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Quaternary Fault and Fold Database of the United States

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Moab fault and deformation zones (Class B) No. 2476

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Compiled in cooperation with the Utah Geological Survey

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Synopsis	Poorly understood late Quaternary deformation related to collapse of the Spanish Valley anticline. As with many other faults in the region, the Moab fault and Spanish Valley faults are probably related to salt dissolution, but may have a tectonic component, thus we classify them as a Class B feature.
Name comments	**Fault ID:** Refers to fault number 18-2 of Hecker (1993 #642).
County(s) and	SAN JUAN COUNTY, UTAH

State(s)	GRAND COUNTY, UTAH
Physiographic province(s)	COLORADO PLATEAUS
Reliability of location	Good Compiled at 1:250,000 scale. *Comments:* Mapped or discussed by McKnight (1940 #6767), Shoemaker and others (1958 #5009), Jones (1959 #4993), Williams (1964 #2789), Woodward-Clyde Consultants (1982, #5025; 1986 #6768), Harden and others (1985 #4988), and Oviatt (1988 #5006), Woodward-Clyde Federal Services (1996 #5027), Doelling and others (2002 #6764), and Hylland and Mulvey (2003 #6766). Mapping from Williams (1964 #2789) and Doelling and others (2002 #6764).
Geologic setting	Northwest-trending zone of faulting and warping from collapse of the Spanish Valley anticline from salt dissolution. The Moab fault bounds the western side of the valley and may have a tectonic component. Shoemaker and others (1958 #5009) and Jones (1959 #4993) indicated that the fault may extend below the salt, offsetting pre-Paradox Formation strata.
Length (km)	68 km.
Average strike	-N52°W
Sense of movement	Normal
Dip	60-68° NE. *Comments:* Bedrock fault exposure with slickenlines that rake 60? east, located <250 m west of Arches National Park visitors center (Doelling and others, 2002 #6764).
Paleoseismology studies	
Geomorphic expression	The Moab fault is subdivided into northern, central, and southern parts based on fault geometry, varying amounts of displacement along strike, geomorphic trends (including reversed scarp topography along the northern part), and concealment of the fault beneath Quaternary basin fill along the southern part (Olig and others, 1996 #1371). Valley-margin deformation collocated with

	the southern part of the fault includes complex, anastomosing faults, fractures, and folds, indicating salt dissolution-related subsidence (Doelling and others, 2002 #6764). The non-tectonic deformation is likely an ongoing process (Doelling and others, 2002 #6764; Hylland and Mulvey, 2003 #6766), evidenced by marsh development at the northwestern end of Moab-Spanish Valley, basin-ward convergence of Bull Lake-aged (~130-200 ka) alluvial terraces near the middle of the valley, and the entrenchment of older alluvial-fan surfaces and successively younger basin-ward directed fan deposition. However, hydrologic controls on deposition could also explain these observed relations. Salt dissolution-related deformation may include unusual Bull Lake terrace geometries, several small (10-cm) displacements in the middle to late Pleistocene deposits, and the beheading of Little Canyon, formed during late Tertiary to early Quaternary time (Oviatt, 1988 #5006).
Age of faulted surficial deposits	Cretaceous.
Historic earthquake	
Most recent prehistoric deformation	undifferentiated Quaternary (<1.6 Ma) *Comments:* Several lines of evidence indicate that the Moab fault has not been active during the Quaternary, although the age constraints are not conclusive. Olig and others (1996 #1371) infer pre-Quaternary displacement on the fault that is spatially similar but kinematically unrelated to Quaternary collapse of the Moab-Spanish Valley salt-cored anticline. Their inference is based on: cross-cutting relationships indicating salt dissolution more recent than fault movement (Doelling, 1988 #6762; Doelling and others, 2002 #6764), fault deformation structures (e.g., cemented vein arrays and cataclastic shear zones), multiple episodes of salt diapirism; however, no differential offset of Permian to Lower Jurassic geologic units, a lack of correlation between the locations of maximum fault displacement and maximum salt thickness, and an estimate of 1.2-7.5 Ma required to erode the bedrock fault escarpment back to its present condition, based on bedrock scarp-retreat rates (0.2-0.5 m/k.y., Olig and others, 1996 #1371). Displacement on the Moab fault may have occurred between the Upper Cretaceous (Campanian to Turonian) and Quaternary

	(Foxford and others, 1996 #6765; Olig and others, 1996 #1371; Woodward-Clyde Federal Services, 1996 #5027); however, the oldest deposits not cut by the Moab fault are middle to late Pleistocene in age. Conversely, movement along deformation bands related to collapse of the Moab-Spanish Valley salt-cored anticline postdates early and middle Pleistocene alluvium (Harden and others, 1985 #4988).
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* Olig and others (1996 #1371) estimated the long-term geologic slip rate along the Moab fault for the period between 2 and 24 Ma as 0.008 mm/yr (0.18 km/22 m.y.) for the northern part, 0.036 mm/yr (0.79 km/22 m.y.) for the central part, and 0.014 mm/yr (0.31 km/22 m.y.) for the southern part.
Date and Compiler(s)	2004 Bill D. Black, Utah Geological Survey Michael D. Hylland, Utah Geological Survey Suzanne Hecker, U.S. Geological Survey
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