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DIVERSITY, ORIGIN AND TECTONIC SIGNIFICANCE OF THE MESOARCHEAN GRANITOIDS OF OURILÂNDIA DO NORTE, CARAJÁS PROVINCE (BRAZIL)

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Abstract:

This study investigates the diversity, origin and tectonic significance of the Ourilândia do Norte Mesoarchean granitoids, emplaced near Rio Maria-Carajás domains boundary, southeastern Amazonian Craton (Brazil). In this area, previous works has identified sanukitoids (~ 2.87 Ga), (quartz) diorites of BADR affinity and undifferentiated leucogranites, with charnockites cross-cutting the other granitoids. New geological mapping data allowed to differentiate three new groups of granitoids: (i) biotite monzogranites (BMzG); (ii) epidote-biotite granodiorites (EBGd); and (iii) porphyritic granitoids (pGrt). Thus, this paper aims to define their classification, nature, formation processes and deformation aspects, and discuss the relations between plutonism and deformation for the Ourilandia do Norte granitoids. The petrographic data showed that each one of these groups can be subdivided into two facies. The BMzG is differentiated into equigranular (eBMzG) and heterogranular (hBMzG) and the EBGd into heterogranular (hEBGd) and sparsely porphyritic (spTEBGd). These granitoids constitute two batholiths separated by a rock strip of sanukitoid and BADR affinities. Both are largely dominated by BMzG rocks, with less abundant EBGd lenses. The pGrt is individualized in porphyritic granodiorites (pBHGd) and trondhjemites (pEBTd), which occur as smaller bodies. Structurally, the central portions these plutons represent lower strain domains, while their borders are marked by large-scale shear zones, where occur submagmatic and mylonitic fabrics of ENE-WSW main direction and subvertical dip, respectively. The meso- and microstructural data indicate that the rocks studied are syn- to late-tectonic and were affected by high temperature deformation (> 500 °C) and low differential stress, in a sinistral transpression regime, indicating that both fabrics are related to the a same deformational event. Geochemically, except the pEBTd facies that has sodic affinity, the Ourilândia do Norte granitoids can be grouped into two suites: (i) Fe-K suite formed by BMzG and spTEBGd; and (ii) Mg-K suite composed of sanukitoids (including hEBGd and pBHGd) and (quartz) diorites of BADR affinity. The origin of the eBMzG is attributed to anatexis of a 2.92-2.98 Ga old TTG crust. The hEBGd has sanukitoid affinity and was produced by intense fractionation of hornblende ± clinopyroxene from the Rio Maria Granodiorite. The granitoids of spTEBGd, hBMzG, pBHGd and pEBTd facies show mingling evidence between contrasting magmas, indicating that their origins require interaction between metassomatized mantle- and crustal derived magmas. Geochemical data and modeling were used to identify their different formation processes: (i) spTEBGd is enriched in HFSE (Ti, Zr and Y) and LILE (Ba and Sr) and it was interpreted as product of the partial melting of an enriched mantle source, with participation of crustal liquids; (ii) hBMzG is generated by the interaction between spTEBGd (60%) and eBMzG (40%) magmas; (iii) pBHGd by hybridization between sanukitoid (80%) and eBMzG (20 %); and (iv) pEBTd by mixture between trondhjemitic (70-80%) and BARD-affinity (20-30%) liquids. Therefore, at ~2.87-2.86 Ga a significant crustal growth and reworking occurred in the final stages of stabilization of the first geotectonic cycle of Carajás province, where all the Ourilândia do Norte Mesoarchean granitoids were emplacement during the second stage of a tectono-magmatic two-stage (subduction-collision) model: (i) first stage (2.98-2.92 Ga) - low-angle subduction with emplacement of slab-melt and mantle wedge metasomatism; (ii) second stage (~ 2.87-2.86 Ga) - collisional environment, where shear zones conditioned the rise and emplacement of the Ourilândia do Norte magmas.

Keywords: Geochemistry; Microstructural; Granitoids; Archean; Carajás province.

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