

Kazakhstanian greenstone belt as typical epicontinental mobile structure of Early Proterozoic

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1. Kazakhstanian Early Proterozoic greenstone belt (KEPGB) stretches archedly through western part of Central Kazakhstan over 700km and exposes in the central parts of Caledonian anticlinoria. KEPGB consists of volcanogenic and sedimentary rocks, metamorphized in green schist facies, overlies with unconformity Archean(?) crystalline rocks. The lowest Balazhezdinskaya Series is narrow spread (South Ulutau), consists of metabasalts (800m) and then metakeratophyres (200m) at the bottom, and of metatrachybasalt-terrigeneous rocks with highly initially sandy-clay matter in the upper part (2300m). The main sequence consists of Aralbayskaya (4500-6800m) and Karsakpayskaya (4000m) Series that are bed conformably and attend in the region one another. Aralbayskaya Series has metabasalt-keratophyre content, varies by character of main middle-acid volcanites from volcanic to volcanic-sedimentary. Series includes three levels of metabasalts (20%) with the thickness increasing in the upper part. In Karsakpayskaya Series in the lower half metabasaltic and quartzite-phyllitic layers combine macrocrystally twice; and in the upper half the same way metabasalts with metarhyolites and acid metavolcanomictic and polymictic rocks, including conglomerates. All three Series are iron-bearing, especially Karsakpayskaya, in connection with basalt volcanism (S.B. Rozanov). The age of the sequence is rejuvenated, but the cover metarhyolitic orogenic complex is characterized by isotopic U-Pb method as 1800-1860 Ma (S.I. Zykov, N.I. Stupnikova).

2. Volcanic complex of the KEPGB is bimodal. Acid rocks mainly basalts. Metabasalts belong to the line tholeiites - subalkal basalts. Volcanites are usually sodium, basalts with high  $TiO_2$ . Karsakpayskaya Series also includes in the lower part genetically independent K-Na-metaserotetrahybasalts. The main in the region Bolbraunskoe iron deposit is connected prospectively with this rocks. The features of basalts are the result of the difficult outlet of basalt magma and partly of the different depth of the magma generation. It is evidently stipulate by the development of the belt paleostructure at the consolidated basement. The tectonic regime was relatively inert even at its the most active stage.

3. KEPGB was asymmetric riftogenetic paleostructure with clear west and east near slopes that was of the marginal position. The east framing massif more consolidated than the west one is fragment of protocontinent. About 2000 Ma ago the inversion, folding and plagiogranitization were taken place. Structure formation role of the plagiogranitization resulted in the structural plan close to the Archean greenstone belts, but more linear.

4. KEPGB can be examine in the lateral line of destructive epicontinental structure with different extent of mobility.

CRUSTAL EVOLUTION OF THE AMAZONIAN CRATON BETWEEN 1.8 Ga TO 1.6 Ga: BASED ON ISOTOPIC EVIDENCES

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The Amazonian craton is composed by an ancient cratonic domain (Central Amazonian Province-CAP), which is surrounded by early to middle proterozoic mobile belts (Maroni Itacaiunas, 2.2Ga - 1.9Ga; Rio Negro-Juruena RNJP, 1.8Ga-1.55Ga, Rondonian-San Ignacio, 1.5Ga-1.3 Ga and Sunsás, 1.25Ga-1.0Ga). The Sr, Pb and Nd isotopic data shows that the development of the mobile belts did involve new crust formations as well as reworking of older crustal materials.

The RNJP occupies large portion of the western part of the Amazonian craton, and is a zone of complex granitisation and migmatitisation. It is composed mainly of gneisses, migmatites, amphibolites, granulites and tonalites as well as syn- and post-tectonic anatectic granites. Regional metamorphism generally took place in the RNJP in the upper amphibolite facies. The granites and gneisses of the RNJP yield Rb-Sr and Pb-Pb whole rock isochron dates in the range 1.75 Ga to 1.55 Ga, with initial  $^{87}Sr/^{86}Sr$  ratios around 0.703 and a single-stage model  $\mu$  value about 8.15. These results were interpreted as indicating the time of original rock-formation from mantle-derived magmas.

In order to improve the geochronological control, SHRIMP U-Pb zircon and conventional U-Pb zircon ages have been undertaken on six samples of granitoids and gneisses from the Papuri-Uaupés and Guaviare-Orinoco rivers areas (northern part of RNJP) and Jari-Machado rivers area (southern part of RNJP). The granitoids from the northern part yielded conventional U-Pb zircon ages of  $1709 \pm 17$  Ma and  $1521 \pm 31$  Ma, and SHRIMP U-Pb concordant zircon results on two metatonalitic samples of  $1800 \pm 18$  Ma. Samples from a foliated metadiorite and a blastomylonitic granulite from the southern part of RNJP yielded SHRIMP U-Pb concordant ages of  $1750 \pm 17$  Ma, and  $1570 \pm 17$  Ma. These new U-Pb results confirm the previous Rb-Sr and Pb-Pb geochronological evidence, that the main magmatic episodes within the RNJP took place mainly between 1750 Ma and 1550 Ma.

In the area of the RNJP and CAP there are several anorogenic rapakivi type granite plutons, mainly subalkaline, and exhibiting characteristics of A-type and within-plate granites. These late to post-tectonic and anorogenic granites were emplaced in three different time periods as follows: 1.6 - 1.5 Ga; 1.4 - 1.2 Ga, and 1.1 - 1.0 Ga. In addition, within the CAP there are several undeformed within-plate bi-modal volcanic and sedimentary covers deposited on rift environments, which their histories are dated since 1.9Ga to 1.5Ga.

The geochronological pattern of the RNJP together the few Sm-Nd  $T_{DM}$  model ages of about 2.0 Ga, obtained on basement rocks, suggest that this crustal province constitute a segment of continental crust newly added to the Amazonian craton at the early and middle Proterozoic, produced through the development of at least two magmatic arcs, although its precise geographical boundaries remain uncertain.

TECTONIC EVOLUTION OF SOUTHERN BRAZIL DURING THE BRASILIANO CYCLE, BASED ON U/Pb AND Sm/Nd GEOCHRONOLOGY

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The Neoproterozoic Brasiliano cycle in southern Brazil is represented by two tectonic units, the Dom Feliciano Belt (DFB), situated along the eastern coast, and the São Gabriel Block (SGB) westward from the DFB. The São Gabriel block is an extension of the Ribeira Belt in southern Brazil, from which it is separated by a Phanerozoic cover.

The DFB is comprised mainly by granites, gneisses and migmatites that occur along a 800 km long and 100 to 200 km wide belt. The SGB is made up by a volcano-sedimentary sequence metamorphosed at greenschist to lower amphibolite facies (Vacacai Supergroup). This unit was thrust over gneissic rocks of the Cambai Complex which are granodioritic to tonalitic in composition and formed under amphibolite facies condition.

Two main orogenic events affected these areas during the Brasiliano - Pan African cycle: the Sao Gabriel event (700 - 750 Ma) and the Dom Feliciano event (ca. 600 Ma) (Chemale Jr. et al., 1994). In order to characterize these events, 5 zircon samples were dated by conventional U/Pb methods and 27 whole-rock samples were analysed by Sm/Nd method.

U/Pb ages determined on granites and gneisses of DFB allowed us to define two structural events in this region. The first one, which occurred between 610 and 620 Ma, is characterized by the tangential tectonics, with westward overthrusting, and generation of granites, gneisses and migmatites. The second deformation is defined by a transcurent tectonics, dated at  $595 \pm 5$  Ma. Sm/Nd data obtained for 16 samples from the DFB can be divided in two groups. The first group consists of Brasiliano granitoids with Nd  $T_{DM}$  ages between 1.3 to 1.7 Ga. The second group includes gneissic rocks with Nd  $T_{DM}$  ages of ca. 2.0 Ga and older. Both groups have negative  $\epsilon_{Nd}(t)$ , where  $t = 600$  Ma, although the values for the second group are more negative. These data show that rocks from both groups represent involvement of older crust during the 600 Ma orogeny. Rocks from the first group (younger  $T_{DM}$ ) suggest a mixture between older material (2.1 Ga Transamazonian basement) and younger material (Brasiliano juvenile magma?), since no 1.3 to 1.7 Ga crust has been recognized in the area. We have not determined any  $T_{DM}$  ages younger than 1.0 Ga in the DFB, with respective positive  $\epsilon_{Nd}(t)$ , which could suggest the presence of juvenile material formed during the 600 Ma event.

Zircon U/Pb ages from the SGB indicate orogenesis between 700 and 750 Ma. The age of 700 Ma is from a tonalitic gneiss (this work) and the age of 750 Ma was determined on metarhyolites from the Campestre Formation (Machado et al., 1990). Sm/Nd data on 11 samples from the SGB show few Nd model ages ( $T_{DM}$ ) as old as 2.0 Ga; most of them are younger than 1.0 Ga, with positive  $\epsilon_{Nd}(t)$ , (where  $t = 700$  Ma). These data indicate generation of juvenile magma during the São Gabriel Orogeny in the Brasiliano - Pan African cycle, suggesting accretion of juvenile terranes in this area, in contrast to the situation observed in the DFB. Since there is an interval of ca. 100 Ma between the two orogens, it is suggested that the São Gabriel block (Vila Nova terrane) occupied a hinterland position during the Dom Feliciano orogeny (600 Ma).

References:

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