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ASSOCIATED A-TYPE SUBALKALINE AND HIGH-K CALC-ALKALINE GRANITES IN THE ITU GRANITE PROVINCE, SE BRAZIL: PETROLOGICAL AND TECTONIC SIGNIFICANCE

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The 590-580 Ma Itu Granite Province (IGP) forms a ~ 60 km large roughly linear belt of granite plutons with minor associated basic rocks extending for some 350 km along the N60E direction in the southern edge of the Apiaí-Guaxupé Terrane (AGT), parallel to the contact with the younger accreted Embu Terrane (Mantiqueira Orogenic System).

Granites showing rapakivi texture (plutons within the Itu and São Francisco batholiths) were given special attention in the literature, but more volumetrically significant are several other compositionally similar subalkaline A-type syenogranites granites where this texture is rare or absent (Atibaia, Capão Bonito; other plutons within Itu and São Francisco) and a distinct suite of monzo- and syenogranites with high-K calc-alkaline signature (Morungaba, Sorocaba, Itupeva pluton from Itu). Volumetrically minor are charnockites (São Francisco Xavier), basic to intermediate rocks (Piracaia Monzodiorite) and evolved granites, which may appear as dikes (topaz granite in São Francisco) or small cupolas next to larger plutons (albite granites from Correas and Itu, bearing Sn and W mineralization).

The IGP was installed in geologic domains that were previously intruded by expressive volumes of 630-600 Ma "syn-orogenic" granites, which formed elongated batholiths of high-K calc-alkaline affinity. The country rocks are high-grade migmatites in the NE domain (Socorro-Guaxupé Nappe, SGN) and medium- to low-grade metamorphic belts in the S-SW (Apiaí and São Roque belts). At least locally a small time gap (~10-15 Ma) seems to have existed between the last "orogenic" granites and the earliest IGP plutons. The emplacement of the latter occurred at shallow-level, implying some previous uplift, and was controlled by subvertical NE-SW strike-slip faulting.

The A-type IGP granites have geochemical features typical of the subalkaline A-type association, such as high HFSE (Nb, Y, Zr) and low Sr abundances, low mg# and moderately fractionated REE patterns with La/Yb(n)= 10-30 and strong negative Eu anomalies. The Sr-Nd isotope data show that the IGP granites have very negative εNd_{590Ma} (-10 to -16) and radiogenic $^{87}Sr/^{86}Sr_{590Ma}$ (0.708-0.718), the least evolved values being observed in plutons intruding the high-grade terranes (SGN). These chemical features point to predominant crustal sources, and magma generation at lower $a(H_2O)$, higher T and lower P as compared to typical crustal melts formed during the orogenic stage. Coeval mantle-derived magmas formed small independent occurrences (the Piracaia Monzodiorite, with a high-K-Ba-Sr chemistry, εNd_{590Ma} = -7 to -10, $^{87}Sr/^{86}Sr_{590Ma}$ = 0.7045-0.7055, indicative of a significant component from the enriched subcontinental lithosphere) and are present in most granite plutons- especially in the high-K calc-alkaline association- as small bodies and mafic microgranular enclaves.

The IGP formation was coeval with younger convergent tectonics between the then recently amalgamated Paranapanema and São Francisco plates and the Mantiqueira Orogenic System, which south of the AGT resulted in the oblique accretion of the Embu Terrane. The shift to shallower depths of granite magma generation and emplacement points to a major reorganization of the continental crust, which was thinned and heated, possibly as a result of the impingement of hot astenosphere at the base of the continental lithosphere.

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