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Polycyclic evolution of the Camboriu Complex, Northeastern Santa Catarina State, South Brazil

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INTRODUCTION

The Camboriu Complex occurs in the northeastern portion of Santa Catarina State (southern Brazil). It consists of two main components: the Morro do Boi Migmatites and the Ponta do Cabeço Granite. Both components might be different stages of the migmatisation that spawned the Ponta do Cabeço Granite. Irregular, meter-sized leucocratic granitoid bodies crosscut the migmatitic banding.

GEOLOGICAL SETTING

In the Morro do Boi Migmatites folded layering predominates, with 1- to 4-cm thick alternating mafic (mesosome) and quartz-feldspar-rich felsic (leucosome). Although banded migmatites predominate, the migmatitic structures can vary within a few meters from coherently layered to agmatitic and more rarely nebulitic. The gray mesosomes are fine- to medium-grained, of monzogranitic to granodioritic average composition. The Ponta do Cabeço Granite represents the predominant unit of the Camboriu Complex. It is of monzogranitic and occasionally syenogranitic composition which carry biotite and in some instances subordinate hornblende. It is whitish gray, with a grain-size banding parallel to the relic compositional banding. The abundance of enclaves is a conspicuous and distinctive characteristic of the Ponta do Cabeço Granite which allows its classification as a migmatitic granitoid where *schollen* and *schlieren* structures predominate. The enclaves are of varied compositions (orthogneiss, amphibolite, pyroxenite, biotitite and calc-silicates), fine- to medium-grained and of varied sizes, reaching up to one meter. The enclaves can present abrupt or rounded contacts and a reaction rim (especially the amphibolitic enclaves). Several enclaves of possible mesosomes of the migmatites can be observed, some displaying folded banding that indicate that the migmatites had already been deformed prior to the Ponta do Cabeço Granite emplacement.

Figure 1 – Metric sized leucogranite cross cutting the Morro do Boi migmatite

Figure 2 – Br 101 outcrop of Ponta do Cabeço granite with mafic enclaves

SHRIMP U-PB GEOCHRONOLOGY

Zircons were analyzed by the U-Pb SHRIMP method at the Research School of Earth Sciences SHRIMP laboratory (ANU, Canberra, Australia) and the Beijing SHRIMP Center (CAGS, Beijing, China). Additionally some zircons previously analyzed by SHRIMP were also analyzed for U-Pb and Hf isotopes by LA ICPMS at the laboratories of the Centro de Pesquisas Geocronológicas (USP, São Paulo, Brazil). The dated zircons were extracted from: 2 samples of the mesosome, 1 of the deformed leucosome, 1 of Ponta do Cabeço monzogranite matrix; 1 from an amphibolitic enclave from this granitoid, and 1 from a tabular leucogranite that crosscuts the migmatites.

The mesosomes of the migmatites yielded Archean $^{207}Pb/^{206}Pb$ ages that cluster at *ca*. 3.3 Ga and 3.0-2.9 Ga. The Paleoproterozoic is also well represented by concordant ages around 2.05 Ga. The cores of zircons from the deformed leucosome yielded Mesoarchean ages around 2.98 Ga while it was possible to obtain an age of *ca*. 0.63 Ga from the overgrowth rims. For the Ponta do Cabeço Granite a total of four clusters around 3.0-2.95 Ga; 2.7 Ga, 2.1-2.0 Ga, and 0.64 Ga were obtained. These ages can be directly correlated to the different overgrowth phases observed in the zircons. Zircons from mafic amphibolitic enclave yielded a unimodal population with a mean age of 1.53 Ga. This value is interpreted as indicative of the formation of the amphibolite and, as such, the oldest age possible for the generation of the Ponta do Cabeço granitoids.

A leucocratic granite cross-cutting the banded migmatites yielded zircon ages in the same range observed in the migmatitic rocks, suggesting that the leucogranites could be derived from melting of the 2.14 Ga banded migmatites. The ages observed for the overgrowths in this sample cluster around 0.61Ga, interpreted here as the age of granite formation. This confirms the field evidence for a relatively late emplacement for this rock.

CONCLUSIONS

The SHRIMP ages on successive zircon overgrowth ages reflect a very long crustal history for the Camboriu Complex. This process, recorded in zircon cores, started at 3.3 Ga, continued during the Mesoarchean, with peaks between 2.9 and 2.7 Ga, and was followed by an important migmatization phase in the Rhyacian-Orosirian (2.05-2.1 Ga). During the Mesoproterozoic (ca 1.5Ga) crustal extension is characterized by basic dike intrusions now preserved as mafic bands and xenoliths. In the Ediacaran, between 0.63 and 0.59 Ga, the migmatites with Paleoproterozoic neosome underwent a new thermal event at high-amphibolite facies that enabled melting to different degrees of preexisting rocks, generating the banded migmatites in their present form and the Ponta do Cabeço Granite.

Furthermore, the existence of roof pendants of the Neoproterozoic Brusque Group metasediments and meta-limestones in the Ponta do Cabeço granitoid, its association with the Morro do Boi Migmatites, and the presence of Mesoproterozoic mafic xenoliths, as well as the SHRIMP data presented, the interpretation that the Camboriu Complex in its present form is a Neoproterozoic Ediacaran unit is reinforced by this study. The generation of this granitoid and the main migmatization phase of the Camboriu Complex occurred in the Neoproterozoic - associated with the regional thermal peak responsible for the emplacement of the granitoids in the Brusque Group, in particular the generation and emplacement of the Valsungana Granite.