PT.007

SOURCES OF NEOPROTEROZOIC GRANITE MAGMAS IN THE EMBU TERRANE, CENTRAL RIBEIRA BELT, BRAZIL: CONSTRAINTS FROM GEOCHEMISTRY AND SR-ND-PB ISOTOPES

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Neoproterozoic granites forming isolated plutons and some large batholiths are widespread in the Embu Terrane (central Ribeira Belt, SE Brazil). Although covering a wide timespan (780-580 Ma), most occurrences were formed in a short interval at the end of this period (600-580 Ma), with scattered manifestations dated at ~ 780-750 Ma (small occurrences of orthogneiss), ~ 680 Ma (Serra do Quebra Cangalha Batholith) and ~ 640 Ma (Santa Catarina Granite). In spite of the several episodes of granite generation, their compositions are mostly restricted to two main rock types, slightly metaluminous Bt monzogranites and peraluminousTur±Grt+Bt+Ms leucogranites. A single main pluton of basic to intermediate composition is known (the Aparecida Monzonite), and fine-grained magmatic enclaves, present in only a few Bt monzogranites, are of felsic composition [1]. Therefore, mantle contribution should have been minor, and the granites are mostly products of crust reworking.The exposed granite country rocks of the Embu Terrane comprise dominantly medium-grade metavolcano-sedimentary sequences and a few small windows of gneiss-migmatite basement. Recent U-Pb dating indicates that the main basement exposure (Rio Capivari Complex) corresponds to Paleoproterozoic (~2.2 Ga) migmatites reworking Archean (~2.7 Ga) crust. The age of the supracrustal sequences is poorly constrained between ~1.8 Ga (youngest detrital zircons in metasandstones and Nd T_{DM} of metapelites) and ~0.78 Ga (age of intrusive orthogneisses). Sr-Nd-Pb isotope signatures of the granites allow identification of some key characteristics of their magma sources. Many ~600-580 Ma plutons show similar $^{87}Sr/^{86}Sr_{(t)}$ (0.7107 to 0.7132) but important variations in $\epsilon Nd_{(t)}$ (from -12 to -18, with less negative values in the Bt monzogranites). More radiogenic $^{87}Sr/^{86}Sr_{(t)}$ (0.7163-0.7276) and less negative $\epsilon Nd_{(t)}$ (-7.3 to -12) are typical of granites from the Lagoinha and Serra do Quebra-Cangalha batholiths. Pb isotopes from Bt monzogranites show retarded common Pb signatures (model ages from 550 to 600 Ma), suggestive of the contribution of unradiogenic sources and consistent with the extraction from a crustal reservoir with $^{238}U/^{204}Pb$ (μ) ~8.75 and time-integrated U/Th (κ) ratios close to 4.9. Bt-Ms leucogranites show much younger model ages suggestive of an extensive contribution of highly radiogenic material, most likely metasediments, as indicated by higher μ and lower κ ratios (~9.0 and 4.0, respectively). These signatures allow identify four major reservoirs, that may be predominant in a single granite occurrence or be a component in mixing processes: 1) a young upper crust of low κ with radiogenic Pb, high $^{87}Sr/^{86}Sr_{(t)}$ and $\epsilon Nd_{(t)}$ (Serra do Quebra Cangalha); 2) a young lower crust and/or old upper crust + juvenile component with high κ and relatively unradiogenic Pb (Santa Catarina pluton); 3) an old upper crust with low κ, radiogenic Pb and low ϵNd_t (Ms-Bt granites); and 4) an intermediate old lower crust with high κ, non-radiogenic Pb, and intermediate ϵNd_t (Bt granites).

[1] Alves et al., 2009. JPet. 50, 2221-2247)