THE RONDONIAN-SAN IGNACIO PROVINCE IN RONDÔNIA REGION, BRAZIL: A REVIEW

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INTRODUCTION

The Rondonian-San Ignacio Province (RSIP) is a 1500-1300 Ma multi-orogen region that occurs in the southwestern part of the Amazonian Craton, and characterized by the collisional-type orogeny bearing the same name (Tassinari et al., 2000; Cordani and Teixeira, 2007). In the Rondônia region the RSIP includes several geological units. Some of them are grouped into major units as the Alto Guaporé Belt (Quadros and Rizzotto, 2007) and the Pacaás Novos domain. The spatial and temporal distributions of these units are shown in Fig. 1.

The controversial boundary between the RSIP and Rio Negro-Juruena Province (RNJP) was earlier inferred based on Rb-Sr and K-Ar ages (Cordani et al., 1979; Teixeira et al., 1989) and U-Pb zircon ages (Tassinari, 1996). Recently, Cordani and Teixiera (2007) re-evaluate the controversial limit based on Ar-Ar ages. In this paper we presents the geological units os the RSIP and assumes an roughly E-W boundary traced at the north of Porto Velho city, mostly based on the spatial distribution of the geological units and Ar-Ar and U-Pb ages (Fig. 1).

ANOROGENIC SUITES

In the Rondônia region, the Rio Crespo Intrusive Suite (ca. 1500 Ma; Bettencourt ey al., 2006) is the oldest geologic unit of the RSIP. This unit forms elongated E-W area across the central Rondônia, roughly constrained by longitudes 62° W and 68° W. The eastern extension of the unit is poorly known, and it possible western continuity into Bolivian territory, where a substancial part of the suite is hidden beneath the Phanerozoic sediments, deserves further investigations (Fig. 1).

The Rio Crespo Intrusive Suite (Payolla et al., 2001) is represented by pink or greenish, fine- to medium-grained, quartz-feldspathic banded gneisses showing amphibole to granulite metamorphic facies. Banding is defined by alternating quartz-feldspatic layers and mafic discontinuous layers, and enhanced by concordant, locally folded granitic veins. Preliminary geochemical data indicates that these rocks are characterized by strong iron enrichment, have metaluminous to marginally peraluminous compositions, and exhibit a high- to ultra-high-K signature (Payolla et al., 2002). Their trace element contents are comparable to the Phanerozoic A-type and within plate granites. The positive ε_{Nd} (+1.0 and +1.8) and the narrow range of T_{DM} (1.73 to 1.75 Ga) of these rocks suggest that they represent younger juvenile material with minor older crustal source contributions (Payolla et al., 2002; Bettencourt et al. 2006).

The Santo Antônio Intrusive Suite (c.a. 1400 to 1360 Ma; Bettencourt et al. 1999; Quadros e Rizzotto 2007), along with the Teotônio Intrusive Suite, forms the composite Santo Antônio batholiths in the northern part of the Rondônia (Fig. 1). This batholith covers an area of ca. 2000 km2, but its true dimensions are unknown because the northern domain is overlain by Phanerozoic continental sediments of the Amazon basin.

The Santo Antônio Intrusive Suite is composed of three granitoid varieties: coarse-grained seriate to locally porphyritic monzogranite and syenogranite with sparse anti-rapakivi and rapakivi textures and intersticial drop quartz; fine-grained equigranular quartz monzonite; and medium-grained equigranular monzogranite. Hybrid rocks dykes, as well as minor synplutonic diabase dykes emplaced in partially molten host granitoids, provide evidence for bimodal magmatism (Payolla, 1994). Geochemically the granitoids exhibit the characteristics of A-type (A_2 group) and within-plates granites. They are subalkaline and marginally peralumious with high K/Na, Fe/Mg and Ga/Al.

The Teotônio Intrusive Suite (c.a. 1387 Ma; Bettencourt et al., 1999) apparently forms a minor part of the Santo Antônio batholiths at the present level of erosion (Fig. 1). The rocks of this suite were described by Payolla (1994) in the Teotônio cataract area. Major units are massive coarse-grained alkali-feldspar granite, banded medium-grained alkali-feldspar granite and pink coarse- to medium-grained quartz alkali-feldspar syenite with less common alkali-feldspar granite and syenogranite. Sparse fayalite-clinopyroxene alkali-feldspar syenite dykes and syn-plutonic diorite, monzodiorite and monzonite dikes cut the granites and syenogranites. Fine-grained syenogranite and monzogranite dykes cut the early rocks. The rocks define an alkaline silica-oversaturated series with strong iron enrichment. The syenites and granites are metaluminous rocks with chemical characteristics of within-plate and A-type (A_1 group) Phanerozoic granites.

ALTO GUAPORÉ BELT

The Alto Guaporé Belt is an elongate WNW-ESE area (ca. 400 x 100 km) situated at S and SE of Rondônia region, along the right bank of the Guaporé river. More specifically it occurs, at north, between the Nova Brasilândia Terrane (SP) and RNJP and, at south, the Paraguá Terrane, and comprises at least five units: Trincheira Mafic-Ultramafic Complex, Colorado Complex, Serra do Colorado Intrusive Suite, Igarapé Enganado Intrusive Suite, and Alto Escondido Intrusive Suite.

The Trincheira Mafic-Ultramafic Complex (unknown age) consists mostly of banded amphibolite, metagabbro, amphibolitic gneiss, metapyroxenite, metabasalt, and serpentinite. Preliminary geochemical data suggest that amphibolites and metagabbros show characteristics of N-MORB (Rizzotto and Quadros, 2007), although some samples exhibit compositional ranges of Nd and Sr isotopes that match oceanic arc basalts (Girardi et al., 2008).

The Colorado Complex is a metasedimentary sequence composed by paragneiss, pelitic schist, calc-silicate gneiss, para-amphibolite, and BIF. The protolith of paragneiss and pelitic schist are interpreted as turbiditic sequence deposited at passive margin basin (Quadros and Rizzotto, 2007). Paleoproterozoic and Mesoproterozoic detrital and metamorphic zircon ages bracket deposition of the original sediments of paragneiss between 1420 and 1340 Ma (Rizzotto and Quadros, 2007).

The Serra do Colorado Intrusive Suite comprises layered mafic-ultramafic complexes, which are intrusive in the Trincheira and Colorado complexes, and made of metagabbro, metagabbronorite, anorthosite, hornblendite, and serpentinite (Quadros and Rizzotto, 2007; Rizzotto and Quadros, 2007). A sample of metagabbro yields crystallization age of 1352 Ma, and shows geochemical and radiogenic isotope features of N-MORB and OAB (Rizzotto et al., 2002; Teixeira et al., 2006; Girardi et al., 2008).

The Igarapé Enganado Intrusive Suite includes mainly syenogranite, monzogranite, and granodiorite, and rare tonalite, gabbro, and hybrid rock. The suite is intrusive in the supracrustal rocks of the Colorado complex, and show normally magmatic and/or metamorphic foliation (Quadros and Rizzotto, 2007). A foliated monzogranite and syenogranite provides a similar crystallization age of 1340 Ma, and the samples give positive ε_{Nd} values of +2.8 and +2.3, respectively (Rizzotto and Quadros, 2007). The rocks have metaluminous character and high-K calc-alkaline affinities, and the granites show trace elements similarities of post-collisional granites (Rizzotto and Quadros, 2007).

The Alto Escondido Intrusive Suite is composed by monzogranite and syenogranite, and is intrusive in the Trincheira and Colorado complex, as well as in the Igarapé Enganado intrusive suite (Quadros and Rizzotto, 2007). A sample of syenogranite gives crystallization age of 1336 Ma, and positive ε_{Nd} value of +2.0 (Rizzotto and Quadros, 2007). The rocks are marginally peraluminous to metaluminous, and exhibit high-K calc-alkaline affinities, and trace elements similarities of post-collisional granites (Rizzotto and Quadros, 2007).

PACÁAS NOVOS DOMAIN

The Pacaás Novos domain is situated at west-central part of the Rondônia region, and its extension to Bolivian territories is uncertain (Fig. 1). The domain is defined here to group at least the Nova Mamoré Metamorphic Suite and Alto Candeias Intrusive Suite. At south, it is limited by Nova Brasilândia Terrane (SP), and to the north it is inferred to include scattered occurrences of both units.

The Nova Mamoré Metamorphic Suite is a metasedimentary sequence. It shows geological similarities with the Colorado Complex of the Alto Guaporé Belt. The suite is composed by migmatitic paragneiss (pelitic and psamitic gneisses), calc-silicate gneiss and granofels, and pelitic schist. The protolith of paragneiss and pelitic schist are interpreted as turbiditic sequence deposited at passive margin basin (Quadros and Rizzotto, 2007). Detrital zircons range in age between 2000 and 1532 Ma, and metamorphic zircons yield an age of 1345 Ma. They constrain deposition of the sedimentary protoliths to be younger than 1532 Ma and older than 1345 Ma (Rizzotto and Quadros, 2007).

The Alto Candeias Intrusive Suite is largely composed of coarse- to medium-grained porphyritic granites and pyterlites, with lesser amounts of porphyritic charnockites, medium- to fine-grained equigranular granite and syenite (Bettencourt et al., 1997). Three samples of the granites provide intrusion ages between 1346 and 1338 Ma (Bettencourt et al., 1999; Santos et al., 2008).

POST-TECTONIC SUITE

The São Lourenço-Caripunas Itrusive Suite consists of normal rapakivi granite varieties, such as pyterlite and minor wiborgite, along with associated porphyritic and equigranular granites and subvolcanic and volcanic felsic rocks (Bettencourt et al., 1997). Two samples of granites and one sample of rhyolite porphyry analysed by Bettencourt et al., (1999) yield intrusion ages between 1314 and 1309 Ma. The rocks are subalkaline, metaluminous to marginally peraluminous, and show strong iron enrichment. They have A-type and within plate granite trace elements signatures (Bettencourt et al., 1997).

METAMORPHISM

Geochronological and petrological studies demonstrate that high-grade tectonometamorphic episode related to Rondonian-San Ignacio orogeny affected the Rondônia region at 1350-1320 Ma (Bettencourt et al., 2006; Quadros and Rizzotto, 2007; Payolla et al., 2002; Santos et al., 2008; Silva et al., 2002; Tassinari et al., 1999). This episode is characterized by critical metamorphic mineral assemblages and anatexis, which are suggestive of upper-amphibolite to granulite metamorphism, and is widespread developed in the supracrustal rocks of Colorado Complex and Nova Mamoré Metamorphic Suite (Quadros and Rizzotto, 2007; Rizzotto and Quadros, 2007). The tectonometamorphic imprint over rocks of the Rio Crespo Intrusive Suite and the RNJP is reported in the Ji-Paraná and Ariquemes region (Bettencourt et al., 2006; Payolla et al., 2002, Santos et al., 2008; Scandolara, 2006; Silva et al., 2002; Tohver et al., 2005).

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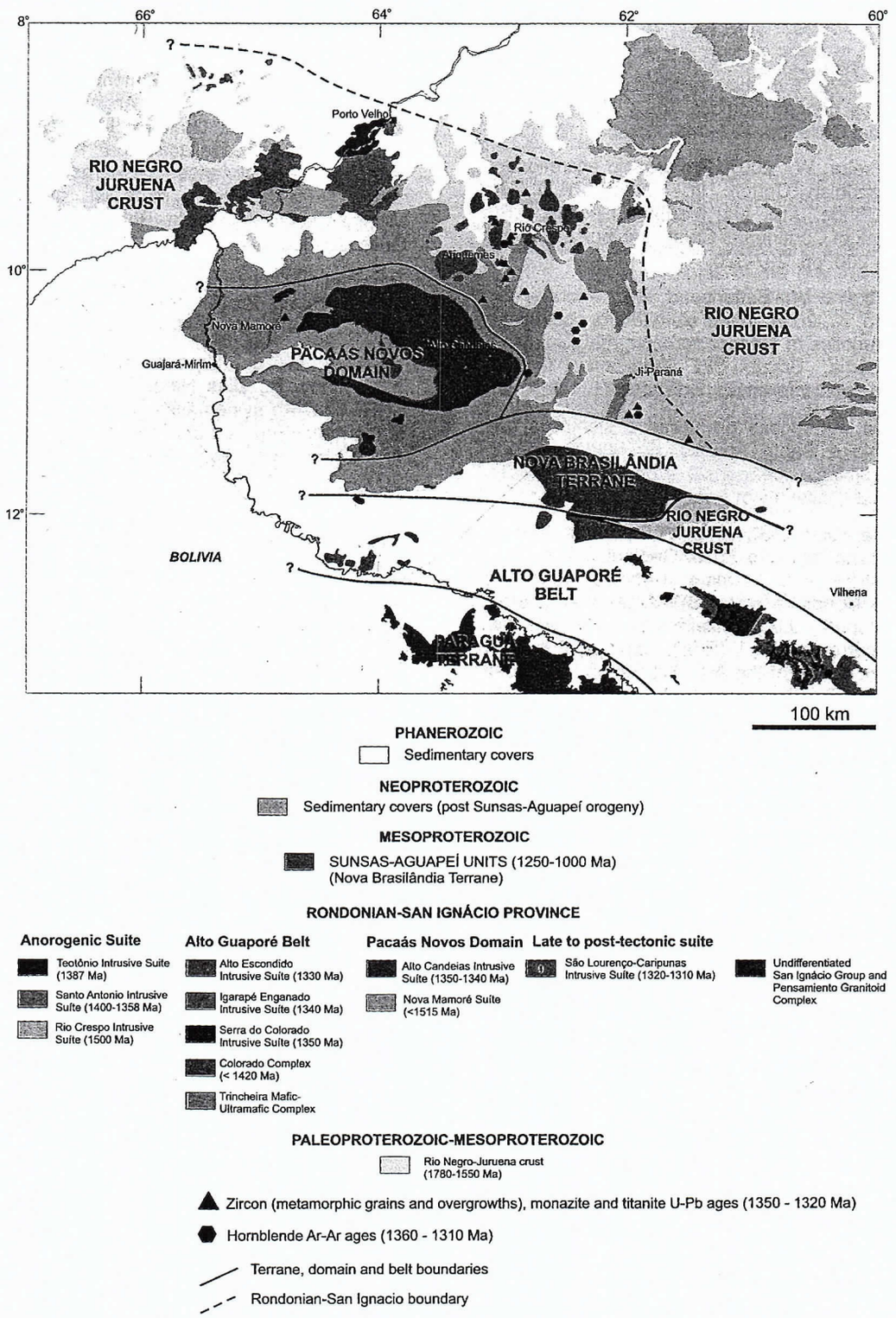

Figure 1. Simplified geological map of the Rondônia region, SW Amazonian Craton, showing geological units and tectonic subdivision.