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**U/Pb (conventional and SHRIMP) and Sm/Nd constrains on granitoids from westernmost sector of Mato Grosso State, SW Amazonian craton: A probable extention of the Paráua Terrane of Bolívia into the Brazilian territory.**

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### Introduction

The Paleo- and Mesoproterozoic framework of SW Amazonian craton have been grouped into the Rio Negro/Juruena, Rondonian/San Ignácio and Sunsás/Aguapeí Geochronologic Provinces, as the result of regional geochronological studies (Cordani et al., 1979, Tassinari 1981, Tassinari & Macambira, 1990). It has been possible to identify, due to more detailed studies, distinct orogenic belts (Figura 1) within each of these provinces. Within the Rio Negro/Juruena Province, juvenile accretions comprised the Alto Jauru orogen (1.79-1.74 Ga) and Cachoeirinha orogen (1.58-1.52 Ga) were identified (Van Schmus et al., 1999; Geraldes et al., 2001, respectively). Within the Rondonian/San Ignácio, the Rio Alegre orogen (1.51-1.50 Ga) and the Santa Helena orogen (1.45-1.42 Ga) province have been identified (Geraldes et al., 2001; Matos et al., this volume, respectively). Within the Sunsás/Aguapeí Province, the Nova Brazilândia orogen (1.15-1.10 Ga), the Sunsás orogen (ca. 1.00 Ga) and the Aguapeí orogen (1.00-0.97 Ga) have been identified (Rizzotto, 1992; Litherland et al., 1986; Geraldes et al., 1987, respectively).

Mesoproterozoic terranes of the Rondoniano/San Ignácio Province are also reported in Bolívia, where schists, gneisses and granulites crop out (Litherland et al., 1986). These rocks are interpreted as belonging to the Paráua Terrane, with rocks formed during the San Ignácio cycle, and comprise sin-kinematic granitoids with Rb/Sr ages from 1375 Ma to 1290 Ma,  $T_{DM}$  ages from 1.99 Ga and 1.09 Ga and  $\epsilon_{Nd(t)}$  values slightly negative (Darbyshire, 1979 and 2000). Post-kinematic granitoids yielded Rb/Sr ages from 1286 Ma and 1283 Ma,  $T_{DM}$  ages from 1.73 Ga to 1.69 Ga and  $\epsilon_{Nd(t)}$  from 1.4 Ga and 1.0 Ga (Darbyshire, 1979, 2000). In addition, the El Tigre alkaline complex signals the final pulse of the San Ignácio orogen. Its rocks yielded Rb/Sr age of 1286 Ma,  $T_{DM}$  of 1.88 Ga e  $\epsilon_{Nd(t)} = 0.9$  (Darbyshire, 1979, 2000). The rocks originated during the San Ignácio event were interpreted by Saes e Fragozo Cesar (1996) as formed in a magmatic arc setting, due to the presence of calc-alkaline granitoids. The granulitic rocks of the Paráua terrane are interpreted as regional basement, and their Rb/Sr age are ca. 1.90 Ga (Litherland et al., 1986).

The possible extension of the Paráua Terrane in the Brazilian territory may be observed in the westernmost sector of the Mato Grosso State. Granitic rocks crop out to the west of the Rio Alegre valley, where Matos & Schorscher (1997) identified shear and fault zones, interpreted as the probable limit between the Rio Alegre and the Paráua orogenic rocks. The objective of this work is to present the geochronology of granitic rocks from this area, using isotope dilution and SHRIMP U/Pb methodologies in zircon, as well as Sm/Nd in whole rock. The results allow to define a possible correlation between these group of rocks and the rocks described in the Paráua Terrane. Tectonic implications of this correlation are also discussed.

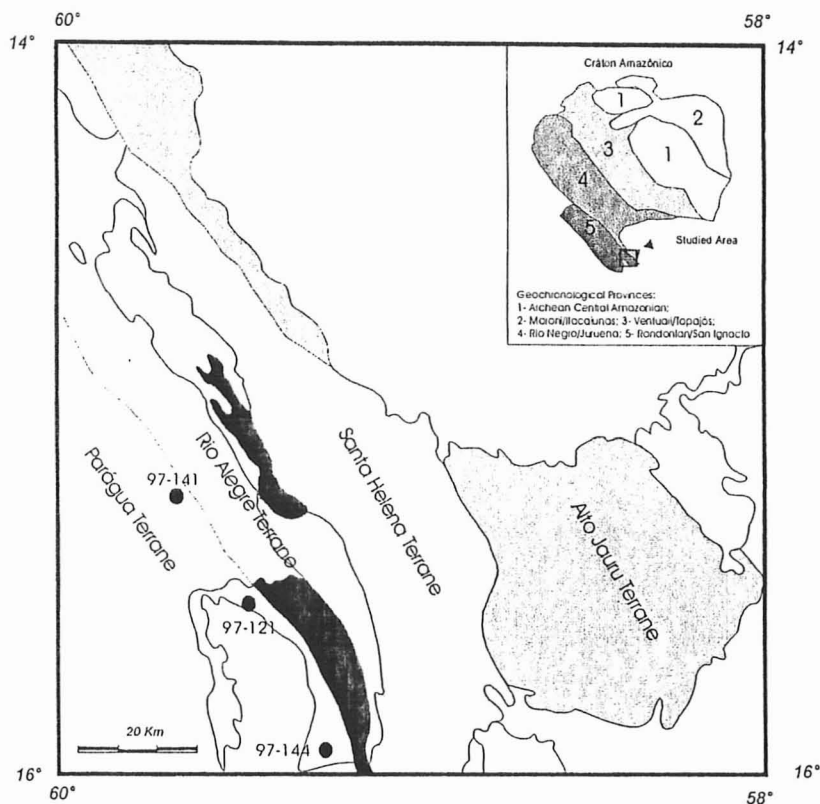


Figura 1. Location of the Mesoproterozoic accretionary terranes in SW Mato Grosso State, SW Amazonian craton. The sampling locations are plotted as full dots.

### Samples Description and U/Pb and Sm/Nd results

The U/Pb isotopic dilution and Sm/Nd analysis were carried out in the Isotope Laboratory, at the University of Kansas (USA). SHRIMP analysis were carried out in the Australian National University (Canberra, Australia). The sampling locations are presented in Figure 1.

The Aguapeí tonalite occurs along the Aguapeí river. Gnaissic rocks with tonalitic to trondhjemitic composition are coarse-grained gray to green rocks. The complex relationships shown with amphibolitic rocks are due to shear deformation (Pinho, 1990). However, isotropic monzonitic rocks are also present probably as a result of partial local tonalite melt.

From a foliated tonalite (sample 97-121) 4 monocrystal U/Pb isotope dilution zircon analysis were obtained which, when plotted in the concordia diagram, yielded an upper intercept age of  $1383 \pm 40$  Ma (Figure 2.A). All the analysis are concordant, but they define a spread on the concordia line, which may be interpreted as due to the resetting of the U and Pb isotopes during the metamorphic event responsible for the deformation of the tonalite and local melting.

SHRIMP analysis on zircons of the same tonalite sample (Figure 2.B) yielded an age of  $1383 \pm 33$  Ma. There is similarly a distribution of analytical points, probably as the result of a resetting process, coherent with the U/Pb isotope dilution results, and may be

interpreted as the minimum crystallization age of the tonalite. A Sm/Nd analysis indicates  $T_{DM}$  age = 1.52 Ga and  $\epsilon_{Nd(t)}$  value of +3.6, suggesting a mantle-derived origin for this rock.

A granodiorite sample (97-142) was collected westward of the Rio Alegre Terrane (see Figure 2). The rock is pink, coarse-grained, and the major minerals are plagioclase, K-feldspar, quartz and amphibole. No foliation is observed in this rock, and the U/Pb isotope dilution analysis carried out in zircon monocrystals (6 points) yielded an age of  $1412 \pm 21$  Ma, interpreted as the crystallization age of the rock (Figure 2.C). Sm/Nd analysis indicates  $T_{DM}$  age = 1.58 Ga and  $\epsilon_{Nd(T)}$  value of +3.6, suggesting a mantle-derived origin for this rock.

The third sample collected is a fine-grained gray foliated granite. The geologic map carried out by Matos e Ruiz (1992) indicates that this granite is partially covered by the Quaternary sediments of the Pantanal Formation. Four U/Pb isotope dilution analysis on zircon monocrystals (4 points) yielded two upper intercept ages of  $1310 \pm 34$  Ma and  $1608 \pm 200$  Ma (Figure 2.D). The oldest one may be interpreted as the crystallization age of the granite, and the youngest one may be interpreted as the metamorphic age. Sm/Nd analyses indicate  $T_{DM}$  age = 1.69 Ga and  $\epsilon_{Nd(1600)} = +3.6$  and  $\epsilon_{Nd(1300)} = 0$ , also suggesting a mantle-derived origin for this rock.

## Discussions and conclusions

The U/Pb and Sm/Nd results of the rocks here studied indicate polycyclic events in the regional geologic history. The U/Pb ages indicate formation (crystallization) ages at ca. 1410-1380 Ma for the samples 97-121 and 97-142 and ca. 1606 Ma for the sample 97-144.  $T_{DM}$  ages (1.69 Ga to 1.52 Ga) and  $\epsilon_{Nd}$  values (from 3.6 to 3.4) indicate a mantle-derivation for these rocks. The group of rocks here studied and the rocks of the Rio Alegre Terrane are overlaid by the Aguapeí metasedimentary rocks, which had the deposition initiated at ca. 1350-1300 Ma (Litherland et al., 1986), coherently with the U/Pb ages here presented.

The probable Paráguá Terrane extension in western Mato Grosso is based upon the geographical continuity and the age correlation of both group of rocks. In addition, the rocks described in the Paráguá terrane (syn-post-kinematic granitoids) are similar to the granitic rocks identified in the studied area, constraining a coherent history for both regions. If the hypothesis of the rocks here studied being an extension of the Paráguá Terrane is correct, consequently the range of ages from 1410 Ma and 1380 Ma should represent the period of magmatic processes correlated to the San Ignácio magmatic arc. The resetting of the U and Pb isotopes occurred at ca. 1360-1310 Ma and may indicate a metamorphic process related to the collisional processes between the Paráguá terrane and the Rio Alegre Terrane.

One important implication on the timing of the San Ignácio magmatic arc is the distinction of this event (related to a magmatic arc setting) and the Rondonian event (related to metamorphic and intracratonic magmatism). In Rondônia, rocks derived from crustal melting are dated from 1.45 Ga and 1.25 Ga (Bettencourt et al., 1999), and the metamorphic age is dated at 1.34 Ga (Tassinari et al., 1999). The time-equivalence of these events based solely on Rb/Sr ages allowed Teixeira and Tassinari (1984) to include them in the San Ignácio/Rondonian Province. The results here reported support that the rocks of San Ignácio and Rondonian events are coeval, and indicate that both events were formed in different tectonic settings.

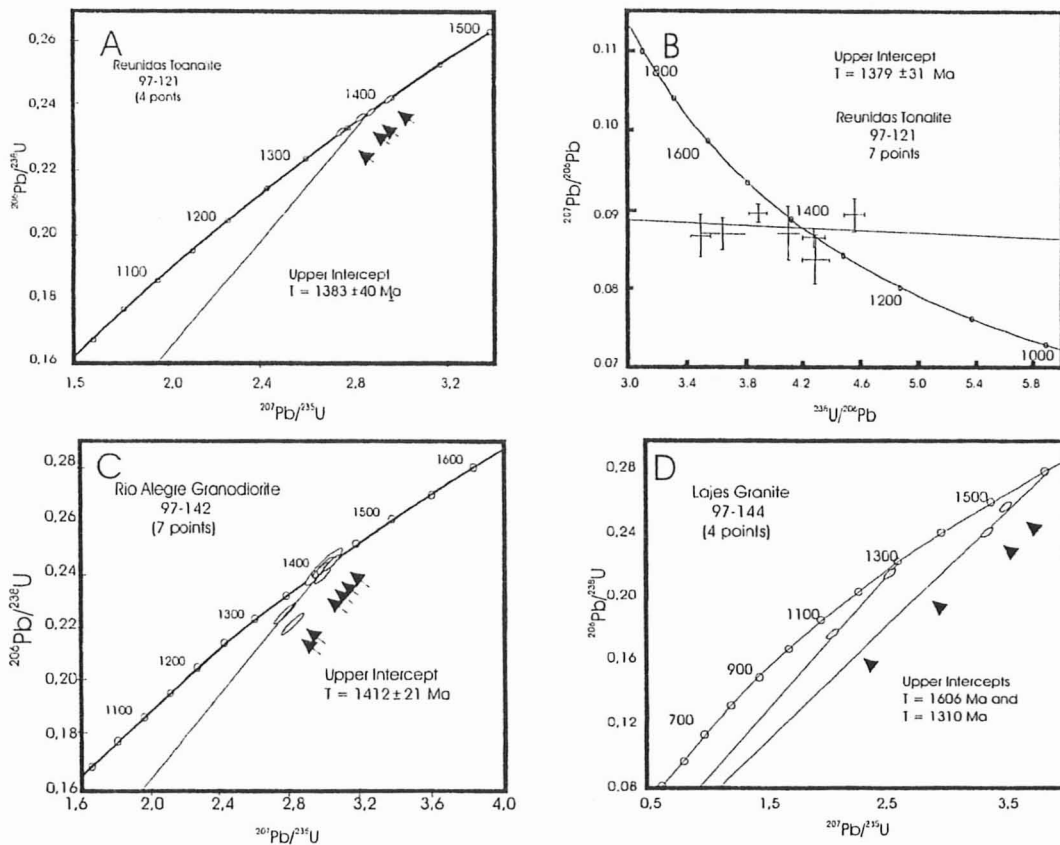


Figure 2. Concordia diagrams for rocks from the westernmost sector of the Mato Grosso State, SW Amazonian craton. Diagrams A, C and D are obtained by U/Pb isotope dilution method on zircon monocrystals analysis. Diagram B is obtained by SHRIMP analysis.

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