Comparison of single-phase thermobarometers and their application to reconstructing the tectonometamorphic evolution of the Rio San Juan Complex (Dominican Republic)

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Trace element and elastic thermobarometers have recently emerged as powerful and precise methods for reconstructing the *P-T* histories of metamorphic rocks. Among them, the Zr-in-rutile thermometer and quartz-in-garnet (QuiG) barometer can be applied in tandem on coexisting rutile and quartz inclusions in garnet to infer peak metamorphic conditions or, when growth zoning in the garnet is present, a *P-T* history. This approach requires few assumptions about chemical equilibrium, can be applied to a range of lithologies, provides precise –often <20°C and 0.05 GPa– estimates, and can be used in conjunction with multiple chronometers (e.g. U-Pb rutile, Sm-Nd or Lu-Hf garnet). However, use of the Zr-in-rutile thermometer is limited to metamorphic rocks that recrystallized at c. $T >$ 500°C and within the rutile stability field, which precludes its application to many HP/LT rocks found in exhumed subduction terranes. The zircon-in-garnet (ZiG) elastic thermometer stands out as a promising alternative for such samples. We applied the ZiG and Zr-in-rutile thermometers, in addition to the QuiG barometer, to inclusions across a c. 1 cm garnet in an eclogite from the Rio San Juan Complex. Zr-in-rutile thermometry and QuiG barometry predict that the core of the garnet nucleated at c. 570°C, followed by peak metamorphic conditions between 650-680°C. ZiG does not consistently reproduce these estimates. We attribute this discrepancy primarily to uncertainty regarding calculation of entrapment pressure for zircon and the effects of anisotropy.