THE RELATIONSHIPS BETWEEN CHARNOCKITES AND ASSOCIATED GRANITOIDS OF RIBEIRA BELT: THEIR AGES AND ORIGINS.

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Ribeira and Araçuaí fold belts (Brasiliano - Pan-African Orogeny) of SE Brazil constitute complex transpressional orogenic segments with strong strain partitioning into deep dextral shear zones which separate their main tectonic zones; deformation, high-grade metamorphism (750 – 850 ºC; 5 – 9 kb) and (granite/granodiorite) magmatic activity lasted from about 670 Ma to 480 Ma. Extensive "granitization" and widespread occurrence of charnockites are typical characteristics of these fold belts. Charnockites include both magmatic charnockite (plutonic, sometimes pegmatitic) intrusive bodies and metamorphic charnockites (ranging from massive types to local "arrested charnockites") that are typically associated with aplite dikes within orthogneisses/granitoids; granite – charnockite boundaries are often subtle, reflecting the gradational nature of the contact. Charnockite mineralogy is similar to that of their associated granitoid rocks, except for ubiquitous orthopyroxene ± clinopyroxene ± garnet which seem to have resulted from dehydration melting of primary biotite + amphibole bearing granite/granodioritic assemblages at peak metamorphic conditions.

This paper addresses chronological and genetic relationships among charnockites, associated aplites and their (granitoid) "host" rocks; it is also our aim to explore the rationale for pervasive charnockite development in Ribeira and Araçuaí fold belts.

SHRIMP U-Pb zircon ages are reported for a suite of charnockite, aplite dikes, granitoids and meta-gabbros (amphiblites) from representative sites within the Ribeira and Araçuaí fold belts. Charnockite, aplite and orthogneiss from Paraibuna provided zircon ages of 571± 20 Ma, 576±16 Ma and 584±13 Ma, respectively. "Arrested charnockites" and their "hosting" orthogneisses, from Ubatuba (Promirim beach) and Parati, yielded ages of 577±32 Ma, 567±27 Ma and 569±17 Ma, 563±34 Ma, respectively, whereas "massive charnockite" and associated aplite dikes from São Fidelis were dated at 575±15 Ma and 561±15 Ma. Charnockite zircons from Italva area yielded an age of 570±7 Ma. In addition, primary igneous zircons from Três-Rios amphibolites were dated at 612±7 Ma.

Ubatuba-Paraibuna charnockites have high initial $^{87}Sr/^{86}Sr$ (~0.7111) and negative ε_{Nd} (t_0) values (–6.1 to –11.0), indicating a crustal origin for these rocks. Also, the whole of U-Pb zircon dates converge to a weighted mean age = 572±9 Ma (2σ), suggesting that very high-grade metamorphism, lower/middle crust partial melting and related charnockite development were contemporaneous over large areas within the Ribeira and Araçuaí fold belts. Additionally, multi-system thermochronological analyses indicate that, (after the thermal peak at ~570 Ma) Ribeira-Araçuaí rocks were sustained at high temperatures (≥ 650 - 700 ºC) for more than 50 Ma. Thus, it is suggested that (post-collision) early lithospheric detachment and related mantle derived mafic magma underplating (~ 610 Ma), along with large-scale incubation of high-heat element productive granitic lithotypes, provided the necessary heat flux to sustain the observed long-term high, continental, geothermal regime. These conditions were likely to promote (late) H_2O-undersaturated middle/lower crustal recrystallization/melting leading to widespread charnockite development, coeval with regional aplitic intrusions.