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showing the intense compression formation at the margin, reflecting the characteristic of conformable intrusion of the pluton. The relatively gentle lineation reflects a kind of rotatory emplacement mechanism. Relatively steep marginal foliation shows the characteristic of compression expanding. Affected by the thermal power of the pluton, the metamorphism of the contact zone has zonation. Both the strike of the axial plane of fold at the contact zone and that of the flow cleavage of the ductile shear zone are consistent with the boundary, which reflects the features of conformable intrusion. The hinges of folds are mostly inclined and erect, which reflects emplacement mechanism of spiraling ascent. Both boudins developed at contact zone and the steep strata indicate that the emplacement characteristic of the balloningly expanding of the pluton. The surrounding rock of the contact zone horizontally shortens. The average percentage of shortening is 39.7%, which further presents the forcefully expanding mechanism of the pluton, and the space occupied by the active expanding intrusion is offered by the shortening of the surrounding rock. The characteristics of left-lateral shearing shown by ductile shear zone and rheomorphic fold reveals that the pluton emplacement and the deformation of surrounding rock are controlled by NNE-striking left-lateral shear stress field in eastern China. The above characteristics of pluton structures suggest a mechanism of emplacement. In the deep, the pluton apically arose left lateral, and in the shallow, the one forcefully emplaced balloningly.

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THE HIGH K CALC-ALKALIC TAVARES BATHOLITH: MAGMA TRANSPORT RATE AND MAGMA CHAMBER BUILDING

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Keywords: magmatic epidote; chamber building; upward transport rate; flow rate; high K calc-alkalic

The well-exposed Tavares batholith is the best known representative, among the magmatic epidote (mEp)-bearing high K calc-alkalic granitic plutons is northeastern Brazil. This batholith intruded gneisses (Alto Pajeú terrane) and schists (Cachoeirinha terrane), and is bounded by shear zones along its northern (dextral) and southern (sinistral) margins. Lithological units comprise syenite to quartz monzonite with K-feldspar megacrysts up to 6 cm long. The pluton is marked by pervasive magmatic foliation with curved, elliptical geometries mainly delineated by biotite + amphibole and K-feldspar, observed on centimeter to hundred-meter scale. Tonalitic to quartz dioritic rocks, linearly distributed, are common and have been interpreted as disrupted narrow synplutonic dikes. Layered xenoliths up to 10-m long (amphibolite alternates with epidote-rich layers) are found in the central portion of this batholith, possibly transported upward from the amphibolite source. The pluton shows a four-sided polygonal geometry with the major sides converging towards northeast. Besides the magmatic foliation that cuts across the pluton, structures include ladder-dikes, snails, mushroom-shaped structures, blobs and concentric rings. Composition of epidote (42 grains) clusters around 19 and 25%Ps (FO2 in the N-NO field). Measured dissolution zone width (mm) of highly corroded subhedral mEp grains, varies from 0.02 to 0.24 mm (avg. 0.2 mm) and indicates an average of 30 yr for dissolution and minimum upward magma transport rate around 600 m.yr.⁻¹. Thermal and fluid dynamical analysis, based on Petford et al. (1993, 1994) allows to estimate that the time necessary to build the Tavares magma chamber (about 1100 km³ in volume) was approximately 200 yr. The conduct through which magma flew had an estimated width of about 2 m and the magma flow rate was 2 cm.yr⁻¹. Well-preserved magmatic epidote crystals, up to 0.65 mm long require 260 yr for complete dissolution and set the maximum time for magma crystallization in this chamber. Petford, N. et al., 1993. Geology 21(9): 845-848. Petford, N. et al., 1994. Lithos 32 (1-2): 161-168.

194-33 Poster Sial, Alcides Nobrega

TRANSPORT RATE AND EMPLACEMENT OF MAGMATIC EPIDOTE GRANITOIDS IN NORTHEASTERN BRAZIL

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Keywords: magmatic epidote; transport rate; emplacement; granitoid; NE Brazil. Magmatic epidote (mEp)-bearing granitoids are known from five tectonostratigraphic terranes in the Borborema province, northeastern Brazil. They are mainly calc-alkalic to high K calc-alkalic plutons, although some shoshonitic to trondhjemitic ones are also known. The high K calc-alkalic and calc-alkalic plutons were emplaced within the 630-650 Ma interval with only few exceptions (e.g. Caldeirão Encantado pluton is 880 Ma old). Granitoids which share same petrological/ geochemical features with them, but were emplaced within the 580-570 Ma interval, are free from mEp. All the studied calc-alkalic and high K calc-alkalic granitoids show epsilon Nd between -1 and -4 and TDM (630) between 1.1 and 1.4 Ga (source material formed during rifting pre-Cariris Velhos = Grenville orogeny) except for the Curral de Cima calc-alkalic granitoid (epsilon Nd = +2 and TDM (600) = 0.9 Ga). The Nd isotope behavior for this pluton assures that there was also Neoproterozoic juvenile crust formation at this province. Most plutons carry amphibole-rich clots, interpreted as pieces detached from the source. One large layered amphibolite xenolith at the Tavares pluton yielded a TDM (600 Ma) of 1.4 Ga, in the range of model ages for most of these plutons. The studied mEp-bearing granitoids were emplaced at 5 to 7 Kbar pressure (outside the Transversal Domain of the province, however, some mEp-bearing plutons were emplaced at shallower depth (3 to 4 Kbar). In high K calc-alkalic and calc-alkalic plutons, mEp was transported upward at rates <2000 m.yr⁻¹ and show dissolution time <35 years. When in contact with microcline, mEp is less corroded than when it is in contact with/hosted by plagioclase. In the São Rafael pluton (Serridó terrane), mEp was transported upward at ~1200 m.yr⁻¹ with average dissolution time of ~15 years. Within three plutons examined in the Cachoeirinha-Salgueiro terrane, mEp underwent corrosion during 15-35 years and were transported upward at 450-1300 m.yr⁻¹. A similar behavior was observed for the mEp studied from six plutons in the Alto Pajeú terrane indicating variable rates of upward migration (650-1050 m.yr⁻¹) and time of dissolution (10-25 years). Finally in the Gloria pluton (Macururé terrane), mEp were transported much faster (~1800 m.yr⁻¹) with shorter mEp dissolution time (~10 years). Plutons usually display elongate shape suggesting transport by dikes and, in a few cases, seem to be products of inflation, at lower pressure, of dike-transported magmas.

194-34 Poster Sial, Alcides Nobrega

DIFFERENTIAL CHARACTERISTICS OF CORDIERITE-BEARING GRANITOIDS FROM ARGENTINA, BRAZIL AND CHILE

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Keywords: cordierite; Argentina; Brazil; Chile; granitoid

Cordierite-bearing granitoids (CBG) in Brazil, Argentina and Chile are, respectively, Neoproterozoic, Early Paleozoic and Early Jurassic in age, emplaced at distinct tectonic environments and structural levels reflected in their mineralogy, geochemistry and metamorphic host rocks. In eastern Brazil, CBG from Nanuque (states of Bahia and Minas Gerais) intruded granulite/metaxite terrains, typical of the mid-crust related to subduction environment.

Cordierite-bearing granitoids from Capilletas and Mazán, Pampean Ranges in Argentina, are associated to greenschist- to amphibolite facies host rocks, shallowly emplaced in a syn-collisional environment. Los Tilos pluton in the Chilean Andes (30°S) was emplaced at a shallow level during extensional/transitional period between Late Paleozoic magmatism and typical mid-Jurassic magmatism. Granitoids from Brazil and Argentina are coarse-grained,

porphyritic and in plutons at Nanuque, Brazil, cordierite is associated to garnet or appears as quartz-cordierite nodules of magmatic origin. Garnet-spinel granulites are mingled with granitoids suggesting in situ partial melting.

La/Yb > 40 ratios suggests presence of garnet in the source. In the Mazán and Capilletas batholiths, Argentina, rests of migmatites in garnet-free granitoids, contain spinel, andalusite, muscovite, and high amounts of biotite. La/Yb < 25 ratios suggest absence of garnet in the source and the cordierite from migmatites and granitoids shows similar chemistry which differs from that of cordierite produced by contact metamorphism. In the Los Tilos pluton, Chile, rocks are equigranular, coarse- to medium-grained and lack garnet.

La/Yb = 23-30 ratios suggest possible garnet in the source. In Los Tilos pluton, cordierite-quartz nodules are similar to those from Nanuque. Cordierite displays the highest Fe and Mn contents (0.9 and 1.6-1.8, respectively) whereas at Nanuque and Capilletas-Mazán, cordierites exhibit, respectively, 0.7-0.8 and 0.04-0.4. The available data indicate syn-collisional origin for the Capilletas-Mazán granitoids. High abundance of biotite, cordierite and andalusite and absence of garnet associated to migmatite enclaves, indicate melting with little migration from the source. Cordierite nodules in Nanuque and Los Tilos plutons could represent near-liquidus mineral assemblages, formed and equilibrated in the source region, and further transported to emplacement levels, under stress regime related to arc plutonism.

194-35 Poster Barbosa Leite JR., Washington

HYBRIDIZATION IN A GRENVILLIAN TIN-BEARING RAPAKIVI GRANITE SUITE, SOUTHWESTERN AMAZONIAN CRATON, RONDÔNIA, BRAZIL

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Keywords: hybridization; magma mixing; rapakivi granite; Amazonian craton; Brazil

The 1.08-1.07 Ga Santa Clara Intrusive Suite (SCIS) is composed of several early- and late-stage intrusions, emplaced in older metamorphic rocks. The volumetrically smaller late intrusions have been subdivided into two subgroups: metaluminous to peralkaline and peraluminous. The former is composed mainly of hornblende alkali-feldspar syenite and microsyenite, biotite (sodic amphibole) alkali-feldspar microgranite, trachyandesite, trachyte, and minor basalt, and the latter is composed of biotite alkali-feldspar granite, alkali-feldspar granite, and rhyolite porphyry (ongonite), showing Nd signatures that indicate dominant mantle and crustal sources, respectively. Late-stage hybrid rocks are found in small subvolcanic complex in the Oriente Novo massif, where black trachyandesite and pink leucorhyolite porphyry, as well as dark gray microsyenite and pink microgranite are interpreted as end-members, although no separate trachyandesite, leucorhyolite and microsyenite bodies are recognized within the complex, and all of them show signs of hybridization. In both cases the hybrid rocks contain high proportion of micro- and macro-enclaves and xenocrysts, and a gradual contact is only observed with microgranite. Xenoliths (< 10 cm in diameter) of coarse-grained rapakivi granite and fragments of others subvolcanic felsic rocks are also present in varying amounts, and larger (0.5 to 4.0 cm in diameter) quartz, alkali-feldspar, plagioclase and biotite xenocrysts are interpreted to have been derived from disaggregated rapakivi granite xenoliths. Hybrid rocks are trachydacite and quartz-alkali-feldspar microsyenite in composition. The trachydacite is gray to pinkish gray in color and is characterized by quartz and alkali-feldspar megacrysts rimmed by biotite, whereas the quartz-alkali-feldspar microsyenite is pinkish gray and show quartz megacrysts mantled with biotite and hornblende, antirrapakivi texture and acicular apatite. Field and petrographic evidence suggest that magma mingling and mixing occurred at moderate to high crustal levels. Unlike hybrid rocks in the classical rapakivi granites of Finland that are product of mixing of mafic and felsic magmas, the hybridization in the SCIS involves magmas of intermediate and felsic compositions.

194-36 Poster Gomes, Maria

GEOCHEMISTRY OF MICROGRANULAR ENCLAVES AND HOST GRANITES FROM REBORDÉLO AND TELÓES, NORTHERN PORTUGAL

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Keywords: microgranular enclaves; granites; hybrid rocks

At Rebordelo, a medium-grained porphyritic biotite-muscovite peraluminous granite crops out along small shear bands subparallel to the Laza-Rebordelo dextral NW-SE shear zone. It is a syntectonic granite of 357 ± 9 Ma old yielded by a whole-rock Rb-Sr isochron. It contains peraluminous tonalitic and granodioritic enclaves. At Telões, a medium- to coarse-grained porphyritic biotite subaluminous granite crops out along the Vila Real NNE-SSW fault. It is a post-tectonic granite of 299 ± 3 Ma old given by U-Pb isotopic data on zircon has

$(^{87}\text{Sr}/^{86}\text{Sr})_0 = 0.7069 \pm 0.0017$ and $\epsilon\text{Nd}(299) = -2.5$, with $T_{DM} = 1.1$ Ga (Martins, 1998). It contains metaluminous to subaluminous tonalitic, granodioritic and monzogranitic enclaves. At both areas, the microgranular enclaves show rounded or ovoid shapes and commonly are of 25 cm in diameter, but at Rebordelo some enclaves have irregular shapes and range from