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# QUIG ELASTIC MODELING REVEALS HT/LP METAMORPHIC OVERPRINT IN A RETROGRADED ECLOGITE: AN EXAMPLE FROM WESTERN GONDWANA

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Elastic (physical) geothermobarometry has recently gained prominence as a reliable and powerful technique for estimating the pressure–temperature (P–T) conditions experienced by rocks that have undergone intense retrogression, particularly in high-grade deep crustal environments. This approach relies on the differential elastic behavior between host minerals—such as garnet—and their mineral inclusions—such as quartz—offering a novel and complementary tool in metamorphic petrology to constrain both the conditions under which the rocks originally formed and the subsequent evolution they underwent during exhumation. In this study, are presented unprecedented Quartz-in-Garnet (QuiG) elastic geobarometric data derived from a retrogressed eclogite that was significantly overprinted by subsequent high-temperature metamorphism. This particular rock sample represents a portion of Neoarchean oceanic crust (approximately 2.65 Ga) that experienced metamorphism during the Neoproterozoic (~600 Ma) within the Campo Grande area of the Borborema Province, located in northeastern Brazil. From a detailed analysis of nine quartz inclusions trapped within garnet crystals, we determined residual pressure (Pinc) values ranging from -0.43(5) to -0.36(5) GPa. These notably negative values suggest the presence of a strong tensile stress regime. The studied inclusion population yielded an average residual pressure of -0.41(3) GPa. This observation is interpreted as reflecting an elastic reset of the host-inclusion system, likely triggered by subsequent high-temperature, low-pressure metamorphism that occurred after the rock had already experienced eclogite facies conditions. Using the Equation of State (EoS) for almandine garnet, we calculated the isomeke and determined that the pressure during re-equilibration was approximately 0.59(1) GPa at a temperature of 725 °C, consistent with the observed residual pressure values. These results are in agreement with the presence of orthopyroxene, which had previously been predicted through thermodynamic modeling based on whole-rock chemistry. Thus, the evidence found in this research supports metamorphic conditions typical of the granulite facies, indicated by the breakdown of high-pressure mineral assemblages and the subsequent formation of orthopyroxene. This interpretation is further strengthened by the regional occurrence of kyanite-bearing granulites and sillimanite-bearing metapelites. Moreover, the volumetric response of quartz inclusions to changes in pressure and temperature during exhumation suggests the development of tensile stress fields, likely associated with a thermal pulse during the uplift of this segment of Western Gondwana. In summary, the integration of physical and chemical geothermobarometric methods provides a more comprehensive understanding of the complex metamorphic and geodynamic history recorded in deeply buried, retrogressed rocks from the Neoproterozoic evolution of the Borborema Province in northeastern Brazil.

**PALAVRAS-CHAVE:** ELASTIC GEOBAROMETRY; RAMAN SPECTROSCOPY; BORBOREMA PROVINCE

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