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Quaternary Fault and Fold Database of the United States

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Wiggins uplift (Class B) No. 2660

Last Review Date: 1998-05-11

citation for this record: **Crone, A.J., compiler, 1998, Fault number 2660, Wiggins uplift, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, https://earthquakes.usgs.gov/hazards/qfaults, accessed 01/04/2021 10:24 AM.**

Synopsis	This feature is classified as a Class B feature solely because of results reported in studies by Burnett and Schumm. These studies offer the only evidence of possible Quaternary uplift of the feature but the data are only considered to be suggestive of Quaternary deformation and are not compelling. Burnett and Schumm base their conclusion of Quaternary uplift on evidence derived from fluvial geomorphology, and they report supporting evidence of uplift from geodetic surveys. If Quaternary deformation is occurring on the Wiggins uplift, then it is not clear if the deformation is truly tectonic or if it could be related to other nontectonic processes such as salt tectonics or differential subsidence. Therefore, this feature is assigned to Class B in this compilation. The inclusion of the Wiggins uplift in this compilation is based on geomorphic evidence of possible Quaternary uplift of the entire structure. This inferred uplift is not related to individual faults, so it is impossible to define and measure fault-specific parameters such as azimuth, length, and dip for the Wiggins uplift.

Name comments	The Wiggins uplift is also known as the Wiggins arch (Cagle and Kahn, 1983 #2819).
County(s) and State(s)	BALDWIN COUNTY, ALABAMA MOBILE COUNTY, ALABAMA FORREST COUNTY, MISSISSIPPI GEORGE COUNTY, MISSISSIPPI HANCOCK COUNTY, MISSISSIPPI HARRISON COUNTY, MISSISSIPPI JACKSON COUNTY, MISSISSIPPI LAMAR COUNTY, MISSISSIPPI MARION COUNTY, MISSISSIPPI PEARL RIVER COUNTY, MISSISSIPPI PERRY COUNTY, MISSISSIPPI STONE COUNTY, MISSISSIPPI WALTHALL COUNTY, MISSISSIPPI WASHINGTON COUNTY, LOUISIANA
Physiographic province(s)	COASTAL PLAIN
Reliability of location	Poor Compiled at 1:2,500,000 scale. *Comments:* The location of the Wiggins uplift is defined on the basis of subsurface data and is typically mapped by the absence of salt in extreme southeastern Louisiana and adjacent southwestern Mississippi (Cagle and Kahn, 1983 #2819; Ewing, 1991 #1994). This salt-free area is confined to the area of the Mobile 2? sheet. However, the outline of the Wiggins uplift shown by Burnett and Schumm (1983 #2815) and Schumm (1986 #2817) is located north of the salt-free area and lies within the limits of the Hattiesburg and Natchez sheets. The counties listed above are determined from the location of the Wiggins uplift as shown by Cagle and Kahn.
Geologic setting	The Wiggins uplift is a small feature centered in southern Mississippi and defined on the basis of subsurface data. It is a second-order structural feature (Ewing, 1991 #1994) located along the northern flank of the Gulf of Mexico basin. It is bounded on the north by the Mississippi Salt basin and on the south by the deep basin of the Coastal zone. The uplift is mainly defined by the absence of salt and some Upper Jurassic strata over the crest of the feature (Cagle and Kahn, 1983 #2819; Ewing,

	1991 #1994). The primary sources of information that suggest possible neotectonic uplift of the Wiggins uplift are reports by Burnett and Schumm (1983 #2815) and Schumm (1986 #2817). These reports briefly discuss fluvial geomorphic evidence that suggests contemporary uplift of the Wiggins uplift. The evidence includes changes in stream channel patterns and sinuosity across the uplift, and channel incision that has resulted in the formation of low terraces along Bogue Homo Creek. A gauging station on the Tallahala River provides evidence of as much as 12 mm/yr of incision since 1940, and longitudinal profiles of terraces and the valley floor along the Pearl River suggest deformation. As further support for their contention of modern uplift, they cite Brown and Oliver (1976 #2818), who indicate an uplift rate of about 4 mm/yr in the area of the uplift. However, Brown and Oliver note that the geodetic data they analyzed only detects relative motion and their data from the entire Coastal Plain of the eastern United States shows a pattern of tilting downward, away from the continental interior. Thus the apparent uplift could actually be the result of a more stable block beneath the uplift subsiding at a slower rate relative to the surrounding areas. Alternatively, the uplift could be the expression of a peripheral forebulge caused by sedimentation in the Mississippi River delta (Brown and Oliver, 1976 #2818). No additional studies have been conducted to confirm the conclusions of the geodetic or geomorphic investigations. Without additional confirmation, the Wiggins uplift is categorized as a Class B feature because it is located in a region of minimal historical seismicity and because the inferred deformation rates are anomalous for the geologic setting of the Gulf Coastal plain.
Length (km)	km.
Average strike	
Sense of movement	No data *Comments:* The exposed faults may be caused be either subsurface dissolution or tectonic faulting. The causal fault, if any, remains unknown and uncharacterized. No movement on specific faults is reported. The geomorphic evidence reported by Burnett and Schumm (1983 #2815) infers vertical uplift of the

	feature rather than movement on individual faults.
Dip	No data *Comments:* The exposed faults may be caused by either subsurface dissolution or tectonic faulting. The causal fault, if any, remains unknown and uncharacterized.
Paleoseismology studies	
Geomorphic expression	The Wiggins uplift does not have any conspicuous geomorphic expression, but Burnett and Schumm (1983 #2815) and Schumm (1986 #2817) describe fluvial geomorphic evidence used to infer Quaternary movement. They report changes in stream channel sinuosity and morphology, and channel incision resulting in the formation of terraces as evidence of continuing uplift.
Age of faulted surficial deposits	Holocene.
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Deposits are not faulted but Burnett and Schumm (1983 #2815) and Schumm (1986 #2817) note that the modern river channels are responding to the deformation, which is indicative of contemporary deformation. Thus, the most recent deformation is Holocene in age.
Recurrence interval	*Comments:* The geomorphic evidence of Quaternary uplift implies that the deformation is a steady, on-going process. It is not clear that the deformation is episodic or coseismic, so it is impossible to quantify the deformation in terms of recurrence intervals.
Slip-rate category	Less than 0.2 mm/yr *Comments:* The evidence for one or a few through-going, causal faults is speculative. The causal faults, if any, remain unknown

	and uncharacterized. The inferred "slip rate" of this feature is not really a slip rate in the same sense as defining a slip rate on a fault; this "slip rate" is actually an inferred uplift rate of the entire feature. The only reported information concerning deformation rates is from Brown and Oliver (1976 #2818). They indicate a geodetic uplift rate of 4 mm/yr, but there is some question about whether this deformation is truly tectonic deformation. This high rate is generally incompatible with the geologic and tectonic setting of the Gulf Coast province, and if this rate were sustained for a significant period of geologic time, then the geomorphic and geologic expression of the uplift would be far more pronounced than it is at present. Thus, this geodetic rate is suspect in terms of it accurately reflecting a long-term tectonic uplift rate. The sparse historical seismicity in the region of the Wiggins uplift contrasts with the unusually high uplift rate. It is not clear if the uplift reflects long-term tectonic processes that produce tectonic strain that could be released by damaging earthquakes. Until some of these fundamental questions about the nature of the deformation are answered, the Wiggins uplift is classified as a Class B feature. Because of the uncertainties described above, the slip rate is defined as "unknown" until better information is available about the nature and rate of Quaternary deformation.
Date and Compiler(s)	1998 Anthony J. Crone, U.S. Geological Survey, Emeritus
References	#2818 Brown, L.D., and Oliver, J.E., 1976, Vertical crustal movements from leveling data and their relation to geologic structure in the eastern United States: Reviews of Geophysics and Space Physics, v. 14, no. 1, p. 13-35. #2815 Burnett, A.W., and Schumm, S.A., 1983, Alluvial-river response to neotectonic deformation in Louisiana and Mississippi: Science, v. 222, p. 49-50. #2819 Cagle, J.W., and Kahn, M.A., 1983, Smackover-Norphlet stratigraphy, south Wiggins arch, Mississippi and Alabama: Transactions of the Gulf Coast Association of Geological Societies, v. 33, p. 23-29. #1994 Ewing, T.E., 1991, Structural framework, *in* Salvador, A., ed., The Gulf of Mexico basin: Boulder, Colorado, Geological Society of America, The Geology of North America, v. J, p. 31-52.

	#2817 Schumm, S.A., 1986, Alluvial river response to active tectonics, *in* Active tectonics: Washington, D.C., National Academy Press, p. 80-94.