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Título do Trabalho: Using two-pyroxene mafic granulites to reconstruct ultrahigh-temperatures and the retrograde P-T path of metamorphism in the Socorro-Guaxupé Nappe (Southern Brasília Orogen, SE Brazil)

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Resumo do trabalho:

In the southernmost part of the Southern Brasília Orogen (SE Brazil), regional ultrahigh-temperature metamorphism has been reported mainly in garnet-bearing granulites and (garnet)-orthopyroxene-bearing leucosomes at the base of the Socorro-Guaxupé Nappe, but detailed petrological studies focusing on garnet-absent mafic granulites at the upper crustal levels of this terrain are still scarce and the tectonic setting in which these extreme thermal conditions were attained are still under debate. In this study, we focus on reconstructing the metamorphic P-T paths of (garnet-absent) mafic granulites at intermediate crustal levels of the Socorro-Guaxupé Nappe using petrography, mineral chemical analysis coupled with compositional maps processed in XMapTools, phase diagram modelling with Theriault-Domino and Ti-in-quartz geothermometry. Both samples (a hornblende-bearing mafic granulite and a pargasite-bearing mafic granulite) are composed mostly of Ca-amphiboles, Ca-Mg-clinopyroxene (diopside), Mg-orthopyroxene (enstatite), and Ca-rich plagioclase. The hornblende-bearing mafic granulite has a fine- to medium-grained granoblastic texture with sparse millimetric leucosome patches composed of plagioclase (\pm quartz). In this rock, hornblende (Aliv = \sim 0.1-1.55 c.p.f.u.; TiM2 = \sim 0.07-0.16 c.p.f.u.) dominates, while diopside (En45.5-41Fs16-10Wo48-39), enstatite (En71-64Fs29.5-25; Alvi = \sim 0.02-0.8 c.p.f.u.), and plagioclase (bytownite; An84-76Or1.5-0.1) are less abundant. Pyrite is the only accessory phase. The pargasite-bearing mafic granulite exhibits a well-developed continuous foliation with a fine- to medium-grained nematogranoblastic texture. It is composed of plagioclase (andesine/labradorite; An52-45Or5.5-1), diopside (En37.5-35Fs21-17.5Wo46.5-43.5), enstatite (En56-50Fs45-40; Alvi = \sim 0.03-0.06 c.p.f.u.), and pargasite (Aliv = 1.4-2 c.p.f.u.; TiM2 = 0.23-0.33 c.p.f.u.). Minor occurrences of K-feldspar, quartz (with \sim 65-115 ppm of Ti), biotite, ilmenite, magnetite, apatite, and zircon are also observed. Their main petrographic features are disequilibrium textures such as: partial replacement of previous pyroxenes by amphibole, orthopyroxene lamellae in clinopyroxene, clinopyroxene lamellae in orthopyroxene, magnetite lamellae in ilmenite and possible clinopyroxene + plagioclase intergrowth. Our results (based on phase diagrams coupled with chemical isopleths of Alvi in orthopyroxene and XAnorthite in plagioclase, and geothermometers of Cpx-Opx, Ti-in-amphibole and Ti-in-quartz) indicate that the mafic granulites record peak P-T conditions of \sim 970 °C and 9.0-9.5 kbar (thermobaric ratio of \sim 1078 °C GPa $^{-1}$) and their retrograde paths are characterized by both decompression and cooling, down to \sim 840-850 °C and 5.5-6.0 kbar. Our peak temperature results are consistent with other estimates for granulites and orthopyroxene-bearing leucosomes throughout the nappe, but the (peak) pressure results indicate its decrease towards the structural top. The similarity of retrograde paths throughout the Guaxupé Nappe suggests similar exhumation dynamics at different crustal depths. Furthermore, a prominent decompression vector along with the thermal peak, indicated by intergrowth textures and chemical zoning, coupled with compositional isopleths, suggests regional metamorphism during the continental collision between the Paranapanema and the São Francisco paleoplates.

Palavras-Chave do trabalho: Compositional maps; phase diagram modeling; Socorro-Guaxupé nappe; Ti-in-quartz geothermometry; Ultrahigh-temperature granulites;