

## Differential exhumation along the southern termination of the Bucaramanga fault discriminated by detrital and quantitative thermochronology

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Recently a kinematic model for the southern termination of the Bucaramanga Fault in the Eastern Cordillera of Colombia has been proposed (Velandia and Bermúdez, 2018) based on geological information, field geology, geomorphological and fractal analysis. Stress tensor solutions show the dominance of pure strike-slip motion in this area, where a set of sub-parallel faults constitutes a positive flower structure extending over 60 km. The Soapaga and Boyacá thrusts faults of this set of faults show a “domino-style” fault system, which may control the exhumation of the Floresta massif today. In this area, normal faults have been reactivated as reverse faults. Evidence for discriminating two different phases of Paleozoic shortening (Caledonian and Hercynian) is based on seismic data (Colletta et al., 1990).

We dated sediments from four rivers located along the southern termination of the Bucaramanga fault, between the Boyacá and Soapaga faults, the Onzaga, Mogoticos, Los Micos and Chaguacá rivers, in order to estimate the long-term exhumation rates of different tectonic blocks present in that area. Contrasting younger populations of apatite fission-track (AFT) ages were found in the Onzaga and Los Micos rivers, both rivers located to the east and west of the southern Bucaramanga fault. The Onzaga River sample yields three AFT age populations of  $11.6 \pm 1.0$ ,  $20.0 \pm 1.9$  and  $52.1 \pm 13.3$  Ma, in contrast to the Los Micos River with population ages of  $7.9 \pm 1.2$ ,  $12.0 \pm 2.5$  and  $18.4 \pm 3.4$  Ma, respectively. The central age of the Onzaga River sample is  $17.0 \pm 1.0$  Ma, in contrast to the Los Micos River sample, which is  $12.3 \pm 0.7$  Ma, confirming that the eastern flank of the Bucaramanga fault experienced more recent exhumation than the western flank of the fault in this sector. Zircon fission-track (ZFT) ages from the same river drainages show similar patterns, with four different ages populations ( $31.8 \pm 7.6$ ,  $54.1 \pm 4.2$ ,  $109.8 \pm 9.7$  and  $164.4 \pm 21.2$  Ma). ZFT central ages of the Onzaga, Chaguacá and Mogoticos rivers located on the eastern flank of the fault  $117.0 \pm 7.4$ ,  $101.6 \pm 7.2$  and  $108.9 \pm 8.2$  Ma, respectively), for Los Micos Qbd ZFT central ages is  $64.5 \pm 4.8$  Ma. These differences are consistent with differential exhumation along the southern Bucaramanga fault termination.

In order to study this asymmetric behavior, synthetic AFT and ZFT detrital age histograms were obtained by computing age distributions at the surface using the thermo-kinematic model PeCube (Braun et al., 2012) for different time intervals. We can observe asymmetrical exhumation to both sides of the southern Bucaramanga fault termination, with the end of a major orogenic event recorded in the detrital age datasets between 8-10 Ma.

Braun, J., van der Beek, P., Valla, P., Robert, X., Herman, F., Glotzbach, C., Prigent, C. (2012). Quantifying rates of landscape evolution and tectonic processes by thermochronology and numerical modeling of crustal heat transport using PECUBE. *Tectonophysics*, 524–525, 1–28. <https://doi.org/10.1016/j.tecto.2011.12.035>

Colletta, B., Hebrard, F., Letouzey, J., Werner, P., Rudkiewicz, J-L., (1990). Tectonic and crustal structure of the Eastern Cordillera (Colombia) from a balanced cross-section.