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EVIDENCE OF HOLOCENE COMPRESSION IN THE VALLE DEL CAUCA, ALONG THE WESTERN FOOTHILLS OF THE CENTRAL CORDILLERA OF COLOMBIA.

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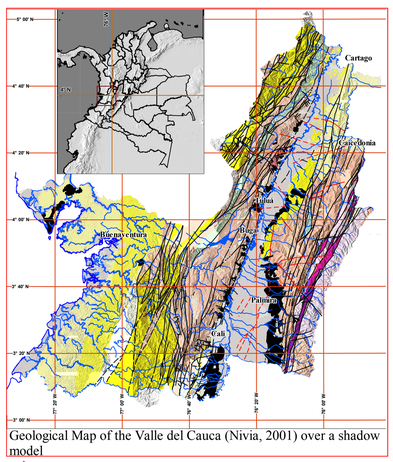
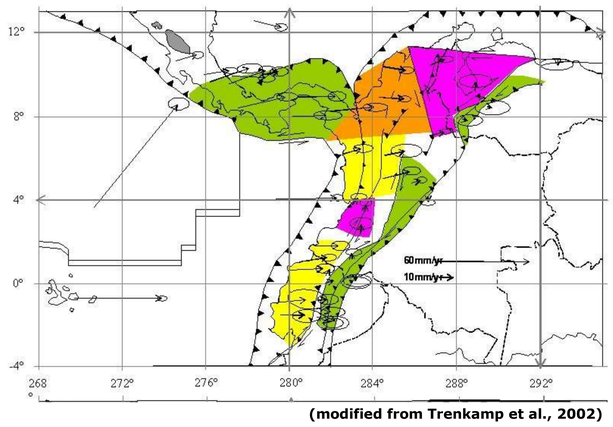
Previous works



Geological Map of the Valle del Cauca (Nivia, 2001) over a shadow model

- The study region (3° – 5°N, 76° – 78°W; SW of Colombia), characterized by humid tropical mountain weather, has been struck by several earthquakes in historical times, without reported surface ruptures. The Quaternary active faulting is essentially established from geomorphological evidence (Woodward Clyde, 1983; Marín & Romero, 1988; París *et al.*, 1989).
- Seismological evidence suggest an East to West change in the N-S faulting dynamics (Meyer & Mejía, 1997).
- This work is part of a larger project that pursues to make a comprehensive seismotectonics model of SW Colombia.
- This study was conducted in the Western foothills of the Central Cordillera of Colombia, east of the town of Tuluá (Valle del Cauca Department).
- The most recent shallow earthquakes that affected the region occurred in Popayán (marz 31, 1983, M=5.4), Páez (june 6, 1994, M=6.4) and Armenia (january 25, 1999, M=5.9). The return period on active faults is surely greater than the combined length of the historic (since 1536) and instrumental record.

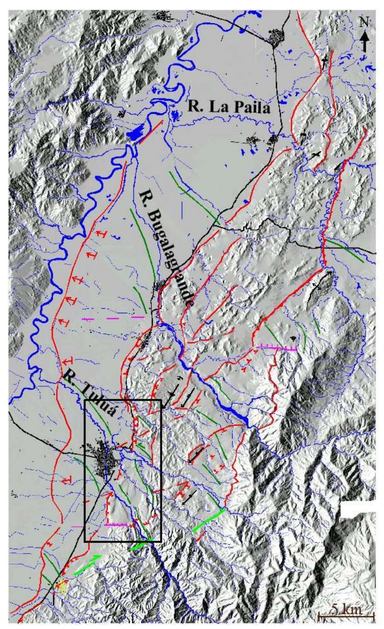
Regional Geodynamic



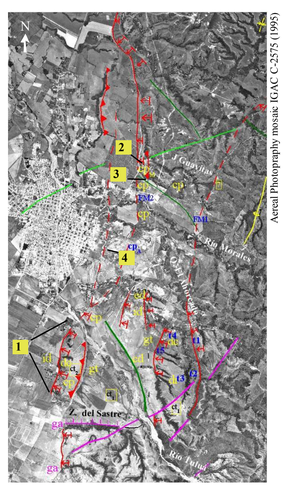
(modified from Trenkamp et al., 2002)

- Geodetic-derived displacements denote a transition around 4°N latitude, with the northern block (yellow on the figure) escaping toward the East.
- The southern block (magenta in the figure) with a few displacement vectors towards the North, implies that some part of the motion is being absorbed by thrusting.

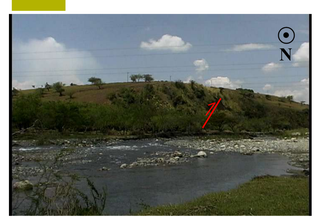
Geomorphologic Evidences



Shadow model – DEM cartography 1:25.000 of IGAC, CVC.



Aereal Photography mosaic IGAC C-2575 (1995)

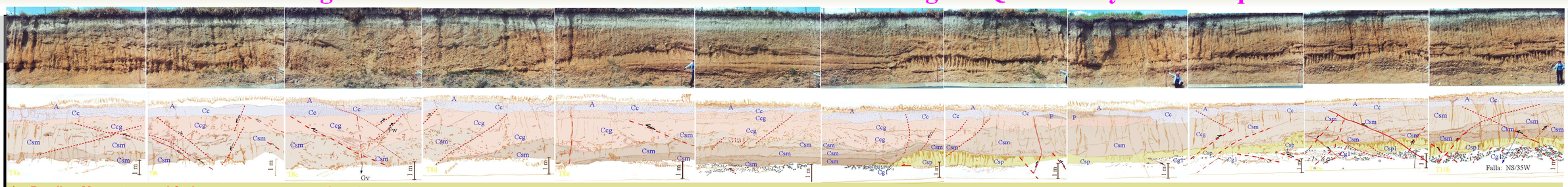


Thrusting faults of both vergences (East and West) affect ground surface, as attested by flexural scarps, pressure ridges and the drainage behavoir: deflections, captures, tectonic gutters, wind gaps, trellis.

3

Fault-propagation folds, Opposing vergence (West-verging synthetic thrusts and East-verging antithetic thrusts), bending-moment normal faults. Deformations in a late Neogene-Quaternary clastic sequence - .

E

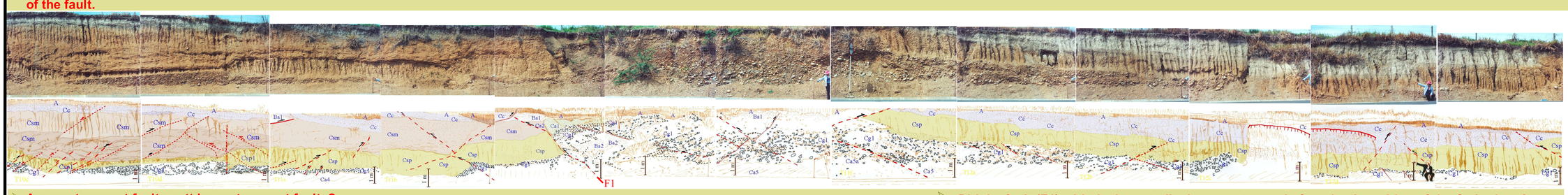


W

- Bending-Moment normal faults .
- Imbricated clasts suggest tilting of the sequence.
- Vertical crevasses influenced by the kinematics of the fault.

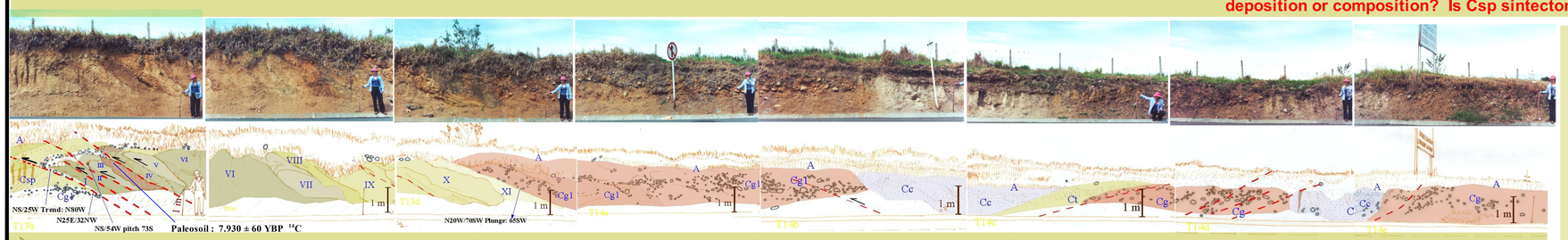
Questions:

- Are west-verging faults propagating over the antithetic east-verging faults?
- Are "graded" faults generated by liquefaction?
- Is the Csm a sintectonic horizon?
- Is the thickness variation of the Csp controlled by: the meeting of vergences?, liquefaction?, or by the behavoir of a blind and deep triangular zone?
- Are there sand injections?
- Is P a sand blow over Cc?



- Are west vergent faults cutt by east vergent faults?
- Was the vertical crevasse generated by the existence of a triangular zone? Of an east vergent fold?
- Did the fault (F1) with the largest displacement occur before the deposition of the Cc horizon?
- Is the columnar structure of the Csp horizon revealing some intrinsic characteristics of its deposition or composition? Is Csp sintectonic?

- Gentle folding occurred during (Cc) deposition.
- The sequence underlying Cc is faulted in micrograbens at the fold hinges.



- Is the east vergent (flexural slip) fault with the largest displacement emerging through the Miocene units after the Cc deposition?
- Is the ^{14}C 7.930 ± 60 YBP-old paleosoil recording the Holocene overthrust of Miocene units?
- What is the coseismic displacement ?

Legend

A: Organic soil horizon, most recent accumulation, black color.
Cc: Alluvial horizon, sandy with volcanic material, grey color.
B: Organic horizon with (?) materials of the underlying horizon, sandy - pebbly, dark brown color.
Ccg: Sandy – pebbly horizon with subangular gravels, brown grey color.
Csm: Coarse sandy – pebbly horizon with some internal structure, brown orange color. Wavy difuse contact with Csm2.
Csp: Coarse to pebbly sands with some sedimentary structures. Columnar structure in outcrop.
Cg: Clast-supported gravels.
I a XI: La Paila Formation.