Sr, Nd and Pb isotope study on intrusive granitoids of the Brusque Group, Santa Catarina, Brazil

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The Dom Feliciano Belt extends through southeastern Brazil and Uruguay comprising the southern end of the Mantiqueira province (Almeida *et al*. 1981), a complex Neoproterozoic structural province that was established during the Brasiliano and Rio Doce orogenies (Campos Neto and Figueiredo 1995, Basei et al. 1998, 2000, Silva et al. 2005).

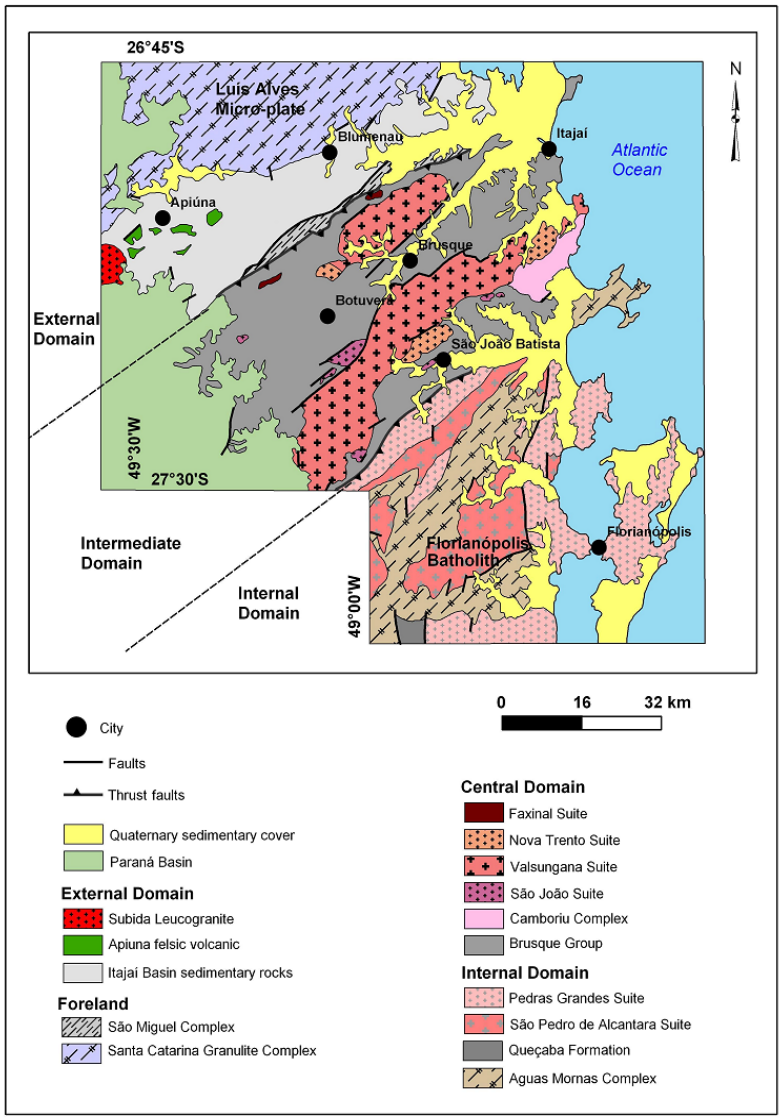

Figure 1: Main domains of the Dom Feliciano Bel in Santa Catarina (modified from Basei Basei et al 2000 and Castro et al 1999

In the state of Santa Catarina, the Dom Feliciano Belt is divided into three tectonic-stratigraphic segments, all with an NE-SW orientation (fig. 1): Internal Domain- Florianópolis Batholith; Central Domain – Brusque Group and associated granitoid intrusions; External Domain – Foreland – with the Itajaí foreland basin and gneissic-migmatitic rocks of the Luis Alves and São Miguel complexes. The Brusque Group, region concerned in this paper, is a metavolcanosedimentary sequence, metamorphosed in the greenschist to amphibolite facies that is related to the development of an S2 foliation, and affected by a large number of granitic bodies that typically present contact aureoles. The northern contact of the Brusque Group is outlined by thrust faults placing it on top of metassedimentary rocks of the Itajaí Group and of the São Miguel Complex gneisses. To the south, the Brusque Group presents a tectonic contact with the Florianópolis Batholith, marked by the Major Gercino Shear Zone

The Neoproterozoic granitoids intruded in the Brusque Group consist of an assemblage of isotropic to faintly deformed bodies (Basei 1985, Caldasso et al. 1988, 1995 a, Castro et al. 1999), with late- to post-tectonic characteristics related to the metamorphism and deformation of its host rocks. The contact metamorphism generated by all of this intrusions reaches the pyroxene-hornfels facies (Caldasso et al. 1988, Basei et al. 2000, Philipp et al. 2004). These igneous rocks can be assembled into three main suites: 1) São João Batista Suite, the oldest of the three, occurs as filonian bodies and is constituted of leucogranitoids bearing muscovite and biotite that may also bear garnet, fluorite and tourmaline; 2) Valsungana Suite, intermediately aged, composed of light-grey bodies with a distinguished magmatic flux marked by orientated mega crystals of microcline in an coarse biotite-rich matrix; Nova Trento Suite, the youngest, in which there is a predominance of light-gray to pink granitoids, with a syenogranitic composition, bearing biotite as main mafic mineral, presenting phaneritic textures with fine to medium granulometry. Xenoliths of the Brusque Group and microgranular enclaves can be observed in all three suites. Available radiometric data for these granitoids are restrained to the Cryogenian-Ediacaran transition, with ages between 638-590Ma, obtained by the U-Pb method in monazites and zircons (Silva 1999, Basei et al. 2000, Silva et al. 2003, Vlach et al. 2008).

Sr, Nd and Pb isotope analyses were performed in whole rock powders of the three intrusive suites in the Brusque Group. The samples were prepared and analyzed at the Centro de Pesquisas Geocronológicas (CPGeo) of the São Paulo University (USP).

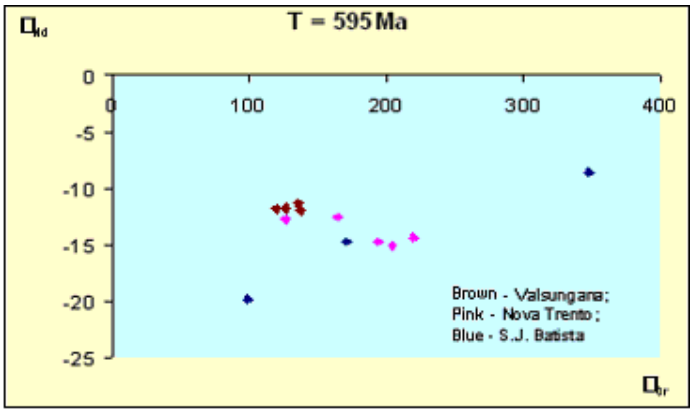

Figure.2: εNd vs. εSr Diagram

The εNd vs. εSr diagram (fig.2), shows a clear influence of crustal material on the generation of all three suites, pointed out by fairly negative values for εNd. This agrees with the Nd model ages (TDM), close to 2.0 Ga observed in both units - granites and Brusque metasediments . Also, there is a remarkable homogeneity, in this diagram, for the samples of the Valsungana suite, which have less negative εNd values then the Nova Trento and São João Batista Suites, suggesting a relative uniform protolith, placed in lower crustal position then the other two Suites.

In a εNd vs. Time diagram, most of the analyzed samples show a normal crustal 147Sm/144Nd ratio, varying between 0.9 and 0.14 with an average value of 0.11(fig. 3). Once again the Valsungana Suite presents the most uniform values, with Nd model ages around 1.8Ga. On the other hand, the Nova Trento and the São João Batista Suites show rather heterogeneous patterns for both εNd and Nd model ages data.

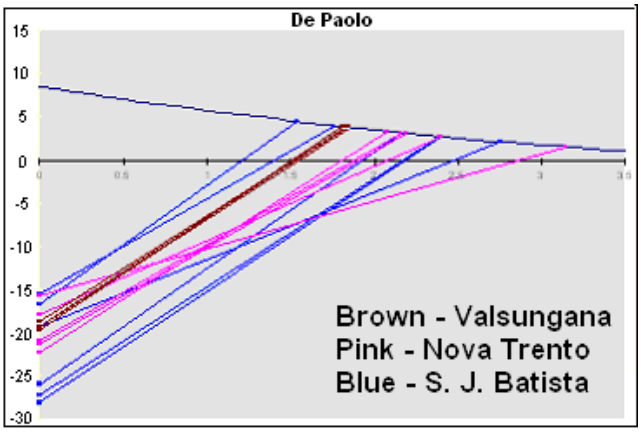

Figure 3: εNd vs. Time Diagram (DePaolo)

On examining the Pb isotopes, the values for μ (calculated in single stage as proposed by Ludwig 2001), are situated between 9.0 and 10.4, endorsing the hypothesis the the protoliths for these rocks are not only crustal but also placed in upper levels of the crust, agreeing with the results for Sr and Nd isotopes. Proximities between the Valsungana and Nova Trento Suites indicate that their protoliths were not all too different, whereas the São João Batista Suite, with far more scattered values, is probably the result of rather heterogeneous protoliths.

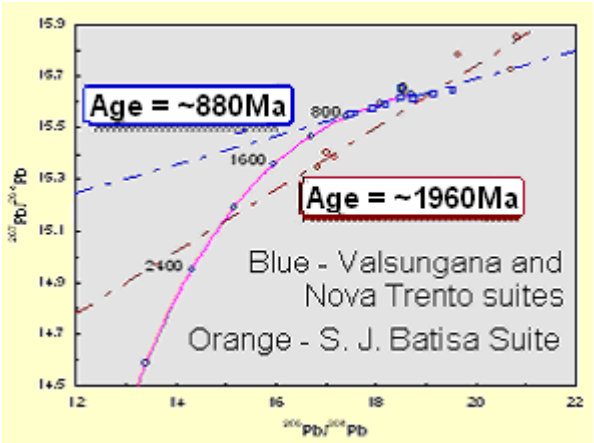

Figure 4 : 207Pb/204Pb vs. 206Pb/204Pb Diagram (Pb evolution graph)

The different isotopic signature of São João Batista granitoids when compared with Nova Trento and Valsungana suites is probably due to the strong upper crust participation on its generation. On the other hand the Valsungana suite shows an apparent homogeneity, as opposed to the rather heterogeneous Nova Trento and São João Batista Suites, suggesting a deeper and more homogeneous source.

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