

Eocene post-orogenic emplacement of the Santa Marta Batholith by extrusion within an overthickened crust, Sierra Nevada de Santa Marta, Colombia

A. Piraquive^{1,2}, M. Bernet¹, A. Kammer²

¹Institut des Sciences de la Terre, Université Grenoble Alpes, CNRS 1381, rue de la Piscine, 38058 Grenoble Cedex 9, France

²Grupo de Investigación en Geología Estructural y Fracturas Universidad Nacional de Colombia. apartado Aereo, 14490 Bogotá, Colombia

New geo-thermochronological data from the Sierra Nevada de Santa Marta massif (SNSM) from the Northern Andes of Colombia, reveal a magmatic event closely followed by rapid exhumation during the Eocene. Our analysis involves U-Pb geochronology, apatite and zircon fission track, apatite (U-Th)/He dating, from an crustal sequence with an inverted metamorphic gradient, that exposes amphibolite to granulite facies metamorphic rocks (Sevilla Belt), migmatization of this lower crust persisted until c.a 50 Ma. Temperature-time paths evidence that cooling occurred diachronous in the massif through the activation of NW verging shear zones (Sevilla Lineament, Orihueca fault) with the onset of rapid erosional exhumation that occurred immediately after Eocene magmatism under an initially high geothermal gradient of 40°C/km. at elevated rates ~0.9 km/Myr during 50-45 Ma. These rates incremented to 2 km/Myr for the interval 45-40 Ma with a decreasing geothermal gradient of 30°C/km, reaching the highest rates of 2.7 km during 37-35 Myr. We interpret the exhumation of this inverted lower crustal sequence as a consequence of a ductile extrusion within a thickened continental crust, which was assisted by surface denudation. After cessation of magmatism post-Eocene exhumation is evidenced by rapid cooling under a decreased exhumation rate of ~0.2 km/Myr at ca. 25 Ma, related to the onset of a transtensive deformation regime at the southern Caribbean plate boundary. This reorganization led to the activation of crustal structures as the E-W trending Oca (OF) and the NW trending Santa Marta - Bucaramanga (SMBF) faults, and was accompanied by reduced exhumation rates of ~0.09 km/Myr, that persisted until the late Miocene.