Rhyacian A-type tholeiitic granites in southern Brazil: geochemistry, U-Pb zircon ages and Nd model ages

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ABSTRACT: In southern South American platform, Siderian-Rhyacian terranes, probably related to Atlantica supercontinent, occur mainly as minor reworked cratonic masses within Neoproterozoic, Brasiliano/Pan-African orogenic belts, as the Ribeira Belt in southern Brazil. The dispersion of such fragments has generated uncertainties about their geotectonic reconstruction, and their study has been supported mainly by elemental and isotope geochemistry. The southern Ribeira Belt lies between the Paranapanema and Luiz Alves cratons and contains reworked Neoarquean and Paleoproterozoic terranes which outcrop as basement nuclei in supracrustal sequences, as the Setuva Complex. The Água Comprida Suite (ACS) situated in the northern part of the Setuva Complex, consists of amphibole-biotite syenogranite (ABS), porphyritic biotite syenogranite (PBS), and equigranular biotite syenogranite (EBS). All granites are foliated and intensively deformed. The oldest foliation (S_n) is marked by augen feldspars set in a recrystallized matrix, followed by a crenulation cleavage (S_{n+1}) which evolves to discrete shear zones. ABS is a metaluminous, reduced A-type granite with $FeO_t/(FeO_t+MgO)$ >0.9, high HFSE and REE contents, corresponding to magmas related to continental medium to high-K tholeiitic series. BPS, and specially BES, are highly differentiated, metaluminous to peraluminous (BES), oxidized granites. Increase of Al_2O_3 and Rb, and decrease of HFS and RE elements relative to ABS indicate their evolution from tholeiitic magmas. ACS granites are cogenetic rocks evolving from a within-plate mantle source, marked by high Nb, Ta, and Y. The influence of previously metasomatised mantle sources is evidenced in negative Nb, Ti, and P anomalies. The U-Pb (zircon) age of ABS is 2187 ± 26 Ma, and of BPS is between 2180 ± 13 to 2186 ± 22 Ma. Nd model age of 2.41 Ga, and εNd (2.18Ga) between -0.23 to -0.27 support that ABS formed from a juvenile material with minor crustal component. The deviation of εNd (2.18Ga) for BPS and BES (-0.69 to -2.65), plus the higher Nd model ages (2.41 to 2.52 Ga) suggest crustal contamination. The post-collisional environment is suggested for the interaction of the mafic tholeiitic and felsic crustal magmas for the formation of ACS, based mainly on geochemical features of these magmas. Post-collisional environments are not yet described in the Rhyacian orogenies of southern Brazil, and this proposition can be an important contribution for the study of the final period of amalgamation of the Paleoproterozoic supercontinent in southern South America.

KEY-WORDS: HIGH-K THOLEIITIC GRANITES; PALEOPROTEROZOIC GRANITIC MAGMATISM; A-TYPE THOLEIITIC GRANITES; A2-TYPE GRANITES; POST-COLLISIONAL MAGMATISM