MORPHOTECTONIC RESPONSE (UPLIFT AND EXHUMATION) OF LITHO-TECTONIC BLOCKS ADJACENT TO THE ANTIOQUEÑO PLATEAU (NORTHERN ANDES): A THERMOCHRONOLOGY ANALYSES APPROACH

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ABSTRACT

Our undergraduate investigation deals with the need to create more coherent thermotectonic models that explain the co-evolution of juxtaposed morphotectonic provinces within the Antioquia Central Massif (ACM); an igneous/metamorphic province located in the northern portion of the Central Cordillera of Colombia. This cordilleran segment includes the Antioqueño Plateau as an elevated erosional surface (~2500 mean elevation), and the adjacent Cauca and Magdalena Inter-Andean valleys, to the west and east respectively. Lack of detailed vertical profiles for thermochronology analyses along the steep Cauca river depression (~3000 m local relief) preclude the generation of morphotectonic models that explain the juxtaposition of these dissimilar geomorphic features. We use relief differences and lithologic composition of several fault-bound blocks within the Cauca river trough to collect samples along vertical profiles on the Amaga Stock (Triassic), Pueblito Diorite (E-Cretaceous), and Heliconia Diorite (L-Cretaceous) to conduct: a) apatite (Ap) and zircon (Zrn) fertility/grain quality assessment, b) U/Pb Zrn geochronology and (U-Th)/He + fission track thermochronology in Ap and Zrn, and c) evaluate the morphotectonic history (uplift-exhumation-fault reactivation) of said blocks as a response to accretionary and subduction (compression- transpression) tectonics in western Colombia.
We collected a total of 19 samples (18 rock samples and one detrital sample, ~5 kg each) as follows: 12 in the Stock of Amaga, 4 in the Pueblito Diorite, 2 in the Heliconia Diorite, and 1 detrital sediment sample in the Quebrada Sinifaná. Samples were subjected to mineral separation though conventional gravimetric (water table, gold pan, heavy liquids) and magnetic susceptibility (Frantz Isodynamic®) procedures to obtain Ap and Zrn separates. Mineral fractions were scanned/hand-picked under reflected and transmitted light at high magnifications and SEM-CL to select adequate grains for He and FT analyses. Preliminary results of this study are discussed, including new thermochronology and geochronology datasets that help elucidating the tectonothermal and morphotectonic history of litho-tectonic blocks on the tectonically active edge adjacent to the ACM at the eastern margin of the Cauca River trough.

STUDY SITE

The Antioquia Central Massif, under study, is located in the Central Cordillera of the Colombian Andes, a transpressional geodynamic environment given by the interaction of the plates of South America, Nazca and the Panama-Choco block.

PROBLEM DEFINITION

Low temperature thermochonology on Mesozoic plutonic masses along vertical profiles in the Cauca River trough may allow the development of more coherent thermotectonic models that explain uplift/exhumation patterns of juxtaposed morphotectonic provinces within the Antioquia Central Massif.

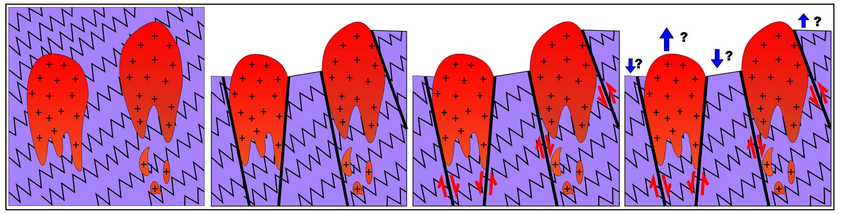
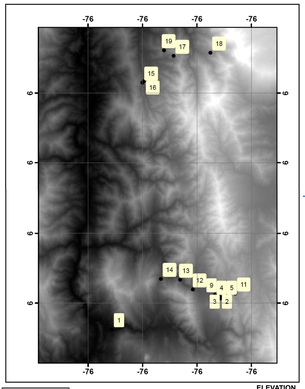
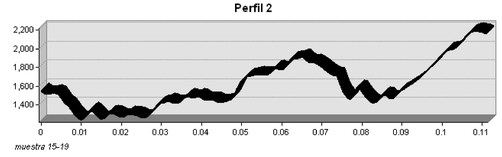
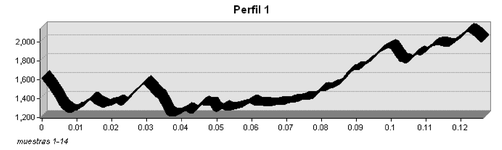


FIG. 02. Changes in the position of the longitudinal profile of a faulting







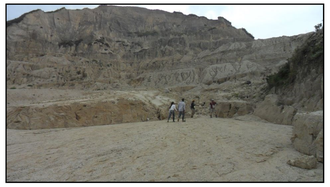
METHODS

Goal:
Introduce the process by which samples of apatite and zircon are prepared for thermochronological studies dating from (U-Th) / He, Ar / Ar, K / Ar and fission track.

Introduction:
The sample preparation process comprises six steps, starting with sample grinding, sieving and washing, density separation, magnetic separation, manual separation and finally assembling.

materials:
Jaw crusher, 300µm, sievedense liquids (organic and inorganic), magnetic separator, Frantz isodynamics, binocular magnifier with magnification of 20 to 80X.

Crushing: This procedure is done ideally with a jaw crusher to try to do the least harm to the material under study.
Sieving: The ideal particle size to be obtained is less than 300 µm to facilitate separation by density, so they must sift the milled material to separate the fraction met.
Density separation: This step can be performed by two methods, the use of trough (or Wilfley table) or the use of heavy liquids, both methods are not exclusive.
Magnetic Separation: Initially magnetite, ilmenite and other magnetic mineral using a common magnet is removed and subsequently separated paramagnetic with a Frantz Isodynamics.
Separation Manual: Manual separation is done with the aim of obtaining the best specimens, the most complete and best size crystals using high magnification loupe to facilitate the work.
Grain assembly: With best mounting separate copies of grains will be further processed and analyzed according to the method to be used.



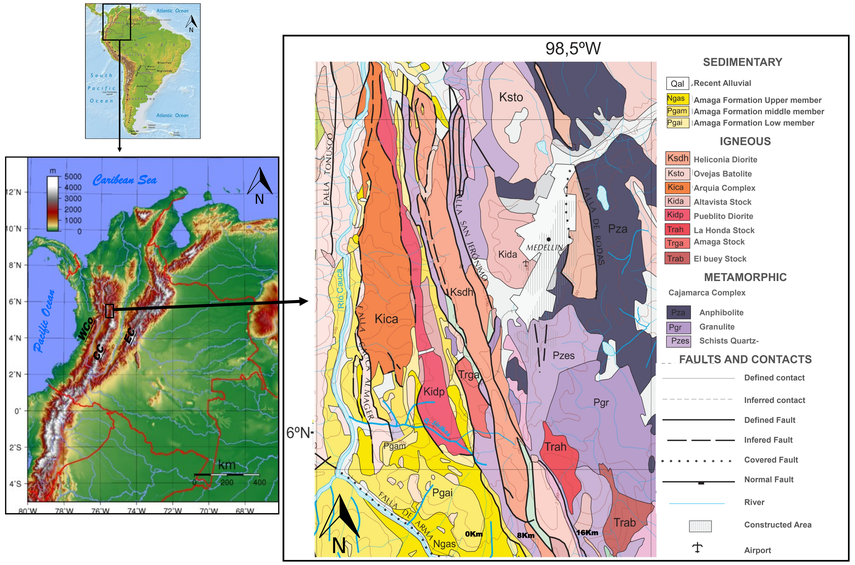
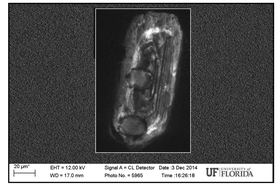
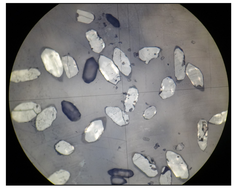
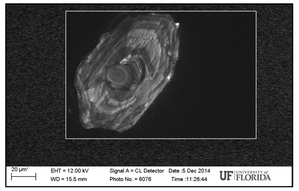


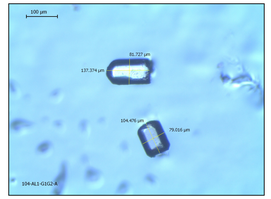
FIG1. Modified of the geological map of Antioquia Ingeominas-1999

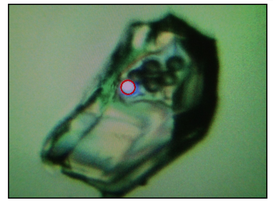
PRELIMINARY RESULTS

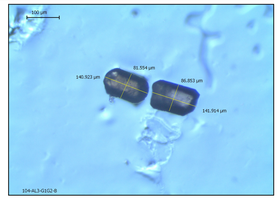












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