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## THE NAMAQUA / GRENVILLE TERRANE OF EASTERN URUGUAY ✓

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Previous work took into account the existence of a high grade metamorphic complex in southeastern Uruguay (Preciozzi *et al.*, 1985) containing migmatites and reworked gneisses (Masquelin, 1990; Preciozzi *et al.*, 1993).

Recent geochronological studies at the Geochronological Research Center of the Sao Paulo University identified igneous rocks with long crustal residence and ages around 1000 Ma. (zircon U / Pb data). These ages and the geological environment of the region suggest the existence of a new tectonic domain on this area within the Uruguayan predevonian shield, defined here as the Punta del Este Terrane (PET).

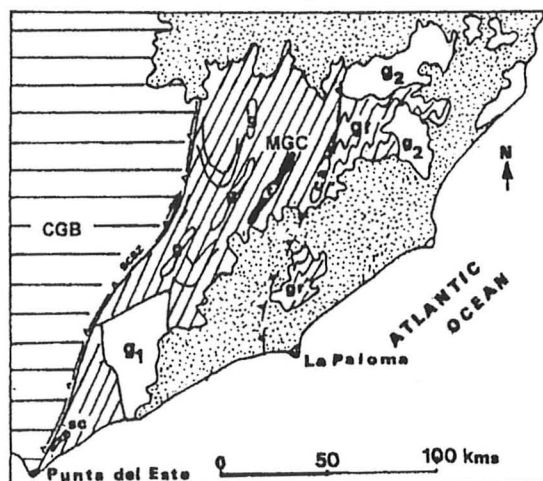
The San Carlos – Cordillera shear zone (SCSZ) separates this terrane, composed by the Main Gneissic Complex (MGC), from the Central Granitic Belt related to the Cambrian – Neoproterozoic tectono-magmatic belt (Figure 1).

The MGC is formed by granitoids of different compositions (augen – gneisses, granitic gneisses and migmatites, interbedded with mafic, calc-silicate rocks and quartzites (Chafalote Suite).

In the eastern part of the PET domain, separated from the gneissic complex by tectonic contact, the Rocha Group of low grade supracrustal rocks predominates. The Cerro Aguirre Formation (Gancio and Campal, 1993) of volcanosedimentary rocks is also present. Late to posttectonic granitic intrusions shown Rb-Sr ages (whole rock) between 0.68 – 0.53 Ga. K – Ar determinations in the same samples, show a range of ages between 0.5 to 0.6 Ga.

The main structural pattern observed in this terrane shows the development of NE-SW trending volcano-sedimentary basins and post-tectonic granitic

intrusion axes. Structural features in the gneissic basement show a predominance of E-W to NW-SE ductile shears, reworked by folding with NE-SW axial trend



**Figure 1:** Geological sketch from Punta del Este terrane (diagonal lines) with: CGB= Central Granitic Belt; scsz= San Carlos-Cordillera shear zone; g= late granitic sheets; g1= José Ignacio granite; g2= Santa Teresa granite; gr= Rocha group; MGC= Main Gneissic Complex; SC=San Carlos Formation; ca=Cerro Aguirre Formation.

So far the PET has no equivalents in Brazil and Argentina, being restricted to the eastern portion of the predevonian shield of Uruguay. The present interpretation is different from that presented by Fragozo Cesar and Machado (1997) which considered as "Rocha Terrane" only the supracrustal rocks.

This terrane may be related to the crystalline shield of the Namaqua Province (Joubert, 1974; Coward, 1983) in the southern portion of the African continent.

## GEOCHRONOLOGICAL DATA

The gneissic-migmatitic suite (and some postectonic granitic intrusions) have a Rb-Sr whole rock and mineral ages around 680 – 600 Ma. for the basement rocks, and *ca.* 550 Ma. for late to postectonic granitoids (Umpierre and Halpern, 1971).

The ages close to 1.0 Ga obtained by the U-Pb method were not observed on the Rb-Sr systematics. This pattern suggests that the Rb-Sr isochronic ages of the MGC may be related to the imprint of the neoproterozoic tectono-thermal event of the Brazilian / Panafrican Orogeny.

Five samples, three from the granitoids and two from the supracrustal rocks were studied by the U-Pb and Sm-Nd methods. In the orthogneisses two zircon types were recognized. The main type, used in the age determinations, was composed by prismatic zircons (2x1 and 3x1), the second type being composed of rounded zircons (fractured and with inclusions).

The results for two samples (UCUR 3 and URPR 26) are shown in the Concordia diagram (figure 2). They were considered together because of their lithological and age similarities. The age of 1006 ± 37 Ma is considered the best estimate for the zircon crystallization and granite emplacement. The ages obtained separately for each rock are 1008 ± 60 Ma (UCUR-03) and 984 ± 64 Ma (URPR-26).

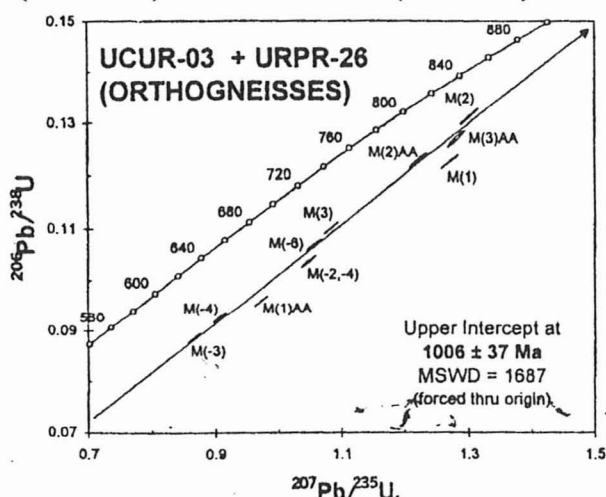


Figure 2: U-Pb discordia for main orthogneisses complex.

The high discordance observed in the Concordia diagram may have been introduced by the Neoproterozoic high temperature metamorphism which reaches anatexis conditions.

A leucosome of a migmatitic rock was analyzed (sample URPR-36). The results are presented in figure 3. The position of the analyzed zircon fractions near the lower intercept suggest that the leucocratic granitic band could be a product of partial melting of crustal material.

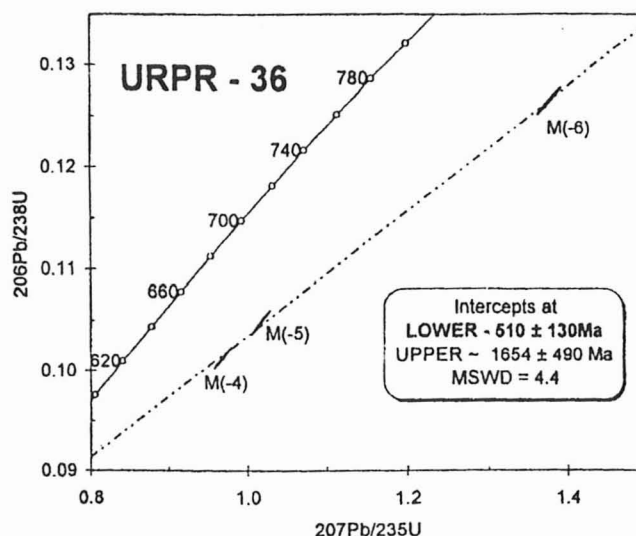


Figure 3: U-Pb discordia for migmatite leucosome (URPR - 36 sample)

At the same time the  $^{207}\text{Pb} / ^{206}\text{Pb}$  ages from each fractions fall in a range between 908 – 1172 Ma, similar to that from the URPR 26 and UCUR 3.

The importance of the obtained age ( $510 \pm 135$  Ma) is that this value is a good indicator that the neoproterozoic migmatization that affected the PET domain was more important than can be observed in the Namaqua region.

The K-Ar and Rb-Sr ages also suggest that the neoproterozoic events were responsible for a regional heating of a previous high grade metamorphic suite.

## SM-ND DATA

Sm – Nd whole rock determinations from three gneissic-migmatitic rocks of the basement present TDM ages between 2.4 to 1.8 Ga, showing a long crustal residence before its emplacement as granitoids during the Namaqua Orogeny (figure 5). The crustal affinity of the precursor material is corroborated by the high negative  $\epsilon(0)\text{Nd}$  values ranging between -13 to -14.3.

Two analyses from the supracrustal metasedi-

mentary rocks (Rocha Group) show 1.97 and 1.54 Ga ages, the last being the maximum age for the deposition of Rocha Group.

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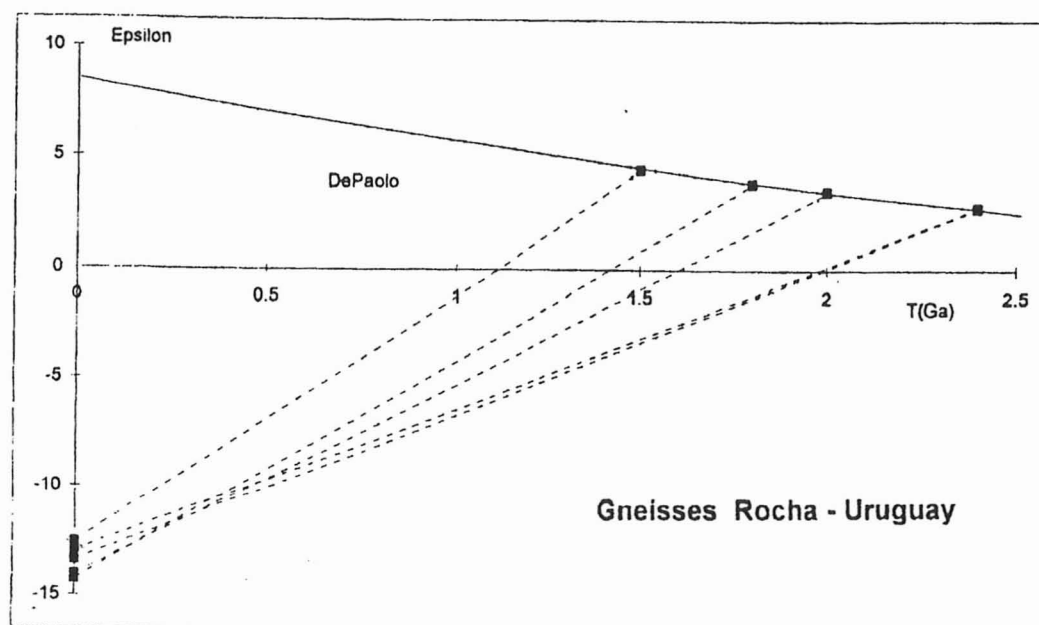


Figure 4: De Paolo diagram showing Epsilon (0)Nd versus T(Ga) for Punta del Este Terrane.