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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.

Central Virginia seismic zone (Class A) No. 2653

Last Review Date: 1998-05-21

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Synopsis	The geologic evidence for Quaternary faulting in the Central Virginia seismic zone is reported at one site having a few, small, latest Holocene sand dikes, and at a second site several tens of kilometers away having a few, small, possible dikes of early Holocene or younger age (Obermeier and McNulty, 1998 #1872). These liquefaction features are evidence of strong shaking, but they do not identify the specific fault or faults that caused an earthquake or earthquakes. Because individual Quaternary faults remain unidentified, it is not possible to define and measure specific attributes (azimuth, length, dip, etc.) for the Central Virginia seismic zone.
Name comments	The Central Virginia seismic zone was named by Bollinger (1973 #1797; 1973 #1798). It is a roughly circular area of 120-150 km

	in diameter, with a low level of diffuse seismicity, three-quarters of which is in the upper 11 km of the crust (1985 #1801).
County(s) and State(s)	AMELIA COUNTY, VIRGINIA BUCKINGHAM COUNTY, VIRGINIA CAROLINE COUNTY, VIRGINIA CHESTERFIELD COUNTY, VIRGINIA CUMBERLAND COUNTY, VIRGINIA FLUVANNA COUNTY, VIRGINIA GOOCHLAND COUNTY, VIRGINIA HANOVER COUNTY, VIRGINIA HENRICO COOUNTY, VIRGINIA LOUISA COUNTY, VIRGINIA ORANGE COUNTY, VIRGINIA POWHATAN COUNTY, VIRGINIA RICHMOND COUNTY, VIRGINIA SPOTSYLVANIA COUNTY, VIRGINIA
Physiographic province(s)	PIEDMONT
Reliability of location	Poor Compiled at 1:1,200,000 scale. *Comments:* The largest historical earthquake in the zone occurred in 1875 near the center of the zone (Oaks and Bollinger, 1986 #2216). The earthquake's intensity was MMI VII, and its magnitude was m b 5.0 and M 4.8 (Bollinger and Hopper, 1971 #1799; Bollinger and Sibol, 1985 #1801; Johnston, 1994 #2042). No surface rupture or liquefaction was reported. Similarly, no prehistoric surface rupture is known in the seismic zone, and the only reported paleoliquefaction features are those few described below under "Paleoseismological studies". Hypocenters of microearthquakes plot within an upper crustal complex of thrust sheets (Coruh and others, 1988 #1807), but the locational uncertainties of both the hypocenters and the individual thrust faults are typically a few kilometers. Therefore, hypocenters and faults cannot be convincingly associated with each other. The result is that the individual seismogenic faults in the Central Virginia seismic zone remain unidentified.
Geologic setting	The Central Virginia seismic zone is underlain by Precambrian and Paleozoic metamorphic and igneous rocks that were folded, juxtaposed, and superimposed by numerous nappes and thrust faults, mostly southeast-dipping, during the assembly of the Appalachians (for example Glover and others, 1983 #1827;

	Glover and others, 1989 #2034; Hatcher and others, 1989 #2036).
Length (km)	km.
Average strike	
Sense of movement	No data *Comments:* Single-earthquake focal mechanisms from the seismic zone are variously oriented and show reverse and strike-slip faulting (Munsey and Bollinger, 1985 #1867; Davison, 1988 #2027). However, the associated hypocenters are scattered geographically, and no surface ruptures are known, so no systematic sense of movement is known.
Dip Direction	Unknown *Comments:* The causative faults remain unidentified and uncharacterized. However, single-earthquake focal mechanisms have nodal planes with generally steep dips, averaging 61° (Bollinger, 1987 #2196).
Paleoseismology studies	Obermeier and McNulty (1998 #1872) examined cutbanks along more than 300 km of many streams throughout the seismic zone, searching for geologic evidence of paleoliquefaction. The geologic record that should have recorded any paleoliquefaction extends back 2,000-3,000 years throughout the seismic zone, and at least 5,000 years in the east. One site has a few small clastic dikes that formed within the last few centuries. A second site tens of kilometers away has a few small, severely weathered, probable dikes that might have formed as long ago as early Holocene. From the close spacing of the searched streams and the paucity of observed dikes, Obermeier and McNulty (1998 #1872) concluded that (1) the seismic zone has not had an earthquake of magnitude larger than approximately 7 for the last 2,000-3,000 years, and for the last 5,000 years in the east, and (2) the geologic records of one or a few earthquakes of magnitudes 6-7 might be concealed between streams or between cutbanks, but such earthquakes could not have been abundant in the seismic zone.
Geomorphic expression	There is no geomorphic expression of the seismic zone beyond the few, small sand dikes described in "Paleoseismological studies".

Age of faulted surficial deposits	No Quaternary fault is known.
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* One and perhaps two sites contain clastic dikes of Holocene age.
Recurrence interval	*Comments:* Two exposures each contain a few small dikes (Obermeier and McNulty, 1998 #1872). Radiocarbon data and lack of severe weathering indicate that the dikes in one exposure are a few centuries old. Severity of weathering indicates that the dikes in the other exposure could be as old as early Holocene. However, the two exposures are several tens of kilometers apart across the regional structural grain, so they are unlikely to record earthquakes on the same fault. Accordingly, no recurrence interval for an individual Quaternary fault can be calculated.
Slip-rate category	Insufficient data *Comments:* No dated offset is known, so no slip rate can be calculated.
Date and Compiler(s)	1998 Russell L. Wheeler, U.S. Geological Survey, Emeritus
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