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The Servita Fault, Eastern Cordillera, Colombia: an Active Thrust Able to Produce an $M > 7.0$ Earthquake very near to Bogotá D.C.

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Field data, aerial photography, and satellite imaging have allowed the identification of active tectonic features in Servita fault which is a thrust whose scarp is located 5km west of Villavicencio (460.000 inhabitants) in the center of Colombia. This fault is thrusting Devonian rocks over Early Cretaceous rocks. This is one of the main faults of the Eastern Frontal Fault System (EFFS) of Colombia and from its morphotectonic expressions, which is of great dimensions compared to the one displayed by other faults recognized as having potential seismoactivity. It's estimated that it can produce earthquakes of at least $M \geq 7.0$. Among the faults that belong to the EFFS, this fault is the closest one to the metropolitan area of Bogotá D.C. . Four magnitude 5.0 or higher earthquakes were confirmed by both historical and instrumental seismicity information has been registered in its influence area to this day. Of these earthquakes, two have transcended in this region due to the economic slump and loss of lives that it caused: the first one occurred on October 18th, 1743 with a current probabilistic magnitude greater than 6.5 and the second one struck on May 24th, 2008 with a $M = 5.9$. In this work we show geomorphological aspects and neotectonic evidences that allow indicating recent local fault activity. In addition, equally show the seismicity record obtained by the Colombian National Seismological Network (RSNC) for the 1993-2012 lapse for this area of the Colombian Eastern Cordillera. With these data currently confirms the potential occurrence of earthquakes in this region. Two aspects must be considered: 1. The fault is the biggest structure in the region and 2. The calculation of its geometry in the configuration of the thrust. Thus, we hereby state that the superficial seismicity that occurs toward east of Bogota D.C. is due to the mobility of this fault.

Key words: Llanos foothills, Colombia, Servita Fault, Eastern Frontal Fault System, Neotectonics, Seismotectonics

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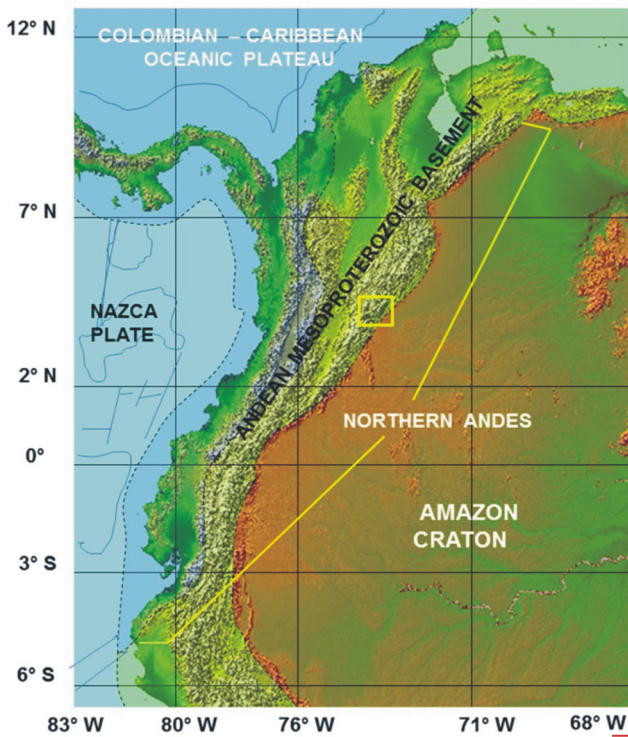


Fig. 1. Map with continental and oceanic plates that constitutes the geodynamic scheme of Northwestern South America. In box work area showing in figure 1.

This area is located between the Eastern Cordillera and the Llanos foothills (Foreland basin) in the center of Colombia. The EFFF is the limit between Andean Mesoproterozoic Basement (ancient Laurentia) and Amazon Craton (ancient Gondwana). These ancient continents collided during Late Mesoproterozoic - Early Neoproterozoic lapse. The EFFF is part of the limits of this continental collision. Because these reason some of these faults are big thrusts that were reactivated in Late Cenozoic

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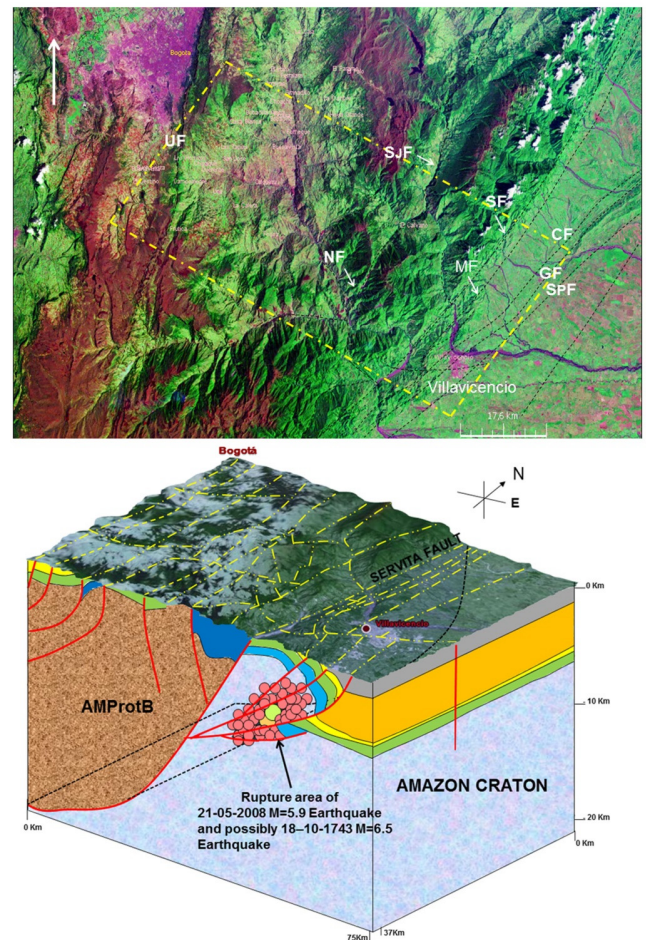


Fig. 2. Above, LANDSAT - TM 5 image of eastern flank of Eastern Cordillera between Bogotá D.C. and Villavicencio. Below, 3-D block corresponding to a sector of image showing above.

The 3-D block shows from a hypothetical point of view, the proposed geometry of the Servitá Fault with the May 24, 2008 Meta Quetame Earthquake and its rupture area that coincides with epicentral area of historical 1743 M ≥ 6.5 Earthquake. CF: Coladepato - Cumaral Fault; GF: Guacáramo Fault; MF: Mirador Fault; NF: Naranjal Fault; SF: Servitá Fault; SJF: San Juanito Fault; SPF: San Pedro Fault; UF: Usme Fault.

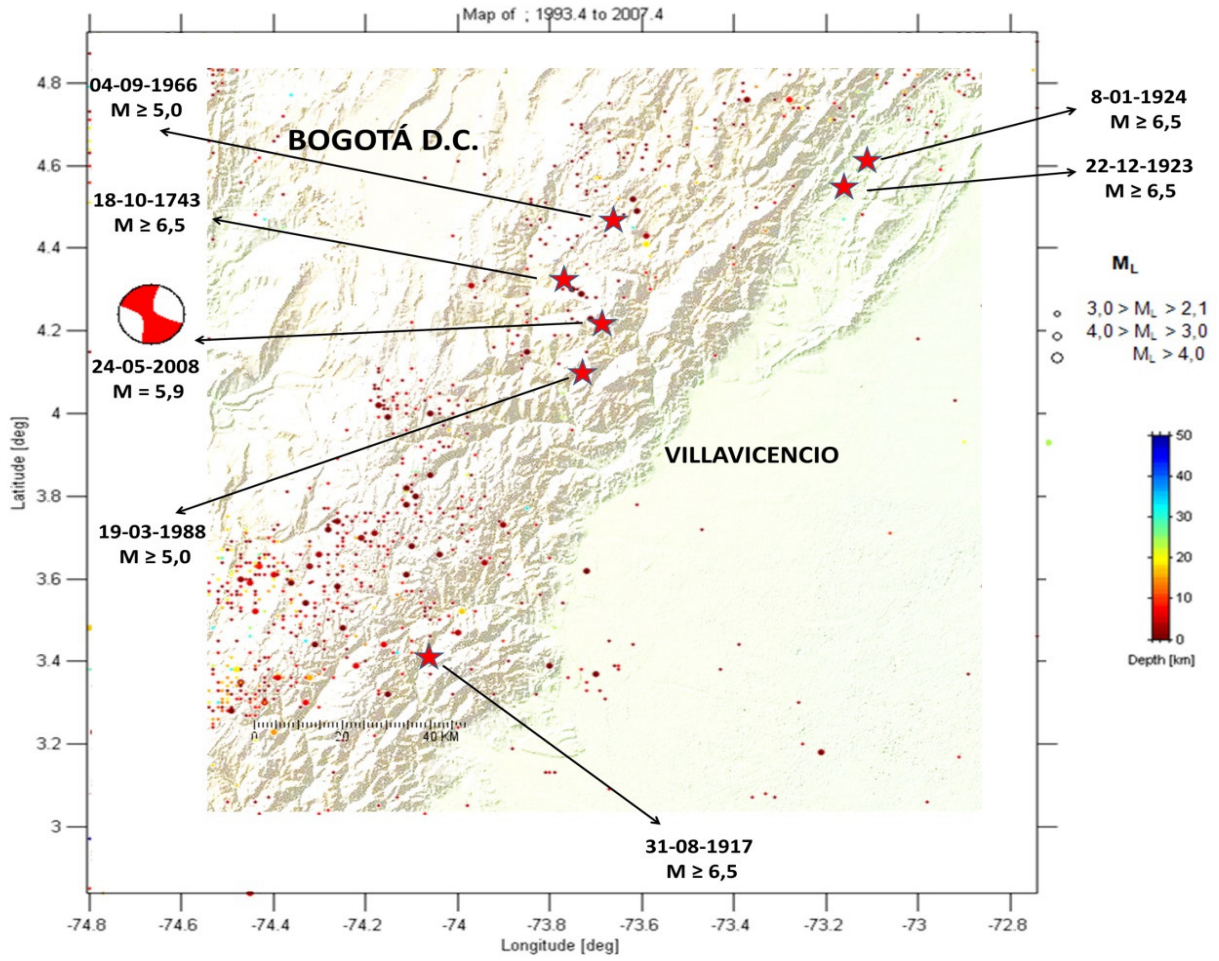


Fig. 3. Great historical earthquakes and RSNC instrumental seismicity records for the period between 1993 and 2007 in the Villavicencio and Llanos foothills region in Central Colombia.