

GEOCHEMISTRY AND Nd ISOTOPIC EVIDENCE OF THE PENSAMIENTO GRANITOID COMPLEX, RONDONIAN SAN IGNACIO PROVINCE, EASTERN PRECAMBRIAN SHIELD OF BOLIVIA: PETROGENETIC CONSTRAINTS FOR A PLUTONIC ARC MODEL.

Ramiro Matos^{1,3}, Wilson Teixeira¹, Umberto G. Cordani¹, Mauro C. Geraldès², Jorge S. Bettencourt¹, Key Sato¹, Nestor Jimenez³

¹ Instituto de Geociências, Universidade de São Paulo, Rua do Lago 562, Cidade Universitária. 05508-080 São Paulo, SP, Brasil.

E-mail: rmatoss@igc.usp.br; wteixeir@usp.br; ucordani@usp.br; jsbetten@usp.br; keisato@usp.br

² Faculdade de Geologia, Universidade do Estado do Rio de Janeiro, Rua São Francisco Xavier 524, 20559-900 Rio de Janeiro, RJ, Brasil.

E-mail: geraldès@uerj.br; gvargas_mattos@hotmail.com

³ Instituto de Geología Económica y del Medio Ambiente,

Universidad Mayor de San Andrés, Calle 27, Pabellón Geología, Campus Universitario Cota Cota. La Paz, Bolivia.

E-mail: rmatoss@yahoo.com

Keywords: Bolivia, Pensamiento Granitoid Complex, San Ignacio Orogeny, Geochemistry, Sm-Nd isotopic, Amazonian Craton.

ABSTRACT

The Pensamiento Granitoid Complex (PGC), the bigger example of granitoids in the eastern Precambrian of Bolivia is related to calc-alkaline plutinism and forms part of the Rondonian- San Ignacio Province (RSIP; 1.55-1.30 Ga) in the SW Amazonian craton. The SW sector embraces several NW-SE trending belts that become younger to the southwest, the youngest of which is the Sunsas Orogeny (1.3-1.0 Ga). The PGC crops out almost entirely within the Paragua craton, and is overprinted in places by low grade metamorphism and shearing tectonically linked with the Sunsas Orogeny. The PGC comprises plutonic granites and subvolcanic terms, and subordinately syenites, granodiorites, tonalites, trondhjemitites and diorites. Tectonically these rocks have been distinguished as syn- to late-kinematic and late- to post- kinematic granitoids correlated to the RSI orogeny. Thirteen whole rock analysis for major, trace and REE in selected samples of the Pensamiento Granitoid Complex and two of the Lomas Maneches Complex indicate that these rocks belong to the subalkaline series, whereas in the AFM diagram they plot in the calc-alkaline field. The syn- to late-kinematics La Junta and San Martin granites show both volcanic arc and within plates granites affinities, as indicated in the Rb vs (Y+Nb) diagram. The wide range of SiO₂ contents suggests an origin by fractional crystallization from mafic and intermediate terms. The REE patterns are moderately fractionated in terms of LREE/HREE with a slightly negative Eu anomaly. One sample shows no negative Eu anomaly. The spider

diagram presents steep patterns because the high LILE contents of these rocks. Negative peaks of Sr, P, and Ti suggest fractionation of feldspar, apatite, and titanomagnetite and sphene, respectively. New SHRIMP U-Pb yielded ages of 1373 ± 20 Ma and 1347 ± 21 Ma respectively. Sm-Nd yielded TDM model ages between 1.7 to 2.0 Ga, and $\epsilon_{\text{Nd}}(1330)$ values ranging from +1.8 to -4.3. The late- to post-kinematic Porvenir, San Cristobal, Diamantina and Piso Firme calc-alkaline granitoids display SiO₂ content that ranges from 72 to 76wt%. They plot on the boundary between metaluminous to peraluminous composition and both have affinities with within plate granites and volcanic arc granites. Regarding the REE patterns the Piso firme Granophyre, San Cristobal and Porvenir granites show low LREE fractionation, and subhorizontal tendency of HREE with negative Eu anomaly. They have deeper negative peaks of Sr, P and Ti. The Diamantina Granite displays REE patterns with two different signatures: first, steep patterns due to high contents of LREE and depletion in HREE with negative europium anomaly. Second, "gull wing" pattern with enriched HREE. In the multielement diagrams show negative peaks of Sr, P, and Ti. The Diamantina Granite yielded SHRIMP U-Pb ages of 1340 ± 20 Ma. Sm-Nd data displays TDM model ages of 1.6 to 1.9 Ga and $\epsilon_{\text{Nd}}(1330)$ values from -1.25 to +0.39. The late- to post-kinematic granites yield Sm-Nd TDM model ages of 1.6 to 1.7 Ga, and the $\epsilon_{\text{Nd}}(1330)$ values of +1.5 to +2.7. Two samples were collected from Lomas Maneches Complex, one sample shows enriched LREE, and depletion of HREE, whereas the other sample displays a less fractionated signature, with relative LREE depletion and HREE increased, and both samples with moderate negative Eu anomaly. The spider diagram shows all two samples with depletion in P and Ti and one further depleted in K and Rb. Sm-Nd

data displays TDM model ages between 1.8 to 2.2 and $\epsilon\text{Nd}(1.66)$ values of +1.46 and -2.87. Recent works using SHRIMP U-Pb analysis to Lomas Maneches show magmatic ages of 1.82 and 1.66 and metamorphic ages between 1.34 to 1.32 Ga.

Geochemical evidence indicates that the PGC rocks exhibit predominantly volcanic arc and within

plate affinities. Coupled litogeochemistry and Sm-Nd isotopic data suggest a plutonic arc setting comprising