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Granite-lamprophyre petrogenetic connection in the Southern Brazilian Shield - a case study of the post-collisional Lavras do Sul intrusive complex

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The volcanoplutonic center (≈ 604-590 Ma), encompassing the Lavras do Sul intrusive complex and the Hilário trachyandesitic sequence, formed in the western foreland during the post-collisional period of the Dom Feliciano Orogeny (640-620 Ma), Southern Brazilian Shield. Volcanic activity, initially controlled by NW-SE and WNW-ESE-striking dextral transtensive systems, started near the orogenic collapse. The intrusive complex was constructed from the north to the south accompanying slip change along the N70-75°W fault zone cutting it across (from dextral to sinistral). It includes: (1) the subvolcanic Tapera monzonite that was disrupted in the south during episodes of caldera collapse or cauldron subsidence controlled by this fault zone; and (2) the Lavras granite formed during events of resurgence also responsible for the uplift of the chamber marginal facies, represented by the Arroio do Jacques K-Mg-rich monzodiorite - a small body between the two intrusions. The Lavras granite consists of two compositional-structural domains evidenced by AMS petrofabric (anisotropy of magnetic susceptibility), which correspond to the central magnesian terms (granodiorite and monzogranite) and the border ferroan ones (syenogranite and alkali feldspar granite) respectively. Its multistage history involves the central laccolith formed through the emplacement of granodiorite beneath the monzogranite sill and annular intrusions of ferroan granites. The latter was formed during the last magmatic events induced by expansion of the high-level reservoir probably due to recharge with lamprophyric mafic-ultramafic magmas, occurring as WNW-ESE to NW-SE dykes (590 ± 2 Ma) in all granites. Most of these lamprophyres, commonly located near Au±Cu±Ag mesothermal ore occurrences, are potassic rocks (K_2O > 3 wt. % and K_2O/Na_2O = 1 to 3 mol., for MgO > 3 wt. %) varying from typical minette to olivine-rich ultramafic terms. Mafic, amphibole-biotite-bearing terms showing lower K_2O/Na_2O (0.6 to 1.0 mol.) are subordinate. We integrated original and compiled geochemical and Sr-Nd-Pb isotopic data for mafic-intermediate and felsic igneous rocks from the volcanoplutonic center to assess the connection between granites and lamprophyric rocks. Major and trace elements in the latter rocks suggest different enrichment degrees of mantle sources with varied contribution of previous subduction events. Minette and olivine-rich terms have values quite similar of $^{87}Sr/^{86}Sr$ (0.7047 – 0.7050) and variable εNd (-1.2 to -4.3) for an intermediate age of 596 Ma, and distinct Pb_i isotopic ratios with the first showing the lowest value. Trachyandesites show comparable $^{87}Sr/^{86}Sr$ values (0.7046-0.7051), but varied εNd (-1.2 to -9.7) and lower $^{207}Pb/^{204}Pb_i$ and $^{208}Pb/^{204}Pb_i$. K-Mg-rich monzodiorites have εNd and $^{87}Sr/^{86}Sr$ similar to the minette, and show higher Nb/Y, Ta/Yb, Th/La and lower Th/Ta, La/Nb and Ba/La ratios relative to trachyandesites, close to the values of some lamprophyres. Geochemical signatures of the Tapera monzonite and the Lavras granite follow trachyandesites and K-Mg-rich monzodiorites respectively, but most granites show εNd and $^{87}Sr/^{86}Sr$ close to olivine-rich lamprophyres. Together Sr-Nd-Pb isotopic and geochemical data reinforce the increasing contribution of lamprophyric mafic-ultramafic magmas or their derivatives during the development of the post-collisional volcanoplutonic center. The crustal contribution apparently more important in relatively early magmatic episodes can be ascribed to processes occurring along the magma-mush