

Supplementary Material A

1. Sample Preparation and Zircon Grain Separation

Samples collected in the field were prepared in the Geological Laboratory for Sample Preparation (LGPA) of the Rio de Janeiro State University (UERJ). For each dated sample, about 10 kg of rock for felsic lithotypes and 20 kg of rock for mafic lithotypes were collected. The preparation of the samples for zircon grain separation obeyed the following steps:

- (a) Washing: each sample was washed and left in a clean place to dry. The washing was done to remove any contaminating material from the sample;
- b) Manual reduction: each sample was manually reduced with the aid of a sledgehammer to reach the appropriate size for the crushing stage;
- c) Crushing: each sample went through the jaw crusher to reduce its size;
- d) Mill: after being crushed, each sample went through a disc mill so that all the material was pulverized and homogenized, causing the crystals to disintegrate in the rock;
- e) Sieve: the ground samples went through manual sieving to separate the 100-mesh fraction;
- f) Vibrating table: at this stage the sieved material was passed through the vibrating table for gravimetric separation and collection of the dense minerals;
- g) Dense liquid: the dense minerals, separated on the vibrating table, were passed through the bromoform for concentration of the denser phases;
- h) Magnetic separator: the concentrate obtained after passing through the bromoform was separated into magnetic susceptibility fractions initially by varying the amperage intensity (and the magnetic field intensity) from 1.5 A, 1.0 A, 0.75 A, 0.5 A up to the value of 0.2 A. The final franz is performed with the variation in tilt angle (5°, 3°, 1°, 0°, -5° and fraction not extractable);
- i) Manual separation and mounting of the epoxy mounts: the zircons from the fractions that came out of the magnetic separator were manually selected with the aid of a binocular magnifying glass and were deposited in epoxy mounts with their positions duly mapped;
- j) Imaging: The mounted epoxy mounts were imaged with the aid of a scanning electron microscope (SEM) through the elaboration of cathodoluminescence images.

At the end of each of the steps (per sample) all the equipment and rooms were properly sanitized and decontaminated so that the next sample could be prepared.

2. Summary of the characteristics of the SAIC rocks

2.1 Leucocratic rocks

They are isotropic rocks, yellowish to whitish in color and inequigranular with granulation ranging from fine to coarse. The average modal composition of this group of rocks is 56% orthoclase, 32% quartz, 4% allanite, 3% biotite, 2% titanite, 2% opaque minerals, 1% plagioclase and ~1% zircon.

2.2 Melanocratic rocks

This set of rocks outcrops mainly in two cores inside the SIAC, in more eroded regions of the relief. In this group are found isotropic, melanocratic rocks with an inequigranular texture from fine to coarse grained. Sometimes orthoclase phenocrysts were observed, however, only outcrops that presented a phenocryst/matrix ratio lower than 10% were considered in this group. The average modal composition of rocks in this group is 53% plagioclase, 16% biotite, 14% augite, 6% hypersthene, 2% quartz, 2% opaque minerals, 1% quartz, 1% titanite, 1% apatite, 1% olivine and <1% zircon.

2.3 Hybrid rocks

In the hybrid zone, monzogranite, monzogabbro quartz and gabbro quartz were found. The main macroscopic features observed in the studied outcrops, which indicate the mingling process, are the networked vein complexes, presence of orthoclase phenocrysts during a melanocratic matrix, inclusions of gabbros with orthoclase phenocrysts in granitoids and quartz grains and /or feldspar maintained by mafic minerals.

The monzogranite samples collected in this mixing zone are inequigranular matrix porphyritic with granulation ranging from medium to coarse. The rocks are isotropic, yellowish in color and with a phenocryst/matrix ratio that varies from 30 to 70%. The average modal composition of monzogranite in the hybrid zone is 27% orthoclase, 25% plagioclase, 19% quartz, 13% biotite, 6% opaque minerals, 3% hornblende, 3% titanite, 2% allanite, 1% apatite and ~1% zircon.

The melanocratic rocks collected in the hybrid zone were classified as monzogabbro quartz and gabbro quartz. The melanocratic rocks of the hybrid zone are porphyritic inequigranular with a fine to medium matrix. The phenocrysts present in these rocks are alkali-feldspar and the proportion in relation to the matrix varies between 15 and 30%. The average modal composition of these rocks is 46% plagioclase, 16% biotite, 14% augite, 7% hypersthene, 4% quartz, 4% orthoclase, 4% opaque minerals, 3% hornblende, 1 % apatite and 1% zircon.