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# TECTONIC EVOLUTION OF THE JUVENILE TONIAN SERRA DA PRATA MAGMATIC ARC IN THE RIBEIRA BELT, SE BRAZIL: IMPLICATIONS FOR EARLY WEST GONDWANA AMALGAMATION

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## Abstract

The evolution of the Ribeira belt resulted from the progressive amalgamation of several terranes against the eastern margin of the São Francisco Craton between ca. 620 and 580 Ma. This work brings new field, U-Pb geochronology, geochemistry and isotopic (Sm-Nd and Sr) data on the evolution primitive rocks from the Serra da Prata magmatic arc and their relationships with the previously described Rio Negro arc. The new U-Pb data allow the distinction of two episodes of arc generation: the Serra da Prata Arc (856-838 Ma) and the Rio Negro Arc (790-620 Ma). Rocks from the oldest stage are composed of metaluminous calc-alkaline diorites, tonalites and granodiorites, and geochemical signatures compatible with magmatic arc scenarios. Their rocks are associated to a metamorphosed volcano-sedimentary of intra or back-arc basin setting platform carbonates, amphibolites (basaltic lavas) and psammitic rocks of the Italva group. Whole-rock Nd and Sr isotope data indicate more primitive contribution than earliest stage: initial εNd= -3.7 to +5.2, TDM= 1.68 to 0.92 Ga and $^{87}Sr/^{86}Sr$ initial ratios between 0.7061 and 0.7113. The second stage – Rio Negro arc – yielded more mature arc signatures: initial εNd= -8.4 to -2.5, TDM= 1.93-1.33 Ga and $^{87}Sr/^{86}Sr$ initial ratios between 0.7098 and 0.7211. The new data have been interpreted as an evolution of a Tonian primitive intra-oceanic stage of the magmatic arc generation, followed by more continental or transitional arcs during the Rio Negro stage. The data from both arc stages contrast with the younger Serra da Bolívia and Rio Doce continental arcs (570-590 Ma) developed in a proximal location. The data are similar to other Tonian-Ediacaran magmatic arcs: the Goiás arc in the Brasília Belt (ca. 862 to 630 Ma) and the São Gabriel arc (ca.840 to 690 Ma), located respectively along the western margin of the São Francisco and Rio de La Plata cratons. In a Western Gondwana scenario, the juvenile signature indicates intra-oceanic tectonic settings. The combination of the older Tonian arcs with the more evolved Cryogenian to Ediacaran arcs within the Neoproterozoic belts, suggests more than 200 m.y. of subduction around the older cratonic blocks that made up Western Gondwana.

## 1. INTRODUCTION

The identification of magmatic arcs and related basins, ophiolitic sutures and high-pressure metamorphic rocks, together with paleomagnetic data are key to better understanding of the paleogeography before Gondwana amalgamation during Neoproterozoic to Cambrian times. Most of the belts that made up the Western Gondwana are presently deeply eroded, and the study of those magmatic arcs allows inference about the vergence and duration of the subduction process that took place before the final amalgamation of the supercontinent.

To address to these questions, our natural laboratory is the Ribeira belt, located in southeastern Brazil (Cordani et al., 2000; Brito Neves, 2003). The belt integrates a complex network of Neoproterozoic belts that led to Western Gondwana amalgamation. The evolution of the Ribeira belt resulted from the progressive accretion of several terranes against the eastern margin of the São Francisco Craton (Heilbron et al., 2000, 2004, 2008; Trouw et al., 2000). Among these terranes, the Paraíba do Sul/Embú and the Oriental Terrane encompass the Neoproterozoic magmatic arcs of the belt that accreted against the São Francisco Craton between ca. 620 and 580 Ma (Machado et al., 1996; Tupinambá & Heilbron, 2002; Heilbron & Machado, 2003; Tupinambá et al., 2012; Heilbron et al., 2013).

A subject of debate concerning the Neoproterozoic evolution of the belts in southeastern Brazil and western Africa (Araçuaí, Ribeira, Dom Feliciano and Kaoko) is the width of the Adamastor Ocean located between the São-Francisco-Congo, Angola, Rio de La Plata and Kalahari paleoplates (Kröner and Cordani, 2003; D'Agrella Filho et al., 2016; Pisarevsky et al., 2003, 2008; Meert and Torsvik 2003; Cordani et al., 2013; Heilbron et al., 2008; Tupinambá et al., 2012; Pedrosa Soares et al., 2008; Gray et al., 2008). Reported long intervals of subduction highlight the large time span of magmatic arc production (ca. 790 to 595 Ma) and favors the hypothesis of consumption of a large oceanic plate during the Neoproterozoic (Tupinambá et al., 2011; Heilbron et al., 2010, 2008, 2013).

Recently, two magmatic arcs have been described in detail in the Ribeira belt: the inner cordilleran Serra da Bolívia Arc (Heilbron et al., 2013) and correlatives in the Araçuaí belt to the north (Degler et al., 2017; Tedeschi et al., 2016; Nalini Junior et al., 2001, 2005), and the more primitive Rio Negro Arc (Tupinambá et al., 2011; Heilbron & Machado, 2003), exposed in the mountain ranges of Rio de Janeiro State (Figures 1 and 2).

Previous data has displayed one single Tonian age in a local publication that is the Explanatory Note for 1: 100.000 sheet we produced for the Brazilian Geological Survey. Now, detailed geological has reinforce the occurrence of older (ca. 860 Ma) and even more primitive tonalitic gneisses of the Serra da Prata complex (Peixoto, 2010; Peixoto & Heilbron, 2010; Heilbron et al., 2013, 2012), see Figures 1 and 2. In this work, we present updated detailed geology of the region of the occurrence of the Serra da Prata arc to compare and show its field relationships with the previously described Rio Negro Arc rocks by Tupinambá et al. (2011). New geochemical, U-Pb geochronology and isotopic (Nd and Sr) data of the Serra da Prata arc-related rocks are presented. Data related to the coeval and associated meta-volcano-sedimentary rocks of the Italva group are presented to draw the complete picture of the convergence processes around São Francisco-Congo cratons in the Adamastor Ocean.

The obtained data suggest a more complex evolution in two stages (older Serra da Prata and younger Rio Negro) and corroborates with the consumption of a large oceanic space between the continental blocks that made up the central portion of Western Gondwana. Finally, a comparison with other Tonian to Cryogenian arcs of Gondwana is addressed.

## 2. TECTONIC ORGANIZATION OF RIBEIRA BELT

The Ribeira belt is one of the belts of the Mantiqueira Province (or orogenic system) that extends for almost 1400 km along the Atlantic coast of Brazil (Almeida et al., 1977; Almeida et al., 1981, Heilbron et al., 2000, 2004a, b). Ribeira belt composed of several tectonostratigraphic terranes (Figure 1) imbricated toward the WNW and includes the São Francisco Craton, Occidental Terrane, Paraíba do Sul and Embú terranes and Oriental Terrane, which encompasses the more juvenile Neoproterozoic magmatic arcs, and the Cabo

Frio Terrane. To the south, the Socorro and Apiaí terranes (Campos Neto, 2000, Janasi and Ulbrich, 1991; Janasi et al., 2001) complete the major tectonic units of the belt (Figure 2).

Accretion of most of these terranes onto the São Francisco cratonic margin was diachronous between ca. 620-565 Ma and oblique resulting in the partition of the deformation between thrust and dextral transpressive shear zones (Machado et al., 1996; Heilbron et al., 2000, 2004b). The Cabo Frio terrane docked later, during Cambrian times (Schmitt et al., 2004).

## 3. THE ORIENTAL TERRANE

The Oriental Terrane includes the Neoproterozoic arc-related associations (Figure 3) that occur within three structural domains imbricated northwestern wards (Rosier,1957, Menezes, 1973, Oliveira et al., 1978, Sad & Donadello, 1978, Sad et al., 1980, Machado et al., 1983, Sad & Dutra, 1988, Machado et al., 1996, Tupinambá & Heilbron, 2002, Heilbron & Machado, 2003, Moraes, 2006, Peixoto, 2008, Peixoto & Heilbron, 2010, Tupinambá et al., 2012 and Heilbron et al., 2013):

a) The terrane consists of Serra da Bolívia Arc (Heilbron et al., 2013) which developed between ca. 650 and 590 Ma as a cordilleran magmatic arc that continues northward into the Rio Doce arc of the Araçuaí belt (G1 granitoids, Nalini-Junior et al., 2000, 2005; Pedrosa Soares et al., 2008; Heilbron et al., 2013; Tedeschi et al., 2016), and southward into the Socorro arc (Hackspacher et al., 2003; Campos Neto, 2000; Janasi et al., 2001). This association is now considered to be associated to the Paraíba do Sul-Embú terrane because of the above mentioned geological correlation (Figure 2).

b) The Rio Negro Complex (Tupinambá et al., 2012; Heilbron & Machado, 2003) extends for more than 500 km in the mountains of the Rio de Janeiro and southern Espírito Santo states (Figure 2), and consists of 790 to 620 Ma intra-oceanic to cordilleran tectonic settings and consistent juvenile signature (Heilbron & Machado 2003; Tupinambá et al., 2012).

c) The Serra da Prata Complex (Peixoto & Heilbron, 2010)  the focus of this work, crops out in the uppermost thrust sheet of the Oriental Terrane, (Figure 3) and consists of foliated orthogneisses represented by diorites, tonalities, and granodiorites intruded by granitic leucogneisses. A single age of ca. 860 Ma for a hornblende-rich tonalitic orthogneiss has been publish by Heilbron et al. (2012). The arc-related rocks occur associated with marbles and amphibolites of the Italva group, and yielded a crystallization age of ca. 848 Ma (Heilbron & Machado, 2003).

## 4. GEOLOGIC CONTEXT

In the studied area, (Figures 3 and 4) rocks of the Costeiro domain are tectonically overlaying by the associations of the Italva Domain, with represents the uppermost thrust sheet of the Oriental Terrane. This tectonic unit was thrust (as a duplex structure) over the Costeiro Domain and refolded in a synformal structure (Peixoto, 2008; Peixoto & Heilbron, 2010).

The Costeiro domain encompasses the granulite facies metasedimentary rocks of the São Fidelis group and the arc-related orthogneisses of the Rio Negro complex (Tupinambá et al., 2012). The Italva Domain consists of metasedimentary rocks of the Italva group and orthogneisses of the Serra da Prata Complex, besides amphibolites and leucogranites. Metamorphism reached upper amphibolite facies with incipient anatexis that resulted in migmatitic textures. The orthogneisses of both the Rio Negro and Serra da Prata Complex, the metasedimentary units and amphibolites of the Italva Domain, the focus of our investigation, are described bellows.

### 4.1 The Italva group.

The Italva group consists of three lithostratigraphic units mapped in detail in the southern segment of the Italva Domain (Figure 4), named from bottom to top as Euclidelândia, São Joaquim, and Macuco units.

### *The Euclidelândia Unit*

Located in the western portion of the studied area (Figure 4), this unit consists of coarse to fine-grained, foliated biotite-muscovite gneiss, composed of quartz, microcline, plagioclase, biotite and muscovite (Figure 5a, b). Tourmaline, magnetite, garnet and sillimanite, zircon and apatite, are common accessory minerals.

Conspicuous centimetric banding and migmatitic structures melanosomes are common. The protoliths are supposed to psammo-pelitic composition with some proportion of volcanic or volcaniclastic contribution.

Pegmatite intrusions are very common and are composed of quartz, feldspar and black tourmaline

The contact between the Euclidelândia unit and the orthogneisses of the Costeiro Terrane was not observed. The boundary with the São Joaquim unit is marked by an abrupt tectonic contact, with repetitions of both units (Figure 4).

### *São Joaquim Unit*

The unit is composed to foliated and banded calcitic marbles with intercalated amphibolites, biotite gneisses (metapelites), centimetre-scale quartzite layers and calcsilicate rocks (Figure 4). The marbles vary in color from white, yellow, and gray to blue. Carbonate-rich layers are usually coarser grained than layers with white mica and tremolite.

In addition, graphite flakes and disseminated sulfides are common and are distributed in thin layers, suggesting preservation of primary sedimentary compositions. Some layers may include quartz, diopside, and prismatic pale green tremolite. Centimetre to metre-scale layers of gneisses, layers and boudins of amphibolites and quartz-rich centimetric levels are common (Figure 5c).

The gneissic and the quartz-rich layers are interpreted as pelitic and psammitic intercalations that were deposited in a carbonate plataform.

In the west part of the area, the contacts between this marble-rich unit and the lowermost Euclidelândia unit is highly deformed, characterized by the presence of mylonitic rocks and tectonic repetitions of both units (Figures 3 and 4). In the east part, the boundary with the paragneisses of the Costeiro Domain was not observed, but a clear metamorphic discontinuity is detected, as the amphibolite facies rocks of the Italva group contrast with the granulite facies of those paragneisses.

### *Macuco Unit*

The uppermost Macuco Unit occupies the central region in the Italva Domain (Figures 4). This unit consists of coarse to fine-grained, banded and foliated garnet-biotite gneisses composed of biotite, garnet, quartz, K-feldspar (microcline) and plagioclase, locally with sillimanite and sulfide minerals. Again, despite the amphibolite facies and lack of preserved primary structures, we supposed that this unit is made up of psammitic rocks, but some volcanic or volcaniclastic contribution could not be discarded once amphibolite lenses and boudins are common (Figure 5d).

Locally, strongly migmatitic rocks characterize the boundary between the Macuco unit and paragneisses of the Costeiro Domain. The paragneiss consist of sillimanite garnet-biotite gneiss with centimetre to metre-scale intercalated sillimanita-feldspar-muscovite bearing quartzite and calcsilicate rocks. Leucosomes contain garnet and cordierite. The leucosomes commonly intrude granitoids of the Morro do Escoteiro Suite (Figure 5d).

## 4.2- Orthogneisses, Granitoids, and amphibolites

### *Serra da Prata Complex*

This complex crops out in the central portion of the synform structure and overlies all units of the Italva Domain (Figures 3 and 4). It consists of mesocratic gray hornblende biotite orthogneisses, pale gray biotite orthogneisses and leucocratic biotite orthogneisses. The composition of the hornblende and biotite orthogneisses varies from diorites, tonalities, granodiorites, while the leucogneisses are mostly granitic (Figure 6a, b, c).

The dioritic to granodiorite orthogneisses (Figure 6 d, e, f) are composed of hornblende, biotite, quartz, plagioclase, K-feldspar, locally with diopside. Primary porphyritic texture and local migmatitic structures are observed. Accessory minerals include magnetite, allanite, epidote, sphene, zircon and garnet. The complex commonly contains lenses of foliated coarse-grained amphibolite (quartz diorite rocks) of variable size.

Field and petrographic observations indicate that modal hornblende are inversely proportional to the modal concentration of biotite. The contact between the dioritic/tonalitic hornblende biotite orthogneiss and the granodiorite biotite orthogneiss is gradational, suggesting an original magmatic layering (Figure 6c).

Layers of white-colored and coarse-grained biotite orthogneiss with granitic composition also occur (Figure 6a, g). They are composed of biotite, quartz, plagioclase, K-feldspar and rare garnet, hornblende, and diopside. Accessory opaque minerals, allanite, epidote, sphene, and zircon are observed. Locally, large plagioclase crystals, interpreted as relict phenocrysts, have been observed.

### *Amphibolites*

The amphibolites are associated with both the metasedimentary rocks of the Italva group (Figure 5c, d) and the orthogneisses of the Serra da Prata Complex (Figure 6b). They occur as thin lenses and *boudins* of outcrop scale, and also as large-decametric map scale lenses (Figures 4). Based on this very homogeneous and mafic composition, we interpret the amphibolites as metamorphosed mafic igneous rocks.

In most outcrops, the amphibolite layers display a strong foliation, but coarse-grained granoblastic textures are also observed. These rocks comprise hornblende as the major constituent (55 to 95%) indicating mafic to ultramafic compositions, besides plagioclase, sphene, apatite, zircon, garnet and pyrite.

### *Morro do Escoteiro Suite Granitoids*

The Morro do Escoteiro Suite crops out as discontinuous lenses that intrude Italva group rocks. The suite comprises garnet-biotite-muscovite granitoid rocks foliated, with coarse-grained and non-foliated to poors textures. Porphyritic varieties with tabular K-feldspar phenocrysts were observed.

The granitoid is composed of quartz, microcline, and minor plagioclase, with rare muscovite, biotite, and garnet. Microcline and plagioclase make up the largest crystals, probably representing relicts of primary phenocrysts.

### *Rio Negro Complex*

The orthogneisses of the Rio Negro complex occur structurally below the rocks of the Italva domain (Figure 3). Near this contact (Figure 4a), the orthogneisses are more foliated and tectonically intercalated with rocks of the Italva group. Heilbron & Machado (2003) dated one of those lenses, which yielded a U-Pb concordant age of 635±5 Ma.

Lenses of the orthogneisses of the Serra da Prata Complex enclosed within the rocks of the Rio Negro Complex were observed in one outcrop. In the northern segment of the Italva domain, bodies of coarse-grained to porphyritic orthogneisses within the marbles of the Italva Group. The field relationships suggest that these rocks represent different evolutionary stages of a single magmatic arc, instead of two juxtaposed magmatic arcs, as previously thought by Heilbron et al. (2013). This supposition is confirmed by the new U-Pb data.

In the studied area, the Rio Negro Complex is typically foliated hornblende biotite orthogneisses which a composition varies between granodiorites and granites not rarely with mafic enclaves (Figure 7a, d, e). The rocks are coarse grained, either magmatic structure or weakly foliated to mylonitic (Figure 7b, c). The mineralogy is dominated by, orthoclase, quartz, plagioclase with biotite as the major mafic component. Porphyritic texture is common with feldspars as phenocrysts or porphyroclasts with rims made of fine-grained crystals (Figure 7f, g). Hornblende, garnet, apatite and zircon are the most common accessory minerals.

Large bodies of leucogneisses with the granitic composition are common, near its contact with other units. Besides microcline, plagioclase, and quartz, minor biotite, muscovite and garnet occur. Zircon, apatite, and monazite are accessory minerals. Heilbron & Machado (2003) dated one of these decametric lenses and yielded crystallization ages of ca. 580 Ma.

## 5- GEOCHEMICAL ANALYSES

### 5.1- Geochemical analyses

The selected least weathered samples from the Italva Domain and Rio Negro arc were crushed and milled at the "*Laboratório Geológico de Processamento de* Amostras" (LGPA) of the Rio de Janeiro State University (UERJ). Whole rock chemical analyses were carried out in the Activation Laboratories Ltd (Act-Labs), Ancaster, Canada.

The analytical techniques used were Lithium Metaborate/Tetraborate Fusion - Inductively Coupled Plasma (ICP) for major and part of trace elements and Mass Spectrometry (MS) for trace elements including rare earth elements. The analytical procedures follow the detailed description found in http://www.actlabs.com/page.aspx?page=516&app=226&cat1=549&tp=12&lk=no&menu=64&print=yes.

### 5.2 - Results

Twenty-two samples were analyzed for major and trace elements (Table 1) including rare earth elements (REE – table 2): seven orthogneiss samples from the Serra da Prata Complex and seven from Rio Negro Complex; three granitoids samples from the Morro do Escoteiro Suite. Five amphibolite samples: three from enclaves within the Serra da Prata Complex (CAM-CMM-184B, CR-R-04AF, SM-CM-18), one within the Macuco unit (SAP-CMM-159) and one sample from amphibolite intercalated with marbles from São Joaquim Unit (SMM-CB-87).

### Orthogneisses and Granitoid rocks

Both the Serra da Prata and Rio Negro orthogneisses include rocks of dioritic, tonalitic and granodioritic chemical compositions (Figure 8a). Foliated sub-alkaline granitoids of the Morro do Escoteiro Suite show calc-alkaline affinity, as visualized in the plots AFM and MgO + $FeO_t$ *versus* $SiO_2$ diagrams (Figure 8b, c).

From the Shand diagram (Figure 8d), it is clear that the Serra da Prata Complex orthogneisses and most samples from the Rio Negro Complex are metaluminous. The leucogranites of the Morro do Escoteiro suite is slightly peraluminous. Both orthogneisses and granitoids define medium-K and high-K series (Figure 8e).

The REE chondrite-normalized diagrams (Boynton, 1984) presented in figure 9a for the orthogneisses of the Serra da Prata Complex indicate enrichment in light rare earth elements (LREE), weak negative Eu anomalies and flat heavy rare earth elements (HREE) patterns. The La/Lu ratios increase with differentiation of the orthogneisses and granitoids. The few samples of the Rio Negro complex display more fractionated patterns, and variable Eu anomalies (Figure 9b) related to the presence of different modal abundances of feldspar phenocrysts.
REE patterns of the peraluminous granitoids from the Morro do Escoteiro Suite (Figure 9c) suggest homogeneous protoliths. The distribution of the HREE suggests the importance of garnet in the source rocks.
Tectonic discrimination diagrams (Figure 10a) such as the NbxY (Pearce et al., 1984) corroborate a subduction environment suggesting arc environments for both the Serra da Prata and Rio Negro Complexes. Presumably, the Morro do Escoteiro Suite represents syn-collisional granites.

Amphibolites

Published geochemical data (Ragatky et al., 2007; Tupinambá & Heilbron, 2002; and Sad & Dutra, 1988) for the amphibolites of the Italva Domain indicate a predominance of tholeiitic rocks with Normal Mid-Oceanic Ridge Basalts (N-MORB) to Enriched-MORB to Back-Arc Basin Basalts (BABB) signature and more rarely, tholeiitic island arc basalts (IAB) signatures suggesting a back arc tectonic environment.
Five amphibolites samples were analyzed: three from Serra da Prata Complex enclaves, one Macuco Unit enclave and one sample intercalated with São Joaquim unit. The new data corroborates that the amphibolites include rocks of diorite, gabbro-diorite and gabbro chemical composition (Figure 8a). These rocks belong to the sub-alkaline series with tholeiitic signature, as represented in the diagrams of figure 8b, c.
According to chondrite-normalized REE diagrams presented in figure 9d, the amphibolites from Serra da Prata Complex display flat patterns with slight

enrichment in LREE suggesting island arc tholeiitic series (IAT) affinity. In contrast, two amphibolite samples from Macuco and São Joaquim units show a horizontal profile suggesting MORB affinities.

The tectonic discrimination diagrams of figure 10d, e, f also indicate signatures from MORB to IAT suggesting an immature arc tectonic setting, as previously considered by other authors (Sad & Dutra, 1988; Heilbron & Machado, 2003; Ragatky et al., 2007; Heilbron et al., 2008).

## 6- U-Pb GEOCHRONOLOGICAL DATA

### 6.1- U-Pb geochronological analyses

The samples procedures for geochronological analyses were performed at the "*Laboratório Geológico de Processamento de* Amostras" of the Rio de Janeiro State University. First samples were crushed and milled, and heavy mineral concentrates were obtained by hand panning from disaggregated material. The heavy minerals were further separated with the Frantz magnetic separator into magnetic and diamagnetic fractions. Selection of zircons crystals, from the diamagnetic (preferably) and less magnetic fractions, was followed by the preparation of polished mounds.

The cathodoluminescence images (CL) were obtained at the "Laboratório de Microscopia Eletrônica de Varredura" (MEV) of the Geosciences Institute of the University of São Paulo (USP) and at the "Laboratório Multi usuário de Meio Ambiente e Materiais" (MuiltiLab) of the Rio de Janeiro State University (UERJ).

The U-Pb analyses of twelve samples were carried out in three different places depending on availability of each laboratory. The laboratories and methods used to analyze the samples are shown in Table 3.

Two international zircon standards were used for laser ablation: the UQ-Z1 (Machado and Gauthier, 1996) and the GJ-1 (Jackson et al., 2004). Laser frequency of 6 to 10 Hz was used with spot diameters of 20-30 µm.

The isotopic data was visualized by the Evaluation Neptune Software and transferred to Excel software for data reduction. The data was reduced and processed using UnB specific software developed by Buhn et al. (2009). The construction of the concordia diagrams was done using the Isoplot (version 3.00) statistical software of Ludwig (2003).

## 6.2 - Rsults

Twelve samples were selected for geochronological investigation, and their location is presented in figure 4: one amphibolite sample; five orthogneisses from the Serra da Prata Complex; three leucogranite samples from the Morro do Escoteiro Suite; two orthogneisses from the Rio Negro Complex; and one metasedimentary sample from Euclidelândia Unit.

The following criteria were established to exclude analyses from age calculations: analyses from fractured zircons, analyses with more than 6% of discordance, high isotope ratio errors and when de laser analyzed either part of cores or rims yielding ages without geological meaning. The data are given in Tables 4 to 15 and the excluded data (*) are identified.

### Amphibolite

The amphibolite sample (SM-CB-84B - Table 4) was collected from a decametric layer within hornblende biotite gneiss of the Serra da Prata Complex. Two zircon populations were identified, both translucent with white and yellow colors and with a size between 60 μm and 250 μm.

The first zircon population consists of prismatic grains more than 200 μm long and with width-to-length ratios of 2:1. The internal structure as observed in CL images shows typical igneous zoning with different phases of metamorphic overgrowth surrounding cores with oscillatory zoning (Figure 11a, b).

The preserved cores from five zircons yielded a concordant age of 859 ± 31 Ma interpreted as the crystallization age of the amphibolite (Figure 11e). This result is very similar to the reported U-Pb TIMS age of 848±11 Ma (Heilbron & Machado, 2003) for an amphibolite sample collected nearby the Italva town.

The second analyzed population consists of grains with rounded and ovoid shapes, with a diameter less than 90 μm and chaotic internal structures (figure 11c, d). According to Hoskin & Black (2000), Hoskin & Schaltegger (2003), Corfu et al. (2003) and Kroner et al. (2014), this texture is typical of zircons that grew during high-grade metamorphism. These zircon grains yielded the concordant age of 584 ± 14 Ma, corroborating the age of the high-temperature metamorphic episode (Figure 11f) previously reported by Heilbron & Machado (2003).

## Serra da Prata Complex

Five samples of representative varieties of the orthogneisses from the Serra da Prata complex were collected: four are hornblende biotite orthogneisses (SM-CB-85, SM-CM-70A, SM-CM-69, SMM-CMM-153); one is representative of the biotite orthogneisses of granitic composition (SM-CM-70B). The numerical data are given in Tables 5 to 9.

The majority of the zircon grains are vitreous and translucent with pale pink color, and rounded, elongate and prismatic shapes with variable sizes between 50 μm and 320 μm and with width-to-length ratios of 1:1 to 6:1. CL images (Figure 12a) show that most zircon grains display internal igneous structures with the concentric and parallel zoning of different widths. Subordinated grains show chaotic cores surrounded by oscillatory zoning.

The analyses of the Serra da Prata Complex furnished ages between 856±9 and 588±12 Ma that reveals both Tonian and Ediacaran geological episodes (see figure 12).

The analyses of the igneous cores from zoned zircons grains yielded Tonian concordant ages of 856 ± 9 Ma, 848 ± 7 Ma, 839 ± 17 Ma 838 ± 8 Ma and 807 ± 4 Ma. These data are interpreted to reflect the age of magmatic crystallization for this complex (Figure 12b, c, d, e, f) which is corroborated by Th/U > 0.1 according to Rubatto et al. (1999) to classify igneous zircons (see table 5 to 9).

Analyzes from chaotic cores and some rims with Th/U < 0.1 provided concordant ages of 629 ± 6 Ma and 620 ± 16 Ma (Figure 12g, h), indicating the Ediacaran age of metamorphism which disordered the internal structure of these Tonian zircons.

These ages are coincident with both new ages presented in this work, and the previously cited published interval between 790 and 620 Ma of the Rio Negro Complex crystallization ages. These data suggest that there are both Tonian and Ediacaran stages for arc evolution in the Ribeira Belt.

Finally, analyzed metamorphic rims produced concordant ages of 602 ± 7 Ma and 580 ± 12 Ma (Figure 12a, i, j) suggesting a regionally extensive metamorphic interval of 602 to 567 Ma in Costeiro and Italva Domain.

### Granitoid rocks from the Morro do Escoteiro Suite

Three granitic samples from the Morro do Escoteiro Suite were collected: SM-CM-07, SM-CM-02 and IT-NM-15 (Tables 10 to 12). The zircons grains exhibit vitreous with pink and yellow colors and dull brownish ones. Their shape is prismatic to elongate with a size between 130 µm and 425 µm and width-to-length ratios of 1:1 to 5:1. The CL images showed both igneous and inherited zircons grains with oscillatory rims (Figure 13a).

The inherited ages from igneous cores yield Paleoproterozoic to Neoproterozoic concordant ages between 2009 and1212 Ma, and of 805 ± 24 Ma and 669 ± 20 Ma (Figure 13b, c, d). The non-inherited ages from igneous cores furnish concordant ages of 602 ± 6 Ma and 600 ± 8 Ma and their real metamorphic rims provide concordant ages of 593 ± 7 Ma (Figure 13e, f, g).

Thse data suggest that the Morro do Escoteiro Suite represents syn-collisional granites and is the result of a high-grade metamorphic event, associated with melting of the Italva Group and the Serra da Prata Complex around ca. 0.60 Ga.

### Rio Negro Complex

Both samples selected for analysis (THE-02 and SMM-CMM-172 – Table 13 and 14) are porphyritic hornblende biotite orthogneisses with granodiorite composition (see location in figure 4). In the map, the location of THE-02 outcrop is hidden in the Serra da Prata Complex mapped area and represents the Rio Negro Complex enclosed within the Serra da Prata Complex.

The zircon grains from both samples display vitreous translucent light gray colors, and prismatic shape, variable widths between 150 µm and 670 µm and width-to-length ratios of 2:1 to 6:1. The internal structures from CL images show concentric igneous cores surrounded by metamorphic rims (Figure 14a).

Analyzes from igneous cores yield two concordant ages of 629 ± 10 Ma and 622 ± 5 Ma, interpreted as the magmatic age (Figure 14b, c). These data support the interpretations for Ediacaran age of arc evolution. The concordant ages obtained from the metamorphic rim is 567 ± 11 Ma represent the youngest age of metamorphism documented in the studied area (Figure 14d).

Euclidelândia Unit

The biotite-muscovite gneiss collected from this unit yield clear and translucent zircon grains with yellow color, a prismatic shape, sizes between 100 μm and 150 μm and with width-to-length ratios of 2:1 to 3:1. CL images (Figure 15a) show an internal igneous structure with the concentric zoning of different widths with metamorphic overgrowth surrounding cores.

The histogram with the $^{206}$Pb/$^{238}$U ages obtained for 68 analyzes show a bimodal distribution (Figure 15b; Table 15): the results from cores indicate zircon ages between ~940 and ~720 Ma with the higher frequency for ca. 850 Ma. The results from metamorphic rims provided concentrations of ages between ~680 and 500 Ma.

The data indicate that primary sedimentary sources for the Euclidelândia unit are the Tonian rocks, probably from the Serra da Prata complex. The Cryogenian-Ediacaran interval encompasses metamorphic ages recorded during both Rio Negro stage (~620-630 Ma) and high-grade metamorphic event previously described (~600 Ma).

## 7- Sm-Nd ISOTOPIC DATA

### 7.1- Sm-Nd and Sr isotopic analyses

The isotopic (Sm-Nd and Sr-Sr) analyses were obtained at the Geochronology and Radiogenic Isotopes Laboratory (LAGIR), of the Rio de Janeiro State University. All chemical procedures were performed in clean rooms with positive air pressure (Valeriano et al., 2008).

Each sample weighing approximately 25 mg was mixed with proportional amounts of a $^{149}$Sm-$^{150}$Nd double tracer solution. Sample dissolution was done in high-pressure PTFE bombs during two 5-day cycles using a mixture of HF (6 mL) and $HNO_3$ 6N (0.5 mL). Separation of Sm and Nd was performed using HCl in two ion exchange columns, the primary ones with AG

50 W-X8 (100-200 mesh) resin for the extraction of Sr and REE and the secondary columns with LN-spec (150 mesh) resin for the extraction of Sm and Nd.

Strontium, Samarium, and Neodymium are separately loaded onto a previously degassed double Re filament mounts, using $H_3PO_4$ as the ionization activator. The isotope ratios were measured with a TRITON thermal ionization mass spectrometer (TIMS). Data acquisition was performed in multi-collector static mode using arrays of up to 8 Faraday detectors. The measured Nd and Sr isotope ratios were normalized respectively to the Jnd1 (Tanaka et al., 2000) and to the NBS 987 reference materials. Corrections were applied for instrumental bias and tracer content. Total procedural blanks are below 1 ng for Nd and 0.1 ng for Sm.

The $^{87}Sr/^{86}Sr$ initial ratios were calculated using the $^{87}Sr/^{86}Sr$ ratios measured by TIMS, and Rb and Sr contents from the lithogeochemical analyes, taking into account $^{147}Sm$ constant decay rate.

### 7.2 - Results

Sixteen representative samples among orthogneisses and amphibolites were selected from the studied area: seven samples from the Serra da Prata Complex, six from the Rio Negro Complex and three amphibolites. The new data are shown in Table 16 and 17.

Published data from the arc-related granitoids of Ribeira and Brasília belts and basement rocks were added to compare and better base the interpretation (Figure 15a, b). These data are from the juvenile Goiás Magmatic Arc (Pimentel & Fuck 1992) and the Rio Negro Arc (Tupinambá et al., 2012), both containing expressive intra-oceanic magmatic arc rocks, and data from Serra da Bolívia Complex (Heilbron et al., 2013). Data from the basement of the São Francisco craton, representing old Paleoproterozoic and Archean basement complexes.

The Nd model ages of mantle extraction ($T_{DM}$) of the Serra da Prata samples fall between 1.68 to 0.92 Ga. Four samples present model age ($T_{DM}$= 1.09-0.92 Ga) are similar to the crystallization ages (~850 Ma) whereas three other samples yield Mesoproterozoic model ages between 1.68 and 1.34.

Moreover, the Rio Negro complex samples provided similar ages model ($T_{DM}$= 1.93-1.33 Ga) suggesting mixing with the older source.

The $T_{DM}$ from amphibolites are between zero and 0.87 Ga. The $T_{DM}$ from the amphibolite with MORB affinity (SM-CB-87 – intercalated with the marbles) is close to the crystallization age, geochemical indications of low degrees of differentiation.

The age model of 0.87 Ga for the amphibolite from Macuco Unit enclave (SM-CM-153) is consistent with the inferred age of Serra da Prata arc activity. Moreover, $T_{DM}$ of 0.67 Ga for one amphibolite from Rio Negro Complex enclave (SMM-CMM-184B), agrees with the age of Rio Negro arc activity.

The εNd values for the Rio Negro complex range between -8.4 and -2.5 (calculated for 630 Ma), for the Serra da Prata Complex is εNd= -3.7 to +5.2 (calculated for 850 Ma) and for the amphibolites is εNd= = +6.0 to +7.1.

Initial $^{87}Sr/^{86}Sr$ ratios between 0.7032 to 0.7046 for the amphibolites, 0.7062 to 0.7113 for the Serra da Prata Complex and 0.7098 to 0.7211 for the Rio Negro Complex.

These results reflect the evolution of the plate convergence and arc environments. In figure 16a, the lines of isotopic evolution do not show a relation with basement rocks but are coincident with juvenile arcs data plotted (Goiás Magmatic Arc and medium K Rio Negro arc).

Moreover, these data corroborate the juvenile contribution to the Serra da Prata arc with values more juvenile than the data obtained for the Rio Negro arc. In figure 16b, the low εNd values and high initial $^{87}Sr/^{86}Sr$ ratios suggest the increase of crustal contamination from amphibolite to the Serra da Prata arc and finally to Rio Negro arc stage.

In an early stage, the MORB to IAT geochemistry of the most juvenile mafic rocks (Serra da Prata arc) indicate an intra-oceanic island arc. The subsequent development of Rio Negro arc would represent a more mature arc stage, previously reported by Tupinambá et al. (2012) as changing from a more primitive or either intra-oceanic setting to a Cordilleran environment.

These results contrast with the data for the more radiogenic, Serra da Bolívia arc (Heilbron et al., 2013). Compared to less contaminated magmatic arcs (figure 16a), the Serra da Bolívia magmatic protoliths probably began and evolved in a Cordilleran tectonic setting.

## 8. DISCUSSIONS

The U-Pb results indicate that the orthogneisses of the Serra da Prata complex and the volcano-metasedimentary units of the Italva group are coeval, with development in the ca. 859 - 838 Ma interval. This time interval is older than the previous magmatic arc episodes described for the Ribeira Belt, such as the Rio Negro (ca.790-620 Ma) and the Serra da Bolívia-Rio Doce arcs (ca. 640-585 Ma), (e.g Cordani et al., 1967, Tupinambá et al., 2000, 2011; Heilbron & Machado 2003; Tedeschi et al., 2016). A similar time interval between ca. 850 to 630 Ma was described in Brazil only for the magmatic arcs of the Northern Brasília Belt (Pimentel & Fuck, 1992; Pimentel et al., 2000) and for the São Gabriel Orogeny (Hartmann et al., 2011), indicating a regional onset of the convergence around São Francisco and minor cratonic blocks. The geochemical and isotopic data of the (arc related) orthogneisses and (IAT to MORB) amphibolites suggest a juvenile arc setting (Ragatky et al., 2007; Sad & Dutra, 1988; Heilbron et al., 2008 and this work), corroborated by juvenile $\varepsilon_{Nd}$ values and young $T_{DM}$ model ages between 1.68 and 0.92 Ga.

The association of arc-related rocks of the Serra da Prata complex, with MORB to IAT basic rocks and shallow platform carbonates, is consistent with an active intra-oceanic arc with small islands surrounded by carbonate fringes, similar to the modern island arcs of the Pacific and Caribbean Oceans. The marbles and amphibolites could have been deposited in intra-arc or back-arc basins, where a roll-back in the subducted slab imply an extensional stress field behind the arc. The Tonian development of the Serra da Prata stage is envisaged in the tectonic model of Figure 17a,d.

Younger arc granitoids with crystallization ages of ca. 635 to 620 Ma are coeval with the main development of the Rio Negro Arc, pointing to an Ediacaran age of arc development. Changes in composition and isotopic signature suggest the evolution from juvenile to more mature stages of the arc (Rio Negro stage, Figure 17b,e). The location of the younger Ediacaran arc rocks, together with the development of a sub-horizontal metamorphic foliation with in situ anatexis suggests that the extensional regime of the subduction zone has changed to compressive regimes. During this stage, a more mature arc, such as the modern Japan magmatic arc could be a possible scenario.

Finally, the collision of the arc terrane (Oriental terrane) against the Ribeira belt is indicated by ca. 601-580 Ma metamorphic rims around magmatic zircons from the Serra da Prata arc rocks, as well as by the occurrence of foliated Morro do Escoteiro Suite granitoid rocks dating ca. 602-567 Ma (Figure 17c,f).

## 9. FINAL REMARKS: THE MAGMATIC ARCS OF THE RIBEIRA BELT IN WEST GONDWANA

Based on the data presented here in both the orthogneisses of the Serra da Prata Complex and the marbles with amphibolite intercalations of the Italva group corroborate the characterization of this older and juvenile Tonian magmatic arc stage with related basins within the Ribeira belt. The new U-Pb data indicate that the development of magmatic arc rocks started earlier than previously reported (the Rio Negro and Serra da Bolívia) magmatic arc associations within the Ribeira belt. Nd and Sr isotopic data point to a primitive and probably intra-oceanic setting for this older, Tonian arc stage at the present Oriental terrane.

The geodynamic evaluation of the Serra da Prata and Rio Negro arcs in the Western Gondwana is in table 18 and figure 18, a compilation of Tonian and Cryogenian/Ediacaran magmatic arcs. This figure represents older Tonian magmatic arcs, most with juvenile character, and younger Cryogenian/Ediacaran arcs, which display both juvenile and crustal-derived isotopic signatures.

Many coeval magmatic arc episodes include the Goiás arc in the Brasília Belt (ca. 862 to 630 Ma) and the São Gabriel arc (ca.840 to 690 Ma), located respectively along the western side of the São Francisco and Rio de La Plata cratons. In the African side, several magmatic arcs of the Arabian-Nubian Shield (ca. 870 to 690 Ma) and minor occurrences at the Hoggar-Dahomey (ca. 860-740 Ma) are documented.

Altogether, these Tonian juvenile magmatic arc rocks bring out additional evidence that subduction zones occurred around Western Gondwana continental blocks since ca. 860 Ma. In the Western Gondwana scenario, the common juvenile signature suggests an intra-oceanic tectonic settings. The combination of the older Tonian magmatic arcs with the previously reported more evolved Cryogenian to Ediacaran magmatic arcs within the Neoproterozoic belts suggests more than 200 m.y. of subduction around the older cratonic blocks of Western Gondwana, which in turn is indicative of consumption of wide oceanic lithosphere.

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Figure 1: a) Location of the Mantiqueira Orogenic System of the Western Gondwana compiled from Heilbron et al. (2000); b) Subdivision of the Mantiqueira Orogenic System (Heilbron et al. 2004).

Figure 2: Ribeira belt tectonic organization (modified from Heilbron et al., 2000, 2008, 2013; Campos Neto, 2000; Trouw et al., 2000).

Figure 3: Geological map from the northern region of Rio de Janeiro State, nearby the Espírito Santo and Minas Gerais borders, compiled from Heilbron et al. (2013).

Figure 4: Geological map of the target area with the location of the analyzed samples.

Figure 5: Photos from Italva Group: Migmatitic biotite gneiss (a) and foliated muscovite gneiss (b) of Euclidelândia Unit; c) layers and boudins of amphibolites intercalated with marble of São Joaquim Unit; d) Garnet-biotite gneiss with amphibolite boudins from Macuco unit, besides an intrusive granitoid.

Figure 6: Plutonic rocks from the Serra da Prata Complex: a) Intercalation of tonalitic hornblende biotite orthogneiss (fig. d) and granitic biotite orthogneiss (fig. g); b) Amphibolites enclave within hornblende biotite orthogneiss; c) Hornblende biotite orthogneiss transitioning into the biotite orthogneiss; d-f) Photomicrographs illustrating the tonalitic to granitic varieties; d) Dioritic hornblende orthogneiss with sphene; e) Tonalitic hornblende biotite orthogneiss with sphene; f) Granodiorite hornblende biotite orthogneiss; g) Granitic biotite orthogneiss with allanite, epidote, and opaque mineral. Allanite (All); Biotite (Bi); Epidote (Ep); (Hb) Hornblende; Opaque mineral (Op); Sphene (Sp).

Figure 7: Plutonic rocks from the Rio Negro Complex: a) coarse-grained hornblende biotite orthogneiss with gneissic foliation and mafic enclave; b) Mylonitic banding showing porphyroclastic feldspars; c) Migmatitic and folded biotite orthogneiss; d-f) Photomicrographs illustrating compositional and texture varieties for orthogneiss; d) Tonalitic hornblende biotite orthogneiss with gneissic foliation; e) Granodiorite hornblende biotite orthogneiss with weak foliation; f and g) Mylonitic texture showing porphyroclastic feldspar with recrystallized rims and surrounded by biotite. Biotite (Bi); (Hb) Hornblende; (Fe) Feldspar.

Figure 8: Geochemistry diagrams from Serra da Prata Complex, Rio Negro Complex, granitoids of Morro do Escoteiro Suite and amphibolites: a) Classification diagram (R1-R2) of De la Roche et al., 1980; b) AFM Ternary Diagrams of Irvine & Baragar, 1971; c) Series diagram ($FeO/MgO_3$ vs. $SiO_2$) of Miyashiro (1974); d) Discrimination diagram A/CNK – A/NK of Shand (1943); e) Series diagram (Co - Th) of Hastie et al., 2007.

Figure 9: Chondrite normalized REE diagrams (Boynton, 1984) for the (a) orthogneisses – Serra da Prata Complex – (b) granitoids – Morro do Escoteiro Suite – (c) amphibolites of the Italva Domain and (d) orthogneisses – Rio Negro Complex – of the Costeiro Domain.

Figure 10: Tectonic diagram for the orthogneisses, granitoids (a) and amphibolites (b-f) from Italva and Costeiro Domain.

Figure 11: Cathodoluminescence images and Concordia diagram from amphibolite of Italva Domain. (2s, decay-const. errors included)

Figure 12: Cathodoluminescence images and Concordia diagram from Serra da Prata Complex of Italva Domain. (2s, decay-const. errors included)

Figure 13: Cathodoluminescence images and Concordia diagram from Morro do Escoteiro Suite of Italva Domain. (2s, decay-const. errors included)

Figure 14: Cathodoluminescence images and Concordia diagram from Rio Negro Complex of Costeiro Domain. (2s, decay-const. errors included)

Figure 15: Cathodoluminescence images and Concordia diagram from Euclidelândia Unit of Italva Domain. (2s, decay-const. errors included)

Figure 16: a) Juvenile Nd isotopic signature of the orthogneisses of the Serra da Prata and Rio Negro Complexes compared to other magmatic arc successions of the Ribeira and Brasília belts. Basement Paleoproterozoic rocks from São Francisco craton, Quirino Complex, and Atlantic MORB are presented for comparison; b) Strontium–neodymium isotope correlation of the amphibolites and orthogneisses of the Serra da Prata and Rio Negro Complexes. The compilation is based on Heilbron et al (2011), Machado et al. (2010), Pimentel et al. (2000), Tupinambá et al. (2000), Tupinambá et al. (2012) and Sato & Siga Junior (2000).

Figure 17: (a-c) reconstructing models of palecontinents of continental crust fragments in the Neoproterozoic (Merdith et al., 2017). Envisaged tectonic model for the evolution of Serra da Prata ((d)-Tonian) and Rio Negro ((e)-Cryogenian) magmatic arcs of the Ribeira belt, before the main collision episode (f);

Figure 18: Location of the Magmatic Arcs of the Western Gondwana, based on Gondwana map of Meet and Liebermam (2008). Numbers and related with the references are presented in Table 18. Legend: Cratonic blocks in gray color; Neoproterozoic belts in magenta; Late Neoproterozoic to Cambrian belts in green; Phanerozoic belts in yellow. Tonian arcs in red stars and Cryogenian arcs in purple stars.

| Sample | Unit | Coordinates | SiO2 | Al2O3 | FeOt | MnO | MgO | CaO | Na2O | K2O | TiO2 | P2O5 | LOI | Total | Y | Sc | Ba | Sr | Zr | Be | V | Cr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SM-CM-07 | MES | 797205/7585648 | 73.02 | 14.38 | 1.45 | 0.02 | 0.31 | 1.24 | 2.75 | 4.68 | 0.22 | 0.07 | 1.48 | 99.62 | 24 | 3 | 1152 | 228 | 117 | 2 | 10 | 20 |
| SM-CM-02 |  | 799453/7584650 | 70.94 | 15.69 | 2.27 | 0.01 | 0.83 | 3.54 | 3.52 | 2.34 | 0.47 | 0.11 | 0.76 | 100.50 | 4 | 4 | 871 | 418 | 139 | 1 | 29 | 20 |
| IT-NM-15 |  | 228871/7635640 | 73.24 | 13.60 | 2.58 | 0.06 | 0.22 | 2.06 | 3.79 | 3.21 | 0.22 | 0.06 | 0.25 | 99.14 | 13 | 6 | 2205 | 263 | 161 | 1 | 14 | 25 |
| SM-CB-85 | SPC | 795256/7587490 | 57.09 | 18.01 | 7.18 | 0.13 | 3.26 | 7.27 | 4.40 | 1.13 | 0.81 | 0.16 | 1.07 | 100.50 | 19 | 19 | 389 | 486 | 140 | 1 | 147 | 20 |
| SM-CM-70A |  | 789945/7580337 | 63.79 | 15.43 | 5.81 | 0.10 | 2.25 | 5.07 | 3.94 | 1.93 | 0.78 | 0.19 | 1.09 | 100.40 | 21 | 14 | 763 | 298 | 228 | 1 | 110 | 20 |
| SM-CM-70B |  | 789945/7580337 | 72.02 | 14.84 | 1.73 | 0.03 | 0.75 | 3.12 | 3.67 | 2.58 | 0.21 | 0.05 | 0.94 | 99.93 | 2 | 4 | 1079 | 339 | 65 | 1 | 32 | 20 |
| CR-R-04SP |  | 793943/7592450 | 58.29 | 16.75 | 7.14 | 0.14 | 3.02 | 6.74 | 3.48 | 1.35 | 0.76 | 0.20 | 0.69 | 99.33 | 20 | 18 | 606 | 416 | 125 | 1 | 143 | 50 |
| SM-CM-69 |  | 791839/7580485 | 71.55 | 14.11 | 2.65 | 0.04 | 0.75 | 2.86 | 3.48 | 3.54 | 0.43 | 0.12 | 1.17 | 100.70 | 17 | 1 | 1382 | 416 | 221 | 1 | 51 | 20 |
| SMM-CM-35 |  | 786663/7570186 | 55.76 | 17.05 | 8.50 | 0.16 | 4.14 | 7.39 | 2.86 | 1.53 | 1.08 | 0.30 | 0.84 | 100.60 | 20 | 22 | 676 | 330 | 298 | <1 | 142 | 70 |
| SMM-CMM-153 |  | 791819/7582016 | 59.32 | 17.10 | 7.29 | 0.19 | 2.96 | 5.66 | 3.72 | 2.01 | 0.70 | 0.22 | 0.68 | 100.70 | 27 | 26 | 537 | 422 | 128 | 2 | 137 | 50 |
| SMM-CMM-172 | RNC | 789649/7591762 | 64.79 | 16.12 | 4.88 | 0.08 | 1.51 | 4.27 | 3.10 | 2.96 | 0.91 | 0.21 | 0.60 | 99.97 | 25 | 10 | 732 | 287 | 283 | 2 | 93 | 70 |
| CT-CMM-177A |  | 775587/7581034 | 71.79 | 13.67 | 2.53 | 0.05 | 1.09 | 3.66 | 3.60 | 1.16 | 0.28 | 0.07 | 0.72 | 98.90 | 5 | 5 | 384 | 362 | 71 | 3 | 55 | 30 |
| CT-CMM-177B |  | 775587/7581034 | 66.95 | 15.91 | 3.60 | 0.08 | 1.81 | 4.23 | 3.84 | 1.35 | 0.58 | 0.14 | 1.69 | 100.60 | 11 | 6 | 590 | 448 | 119 | 2 | 71 | 40 |
| CA-NM-22 |  | 773058/7570588 | 71.86 | 14.57 | 1.63 | 0.02 | 0.40 | 1.95 | 2.94 | 4.63 | 0.29 | 0.09 | 0.85 | 99.39 | 8 | 3 | 1539 | 316 | 185 | 1 | 12 | 20 |
| SAP-SMM-179A |  | 804376/7600531 | 63.40 | 15.89 | 5.29 | 0.10 | 1.98 | 5.01 | 2.93 | 2.89 | 0.70 | 0.12 | 0.92 | 99.82 | 24 | 22 | 757 | 289 | 141 | 2 | 92 | 100 |
| SAP-SMM |  | 804376/7600531 | 66.2 | 15.71 | 4.18 | 0.06 | 1.41 | 4.13 | 2.93 | 3.01 | 0.71 | 0.20 | 0.7 | 99.77 | 12 | 6 | 872 | 30 | 27 | 2 | 69 | 80 |

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -179B | | | 6 | | | | | | | | | | 0 | | | | | 8 | 3 | | | |
| SAP-SMM-179C | | 804376/7600531 | 67.97 | 15.33 | 3.30 | 0.05 | 1.12 | 3.93 | 2.84 | 3.37 | 0.62 | 0.15 | 0.56 | 99.60 | 18 | 6 | 1057 | 316 | 282 | 2 | 58 | 60 |
| SMM-CB-87 | Amp | 793605/7591123 | 50.74 | 13.51 | 12.66 | 0.22 | 7.10 | 10.20 | 2.88 | 0.24 | 1.26 | 0.11 | 0.45 | 100.80 | 33 | 48 | 39 | 91 | 76 | <1 | 366 | 160 |
| CAM-CMM-184B | | 197657/7608536 | 48.87 | 16.74 | 8.61 | 0.18 | 6.11 | 11.91 | 2.91 | 0.54 | 1.18 | 0.15 | 0.85 | 99.00 | 22 | 29 | 179 | 474 | 97 | <1 | 248 | 190 |
| CR-R-04AF | | 793943/7592450 | 55.62 | 16.34 | 8.72 | 0.17 | 3.07 | 7.36 | 3.24 | 1.13 | 1.21 | 0.26 | 0.47 | 98.55 | 22 | 24 | 636 | 422 | 160 | 1 | 173 | 50 |
| SAP-CMM-159 | | 799308/7593420 | 49.61 | 13.92 | 11.58 | 0.36 | 4.22 | 12.25 | 3.09 | 0.79 | 1.76 | 0.17 | 0.60 | 99.65 | 32 | 41 | 331 | 235 | 105 | <1 | 339 | 90 |
| SM-CM-18 | | 793171/7576227 | 51.29 | 18.23 | 10.16 | 0.18 | 4.50 | 9.68 | 1.92 | 1.49 | 0.95 | 0.17 | 1.12 | 99.70 | 23 | 32 | 307 | 259 | 116 | 1 | 242 | 20 |

Table 1: Chemical analyses of major (%), and trace elements (ppm) for samples of the orthogneisses (Serra da Prata and Rio Negro Complexes), granitoids (Morro do Escoteiro Suite) and amphibolites. EU – Euclidelândia Unit; MES – Morro do Escoteiro Suite; SPC – Serra da Prata Complex; RNC – Rio Negro Complex; Amp – amphibolites.

| Sample | Unit | Coordinates | Co | Rb | Ni | Cu | Zn | Ga | Ge | As | Nb | Mo | Ag | In | Sn | Sb | Cs | Hf | W | Ta | Tl | Pb | Bi | Th | U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SM-CM-07 | MES | 797205/7585648 | 38 | 116 | 20 | 10 | 50 | 19 | 1 | 5 | 10 | 2 | 1 | 0 | 1 | 1 | 1.5 | 3.7 | 489.0 | 0.7 | 0.4 | 26.0 | 0.4 | 13.1 | 2.0 |
| SM-CM-02 | | 799453/7584650 | 25 | 58 | 20 | 10 | 50 | 19 | 1 | 5 | 8 | 2 | 1 | 0 | 1 | 1 | 1.0 | 3.9 | 392.0 | 0.4 | 0.1 | 16.0 | 0.4 | 4.7 | 0.4 |
| IT-NM-15 | | 228871/7635640 | 10 | 73 | 20 | 10 | 54 | 15 | 2 | 5 | 5 | 2 | 1 | 0 | 1 | 0 | 1.3 | 4.1 | 87.2 | 0.3 | 0.4 | 13.2 | 0.1 | 5.1 | 0.7 |
| SM-CB-85 | SPC | 795256/7587490 | 32 | 26 | 20 | 10 | 70 | 18 | 1 | 5 | 6 | 2 | 1 | 0 | 1 | 1 | 1.2 | 3.5 | 160.0 | 0.3 | 0.1 | 9.0 | 0.4 | 0.7 | 0.5 |
| SM-CM-70A | | 789945/7580337 | 28 | 53 | 20 | 20 | 50 | 16 | 1 | 5 | 8 | 2 | 1 | 0 | 1 | 1 | 1.5 | 5.8 | 199.0 | 0.5 | 0.2 | 11.0 | 0.4 | 5.9 | 0.9 |
| SM-CM-70B | | 789945/7580337 | 32 | 55 | 20 | 10 | 30 | 13 | 1 | 5 | 4 | 2 | 1 | 0 | 1 | 1 | 1.5 | 2.0 | 503.0 | 0.3 | 0.1 | 15.0 | 0.4 | 6.1 | 0.3 |
| CR-R-04SP | | 793943/7592450 | 26 | 38 | <20 | 20 | 80 | 18 | 1 | <5 | 7 | <2 | <0.5 | <0.2 | <1 | <0.5 | 1.7 | 3.0 | 54.0 | 0.4 | 0.1 | 7.0 | <0.4 | 1.1 | 0.5 |
| SM-CM-69 | | 791839/7580485 | 31 | 57 | 20 | 10 | 30 | 13 | 1 | 5 | 8 | 2 | 1 | 0 | 1 | 1 | 1.4 | 6.0 | 413.0 | 1.4 | 0.1 | 17.0 | 0.4 | 9.7 | 1.0 |
| SM | | 786663 | 2 | 4 | < | 2 | 1 | 1 | 1 | < | 5 | < | 1 | < | < | < | 0. | 5 | 36 | 0 | 0. | 6. | < | 0. | 0 |

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M-CM-35 | | /7570186 | 7 | 5 | 20 | 0 | 00 | 9 | | 5 | | 2 | | 0.2 | 1 | 0.5 | 9 | .7 | .0 | .3 | 2 | 0 | 0.4 | 8 | .5 |
| SMM-CMM-153 | | 791819/7582016 | 20 | 69 | <20 | 40 | 100 | 19 | 2 | <5 | 10 | <2 | <0.5 | <0.2 | 2 | <0.5 | 2.2 | 3.3 | 28.0 | 0.5 | 0.3 | 11.0 | <0.4 | 8.2 | 0.5 |
| SMM-CMM-172 | RNC | 789649/7591762 | 11 | 128 | <20 | <10 | 110 | 23 | 1 | <5 | 16 | <2 | 1 | <0.2 | <1 | <0.5 | 1.8 | 6.8 | 37.0 | 0.9 | 0.5 | 14.0 | <0.4 | 9.7 | 0.9 |
| CT-CMM-177A | | 775587/7581034 | 16 | 70 | <20 | 110 | 40 | 18 | 2 | <5 | 4 | <2 | <0.5 | <0.2 | 2 | <0.5 | 1.1 | 1.8 | 94.0 | 0.6 | 0.2 | 10.0 | <0.4 | 1.8 | 1.5 |
| CT-CMM-177B | | 775587/7581034 | 20 | 68 | 20 | <10 | 50 | 18 | 1 | <5 | 5 | <2 | <0.5 | <0.2 | 2 | <0.5 | 0.7 | 2.8 | 109.0 | 0.5 | 0.3 | 7.0 | <0.4 | 1.1 | 1.2 |
| CA-NM-22 | | 773058/7570588 | 9 | 105 | 20 | 10 | 38 | 19 | 1 | 5 | 6 | 2 | 1 | 0 | 1 | 0 | 1.3 | 5.0 | 86.1 | 0.5 | 0.4 | 10.1 | 0.1 | 14.7 | 0.9 |
| SAP-SMM-179A | | 804376/7600531 | 13 | 101 | <20 | <10 | 90 | 21 | 2 | <5 | 11 | <2 | <0.5 | <0.2 | 3 | <0.5 | 2.2 | 3.5 | 57.0 | 1.0 | 0.4 | 15.0 | <0.4 | 7.5 | 1.1 |
| SAP-SMM-179B | | 804376/7600531 | 8 | 123 | <20 | <10 | 80 | 20 | 1 | <5 | 9 | <2 | 1 | <0.2 | 1 | <0.5 | 2.8 | 6.7 | 22.0 | 0.9 | 0.5 | 16.0 | <0.4 | 17.2 | 1.5 |
| SAP-SMM-179C | | 804376/7600531 | 9 | 113 | <20 | <10 | 60 | 19 | 1 | <5 | 12 | <2 | 1 | <0.2 | 2 | <0.5 | 2.2 | 7.0 | 44.0 | 1.7 | 0.5 | 18.0 | <0.4 | 10.9 | 1.8 |
| SMM-CB-87 | Amp | 793605/7591123 | 45 | 5 | 60 | 20 | 100 | 16 | 2 | <5 | 2 | <2 | <0.5 | <0.2 | <1 | <0.5 | <0.5 | 2.1 | 14.0 | 0.1 | <0.1 | <5 | <0.4 | 0.4 | 0.1 |
| CAM-CMM-184B | | 197657/7608536 | 49 | 5 | 140 | 30 | 60 | 15 | 1 | <5 | 3 | <2 | <0.5 | <0.2 | <1 | <0.5 | <0.5 | 2.1 | 30.0 | 0.2 | <0.1 | <5 | <0.4 | 0.4 | 0.5 |
| CR-R-04AF | | 793943/7592450 | 24 | 28 | <20 | 20 | 120 | 21 | 1 | <5 | 7 | <2 | <0.5 | <0.2 | 1 | <0.5 | 1.1 | 4.0 | 27.0 | 0.4 | <0.1 | 13.0 | <0.4 | 2.9 | 0.7 |
| SAP-CMM-159 | | 799308/7593420 | 43 | 4 | 80 | 60 | 90 | 19 | 2 | <5 | 7 | <2 | <0.5 | <0.2 | <1 | <0.5 | <0.5 | 2.6 | 27.0 | 0.5 | <0.1 | 6.0 | <0.4 | 0.9 | 0.4 |
| SM-CM-18 | | 793171/7576227 | 41 | 38 | 20 | 30 | 90 | 19 | 1 | 5 | 8 | 2 | 1 | 0 | 1 | 1 | 0.9 | 3.2 | 286.0 | 0.4 | 0.1 | 6.0 | 0.4 | 1.2 | 0.6 |

Table 1: Continued

| Sample | Unit | Coordinates | La | Ce | Pr | Nd | Sm | Eu | Gd | Tb | Dy | Ho | Er | Tm | Yb | Lu |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SM-CM-07 | MES | 797205/7585648 | 56.6 | 86.0 | 11.5 | 42.2 | 7.7 | 2.3 | 5.8 | 0.8 | 4.5 | 0.8 | 2.3 | 0.3 | 2.2 | 0.3 |
| SM-CM-02 | | 799453/7584650 | 31.3 | 59.4 | 6.6 | 24.3 | 4.2 | 1.3 | 2.9 | 0.3 | 1.3 | 0.2 | 0.4 | 0.1 | 0.3 | 0.0 |
| IT-NM-15 | | 228871/7635640 | 33.9 | 60.6 | 6.4 | 22.9 | 3.7 | 1.4 | 3.3 | 0.5 | 2.4 | 0.5 | 1.3 | 0.2 | 1.4 | 0.2 |
| SM-CB-85 | SPC | 795256/7587490 | 7.9 | 18.8 | 2.7 | 12.5 | 3.4 | 1.2 | 3.8 | 0.6 | 3.8 | 0.7 | 2.2 | 0.3 | 2.1 | 0.3 |
| SM-CM-70A | | 789945/7580337 | 21.7 | 42.1 | 4.7 | 18.4 | 4.1 | 1.2 | 4.0 | 0.7 | 4.0 | 0.8 | 2.3 | 0.4 | 2.4 | 0.4 |
| SM-CM-70B | | 789945/7580337 | 15.2 | 27.3 | 2.7 | 8.8 | 1.3 | 0.4 | 0.9 | 0.1 | 0.4 | 0.1 | 0.2 | 0.1 | 0.2 | 0.0 |
| CR-R-04SP | | 793943/7592450 | 14.3 | 31.9 | 3.7 | 15.7 | 3.8 | 1.2 | 3.8 | 0.6 | 3.7 | 0.8 | 2.3 | 0.3 | 2.2 | 0.4 |
| SM-CM-69 | | 791839/7580485 | 37.9 | 75.3 | 8.4 | 30.7 | 5.7 | 1.0 | 4.6 | 0.7 | 3.6 | 0.7 | 1.9 | 0.3 | 1.7 | 0.3 |
| SMM-CM-35 | | 786663/7570186 | 13.9 | 33.1 | 4.4 | 19.4 | 4.3 | 1.5 | 4.1 | 0.6 | 3.9 | 0.8 | 2.4 | 0.4 | 2.4 | 0.4 |
| SMM-CMM-153 | | 791819/7582016 | 26.3 | 46.2 | 5.5 | 22.6 | 5.7 | 1.2 | 5.4 | 0.9 | 5.5 | 1.0 | 3.0 | 0.4 | 2.9 | 0.5 |
| SMM-CMM-172 | RNC | 789649/7591762 | 35.6 | 76.1 | 9.1 | 35.2 | 8.1 | 1.5 | 7.2 | 1.0 | 5.8 | 1.0 | 2.6 | 0.3 | 1.7 | 0.3 |
| CT-CMM-177A | | 775587/7581034 | 4.0 | 9.7 | 1.1 | 4.4 | 1.0 | 0.4 | 0.9 | 0.2 | 1.0 | 0.2 | 0.6 | 0.1 | 0.5 | 0.1 |
| CT-CMM-177B | | 775587/7581034 | 11.5 | 24.4 | 2.9 | 11.9 | 2.4 | 0.8 | 2.0 | 0.3 | 1.9 | 0.4 | 1.1 | 0.2 | 1.2 | 0.2 |
| CA-NM-22 | | 773058/7570588 | 57.9 | 103.8 | 12.5 | 46.8 | 7.7 | 1.6 | 5.3 | 0.5 | 1.9 | 0.3 | 0.7 | 0.1 | 0.6 | 0.1 |
| SAP-CMM-179A | | 804376/7600531 | 28.9 | 61.1 | 7.0 | 26.9 | 6.0 | 1.4 | 5.6 | 0.9 | 5.0 | 0.9 | 2.4 | 0.4 | 2.2 | 0.3 |
| SAP-CMM-179B | | 804376/7600531 | 61.6 | 124.0 | 14.0 | 51.7 | 8.8 | 1.6 | 5.8 | 0.7 | 3.2 | 0.5 | 1.3 | 0.2 | 1.0 | 0.2 |
| SAP-CMM-179C | | 804376/7600531 | 36.0 | 74.0 | 8.6 | 33.7 | 7.1 | 1.6 | 5.7 | 0.8 | 4.4 | 0.7 | 1.8 | 0.2 | 1.4 | 0.2 |
| SMM-CB-87 | Amp | 793605/7591123 | 4.4 | 11.5 | 1.8 | 9.0 | 3.1 | 1.2 | 4.6 | 0.9 | 6.1 | 1.3 | 3.8 | 0.6 | 3.8 | 0.6 |
| CAM-CMM-184B | | 197657/7608536 | 7.1 | 16.3 | 2.5 | 11.9 | 3.3 | 1.3 | 4.1 | 0.7 | 4.3 | 0.9 | 2.5 | 0.3 | 2.4 | 0.4 |
| CR-R-04AF | | 793943/7592450 | 25.7 | 56.6 | 7.0 | 27.7 | 6.0 | 2.0 | 5.4 | 0.9 | 5.3 | 1.0 | 2.9 | 0.4 | 2.7 | 0.4 |
| SAP-CMM-159 | | 799308/7593420 | 10.2 | 21.4 | 3.2 | 15.2 | 4.4 | 1.7 | 5.6 | 1.0 | 6.4 | 1.3 | 3.7 | 0.6 | 3.4 | 0.6 |
| SM-CM-18 | | 793171/7576227 | 13.2 | 32.2 | 4.4 | 18.7 | 4.5 | 1.3 | 4.7 | 0.8 | 4.5 | 0.9 | 2.6 | 0.4 | 2.5 | 0.4 |

Table 2: Chemical analyses of REE (ppm) for samples of the orthogneisses (Serra da Prata and Rio Negro Complexes), granitoids (Morro do Escoteiro Suite) and amphibolites. EU – Euclidelândia Unit; MES – Morro do Escoteiro Suite; SPC – Serra da Prata Complex; RNC – Rio Negro Complex; Amp – amphibolite.

| Sample | Unit | Method U-Pb in zircon | Laboratory |
|---|---|---|---|
| SM-CB-84B | Amp | LA-MC-ICPMS | "Laboratório de Estudos Geocronológicos, Geodinâmicos e Ambientais"<br>Geosciences Institute of the University of Brasília, Brazil |
| SM-CM-07 | MES | | |
| SM-CM-02 | MES | | |
| SM-CM-69 | SPC | | |
| SM-CM-70A | SPC | | |
| SM-CM-70B | SPC | | |
| SM-CB-85 | SPC | | |
| SM-CMB-148 | EU | | |
| SMM-CMM-172 | RNC | LA-MC-ICPMS | Laboratório Multi usuário de Meio Ambiente e Materiais<br>University of Rio de Janeiro State, Brasil (http://multilab-uerj.com.br/upb) |
| SMM-CMM-153 | SPC | | |
| THE-02 | RNC | SHRIMP | Laboratory of the Australian National University, Canberra, Australia.<br>(http://shrimp.anu.edu.au/shrimp.php) |
| IT-NM-15 | MES | SHRIMP | Radiogenic Isotope Facility of the Department of Earth and Atmospheric Sciences,<br>University of Alberta, Edmonton, Canada. (Simonetti et al., 2006) |

Table 3: Laboratories and methods used to yielder U-Pb geochronological data from Oriental Terrane.

| SM-CB-84B | U ppm | Isotope Ratios | | | | | | | Ages (Ma) | | | | | | Disc. % | f 206 | Age (Ma) | ± | $^{232}$Th/$^{238}$U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $^{207}$Pb*/$^{235}$U | ± | $^{206}$Pb*/$^{238}$U | ± | Rho 1 | $^{207}$Pb*/$^{206}$Pb* | ± | $^{206}$Pb/$^{238}$U | ± | $^{207}$Pb/$^{235}$U | ± | $^{207}$Pb/$^{206}$Pb | ± | | | | | |
| FIRST POPULATION | | | | | | | | | | | | | | | | | | | |
| Z1 | 192.0 | 1.29276 | 4.83 | 0.13947 | 3.19 | 0.66 | 0.06722 | 3.62 | 842 | 27 | 843 | 41 | 845 | 31 | 0 | 0.0010 | 842 | 48 | 0.06 |
| Z2 | 559.8 | 0.82176 | 4.04 | 0.09910 | 2.40 | 0.59 | 0.06014 | 3.25 | 609 | 15 | 609 | 25 | 609 | 20 | 0 | 0.0003 | 609 | 27 | 0.53 |
| Z3* | 306.2 | 1.26191 | 5.29 | 0.13185 | 3.74 | 0.71 | 0.06941 | 3.74 | 798 | 30 | 829 | 44 | 911 | 34 | 12 | 0.0006 | 809 | 54 | 1.59 |
| Z4 B | 443.8 | 0.74651 | 3.97 | 0.09157 | 2.22 | 0.56 | 0.05913 | 3.29 | 565 | 13 | 566 | 22 | 572 | 19 | 1 | 0.0005 | 565 | 24 | 0.32 |
| Z4 N | 18.0 | 1.33965 | 10.81 | 0.14352 | 6.89 | 0.64 | 0.06770 | 8.33 | 865 | 60 | 863 | 93 | 859 | 72 | -1 | 0.0029 | 864 | 110 | 0.23 |
| Z5 | 27.5 | 1.25417 | 9.66 | 0.13773 | 6.87 | 0.71 | 0.06604 | 6.79 | 832 | 57 | 825 | 80 | 808 | 55 | -3 | 0.0020 | 829 | 100 | 0.38 |
| Z5 B | 49.0 | 1.40742 | 5.74 | 0.14776 | 4.22 | 0.73 | 0.06908 | 3.89 | 888 | 37 | 892 | 51 | 901 | 35 | 1 | 0.0019 | 890 | 64 | 0.23 |
| Z6 | 55.6 | 1.35817 | 6.34 | 0.14499 | 4.63 | 0.73 | 0.06794 | 4.34 | 873 | 40 | 871 | 55 | 867 | 38 | -1 | 0.0009 | 872 | 70 | 1 |
| Z7* | -0.3 | 1.67483 | 18.51 | 0.16847 | 16.22 | 0.88 | 0.07210 | 8.93 | 1004 | 163 | 999 | 185 | 989 | 88 | -1 | 0.0463 | 998 | 230 | -3.51 |
| Z8* | 12.5 | 1.15995 | 7.29 | 0.13133 | 4.70 | 0.64 | 0.06406 | 5.58 | 795 | 37 | 782 | 57 | 743 | 41 | -7 | 0.0054 | 791 | 67 | 0.28 |
| SECOND POPULATION | | | | | | | | | | | | | | | | | | | |
| 0Z9 | 140.7 | 0.78041 | 5.55 | 0.09507 | 3.03 | 0.55 | 0.05953 | 4.65 | 585 | 18 | 586 | 32 | 587 | 27 | 0 | 0.0005 | 589 | 33 | 0.12 |
| Z10 | 18.2 | 0.77572 | 5.40 | 0.09428 | 3.05 | 0.57 | 0.05968 | 4.45 | 581 | 18 | 583 | 31 | 592 | 26 | 2 | 0.0048 | 581 | 33 | 0.63 |
| Z11* | 39.5 | 0.96793 | 9.74 | 0.11256 | 6.52 | 0.67 | 0.06237 | 7.24 | 688 | 45 | 687 | 67 | 687 | 50 | 0 | 0.0020 | 688 | 82 | 0.40 |
| Z12* | 58.4 | 0.92588 | 7.60 | 0.10830 | 6.60 | 0.87 | 0.06200 | 3.78 | 663 | 44 | 665 | 51 | 674 | 26 | 2 | 0.0013 | 665 | 74 | 0.29 |
| Z13* | 47.0 | 1.15400 | 5.85 | 0.10030 | 4.04 | 0.69 | 0.08345 | 4.23 | 616 | 25 | 779 | 46 | 1280 | 54 | Disc. | 0.0036 | - | - | 0.45 |
| Z14* | 61.2 | 0.88886 | 8.39 | 0.10172 | 4.80 | 0.57 | 0.06338 | 6.87 | 624 | 30 | 646 | 54 | 721 | 50 | 13 | 0.0014 | 627 | 56 | 0.55 |
| Z15* | 53.6 | 1.33712 | 5.85 | 0.13175 | 5.04 | 0.86 | 0.07360 | 4.93 | 798 | 40 | 862 | 61 | 1031 | 51 | Disc. | 0.0026 | - | - | 0.43 |

Table 4: U-Pb isotopic data (LA-ICP-MS) from sample SM-CB-84B – Amphibolite. *Spots excluded from the calculation. Disc.: do not provide age.

| SMM-CMM-153 | U ppm | Isotope Ratios | | | | | | | Ages (Ma) | | | | | | Disc % | f206 | Age (Ma) | ± | $^{232}$Th/$^{238}$U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $^{207}$Pb*/$^{235}$U | ± | $^{206}$Pb*/$^{238}$U | ± | Rho | $^{207}$Pb*/$^{206}$Pb* | ± | $^{206}$Pb/$^{238}$U | ± | $^{207}$Pb/$^{235}$U | ± | $^{207}$Pb/$^{206}$Pb | ± | | | | | |
| MA/01A | 151,7 | 0,63522 | 7,24 | 0,06396 | 5,34 | 0,74 | 0,07203 | 4,89 | 400 | 21,36 | 499 | 36,18 | 987 | 48,26 | Disc. | 0,0315 | - | - | 0,55 |
| MA/02A | 201,2 | 1,27654 | 4,90 | 0,13950 | 3,87 | 0,79 | 0,06637 | 3,00 | 842 | 32,59 | 835 | 40,89 | 818 | 24,51 | -3 | 0,0113 | 837 | 27 | 0,34 |
| MA/03A | 769,3 | 0,86832 | 5,39 | 0,10514 | 4,58 | 0,85 | 0,05990 | 2,85 | 644 | 29,53 | 635 | 34,24 | 600 | 17,07 | -7 | 0,0031 | 636 | 25 | 0,27 |
| MA/004A | 221,6 | 1,31812 | 4,46 | 0,14184 | 3,61 | 0,81 | 0,06740 | 2,62 | 855 | 30,88 | 854 | 38,07 | 850 | 22,24 | -1 | 0,0058 | 854 | 26 | 0,32 |
| MA/05A | 176,4 | 1,46378 | 3,49 | 0,15712 | 2,31 | 0,66 | 0,06757 | 2,61 | 941 | 21,77 | 916 | 31,95 | 855 | 22,34 | -10 | 0,0102 | 929 | 19 | 0,47 |
| MA/06A* | 249,1 | 1,16054 | 5,00 | 0,12579 | 3,69 | 0,74 | 0,06691 | 3,38 | 764 | 28,18 | 782 | 39,12 | 835 | 28,19 | 9 | 0,0082 | 772 | 25 | 0,17 |
| MA/07A | 53,1 | 1,10859 | 12,32 | 0,12328 | 7,74 | 0,63 | 0,06522 | 9,59 | 749 | 57,98 | 757 | 93,31 | 781 | 74,90 | 4 | 0,0452 | 751 | 53 | 0,23 |
| MA/08A* | 207,7 | 0,60641 | 7,32 | 0,07295 | 4,83 | 0,66 | 0,06029 | 5,50 | 454 | 21,92 | 481 | 35,23 | 614 | 33,78 | 26 | 0,0159 | 457 | 42 | 0,10 |
| MA/09A | 102,4 | 1,19552 | 12,86 | 0,13020 | 11,99 | 0,93 | 0,06659 | 4,65 | 789 | 94,60 | 799 | 102,69 | 825 | 38,37 | 4 | 0,0211 | 805 | 66 | 0,56 |
| MA/01B | 211,6 | 1,42292 | 3,09 | 0,15162 | 2,11 | 0,68 | 0,06807 | 2,26 | 910 | 19,21 | 899 | 27,80 | 871 | 19,68 | -5 | 0,0094 | 905 | 17 | 0,49 |
| MA/02B | 388,3 | 1,19020 | 3,82 | 0,13266 | 2,42 | 0,63 | 0,06507 | 2,96 | 803 | 19,42 | 796 | 30,44 | 777 | 23,00 | -3 | 0,0043 | 801 | 17 | 0,71 |
| MA/03B* | 588,5 | 0,84345 | 3,80 | 0,10550 | 2,08 | 0,55 | 0,05798 | 3,18 | 647 | 13,45 | 621 | 23,60 | 529 | 16,82 | -22 | 0,0145 | 642 | 25 | 0,01 |
| MA/04B* | 473,5 | 1,33780 | 3,05 | 0,14808 | 2,33 | 0,76 | 0,06552 | 1,97 | 890 | 20,76 | 862 | 26,33 | 791 | 15,59 | -13 | 0,0012 | 870 | 17 | 0,58 |
| MA/05B | 3445,3 | 0,77966 | 3,81 | 0,09523 | 2,97 | 0,78 | 0,05938 | 2,39 | 586 | 17,39 | 585 | 22,29 | 581 | 13,88 | -1 | 0,0011 | 586 | 16 | 0,69 |
| MA/06B* | 276,0 | 1,44291 | 3,13 | 0,15925 | 2,32 | 0,74 | 0,06571 | 2,09 | 953 | 22,13 | 907 | 28,34 | 797 | 16,67 | -19 | 0,0055 | 920 | 18 | 0,61 |
| MA/07B* | 4124,5 | 1,04894 | 3,00 | 0,12668 | 2,06 | 0,69 | 0,06005 | 2,19 | 769 | 15,81 | 728 | 21,86 | 605 | 13,23 | Disc. | 0,0005 | - | - | 0,22 |
| MA | 21 | 1,3 | 4, | 0,1 | 2, | 0, | 0,0 | 3, | 8 | 26, | 8 | 39, | 8 | 28, | - | 0, | 8 | 2 | 0, |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| /08B | 4,9 | 4794 | 59 | 4850 | 93 | 64 | 6583 | 54 | 93 | 19 | 67 | 82 | 01 | 32 | 11 | 0077 | 82 | 3 | 68 |
| MA/09B | 595,7 | 1,18517 | 3,71 | 0,12969 | 2,05 | 0,55 | 0,06628 | 3,10 | 786 | 16,11 | 794 | 29,47 | 815 | 25,24 | 4 | 0,0023 | 788 | 15 | 0,54 |
| MA/01C* | 734,2 | 1,62714 | 5,16 | 0,17829 | 4,09 | 0,79 | 0,06619 | 3,14 | 1058 | 43,28 | 981 | 50,60 | 812 | 25,53 | -30 | 0,0025 | 982 | 65 | 1,05 |
| MA/02C* | 584,4 | 1,38320 | 4,46 | 0,15296 | 2,85 | 0,64 | 0,06559 | 3,43 | 918 | 26,15 | 882 | 39,29 | 793 | 27,17 | -16 | 0,0027 | 902 | 23 | 0,37 |
| MA/03C* | 461,8 | 1,61811 | 4,35 | 0,17814 | 2,24 | 0,52 | 0,06588 | 3,73 | 1057 | 23,71 | 977 | 42,51 | 803 | 29,91 | -32 | 0,0124 | Disc | - | 0,59 |
| MA/04C* | 554,2 | 1,43576 | 3,91 | 0,15936 | 1,78 | 0,45 | 0,06534 | 3,48 | 953 | 16,92 | 904 | 35,33 | 785 | 27,35 | -21 | 0,0041 | 943 | 15 | 0,88 |
| MA/05C | 404,2 | 1,19397 | 5,38 | 0,13215 | 4,16 | 0,77 | 0,06553 | 3,40 | 800 | 33,31 | 798 | 42,89 | 791 | 26,92 | -1 | 0,0046 | 799 | 29 | 0,42 |
| MA/06C* | 546,3 | 1,54372 | 3,73 | 0,17080 | 1,64 | 0,44 | 0,06555 | 3,35 | 1017 | 16,71 | 948 | 35,39 | 792 | 26,55 | -28 | 0,0037 | 1002 | 620 | 0,52 |
| MA/07C* | 5099,1 | 0,93914 | 4,60 | 0,11578 | 2,95 | 0,64 | 0,05883 | 3,52 | 706 | 20,86 | 672 | 30,92 | 561 | 19,76 | -26 | 0,0004 | 695 | 450 | 0,20 |
| MA/08C | 1573,1 | 1,09114 | 7,45 | 0,12043 | 6,72 | 0,90 | 0,06571 | 3,22 | 733 | 49,25 | 749 | 55,80 | 797 | 25,65 | 8 | 0,0010 | 753 | 39 | 0,37 |
| MA/09C | 608,0 | 1,54088 | 4,78 | 0,16349 | 2,93 | 0,61 | 0,06835 | 3,78 | 976 | 28,58 | 947 | 45,28 | 879 | 33,25 | -11 | 0,0030 | 965 | 25 | 0,43 |
| MA/01D* | 416,2 | 1,43849 | 3,29 | 0,15733 | 1,96 | 0,59 | 0,06631 | 2,65 | 942 | 18,42 | 905 | 29,82 | 816 | 21,64 | -15 | 0,0039 | 929 | 16 | 0,49 |
| MA/02D | 4667,7 | 0,82925 | 3,83 | 0,10149 | 2,82 | 0,74 | 0,05926 | 2,58 | 623 | 17,60 | 613 | 23,47 | 577 | 14,90 | -8 | 0,0004 | 619 | 16 | 0,20 |
| MA/03D* | 483,2 | 1,40437 | 3,86 | 0,15464 | 2,72 | 0,71 | 0,06587 | 2,73 | 927 | 25,22 | 891 | 34,35 | 802 | 21,91 | -16 | 0,0040 | 906 | 21 | 0,68 |
| MA/04D* | 4621,5 | 0,99196 | 3,61 | 0,12111 | 2,56 | 0,71 | 0,05941 | 2,54 | 737 | 18,89 | 700 | 25,23 | 582 | 14,76 | -27 | 0,0005 | 718 | 570 | 0,17 |
| MA/05D | 401,7 | 1,09146 | 4,00 | 0,12149 | 2,86 | 0,72 | 0,06516 | 2,79 | 739 | 21,17 | 749 | 29,96 | 779 | 21,76 | 5 | 0,0023 | 743 | 19 | 0,65 |
| MA/06D | 2680,0 | 0,77734 | 5,40 | 0,09474 | 4,72 | 0,87 | 0,05951 | 2,62 | 583 | 27,54 | 584 | 31,53 | 586 | 15,34 | 0 | 0,0009 | 584 | 24 | 0,16 |
| MA/07D | 1033,6 | 1,27913 | 12,57 | 0,14021 | 12,31 | 0,98 | 0,06617 | 2,53 | 846 | 104,16 | 836 | 105,17 | 812 | 20,57 | -4 | 0,0023 | 820 | 47 | 0,49 |
| MA/08D | 3171,7 | 1,18766 | 6,76 | 0,13235 | 6,33 | 0,94 | 0,06509 | 2,36 | 801 | 50,74 | 795 | 53,72 | 777 | 18,33 | -3 | 0,0012 | 790 | 34 | 0,14 |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MA/09D* | 668,2 | 1,44953 | 3,00 | 0,15805 | 1,83 | 0,61 | 0,06652 | 2,38 | 946 | 17,35 | 910 | 27,33 | 823 | 19,57 | -15 | 0,0024 | 932 | 15 | 0,59 |
| MA/01E | 2433,3 | 0,75950 | 4,61 | 0,09342 | 3,08 | 0,67 | 0,05896 | 3,43 | 576 | 17,71 | 574 | 26,45 | 566 | 19,43 | -2 | 0,0013 | 575 | 17 | 0,22 |
| MA/02E* | 717,1 | 1,42303 | 4,37 | 0,15836 | 3,03 | 0,69 | 0,06517 | 3,15 | 948 | 28,72 | 899 | 39,27 | 780 | 24,55 | -21 | 0,0024 | 919 | 730 | 0,64 |
| MA/03E* | 6718,7 | 1,26505 | 3,61 | 0,15258 | 1,74 | 0,48 | 0,06013 | 3,17 | 915 | 15,91 | 830 | 30,00 | 608 | 19,27 | Disc. | 0,0017 | - | - | 0,64 |
| MA/04E* | 727,6 | 1,81892 | 4,77 | 0,19607 | 2,97 | 0,62 | 0,06728 | 3,74 | 1154 | 34,24 | 1052 | 50,20 | 847 | 31,63 | Disc. | 0,0080 | - | - | 0,61 |
| MA/05E* | 9339,6 | 0,66436 | 6,23 | 0,07574 | 4,98 | 0,80 | 0,06361 | 3,76 | 471 | 23,42 | 517 | 32,24 | 729 | 27,37 | 35 | 0,0067 | 477 | 850 | 1,79 |
| MA/06E* | 898,8 | 1,27029 | 24,88 | 0,13800 | 5,11 | 0,21 | 0,06676 | 24,35 | 833 | 42,55 | 833 | 207,14 | 830 | 202,21 | 0 | 0,0058 | 833 | 40 | 0,06 |
| MA/07E | 4425,6 | 0,72761 | 5,08 | 0,09053 | 3,82 | 0,75 | 0,05829 | 3,35 | 559 | 21,33 | 555 | 28,21 | 541 | 18,13 | -3 | 0,0005 | 557 | 20 | 0,26 |
| ME/01A | 83,6 | 1,34141 | 1,82 | 0,14560 | 1,27 | 0,70 | 0,06682 | 1,31 | 876 | 11,12 | 864 | 15,74 | 832 | 10,88 | -5 | 0,0032 | 870 | 9,6 | 0,81 |
| ME/02A | 447,8 | 0,86934 | 2,42 | 0,10401 | 2,19 | 0,91 | 0,06062 | 1,02 | 638 | 13,98 | 635 | 15,37 | 626 | 6,41 | -2 | 0,0027 | 635 | 11 | 0,28 |
| ME/03A* | 82,2 | 1,08955 | 3,21 | 0,11781 | 2,59 | 0,80 | 0,06707 | 1,91 | 718 | 18,56 | 748 | 24,05 | 840 | 16,03 | 15 | 0,0041 | 734 | 590 | 0,32 |
| ME/04A* | 154,4 | 1,04534 | 2,33 | 0,12526 | 1,96 | 0,84 | 0,06053 | 1,26 | 761 | 14,91 | 727 | 16,91 | 622 | 7,81 | Disc. | 0,0248 | - | - | 0,31 |
| ME/05A* | 41,5 | 1,40755 | 2,46 | 0,15424 | 1,72 | 0,70 | 0,06619 | 1,76 | 925 | 15,87 | 892 | 21,94 | 812 | 14,31 | -14 | 0,0048 | 907 | 490 | 0,62 |
| ME/06A | 249,6 | 0,90802 | 2,94 | 0,10792 | 2,04 | 0,69 | 0,06102 | 2,11 | 661 | 13,50 | 656 | 19,29 | 640 | 13,54 | -3 | 0,0014 | 659 | 12 | 0,16 |
| ME/07A* | 87,1 | 1,05503 | 4,24 | 0,11468 | 4,02 | 0,95 | 0,06672 | 1,34 | 700 | 28,15 | 731 | 31,01 | 829 | 11,13 | Disc. | 0,0040 | - | - | 0,60 |
| ME/08A | 179,6 | 0,80968 | 4,84 | 0,09751 | 4,37 | 0,90 | 0,06023 | 2,06 | 600 | 26,24 | 602 | 29,13 | 612 | 12,63 | 2 | 0,0087 | 603 | 22 | 0,15 |
| ME/09A* | 159,3 | 1,05847 | 2,38 | 0,11403 | 1,66 | 0,70 | 0,06733 | 1,70 | 696 | 11,56 | 733 | 17,44 | 848 | 14,44 | Disc. | 0,0023 | - | - | 0,69 |
| ME/01B | 4367,1 | 1,12813 | 8,02 | 0,12603 | 7,59 | 0,95 | 0,06492 | 2,59 | 765 | 58,06 | 767 | 61,48 | 772 | 19,96 | 1 | 0,0003 | 768 | 39 | 0,07 |
| ME/02B | 726,0 | 1,47710 | 6,92 | 0,15006 | 6,38 | 0,92 | 0,07139 | 2,68 | 901 | 57,50 | 921 | 63,74 | 969 | 25,97 | 7 | 0,0011 | 934 | 39 | 0,73 |
| ME/ | 29 | 1,5 | 6, | 0,1 | 6, | 0, | 0,0 | 2, | 9 | 57, | 9 | 62, | 9 | 22, | 3 | 0, | 9 | 3 | 0, |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 03B | 97,1 | 0085 | 68 | 5403 | 24 | 93 | 7067 | 38 | 23 | 64 | 31 | 18 | 48 | 59 | | 0002 | 37 | 6 | 07 |
| ME/04B | 2107,7 | 1,50773 | 6,93 | 0,15323 | 6,45 | 0,93 | 0,07136 | 2,55 | 919 | 59,27 | 934 | 64,74 | 968 | 24,67 | 5 | 0,0005 | 945 | 38 | 0,24 |
| ME/05B | 365,0 | 1,49520 | 6,96 | 0,15427 | 6,45 | 0,93 | 0,07029 | 2,59 | 925 | 59,70 | 928 | 64,58 | 937 | 24,29 | 1 | 0,0039 | 931 | 38 | 0,42 |
| ME/06B* | 119,9 | 1,63354 | 8,79 | 0,18427 | 5,47 | 0,62 | 0,06430 | 6,88 | 1090 | 59,65 | 983 | 86,44 | 751 | 51,70 | -45 | 0,0100 | 1031 | 49 | 0,74 |
| ME/07B* | 129,2 | 0,82986 | 13,11 | 0,09280 | 11,93 | 0,91 | 0,06486 | 5,44 | 572 | 68,22 | 614 | 80,42 | 770 | 41,88 | 26 | 0,0111 | 608 | 61 | 1,01 |
| ME/08B | 2081,6 | 1,24404 | 9,87 | 0,13444 | 7,13 | 0,72 | 0,06711 | 6,82 | 813 | 58,00 | 821 | 80,97 | 841 | 57,35 | 3 | 0,0074 | 817 | 51 | -0,63 |
| ME/09B | 460,9 | 1,60168 | 7,16 | 0,16697 | 6,05 | 0,84 | 0,06957 | 3,84 | 995 | 60,19 | 971 | 69,54 | 916 | 35,17 | -9 | 0,0021 | 979 | 41 | 0,60 |
| ME/01C* | 774,7 | 0,77462 | 3,93 | 0,09243 | 3,78 | 0,96 | 0,06078 | 1,09 | 570 | 21,53 | 582 | 22,90 | 632 | 6,91 | 10 | 0,0022 | Disc | - | 0,72 |
| ME/02C | 804,5 | 1,43638 | 1,47 | 0,15432 | 0,97 | 0,66 | 0,06751 | 1,10 | 925 | 8,98 | 904 | 13,26 | 853 | 9,39 | -8 | 0,0014 | 916 | 8 | 0,39 |
| ME/03C | 424,0 | 0,83280 | 7,99 | 0,09831 | 7,59 | 0,95 | 0,06144 | 2,50 | 604 | 45,88 | 615 | 49,16 | 655 | 16,37 | 8 | 0,0213 | 624 | 34 | 0,10 |
| ME/04C* | 17,2 | 0,95246 | 7,01 | 0,10696 | 4,93 | 0,70 | 0,06458 | 4,99 | 655 | 32,27 | 679 | 47,63 | 761 | 37,95 | 14 | 0,0197 | 662 | 30 | 2,01 |
| ME/05C | 419,9 | 0,96602 | 7,71 | 0,10967 | 7,47 | 0,97 | 0,06388 | 1,91 | 671 | 50,09 | 686 | 52,91 | 738 | 14,10 | 9 | 0,0003 | 710 | 31 | 0,13 |
| ME/06C* | 197,8 | 1,51255 | 1,49 | 0,16217 | 1,06 | 0,72 | 0,06765 | 1,04 | 969 | 10,29 | 935 | 13,89 | 858 | 8,90 | Disc. | 0,0029 | - | - | 0,28 |
| ME/07C* | 78,2 | 1,20389 | 3,09 | 0,13302 | 2,73 | 0,88 | 0,06564 | 1,44 | 0 | 8484,06 | 6 | 1429,28 | 0 | 5746,36 | 69 | 0,0094 | 802 | 34 | 1,86 |
| ME/08C | 180,8 | 1,35729 | 1,51 | 0,14609 | 0,94 | 0,63 | 0,06738 | 1,17 | 879 | 8,30 | 871 | 13,11 | 850 | 9,96 | -3 | 0,0019 | 876 | 7,4 | 0,67 |
| ME/09C | 110,6 | 1,48470 | 4,83 | 0,15534 | 1,81 | 0,38 | 0,06932 | 4,48 | 931 | 16,89 | 924 | 44,64 | 908 | 40,66 | -2 | 0,0136 | 930 | 15 | 1,36 |
| ME/01D | 219,9 | 1,21981 | 2,01 | 0,13349 | 1,68 | 0,84 | 0,06627 | 1,10 | 808 | 13,58 | 810 | 16,28 | 815 | 8,99 | 1 | 0,0009 | 809 | 11 | 0,17 |
| ME/02D | 99,5 | 1,22256 | 2,15 | 0,13321 | 1,19 | 0,55 | 0,06656 | 1,79 | 806 | 9,58 | 811 | 17,40 | 824 | 14,72 | 2 | 0,0026 | 807 | 8,8 | 0,51 |
| ME/03D | 228,7 | 1,19376 | 3,37 | 0,13151 | 2,35 | 0,70 | 0,06584 | 2,41 | 796 | 18,71 | 798 | 26,86 | 801 | 19,32 | 1 | 0,0017 | 797 | 17 | 0,71 |
| ME/ | 93 | 0,7 | 1, | 0,0 | 1, | 0, | 0,0 | 0, | 5 | 9,4 | 5 | 11, | 5 | 5,8 | 0 | 0, | 5 | 8 | 0, |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 04D | 0,3 | 8498 | 89 | 9551 | 61 | 85 | 5961 | 99 | 88 | 9 | 88 | 13 | 89 | 2 | | 0004 | 88 | ,4 | 26 |
| ME/05D | 461,5 | 0,84732 | 5,08 | 0,10225 | 4,81 | 0,95 | 0,06010 | 1,62 | 628 | 30,21 | 623 | 31,65 | 607 | 9,81 | -3 | 0,0087 | 619 | 22 | 0,20 |
| ME/06D* | 4,5 | 1,23740 | 47,00 | 0,14816 | 40,57 | 0,86 | 0,06057 | 23,75 | 891 | 361,30 | 818 | 384,36 | 624 | 148,20 | -43 | 0,2171 | 801 | 270 | -0,18 |
| ME/07D | 262,7 | 1,21572 | 1,79 | 0,13346 | 1,21 | 0,68 | 0,06607 | 1,31 | 808 | 9,80 | 808 | 14,45 | 809 | 10,62 | 0 | 0,0017 | 808 | 8,7 | 0,35 |
| ME/08D | 182,0 | 0,73740 | 2,99 | 0,08984 | 2,57 | 0,86 | 0,05953 | 1,53 | 555 | 14,27 | 561 | 16,78 | 586 | 8,95 | 5 | 0,0335 | 559 | 13 | -0,22 |
| ME/09D | 58,6 | 1,25229 | 3,18 | 0,13749 | 1,82 | 0,57 | 0,06606 | 2,60 | 830 | 15,15 | 824 | 26,21 | 808 | 21,04 | -3 | 0,0070 | 829 | 14 | 0,30 |
| ME/01E* | 119,9 | 1,15125 | 8,71 | 0,08249 | 4,58 | 0,53 | 0,10122 | 7,41 | 511 | 23,41 | 778 | 67,74 | 1647 | 121,94 | Disc. | 0,1943 | - | - | 0,86 |
| ME/02E | 257,5 | 0,81567 | 3,17 | 0,09776 | 2,81 | 0,89 | 0,06051 | 1,47 | 601 | 16,92 | 606 | 19,22 | 622 | 9,13 | 3 | 0,2821 | 605 | 14 | -0,53 |
| ME/03E | 1274,3 | 0,81705 | 2,72 | 0,09907 | 2,51 | 0,92 | 0,05981 | 1,06 | 609 | 15,28 | 606 | 16,52 | 597 | 6,32 | -2 | 0,0004 | 605 | 12 | 0,28 |
| ME/04E | 85,0 | 1,34155 | 1,87 | 0,14349 | 1,03 | 0,55 | 0,06781 | 1,56 | 864 | 8,86 | 864 | 16,13 | 863 | 13,47 | 0 | 0,0039 | 864 | 8 | 0,54 |
| ME/05E* | 1,3 | 1,77148 | 56,83 | 0,20224 | 27,82 | 0,49 | 0,06353 | 49,55 | 1187 | 330,27 | 1035 | 588,18 | 726 | 359,72 | -64 | 0,3478 | 1122 | 270 | 1,95 |
| ME/06E | 188,6 | 1,28363 | 1,57 | 0,14102 | 1,06 | 0,68 | 0,06602 | 1,15 | 850 | 9,05 | 838 | 13,14 | 807 | 9,29 | -5 | 0,0019 | 845 | 8 | 0,17 |
| ME/07E* | 102,4 | 0,99200 | 2,56 | 0,10841 | 1,74 | 0,68 | 0,06636 | 1,87 | 664 | 11,57 | 700 | 17,90 | 818 | 15,31 | Disc. | 0,0044 | - | - | 0,26 |

Table 5: U-Pb isotopic data (LA-ICP-MS) from sample SMM-CMM-153 – Serra da Prata Complex. *Spots excluded from the calculation. Disc.: do not provide age.

| **SM-CM -85** | **U ppm** | **Ratios** | | | | | | | **Age (Ma)** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **$^{207}$Pb*/$^{235}$U** | ± | **$^{206}$Pb*/$^{238}$U** | ± | **Rho 1** | **$^{207}$Pb*/$^{206}$Pb*** | ± | **$^{206}$Pb/$^{238}$U** | ± | **$^{207}$Pb/$^{235}$U** | ± | **$^{207}$Pb/$^{206}$Pb** |
| Z1 | 26.0 | 1.25055 | 6.56 | 0.13644 | 4.58 | 0.70 | 0.06647 | 4.70 | 825 | 38 | 824 | 54 | 821 |
| Z2 | 24.2 | 1.26804 | 6.27 | 0.13750 | 3.93 | 0.63 | 0.06689 | 4.89 | 831 | 33 | 832 | 52 | 834 |
| Z3B | 298.3 | 0.79205 | 3.07 | 0.09533 | 1.64 | 0.53 | 0.06026 | 2.60 | 587 | 10 | 592 | 18 | 613 |
| Z3N | 48.3 | 1.27613 | 4.71 | 0.13819 | 2.38 | 0.51 | 0.06698 | 4.06 | 834 | 20 | 835 | 39 | 837 |
| Z4 | 22.9 | 1.29532 | 6.34 | 0.14000 | 4.05 | 0.64 | 0.06710 | 4.88 | 845 | 34 | 844 | 54 | 841 |
| Z5 | 19.4 | 1.34230 | 6.72 | 0.14361 | 4.73 | 0.70 | 0.06779 | 4.77 | 865 | 41 | 864 | 58 | 862 |
| Z6 | 24.4 | 1.33631 | 5.52 | 0.14296 | 3.24 | 0.59 | 0.06780 | 4.46 | 861 | 28 | 862 | 48 | 862 |
| Z7 | 12.6 | 1.15679 | 6.84 | 0.12874 | 4.79 | 0.70 | 0.06517 | 4.88 | 781 | 37 | 780 | 53 | 780 |
| Z8 | 23.3 | 1.30827 | 5.78 | 0.14037 | 4.80 | 0.83 | 0.06760 | 3.22 | 847 | 41 | 849 | 49 | 856 |
| Z9 | 42.3 | 1.22465 | 6.19 | 0.13477 | 3.88 | 0.63 | 0.06591 | 4.83 | 815 | 32 | 812 | 50 | 803 |
| Z10 | 32.5 | 1.36357 | 5.95 | 0.14485 | 4.25 | 0.71 | 0.06827 | 4.16 | 872 | 37 | 873 | 52 | 877 |
| Z11N | 40.4 | 1.33484 | 5.44 | 0.14293 | 2.39 | 0.44 | 0.06774 | 4.89 | 861 | 21 | 861 | 47 | 860 |
| Z11B | 38.7 | 1.34317 | 5.61 | 0.14333 | 2.39 | 0.43 | 0.06797 | 5.08 | 863 | 21 | 865 | 49 | 867 |
| Z12 | 33.1 | 1.28456 | 5.00 | 0.13814 | 3.30 | 0.66 | 0.06744 | 3.76 | 834 | 27 | 839 | 42 | 851 |
| Z13 | 37.9 | 1.38914 | 5.16 | 0.14686 | 2.69 | 0.52 | 0.06860 | 4.41 | 883 | 24 | 884 | 46 | 887 |
| Z14N | 55.0 | 1.33003 | 4.35 | 0.14271 | 2.90 | 0.67 | 0.06759 | 3.24 | 860 | 25 | 859 | 37 | 856 |
| Z14B | 576.9 | 0.82013 | 3.19 | 0.09882 | 1.34 | 0.42 | 0.06019 | 2.89 | 607 | 8 | 608 | 19 | 610 |
| Z15N | 49.5 | 1.35377 | 4.69 | 0.14448 | 2.93 | 0.63 | 0.06795 | 3.66 | 870 | 26 | 869 | 41 | 867 |
| Z15B | 101.3 | 0.86029 | 4.72 | 0.10166 | 3.01 | 0.64 | 0.06138 | 3.63 | 624 | 19 | 630 | 30 | 652 |
| Z16 | 61.4 | 1.33798 | 4.45 | 0.14301 | 2.66 | 0.60 | 0.06785 | 3.57 | 862 | 23 | 862 | 38 | 864 |
| Z17N* | -4286.2 | 1.35395 | 5.68 | 0.14350 | 3.19 | 0.56 | 0.06843 | 4.70 | 864 | 28 | 869 | 49 | 882 |
| Z17B* | -41974.5 | 0.80391 | 3.43 | 0.09738 | 1.38 | 0.40 | 0.05987 | 3.14 | 599 | 8 | 599 | 21 | 599 |
| Z18* | -10559.1 | 1.33059 | 4.05 | 0.14158 | 2.42 | 0.60 | 0.06816 | 3.25 | 854 | 21 | 859 | 35 | 874 |
| Z19* | -7075.1 | 1.31521 | 5.70 | 0.14041 | 3.46 | 0.61 | 0.06793 | 4.53 | 847 | 29 | 852 | 49 | 867 |
| Z20 | 165.3 | 1.32504 | 4.31 | 0.14196 | 2.69 | 0.62 | 0.06770 | 3.36 | 856 | 23 | 857 | 37 | 859 |
| Z21 | 128.0 | 1.36566 | 4.38 | 0.14586 | 2.66 | 0.61 | 0.06790 | 3.47 | 878 | 23 | 874 | 38 | 866 |
| Z22 | 101.4 | 1.35163 | 3.86 | 0.14607 | 1.60 | 0.42 | 0.06711 | 3.51 | 879 | 14 | 868 | 34 | 841 |
| Z23N | 95.0 | 1.40386 | 6.03 | 0.14810 | 3.88 | 0.64 | 0.06875 | 4.62 | 890 | 35 | 891 | 54 | 891 |
| Z23B | 594.0 | 0.81446 | 2.42 | 0.09881 | 1.25 | 0.52 | 0.05978 | 2.08 | 607 | 8 | 605 | 15 | 596 |
| Z24 | 58.2 | 1.27039 | 4.75 | 0.13794 | 2.45 | 0.52 | 0.06679 | 4.07 | 833 | 20 | 833 | 40 | 831 |
| Z25 | 58.5 | 1.32276 | 4.84 | 0.14222 | 3.19 | 0.66 | 0.06746 | 3.65 | 857 | 27 | 856 | 41 | 852 |
| Z26 | 64.0 | 1.37150 | 5.52 | 0.14671 | 3.11 | 0.56 | 0.06780 | 4.56 | 882 | 27 | 877 | 48 | 862 |
| Z27 | 68.6 | 1.36621 | 3.38 | 0.14587 | 2.75 | 0.81 | 0.06793 | 1.96 | 878 | 24 | 875 | 30 | 866 |
| Z28 | 79.5 | 1.35224 | 3.72 | 0.14487 | 2.51 | 0.68 | 0.06770 | 2.74 | 872 | 22 | 869 | 32 | 859 |
| Z29 | 78.4 | 1.40968 | 4.15 | 0.15050 | 1.59 | 0.38 | 0.06793 | 3.84 | 904 | 14 | 893 | 37 | 866 |

Table 6: U-Pb isotopic data (LA-ICP-MS) from sample SM-CB-85 – Serra da Prata Complex. *Spots excluded from the calculation.

| 0A | U ppm | Isotope Ratios | | | | | | | Ages (Ma) | | | | | | Disc. % | f 206 | Age (Ma) | ± |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $^{207}Pb^*/^{235}U$ | ± | $^{206}Pb^*/^{238}U$ | ± | Rho 1 | $^{207}Pb^*/^{206}Pb^*$ | ± | $^{206}Pb/^{238}U$ | ± | $^{207}Pb/^{235}U$ | ± | $^{207}Pb/^{206}Pb$ | ± | | | | |
| | 59.5 | 1.36527 | 3.71 | 0.14753 | 2.10 | 0.56 | 0.06712 | 3.07 | 887 | 19 | 874 | 32 | 841 | 26 | -5 | 0.0005 | 884 | 36 |
| | 86.4 | 1.32485 | 4.55 | 0.14216 | 2.82 | 0.62 | 0.06759 | 3.57 | 857 | 24 | 857 | 39 | 856 | 31 | 0 | 0.0005 | 857 | 43 |
| | 33.2 | 1.34879 | 6.58 | 0.14460 | 4.83 | 0.73 | 0.06765 | 4.47 | 871 | 47 | 867 | 57 | 858 | 38 | -1 | 0.0011 | 869 | 72 |
| | 18.2 | 1.27857 | 7.42 | 0.13853 | 5.60 | 0.75 | 0.06694 | 4.87 | 836 | 47 | 836 | 62 | 836 | 41 | 0 | 0.0021 | 836 | 81 |
| | 29.9 | 1.23446 | 5.69 | 0.13487 | 4.27 | 0.75 | 0.06638 | 3.75 | 816 | 35 | 816 | 46 | 818 | 31 | 0 | 0.0007 | 816 | 60 |
| | 53.4 | 1.22699 | 4.78 | 0.13439 | 3.25 | 0.68 | 0.06622 | 3.51 | 813 | 26 | 813 | 39 | 813 | 29 | 0 | 0.0008 | 813 | 47 |
| | 77.6 | 1.27214 | 3.71 | 0.13802 | 2.71 | 0.73 | 0.06685 | 2.53 | 833 | 23 | 833 | 31 | 833 | 21 | 0 | 0.0005 | 833 | 39 |
| | -0.2 | 5.33722 | 31.48 | 0.04700 | 27.40 | 0.87 | 0.82363 | 15.50 | 296 | 81 | 1875 | 590 | 4963 | 769 | 94 | 0.1989 | 80 | 85 |
| | 39.0 | 1.26499 | 5.54 | 0.13756 | 3.36 | 0.61 | 0.06670 | 4.40 | 831 | 28 | 830 | 46 | 828 | 36 | 0 | 0.0012 | 831 | 50 |
| | 55.6 | 1.28926 | 4.88 | 0.14000 | 3.24 | 0.66 | 0.06679 | 3.65 | 845 | 27 | 841 | 41 | 831 | 30 | -2 | 0.0006 | 843 | 48 |
| | 33.6 | 1.22110 | 6.77 | 0.13441 | 4.69 | 0.69 | 0.06589 | 4.89 | 813 | 38 | 810 | 55 | 803 | 39 | -1 | 0.0018 | 812 | 67 |
| | 76.9 | 1.23988 | 3.81 | 0.13540 | 2.82 | 0.74 | 0.06641 | 4.87 | 819 | 23 | 819 | 31 | 819 | 21 | 0 | 0.0005 | 819 | 40 |
| | 58.3 | 1.26478 | 5.23 | 0.13711 | 2.25 | 0.43 | 0.06690 | 4.72 | 828 | 19 | 830 | 43 | 835 | 39 | 1 | 0.0009 | 828 | 34 |
| | 42.1 | 1.23623 | 6.72 | 0.13525 | 4.94 | 0.73 | 0.06629 | 4.55 | 818 | 40 | 817 | 55 | 816 | 37 | 0 | 0.0011 | 817 | 70 |
| | 53.1 | 1.31860 | 5.70 | 0.14156 | 3.70 | 0.65 | 0.06756 | 4.34 | 853 | 32 | 854 | 49 | 855 | 37 | 0 | 0.0006 | 854 | 56 |
| * | 208.2 | 0.92827 | 3.48 | 0.10895 | 2.25 | 0.65 | 0.06180 | 2.65 | 667 | 15 | 667 | 23 | 667 | 18 | 0 | 0.0003 | 667 | 28 |
| | 65.7 | 1.28544 | 4.03 | 0.13920 | 2.70 | 0.67 | 0.06698 | 3.00 | 840 | 23 | 839 | 34 | 837 | 25 | 0 | 0.0008 | 840 | 40 |
| | 43.9 | 1.33343 | 5.21 | 0.14398 | 3.14 | 0.60 | 0.06717 | 4.16 | 867 | 27 | 860 | 45 | 843 | 35 | -3 | 0.0010 | 865 | 49 |
| | 40.6 | 1.29809 | 5.31 | 0.14139 | 3.49 | 0.66 | 0.06659 | 4.00 | 853 | 30 | 845 | 45 | 825 | 33 | -3 | 0.0010 | 850 | 53 |
| | 43.2 | 1.25730 | 5.19 | 0.13721 | 4.24 | 0.82 | 0.06646 | 2.99 | 829 | 35 | 827 | 43 | 821 | 25 | -1 | 0.0014 | 827 | 58 |
| | 63.7 | 1.30815 | 4.39 | 0.14084 | 3.13 | 0.71 | 0.06737 | 3.08 | 849 | 27 | 849 | 37 | 849 | 26 | 0 | 0.0007 | 849 | 46 |
| | 56.1 | 1.34771 | 3.95 | 0.14405 | 3.33 | 0.84 | 0.06786 | 2.12 | 868 | 29 | 867 | 34 | 864 | 18 | 0 | 0.0008 | 867 | 46 |
| | 79.9 | 1.31111 | 3.92 | 0.14120 | 2.59 | 0.66 | 0.06734 | 2.94 | 851 | 22 | 851 | 33 | 848 | 25 | 0 | 0.0005 | 851 | 39 |
| | 64.6 | 1.31718 | 4.10 | 0.14154 | 2.95 | 0.72 | 0.06750 | 2.86 | 853 | 25 | 853 | 35 | 853 | 24 | 0 | 0.0007 | 853 | 44 |
| | 69.2 | 1.04058 | 3.94 | 0.11681 | 3.21 | 0.82 | 0.06461 | 2.27 | 712 | 23 | 724 | 29 | 762 | 17 | 6 | 0.0043 | 720 | 40 |
| | 72.9 | 1.34945 | 3.35 | 0.14639 | 2.62 | 0.78 | 0.06686 | 2.09 | 881 | 23 | 867 | 29 | 833 | 17 | -6 | 0.0027 | 871 | 38 |
| | 47.3 | 1.02753 | 5.71 | 0.11396 | 3.13 | 0.55 | 0.06539 | 4.77 | 696 | 22 | 718 | 41 | 787 | 38 | 12 | 0.0068 | 699 | 41 |
| | 45.8 | 1.26294 | 7.24 | 0.13668 | 3.25 | 0.45 | 0.06702 | 6.47 | 826 | 27 | 829 | 60 | 838 | 54 | 1 | 0.0060 | 826 | 50 |
| | 111.3 | 1.29857 | 3.18 | 0.13900 | 1.98 | 0.62 | 0.06776 | 2.49 | 839 | 17 | 845 | 27 | 861 | 21 | 3 | 0.0012 | 841 | 30 |
| | 67.9 | 1.21041 | 2.81 | 0.13061 | 1.74 | 0.62 | 0.06721 | 2.20 | 791 | 14 | 805 | 23 | 844 | 19 | 6 | 0.0042 | 795 | 25 |
| | 48.1 | 0.89810 | 11.85 | 0.09891 | 9.55 | 0.81 | 0.06585 | 7.02 | 608 | 58 | 651 | 77 | 802 | 56 | 24 | 0.0097 | 623 | 110 |
| | 38.1 | 0.99251 | 11.36 | 0.10634 | 9.53 | 0.84 | 0.06770 | 6.17 | 651 | 62 | 700 | 79 | 859 | 53 | 24 | 0.0051 | 676 | 56 |
| | 47.9 | 1.37773 | 6.00 | 0.14391 | 4.20 | 0.70 | 0.06944 | 4.28 | 867 | 36 | 879 | 53 | 912 | 39 | 5 | 0.0153 | 872 | 32 |
| | 55.7 | 1.17765 | 5.06 | 0.12540 | 3.29 | 0.65 | 0.06811 | 3.84 | 762 | 25 | 790 | 40 | 872 | 34 | 13 | 0.0026 | 769 | 23 |
| | 72.5 | 1.25885 | 4.52 | 0.13642 | 3.15 | 0.70 | 0.06692 | 3.25 | 824 | 26 | 827 | 37 | 835 | 27 | 1 | 0.0018 | 826 | 23 |
| | 412.0 | 0.82558 | 3.06 | 0.09764 | 2.18 | 0.71 | 0.06132 | 2.15 | 601 | 13 | 611 | 19 | 651 | 14 | 8 | 0.0005 | 604 | 24 |
| | 132.3 | 0.83235 | 4.09 | 0.09924 | 2.97 | 0.73 | 0.06083 | 2.82 | 610 | 18 | 615 | 25 | 633 | 18 | 4 | 0.0015 | 612 | 27 |
| | 51.6 | 1.25773 | 8.89 | 0.13415 | 5.72 | 0.64 | 0.06800 | 6.81 | 811 | 46 | 827 | 74 | 869 | 59 | 7 | 0.0040 | 816 | 42 |
| | 231.2 | 0.90990 | 3.34 | 0.10488 | 2.32 | 0.70 | 0.06292 | 2.40 | 643 | 15 | 657 | 22 | 706 | 17 | 9 | 0.0015 | 647 | 28 |

Table 7: U-Pb isotopic data (LA-ICP-MS) from sample SM-CM-70A – Serra da Prata Complex. *Spots excluded from the calculation.

| SM-CM-70B | U ppm | Isotope Ratios | | | | | | | Ages (Ma) | | | | | | Disc. % | f 206 | Age (Ma) | ± | $^{232}$Th/$^{238}$U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $^{207}$Pb*/$^{235}$U | ± | $^{206}$Pb*/$^{238}$U | ± | Rho 1 | $^{207}$Pb*/$^{206}$Pb* | ± | $^{206}$Pb/$^{238}$U | ± | $^{207}$Pb/$^{235}$U | ± | $^{207}$Pb/$^{206}$Pb | ± | | | | | |
| Z1 | 35.2 | 1.28597 | 6.56 | 0.13831 | 4.82 | 0.73 | 0.06743 | 4.45 | 835 | 40 | 840 | 55 | 851 | 38 | 2 | 0.0013 | 837 | 70 | 0.51 |
| Z2 | 37.2 | 1.25156 | 5.71 | 0.13563 | 4.72 | 0.83 | 0.06693 | 3.21 | 820 | 39 | 824 | 47 | 836 | 27 | 2 | 0.0014 | 823 | 64 | 0.54 |
| Z3 | 40.3 | 1.27388 | 5.04 | 0.13767 | 2.70 | 0.54 | 0.06711 | 4.25 | 831 | 22 | 834 | 42 | 841 | 36 | 1 | 0.0013 | 832 | 41 | 0.67 |
| Z4* | 68.2 | 1.28229 | 2.65 | 0.13540 | 1.58 | 0.60 | 0.06868 | 2.13 | 819 | 13 | 838 | 22 | 889 | 19 | 8 | 0.0008 | 823 | 24 | 0.63 |
| Z5 | 84.1 | 1.26164 | 3.54 | 0.13734 | 3.09 | 0.87 | 0.06662 | 1.73 | 830 | 26 | 829 | 29 | 826 | 14 | 0 | 0.0005 | 829 | 40 | 0.93 |
| Z6 | 20.1 | 1.29668 | 5.52 | 0.13994 | 4.58 | 0.83 | 0.06720 | 3.07 | 844 | 39 | 844 | 47 | 844 | 26 | 0 | 0.0015 | 844 | 63 | 0.51 |
| Z7 | 27.4 | 1.28563 | 5.19 | 0.13717 | 3.51 | 0.68 | 0.06798 | 3.81 | 829 | 29 | 839 | 44 | 868 | 33 | 5 | 0.0014 | 833 | 52 | 0.71 |
| Z8 | 14.5 | 1.30272 | 8.43 | 0.13771 | 5.93 | 0.70 | 0.06861 | 6.00 | 832 | 49 | 847 | 71 | 887 | 53 | 6 | 0.0024 | 838 | 87 | 0.45 |
| Z9* | 28.4 | 1.03558 | 4.92 | 0.11812 | 3.39 | 0.69 | 0.06358 | 3.57 | 720 | 24 | 722 | 36 | 728 | 26 | 1 | 0.0009 | 720 | 44 | 0.53 |
| Z10 | 36.4 | 1.28449 | 3.80 | 0.13902 | 1.92 | 0.50 | 0.06701 | 3.29 | 839 | 16 | 839 | 32 | 838 | 28 | 0 | 0.0006 | 839 | 29 | 0.77 |
| Z11 | 9.9 | 1.32384 | 5.96 | 0.14190 | 3.87 | 0.65 | 0.06766 | 4.53 | 855 | 33 | 856 | 51 | 858 | 39 | 0 | 0.0026 | 856 | 59 | 0.48 |
| Z12 | 12.5 | 1.31506 | 5.93 | 0.14033 | 4.10 | 0.69 | 0.06797 | 4.28 | 847 | 35 | 852 | 51 | 868 | 37 | 2 | 0.0019 | 849 | 61 | 0.62 |
| Z13 | 19.1 | 1.30542 | 4.79 | 0.14054 | 3.08 | 0.64 | 0.06737 | 3.67 | 848 | 26 | 848 | 41 | 849 | 31 | 0 | 0.0009 | 848 | 47 | 0.74 |
| Z14 | 21.4 | 1.27531 | 3.35 | 0.13713 | 2.31 | 0.69 | 0.06745 | 2.43 | 828 | 19 | 835 | 28 | 852 | 21 | 3 | 0.0010 | 832 | 34 | 0.66 |
| Z15B* | 36.7 | 1.26033 | 2.41 | 0.13142 | 1.73 | 0.72 | 0.06956 | 1.68 | 796 | 14 | 828 | 20 | 915 | 15 | 13 | 0.0008 | 808 | 500 | 0.46 |
| Z15N | 24.7 | 1.26667 | 4.98 | 0.13750 | 2.56 | 0.51 | 0.06681 | 4.28 | 830 | 21 | 831 | 41 | 832 | 36 | 0 | 0.0010 | 831 | 39 | 0.50 |
| Z16 | 26.6 | 1.28653 | 3.35 | 0.13813 | 1.92 | 0.57 | 0.06755 | 2.75 | 834 | 16 | 840 | 28 | 855 | 24 | 2 | 0.0008 | 835 | 29 | 0.43 |
| Z17N | 22.6 | 1.29808 | 3.54 | 0.13988 | 2.55 | 0.72 | 0.06730 | 2.46 | 844 | 21 | 845 | 30 | 847 | 21 | 0 | 0.0006 | 844 | 38 | 0.56 |
| Z17B* | 46.2 | 1.20949 | 2.02 | 0.12923 | 1.06 | 0.53 | 0.06788 | 1.72 | 783 | 8 | 805 | 16 | 865 | 15 | 9 | 0.0007 | 787 | 210 | 0.83 |
| Z18 | 131.9 | 1.32365 | 2.63 | 0.14150 | 2.10 | 0.80 | 0.06784 | 1.57 | 853 | 18 | 856 | 22 | 864 | 14 | 1 | 0.0002 | 855 | 30 | 0.45 |
| Z19 | 84.0 | 1.35741 | 2.49 | 0.14452 | 1.35 | 0.54 | 0.06812 | 2.09 | 870 | 12 | 871 | 22 | 872 | 18 | 0 | 0.0001 | 870 | 21 | 0.65 |
| Z20N* | 108.8 | 0.88373 | 3.33 | 0.10481 | 2.30 | 0.69 | 0.06115 | 2.41 | 643 | 15 | 643 | 21 | 645 | 16 | 0 | 0.0002 | 643 | 27 | 0.44 |
| Z20B* | 825.0 | 0.77074 | 3.25 | 0.09440 | 2.76 | 0.85 | 0.05922 | 1.71 | 581 | 16 | 580 | 19 | 575 | 10 | -1 | 0.0002 | 581 | 28 | 0.45 |
| Z21 | 37.9 | 1.29193 | 3.60 | 0.14011 | 2.33 | 0.65 | 0.06687 | 2.74 | 845 | 20 | 842 | 30 | 834 | 23 | -1 | 0.0004 | 844 | 35 | 0.45 |
| Z22* | 185.1 | 1.06351 | 3.10 | 0.12132 | 1.73 | 0.56 | 0.06358 | 2.57 | 738 | 13 | 736 | 23 | 728 | 19 | -1 | 0.0002 | 738 | 24 | 0.28 |
| Z23 | 82.4 | 1.32383 | 2.44 | 0.14198 | 1.23 | 0.50 | 0.06762 | 2.10 | 856 | 11 | 856 | 21 | 857 | 18 | 0 | 0.0002 | 856 | 19 | 0.53 |
| Z24 | 151.8 | 1.29968 | 2.18 | 0.13997 | 1.28 | 0.59 | 0.06734 | 1.76 | 845 | 11 | 846 | 18 | 848 | 15 | 0 | 0.0001 | 845 | 20 | 0.63 |
| Z25 | 76.4 | 1.30652 | 2.90 | 0.14079 | 1.87 | 0.64 | 0.06730 | 2.22 | 849 | 16 | 849 | 25 | 847 | 19 | 0 | 0.0002 | 849 | 28 | 0.50 |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ZR1 | 121.2 | 1.31938 | 6.14 | 0.13901 | 2.78 | 0.45 | 0.06884 | 5.47 | 839 | 23 | 854 | 52 | 894 | 49 | 6 | 0.0027 | 841 | 43 | 0.78 |
| ZR2N | 380.4 | 1.36607 | 3.14 | 0.14407 | 1.87 | 0.59 | 0.06877 | 2.53 | 868 | 16 | 874 | 27 | 892 | 23 | 3 | 0.0015 | 869 | 29 | 0.82 |
| ZR2B* | 91.9 | 1.20514 | 8.14 | 0.12725 | 4.13 | 0.51 | 0.06869 | 7.02 | 772 | 32 | 803 | 65 | 889 | 62 | 13 | 0.0037 | 776 | 59 | 0.16 |
| ZR3N* | 153.6 | 4.45949 | 4.31 | 0.27210 | 3.09 | 0.72 | 0.11887 | 3.00 | 1551 | 48 | 1723 | 74 | 1939 | 58 | Disc. | 0.0021 | - | - | 1.07 |
| ZR3B* | 167.5 | 3.33375 | 5.01 | 0.19983 | 3.68 | 0.74 | 0.12099 | 3.39 | 1174 | 43 | 1489 | 75 | 1971 | 67 | Disc. | 0.0012 | - | - | 0.43 |
| ZR4N* | 142.0 | 0.92627 | 6.73 | 0.10023 | 4.50 | 0.67 | 0.06703 | 5.01 | 616 | 28 | 666 | 45 | 839 | 42 | 27 | 0.0036 | 623 | 52 | 0.39 |
| ZR4B* | 184.9 | 0.87965 | 4.82 | 0.09841 | 3.01 | 0.62 | 0.06483 | 3.76 | 605 | 18 | 641 | 31 | 769 | 29 | 21 | 0.0033 | 610 | 34 | 0.71 |

Table 8: U-Pb isotopic data (LA-ICP-MS) from sample SM-CM-70B– Serra da Prata Complex. *Spots excluded from the calculation. Disc.: do not provide age.

| SM-CM-69 | U ppm | Isotope Ratios |  |  |  |  |  |  | Ages (Ma) |  |  |  |  |  | Disc. % | f 206 | Age (Ma) | ± | $^{232}$Th/$^{238}$U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  | $^{207}$Pb*/$^{235}$U | ± | $^{206}$Pb*/$^{238}$U | ± | Rho 1 | $^{207}$Pb*/$^{206}$Pb* | ± | $^{206}$Pb/$^{238}$U | ± | $^{207}$Pb/$^{235}$U | ± | $^{207}$Pb/$^{206}$Pb | ± |  |  |  |  |  |
| Z1* | 36.2 | 1.05844 | 6.14 | 0.08537 | 4.67 | 0.76 | 0.08992 | 3.9841 | 528 | 25 | 733 | 45 | 1424 | 57 | Disc. | 0.0024 | - | - | 0.56 |
| Z2 | 164.9 | 0.82384 | 3.81 | 0.09952 | 2.78 | 0.73 | 0.06004 | 2.62 | 612 | 17 | 610 | 23 | 605 | 16 | -1 | 0.0001 | 611 | 16 | 0.13 |
| Z3 | 45.9 | 1.33502 | 6.21 | 0.14335 | 4.91 | 0.79 | 0.06755 | 3.80 | 864 | 42 | 861 | 53 | 855 | 32 | -1 | 0.0009 | 862 | 35 | 0.25 |
| Z4 | 77.0 | 1.32066 | 4.45 | 0.14188 | 3.35 | 0.75 | 0.06751 | 2.93 | 855 | 29 | 855 | 38 | 854 | 25 | 0 | 0.0005 | 855 | 25 | 0.78 |
| Z5 | 34.8 | 1.26012 | 4.59 | 0.13794 | 3.92 | 0.85 | 0.06625 | 2.38 | 833 | 33 | 828 | 38 | 814 | 19 | -2 | 0.0006 | 828 | 26 | 0.48 |
| Z6 | 173.5 | 0.93478 | 4.12 | 0.10863 | 3.32 | 0.81 | 0.06241 | 2.44 | 665 | 22 | 670 | 28 | 688 | 17 | 3 | 0.0003 | 688 | 20 | 1.87 |
| Z7 | 83.7 | 1.25569 | 4.65 | 0.13589 | 3.87 | 0.83 | 0.06702 | 2.58 | 821 | 32 | 826 | 38 | 838 | 22 | 2 | 0.0004 | 825 | 26 | 0.84 |
| Z8 | 155.4 | 0.81368 | 4.83 | 0.09785 | 3.72 | 0.77 | 0.06031 | 3.07 | 602 | 22 | 605 | 29 | 615 | 19 | 2 | 0.0003 | 603 | 20 | 0.21 |
| Z9* | 61.8 | 1.13927 | 7.45 | 0.12685 | 6.26 | 0.84 | 0.06514 | 4.03 | 770 | 48 | 772 | 57 | 779 | 31 | 1 | 0.0012 | 772 | 80 | 0.47 |
| Z10 | 955.9 | 0.94170 | 3.22 | 0.11104 | 2.69 | 0.83 | 0.06151 | 1.78 | 679 | 18 | 674 | 22 | 657 | 12 | -3 | 0.0001 | 675 | 16 | 0.01 |
| Z11 | 102.6 | 1.22113 | 5.11 | 0.13373 | 4.38 | 0.86 | 0.06623 | 2.64 | 809 | 35 | 810 | 41 | 814 | 22 | 1 | 0.0007 | 810 | 29 | 1.02 |
| Z12 | 436.8 | 0.86159 | 3.30 | 0.10235 | 2.39 | 0.72 | 0.06105 | 2.27 | 628 | 15 | 631 | 21 | 641 | 15 | 2 | 0.0001 | 629 | 14 | 0.01 |
| Z13* | 100.5 | 0.77479 | 4.21 | 0.09400 | 2.72 | 0.65 | 0.05978 | 3.21 | 579 | 16 | 583 | 25 | 596 | 19 | 3 | 0.0004 | 580 | 29 | 0.17 |
| Z14* | 15.7 | 1.33320 | 9.95 | 0.08391 | 9.01 | 0.91 | 0.11523 | 4.23 | 519 | 47 | 860 | 86 | 1883 | 80 | Disc. | 0.0067 | - | - | 1.27 |
| Z15* | 32.8 | 0.94118 | 4.95 | 0.08546 | 3.14 | 0.64 | 0.07988 | 3.82 | 529 | 17 | 673 | 33 | 1194 | 46 | Disc. | 0.0031 | - | - | 2.77 |
| Z16* | 36.5 | 0.96289 | 4.20 | 0.08595 | 3.31 | 0.79 | 0.08126 | 2.59 | 532 | 18 | 685 | 29 | 1228 | 32 | Disc. | 0.0025 | - | - | 2.72 |
| Z17 | 497.6 | 0.88165 | 3.31 | 0.10471 | 2.40 | 0.73 | 0.06107 | 2.28 | 642 | 15 | 642 | 21 | 642 | 15 | 0 | 0.0001 | 642 | 14 | 0.01 |
| Z18 | 160.3 | 0.88793 | 4.76 | 0.10539 | 3.65 | 0.77 | 0.06110 | 3.05 | 646 | 24 | 645 | 31 | 643 | 20 | 0 | 0.0002 | 646 | 21 | 0.01 |
| Z19 | 18.7 | 1.32123 | 6.12 | 0.14179 | 4.60 | 0.75 | 0.06758 | 4.03 | 855 | 39 | 855 | 52 | 856 | 35 | 0 | 0.0023 | 855 | 34 | 0.38 |
| Z20 | 96.2 | 1.36952 | 5.84 | 0.14607 | 4.48 | 0.74 | 0.06800 | 3.74 | 879 | 39 | 876 | 51 | 869 | 33 | -1 | 0.0011 | 877 | 33 | 1.02 |
| Z21 | 142.7 | 1.32595 | 5.09 | 0.14255 | 3.37 | 0.66 | 0.06746 | 3.81 | 859 | 29 | 857 | 44 | 852 | 32 | -1 | 0.0014 | 858 | 26 | 1.04 |
| Z22* | 60.9 | 1.50766 | 10.09 | 0.08402 | 9.02 | 0.13 | 0.13015 | 4.53 | 520 | 47 | 933 | 94 | 2100 | 95 | Disc. | 0.0076 | - | - | 0.37 |
| ZR1B | 294.0 | 0.76194 | 3.01 | 0.09229 | 2.29 | 0.76 | 0.05988 | 1.96 | 569 | 13 | 575 | 17 | 599 | 12 | 5 | 0.0013 | 571 | 12 | 0.13 |
| ZR1N* | 223.6 | 1.05471 | 7.75 | 0.11322 | 5.60 | 0.72 | 0.06756 | 5.35 | 691 | 39 | 731 | 57 | 855 | 46 | 19 | 0.0109 | 703 | 71 | 0.58 |
| ZR2B* | 139.8 | 0.75717 | 3.75 | 0.09327 | 2.98 | 0.80 | 0.05887 | 2.27 | 575 | 17 | 572 | 21 | 562 | 13 | -2 | 0.0184 | 574 | 16 | 0.18 |
| ZR3B | 156.4 | 0.79312 | 2.95 | 0.09451 | 2.11 | 0.72 | 0.06087 | 2.06 | 582 | 12 | 593 | 17 | 635 | 13 | 8 | 0.0010 | 585 | 11 | 0.46 |
| ZR4B* | 67.2 | 0.84337 | 5.47 | 0.09718 | 2.31 | 0.42 | 0.06294 | 4.96 | 598 | 14 | 621 | 34 | 706 | 35 | 15 | 0.0203 | 599 | 13 | 0.12 |
| ZR5N* | 416.3 | 0.87101 | 3.20 | 0.09345 | 2.39 | 0.75 | 0.06760 | 2.13 | 576 | 14 | 636 | 20 | 856 | 18 | Disc. | 0.0076 | - | - | 2.09 |
| ZR6B | 25 | 0.8351 | 3.7 | 0.1012 | 3. | 0.8 | 0.05982 | 1.9 | 622 | 2 | 616 | 2 | 597 | 1 | -4 | 0.0 | 61 | 17 | 0.06 |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.2 | 1 | 3 | 5 | 19 | 5 | | 4 | | 0 | | 3 | | 2 | | 046 | 7 | | |
| ZR7N* | 44.8 | 1.36604 | 6.33 | 0.15120 | 4.75 | 0.75 | 0.06553 | 4.18 | 908 | 43 | 874 | 55 | 791 | 33 | -15 | 0.0021 | 885 | 71 | 0.49 |
| ZR7B | 262.6 | 0.83253 | 2.28 | 0.10123 | 1.32 | 0.58 | 0.05965 | 1.86 | 622 | 8 | 615 | 14 | 591 | 11 | -5 | 0.0041 | 620 | 8 | 0.08 |
| ZR8B | 785.2 | 0.88992 | 2.00 | 0.10542 | 1.15 | 0.57 | 0.06123 | 1.64 | 646 | 7 | 646 | 13 | 647 | 11 | 0 | 0.0017 | 646 | 7 | 0.02 |
| ZR9B* | 243.7 | 1.07117 | 3.48 | 0.12138 | 1.26 | 0.36 | 0.06401 | 3.25 | 738 | 9 | 739 | 26 | 742 | 24 | 0 | 0.0030 | 739 | 8 | 0.24 |
| ZR10B | 192.3 | 0.77018 | 3.30 | 0.09433 | 2.26 | 0.68 | 0.05922 | 2.41 | 581 | 13 | 580 | 19 | 575 | 14 | -1 | 0.0061 | 581 | 12 | 0.09 |
| ZR11B1 | 574.8 | 0.83425 | 2.93 | 0.09969 | 2.33 | 0.80 | 0.06069 | 1.77 | 613 | 14 | 616 | 18 | 628 | 11 | 3 | 0.0012 | 614 | 13 | 0.03 |
| ZR11B2* | 309.0 | 0.77643 | 3.16 | 0.09035 | 1.98 | 0.63 | 0.06233 | 2.46 | 558 | 11 | 583 | 18 | 685 | 17 | 19 | 0.0052 | 561 | 310 | 0.19 |
| ZR12N* | 349.1 | 0.91005 | 3.47 | 0.10736 | 2.70 | 0.78 | 0.06148 | 2.19 | 657 | 18 | 657 | 23 | 656 | 14 | 0 | 0.0038 | 657 | 16 | 0.36 |
| ZR12B1 | 186.7 | 0.76121 | 4.65 | 0.09313 | 3.88 | 0.83 | 0.05928 | 2.57 | 574 | 22 | 575 | 27 | 577 | 15 | 1 | 0.0048 | 574 | 20 | 0.27 |
| ZR12B2 | 299.1 | 0.77663 | 3.06 | 0.09555 | 2.33 | 0.76 | 0.05895 | 1.98 | 588 | 14 | 584 | 18 | 565 | 11 | -4 | 0.0042 | 586 | 12 | 0.12 |
| ZR13N | 157.9 | 0.93144 | 8.45 | 0.10793 | 8.07 | 0.96 | 0.06259 | 2.51 | 661 | 53 | 668 | 56 | 694 | 17 | 5 | 0.0019 | 677 | 37 | 0.31 |
| ZR13B | 194.6 | 0.82197 | 3.20 | 0.10029 | 2.07 | 0.65 | 0.05944 | 2.45 | 616 | 13 | 609 | 19 | 583 | 14 | -6 | 0.0020 | 614 | 12 | 0.15 |
| ZR14N | 52.7 | 1.24970 | 4.80 | 0.13675 | 3.44 | 0.72 | 0.06628 | 3.36 | 826 | 28 | 823 | 40 | 815 | 27 | -1 | 0.0028 | 825 | 25 | 0.45 |
| ZR14B | 199.4 | 0.81882 | 2.96 | 0.09918 | 2.18 | 0.73 | 0.05988 | 2.01 | 610 | 13 | 607 | 18 | 599 | 12 | -2 | 0.0037 | 609 | 12 | 0.10 |
| ZR15N* | 211.0 | 1.18181 | 6.34 | 0.13068 | 1.59 | 0.25 | 0.06559 | 6.14 | 792 | 13 | 792 | 50 | 793 | 49 | 0 | 0.0063 | 792 | 12 | 0.48 |
| ZR15B | 529.6 | 0.83055 | 2.98 | 0.10066 | 2.04 | 0.69 | 0.05984 | 2.17 | 618 | 13 | 614 | 18 | 598 | 13 | -3 | 0.0013 | 617 | 12 | 0.11 |
| ZR16N* | 141.9 | 1.42240 | 3.35 | 0.15327 | 2.14 | 0.64 | 0.06731 | 2.57 | 919 | 20 | 898 | 30 | 847 | 22 | -9 | 0.0042 | 911 | 17 | 0.63 |
| ZR16B* | 118.8 | 0.88250 | 3.30 | 0.09958 | 2.20 | 0.66 | 0.06427 | 2.47 | 612 | 13 | 642 | 21 | 751 | 19 | 18 | 0.0180 | 617 | 400 | 0.25 |
| ZR17N | 96.3 | 1.26380 | 4.93 | 0.13763 | 2.70 | 0.55 | 0.06660 | 4.12 | 831 | 22 | 830 | 41 | 825 | 34 | -1 | 0.0027 | 831 | 20 | 0.66 |
| ZR17b* | 156.1 | 0.97163 | 2.88 | 0.11301 | 2.03 | 0.70 | 0.06236 | 2.05 | 690 | 14 | 689 | 20 | 686 | 14 | -1 | 0.0017 | 690 | 13 | 0.16 |

Table 9: U-Pb isotopic data (LA-ICP-MS) from sample SM-CM-69 – Serra da Prata Complex. *Spots excluded from the calculation. Disc.: do not provide age.

| **SM-CM-07** | **U ppm** | **Isotope Ratios** | | | | | | | **Ages (Ma)** | | | | | | **Disc. %** | **f 206** | **Age (Ma)** | **±** | **$^{232}$Th/$^{238}$U** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **$^{207}$Pb*/$^{235}$U** | **±** | **$^{206}$Pb*/$^{238}$U** | **±** | **Rho 1** | **$^{207}$Pb*/$^{206}$Pb*** | **±** | **$^{206}$Pb/$^{238}$U** | **±** | **$^{207}$Pb/$^{235}$U** | **±** | **$^{207}$Pb/$^{206}$Pb** | **±** | | | | | |
| Z1* | 21.4 | 0.78201 | 13.34 | 0.09412 | 12.15 | 0.91 | 0.06026 | 5.50 | 580 | 70 | 587 | 78 | 613 | 34 | 5 | 0.0090 | 588 | 120 | 0.83 |
| Z2* | 214.8 | 0.74194 | 5.37 | 0.08814 | 3.93 | 0.73 | 0.06105 | 3.66 | 545 | 21 | 564 | 30 | 641 | 23 | 15 | 0.0011 | 549 | 40 | 0.41 |
| Z3* | 94.6 | 0.74172 | 6.46 | 0.08783 | 4.53 | 0.70 | 0.06125 | 4.60 | 543 | 25 | 563 | 36 | 648 | 30 | 16 | 0.0019 | 547 | 46 | 0.81 |
| Z4* | 170.2 | 1.09802 | 5.77 | 0.12616 | 4.18 | 0.72 | 0.06312 | 3.98 | 766 | 32 | 752 | 43 | 712 | 28 | -8 | 0.0023 | 759 | 56 | 0.50 |
| Z5* | 646.9 | 0.89754 | 3.46 | 0.10363 | 2.78 | 0.80 | 0.06281 | 2.06 | 636 | 18 | 650 | 22 | 702 | 14 | 9 | 0.0004 | 643 | 32 | 0.02 |
| Z6 | 143.0 | 0.80614 | 4.68 | 0.09757 | 3.60 | 0.77 | 0.05992 | 2.99 | 600 | 22 | 600 | 28 | 601 | 18 | 0 | 0.0003 | 600 | 39 | 0.05 |
| Z7* | 12.7 | 0.63307 | 12.01 | 0.08018 | 9.62 | 0.80 | 0.05726 | 7.19 | 497 | 48 | 498 | 60 | 502 | 36 | 1 | 0.0025 | 488 | 88 | 0.71 |
| Z8* | 5.4 | 0.70297 | 15.86 | 0.08732 | 10.93 | 0.69 | 0.05839 | 11.50 | 540 | 59 | 541 | 86 | 544 | 63 | 1 | 0.0078 | 540 | 110 | 1.02 |
| Z9 | 20.4 | 0.82820 | 7.17 | 0.10066 | 4.86 | 0.68 | 0.05967 | 5.27 | 618 | 30 | 613 | 44 | 592 | 31 | -4 | 0.0009 | 617 | 55 | 0.66 |
| Z10 | 17.2 | 0.79814 | 6.79 | 0.09603 | 4.79 | 0.71 | 0.06028 | 4.80 | 591 | 28 | 596 | 40 | 614 | 29 | 4 | 0.0018 | 592 | 53 | 0.80 |
| Z11 | 109.4 | 0.82253 | 2.78 | 0.09950 | 1.71 | 0.62 | 0.05995 | 2.19 | 611 | 10 | 609 | 17 | 602 | 13 | -2 | 0.0004 | 611 | 20 | 0.01 |
| Z12 | 23.4 | 0.75108 | 5.88 | 0.09230 | 3.29 | 0.56 | 0.05902 | 4.88 | 569 | 19 | 569 | 33 | 568 | 28 | 0 | 0.0019 | 569 | 35 | 0.92 |
| Z13* | 215.4 | 2.35337 | 2.56 | 0.20452 | 1.88 | 0.73 | 0.08345 | 1.75 | 1200 | 23 | 1229 | 31 | 1280 | 22 | 6 | 0.0008 | 1220 | 460 | 0.56 |
| Z14* | 26.5 | 0.79682 | 8.52 | 0.09674 | 6.59 | 0.77 | 0.05974 | 5.40 | 595 | 39 | 595 | 51 | 594 | 32 | 0 | 0.0021 | 595 | 71 | 0.86 |
| Z22 | 77.1 | 0.85509 | 5.43 | 0.10225 | 4.36 | 0.80 | 0.06065 | 3.23 | 628 | 27 | 627 | 34 | 627 | 20 | 0 | 0.0003 | 627 | 49 | 0.20 |
| ZR1B* | 21.3 | 0.59890 | 15.68 | 0.07596 | 12.42 | 0.79 | 0.05718 | 9.58 | 472 | 59 | 477 | 75 | 499 | 48 | 5 | 0.0084 | 474 | 55 | 0.75 |
| ZR2 | 534.4 | 0.78915 | 2.59 | 0.09537 | 1.34 | 0.52 | 0.06001 | 2.22 | 587 | 8 | 591 | 15 | 604 | 13 | 3 | 0.0029 | 588 | 15 | 0.01 |
| ZR3N* | 352.1 | 2.41600 | 3.81 | 0.18353 | 1.68 | 0.44 | 0.09547 | 3.42 | 1086 | 18 | 1247 | 48 | 1537 | 53 | Disc. | 0.0346 | - | - | 0.18 |
| ZR3B | 357.6 | 0.84685 | 3.12 | 0.10001 | 2.14 | 0.69 | 0.06142 | 2.27 | 614 | 13 | 623 | 19 | 654 | 15 | 6 | 0.0045 | 617 | 24 | 0.03 |
| ZR4N | 294.0 | 0.92230 | 6.28 | 0.10717 | 2.29 | 0.37 | 0.06242 | 5.84 | 656 | 15 | 664 | 42 | 688 | 40 | 5 | 0.0197 | 657 | 28 | 0.10 |
| ZR4B* | 846.7 | 1.35156 | 2.88 | 0.09581 | 2.07 | 0.72 | 0.10231 | 2.01 | 590 | 12 | 868 | 25 | 1666 | 33 | Disc. | 0.0665 | - | - | 0.03 |
| ZR5N | 152.6 | 0.77493 | 4.45 | 0.09375 | 2.93 | 0.66 | 0.05995 | 3.35 | 578 | 17 | 583 | 26 | 602 | 20 | 4 | 0.0046 | 579 | 32 | 0.23 |
| ZR5B* | 519.4 | 0.88511 | 5.23 | 0.09482 | 2.57 | 0.49 | 0.06770 | 4.56 | 584 | 15 | 644 | 34 | 859 | 39 | 32 | 0.0149 | 586 | 27 | 0.01 |
| ZR6N* | 37.2 | 1.02714 | 11.17 | 0.09855 | 8.87 | 0.79 | 0.07559 | 6.79 | 606 | 54 | 717 | 80 | 1084 | 74 | 44 | 0.0182 | 608 | 100 | 0.89 |
| ZR6B* | 173.9 | 0.75523 | 4.44 | 0.08806 | 2.72 | 0.61 | 0.06220 | 3.51 | 544 | 15 | 571 | 25 | 681 | 24 | 20 | 0.0077 | 547 | 28 | 0.09 |
| ZR7 | 193. | 1.14003 | 5.5 | 0.08279 | 2.3 | 0.41 | 0.09987 | 5.0 | 513 | 12 | 773 | 43 | 1622 | Dis | 68 | 0.065 | - | - | 0.09 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| * | 0 | | 7 | | 0 | | | 7 | | | | | | c. | | 1 | | | |
| ZR8B* | 24.1 | 0.87355 | 24.73 | 0.10343 | 15.91 | 0.64 | 0.06125 | 18.93 | 634 | 101 | 637 | 158 | 648 | 123 | 2 | 0.0106 | 635 | 190 | 0.95 |
| ZR9N* | 17.5 | 0.89191 | 21.49 | 0.10528 | 12.99 | 0.60 | 0.06144 | 17.12 | 645 | 84 | 647 | 139 | 655 | 112 | 1 | 0.0194 | 646 | 160 | 1.16 |
| ZR9B* | 15.7 | 1.00314 | 24.45 | 0.10184 | 15.85 | 0.65 | 0.07144 | 18.61 | 625 | 99 | 705 | 172 | 970 | 181 | 36 | 0.0302 | 6311 | 19 | 0.76 |
| ZR10N | 45.0 | 0.95478 | 5.50 | 0.11165 | 2.35 | 0.43 | 0.06202 | 4.98 | 682 | 16 | 681 | 37 | 675 | 34 | -1 | 0.0091 | 682 | 30 | 0.53 |
| ZR11 | 359.6 | 0.93750 | 6.61 | 0.10799 | 6.06 | 0.92 | 0.06296 | 2.63 | 661 | 40 | 672 | 44 | 707 | 19 | 6 | 0.0217 | 675 | 32 | 0.10 |
| ZR12* | 16.6 | 0.88510 | 33.27 | 0.10067 | 20.99 | 0.63 | 0.06377 | 25.81 | 618 | 130 | 644 | 214 | 734 | 189 | 16 | 0.0231 | 623 | 240 | 0.83 |
| ZR13B | 1070.9 | 0.82364 | 2.19 | 0.09844 | 1.31 | 0.60 | 0.06068 | 1.76 | 605 | 8 | 610 | 13 | 628 | 11 | 4 | 0.0015 | 606 | 15 | 0.02 |

Table 10: U-Pb isotopic data (LA-ICP-MS) from sample SM-CM-07 – Morro do Escoteiro Suite. *Spots excluded from the calculation. Disc.: do not provide age.

| SM-CM-02 | U ppm | Isotope Ratios |  |  |  |  |  |  | Ages (Ma) |  |  |  |  |  | Disc. % | f206 | Age (Ma) | ± | $^{232}$Th/$^{238}$U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  | $^{207}$Pb*/$^{235}$U | ± | $^{206}$Pb*/$^{238}$U | ± | Rho 1 | $^{207}$Pb*/$^{206}$Pb* | ± | $^{206}$Pb/$^{238}$U | ± | $^{207}$Pb/$^{235}$U | ± | $^{207}$Pb/$^{206}$Pb | ± |  |  |  |  |  |
| Z1* | 192.3 | 0.94646 | 5.73 | 0.10952 | 3.64 | 0.64 | 0.06267 | 4.43 | 670 | 24 | 676 | 39 | 697 | 31 | 4 | 0.0007 | 671 | 45 | 0.02 |
| Z2* | 321.5 | 2.73747 | 8.09 | 0.21523 | 4.80 | 0.59 | 0.09225 | 6.51 | 1257 | 60 | 1339 | 108 | 1472 | 96 | 15 | 0.0002 | 1283 | 100 | 0.36 |
| Z3 | 95.8 | 6.89687 | 5.41 | 0.37672 | 3.85 | 0.71 | 0.13278 | 3.80 | 2061 | 79 | 2098 | 113 | 2135 | 81 | 3 | 0.0007 | 2098 | 96 | 0.39 |
| Z4 | 104.5 | 5.03560 | 3.66 | 0.33261 | 2.59 | 0.71 | 0.10980 | 2.59 | 1851 | 48 | 1825 | 67 | 1796 | 47 | -3 | 0.0008 | 1827 | 62 | 0.61 |
| Z5B* | 453.5 | 0.72539 | 5.00 | 0.08828 | 3.83 | 0.77 | 0.05960 | 3.21 | 545 | 21 | 554 | 28 | 589 | 19 | 7 | 0.0003 | 548 | 39 | 0.04 |
| Z5N* | 34.2 | 0.85911 | 14.28 | 0.10182 | 12.72 | 0.89 | 0.06120 | 6.48 | 625 | 79 | 630 | 90 | 646 | 42 | 3 | 0.0036 | 630 | 130 | 0.80 |
| Z6 | 301.1 | 0.79822 | 4.66 | 0.09634 | 2.78 | 0.60 | 0.06009 | 3.73 | 593 | 17 | 596 | 28 | 607 | 23 | 2 | 0.0004 | 593 | 31 | 0.05 |
| Z7 | 54.0 | 0.74174 | 8.56 | 0.09126 | 4.65 | 0.54 | 0.05895 | 7.19 | 563 | 26 | 563 | 48 | 565 | 41 | 0 | 0.0024 | 563 | 50 | 0.77 |
| Z8N | 194.1 | 4.15531 | 5.51 | 0.29203 | 3.58 | 0.65 | 0.10320 | 4.19 | 1652 | 59 | 1665 | 92 | 1682 | 70 | 2 | 0.0008 | 1661 | 87 | 0.45 |
| Z8B | 199.5 | 0.71742 | 4.73 | 0.08884 | 3.02 | 0.64 | 0.05857 | 3.64 | 549 | 17 | 549 | 26 | 551 | 20 | 0 | 0.0006 | 549 | 31 | 0.03 |
| Z9 | 481.9 | 0.81532 | 4.00 | 0.09790 | 1.77 | 0.44 | 0.06040 | 3.59 | 602 | 11 | 605 | 24 | 618 | 22 | 3 | 0.0003 | 602 | 20 | 0.07 |
| Z10* | 331.1 | 0.82063 | 3.92 | 0.09848 | 1.79 | 0.46 | 0.06043 | 3.49 | 606 | 11 | 608 | 24 | 619 | 22 | 2 | 0.0003 | 606 | 21 | 0.09 |
| Z11B | 22.5 | 0.76902 | 9.00 | 0.09480 | 4.08 | 0.45 | 0.05884 | 8.03 | 584 | 24 | 579 | 52 | 561 | 45 | -4 | 0.0030 | 583 | 45 | 0.61 |
| Z11N | 21.7 | 0.75623 | 8.72 | 0.09319 | 6.87 | 0.79 | 0.05886 | 5.37 | 574 | 39 | 572 | 50 | 562 | 30 | -2 | 0.0030 | 573 | 72 | 0.68 |
| Z12* | 172.1 | 0.77239 | 4.91 | 0.09393 | 2.40 | 0.49 | 0.05964 | 4.29 | 579 | 14 | 581 | 29 | 591 | 25 | 2 | 0.0003 | 579 | 26 | 0.02 |
| Z13B* | 237.0 | 0.76466 | 3.71 | 0.09010 | 1.52 | 0.41 | 0.06155 | 3.38 | 556 | 8 | 577 | 21 | 658 | 22 | 16 | 0.0005 | 557 | 16 | 0.02 |
| Z13N* | 18.2 | 0.72024 | 9.98 | 0.08715 | 8.14 | 0.82 | 0.05994 | 5.78 | 539 | 44 | 551 | 55 | 601 | 35 | 10 | 0.0006 | 544 | 81 | 0.55 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | 1 | | | |
| Z14* | 7.1 | 1.10830 | 25.37 | 0.12572 | 23.14 | 0.91 | 0.06394 | 10.40 | 763 | 177 | 757 | 192 | 740 | 77 | -3 | 0.0188 | 755 | 260 | 1.36 |
| Z15B | 80.1 | 0.74650 | 6.28 | 0.09140 | 3.64 | 0.58 | 0.05923 | 5.12 | 564 | 21 | 566 | 36 | 576 | 29 | 2 | 0.0014 | 564 | 39 | 0.03 |
| Z15N | 14.7 | 0.90020 | 7.35 | 0.10564 | 6.57 | 0.89 | 0.06180 | 3.30 | 647 | 43 | 652 | 48 | 667 | 22 | 3 | 0.0055 | 652 | 71 | 2.04 |
| Z16 | 84.9 | 4.49291 | 3.99 | 0.29275 | 2.84 | 0.71 | 0.11131 | 2.80 | 1655 | 47 | 1730 | 69 | 1821 | 51 | 9 | 0.0019 | 1717 | 1100 | 1.04 |
| Z17* | 158.4 | 2.76790 | 4.94 | 0.20475 | 3.17 | 0.64 | 0.09805 | 3.79 | 1201 | 38 | 1347 | 67 | 1587 | 60 | Disc. | 0.0017 | - | - | 0.26 |
| Z18N* | 43.0 | 0.64047 | 11.27 | 0.08357 | 9.97 | 0.89 | 0.05558 | 5.24 | 517 | 52 | 503 | 57 | 436 | 23 | -19 | 0.0038 | 503 | 89 | 0.73 |
| Z18B* | 344.7 | 1.02326 | 5.40 | 0.08978 | 3.14 | 0.58 | 0.08266 | 4.39 | 554 | 17 | 716 | 39 | 1261 | 55 | Disc. | 0.0032 | - | - | 0.06 |
| Z19 | 40.0 | 2.56435 | 7.56 | 0.20757 | 6.83 | 0.90 | 0.08960 | 3.25 | 1216 | 83 | 1291 | 98 | 1417 | 46 | 14 | 0.0022 | 1338 | 1300 | 0.57 |
| Z20* | 37.5 | 0.75244 | 8.46 | 0.09283 | 3.63 | 0.43 | 0.05879 | 7.64 | 572 | 21 | 570 | 48 | 559 | 43 | -2 | 0.0022 | 572 | 39 | 0.85 |
| Z21 | 30.9 | 1.90315 | 7.32 | 0.18110 | 4.76 | 0.65 | 0.07622 | 5.56 | 1073 | 51 | 1082 | 79 | 1101 | 61 | 3 | 0.0034 | 1077 | 87 | 0.55 |
| Z22 | 136.9 | 0.85715 | 4.77 | 0.10116 | 1.68 | 0.35 | 0.06145 | 4.46 | 621 | 10 | 629 | 30 | 655 | 29 | 5 | 0.0005 | 622 | 20 | 0.74 |
| ZR1 | 157.6 | 0.77057 | 3.91 | 0.09432 | 3.06 | 0.78 | 0.05925 | 2.43 | 581 | 18 | 580 | 23 | 576 | 14 | -1 | 0.0070 | 581 | 16 | 0.03 |
| ZR2N* | 111.0 | 0.80854 | 5.10 | 0.09484 | 3.76 | 0.74 | 0.06183 | 3.45 | 584 | 22 | 602 | 31 | 668 | 23 | 13 | 0.0165 | 589 | 20 | 0.05 |
| ZR2B* | 58.0 | 0.79332 | 13.24 | 0.09480 | 4.38 | 0.33 | 0.06070 | 12.49 | 584 | 26 | 593 | 79 | 628 | 79 | 7 | 0.0796 | 584 | 24 | 0.02 |
| ZR3B | 157.5 | 0.73608 | 4.16 | 0.09094 | 3.62 | 0.87 | 0.05870 | 2.05 | 561 | 20 | 560 | 23 | 556 | 11 | -1 | 0.0124 | 560 | 18 | 0.03 |
| ZR4B* | 193.1 | 1.07057 | 4.82 | 0.11883 | 4.20 | 0.87 | 0.06534 | 2.37 | 724 | 30 | 739 | 36 | 785 | 19 | 8 | 0.0116 | 738 | 25 | 0.10 |
| ZR5B* | 129.1 | 1.00392 | 5.48 | 0.11545 | 4.44 | 0.81 | 0.06307 | 3.21 | 704 | 31 | 706 | 39 | 710 | 23 | 1 | 0.0138 | 705 | 27 | 0.03 |
| ZR6N | 158.4 | 0.79722 | 4.11 | 0.09635 | 3.28 | 0.80 | 0.06001 | 2.48 | 593 | 19 | 595 | 24 | 604 | 15 | 2 | 0.0077 | 594 | 18 | 0.05 |
| ZR6B* | 64.3 | 0.84708 | 18.0 | 0.09918 | 11.0 | 0.61 | 0.06194 | 14.2 | 610 | 67 | 623 | 11 | 672 | 96 | 9 | 0.015 | 612 | 63 | 0.03 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0 | | 2 | | | 3 | | | | 2 | | | | 8 | | | |
| ZR7 | 83.6 | 0.75849 | 7.72 | 0.09273 | 6.07 | 0.79 | 0.05932 | 4.76 | 572 | 35 | 573 | 44 | 579 | 28 | 1 | 0.01133 | 572 | 32 | 0.02 |
| ZR8N | 225.1 | 0.77752 | 5.40 | 0.09503 | 4.85 | 0.90 | 0.05934 | 2.38 | 585 | 28 | 584 | 32 | 580 | 14 | -1 | 0.00035 | 584 | 24 | 0.03 |
| ZR8B* | 98.1 | 0.85552 | 4.80 | 0.09670 | 3.52 | 0.73 | 0.06416 | 3.26 | 595 | 21 | 628 | 30 | 747 | 24 | 20 | 0.01666 | 603 | 39 | 0.02 |
| ZR9B | 145.0 | 0.81005 | 6.03 | 0.09863 | 5.23 | 0.87 | 0.05957 | 2.99 | 606 | 32 | 602 | 36 | 588 | 18 | -3 | 0.00037 | 603 | 27 | 0.02 |
| ZR9N | 156.4 | 1.09609 | 7.62 | 0.12293 | 4.69 | 0.62 | 0.06467 | 6.01 | 747 | 35 | 751 | 57 | 764 | 46 | 2 | 0.00055 | 748 | 32 | 0.09 |
| ZR9B2 | 244.3 | 0.90551 | 6.05 | 0.10696 | 4.41 | 0.73 | 0.06140 | 4.13 | 655 | 29 | 655 | 40 | 653 | 27 | 0 | 0.00058 | 655 | 26 | 0.08 |
| ZR10 | 156.7 | 0.84300 | 5.24 | 0.10209 | 3.76 | 0.72 | 0.05989 | 3.65 | 627 | 24 | 621 | 33 | 599 | 22 | -5 | 0.00017 | 625 | 22 | 0.35 |
| ZR11N* | 125.9 | 0.97810 | 7.70 | 0.11410 | 3.76 | 0.49 | 0.06217 | 6.72 | 697 | 26 | 693 | 53 | 680 | 46 | -2 | 0.00083 | 696 | 24 | 0.24 |
| ZR11B | 280.3 | 0.90922 | 5.80 | 0.10713 | 4.30 | 0.74 | 0.06156 | 3.90 | 656 | 28 | 657 | 38 | 659 | 26 | 0 | 0.00032 | 656 | 26 | 0.07 |
| ZR12N* | 202.1 | 1.14762 | 13.91 | 0.12559 | 2.51 | 0.18 | 0.06627 | 13.68 | 763 | 19 | 776 | 108 | 815 | 112 | 6 | 0.00031 | 763 | 18 | 0.10 |
| ZR12B | 160.8 | 0.92263 | 6.28 | 0.10718 | 5.53 | 0.88 | 0.06243 | 2.97 | 656 | 36 | 664 | 42 | 689 | 20 | 5 | 0.01055 | 664 | 31 | 0.04 |
| ZR13B1 | 42.7 | 0.77804 | 9.22 | 0.09488 | 6.68 | 0.73 | 0.05947 | 6.35 | 584 | 39 | 584 | 54 | 584 | 37 | 0 | 0.00054 | 584 | 36 | 0.72 |
| ZR13B2 | 51.8 | 0.83019 | 8.61 | 0.09940 | 5.41 | 0.63 | 0.06058 | 6.70 | 611 | 33 | 614 | 53 | 624 | 42 | 2 | 0.00045 | 611 | 31 | 0.69 |
| ZR14N | 261.3 | 0.73715 | 4.89 | 0.09056 | 3.16 | 0.65 | 0.05904 | 3.72 | 559 | 18 | 561 | 27 | 568 | 21 | 2 | 0.00016 | 559 | 17 | 0.08 |
| ZR14B | 227.4 | 0.76391 | 4.63 | 0.09395 | 3.29 | 0.71 | 0.05898 | 3.26 | 579 | 19 | 576 | 27 | 566 | 18 | -2 | 0.00020 | 578 | 18 | 0.08 |
| ZR15 | 101.2 | 0.79066 | 6.48 | 0.09699 | 4.72 | 0.73 | 0.05912 | 4.44 | 597 | 28 | 592 | 38 | 572 | 25 | -4 | 0.00041 | 595 | 23 | 0.31 |
| ZR16N | 105.8 | 0.87552 | 5.29 | 0.10320 | 3.69 | 0.70 | 0.06153 | 3.80 | 633 | 23 | 639 | 34 | 658 | 25 | 4 | 0.00022 | 635 | 22 | 1.00 |
| ZR16B | 289.9 | 0.75142 | 5.21 | 0.09160 | 4.26 | 0.82 | 0.05950 | 3.00 | 565 | 24 | 569 | 30 | 585 | 18 | 3 | 0.00014 | 567 | 22 | 0.02 |
| ZR17 | 51.1 | 0.77268 | 8.56 | 0.09435 | 6.29 | 0.74 | 0.05939 | 5.80 | 581 | 37 | 581 | 50 | 582 | 34 | 0 | 0.005 | 581 | 34 | 0.40 |

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| | | | | | | | | | | | | | | | | 1 | | | |
| ZR18N* | 139.2 | 0.83990 | 8.14 | 0.09926 | 4.93 | 0.61 | 0.06137 | 6.48 | 610 | 30 | 619 | 50 | 652 | 42 | 6 | 0.0076 | 612 | 28 | 0.18 |
| ZR18B* | 125.1 | 1.19276 | 6.56 | 0.11754 | 4.19 | 0.64 | 0.07360 | 5.05 | 716 | 30 | 797 | 52 | 1030 | 52 | 30 | 0.0139 | 726 | 56 | 0.13 |
| ZR19B | 109.1 | 1.20210 | 7.06 | 0.13207 | 4.65 | 0.66 | 0.06601 | 5.30 | 800 | 37 | 802 | 57 | 807 | 43 | 1 | 0.0086 | 800 | 33 | 0.09 |
| ZR19N* | 156.2 | 7.66344 | 2.09 | 0.44807 | 0.80 | 0.38 | 0.12405 | 1.93 | 2387 | 19 | 2192 | 46 | 2015 | 39 | Disc. | 0.0005 | - | - | 0.35 |
| ZR20N* | 265.3 | 0.95807 | 5.56 | 0.10893 | 4.81 | 0.87 | 0.06379 | 2.78 | 667 | 32 | 682 | 38 | 735 | 20 | 9 | 0.0061 | 680 | 28 | 0.13 |
| ZR20B | 341.8 | 0.78263 | 3.90 | 0.09502 | 2.52 | 0.65 | 0.05974 | 2.98 | 585 | 15 | 587 | 23 | 594 | 18 | 2 | 0.0031 | 586 | 14 | 0.02 |
| ZR21B* | 906.7 | 0.93555 | 3.99 | 0.09026 | 3.24 | 0.81 | 0.07517 | 2.33 | 557 | 18 | 671 | 27 | 1073 | 25 | Disc. | 0.0172 | - | - | 0.06 |
| ZR22B | 487.0 | 1.24301 | 6.15 | 0.13632 | 2.01 | 0.33 | 0.06613 | 5.81 | 824 | 17 | 820 | 50 | 811 | 47 | -2 | 0.0102 | 824 | 15 | 0.09 |
| ZR23N | 183.6 | 1.16769 | 10.40 | 0.12854 | 5.37 | 0.52 | 0.06589 | 8.91 | 780 | 42 | 786 | 82 | 803 | 72 | 3 | 0.0200 | 780 | 19 | 0.20 |
| ZR24N* | 54.1 | 1.09815 | 7.67 | 0.12607 | 3.58 | 0.47 | 0.06317 | 6.79 | 765 | 27 | 752 | 58 | 714 | 48 | -7 | 0.0071 | 764 | 13 | 0.09 |

Table 11: U-Pb isotopic data (LA-ICP-MS) from sample SM-CM-02 – Morro do Escoteiro Suite. *Spots excluded from the calculation. Disc.: do not provide age.

| IT-NM-15 | | | Ratios | | | | | | | Age (Ma) | | | | Disc. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Grain#** | **206Pb cps** | **$^{206}$Pb/$^{204}$Pb** | **$^{207}$Pb/$^{206}$Pb** | **2s error** | **$^{207}$Pb/$^{235}$U** | **2s error** | **$^{206}$Pb/$^{238}$U** | **2s error** | **rho** | **$^{207}$Pb/$^{206}$Pb** | **2s error** | **$^{206}$Pb/$^{238}$U** | | **%** |
| 1 | 181087 | infinite | 0.06138 | 0.00097 | 0.7965 | 0.0335 | 0.0926 | 0.0037 | 0.927 | 653 | 34 | 571 | 23 | 12.5 |
| 2 | 235059 | infinite | 0.05990 | 0.00067 | 0.7708 | 0.0281 | 0.0933 | 0.0034 | 0.952 | 600 | 24 | 575 | 21 | 4.1 |
| 3 | 158875 | infinite | 0.06027 | 0.00066 | 0.8097 | 0.0299 | 0.0963 | 0.0035 | 0.955 | 613 | 24 | 593 | 22 | 3.3 |
| 4 | 205833 | infinite | 0.06141 | 0.00072 | 0.7786 | 0.0289 | 0.0910 | 0.0033 | 0.949 | 654 | 25 | 561 | 21 | 14.1 |
| 5 | 512881 | infinite | 0.05961 | 0.00065 | 0.7919 | 0.0327 | 0.0966 | 0.0040 | 0.965 | 590 | 24 | 595 | 24 | -0.9 |
| 6 | 132300 | infinite | 0.06033 | 0.00073 | 0.8183 | 0.0404 | 0.0975 | 0.0048 | 0.970 | 615 | 26 | 600 | 29 | 2.5 |
| 7 | 334380 | infinite | 0.06005 | 0.00066 | 0.7696 | 0.0246 | 0.0926 | 0.0029 | 0.941 | 605 | 24 | 571 | 18 | 5.7 |
| 8 | 134260 | infinite | 0.05977 | 0.00068 | 0.7841 | 0.0281 | 0.0943 | 0.0033 | 0.949 | 595 | 25 | 581 | 21 | 2.4 |
| 9 | 379986 | infinite | 0.05880 | 0.00061 | 0.7003 | 0.0294 | 0.0864 | 0.0036 | 0.969 | 560 | 23 | 534 | 22 | 4.6 |
| 10 | 344076 | infinite | 0.06022 | 0.00069 | 0.7595 | 0.0281 | 0.0918 | 0.0033 | 0.951 | 611 | 25 | 566 | 21 | 7.4 |
| 11 | 147173 | infinite | 0.06280 | 0.00139 | 0.7613 | 0.0301 | 0.0872 | 0.0030 | 0.830 | 702 | 47 | 539 | 18 | 23.2 |
| 12 | 122361 | infinite | 0.06101 | 0.00072 | 0.7967 | 0.0371 | 0.0940 | 0.0043 | 0.968 | 640 | 25 | 579 | 27 | 9.5 |
| 13 | 110033 | infinite | 0.06185 | 0.00093 | 0.7980 | 0.0270 | 0.0923 | 0.0029 | 0.897 | 669 | 32 | 569 | 18 | 14.9 |
| 14 | 434372 | infinite | 0.06000 | 0.00068 | 0.7603 | 0.0245 | 0.0920 | 0.0029 | 0.938 | 603 | 24 | 567 | 18 | 6.0 |
| 15 | 129018 | infinite | 0.06040 | 0.00077 | 0.7878 | 0.0296 | 0.0929 | 0.0034 | 0.941 | 618 | 28 | 573 | 21 | 7.3 |
| 16 | 83779 | infinite | 0.06002 | 0.00070 | 0.8154 | 0.0302 | 0.0975 | 0.0036 | 0.950 | 604 | 25 | 600 | 22 | 0.8 |
| 17 | 228951 | infinite | 0.05947 | 0.00068 | 0.7603 | 0.0237 | 0.0922 | 0.0028 | 0.932 | 584 | 25 | 569 | 17 | 2.7 |
| 18 | 95055 | infinite | 0.05955 | 0.00068 | 0.8546 | 0.0332 | 0.1028 | 0.0040 | 0.956 | 587 | 25 | 631 | 24 | -7.4 |
| 19 | 282119 | infinite | 0.06057 | 0.00071 | 0.7761 | 0.0301 | 0.0929 | 0.0036 | 0.954 | 624 | 25 | 573 | 22 | 8.2 |
| 20 | 259550 | infinite | 0.05958 | 0.00062 | 0.8096 | 0.0270 | 0.0984 | 0.0033 | 0.951 | 588 | 23 | 605 | 20 | -2.8 |
| 21 | 254793 | infinite | 0.06008 | 0.00071 | 0.8249 | 0.0291 | 0.0991 | 0.0034 | 0.943 | 606 | 26 | 609 | 21 | -0.4 |
| 22 | 235356 | infinite | 0.06028 | 0.00064 | 0.7917 | 0.0313 | 0.0949 | 0.0037 | 0.964 | 614 | 23 | 585 | 23 | 4.7 |
| 23 | 366794 | infinite | 0.05987 | 0.00064 | 0.8091 | 0.0293 | 0.0980 | 0.0035 | 0.956 | 599 | 23 | 602 | 22 | -0.6 |
| 24 | 191073 | 11942 | 0.05989 | 0.00144 | 0.8192 | 0.0330 | 0.0984 | 0.0033 | 0.803 | 600 | 52 | 605 | 20 | -0.9 |

Table 12: U-Pb isotopic data (SHRIMP) from sample IT-NM-15 – Morro do Escoteiro Suite.

| SMM-CMM-172 | U ppm | Isotope Ratios | | | | | | | Ages (Ma) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $^{207}Pb^*/^{235}U$ | ± | $^{206}Pb^*/^{238}U$ | ± | Rho 1 | $^{207}Pb^*/^{206}Pb^*$ | ± | $^{206}Pb/^{238}U$ | ± | $^{207}Pb/^{235}U$ | ± |
| 001 A | 476.9 | 0.88348 | 3.28 | 0.10584 | 2.31 | 0.71 | 0.06054 | 2.32 | 649 | 15 | 643 | 21 |
| 002 A | 173.0 | 0.73815 | 5.62 | 0.09060 | 3.47 | 0.62 | 0.05909 | 4.41 | 559 | 19 | 561 | 32 |
| 003 A | 92.1 | 0.72755 | 5.69 | 0.08974 | 2.74 | 0.48 | 0.05880 | 4.99 | 554 | 15 | 555 | 32 |
| 004 A* | 142.6 | 0.77815 | 7.06 | 0.09598 | 5.21 | 0.74 | 0.05880 | 4.77 | 591 | 31 | 584 | 41 |
| 005 A | 925.8 | 0.81027 | 2.86 | 0.09845 | 1.95 | 0.68 | 0.05969 | 2.09 | 605 | 12 | 603 | 17 |
| 006 A | 609.7 | 0.77626 | 3.56 | 0.09472 | 1.57 | 0.44 | 0.05944 | 3.19 | 583 | 9 | 583 | 21 |
| 007 A | 447.8 | 0.73751 | 4.01 | 0.09013 | 2.08 | 0.52 | 0.05934 | 3.43 | 556 | 12 | 561 | 22 |
| 008 A | 952.0 | 0.80794 | 5.75 | 0.09771 | 3.67 | 0.64 | 0.05997 | 4.43 | 601 | 22 | 601 | 35 |
| 009 A | 209.3 | 0.72604 | 4.61 | 0.08993 | 3.18 | 0.69 | 0.05855 | 3.34 | 555 | 18 | 554 | 26 |
| 001 B* | 1881.3 | 0.83943 | 6.49 | 0.09881 | 3.41 | 0.53 | 0.06161 | 5.52 | 607 | 21 | 619 | 40 |
| 002 B | 1086.6 | 0.86174 | 6.77 | 0.10207 | 3.46 | 0.51 | 0.06123 | 5.81 | 627 | 22 | 631 | 43 |
| 003 B | 978.6 | 0.84907 | 6.76 | 0.10051 | 3.73 | 0.55 | 0.06127 | 5.64 | 617 | 23 | 624 | 42 |
| 004 B* | 733.4 | 1.13414 | 5.40 | 0.12189 | 2.87 | 0.53 | 0.06748 | 4.58 | 741 | 21 | 770 | 42 |
| 005 B* | 140.7 | 0.72474 | 12.18 | 0.09009 | 3.94 | 0.32 | 0.05834 | 11.53 | 556 | 22 | 553 | 67 |
| 006 B | 774.4 | 0.84128 | 6.77 | 0.09925 | 4.01 | 0.59 | 0.06147 | 5.46 | 610 | 24 | 620 | 42 |
| 007 B | 319.1 | 0.93727 | 6.77 | 0.10843 | 4.49 | 0.66 | 0.06269 | 5.07 | 664 | 30 | 671 | 45 |
| 008 B | 189.4 | 0.76776 | 7.97 | 0.09192 | 4.05 | 0.51 | 0.06058 | 6.87 | 567 | 23 | 578 | 46 |
| 009 B* | 1109.1 | 0.77730 | 7.23 | 0.09203 | 4.71 | 0.65 | 0.06125 | 5.49 | 568 | 27 | 584 | 42 |
| 001 C | 1763.9 | 0.84642 | 6.99 | 0.10013 | 5.09 | 0.73 | 0.06131 | 4.80 | 615 | 31 | 623 | 44 |
| 002 C | 617.3 | 0.84210 | 7.64 | 0.09928 | 5.44 | 0.71 | 0.06152 | 5.36 | 610 | 33 | 620 | 47 |
| 003 C* | 169.1 | 0.76177 | 9.92 | 0.09035 | 7.03 | 0.71 | 0.06115 | 7.00 | 558 | 39 | 575 | 57 |
| 004 C | 1862.8 | 0.90377 | 6.84 | 0.10602 | 4.80 | 0.70 | 0.06182 | 4.87 | 650 | 31 | 654 | 45 |
| 005 C* | 333.1 | 0.79956 | 8.28 | 0.09526 | 6.17 | 0.75 | 0.06087 | 5.51 | 587 | 36 | 597 | 49 |
| 006 C* | 1143.4 | 0.78246 | 7.22 | 0.09266 | 5.49 | 0.76 | 0.06124 | 4.70 | 571 | 31 | 587 | 42 |
| 007 C* | 999.2 | 0.85286 | 8.01 | 0.09958 | 6.49 | 0.81 | 0.06212 | 4.70 | 612 | 40 | 626 | 50 |
| 008 C | 860.2 | 0.88260 | 6.80 | 0.10469 | 4.94 | 0.73 | 0.06114 | 4.67 | 642 | 32 | 642 | 44 |
| 009 C | 1451.9 | 0.89668 | 7.62 | 0.10546 | 6.19 | 0.81 | 0.06166 | 4.44 | 646 | 40 | 650 | 50 |
| 001 D* | 166.5 | 0.80589 | 10.51 | 0.09882 | 6.69 | 0.64 | 0.05915 | 8.10 | 607 | 41 | 600 | 63 |
| 002 D | 3434.0 | 0.92021 | 6.93 | 0.10842 | 4.46 | 0.64 | 0.06155 | 5.30 | 664 | 30 | 662 | 46 |
| 004 D* | 155.1 | 0.86161 | 10.13 | 0.10025 | 4.96 | 0.49 | 0.06234 | 8.83 | 616 | 31 | 631 | 64 |
| 005 D | 1705.8 | 0.87122 | 6.86 | 0.10309 | 4.27 | 0.62 | 0.06129 | 5.37 | 632 | 27 | 636 | 44 |
| 006 D | 392.7 | 0.89594 | 8.61 | 0.10675 | 4.47 | 0.52 | 0.06087 | 7.35 | 654 | 29 | 650 | 56 |
| 007 D | 1686.5 | 0.89576 | 7.24 | 0.10661 | 4.54 | 0.63 | 0.06094 | 5.64 | 653 | 30 | 649 | 47 |
| 008 D | 464.7 | 0.85031 | 9.26 | 0.10155 | 7.06 | 0.76 | 0.06073 | 5.99 | 623 | 44 | 625 | 58 |
| 009 D | 1474.5 | 0.93391 | 7.36 | 0.11127 | 4.46 | 0.61 | 0.06087 | 5.85 | 680 | 30 | 670 | 49 |
| 001 E* | 406.0 | 0.98116 | 18.69 | 0.11059 | 6.75 | 0.36 | 0.06434 | 17.42 | 676 | 46 | 694 | 130 |
| 002 E* | 783.4 | 0.91021 | 20.76 | 0.10793 | 9.32 | 0.45 | 0.06116 | 18.55 | 661 | 62 | 657 | 136 |
| 003 E* | 219.1 | 0.61703 | 20.15 | 0.07134 | 8.46 | 0.42 | 0.06273 | 18.29 | 444 | 38 | 488 | 98 |
| 004 E* | 44.4 | 0.61532 | 54.72 | 0.08055 | 25.93 | 0.47 | 0.05540 | 48.19 | 499 | 129 | 487 | 266 |

Table 13: U-Pb isotopic data (LA-ICP-MS) from sample SM-CM-172 – Rio Negro Complex. *Spots excluded from the calculation.

| THE-02 | | | | | | Age | | | | | Ration | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grain. Spot | % 206 Pbc | ppm U | $^{232}Th/^{238}U$ | ± % | ppm 206 Pb* | $^{206}Pb/^{238}U$ | | $^{207}Pb/^{206}Pb$ | | % Disc. | $^{207}Pb^*/^{206}Pb^*$ | ± % | $^{207}Pb^*/^{235}U$ | ± % | $^{206}Pb^*/^{238}U$ | ± % | err corr |
| 1.1 | -- | 1152 | 0.06 | 0.79 | 100 | 619 | ±6 | 605 | ±14 | -2 | 0.06004 | 0.67 | 0.835 | 1.3 | 0.1009 | 1.1 | 0.85 |
| 1.2 | -- | 1414 | 0.98 | 0.15 | 123 | 62 | ±6 | 64 | ±1 | +4 | 0.06127 | 0.55 | 0.856 | 1.2 | 0.1014 | 1.1 | 0.89 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 2 | | 9 | 2 | | | | | | | | |
| 2.1 | 0.04 | 296 | 0.49 | 0.31 | 25 | 606 | ±7 | 611 | ±29 | +1 | 0.06020 | 1.34 | 0.818 | 1.8 | 0.0986 | 1.2 | 0.66 |
| 3.1 | 0.01 | 895 | 1.29 | 1.31 | 79 | 627 | ±6 | 635 | ±16 | +1 | 0.06088 | 0.74 | 0.858 | 1.3 | 0.1022 | 1.1 | 0.82 |
| 4.1 | -- | 493 | 0.27 | 0.91 | 43 | 623 | ±7 | 603 | ±23 | -3 | 0.05999 | 1.05 | 0.839 | 1.5 | 0.1014 | 1.1 | 0.73 |
| 5.1 | -- | 836 | 0.11 | 0.38 | 60 | 521 | ±7 | 537 | ±19 | +3 | 0.05819 | 0.87 | 0.676 | 1.6 | 0.0842 | 1.4 | 0.84 |
| 5.2 | 0.07 | 373 | 0.75 | 0.25 | 32 | 612 | ±8 | 589 | ±28 | -4 | 0.05960 | 1.28 | 0.819 | 1.9 | 0.0997 | 1.4 | 0.73 |
| 6.1 | -- | 1645 | 0.74 | 0.15 | 145 | 631 | ±6 | 622 | ±11 | -1 | 0.06052 | 0.50 | 0.858 | 1.2 | 0.1028 | 1.1 | 0.90 |
| 7.1 | 0.01 | 801 | 0.24 | 0.25 | 69 | 616 | ±7 | 636 | ±16 | +3 | 0.06090 | 0.72 | 0.842 | 1.5 | 0.1003 | 1.3 | 0.87 |
| 8.1 | 0.07 | 806 | 0.10 | 1.13 | 71 | 627 | ±7 | 600 | ±18 | -5 | 0.05991 | 0.85 | 0.844 | 1.4 | 0.1022 | 1.1 | 0.79 |
| 9.1 | -- | 771 | 0.57 | 0.20 | 68 | 628 | ±7 | 628 | ±16 | +0 | 0.06067 | 0.75 | 0.855 | 1.3 | 0.1023 | 1.1 | 0.82 |
| 10.1 | 0.06 | 483 | 0.31 | 0.30 | 42 | 628 | ±7 | 609 | ±41 | -3 | 0.06014 | 1.89 | 0.849 | 2.2 | 0.1024 | 1.1 | 0.51 |
| 11.1 | 0.02 | 1898 | 0.78 | 0.15 | 164 | 618 | ±6 | 628 | ±11 | +2 | 0.06069 | 0.50 | 0.841 | 1.2 | 0.1005 | 1.1 | 0.90 |
| 12.1 | 0.05 | 746 | 0.24 | 0.49 | 66 | 629 | ±6 | 614 | ±16 | -3 | 0.06029 | 0.74 | 0.852 | 1.3 | 0.1025 | 1.1 | 0.83 |
| 13.1 | 0.02 | 890 | 0.04 | 1.03 | 79 | 631 | ±7 | 632 | ±23 | +0 | 0.06080 | 1.06 | 0.862 | 1.6 | 0.1028 | 1.2 | 0.75 |
| 14.1 | 0.09 | 1297 | 0.89 | 0.16 | 110 | 606 | ±6 | 624 | ±14 | +3 | 0.06058 | 0.65 | 0.823 | 1.2 | 0.0986 | 1.1 | 0.85 |
| 15.1 | 0.00 | 752 | 0.31 | 0.49 | 66 | 624 | ±7 | 609 | ±17 | -3 | 0.06015 | 0.79 | 0.843 | 1.3 | 0.1017 | 1.1 | 0.81 |
| 16.1 | 0.02 | 2017 | 0.91 | 0.39 | 172 | 610 | ±7 | 616 | ±10 | +1 | 0.06033 | 0.48 | 0.826 | 1.2 | 0.0993 | 1.1 | 0.92 |
| 17.1 | 0.00 | 2101 | 0.93 | 0.14 | 183 | 622 | ±6 | 637 | ±10 | +3 | 0.06095 | 0.46 | 0.851 | 1.1 | 0.1013 | 1.0 | 0.91 |

Table 14: U-Pb isotopic data (SHRIMP) from sample THE-02 – Rio Negro Complex.

| SMCMB-148 | U ppm | Isotope Ratios $^{207}Pb^{*}/^{235}U$ | ± | $^{206}Pb^{*}/^{238}U$ | ± | Rho 1 | $^{207}Pb^{*}/^{206}Pb^{*}$ | ± | Ages (Ma) $^{206}Pb/^{238}U$ | ± | $^{207}Pb/^{235}U$ | ± | $^{207}Pb/^{206}Pb$ | ± | Disc. % | f206 | Age (Ma) | ± | $^{232}Th/^{238}U$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Z1* | -274.4758 | 1.3211 | 7.70 | 0.13847 | 5.37 | 0.70 | 0.0692 | 5.52 | 836 | 45 | 855 | 66 | 905 | 50 | 8 | 0.0014 | 843 | 40 | 0.48 |
| Z2 | -91.3811 | 1.3249 | 10.95 | 0.13874 | 9.20 | 0.84 | 0.0693 | 5.93 | 838 | 77 | 857 | 94 | 906 | 54 | 8 | 0.0041 | 854 | 63 | 0.66 |
| Z3B* | -142.7315 | 0.6164 | 9.77 | 0.07261 | 7.55 | 0.77 | 0.0616 | 6.20 | 452 | 34 | 488 | 48 | 659 | 41 | 31 | 0.0011 | 457 | 65 | 0.21 |
| Z3N* | -212.0141 | 0.6697 | 8.00 | 0.07930 | 5.61 | 0.70 | 0.0612 | 5.70 | 492 | 28 | 521 | 42 | 648 | 37 | 24 | 0.0010 | 496 | 53 | 0.31 |
| Z4 | 158.4868 | 1.2617 | 6.78 | 0.13473 | 5.00 | 0.74 | 0.0679 | 4.58 | 815 | 41 | 829 | 56 | 866 | 40 | 6 | 0.0010 | 821 | 36 | 0.63 |
| Z5 | 112.0645 | 1.2528 | 7.42 | 0.13628 | 5.74 | 0.77 | 0.0667 | 4.70 | 824 | 47 | 825 | 61 | 828 | 39 | 0 | 0.0015 | 824 | 40 | 0.55 |
| Z6 | 269.5596 | 1.3056 | 4.50 | 0.13997 | 3.05 | 0.68 | 0.0677 | 3.31 | 844 | 26 | 848 | 38 | 858 | 28 | 2 | 0.0008 | 846 | 23 | 0.64 |
| Z7 | 46.2007 | 1.4690 | 10.87 | 0.13890 | 7.72 | 0.71 | 0.0767 | 7.65 | 838 | 65 | 918 | 100 | 1113 | 85 | 25 | 0.0061 | 860 | 120 | 1.71 |
| Z8 | 27.6979 | 0.9444 | 17.79 | 0.09794 | 16.67 | 0.94 | 0.0699 | 6.22 | 602 | 100 | 675 | 120 | 926 | 58 | 35 | 0.0096 | 686 | 170 | 0.42 |
| Z9 | 33.6631 | 1.4312 | 9.99 | 0.14871 | 7.63 | 0.76 | 0.0698 | 6.45 | 894 | 68 | 902 | 90 | 922 | 59 | 3 | 0.0051 | 899 | 58 | 0.47 |
| Z10 | 90.8504 | 1.3545 | 5.85 | 0.14151 | 3.57 | 0.61 | 0.0694 | 4.64 | 853 | 30 | 869 | 51 | 911 | 42 | 6 | 0.0020 | 857 | 28 | 0.82 |
| Z11 | 91.1489 | 1.4249 | 6.12 | 0.14585 | 3.70 | 0.60 | 0.0709 | 4.88 | 878 | 33 | 899 | 55 | 953 | 46 | 8 | 0.0017 | 883 | 29 | 0.37 |
| Z12B | 291.5513 | 0.6908 | 5.92 | 0.08368 | 2.78 | 0.47 | 0.0599 | 5.23 | 518 | 14 | 533 | 32 | 599 | 31 | 14 | 0.0005 | 519 | 14 | 0.31 |
| Z12N | 96.5220 | 1.1849 | 8.02 | 0.12840 | 4.93 | 0.61 | 0.0669 | 6.33 | 779 | 38 | 794 | 64 | 836 | 53 | 7 | 0.0020 | 782 | 35 | 1.04 |
| Z1 | 72. | 1.28 | 1 | 0.13 | 8. | 0. | 0.06 | 6 | 832 | 6 | 838 | 8 | 853 | 5 | 2 | 0. | 8 | 5 | 0.3 |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 4985 | 30 | 0.36 | 784 | 11 | 78 | 75 | .44 | | 8 | | 7 | | 5 | | 0021 | 36 | 8 | 6 |
| Z14B | 281.3255 | 0.7526 | 4.74 | 0.08731 | 2.33 | 0.49 | 0.0625 | 4.12 | 540 | 13 | 570 | 27 | 692 | 29 | 22 | 0.0006 | 541 | 24 | 0.16 |
| Z14N | 181.3186 | 1.3481 | 5.58 | 0.14411 | 3.63 | 0.65 | 0.0678 | 4.24 | 868 | 31 | 867 | 48 | 864 | 37 | 0 | 0.0017 | 867 | 28 | 0.38 |
| Z15 | 86.1455 | 1.2113 | 11.47 | 0.13079 | 7.98 | 0.70 | 0.0672 | 8.24 | 792 | 63 | 806 | 92 | 843 | 69 | 6 | 0.0032 | 797 | 57 | 0.60 |
| Z16 | 386.3755 | 1.2374 | 4.81 | 0.12987 | 1.89 | 0.39 | 0.0691 | 4.43 | 787 | 15 | 818 | 39 | 902 | 40 | 13 | 0.0016 | 789 | 14 | 0.38 |
| Z17* | 1376.0413 | 0.9846 | 3.49 | 0.10689 | 1.74 | 0.50 | 0.0668 | 3.02 | 655 | 11 | 696 | 24 | 832 | 25 | 21 | 0.0005 | 658 | 22 | 0.91 |
| Z18 | 886.3846 | 0.7414 | 4.09 | 0.09143 | 2.05 | 0.50 | 0.0588 | 3.54 | 564 | 12 | 563 | 23 | 560 | 20 | -1 | 0.0002 | 564 | 11 | 0.04 |
| Z19* | 119.2942 | 1.0260 | 5.60 | 0.11547 | 3.26 | 0.58 | 0.0644 | 4.55 | 704 | 23 | 717 | 40 | 756 | 34 | 7 | 0.0020 | 707 | 21 | 0.47 |
| Z20* | 484.9377 | 1.0429 | 4.50 | 0.11484 | 2.37 | 0.53 | 0.0659 | 3.83 | 701 | 17 | 725 | 33 | 802 | 31 | 13 | 0.0004 | 704 | 16 | 0.30 |
| Z21 | 999.1393 | 1.3901 | 3.37 | 0.14815 | 1.33 | 0.40 | 0.0681 | 3.09 | 891 | 12 | 885 | 30 | 870 | 27 | -2 | 0.0002 | 890 | 11 | 0.89 |
| Z22 | 70.3715 | 1.2535 | 4.84 | 0.13570 | 2.35 | 0.49 | 0.0670 | 4.23 | 820 | 19 | 825 | 40 | 838 | 35 | 2 | 0.0004 | 821 | 18 | 0.52 |
| Z23 | 98.9534 | 1.3016 | 6.85 | 0.13979 | 1.83 | 0.27 | 0.0675 | 6.60 | 843 | 15 | 846 | 58 | 854 | 56 | 1 | 0.0004 | 844 | 14 | 1.02 |
| Z24 | 131.6318 | 1.3365 | 4.28 | 0.14371 | 1.96 | 0.46 | 0.0675 | 3.80 | 866 | 17 | 862 | 37 | 852 | 32 | -2 | 0.0003 | 865 | 16 | 0.85 |
| Z25 | 109.5158 | 1.4830 | 4.74 | 0.15475 | 1.94 | 0.41 | 0.0695 | 4.33 | 928 | 18 | 923 | 44 | 914 | 40 | -2 | 0.0005 | 927 | 16 | 0.87 |
| ZR1N | 94.5759 | 1.1847 | 5.14 | 0.12937 | 3.82 | 0.74 | 0.0664 | 3.45 | 784 | 30 | 793 | 41 | 819 | 28 | 4 | 0.0047 | 789 | 26 | 0.56 |
| ZR1B | 81.8209 | 1.1052 | 5.66 | 0.12147 | 4.24 | 0.75 | 0.0660 | 3.76 | 739 | 31 | 756 | 43 | 806 | 30 | 8 | 0.0042 | 746 | 28 | 0.45 |
| ZR2N | 151.3457 | 1.1776 | 6.41 | 0.12637 | 5.27 | 0.82 | 0.0676 | 3.6 | 767 | 40 | 790 | 51 | 856 | 31 | 10 | 0.0047 | 783 | 35 | 0.71 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 4 | | | | | | | | | | | |
| ZR2B | 271.0344 | 0.9477 | 5.08 | 0.10961 | 1.86 | 0.37 | 0.0627 | 4.73 | 670 | 12 | 677 | 34 | 698 | 33 | 4 | 0.0025 | 671 | 12 | 0.20 |
| ZR3N | 93.2536 | 1.2492 | 5.83 | 0.13849 | 3.51 | 0.60 | 0.0654 | 4.65 | 836 | 29 | 823 | 48 | 788 | 37 | -6 | 0.0127 | 832 | 26 | 0.31 |
| ZR3B | 145.2919 | 0.8610 | 5.28 | 0.10260 | 4.27 | 0.81 | 0.0609 | 3.11 | 630 | 27 | 631 | 33 | 634 | 20 | 1 | 0.0225 | 630 | 24 | 0.03 |
| ZR4N | 134.2470 | 1.3969 | 3.97 | 0.14757 | 2.51 | 0.63 | 0.0687 | 3.08 | 887 | 22 | 888 | 35 | 888 | 27 | 0 | 0.0048 | 887 | 20 | 0.72 |
| ZR5N | 178.0079 | 1.2681 | 3.11 | 0.13819 | 2.19 | 0.70 | 0.0666 | 2.21 | 834 | 18 | 832 | 26 | 824 | 18 | -1 | 0.0020 | 833 | 16 | 0.47 |
| ZR5B* | 204.7461 | 1.1310 | 3.03 | 0.12373 | 2.18 | 0.72 | 0.0663 | 2.10 | 752 | 16 | 768 | 23 | 816 | 17 | 8 | 0.0011 | 758 | 15 | 0.64 |
| ZR6N | 141.3908 | 1.1981 | 4.17 | 0.13138 | 2.17 | 0.52 | 0.0661 | 3.57 | 796 | 17 | 800 | 33 | 811 | 29 | 2 | 0.0030 | 796 | 16 | 0.44 |
| ZR6B | 153.2474 | 1.1127 | 4.74 | 0.12615 | 2.56 | 0.54 | 0.0640 | 3.99 | 766 | 20 | 759 | 36 | 741 | 30 | -3 | 0.0039 | 765 | 18 | 0.37 |
| ZR7 | 252.3385 | 0.9956 | 4.66 | 0.10802 | 3.81 | 0.82 | 0.0668 | 2.68 | 661 | 25 | 702 | 33 | 833 | 22 | 21 | 0.0022 | 681 | 46 | 0.89 |
| ZR8N | 176.4941 | 1.1734 | 3.96 | 0.12298 | 2.85 | 0.72 | 0.0692 | 2.75 | 748 | 21 | 788 | 31 | 905 | 25 | 17 | 0.0115 | 761 | 39 | 0.62 |
| ZR8B | 109.7409 | 1.2245 | 3.97 | 0.13699 | 2.66 | 0.67 | 0.0648 | 2.95 | 828 | 22 | 812 | 32 | 769 | 23 | -8 | 0.0037 | 821 | 19 | 0.18 |
| ZR9 | 29.3913 | 1.3656 | 9.77 | 0.14053 | 6.44 | 0.66 | 0.0705 | 7.35 | 848 | 55 | 874 | 85 | 942 | 69 | 10 | 0.0091 | 856 | 49 | 0.51 |
| ZR10N | 35.1401 | 1.3199 | 9.37 | 0.14104 | 5.31 | 0.57 | 0.0679 | 7.73 | 851 | 45 | 854 | 80 | 865 | 67 | 2 | 0.0013 | 851 | 41 | 0.57 |
| ZR10B | 48.1802 | 1.3466 | 6.56 | 0.14650 | 4.32 | 0.66 | 0.0667 | 4.94 | 881 | 38 | 866 | 57 | 827 | 41 | -7 | 0.0059 | 875 | 33 | 0.58 |
| ZR11N | 75.0474 | 1.1787 | 4.10 | 0.12191 | 2.52 | 0.61 | 0.0701 | 3.23 | 742 | 19 | 791 | 32 | 932 | 30 | 20 | 0.0002 | 750 | 35 | 0.88 |
| ZR11B | 78.1162 | 1.3432 | 4.27 | 0.14029 | 2.88 | 0.67 | 0.0694 | 3.15 | 846 | 24 | 865 | 37 | 912 | 29 | 7 | 0.0006 | 853 | 22 | 0.69 |
| ZR | 27. | 0.95 | 8. | 0.10 | 4. | 0. | 0.06 | 7 | 653 | 3 | 680 | 5 | 771 | 5 | 15 | 0. | 6 | 3 | 1.2 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 8114 | 40 | 66 | 664 | 82 | 56 | 49 | .19 | | 1 | | 9 | | 5 | | 0232 | 56 | 0 | 5 |
| ZR 13 | 21.3804 | 1.2684 | 8.23 | 0.13839 | 4.33 | 0.53 | 0.0665 | 7.00 | 836 | 36 | 832 | 68 | 821 | 57 | -2 | 0.0300 | 835 | 33 | 0.83 |
| ZR 14 N | 20.1691 | 1.2079 | 10.56 | 0.12914 | 6.13 | 0.58 | 0.0678 | 8.60 | 783 | 48 | 804 | 85 | 864 | 74 | 9 | 0.0320 | 787 | 44 | 0.73 |
| ZR 14 B | 26.9646 | 0.7000 | 12.51 | 0.08118 | 10.74 | 0.86 | 0.0625 | 6.41 | 503 | 54 | 539 | 67 | 693 | 44 | 27 | 0.0439 | 517 | 100 | 0.13 |
| ZR 15 | 50.7441 | 1.2670 | 3.97 | 0.13645 | 3.30 | 0.83 | 0.0673 | 2.20 | 825 | 27 | 831 | 33 | 848 | 19 | 3 | 0.0052 | 830 | 22 | 1.37 |
| ZR 16 | 45.5011 | 1.2513 | 5.47 | 0.13431 | 2.77 | 0.51 | 0.0676 | 4.71 | 812 | 23 | 824 | 45 | 855 | 40 | 5 | 0.0029 | 814 | 21 | 0.64 |
| ZR 17 | 27.3255 | 1.5899 | 11.71 | 0.13365 | 7.57 | 0.65 | 0.0863 | 8.93 | 809 | 61 | 966 | 113 | 1344 | 120 | 40 | 0.0188 | 815 | 100 | 0.57 |
| ZR 18 | 33.0069 | 1.1541 | 7.20 | 0.11942 | 4.37 | 0.61 | 0.0701 | 5.72 | 727 | 32 | 779 | 56 | 931 | 53 | 22 | 0.0099 | 735 | 59 | 0.58 |
| ZR 19 N | 120.6063 | 1.2836 | 4.72 | 0.13426 | 2.06 | 0.44 | 0.0693 | 4.24 | 812 | 17 | 838 | 40 | 909 | 39 | 11 | 0.0032 | 815 | 16 | 0.59 |
| ZR 19 B | 91.5051 | 1.1954 | 3.82 | 0.13136 | 1.90 | 0.50 | 0.0660 | 3.31 | 796 | 15 | 798 | 30 | 806 | 27 | 1 | 0.0034 | 796 | 14 | 0.35 |
| ZR 20 N | 65.2161 | 1.2984 | 4.56 | 0.13706 | 3.31 | 0.73 | 0.0687 | 3.13 | 828 | 27 | 845 | 39 | 890 | 28 | 7 | 0.0045 | 836 | 24 | 0.68 |
| ZR 20 B | 45.4293 | 1.1284 | 7.58 | 0.12322 | 4.75 | 0.63 | 0.0664 | 5.91 | 749 | 36 | 767 | 58 | 819 | 48 | 9 | 0.0133 | 753 | 33 | 0.06 |
| ZR 21 N* | 65.7096 | 0.8220 | 7.34 | 0.09132 | 5.88 | 0.80 | 0.0653 | 4.38 | 563 | 33 | 609 | 45 | 783 | 34 | 28 | 0.0027 | 576 | 62 | 0.05 |
| ZR 21 B | 77.0101 | 0.9203 | 5.18 | 0.10593 | 3.10 | 0.60 | 0.0630 | 4.15 | 649 | 20 | 663 | 34 | 708 | 29 | 8 | 0.0076 | 651 | 19 | 0.04 |
| ZR 22 | 90.8447 | 1.1323 | 7.78 | 0.12456 | 6.60 | 0.85 | 0.0659 | 4.11 | 757 | 50 | 769 | 60 | 804 | 33 | 6 | 0.0024 | 767 | 42 | 0.04 |
| ZR 23 | 192.1723 | 1.2870 | 3.48 | 0.13878 | 1.06 | 0.30 | 0.0673 | 3.31 | 838 | 9 | 840 | 29 | 846 | 28 | 1 | 0.0039 | 838 | 8 | 0.50 |
| ZR 24 N | 251.8186 | 1.2032 | 3.34 | 0.12864 | 2.51 | 0.75 | 0.0678 | 2.2 | 780 | 20 | 802 | 27 | 864 | 19 | 10 | 0.0049 | 790 | 17 | 0.57 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 0 | | | | | | | | | | | |
| ZR24B | 175.9142 | 1.2236 | 5.65 | 0.13552 | 1.47 | 0.26 | 0.0655 | 5.46 | 819 | 12 | 811 | 46 | 790 | 43 | -4 | 0.0039 | 819 | 11 | 0.36 |
| ZR25B | 79.1209 | 1.2531 | 5.33 | 0.13668 | 2.59 | 0.49 | 0.0665 | 4.65 | 826 | 21 | 825 | 44 | 822 | 38 | 0 | 0.0089 | 826 | 20 | 0.21 |
| ZR26N | 92.4958 | 1.2731 | 3.24 | 0.13878 | 1.88 | 0.58 | 0.0665 | 2.64 | 838 | 16 | 834 | 27 | 823 | 22 | -2 | 0.0015 | 837 | 14 | 0.55 |
| ZR26B | 263.3703 | 0.9628 | 5.33 | 0.10811 | 4.22 | 0.79 | 0.0646 | 3.26 | 662 | 28 | 685 | 37 | 761 | 25 | 13 | 0.0077 | 672 | 25 | 0.16 |

Table 15: U-Pb isotopic data (LA-ICP-MS) from sample SM-CMB-148 – Euclidelândia unit. *Spots excluded from the calculation.

| Samples | Unit | Sm ppm | Nd ppm | f Sm/Nd | $^{143}$Nd/$^{144}$Nd (m) | Erro (2s) | $^{147}$Sm/$^{144}$Nd (m) | time $_{(t)}$ Ma | $^{143}$Nd/$^{144}$Nd $_{(t)}$ | eNd$_{(i)}$ | eNd$_{(0)}$ | T$_{(CHUR)}$ | T$_{(DM)}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CAM-CMM-184B | AMP | 3.4 | 12.2 | -0.14 | 0.512860 | 0.000006 | 0.16920 | 630 | 0.512161 | 6.6 | 4.3 | -1.24 | 0.67 |
| SAP-CMM-159 | | 4.1 | 14.5 | -0.12 | 0.512809 | 0.000008 | 0.17250 | 850 | 0.511847 | 6.0 | 3.3 | -1.09 | 0.87 |
| SMM-CB-87 | | 3.0 | 8.5 | 0.09 | 0.513102 | 0.000005 | 0.21470 | 850 | 0.511905 | 7.1 | 9.1 | 3.87 | -0.03 |
| SM-CM-69 | SPC | 3.6 | 20.1 | -0.45 | 0.512083 | 0.000005 | 0.10816 | 850 | 0.511480 | -1.2 | -10.8 | 0.96 | 1.34 |
| SM-CM-70A | | 2.5 | 12.0 | -0.35 | 0.512518 | 0.000009 | 0.12757 | 850 | 0.511807 | 5.2 | -2.3 | 0.26 | 0.92 |
| SM-CM-70B | | 0.8 | 5.7 | -0.55 | 0.512255 | 0.000006 | 0.08886 | 850 | 0.511760 | 4.3 | -7.5 | 0.54 | 0.95 |
| CM-CB-85 | | 2.2 | 8.6 | -0.21 | 0.512629 | 0.000007 | 0.15557 | 856 | 0.511755 | 4.3 | -0.2 | 0.03 | 1.05 |
| CR-R-04SP | | 3.7 | 16.3 | -0.31 | 0.512471 | 0.000005 | 0.13570 | 850 | 0.511714 | 3.4 | -3.3 | 0.42 | 1.09 |
| SMM-CM-35 | | 4.3 | 19.8 | -0.33 | 0.512089 | 0.000006 | 0.13210 | 850 | 0.511352 | -3.7 | -10.7 | 1.30 | 1.68 |
| SMM-CMM-153 | | 5.4 | 23.2 | -0.29 | 0.512376 | 0.000008 | 0.14040 | 850 | 0.511593 | 1.0 | -5.1 | 0.71 | 1.32 |
| CT-CMM-177A | RNC | 1.0 | 4.4 | -0.27 | 0.512223 | 0.000005 | 0.14270 | 630 | 0.511655 | -3.3 | -8.1 | 1.07 | 1.55 |
| CT-CMM-177B | | 2.3 | 11.7 | -0.39 | 0.512199 | 0.000007 | 0.12090 | 630 | 0.511700 | -2.5 | -8.6 | 0.88 | 1.33 |
| SAP-SMM-179A | | 6.1 | 27.6 | -0.32 | 0.511949 | 0.000007 | 0.13320 | 630 | 0.511399 | -8.3 | -13.4 | 1.65 | 1.93 |
| SAP-SMM-179B | | 8.4 | 51.0 | -0.49 | 0.511836 | 0.000008 | 0.09990 | 630 | 0.511423 | -7.9 | -15.6 | 1.26 | 1.55 |
| SAP-SMM-179C | | 7.2 | 37.3 | -0.41 | 0.511909 | 0.000004 | 0.11610 | 630 | 0.511429 | -7.7 | -14.2 | 1.38 | 1.68 |
| SMM-CMM-172 | | 9.3 | 43.2 | -0.34 | 0.511931 | 0.000007 | 0.12980 | 630 | 0.511395 | -8.4 | -13.8 | 1.61 | 1.89 |

Table 16: Sm-Nd whole rock analytical data of the amphibolites, Serra da Prata and Rio Negro Complex.

| **Samples** | **Unit** | **Rb ppm** | **Sr ppm** | **$^{87}Sr/^{86}Sr$ (m)** | **Erro (2s)** | **Time $_{(t)}$ Ma** | **$^{87}Sr/^{86}Sr_{(t)}$** | **$^{87}Sr/^{86}Sr_{(t,CHUR)}$** |
|---|---|---|---|---|---|---|---|---|
| CAM-CMM-184B | AMP | 5.0 | 474.0 | 0.70322 | 0.000008 | 630 | 0.70320 | 0.70442 |
| SAP-CMM-159 | | 4.0 | 235.0 | 0.70464 | 0.000006 | 850 | 0.70458 | 0.70440 |
| SMM-CB-87 | | 5.0 | 91.0 | 0.70423 | 0.000007 | 850 | 0.70404 | 0.70440 |
| SM-CM-69 | SPC | 26.0 | 486.0 | 0.70882 | 0.000008 | 850 | 0.70864 | 0.70440 |
| SM-CM-70A | | 53.0 | 298.0 | 0.70957 | 0.000005 | 850 | 0.70895 | 0.70440 |
| SM-CM-70B | | 55.0 | 339.0 | 0.70905 | 0.000005 | 850 | 0.70848 | 0.70440 |
| CM-CB-85 | | 26.0 | 486.0 | 0.70523 | 0.000010 | 850 | 0.70504 | 0.70440 |
| CR-R-04SP | | 38.0 | 416.0 | 0.70647 | 0.000007 | 850 | 0.70615 | 0.70440 |
| SMM-CM-35 | | 45.0 | 330.0 | 0.71178 | 0.000009 | 850 | 0.71130 | 0.70440 |
| SMM-CMM-153 | | 69.0 | 422.0 | 0.70852 | 0.000009 | 850 | 0.70795 | 0.70440 |
| CT-CMM-177A | RNC | 70.0 | 362.0 | 0.71076 | 0.000008 | 630 | 0.71026 | 0.70442 |
| CT-CMM-177B | | 68.0 | 448.0 | 0.71016 | 0.000009 | 630 | 0.70977 | 0.70442 |
| SAP-SMM-179A | | 101.0 | 289.0 | 0.71940 | 0.000009 | 630 | 0.71850 | 0.70442 |
| SAP-SMM-179B | | 123.0 | 308.0 | 0.72017 | 0.000008 | 630 | 0.71914 | 0.70442 |
| SAP-SMM-179C | | 113.0 | 316.0 | 0.71933 | 0.000008 | 630 | 0.71841 | 0.70442 |
| SMM-CMM-172 | | 128.0 | 287.0 | 0.72225 | 0.000006 | 630 | 0.72110 | 0.70442 |

Table 17: Sr whole rock analytical data of the amphibolites, Serra da Prata and Rio Negro Complex.

| | Belt | Terranes/Unit | Juvenile Arcs | Evolved Arcs | |
|---|---|---|---|---|---|
| **1** | Ribeira | Oriental terrane: Rio Negro and Serra da Prata Arcs | 860-790<br>760-620 | 640-620 | This work. T |
| **2** | Araçuaí-Ribeira | Internal Domain / Paraíba do Sul terrane: Rio Doce and Serra da Bolívia arcs | 650-585 | 635-595 | Pedrosa S |
| **3** | Southern Ribeira | Socorro Arc and magmatic rocks of the Embú terrane | | 760-620 | Hacksp |
| **4** | Kaoko | Coastal terrane | | 625 | Goscom |
| **5** | Dom Feliciano | Pelotas Batolith | | 670-620 | Hart |
| **6** | São Gabriel | Passinho and Vila Nova arcs | 900-850<br>800-700 | | Bab |
| **7** | Southern Brasília | Guaxupé and Anápolis Itauçu | | 690-625 | Valeri |
| **8** | Northern Brasília | Mara Rosa | 900-760 | 660-600 | Pimentel |
| **9** | Sergipano | | | 640-620 | |
| **10** | NE system | Martinópole and Santa Quitéria | 870-850 | 640-620 | Brito Neve |
| **11** | Central Africa | Granitoids and Diorites | | 660-580 | |
| **12** | Eastern African System | Arabian-Nubian shield intra-oceanic arcs | 890-710<br>760-650<br>680-640 | 640-580 | Fritz et al.,<br>Ku |
| **13** | EAS/Madagascar | | | 804-776 | |
| **14** | Transaharan (Hoogar Dahomey) | Iskel. Ouguda and Iforas. Tilemsi-amalaoulaou. | 868-740<br>690-650 | 650-620 | |
| **15** | West African orogens Rockelides. Bassarides and Mauritanide blets | | | 620-580 | |

Table 18: Summary of the Neoproterozoic reported magmatic arcs of Western Gondwana. Classified according age and isotopic signature.

**Highlights**

- New U-Pb, Sm-Nd and Sr isotopic data of a Juvenile Tonian Arc (Serra da Prata) at the Ribeira belt, SE-Brazil.

-The Serra da Prata complex represents the oldest pre-collision interval of arc-related rocks described for the Ribeira belt until now.

-The associated marbles and MORB to IAT amphibolites are suggestive for a primitive intra-oceanic setting, followed by a cordilleran setting, finally culminating with the collision of the magmatic arc onto the São Francisco Margin.

- In the Western Gondwana Scenario, the arc-related rock together with few ophiolites suggests large oceanic space between the cratonic blocks.