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Cretaceous flux-driven anatexis in the Colombian Central Cordillera

David Alejandro Llano-Montenegro[(1)], Mauricio Ibañez-Mejía[(2)], Luz Mary Toro-Toro[(3)],

Luis Carlos Rosero López[(4)]

[(1)] Grupo de Investigaciones en Riesgos, Amenazas y Medio Ambiente (GRAMA), Universidad de Nariño, Pasto, Colombia. [(2)] University of Rochester, Rochester, NY 14620, U.S.A. [(3)] Departamento de Ciencias Geológicas, Universidad de Caldas, Manizales, Colombia. ([(4)] Corporación Autónoma Regional de Nariño (Corponariño), Pasto, Colombia.

The Cocha – Río Téllez Migmatitic Complex (CRTMC) is the southernmost high-grade metamorphic unit in the Colombian Central Cordillera, but its age and origin remains poorly understood. This unit was originally described in Ponce (1979), who ascribed it a Precambrian age and suggested a correlation with the high-grade basement of the Eastern Cordillera (i.e., Garzón Massif). In this work, we use field relationships, petrography, and U-Pb zircon dating by LA-ICP-MS of stromatic migmatite to better understand the age and origin of the CRTMC, and evaluate its tectonic implications. For migmatite characterization the classification of Sawyer (2008) was applied used by the genetic interpretation of partial melting. Our results suggest the studied stromatic migmatites developed through partial melting of an amphibolite protolith, via the melting reaction Hbl + Pl (An25) + Ep ± Cpx + H2O ïƒ Hbl + Cpx + Pl (An17) ±Bt+liquid. Comparison with thermobarometric results from lithologies with similar mineral assemblages suggests that the paleosome was likely formed under conditions ca. 600 – 700° C at <10 kbar, and the melting reaction occurred at ~700 – 750 °C at 8 – 10 kbar (Guilmette et al., 2008). Because amphibole dehydation melting at pressures ~10 kbar occurs at ~ 850 – 900 °C. (Wolf & Wyllie, 1994), infiltration of an aqueous fluid is necessary to induce partial melting at mid-amphibolite facies conditions. Field relationships indicate syn-anatectic deformation of the migmatites. Zircon crystals separated from a migmatite neosome were dated by LA-ICP-MS and yield a mean U-Pb date of 80.73 ± 0.47 Ma. We interpret this as the age of crystallization of the CRTMC migmatites, which presumably approximates the age of the water-fluxed anatexis (Weinberg & Hasalová, 2015) responsible for the widespread development of veined, stromatic metatexites and diatexites at upper amphibolite conditions. Our results demonstrated that the CRTMC does not represent a block of Proterozoic basement exposed in the W flank of the Central Cordillera, but instead that this unit is related to Upper Cretaceous (Campanian) heating and syn-anatectic deformation, presumably related to compressional tectonic events affecting the NW South American margin during this time period.