

#### 4 - CONCLUSÕES

- O arranjo espacial definido para os tensores tectônicos responsáveis pela geração de estruturas rúpteis, nessa porção do CCNC mostra que  $\sigma_1$  é subhorizontal e posicionou-se sempre próximo à direção E-W;
- As anisotropias relacionadas ao arranjo estrutural de corpos rochosos em escala regional, segundo a direção NE-SW, foram fortes condicionantes na redistribuição das tensões gerando juntas e falhas;
- As juntas de direção N30°W, correspondentes às mais importantes discontinuidades no contexto do Grupo Serra Grande, funcionaram como planos de movimentação que bascularam o acamamento original dos conjuntos rochosos, levando a posicionarem-se até subverticalmente;
- A análise cinemática estabelecida sobre o corpo granitóide indica a atuação de um cisalhamento rotacional, no qual a direção N60°E, pervasiva naquele corpo, funcionou como uma zona de movimentação transcorrente dextral.

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#### LATE MESOPROTEROZOIC AND MIDDLE NEOPROTEROZOIC MAGMATISM IN THE ZONA TRANSVERSAL OF THE BORBOREMA PROVINCE, BRAZIL

Kozuch, M.<sup>1</sup>, Bretas Bittar, S.M.<sup>2</sup>, Van Schmus, W.R.<sup>1</sup>, and Brito Neves, B.B.<sup>3</sup>

1: Dept. of Geology, Univ. of Kansas, Lawrence, KS, USA

2: Univ. Federal Rural de Pernambuco, Recife, PE, Brasil

3: Instituto de Geociências, Univ. de São Paulo, São Paulo, SP, Brasil

#### INTRODUCTION

The Zona Transversal (ZT) of the Borborema Province in northeast Brazil preserves a long and complex history of Precambrian tectonic activity. The assembly of western Gondwana during the Brasiliano-Pan African orogeny marked the youngest phase of this tectonism and magmatism in the ZT, which modified preexisting continental crust. Deciphering the exact nature of preexisting crust in the ZT, including the ages and petrogenesis of crustal blocks and belts that comprise it, allows ZT history to be

extended back beyond the Brasiliano cyclet and to understand better the assembly history of West Gondwana.

The current study area lies within the central ZT and stretches northeast from Serra Talhada to just south of Teixeira. Between the two localities is the Teixeira-Terra Nova Tectonic High<sup>2</sup>, an elevated area of basement gneisses and syenitic plutons. Flanking the Teixeira-Terra Nova Tectonic High eastward is the Pajeú-Paraíba Fold Belt<sup>1</sup> (SPP); to the west is the Piancó-Alta Brígida Fold Belt<sup>1</sup> (SPAB). The SPP and SPAB are variably deformed sedimentary basins in which volcanogenic strata are present. The SPP, and SPAB are intruded by numerous Brasiliano granites.

## U-PB GEOCHRONOLOGY

Late Mesoproterozoic. Seven zircon fractions from the Ambó orthogneiss, 20 km S of Teixeira, give an upper intercept age of  $1006 \pm 20$  Ma when the lower intercept is forced through 600 Ma. When forced through the origin, regression yields an age of  $950 \pm 8$  Ma. The Fazenda Arroz orthogneiss, 35 km WSW of Ambó, yields a concordia age of  $923 \pm 28$  Ma. The Lagoa do Guedes orthogneiss, which surrounds the Palmeira granite 38 km W of Ambó, yields an upper intercept age of  $956 \pm 24$  Ma and a lower intercept of  $418 \pm 200$  Ma. Augen-gneiss a few km N of Serra Talhada contains two populations of zircon, the older of which yields a concordia age of  $963 \pm 14$  Ma. The younger population, when regressed, gives an age of  $624 \pm 16$  Ma.

The Piaus rhyolitic tuff, north of Princesa Izabel in SPAB, contains zircons which give a preliminary U-Pb age of  $930 \pm 25$  Ma. The Serra do Pinheiro andesite, between Manaíra and Santana de Mangueira in SPAB, contains two populations of zircon, the younger of which has an age of approximately 984 Ma. The older population indicates that there is an inherited component with a minimum age of 1400 Ma; more work is required to resolve the exact nature of inheritance in this andesite. A rhyolite tuff from near Manaíra (SPAB) containing very few zircons was previously studied<sup>7</sup> included one fraction with a composite age of  $1055 \pm 20$  Ma. U-Pb zircon ages of  $1008 \pm 30$  Ma and  $1012 \pm 18$  Ma for metavolcanic rocks are also reported in the Floresta region of SPP<sup>7</sup>.

The initial data indicate that the four gneissic protoliths formed 1030-923 Ma with no apparent inherited zircon; the gneisses were subsequently affected to varying degrees at about 600 Ma during peak Brasiliano metamorphism. These results are similar to single zircon  $^{207}\text{Pb}/^{206}\text{Pb}$  ages of  $927 \pm 25$  Ma for orthogneiss of Serra do Machado in the northern ZT<sup>3</sup> and U-Pb zircon ages of  $999 \pm 50$  Ma and  $1037 \pm 30$  Ma for orthogneisses south of Salgueiro and north of Floresta<sup>7</sup>, respectively, in the southern ZT. Rb-Sr whole-rock ages of about 970 Ma on orthogneisses including these<sup>2,3,5</sup> are in general agreement with the U-Pb ages, suggesting that their Rb-Sr systems were not greatly affected by (dry?) Brasiliano metamorphism. The volcanic rock data indicate that the duration of magmatism began 1080 Ma at minimum and lasted at least until 930 Ma.

Middle Neoproterozoic. A rhyolitic porphyry from SPAB comes from Fazenda Mocambo, SE of Nova Olinda. Preliminary U-Pb work on this sample suggests that the age of this rock is about 730 Ma, which is much younger than other extrusive igneous rocks from the SPAB. A well-exposed package of metavolcanic rocks from the Irajá complex exists SE of Iguaraci-PE in SPP. A rhyolitic porphyry from this locality has been analysed, yielding a concordia age of about 725 Ma. There is some indication that an older component is present in the rhyolite SE of Iguaraci, although additional work is required to refine the precise crystallization age and age of the inherited component. These rocks represent a younger, newly recognized pulse of magmatism that occurred about 730 Ma.

Late Neoproterozoic. The Solidão batholith from the central ZT is generally agreed to be of Brasiliano age. U-Pb geochronology conducted for this granitoid confirms that the batholith has a minimum age of  $574 \pm 54$  Ma. There is a large inherited component present in the rock that has a minimum age of  $1991 \pm 90$  Ma. This inherited component is also present in another Brasiliano pluton, the Palmeira granite, which has a lower intercept minimum age of  $505 \pm 4$  Ma with an upper intercept age about  $2032 \pm 15$  Ma; both ages need further refinement.

## SM-ND ISOTOPE GEOCHEMISTRY

Table 1. Geochronologic and isotopic summary for Zona Transversal rocks.

| Sample Loc.       | Rock Type    | Latitude, Longitude | Age<br>(Ga) | $\epsilon_{\text{Nd}}$<br>0.6 Ga | $\epsilon_{\text{Nd}}$<br>1.0 Ga | T(DM)<br>(Ga) |
|-------------------|--------------|---------------------|-------------|----------------------------------|----------------------------------|---------------|
| Serra Talhada     | augen gneiss | 7:58.52S, 38:16.82W | 0.98        | -3.5                             | 1.7                              | 1.40          |
| Fazenda Arroz     | orthogneiss  | 7:27.52S, 37:34.43W | 0.96        | -4.3                             | -0.3                             | 1.67          |
| Ambó              | orthogneiss  | 7:23.52S, 37:16.24W | 1.00        | -4.8                             | -1.1                             | 1.78          |
| Lagoa do Guedes   | orthogneiss  | 7:23.86S, 37:36.78W | 0.97        | -5.8                             | -1.0                             | 1.64          |
| Piaus             | rhy. tuff    | 7:36.07S, 38:02.51W | 0.93        | -10.1                            | -5.0                             | 1.77          |
| Serra do Pinheiro | andesite     | 7:39.36S, 38:12.30W | 0.93        | -5.2                             | -1.7                             | 1.66          |
| Manáira           | rhy. tuff    | 7:40.39S, 38:11.47W | 1.06        | -5.0                             | 0.0                              | 1.56          |
| Mocambo Farm      | rhy. porph.  | 7:31.58S, 37:56.94W | 0.75        | -3.2                             | --                               | 1.34          |
| Baixa Grande      | rhy. porph.  | 7:52.66S, 37:29.61W | 0.75        | -3.4                             | --                               | 1.51          |
| Solidão           | granitoid    | 7:43.36S, 37:45.45W | 0.57        | -15.5                            | --                               | 2.14          |
| Palmeira          | granite      | 7:22.79S, 37:37.50W | 0.51        | -14.2                            | --                               | 2.17          |

\* = high  $^{147}\text{Sm}/^{144}\text{Nd}$ ; nd = not determined; latitude and longitude: NN:nn.nn = degrees and decimal minutes. Data from this work and reference 7.

The ca. 1 Ga gneisses possess  $\epsilon_{\text{Nd}}(1 \text{ Ga})$  from -1.1 to 1.7, with depleted-mantle model ages, T(DM), of 1.78-1.64 Ga. Sm-Nd data for the metavolcanic rocks are similar, with  $\epsilon_{\text{Nd}}(1 \text{ Ga})$  from -5.0 to 0.0 and T(DM) 1.77-1.56 Ga.  $\epsilon_{\text{Nd}}(600 \text{ Ma})$  values for the ca. 750 Ma metavolcanic units are comparable to those for the 1000 Ma metavolcanic units and gneisses; however, the T(DM) for the 750 Ma rocks are a little younger, between 1.51 and 1.34 Ga. The isotopic data for the granitoid rocks in the Teixeira-Terra Nova Tectonic High are different from the gneisses or metavolcanic units. At ca. 600 Ma their  $\epsilon_{\text{Nd}}$  values are more negative, between -14.2 and -15.5 (Table 1), and their T(DM) ages are older, about 2.15 Ga.

## DISCUSSION

The close agreement in age between the basement gneisses and some of the metavolcanic deposits in SPAB and SPP strongly suggests that these rocks formed during the same magmatic cycle in the latest Mesoproterozoic and earliest Neoproterozoic. This theory is supported by Nd data for these rocks, where all share mildly negative  $\epsilon_{\text{Nd}}$  values at the time of their formation. The negative  $\epsilon_{\text{Nd}}$  values may be due either to derivation from an enriched lithospheric mantle source or to derivation from a mixture of depleted mantle and enriched crustal sources. T(DM) for these rocks indicate that the second option may be correct, since there is no evidence in Borborema Province for any event occurring 1.78 to 1.34 Ga, and the isotopic data could be explained by a  $1.0 \pm 0.1$  Ga continental margin magmatic arc developed on older crust. The older crustal source may be Transamazonian basement (approximately 2.1 Ga), and the younger source may be mafic roots of the 1.0 Ga arc that were melted during the 1.0 Ga event.



Subsequent magmatic activity that was probably unrelated to the 1.0 Ga event occurred some 200-250 m.y. later.  $\epsilon_{\text{Nd}}$  (600 Ma) (about -3.3) for these middle Neoproterozoic rocks are similar to  $\epsilon_{\text{Nd}}$  (600 Ma) values for late Mesoproterozoic to early Neoproterozoic activity in the ZT, indicating that 750 Ma magmatism may have been due to partial melting of the 1.0 Ga rocks. Zircon inheritance in the 750 Ma rhyolite tuff SE of Iguaraci supports this interpretation.

Petrogenetic environments that spawned magmatism at 1000 Ma and 750 Ma are not well constrained at this time. It has been proposed that the 1000 Ma event is related, at least in part, to rifting<sup>7</sup>, while others suggest that convergence and arc formation are responsible for most of the magmatism in the ZT<sup>2,3,4,6</sup>. Research is currently being conducted that will bring the 1000 Ma petrogenesis into focus through further precise U-Pb geochronology, Sm-Nd isotopic studies, and trace element geochemical analyses.

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## DEFINIÇÃO E CARACTERIZAÇÃO DO EMBASAMENTO DA PORÇÃO OESTE DA FAIXA SERIDÓ (PROVÍNCIA BORBOREMA, NE-BRASIL)\*

*Jean Michel Legrand (1), Elton Luiz Dantas (2) e Jean Paul Liegeois (3)*

(1) Depto. Geologia/Pós Graduação em Geociências - UFRN - Natal - RN

(2) Pós Graduação em Geociências - UNESP - Rio Claro - SP

(3) Musée Royal de L'Afrique Centrale - Tervueren - Belgique

\*Apoio Financeiro - CNPq / FAPESP e Centre Belge de Geochronologie

## INTRODUÇÃO

A definição geodinâmica do embasamento do flanco oeste da Faixa Seridó, está em debate desde 1975, quando Brito Neves definiu o Grupo São Vicente de idade arqueana, retrabalhado durante a tectônica Transamazônica e Brasiliana, a primeira sendo mais penetrativa (Brito Neves, *et al.* 1975; Pessoa, 1976). Mais recentemente, medidas geocronológicas, tanto U/Pb sobre zircões, como Rb/Sr de rochas totais, evidenciaram que a presença de rochas arqueanas é questionável e que de fato, o embasamento é sobretudo formado de uma sequência magmática diferenciada de idade pré-Transamazônica (Hackspacher, 1990; Legrand, *et al.* 1991; Souza, *et al.* 1993 e Van Schmus, *et al.* 1995). As idades evoluem de 2,25Ga até 2,18Ga para esta sequência calcio-alcálica, cujos resultados de Nd indicariam que a sua origem envolve material crustal mais velho (Van Schmus *et al.*, 1995).

Uma suíte de ortognaisses porfiríticos — Augen gnaisses G<sub>2</sub>, muitas vezes localizada no contato com as supracrustais do Grupo Seridó é tema de discussão quanto à sua integração como o termo mais