U-Pb SHRIMP and Sm-Nd geochronology of the Silvânia Volcanics and Jurubatuba Granite: juvenile Paleoproterozoic crust in the basement of the Neoproterozoic Brasília Belt, Goiás, central Brazil

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ABSTRACT

U-Pb SHRIMP and Sm-Nd isotopic ages were determined for felsic metavolcanic rocks from the Silvânia Sequence and Jurubatuba Granite in the central part of the Brasília Belt. Zircon grains from a metavolcanic sample yielded 2115±23 Ma and from the granite yielded 2089±14 Ma, interpreted as crystallization ages of these rocks.

Six metavolcanic samples of the Silvânia Sequence yielded a six-point whole-rock Sm-Nd isochron indicating a crystallization age of 2262±110 Ma and positive εNd(T) = +3.0 interpreted as a juvenile magmatic event.

Nd isotopic analyses on samples from the Jurubatuba Granite have Paleoproterozoic TDM model ages between 2.30 and 2.42 Ga and εNd(T) values vary between −0.22 and −0.58. The oldest TDM value refers to a sedimentary xenolith in the granite. These results suggest crystallization ages of Silvânia volcanics and Jurubatuba Granite are the first evidence of a ca. 2.14-2.08 juvenile magmatic event in the basement of the central part of the Brasília Belt that implies the presence of arc/suture hidden in reworked basement of the Brasília Belt.

Key words: U-Pb SHRIMP, Sm-Nd isotopic data, Brasília Belt, basement rocks.

INTRODUCTION

The Brasília Belt is a large Neoproterozoic orogen formed along the western margin of the São Francisco/Congo Craton in central Brazil. It comprises: (i) a thick Meso-Neoproterozoic metasedimentary/sedimentary pile with eastward tectonic vergence; (ii) a large Neoproterozoic juvenile arc in the west (Goiás Magmatic Arc); and (iii) a micro-continent (or exotic sialic terrain) formed by Archean rock units (the Crixás-Goiás granite-greenstones) and associated Proterozoic formations (Almeida et al. 1981, Fuck et al. 1993, 1994, Pimentel et al. 2000a, b) (Figure 1).

The sialic basement on which the Brasília Belt sediments were deposited is poorly understood, despite being well exposed in some areas of Goiás and Tocantins states (Figure 1). Gneiss and volcano-sedimentary units form most of this basement. Early studies have suggested that these rock units are dominantly Archean (Danni et al. 1982, Marini et al.1984). However, recent Sm-Nd isotopic studies have indicated that most of them are Paleoprotero-
zoic (Pimentel et al. 1999a, 2000b, Sato 1998).

In central Goiás, a large part of the Brasília Belt is underlain by high-grade metamorphic rocks known as the Anápolis-Itauçu Complex, together with surrounding greenschist to amphibolite facies Mesozoic cover metasediments of the Araxá Group, these rocks represent the main constituent of the internal zone of the Neoproterozoic Brasília Belt (Fuck et al. 1994, Pimentel et al. 2000b) (Figures 1 and 2). There are also volcano-sedimentary associations and granites. One of the supracrustal associations is known as Silvânia Sequence (Valente 1986); together with the Jurubatuba Granite, it is located between the Araxá Group, and the easternmost part of the Anápolis-Itauçu Complex (Figure 2).

Several high grade rock types have been recorded within the Anápolis-Itauçu Complex, the most extensive of which are felsic granulites, sillimanite-garnet gneiss, hypersthene bearing mafic-ultramafic granulites, and many granite intrusions.

In this study we investigate the age and isotopic characteristics of the Silvânia Sequence and the Jurubatuba Granite. We report U-Pb SHRIMP age determinations and Sm-Nd isotopic studies of these rock units in order to understand their nature, timing of crystallization and mantle extraction aiming their tectonic significance within the framework of the Brasília Belt (Figures 1 and 2).

### NEOPROTEROZOIC BRASÍLIA BELT

The Brasília Belt in central Brazil constitutes the central/eastern part of the Tocantins province, representing a roughly N-S belt extending for more than 1000 km along the western margin of the São Francisco/Congo Craton.

The Tocantins Province resulted from collision of three major continental blocks at the end of the Neoproterozoic: the Amazon Craton, to the west, the São Francisco/Congo Craton, to the east, and the Paranapanema block, to the south, presently covered by Phanerozoic rocks of the Paraná Basin.

The westernmost part of the Brasília Belt consists of a Neoproterozoic juvenile arc (Goiás Magmatic Arc) formed by arc type volcano-sedimentary rocks and tonalite/granodiorite gneisses with ages ranging from ca. 930 to 640 Ma ago (Pimentel et al. 1991, 1997, Pimentel and Fuck 1992).


East of the Goiás Massif the easternmost part of the Brasília Belt is known as the external zone (Figure 1). This is largely comprised of Neoproterozoic metasedimentary units in which deformation and metamorphism decrease eastwards towards the São Francisco Craton. Northwards, these Neoproterozoic units (see Dardenne 2000 for a comprehensive review) lie unconformably over Paleoproterozoic basement units containing minor Archean contribution (Correia et al. 1997, Sato 1998, Pimentel et al. 2000a, Cruz et al. 2000). It has been suggested that these rocks may represent the western extension of the São Francisco Craton.

To the southeast of Goiás Massif is the metamorphic complex of the internal zone of the Brasília Belt. This part of the belt comprises mainly the Araxá Group metasediments including an ophiolite mélangé (Drake Jr. 1980, Sato 1998), and intensively deformed intrusive granites. The internal zone also includes the high grade rocks of the Anápolis-Itauçu Complex. The age and tectonic significance of the Anápolis-Itauçu Complex is still a matter of debate. It has been traditionally interpreted as Archean basement within the Brasília Belt (Danni et al. 1982, Marini et al. 1984, Wolff 1991, Lacerda Filho and Oliveira 1995, Winge 1995). However, recent isotopic data have challenged this model (Fischel et al. 1998, 1999, Pimentel et al. 1999a).
Fig. 1 – Geological sketch of the Brasília Belt. Modified after Fuck et al. (1994).
fall within the interval between 1.9 and 1.2 Ga. These model ages are interpreted as the approximate upper limit for the age of the protoliths. The similarity of Nd isotopic composition of felsic granulites and metapelites of the Araxá Group led to the suggestion that at least some of the felsic granulites could represent high grade equivalents of the Araxá Group metasediments (Pimentel et al. 1999a).

Metasediments of the Araxá Group surrounding the Anápolis-Itauçu Complex (Figures 1 and 2)
show bimodal distribution of $T_{DM}$ model ages. A group of samples displays $T_{DM}$ values between 1.8 and 2.3 Ga and another group shows younger model ages, between ca. 1.0 and 1.3 Ga (Pimentel et al. 1999b, 2000b, Fischel et al. 1999).

Granite intrusions in the Anápolis-Itauçu Complex were metamorphosed under high grade conditions at ca. 630 Ma ago (Sm-Nd whole rock-garnet isochron, Fischel et al. 1998). The same age was established with U-Pb SHRIMP data on metamorphic zircons from the Hinterlândia quarry granulite (Tassinari et al. 1999).

To the east of the high grade terrains the sediments of the Araxá Group were overthrust on top of the thick metasedimentary/sedimentary pile of the external zone of the Brasília Belt. These rocks display tectonic vergence to the east, and constitute the Neoproterozoic Paranoá, Canastra, Ibiá and Vazante groups (Fuck et al. 1993, 1994, Dardenne 2000) (Figure 1). Nd isotopic composition of the Paranoá and Canastra groups indicate that these sediments were derived from a Paleoproterozoic source, probably from the São Francisco continent (Pimentel et al. 2000b). However, several rock samples of the Araxá and Ibiá groups have very young model ages, suggesting contribution from Neoproterozoic juvenile source areas, such as the Goiás Magmatic Arc.

THE SILVÂNIA SEQUENCE AND THE JURUBATUBA GRANITE

The volcano-sedimentary Silvânia Sequence (Vallente 1986) forms a ca. 70 km long NW-SE strip limited to the southwest by felsic granulites of the Anápolis-Itauçu Complex and to the northeast by the Jurubatuba Granite. The Silvânia Sequence and Jurubatuba Granite are strongly deformed, displaying a NW-SE foliation, typical of the central and southern parts of the Brasília Belt.

The Silvânia Sequence comprises two units: (i) a metavolcanic unit of garnet-rich amphibolite, metabasalt, meta-andesite, and felsic metavolcanic rocks and (ii) a metasedimentary unit of quartzite, garnet quartzite, micaschist, and garnet micaschist. Lithogeochemical data indicate tholeiitic to calc-alkaline signatures for the metavolcanic unit (Oliveira 1994, Freitas and Kuyumjian 1995).

The 65 km long, NW-SE trending Jurubatuba granite crops out to the northeast of the Silvânia Sequence and the contact is of tectonic nature striking N50W and dipping 70° to NE. The northern margin of the granite is characterized by a faulted contact with metasediments of the Araxá Group. The granite body is homogeneous and is composed essentially of a white to pink, foliated biotite granite with hypidiomorphic K-feldspar, plagioclase, quartz, and reddish biotite in thin section. Xenoliths of mafic and metasedimentary rocks (quartz-garnet-biotite schist) are common.

U-Pb SHRIMP AND Sm-Nd RESULTS

ANALYTICAL PROCEDURES

U-Pb SHRIMP

20 kg of each sample ANA 128 (felsic volcanic rock from the Silvânia Sequence) and ANA 5 (Jurubatuba granite) were collected (Figure 2). Rock samples were initially crushed to cm-sized fragments using a jaw crusher. The fragments were then ground, in small batches, in a tungsten carbide disk.

Each sample was sieved and heavy mineral concentrates were obtained using a DENSITEST® table. The concentrates were then passed through a Frantz isodynamic magnetic separator to obtain a pure zircon fraction. At least 100 representative zircons were hand-picked from this fraction under a binocular microscope, mounted in a one inch diameter epoxy disk with standard zircon crystals SL13 + AS3 and sectioned approximately in half. The mount surface was then polished to expose the grain interiors. The mount was then photographed at X150 magnification in reflected and transmitted light and CL images were obtained in order to reveal internal structures of the zircons.

Ion microprobe analyses were carried out using SHRIMP at the Research School of Earth Sciences, Australian National University, Canberra, Australia. SHRIMP analytical methods and data treatment follow those described by Stern (1997), Williams and Meyer (1998).

Uncertainties reported in tables and figures are given at 1σ level, and final ages are quoted at 95% confidence level. Concordia diagrams were calculated and yielded using Isoplot (Ludwig 1999).

Sm-Nd

Sm-Nd isotopic analyses followed the method described by Gioia and Pimentel (2000) and were carried out at the Geochronology Laboratory of the University of Brasília. Whole rock powders (ca. 50 mg) were mixed with 149Sm-150Nd spike solution and dissolved in Savillex capsules. Sm and Nd extraction of whole-rock samples followed conventional cation exchange techniques, using teflon columns containing LN-Spec resin (HDEHP – diethylhexil phosphoric acid supported on PTFE powder). Sm and Nd samples were loaded on Re evaporation filaments of double filament assemblies and the isotopic measurements were carried out on a multi-collector Finnigan MAT 262 mass spectrometer in static mode. Uncertainties for Sm/Nd and 143Nd/144Nd ratios are better than ±0.2‰ (2σ) and ±0.003‰ (2σ) respectively, based on repeated analyses of international rock standards BHVO-1 and BCR-1. 143Nd/144Nd ratios were normalized to 146Nd/144Nd of 0.7219 and the decay constant (λ) used was 6.54 × 10^-12. TDM values were calculated using De Paolo’s (1981) model. Isochron ages were calculated using Isoplot (Ludwig 1999).

Silvânia Sequence

Sample ANA 128 contains pink elongate zircon crystals. Cathodeluminescence (CL) images of zircon grains typically show cores with fine magmatic zoning, surrounded by rims with irregular, patchy zoning (Figure 3A).

Fourteen spots in ten zircons were analysed (Table I). Ten analyses yield a nearly concordant age of 2115 ± 23 Ma (Figure 4). One rim (analysis 3.2) yielded an age of 524 ± 83 Ma for metamorphic overgrowth (Figure 4).

Sixteen spots of eleven zircons from ANA 128 and ANA 5 (Jurubatuba granite) were analysed using SHRIMP at the Research School of Earth Sciences, Australian National University, Canberra, Australia. SHRIMP analytical methods and data treatment follow those described by Stern (1997), Williams and Meyer (1998).

Uncertainties reported in tables and figures are given at 1σ level, and final ages are quoted at 95% confidence level. Concordia diagrams were calculated and yielded using Isoplot (Ludwig 1999).

Jurubatuba Granite

Zircon grains from ANA 5 are clear to yellowish and form stubby prismatic crystals. CL images (Figure 3B), show zircon crystals with typical magmatic growth zoning.

Fourteen spots of eleven zircons from ANA...
Fig. 3 – (A) CL images of zircon grains from felsic metavolcanic rock (sample ANA 128) of the Silvânia Sequence. (B) CL images of zircon from Jurubatuba Granite (sample ANA 5). Arrow indicates the zircon number and circle indicates analyzed spot.
Fig. 4 – Concordia diagram of zircon analyses from Silvânia Sequence (ANA 128).
Data-point error ellipses are 68.3% conf.

5 were analysed (Table III). Twelve analyses are nearly concordant and yield an age of 2089 ± 14 Ma (Figure 6). Two analyses of rims (analyses 3.2 and 6.2, Table III) yielded younger and discordant ages suggesting Pb loss at ca. 574 ± 75 Ma.

Sm-Nd whole rock analyses were performed on five samples of the Jurubatuba Granite (Table II, Figure 2). Samples ANA 5, 7a, 13, and 229 have Paleoproterozoic TDM model ages between 2.30 and 2.42 Ga. The oldest TDM value (2.50 Ga) refers to a sedimentary xenolith in the granite (Sample 7b). εNd(T) values vary between −0.22 and −0.58. One sample of a diorite (ANA 229) has a TDM model age of 2.30 Ga and εNd(T) = +0.99 (Figure 7).

DISCUSSION

U-Pb and Sm-Nd isotopic data indicate that the felsic volcanic rocks of the Silvânia Sequence and part of Jurubatuba Granite (ANA 229) are Paleoproterozoic and contain a large proportion of Paleoproterozoic juvenile crustal components. They are juvenile extracts from the mantle and represent a Paleoproterozoic crust forming event (εNd = +3.0 and +0.99 respectively). TDM model age of ca. 2.25 Ga is equal within error to U-Pb crystallization age of 2.11 Ga suggesting ca. 2.1-2.2 Ga crust forming event. Geochemical data (Oliveira 1994, Freitas and Kuyumjian 1995) indicate that protoliths were formed in an island arc setting (Lacerda Filho et al. 1991, Lacerda Filho and Oliveira 1995).

The difference between 2.3-2.4 Ga Jurubatuba granite model ages and 2.09 Ga zircon crystallization age associated with slightly negative εNd values at the time of crystallization indicate a limited but not negligible degree of crustal contamination as supported by common metasediment xenoliths, one of which displays the oldest model age (TDM = 2.5 Ga) so far recorded in the study area. This suggests that the granite is either derived from re-melting of Paleoproterozoic crustal rocks, including metasediments, or is heavily contaminated with them.
TABLE I

Summary of SHRIMP U-Th-Pb zircon results for sample ANA 128.

<table>
<thead>
<tr>
<th>Grain</th>
<th>U (ppm)</th>
<th>Th (ppm)</th>
<th>Th/U</th>
<th>206Pb/238U ± 207Pb/235U ±</th>
<th>207Pb/206Pb ±</th>
<th>Conc. %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>186</td>
<td>65</td>
<td>0.3</td>
<td>76</td>
<td>0.000080</td>
<td>0.12</td>
</tr>
<tr>
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<td>640</td>
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<td>0.2</td>
<td>116</td>
<td>0.00092</td>
<td>0.14</td>
</tr>
<tr>
<td>2.1</td>
<td>323</td>
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<td>0.1</td>
<td>118</td>
<td>0.000055</td>
<td>0.05</td>
</tr>
<tr>
<td>3.1</td>
<td>149</td>
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<td>0.68</td>
</tr>
<tr>
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<td>330</td>
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<td>3.38</td>
</tr>
<tr>
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<td>0.47</td>
</tr>
<tr>
<td>5.1</td>
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<td>77</td>
<td>0.4</td>
<td>84</td>
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<td>0.02</td>
</tr>
<tr>
<td>6.1</td>
<td>149</td>
<td>33</td>
<td>0.2</td>
<td>60</td>
<td>0.000010</td>
<td>0.02</td>
</tr>
<tr>
<td>7.1</td>
<td>77</td>
<td>14</td>
<td>0.2</td>
<td>26</td>
<td>0.000210</td>
<td>0.31</td>
</tr>
<tr>
<td>7.2</td>
<td>140</td>
<td>121</td>
<td>0.9</td>
<td>25</td>
<td>0.000566</td>
<td>0.84</td>
</tr>
<tr>
<td>8.1</td>
<td>204</td>
<td>29</td>
<td>0.1</td>
<td>67</td>
<td>0.000399</td>
<td>0.30</td>
</tr>
<tr>
<td>9.1</td>
<td>46</td>
<td>16</td>
<td>0.3</td>
<td>18</td>
<td>0.000715</td>
<td>1.07</td>
</tr>
<tr>
<td>10.1</td>
<td>27</td>
<td>6</td>
<td>0.24</td>
<td>9</td>
<td>0.000452</td>
<td>0.67</td>
</tr>
</tbody>
</table>
Fig. 5 – Sm-Nd whole-rock isochron of metavolcanic rocks from the Silvânia Sequence.

TABLE II

Sm-Nd isotopic data for rocks from the Silvânia Sequence and Jurubatuba Granite.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Sm (ppm)</th>
<th>Nd (ppm)</th>
<th>$^{147}$Sm/$^{144}$Nd</th>
<th>$^{143}$Nd/$^{144}$Nd*</th>
<th>T DM (Ga)</th>
<th>$\varepsilon$Nd (0)</th>
<th>$\varepsilon$Nd (2115)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ana 126</td>
<td>2.89</td>
<td>8.593</td>
<td>0.203326</td>
<td>0.512848 (22)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Ana 127</td>
<td>3.003</td>
<td>11.278</td>
<td>0.160939</td>
<td>0.512259 (11)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ana 127(b)</td>
<td>2.779</td>
<td>10.467</td>
<td>0.16049</td>
<td>0.512239 (25)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ana 128</td>
<td>1.871</td>
<td>9.251</td>
<td>0.122254</td>
<td>0.511686 (43)</td>
<td>2.25</td>
<td>-18.57</td>
<td>+3.15</td>
</tr>
<tr>
<td>Ana 228(a)</td>
<td>2.346</td>
<td>7.190</td>
<td>0.197242</td>
<td>0.512817 (27)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ana 228(b)</td>
<td>2.805</td>
<td>8.0503</td>
<td>0.199399</td>
<td>0.512865 (28)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample</th>
<th>Sm (ppm)</th>
<th>Nd (ppm)</th>
<th>$^{147}$Sm/$^{144}$Nd</th>
<th>$^{143}$Nd/$^{144}$Nd*</th>
<th>T DM (Ga)</th>
<th>$\varepsilon$Nd (0)</th>
<th>$\varepsilon$Nd (2089)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ana 5</td>
<td>10.005</td>
<td>65.89</td>
<td>0.0922</td>
<td>0.511175 (29)</td>
<td>2.333</td>
<td>-28.54</td>
<td>-0.53</td>
</tr>
<tr>
<td>Ana 7(a)</td>
<td>6.784</td>
<td>36.342</td>
<td>0.1128</td>
<td>0.511471 (19)</td>
<td>2.367</td>
<td>-22.76</td>
<td>-0.28</td>
</tr>
<tr>
<td>Ana 13</td>
<td>6.116</td>
<td>28.477</td>
<td>0.1298</td>
<td>0.511708 (16)</td>
<td>2.417</td>
<td>-18.13</td>
<td>-0.22</td>
</tr>
<tr>
<td>Ana 229</td>
<td>9.0516</td>
<td>42.671</td>
<td>0.12890</td>
<td>0.511756 (18)</td>
<td>2.30</td>
<td>-17.21</td>
<td>+0.99</td>
</tr>
<tr>
<td>Ana 7(b) (xenolith)</td>
<td>6.544</td>
<td>32.139</td>
<td>0.1231</td>
<td>0.511555 (09)</td>
<td>2.506</td>
<td>-21.13</td>
<td></td>
</tr>
</tbody>
</table>

$^{*}$The numbers in parentheses are 1σ errors in the last two digits of the isotopic ratio.
Paleoproterozoic rocks have been described previously in other areas of the Tocantins Province. Granite gneiss to the south and east of the Barro Alto mafic-ultramafic layered complex has been dated at 2128 ± 15 Ma (207Pb/206Pb) (Correia et al. 1997). Calc-alkaline granite gneiss from the Almas-Dianópolis area has been dated at ca. 2.2 Ga (U-Pb SHRIMP on zircon, Cruz et al. 2000). The latter is probably the western extension of Paleoproterozoic rocks which underlie the San Francisco Craton to the east of the Brasilia Belt.

Zircons of both lithological units also present Pb loss at 524 ± 83 Ma and 574 ± 75 Ma, related to the Brasiliano/Pan-African metamorphic event. This event is evident in different parts of the Brasilia Belt: in the Goiás Massif, Queiroz et al. (1999) report ages of 590 ± 10 Ma (U-Pb SHRIMP in zircon and titanite); Fortes and Jost (1996) dated the metamorphic peak in Crixás Greenstone Belt at ca. 550 Ma (Ar-Ar and K-Ar in muscovite); K-Ar in muscovite and biotite in samples from Araxá Group and Anápolis-Itaúçu Complex near Goiânia yielded ages between 580 Ma and 800 Ma (Hasui and Almeida 1970).

CONCLUSIONS
The Paleoproterozoic crystallization ages (U-Pb SHRIMP and Sm-Nd whole rock isochron) of the volcano-sedimentary Silvânia Sequence and of the Jurubatuba Granite are the first documented evidence of a ca. 2.14-2.08 Ga juvenile magmatic event in the basement of the southern portion of the

Fig. 6 – Concordia diagram for the Jurubatuba granite (sample ANA 5). Data-point error ellipses are 68.3% conf.
### TABLE III

Summary of SHRIMP U-Th-Pb zircon results for sample ANA 5.

<table>
<thead>
<tr>
<th>Grain spot</th>
<th>U (ppm)</th>
<th>Th (ppm)</th>
<th>Th/U</th>
<th>206Pb/238U</th>
<th>207Pb/235U</th>
<th>207Pb/235U</th>
<th>f206 Pb</th>
<th>Radiogenic Ratios</th>
<th>Ages (in Ma)</th>
<th>Conc. %</th>
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<tbody>
<tr>
<td>1.1</td>
<td>174</td>
<td>83</td>
<td>0.48</td>
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<td>0.000015</td>
<td>0.02</td>
<td>4.027</td>
<td>± 0.0123</td>
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<td>0.238</td>
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<td>0.3974</td>
<td>± 0.0128</td>
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<td>± 0.0124</td>
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<td>± 0.0051</td>
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<td>0.4312</td>
<td>± 0.0184</td>
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<tr>
<td>4.2</td>
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Brasília Belt. U-Pb SHRIMP zircon ages of the Silvânia dacite and Jurubatuba granite are similar: 2115 ± 23 Ma and 2089 ± 14 Ma respectively and rim overgrown in zircon of both lithological units indicate recrystallization during the Brasiliano/Pan-African metamorphic event.

Isotopic, litogeochemical, and field data suggest a Paleoproterozoic magmatic arc setting which we named Silvânia Magmatic Arc with juvenile magma as indicated by positive $\varepsilon_{Nd}$ at the time of crystallization. The homogeneous and slightly negative Sm-Nd model ages and $\varepsilon_{Nd}$ values at the time of crystallization of the Jurubatuba Granite suggest crustal contamination. The oldest $T_{DM}$ (2.5 Ga) in the study area is from a xenolith within the granite body. These data suggest that the original granitic magma was derived by the remelting of crustal rocks, including sedimentary sources similar to the enclave or was heavily contaminated by it.

The Silvânia Magmatic Arc probably represents the westernmost autochthonous exposure of Paleoproterozoic rocks belonging to the São Francisco continent involved in the Neoproterozoic orogeny. During the Neoproterozoic the Silvânia Magmatic Arc was juxtaposed with the Anápolis-Itauçu Complex and Araxá Group.

ACKNOWLEDGEMENTS

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RESUMO

Idades isotópicas U-Pb SHRIMP e Sm-Nd foram determinadas em rochas metavulcânicas félisicas da Sequênc-
cianização de Silvânia e Granito Jurubatuba na porção central da Faixa Brasília. Grãos de zircão da rocha metavulcânica da Seqüência de Silvânia e do granito forneceram, respectivamente, as idades de 2115 ± 23 Ma e 2089 ± 14 Ma, interpretadas como idades de cristalização destas rochas. Amostras da Seqüência de Silvânia resultaram em isócrona Sm-Nd em rocha total, indicando idade de cristalização de 2262 ± 110 Ma e εNd(T) = +3.0 interpretada como representativa de evento magmático juvenil para estas rochas.

Análises isotópicas de Nd em amostras do Granito Jurubatuba resultaram em idades modelo TDM entre 2.30 e 2.42 Ga e valores de εNd(T) variando entre −0.22 e −0.58. O valor mais antigo de idade modelo TDM refere-se a um xenólito de rocha metassedimentar no granito. As idades de cristalização paleoproterozóicas da Seqüência de Silvânia e do Granito Jurubatuba são a primeira evidência de evento magmático juvenil ocorrido entre 2.14-2.08 Ga no embasamento da porção central da Faixa Brasília.

**Palavras-chave:** U-Pb SHRIMP, dados isotópicos Sm-Nd, Faixa Brasília, embasamento.

**REFERENCES**


FUCK RA, PIMENTEL MM AND D'E L REY SILVA LJH. 1994. Compartimentação tectônica da porção orien-


