

## Supplementary Material A (Analytical Methods)

### A.1 Litho geochemistry

Based on field observations, seven samples were selected for whole-rock major and trace element composition analyses. The samples were cut, crushed in a jaw crusher and milled in the Laboratório Geológico de Preparação de Amostras (LGPA) of the Faculdade de Geologia of the Rio de Janeiro State University, Brazil.

Element composition analyses were carried out by Activation Laboratories Ltd -Actlabs (Ancaster, Canada), where samples are prepared and analyzed in a batch system, following their Litho analytical protocol, which is a combination of Code 4B (lithium metaborate/tetraborate fusion ICP-OES whole rock), Code 4B2 (trace element ICP-MS) and Code 4B (major elements and Ba, Sc, Sr, V, Y, and Zr)

Each batch contains a method reagents blank, a certified reference material and samples with 6% replicates. Samples are mixed with a flux of lithium metaborate and lithium tetraborate and fused in an induction furnace. The melt is immediately poured into a solution of 5% nitric acid containing an internal reference material and continuously mixed until completely dissolved, taking ca. 45 min. The samples are run for major oxides and selected trace elements (4B) in a combination of simultaneous/sequential Thermo Jarrell-Ash ENVIRO II ICP or a Varian Vista 735 ICP. Calibration is performed using 14 prepared USGS and CANMET certified reference materials. One of the 14 standards is used during the analysis for every group of ten samples. Major element total weight % should be between 98.5% and 101%. If results come out lower, samples are scanned for base metals. Samples with low totals however are automatically re-fused and re-analyzed. Samples fused under code 4B2 are diluted and analyzed with a Perkin Elmer Sciex ELAN 6000, 6100, or 9000 ICP/MS. Three blanks and five controls, three before the sample group and two afterwards, are analyzed per group of samples. Duplicates are fused and analyzed at every 15 samples. The instrument is recalibrated at every 40 samples.

Further details of the analytical routine can be found on the website of the aforementioned laboratory (<https://actlabs.com/geochemistry/>).

The analytical results were analyzed using the GCDkit 6.0 software of Janousek *et al.* (2006).

### A.2 Zircon U-Pb geochronology analysis

Two samples were, 2 samples were prepared at LGPA (UERJ - Rio de Janeiro, Brazil), for U-Pb zircon geochronology analyses. Samples were crushed with a jaw crusher, and heavy mineral concentrates were obtained using a Wilfley table, followed by a Frantz magnetic separator and

35 dense liquid (bromoform and iodide). Mineral types were identified with a binocular microscope,  
36 and zircon grains were hand-picked, mounted in resin epoxy, and polished. Cathodoluminescence  
37 and backscattered electron SEM images were obtained at the Laboratório Multiusuário de Meio  
38 Ambiente e Materiais (Multilab/Rio de Janeiro State University, Brazil).

39 U-Pb zircon analyses were performed in Multilab using LA-MC-ICP-MS Neptune Plus  
40 mass spectrometer coupled with a laser system. During laser ablation, beam diameters of 30  $\mu\text{m}$   
41 (sample CA-17) and 40  $\mu\text{m}$  (sample CA-14) were used. To control and validate the results, the  
42 GJ-1 zircon primary reference material (608 Ma – Jackson *et al.* 2004) was used, and 91500 zircon  
43 (1068 Ma – Blichert-Toft 2008) as a secondary reference material. The data obtained for each of  
44 the standards are compatible with the data available in the literature, and are presented as  
45 supplementary material (Supplementary Material B)

46 Data with excessively high (> 5%) common lead and/or with large ratio (8%) uncertainties  
47 were discarded. The data were processed using the Isoplot software (Ludwig 2011), version 4.15,  
48 and the upper and lower intercept ages of Discordia (the high degree of discordance of the data  
49 did not allow the calculation of Concordia ages) were constructed in 2s.

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### 51 **A.3 Sm-Nd and Sr analysis**

52 For the measurement Sm-Nd and Sr isotopes, four selected samples were cut, crushed, and  
53 milled in LGPA (UERJ) and sent to the Laboratório de Geocronologia e Isótopos Radiogênicos  
54 (LAGIR, also at UERJ). To each aliquot, between 25 and 50 mg of pulverized sample, a double  
55  $^{149}\text{Sm}$ - $^{150}\text{Nd}$  isotope tracer was added before acid digestion. Separation of Sr and REE used  
56 cation exchange columns filled with Biorad<sup>®</sup> AG50W-X8 resin (100–200 mesh) in HCl medium.  
57 For the separation of Sm and Nd a secondary column was used with the Eichrom LN-B-25 S (50–  
58 100  $\mu\text{m}$ ) resin. Sm and Nd isotope ratios were measured in double Rhenium filament mounts using  
59 a Thermo Scientific TRITON multi-collector mass spectrometer. Isotope ratio measurements were  
60 performed with 8 and 16 blocks of 10 cycles each, respectively. Sr, in turn, was ionized in a Ta  
61 single filament, and measured in 10 blocks. Absolute (1s) uncertainties of measured isotope ratios  
62 are below  $10^{-5}$ . Measured ratios were normalized respectively to the natural constant ratios of  
63  $^{146}\text{Nd}/^{144}\text{Nd} = 0.7219$ ,  $^{147}\text{Sm}/^{152}\text{Sm} = 0.5608$ , and  $^{88}\text{Sr}/^{86}\text{Sr} = 8.3702$ . The Sm-Nd depleted mantle  
64 model ages ( $T_{\text{DM}}$ ) were calculated using the depleted mantle model of DePaolo (1981).

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