REPEATED PARTIAL MELTING EVENTS IN THE ARAÇUAÍ OROGEN (SOUTHEASTERN BRAZIL): EVIDENCE FROM THE POLYMETAMORPHIC CARLOS CHAGAS BATHOLITH

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The Carlos Chagas batholith (CCB) is the largest (~14,000 km2) granitic body ascribed to the collisional G2 supersuite (ca. 585-545 Ma) of the Araçuaí orogen (AO), southeastern Brazil. The CCB includes a dominant granite richer in garnet than in biotite (the Carlos Chagas leucogranite) and lithotypes with generally prevalent biotite (Montanha and Nanuque granites). Our work focuses on the Carlos Chagas leucogranite, cropping out in the CCB central to southern region, with a view to better understanding crustal recycling during a long-lived orogeny. Three major mineral associations within CCB can be identified: A1) Qz+Pl+Kfs+Bt+Grt+Ilm±Rt; A2) Qz+Pl+Kfs+Bt+Grt+Ilm+Sil; and A3) Qz+Pl+Kfs+Bt+Grt+Ilm+Sil +Spl. Textural evidence for the presence of former melt, recognized in all studied samples, includes: silicate melt inclusions in poikiloblastic garnet, pseudomorphed thin films of melt surrounding the two generations of garnet, pseudomorphed melt pools adjacent to garnet and biotite, and plagioclase and quartz with cuspate-lobate shapes occurring among matrix grains.Two generations of garnet (Grt_1 and Grt_2) are identified within CCB and both are unzoned in terms of major element concentration, both contain small rounded inclusions of Ti-rich biotite and, in addition, the Grt_2 crystals also contains inclusions of remnant sillimanite needles. This microstructural evidence, in combination with the mineral chemistry, indicates that the garnet crystals grew during two distinct partial melting events, assisted by fluid-absent reactions consuming biotite. P-T pseudosections calculated via Theriak Domino in combination with (LA-ICP-MS) *in situ* U-Pb monazite and zircon dating provide new constraints on the thermal evolution of the AO. Data from A1 records P-T conditions of the first granulite-facies metamorphic event (M1) at 790-820 ºC and 9.5-10.5 kbar in depths of 29-32 km, whilst A2 records P-T conditions of the second granulite-facies metamorphism (M2) at 770 ºC and 6.6 kbar corresponding to depths of 20 km. These metamorphism events are recorded in monazites and zircons in all associations, with peak at ca. 564-552 and ca. 530-515 Ma, respectively. The evidence described in this work indicates three episodes of crustal recycling in the Araçuaí orogeny. In the first event source rocks with a volume substantially larger than that of the CCB melted to produce a hydrous, peraluminous granitic melt that intruded at presumably higher crustal level within the orogenic belt at ca. 576-577 Ma. At least part of the water in this hydrous magma was trapped due to biotite crystallization producing significant fertility for the generation of melt from the resultant granite. Thickening and further evolution of the orogen introduced the CCB into the deep crust producing a second process of crustal differentiation, some 20 Ma after the first. This produced an almost completely anhydrous rock, infertile for the production of granitic melt. The third and final episode of recycling occurred only where hydration due to shearing had refertilized the CCB for melt generation and produced relatively minor melt volumes, which were lost leaving the CCB dry and refractory.

PALAVRAS-CHAVE: MULTIPLE ANATECTIC EVENT, MONAZITE AND ZIRCON DATING, ARAÇUAÍ OROGEN