U/Pb constraints on the origin of Mesoproterozoic granites of Pontes e Lacerda region, SW of Amazon Craton

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U/Pb studies were carried out on Mesoproterozoic granites from SW Mato Grosso State (SW of Amazon Craton) to contribute to the understanding of the geologic evolution of this region. The regional geologic framework as constrained by Rb/Sr geochronology includes a Paleoproterozoic Basal Complex (granulites, gneisses and migmatites, ca. 1.9 Ga), a Mesoproterozoic metavulcano-metasedimentary sequence (ca. 1.7 Ga), mafic to felsic plutons (both foliated and non-foliated, ca. 1.3 Ga), metasedimentary rocks of Aguapei Group (1.3 to 1.0 Ga) and young basic to felsic intrusives (ca. 1.0 Ga).

Four U/Pb ages have been performed for the followings units: Santa Helena Granite-Gneiss, Maraboa Granite, Lavrinha Tonalite and Paragneiss (of the Paleoproterozoic Basal Complex). The regional tectonic importance of these units and their large exposure were the main basis for chooosing them. The zircon separation was done in CPGeo (IG-USP) and the analysis was carried out in Isotope Geochemistry Lab of the University of Kansas using the methods described by Parrish (1987). Ages were calculated using values of Steiger and Jäger (1978). Errors are reported at the 2σ level.

Santa Helena Granite-Gneiss (SHGG)

The batolith represented by SHGG occurs over a large area, including the Pontes e Lacerda, Jauru, Santa Barbara, Rio Itaituba and Aguapei 1:100.000 sheets. In the Pontes e Lacerda sheet, the SHGG shows restricted compositional and textural variations and is represented by gray to pink, usually equigranular, foliated biotite granites. A Rb/Sr (whole rock) best fit isochron yielded an age of 1,318 ± 24 Ma (Geraldes, 1996). Three zircon fractions from this unit yield an upper intercept (crystallization age) of 1,434 ± 42 Ma on the U/Pb concordia diagram (Figure 1a). Two other, more magnetic fractions of rounded zircons from this granite were analyzed. The more magnetic fraction of the two has a $^{207}Pb/^{236}Pb$ age of 1,416 ± 3 Ma. The less magnetic fraction has a $^{207}Pb/^{206}Pb$ age of 2,826 ± 2 Ma suggesting that some zircons grains from this unit have inherited cores from a Archean source. (Figure 1e).

Maraboa Granite (MG)

The Maraboa Granite is an isotropic granite included in the SHGG (Menezes et. al., 1993). The post-kinematic isotropic characteristics and Rb/Sr whole rock errorchron age of 1,257 ± 125 Ma (Geraldes, 1996) constrain its separation from SHGG. The rocks are coarse grained, pink to red, biotite granites, which are sometimes inequigranular due the presence of K-feldspar phenocrystals. Zircon, apatite and fluorite are common accessory minerals. The U/Pb results of MG when plotted on a U/Pb concordia diagram (Figure 1b) yielded a upper intercept (crystallization age) at 1,446 ± 15 Ma .

Lavrinha Tonalite

The zircon fractions from a sample of hornblende tonalite collected in Pontes e Lacerda area were analyzed. This rock is informally denominated here as Lavrinha Tonalite. The rocks are gray to green, isotropic with medium to coarse grain size. The presence of sericite, biotite, clorite, epidote and titanite are due post-crystallization hydrothermal alteration. The three analysis plotted on a U/Pb concordia diagram yielded an upper intercept (crystallization age) at 1,463 ± 3,6 Ma with an lower intercept forced through 0 Ma (Figure 2c). All three analyses fall near the concordia curve, resulting in a high-precision age.

Paragneiss

This rock belongs to the Alto Guapore Metamorphic Complex and was interpreted by Menezes et. al., (1993), as basement of the region. The sample was collected in NE part of Pontes e Lacerda area where the unit was divided into granodioritic orthogneiss and garnet-muscovite paragneiss. In the region the paragneiss is marked by a banding due the alternation of layers rich in mafic minerals with layers rich in quartz and feldspars. Pegmatites are also observed. A homogeneous unbanded sample was collected. It contains k-feldspar, quartz, amphibole and biotite. Three zircon fractions plotted on a U/Pb concordia diagram (Figure 1d) yielded an imprecise upper intercept at 1,450 ± 82 Ma. Additional analyses are being done to refine this age.

Discussion

The preliminary U/Pb results on these four units obtained allow a revised interpretation for the evolution of the region. Units formally considered younger due to the Rb/Sr ages, may now be associated in a short interval of time between 1,434 and 1,463 Ma. The coincidence among the ages of all samples (SHGG, LT and MG) is seen in Figure 1e, in which all results were plotted together. This agreement in age indicates an origin during a short time interval, and these units are probably related to an important, wide-spread, and varied granite forming event. The units generated in this event crop out throughout the Aguapei, Santa Barbara, Rio Pindaituba, and Jauru areas. The existence of paragneiss, whose zircons yielded 1,450 ± 82 Ma, suggests a high-grade (anfibolite facies) metamorphic event more or less generated in this event.

The existence of inherited zircons with ca. 2.85 Ga age in SHGG suggests a possible Archean sialic crust componente in the source region of the granite formation (Figure 1e).

In conclusion, we propose that SHGG, LT, MG have ages concordant with the metamorphism which formed the paragneiss. The age agreement of a large number of granitic bodies may be due to a important event of granite formation. This indicates an epoch of sialic crust generation which include some contribuition from older sialic material and metamorphism of such stabilized crust at 1,460 Ma.

Acknowledgments

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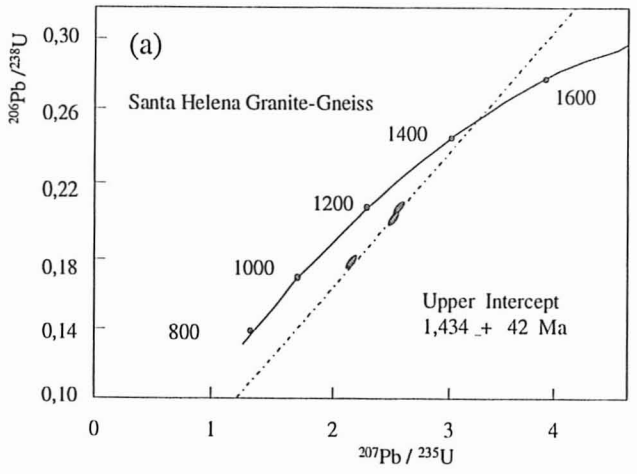

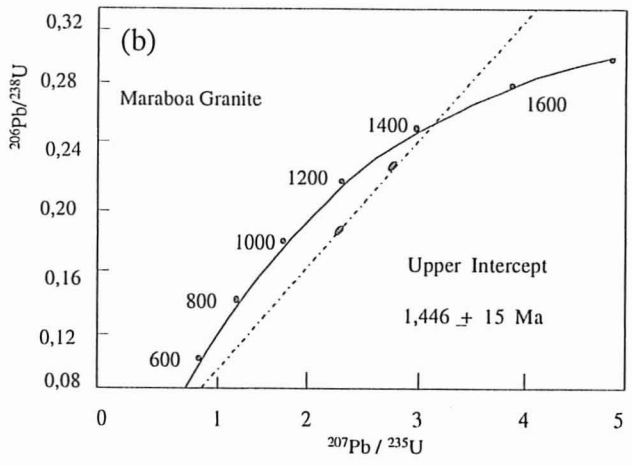

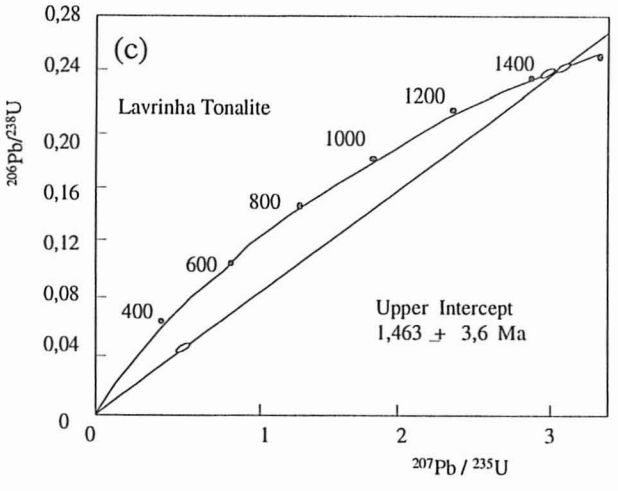

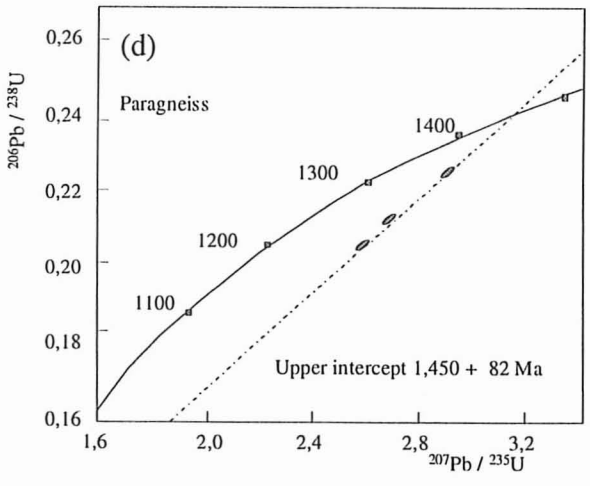

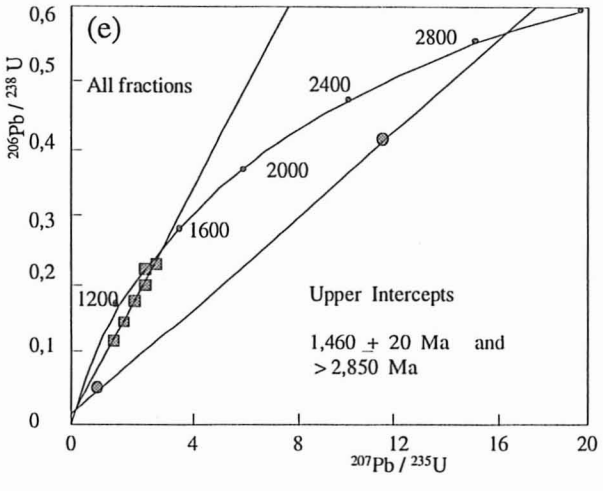

Figure 1. Concordia diagrams:
(a) Santa Helena Granite-Gneiss;
(b) Maraboa Granite;
(c) Lavrinha Tonalite;
(d) Paragneiss;
(e) All fractions.

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