

GEOTECTONIC EVOLUTION AND SEISMOTECTONICS OF NORTH FAULTS OF ALGECIRAS FAULT SYSTEM, COLOMBIA

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ABSTRACT

The Eastern cordillera of Colombia was originated by the rapid upwelling of Mesozoic and Cenozoic rocks which began 8 millions years ago as a result of the tectonic inversion that occurred in normal faults that originated during the evolution of a Late Triassic basin that appeared when the Pangea supercontinent broke. The thickness of the sediments of this basin as result of its evolution is approximately 8 km. During Cenozoic the northwestern South America suffered two compressive tectonic (orogenic) phases. The first phase it was due to the final adjust (accretion) of oceanic blocks related to the Caribbean plate to Northwestern margin of South America during Campanian - Late Eocene lapse and, the second phase that began in Late Oligocene, is due to the development of the subduction of the Nazca Plate under northwest of South America.

In these tectonic phases the tectonic inversion produced that the normal faults that originated the basin, became in reverse and/or thrusting faults making the Eastern Cordillera grow. This cordillera is limited by two large faults systems: the Salinas Fault System toward west and, the Eastern Frontal Fault System toward east. The seismic networks have recorded a high shallow seismicity activity associated with these fault systems.

The Algeciras Fault System (AFS) is part of the Eastern Frontal Fault System. For the AFS with the help of the historical seismic intensity evaluation and instrumental historical seismicity record (1967 earthquake) have been assigned the 1785, 1827, 1917 and, 1967 historical earthquakes. These earthquakes were felt in Bogotá and several Colombian cities located towards the center and southwest of the country. The Guayuriba Fault is reverse with 142,3 km of cumulative length is part of the AFS and corresponds to the northern fault of the fault system. Towards the west of the región where the Guayuriba Fault crosses, there are two semi-parallel reverse faults which are Altamira, and Nazareth. These last faults form the watershed of the cordillera.

In this región occurred recently the earthquakes $M = 5.4$ and $M = 5.0$ of October 30, 2016, The earthquake $M = 4.7$ of December 16, 2016, and the earthquake $M = 5.7$ of February 6, 2017. The hypocenters of these earthquakes were located by the National Seismological Network of Colombia (RSNC). Also for this región with the historical seismic intensity evaluation have been assigned the historical earthquakes of July 12, 1785 and August 31, 1917.

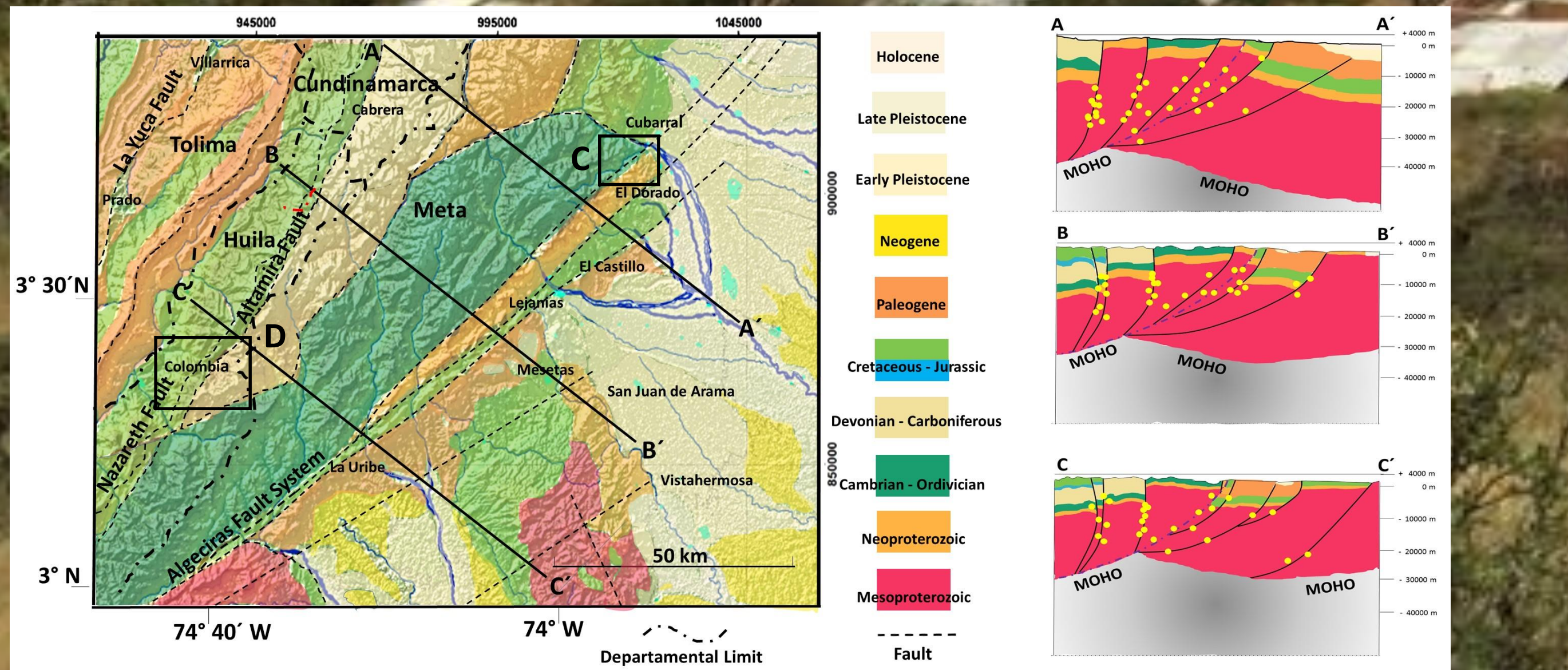
The location of the epicenters verified here with field work, which are coincident with the location of the hypocenters given by RSNC makes estimate that the asperities are related with the interception in Deep between Altamira and Nazareth faults with Guayuriba Fault. In conclusion here estimated that the main seismicity source is the Guayuriba Fault and the second seismicity source in this region are Altamira and Nazareth Faults. In the field work also checked tectonic geomorphology for faults scarps and several geomorphic expressions associated.

C.



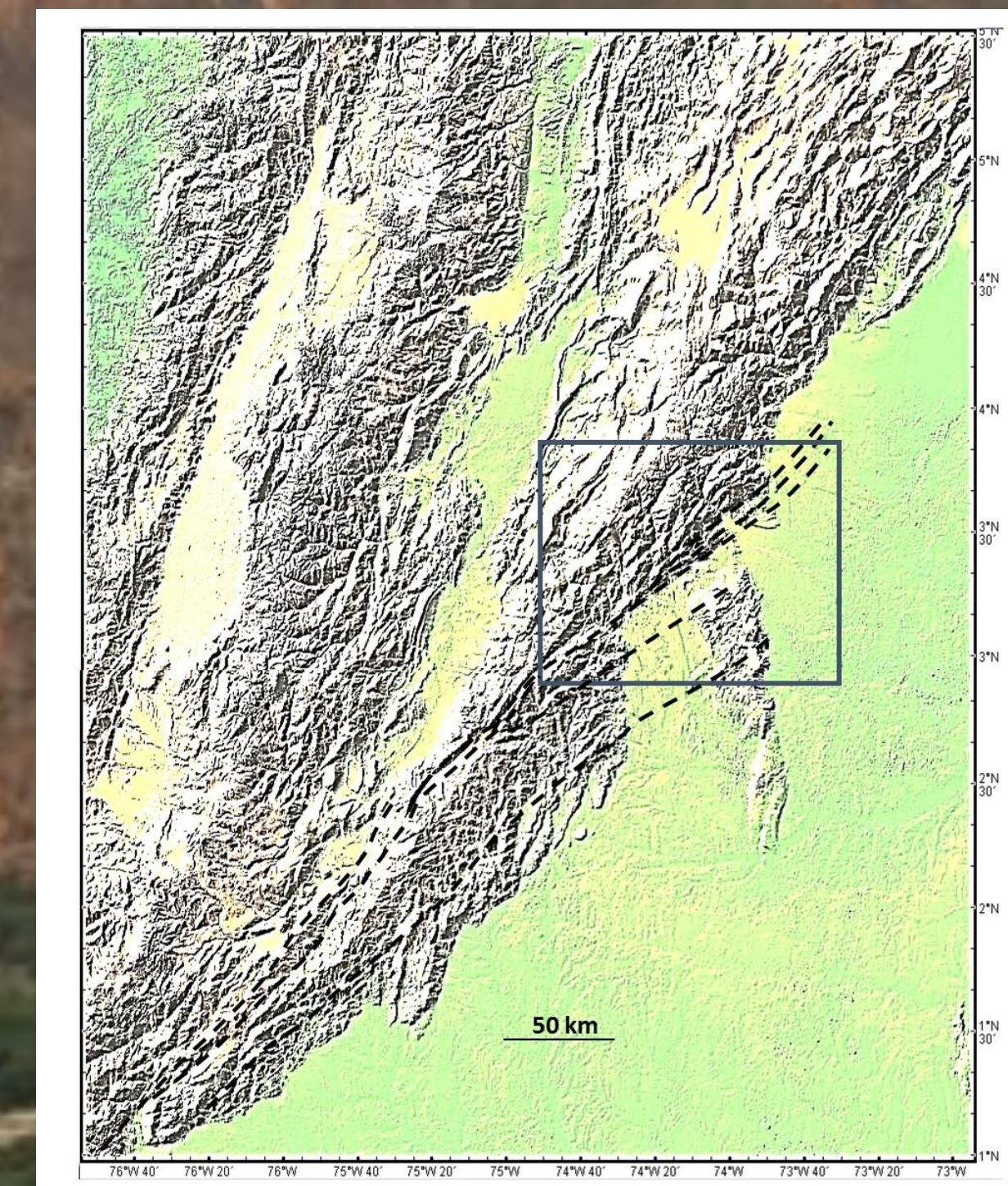
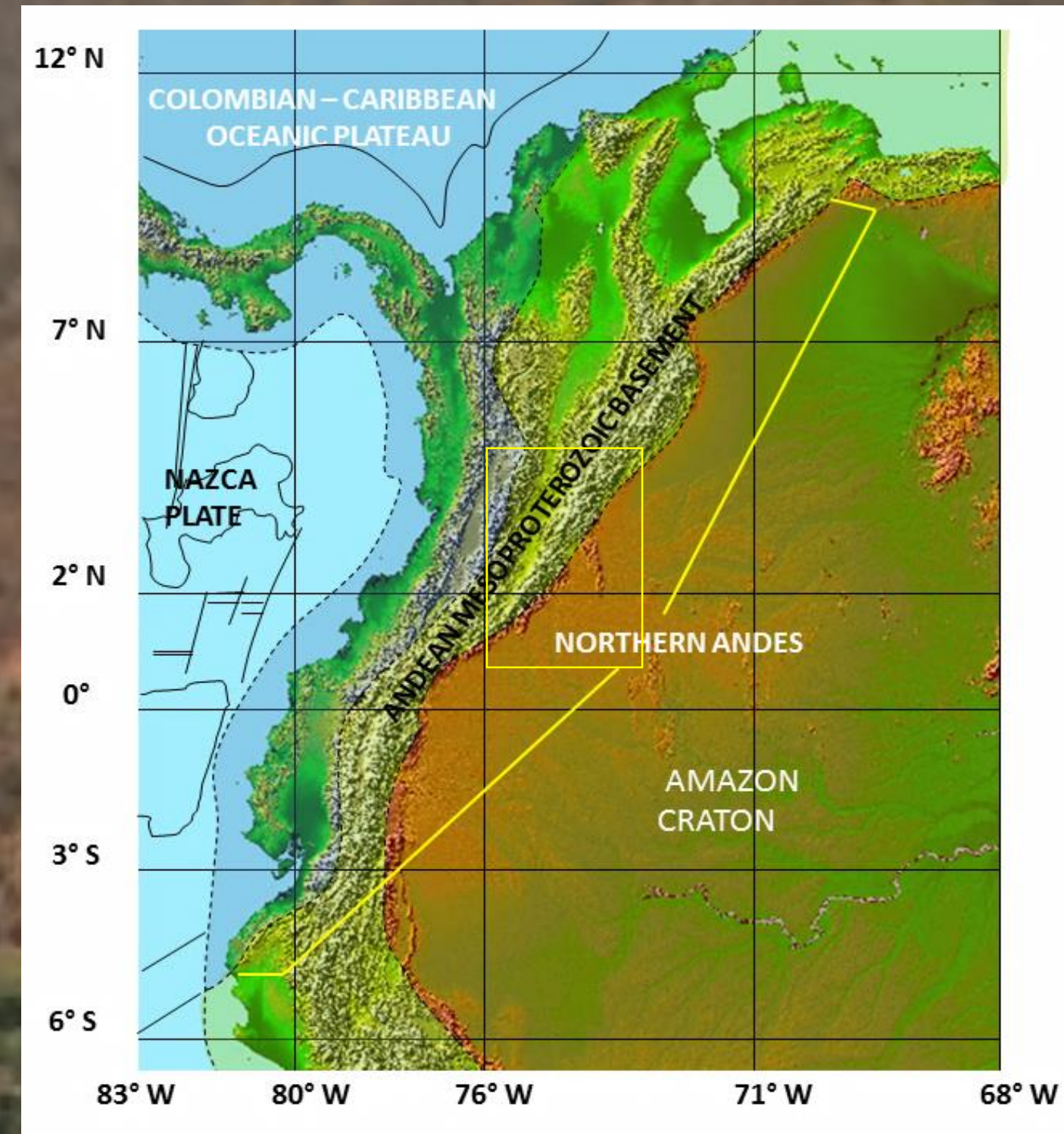
Images near to Cubarral town located toward southwestern of Meta department, on eastern flank of the Colombian Eastern Cordillera. Here can observe geoforms and several faults scarps related to some faults of Algeciras Fault System.

F.

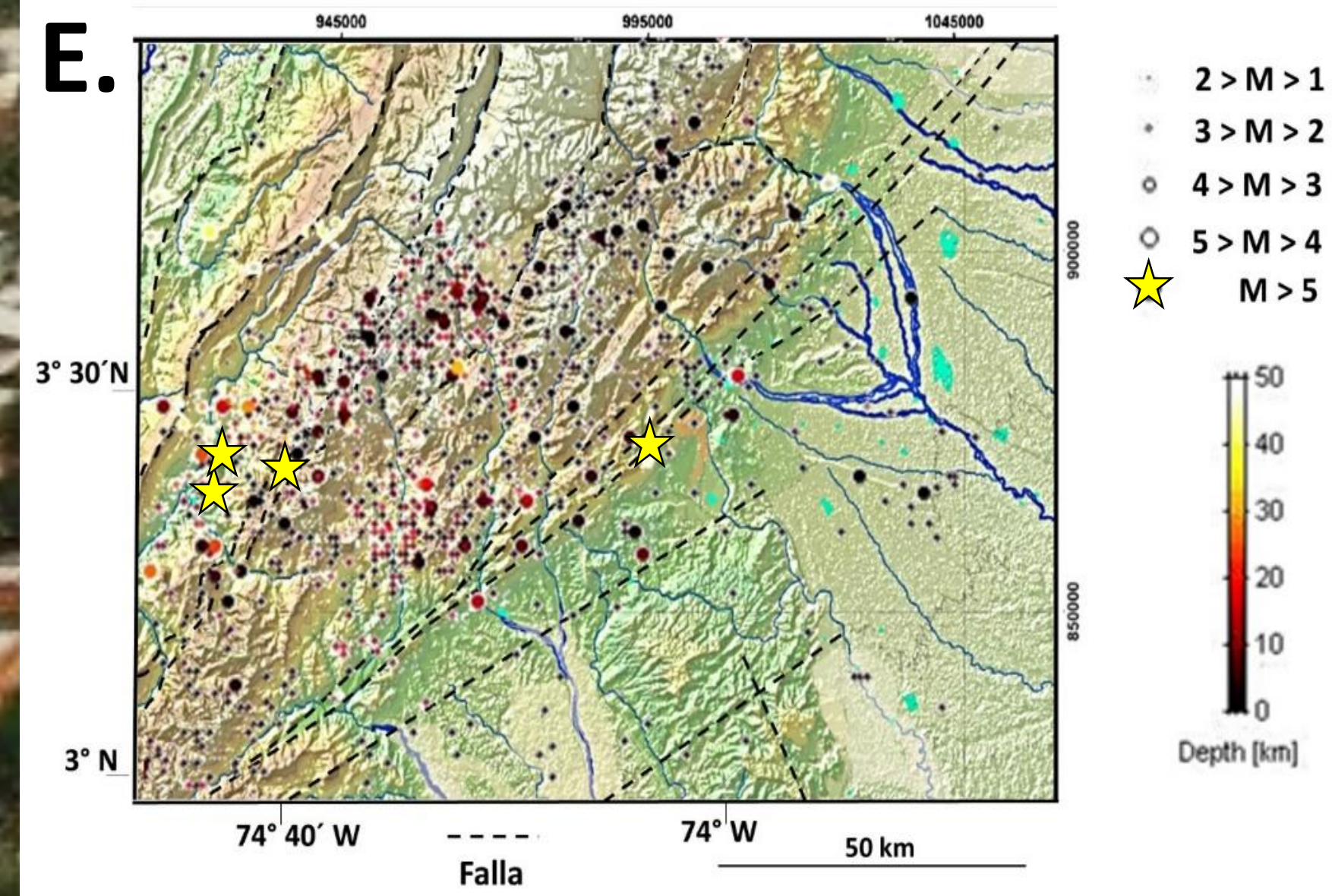


Geologic map of the study area with three profiles supported by geologic and geophysics data

A. LOCATION

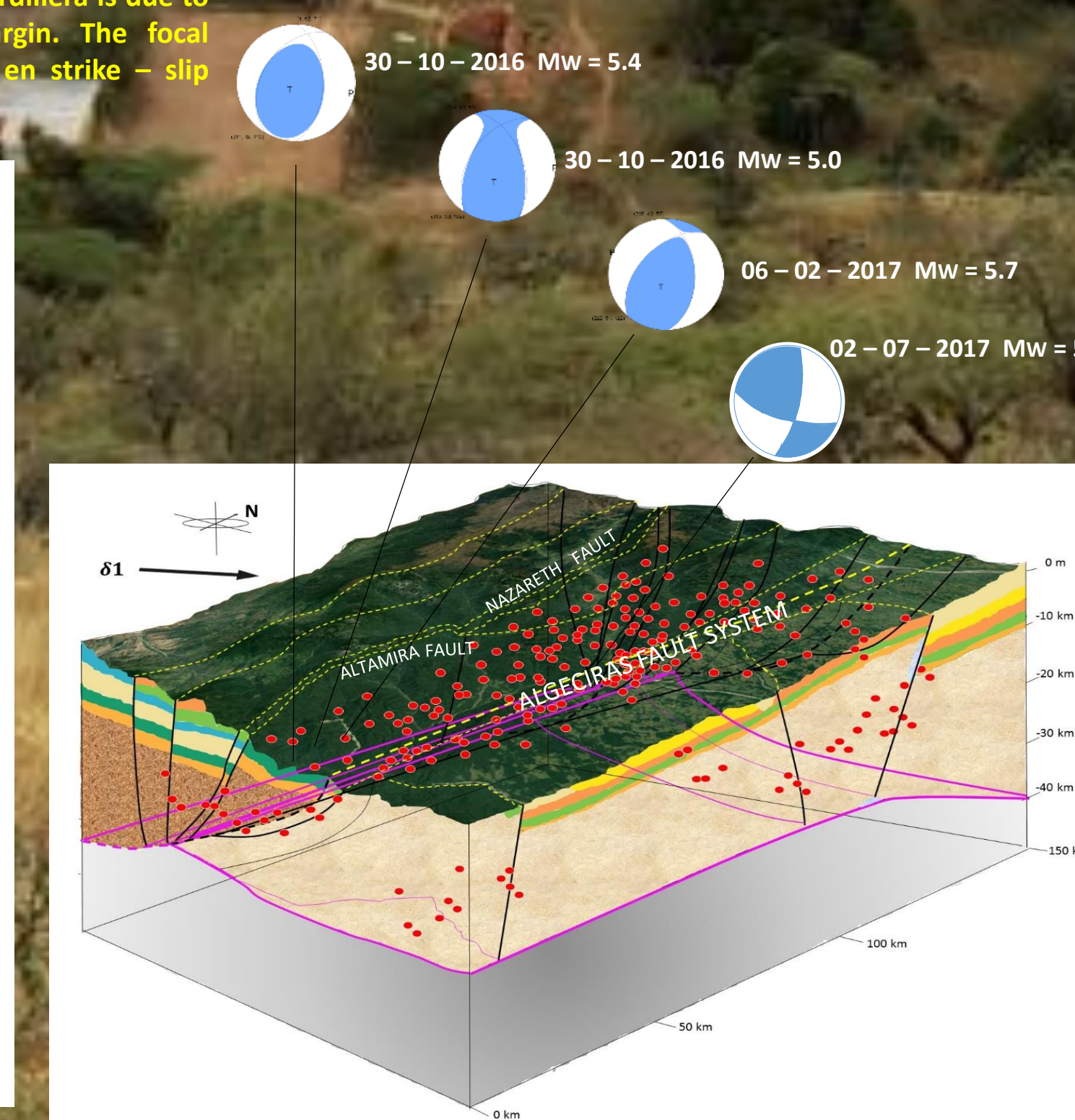
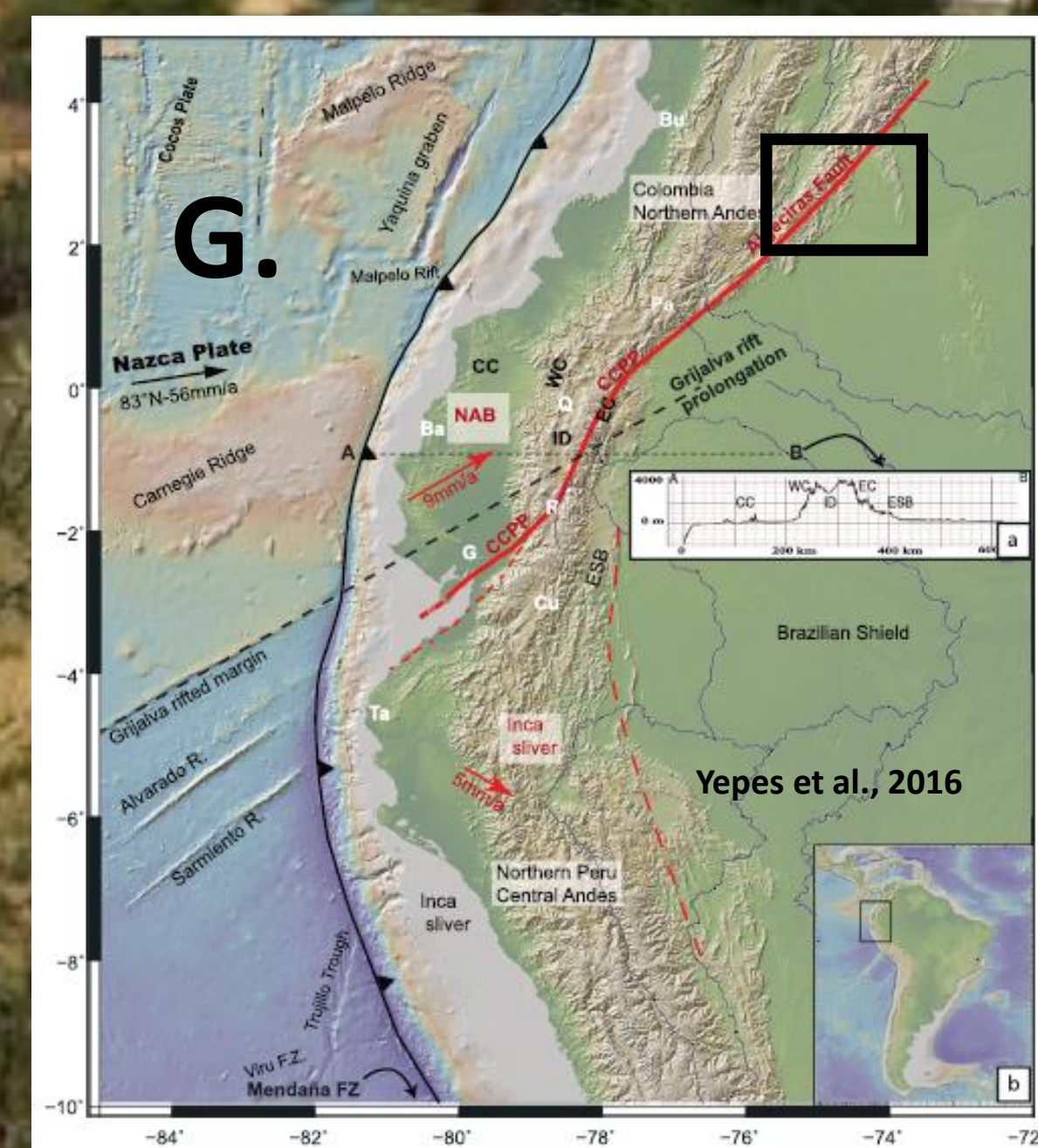


Images of Colombia town and neighborhood located toward northeastern of Huila department, on western flank of the Colombian Eastern Cordillera. Here can observe geoforms, fault scarps and site effects in cars and households due to the October 30, 2016 and February 6, 2017 earthquakes. The Ambica fault is a synthetic fault of Altamira fault.

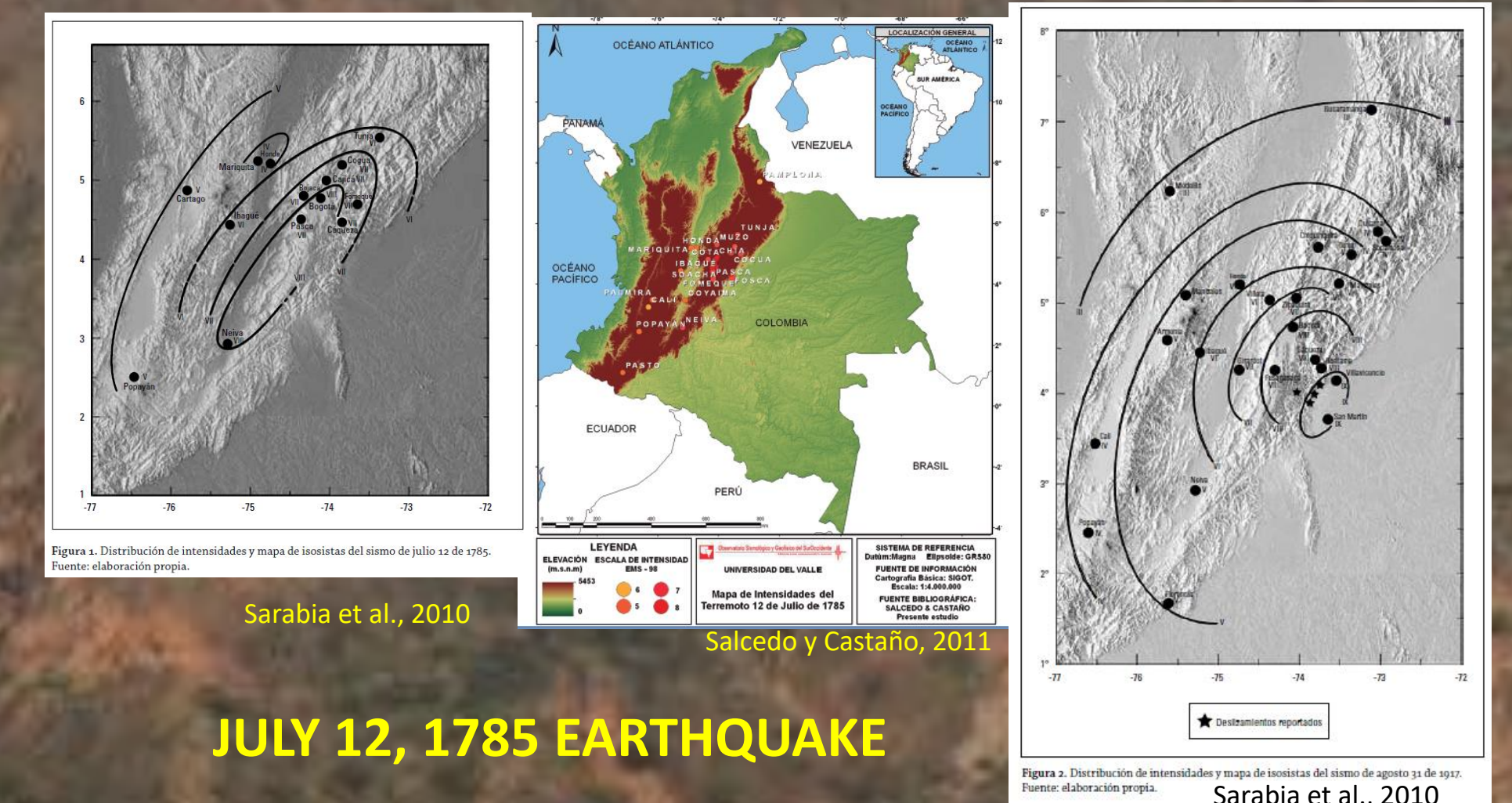


Earthquakes hypocenters located on tectonic map after Colombian Geological Service database (SGC, 2017). The yellow star are the 2016 & 2017 earthquakes.

The origin of the seismicity for this sector of Colombian Eastern Cordillera is due to the oblique push of the Nazca plate on South America margin. The focal mechanisms predominantly confirm a kinematic dextral sliding on strike-slip faults with a inverse component, thrust



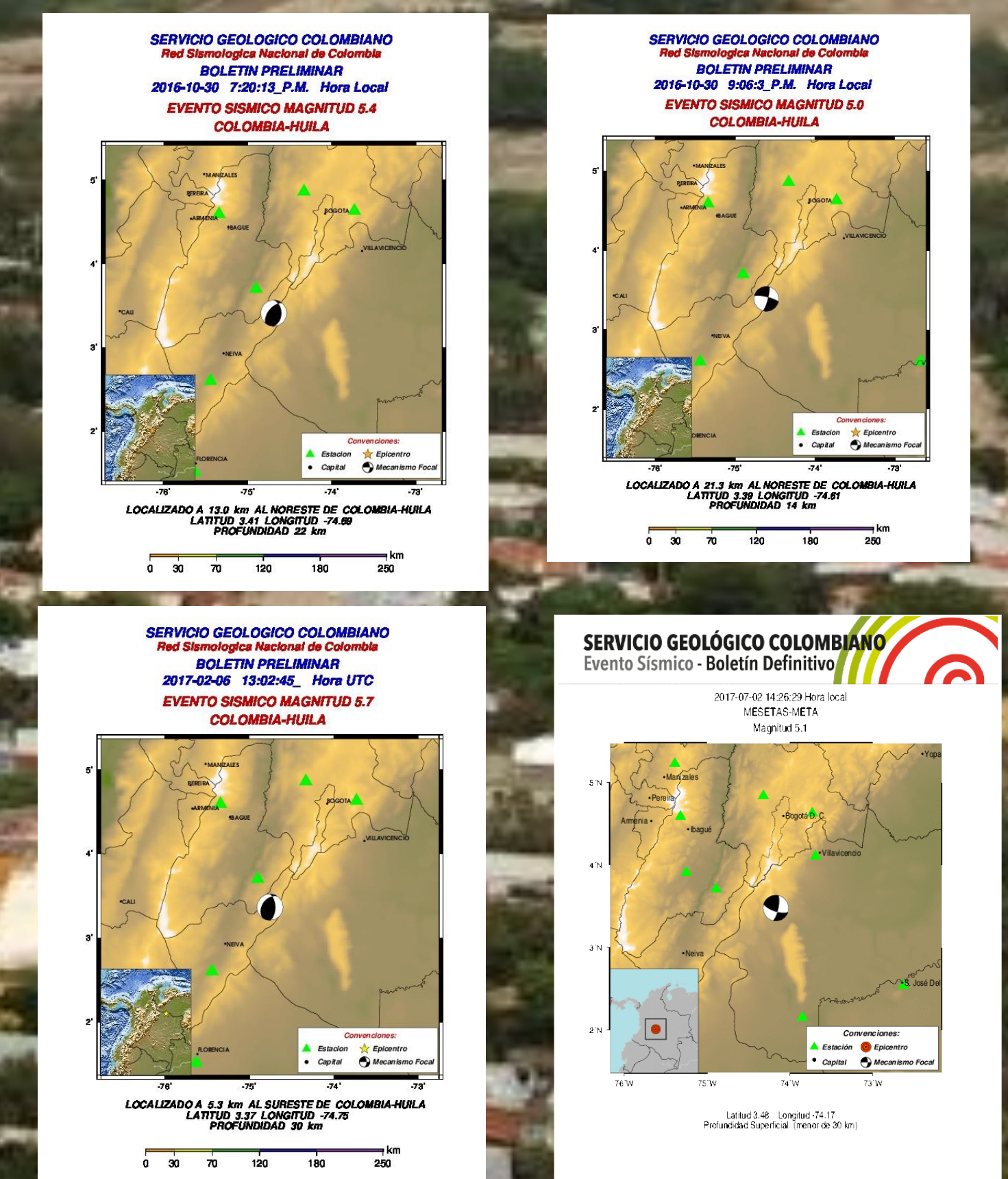
B. HISTORICAL SEISMICITY



JULY 12, 1785 EARTHQUAKE

AUGUST 31, 1917 EARTHQUAKE

2016 & 2017 EARTHQUAKES



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