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Magnetic fabric, petrography and timing of exhumation of the Palmitas protomylonictic granite, Colombian Northern Andes

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The western margin of Pangea contains a series of S-type granites and metagranites with origins related to the formation and disassembly of the supercontinent. The Central Cordillera of Colombia records an alleged syntectonic Permo-Triassic magmatism in western Gondwana through bodies as the Protomylonictic Granite of Palmitas (PGP) (name assigned in this study for the also called Palmitas Granitic Gneiss or Palmitas Orthogneiss). This intrusive may have been deformed by several reactivation periods of the Romeral Fault. This hypothesis is supported by preliminary petrographic observations which have identified solid state deformations and high-temperature recrystallization events in the PGP. However, the origin of the macroscopic and microscopic structures of PGP has not been clearly described and deformational characteristics of this intrusive as the temperature, regime and mechanism of deformation have not been deeply studied. Thereby, an igneous or metamorphic character has not been assigned for the PGG and the probable syntectonic emplacement of this body is yet matter of discussion. In this study, we present new petrographic and magnetic fabric in order to describe the deformational history of the PGP. Our data reflect that the PGP had its origin linked to protoliths of granitic composition. This intrusive was affected by protoclastic deformation which was linked to the Upper-Cretaceous oblique arrival and collision of the Caribbean Large Igneous Providence to the northwestern margin of the South American Plate. This event caused a transpressive or compressional regime with a NW-SE σ1 strain over the Central Cordillera of Colombia, causing solid-state deformation in the PGP. The PGP was subjected to temperatures between ~450ºC and ~550ºC during its solid-state deformation. This range of temperature is coincident with metamorphic facies as upper green schist and lower amphibolite. The intensity of the deformation increases from the eastern to the western part of the PGP, characterizing activity of faults associated with the Romeral Fault System during Maastrichtian times. The time-temperature path is showing a slow continuous cooling from the Late Cretaceous (from about 350°C) to Paleocene-Eocene (to about 240° C) to the present (surface temperatures) together with the Romeral induced-deformation. The age-elevation trend seems to hint a slightly accelerated cooling at around 45 Ma, but cooling rates must have been slow since the Eocene, on the order of 5°C/Myr.