and a preceding event that occurred middle Pleistocene time or earlier. **Sections:** This fault has 2 sections. The two sections described here are based on the distinctly different surficial expression of the fault along each section. A conspicuous, continuous Holocene scarp is present along a 26-km-long section of the fault, but low-

	sun angle photography suggests that the Holocene rupture along this section may be as much as 37 km long (Ramelli and others, 1987 #668; Ramelli and Slemmons, 1990 #665). This 26- or possibly 37-km-long section is considered as section 1031b in this compilation. A poorly studied section is located northwest of section 1031b, and is referred to as section 1031a in this compilation. Knowledge and information on this northwesterly section is based solely on work by Cetin (1990 #658; 1992 #674). The actual length and details of the subsurface extent of the Meers fault are not well known, but subsurface (Harlton, 1951 #670; 1963 #667) and magnetic (Jones-Cecil and Crone, 1989 #663; Jones-Cecil, 1995 #673) data show that the fault extends for tens of kilometers to the northwest and southeast of the Quaternary scarp (section b). Other sections of the fault may exist at depth that are not expressed in Quaternary deposits.
Name comments	**General:** Originally named the Thomas fault by Harlton (1951 #670). It was renamed the Meers Valley fault on the 1954 version of the Oklahoma Geologic map (Harlton, 1963 #667), but subsequent common usage has shortened the name to the Meers fault. The sections of the fault discussed here extend from near Sugar Creek on the northwest to near Beef Creek (tributary of East Cache Creek) on the southeast. **Section:** Cetin (1990 #658; 1992 #674) discusses this section of the fault, but does not give it a name. This section is confined to Kiowa County and extends from near Sugar Creek on the northwest to the Comanche County line on the southeast. **Fault ID:** Decription of the Meers fault was originally assigned a Structure Number of 1020 in the compilation of Crone and Wheeler (2000 #4359), but subsequently, the Structure Number was changed to 1031.
County(s) and State(s)	COMANCHE COUNTY, OKLAHOMA KIOWA COUNTY, OKLAHOMA
Physiographic province(s)	CENTRAL LOWLAND
Reliability of location	Poor Compiled at 1:100,000 scale. *Comments:* Location based on 1:100,000-scale sketch map in Cetin (1992 #674). Cetin (1990 #658) contends that evidence exists that indicates Holocene surface deformation extends about

	30 km northwest of the northwestern end of the continuous scarp (1031b).
Geologic setting	The fault is one of at least four west- to northwest-trending faults that form the Frontal Wichita fault system (Harlton, 1951 #670; 1963 #667; 1972 #666), which is the boundary between the Paleozoic sedimentary rocks in the Anadarko basin to the northeast and the Cambrian intrusive and extrusive igneous rocks that comprise the Wichita Mountains to the southwest. Faults in the frontal fault system have a cumulative down-to-the-northeast throw of as much as 10 km. In contrast, the Quaternary scarp indicates a down-to-the-south-west sense of throw on the fault. Uncertain amounts of lateral slip have probably occurred on many faults in the frontal fault system; estimates range from a few kilometers to as much as 120 km. The location and trend of the fault system were probably controlled by zones of crustal weakness that developed during formation of the Southern Oklahoma aulacogen in latest Precambrian to Early Cambrian time.
Length (km)	This section is 18 km of a total fault length of 54 km.
Average strike	N67°W (for section) versus N°64W (for whole fault)
Sense of movement	Left lateral *Comments:* Exposures in stream cuts reveal down-to-the-southwest vertical offset. Lateral slip is inferred to be the same as that for the adjacent section of the fault to the southeast (1031b).
Dip	80° NE–60° SW *Comments:* Drill-hole and seismic-reflection data indicate that the faults in the frontal fault system dip at moderate angles (approximately 30°–40°) to the southwest at depth. The assigned dip value assumes that this section of the fault has a dip at depth that is similar to other major faults in the frontal fault system. In the exposures discussed by Cetin (1992 #674), the fault''s dip is probably near vertical based on his schematic maps, which show steep dips ranging from about 80° NE to about 60° SW.
Paleoseismology studies	Cetin (1992 #674) examined natural exposures along the banks of Saddle Mountain Creek, Longhorn Mountain Creek, and Sugar Creek and their tributaries for evidence of deformation and

	possible faulting. He mapped seven exposures in detail, but in the 1992 report, he only discussed three exposures, all of which are in Kiowa County: 1) a site on a branch of Saddle Mountain Creek (NE, SW, Sec. 30, T. 5 N., R. 14 W.), 2) on Longhorn Creek (NW, NE, Sec. 23, T. 5 N., R. 14 W.), and 3) on Sugar Creek (SW, NW, Sec 16, T. 5 N., R. 14 W.). At these sites, he reports folding in Paleozoic rocks that are commonly undeformed elsewhere, cracks in the rocks that are filled with Quaternary sediments, and overthickened A horizons on the downthrown side of the fault.
Geomorphic expression	There is no geomorphic expression.
Age of faulted surficial deposits	Possibly late Holocene (Cetin, 1990 #658).
Historic earthquake	
Most recent prehistoric deformation	undifferentiated Quaternary (<1.6 Ma) *Comments:* The only studies of this section of the fault are those of Cetin (1990 #658; 1992 #674) in which he cites buried organic soil horizons, displaced terrace deposits, deflected stream alignments, and buried fragments of soil A horizons in colluvium on the downthrown side of the fault as evidence of Holocene fault movement in this area. He indicates that the faulting is late Holocene in age because of radiocarbon ages of 1090 yr B.P. and 706 yr B.P. (apparently uncalibrated ages) on soil organics in stream exposures. It is difficult to confidently determine the stratigraphic relations between the dated samples and the inferred faulting. The absence of a conspicuous scarp along this section of the fault seems to be contrary to the inference of late Holocene faulting. Without further study, the evidence of late Holocene rupture on this section is suspect because relations between dated samples and stratigraphic units that are inferred to indicate faulting are unclear.
Recurrence interval	*Comments:* No individual earthquakes have been recognized, so no recurrence interval can be calculated.
Slip-rate category	Less than 0.2 mm/yr

	Comments: Little is known about the surface-faulting events on this section, but the long-term slip rate is probably much less that 1 mm/yr as inferred from the poor surface expression of the fault. The subdued geomorphic expression of the fault along this section argues that the late Quaternary slip rate on this section is lower than the rate on the southeastern section (1031b).
Date and Compiler(s)	1994 Anthony J. Crone, U.S. Geological Survey, Emeritus
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