

Quaternary Fault and Fold Database of the United States

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Southern Sangre de Cristo fault, Hondo section (Class A) No. 2017d

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Synopsis

General: The Southern Sangre de Cristo fault is a west-dipping fault that in New Mexico forms the border between the Sangre de Cristo Mountains and the San Luis basin. In Colorado, the fault forms the border between San Pedro Mesa to the east and San Luis Valley to the west. At an embayment in the Sangre de Cristo Range, at the New Mexico/Colorado border, faulting steps eastward to the Northern Sangre de Cristo fault [2321]. The Southern Sangre de Cristo fault has subdued geomorphic expression compared to the Northern Sangre de Cristo fault.

Sections: This fault has 5 sections. The four sections in New Mexico are better exposed and have been studied in more detail than the single section in Colorado. Menges (1988 #1120; 1990 #1116; 1990 #1387) defined 4 geometric segments and 13 subsegments of the Southern Sangre de Cristo fault in New Mexico on the basis of physiographic and geomorphic expression of the fault zone and the morphology of the Sangre de Cristo range front in New Mexico, but did not investigate the part of the fault that extends north into Colorado. The trace of the fault in Colorado is mainly buried by Quaternary landslide debris. On the basis of fault scarp geomorphic expression, morphometric analyses of scarps, and surficial mapping, Ruleman and Machette (2007 #7252) suggest combining the Urraca and Questa sections into the Latir Peaks section of the fault. The original sectioning of the fault is retained in this update because of the lack of robust understanding of the timing of the most recent event, vertical-displacement rates, and recurrence intervals along the fault.

**Name
comments**

General: The Sangre de Cristo fault system borders the eastern margin of the San Luis basin, which extends from Poncha Pass, Colorado, to near Taos, New Mexico. This description addresses only the southern part of the fault system, which extends from the north end of San Pedro Mesa Creek south to its intersection with the Embudo fault at Talpa Rancho, about 8 km south of Taos. Upson (1939 #1142) first mapped the fault in Colorado and northern New Mexico. The Southern Sangre de Cristo fault, as used by Menges (1988 #1120; 1990 #1116; 1990 #1387) and herein, includes the Sangre de Cristo fault zone of Lipman and Mehnert (1975 #1955), the Taos fault of Dungan and others (1984 #1181), and the Cedros Canyon, Urraca Ranch, Taos Pueblo, and Cañon faults of Machette and Personius (1984 #1113) and Personius and Machette (1984 #1124). Ruleman and Machette (2007 #7252) suggest the Sangre de Cristo fault system (including the Northern Sangre de Cristo [2321] and the Southern Sangre de Cristo, herein) is more appropriately divided into northern, central, and southern based on tectonic activity that has shifted from the southern and northern parts of the fault system to the central part during the late Quaternary. The southern fault zone of Ruleman and Machette (2007 #7252) coincides with what we call the Southern Sangre de Cristo fault.

Section: This section is essentially coincident with segment 3 of Menges (1988 #1120; 1990 #1116; 1990 #1387), but a new name is used to avoid numerical section designations. The northern

	<p>termination of the section is at San Cristobal Creek, about 3 km northeast of the village of San Cristobal, which coincides with a large salient in the Sangre de Cristo range front. The southern end of the section is at Rio Pueblo de Taos, about 7 km northeast of the town of Taos. This boundary coincides with a large re-entrant in the range front and is the boundary between segments 3 and 4 of Menges (1988 #1120; 1990 #1116; 1990 #1387).</p> <p>Fault ID: Segment 3 of Menges (1988 #1120; 1990 #1116; 1990 #1387).</p>
County(s) and State(s)	TAOS COUNTY, NEW MEXICO
Physiographic province(s)	SOUTHERN ROCKY MOUNTAINS
Reliability of location	<p>Good Compiled at 1:250,000 scale.</p> <p><i>Comments:</i> Menges (1988 #1120) mapped fault traces from aerial photography at scales of 1:15,780 to 1:70,000, and presents mapping at a scale of about 1:400,000. Machette and Personius (1984 #1113) mapped fault traces at a scale of 1:250,000.</p>
Geologic setting	<p>The Southern Sangre de Cristo fault is part of a major rift-margin structure of Neogene age that borders the eastern margin of the Rio Grande rift in south-central Colorado and north-central New Mexico. The entire Sangre de Cristo fault system generally forms the boundary between the San Luis basin to the west, a narrow (10–25 km wide), east-tilted, asymmetrical half-graben on the west, and the Sangre de Cristo Mountains to the east. There is 7–8 km of structural relief on Precambrian basement rock across the Sangre de Cristo fault zone (Lipman and Mehnert, 1975 #1955). The western margin of the San Luis basin has comparatively little displacement, and no evidence of late Quaternary displacement. The southern end of the fault merges with or intersects the north-down, sinistral Pilar section of the Embudo fault [2007a] near the village of Talpa, New Mexico; geologic mapping shows there is not a distinct boundary between the Embudo and the Southern Sangre de Cristo faults (Bauer and Kelson, 2004 #7250). Wong and others (1995 #1155) note that a few well-located earthquakes appear to have occurred near the fault in New Mexico.</p>
Length (km)	This section is 21 km of a total fault length of 96 km.

Average strike	N32°W (for section) versus N6°W (for whole fault)
Sense of movement	Normal
Dip	60° W <i>Comments:</i> Deep seismic reflection data and two-dimensional modeling of gravity data suggest that the most likely dip of the Sangre de Cristo fault is 60° (Kluth and Schaftenaar, 1994 #1183). Tandon (1992 #1390; cited in Chapin and Cather, 1994 #1180) interprets the same data set processed for deeper resolution, and concludes that the fault dips about 60° to at least 26 to 28 km, which is probably below the brittle-ductile transition zone.
Paleoseismology studies	Menges (1988 #1120; 1990 #1116; 1990 #1387) mapped the fault traces and conducted detailed morphometric analyses of the fault scarps. However, there have been no detailed paleoseismic investigations of the southern Sangre de Cristo fault.
Geomorphic expression	Prominent west-facing fault scarps are present on late Pleistocene and possibly Holocene alluvial fans derived from the Sangre de Cristo Mountains. Menges (1988 #1120; 1990 #1116; 1990 #1387) documents the presence of truncated ridge spurs and triangular facets along the Sangre de Cristo range front, and interprets these as products of long-term displacement.
Age of faulted surficial deposits	Kelson (1986 #1109) mapped late Quaternary deposits and some fault strands along this section, and shows faulted Pleistocene alluvial-fan deposits. Menges (1990 #1116; 1990 #1387) did not map surficial deposits along the fault, but concludes that this fault section has experienced middle to early Holocene movement.
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) <i>Comments:</i> The exact timing of the most-recent event on this section is unknown. Menges (1988 #1120; 1990 #1116; 1990 #1387) conducted an exhaustive study of fault-related landforms, and suggests the possibility of middle to early Holocene movement along the northern part of the Hondo section.

Recurrence interval	<p>10 to 50 k.y.</p> <p><i>Comments:</i> Menges (1988 #1120; 1990 #1116; 1990 #1387) estimated recurrence at a given site along the southern Sangre de Cristo fault as 10,000 years and stated that this is compatible with data from the northern part of the Sangre de Cristo fault system (10 to 50 k.y.) given by McCalpin (1982 #791). No data exist that are specific to this section.</p>
Slip-rate category	<p>Less than 0.2 mm/yr</p> <p><i>Comments:</i> Menges (1988 #1120; 1990 #1116; 1990 #1387) estimated two slip rates for the southern Sangre de Cristo fault on the basis of fault scarp data: (1) a post-middle Pleistocene (post-Bull Lake) rate of 0.03–0.06 mm/yr, and (2) a post-Pliocene (post-4 Ma) rate of 0.12–0.23 mm/yr.</p>
Date and Compiler(s)	<p>1998</p> <p>Keith I. Kelson, William Lettis & Associates, Inc. Robert M. Kirkham, Colorado Geological Survey Michael N. Machette, U.S. Geological Survey, Retired</p>
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