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GEOLOGY, AIRBORNE GEOPHYSICS AND GROUND GRAVITY OF THE CENTRAL GRABEN OF ÁGUA BONITA, BRAZIL

Diogo Luiz Orphão de Carvalho[1], Roberta Mary Vidotti[2], José Oswaldo de Araújo Filho[3] and Paulo Roberto Meneses[4]

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ABSTRACT. For over half a century geophysical data is an important auxiliary tool used in geosciences research. Among other features, these products facilitate the discrimination of structural features, aid the characterization of subsurface geological bodies and allow the delimitation of areas with corresponding geophysical and geological data. The Água Bonita Graben (GAB), which straddles the border of Goiás and Tocantins states, was defined in the mid-60s as an 80-km long by 7-km wide structure, with parallel, straight borders towards N35-40°E. This paper presents an interpretation of the geophysical data obtained by the the Geophysical Survey Brazil-Canada (Programa de Levantamentos Geofísicos Brasil-Canadá, PGBC), as well as acquisition and interpretation of ground gravity data aiming at improving the geological knowledge of the Água Bonita Graben, situated in the Transbrasilian Lineament. The PGBC geophysical data allowed the extraction of lineaments and geophysical delineation of the GAB limits. The 2D model suggests that the Água Bonita Graben leans to the west, due to the observed low gravity anomaly values and inclined detrital sedimentary sequences dipping 8°-12°, in the direction 300° to 330°, suggesting that the depocenter of the Água Bonita Formation is nearby the western edge of the graben.

Keywords: ground gravity, Água Bonita Graben, Transbrasilian Lineament.

RESUMO. Há mais de meio século a utilização de dados geofísicos representa importante ferramenta auxiliar nas pesquisas em geociências. Dentre outras características, tais produtos facilitam a discriminação de feições estruturais, ajudam a caracterização de corpos geológicos em subsuperfície e permitem a delimitação de domínios geofísicos com correspondentes geológicos. O *Graben* de Água Bonita, localizado nos estados de Goiás e Tocantins, foi definido na metade da década de 60 do século XX como uma estrutura de 80 km por 7 km, com bordas paralelas e retilíneas de direção N35-40°E. O conhecimento desta estrutura restringe-se ao mapeamento geológico, inexistindo dados em profundidade. O presente trabalho trata da interpretação de dados aerogeofísicos do Levantamento Geofísico Brasil-Canadá (PGBC); aquisição e interpretação de dados gravimétricos terrestres visando contribuir ao conhecimento geológico-estrutural do *Graben* de Água Bonita, situado no contexto do Lineamento Transbrasiliano. A interpretação qualitativa e quantitativa dos dados geofísicos e geológicos originada de modelagem 2D, sugere que o *Graben* de Água Bonita inclina-se para oeste, devido às baixas anomalias e ao mergulho das sequências sedimentares detríticas. Esta inclinação evidencia que o depocentro da Formação Água Bonita localiza-se a aproximadamente 4 km de profundidade a oeste do limite superficial desta Formação.

Palavras-chave: gravimetria terrestre, *Graben* de Água Bonita, Lineamento Transbrasiliano.

[1]HCGN 715, Bloco G, Casa 39, Asa Norte, 70770-707 Brasília, DF, Brazil. Phone: +55(61) 3349-4630/81589182 – E-mail: orphao@gmail.com

[2]Instituto de Geociências, Universidade de Brasília, Campus Universitário Darcy Ribeiro, 70910-900 Brasília, DF, Brazil. Phone: +55(61) 3107-6985; Fax +55(61) 3272-4286 – E-mail: roberta@unb.br

[3]Instituto de Geociências, Universidade de Brasília, Campus Universitário Darcy Ribeiro, 70910-900 Brasília, DF, Brazil. Phone: +55(61) 3307-2433; Fax +55(61) 3272-4286 – E-mail: oswaldo@unb.br

[4]Instituto de Geociências, Universidade de Brasília, Campus Universitário Darcy Ribeiro, 70910-900 Brasília, DF, Brazil. Phone: +55(61) 3307-2433; Fax +55(61) 3272-4286 – E-mail: pmeneses@unb.br

INTRODUCTION

The existence of a graben in Ilha do Bananal was suggested in the mid-60s, (Barbosa et al., 1981). From photointerpretation during the Brasilia Project, Baptista & Cartner-Dyer (1966) observed an extensive region with different morphological and textural aspects as compared to the regional morphologies dominating the geological map sheetsof Porangatu, Araguaçu and São Miguel do Araguaia. Later on, these authors confirmed the existence of such structure during fieldwork and named it Água Bonita Graben (GAB). GAB is described as an elongated, 80-km wide and 7-km long structure towards the N35-40°E that straddles Tocantins and Goiás states, between the municipalities of Araguaçu (TO) to the west and Novo Planalto (GO) to the east (Fig. 1).

The study area has few rocky outcrops due to weathering, which develops extensive lateritic and sandy covers that often hide the geological contacts and fault surfaces. The mapped lithotypes belong to three tectonic compartments: Mara Rosa Magmatic Arc, consisting of orthogneiss and amphibolites of the Complexo Rio dos Mangues; Araguaia Belt, represented by quartz-biotite-muscovite schist and biotite-muscovite paragneiss of Xambioá Formation; and Água Bonita Formation consisting mainly of sandstones and interleaved siltstones deposited on the Água Bonita Graben. Mylonitic rocks were mapped in shear zones that delimit the study site mainly on the western edge of the Água Bonita Graben (Fig. 1). Possible restricted lenses of mafic and ultramafic rocks interleaved with quartzite-mylonites have been described near the eastern edge (Carvalho, 2011).

The Água Bonita Graben is a not well-known structure, besides its great geological relevance, related to a possible reactivation of the Transbrasilian Lineament (Schobbenhaus et al., 1975). Currently, the characterization of this structure, including the definition of its structural limits, is restricted to the regional geological maps and there is no information on the geometry of the Água Bonita Graben subsurface. Therefore, this work aims at improving the geological knowledge of the Água Bonita Graben by interpreting the airborne geophysical and gravimetric data and integrating the results with the geological data.

The 1,170 km^2 study area is rectangular, E-W elongated and located in the central portion of the Água Bonita Graben limited by the coordinates 12°51'S, 13°07'S, 49°56'W and 49°34'W, having as reference the city of Araguaçu, Tocantins State. The study area is located inside thetopographic maps of Araguaçu (SD-22-X-A-VI) and Novo Planalto (SD-22-X-C-III) at 1:100,000 scale (Fig. 1).

METHODOLOGY

The first part of the work consisted of processing and interpreting the airborne geophysical data from the Brazil-Canada Geophysical Survey, PGBC from 1975. The data resulted from the agreement between the Ministry of Mines and Energy of Brazil (MME) and the Canadian International Development Agency (CIDA) to survey the mineral resources present in the Midwest region of Brazil, between the latitudes 5°S and 16°S and longitudes 48°W and 51°W. Aeromagnetometric and aerogamma-ray spectrometry data were acquired by along N-S flight lines spaced 2 km and E-W tie lines spaced 14 km. The PGBC covered an area of 780 thousand km^2, divided into three blocks (DNPM, 1981; Blum, 1999). The PGBC data were processed to generate magnetometry and gamma-ray spectrometry products. Originally these data are divided according to the topographical scale of 1:100,000 in the topographical map sheets of Araguaçu (SD-22-X-A-VI) and Novo Planalto (SD-22-X-C-III) (Fig. 1). The data were processed using the software Oasis Montaj® from Geosoft® (GEOSOFT, 2008). The anomalous magnetic field data were used to calculate power spectrum and Euler deconvolution in order to locate the magnetic sources.

The second part of the work consisted of acquiring, processing and interpreting ground gravity data to complement the geophysical characterization of the Graben. The gravity survey lasted 12 days and 147 stations were obtained on unpaved roads that cross the structure. The gravimetric readings were performed using a Lacoste & Romberg G613 gravity meter with a DGPS system and RTK Hiper Lite+ Topcon receiver. The gravity data generated the free-air and Bouguer anomaly maps, which are very similar since this is a region of small topographic variation. The acquired data were integrated with the pre-existing gravity stations of the area. The depth of the gravimetric anomalies were determined by the power spectrum along the main gravity profile. Finally, a 2D gravity model of the central Água Bonita Graben was built.

Study site geology

Outcrops of orthogneisses were mapped in the northeastern and most eastern portion of the study area as decametric rocky pavements with rounded edges or as metric boulders (Fig. 1). This lithotype, whose composition varies between monzogranite and granodiorite, is not easily differentiated from other lithotypes of the Rio dos Mangues Complex in geophysical and remote sensing products. Metamorphic foliation strongly folded with centimetric felsic and mafic bands was also observed in a decametric

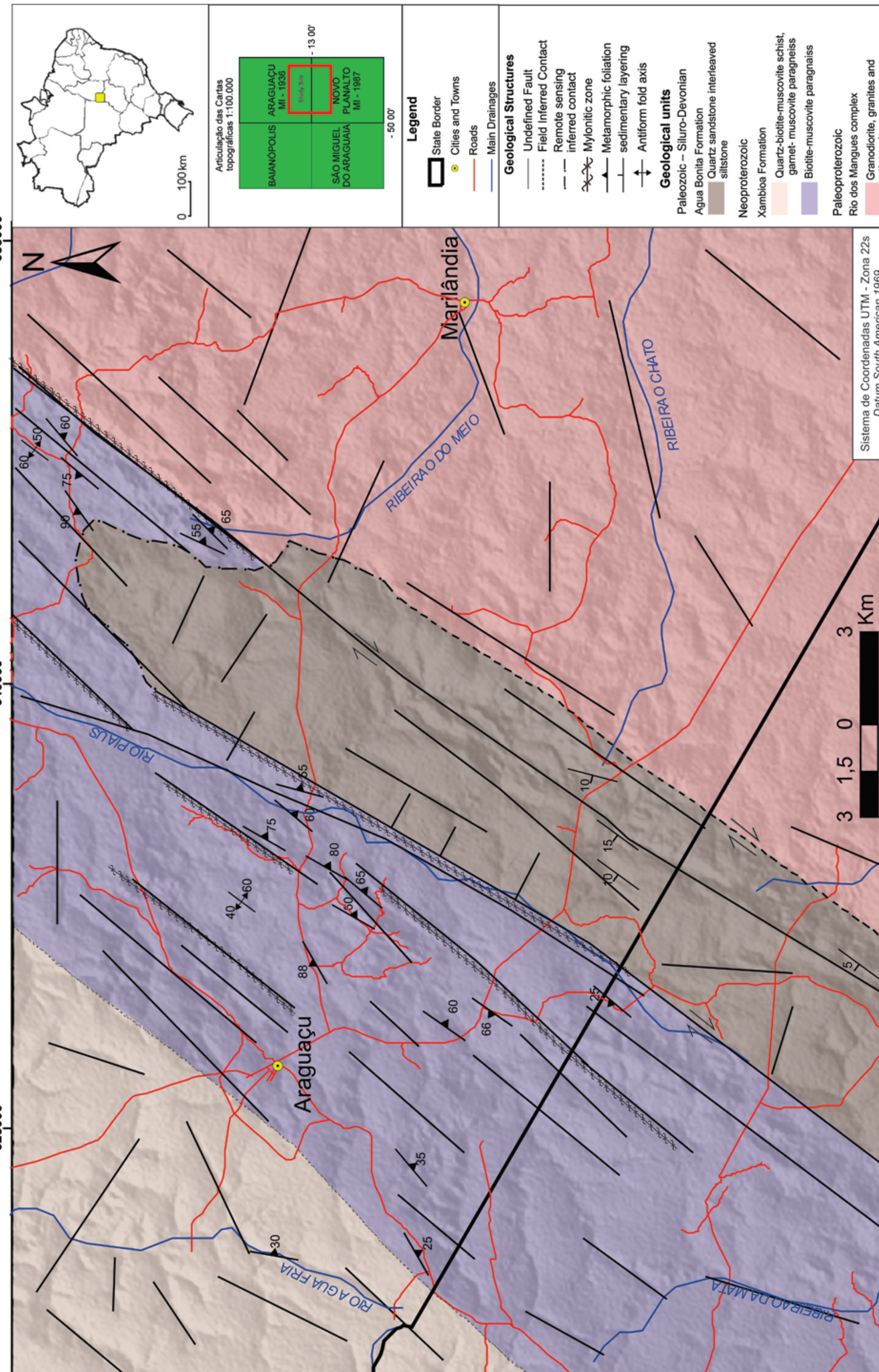

Figure 1 – Geological map of the study area, central portion of Água Bonita Graben (Carvalho, 2011).

outcrop at the southern entrance of Marilândia town. Amid the banding, quartz and plagioclase crystals are rotated or stretched parallel to the band boundaries. Transposition fractures and faults cut the rock at a high angle. Hornblendite and hornblende granodiorite blocks of a dark brown color, phaneritic texture, medium grained, associated with extensive lateritic cover occur locally, near the eastern edge of the Água Bonita Graben. Nematoblastic texture marked by orientation of hornblende prisms predominates. Grains of quartz and plagioclase crystals indicate dynamic recrystallization forming strands and strong mineral fabric orientation. It is assumed that pure shear dominates locally, since there were no kinematic indicators of simple shear.

Deformed rocks classified as quartz-biotite-muscovite, garnet-biotite-muscovite and graphite schists to a lesser extent were mapped on the western edge of the site (Fig. 1). The best preserved outcrops were seen along GO-164 highway that connects Araguaçu to São Miguel do Araguaia. Leaving the highway, heading west by an unpaved road there is a small hill with quartz schist outcrops at the base. As quartz concentration drastically decreases going up the hill, weakly quartzose biotite-muscovite-schist crops out at the top.

Banded rocks, probably from sedimentary protoliths, were mapped in the NE-SW strip located between the schists of Formação Xamboá and the mylonitic zones along the edge of Água Bonita Graben (Fig. 1). The drainage pattern and the structural lineaments are in contrast with adjacent geological units. This lithotype rich in phyllosilicates, mainly muscovite and biotite, is classified as biotite-muscovite paragneiss with metric to decametric outcrops along the roadsides , drainages and nearby Serra do Clemente, located on the north of the study site. The best outcrop of this biotite-muscovite paragneiss is found in a farm pasture near GO-164 highway, that connects Araguaçu to São Miguel do Araguaia. It is characterized as mesocratic, medium grained and centimetric banding defined by dark segregation levels, rich in biotite and muscovite, as well as light colored bandings containing quartz and plagioclase.

Água Bonita Formation (FAG) occurs over a NE-SW strip of approximately 198 km^2, in the central part of the study site (Fig. 1). It crops out in tabular banks, weathered and friable, which hinders the occurrence of well-preserved rocky outcrops. The only lithotype identified in Água Bonita Formation was the white colored quartz sandstone, poorly selected and often interspersed with siltstone. Preserved rocky outcrops are difficult to find, and the sandy weathered covers are exploited by small local miners. The region occupied by Água Bonita Formation is clearly distinguished by the morphological texture and low drainage density. On the other hand, this distinction is not clear in the gamma-ray spectrometry images due to the acquisition scale and noisy data.

Muscovite-quartzite mylonite outcrops occur along kilometric shear zones mainly in NE-SW direction throughout the study area (Fig. 1). These faults probably caused by the reactivation of Brasiliano faults, delimit the edge of the Água Bonita Graben. The geophysical products and satellite images show that the region near the boundary of the Graben is characterized by structural and geophysical lineaments in the approximate N30°E direction. In the field, it was observed that the vast majority of these structures originated mylonites.

Airborne geophysics

Magnetometry

The original data display the Total Magnetic Intensity (TMI), where the IGRF (International Geomagnetic Reference Field) has already been removed. The TMI data were interpolated using a 500 m cell, corresponding to 1/4 of flight line spacing applying a Bigrid method, to create the Total Magnetic Intensity (TMI) grid. The Bigrid interpolation method was more efficient than the minimum curvature method, also tested in this study. The chosen method has an efficient algorithm to correct the data line by line and to interpolate by cubic spline both along and through the flight lines. The next step included micro-leveling the data, whose objective is to improve the signal by filtering the noise in a direction coincident with the flight lines (N-S). The first order derivatives were generated in three directions, horizontal (DX and DY) and vertical (DZ). Subsequently, the module of the intensity of the residual magnetic field vector was calculated to generate the analytic signal (AS). The horizontal derivatives were used to determine Horizontal Gradient (HD), which represents the lateral rate change and enhances geological contacts. Lastly, the Tild Derivative (TILT) was generated, which is the angle formed between the amplitude of the analytic signal vector and its horizontal projection, to estimate the dip angle of the magnetic source. Figure 2a shows the flowchart of the products generated using the magnetic data.

Gamma-ray spectrometry

The processing of airborne gamma-ray spectrometry data started by data interpolation using the minimum curvature method that resulted in matrix files for the elements K, U and Th. The main feature of this method is the ability to convert the data into a smoothed surface as close as possible to the original values. K, U and Th individual images are used to compare the relative amounts of these elements, to analyze the spatial distribution of

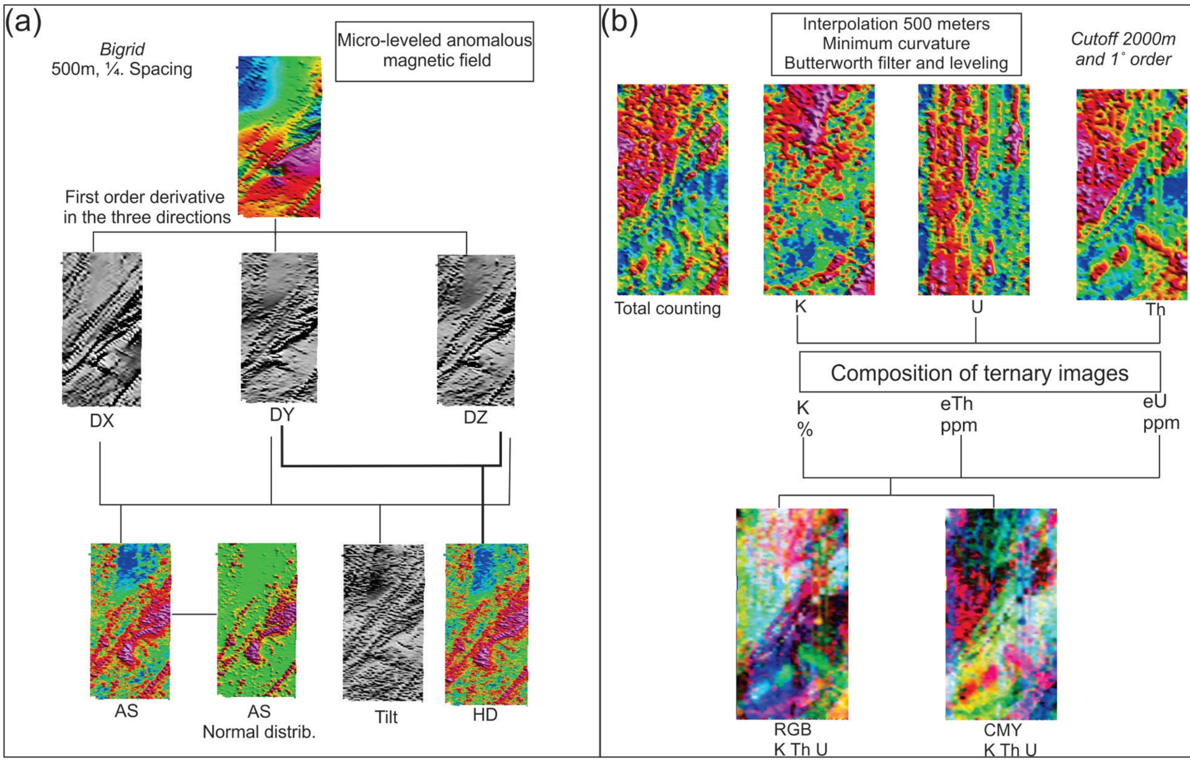

Figure 2 – Schematic flowchart for processing airborne geophysical data, (a) magnetometry (b) gamma-ray spectrometry.

each element and to compare it with the regional geomorphology, since K and U are more mobile than Th when submitted to weathering and erosive conditions (Blum, 1999; Ferreira & Souza, 2002). Preliminary analysis of the data demonstrated the need for leveling, which was performed by analyzing the Uranium and Thorium channels data, line by line. After interpolation on regular grid, the Butterworth filter (cutoff 2000 m and 1st order) was applied. Finally, ternary false RGB and CMY color compositions were generated. Figure 2b shows the flowchart of the products generated using the gamma-ray spectrometry data.

Qualitative interpretation of geophysical data

The interpretation included the extraction of geophysical lineaments and discrimination of gamma-ray spectrometry and magnetic fields. The magnetic lineaments (Fig. 3a) were plotted based on the products derived from the magnetic field: DZ, AS and HD (e.g. Silva et al., 2003). These lineaments may be grouped into three orders according to their shape and azimuth orientation: 1st order, are rectilinear to sub-curvilinear, approximately E-W; 2nd order, rectilinear and N35E oriented; and 3rd order, curvilinear with NE-SW and NW-SE orientation. The 1st order lineaments are found mainly to the west of the Água Bonita Graben; with lengths from 7 to 13 km and occupy the region dominated by Xambioá Formation rocks. The 2nd order lineaments have between 11 and 70 km of lengths, and are interpreted as components of the Transbrasilian lineament that delimits the west and east boundaries of the Água Bonita Graben. The 3rd order lineaments are between 24 and 7 km long and intercept the oldest rocks in the region, located to the west of the Graben. The latter group is truncated by the 2nd order lineaments on the eastern edge of the Graben, indicating that their formation precedes the other two (Fig. 3a).

Six magnetic domains, M1 to M6, were plotted using the TMI and AS (e.g. Silva et al., 2003; Ruy et al., 2006). The main parameters used to delimit these domains were lineament direction, topography and amplitude of magnetic anomalies. According to the the amplitude, the domains are described as: (M1) low, (M2) average, (M3) average to high, (M4) low to average, (M5) high to average, (M6) high. A discrepancy was observed between M4 domain and the boundary of the Água Bonita Formation, which may represent the orientation of sedimentary rocks of the Formation in the subsurface.

The gamma-ray spectrometry interpretation used mainly the Th map to extract the lineaments and the ternary RGB and CMY images to delimit the domains (Fig. 3c and 3d) (e.g. Silva et al., 2003; Ruy et al., 2006). The Th map was used because this element is less mobile compared to K and U in weathering

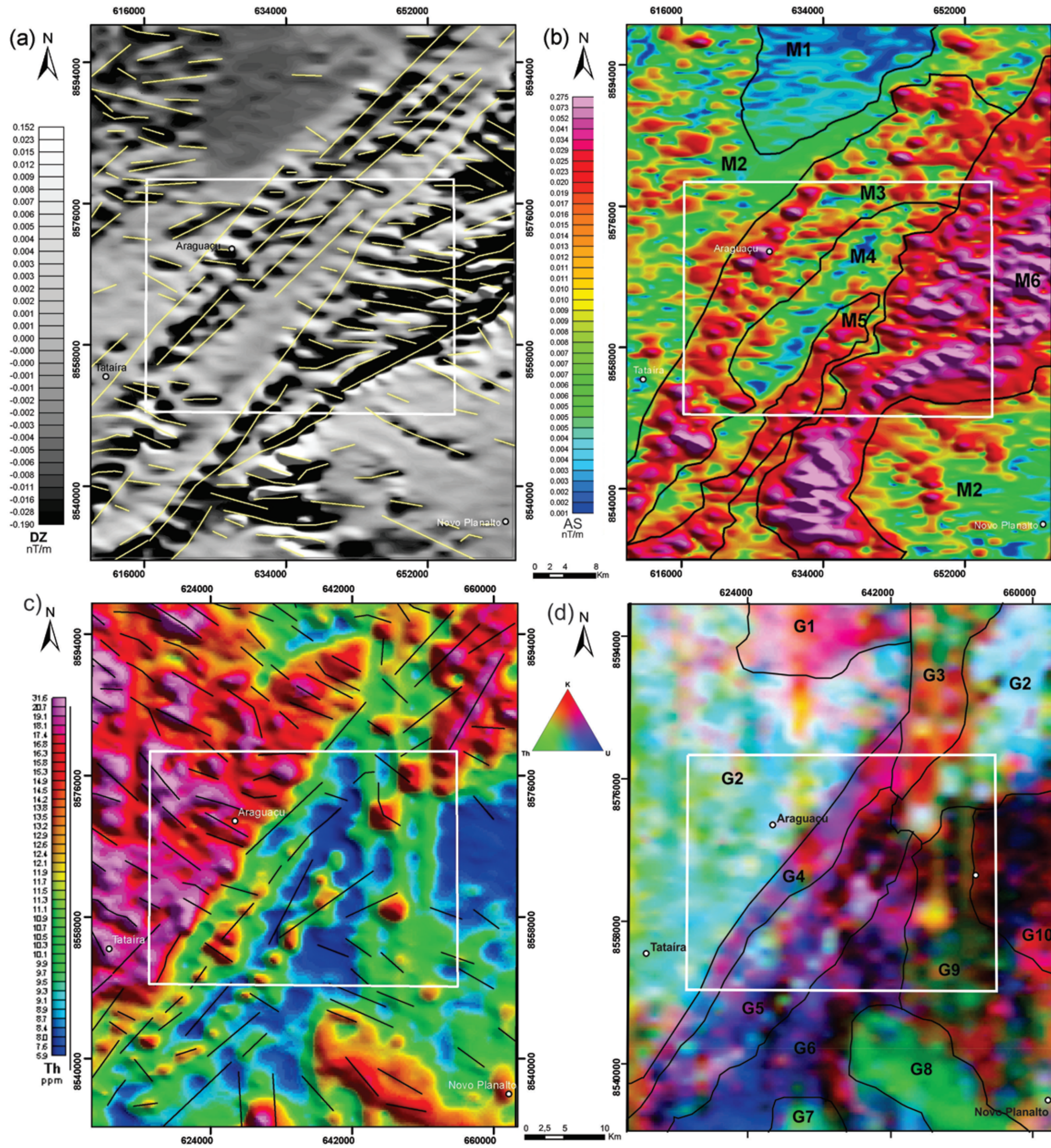

Figure 3 – (a) Vertical derivative – DZ and magnetic lineaments. (b) Analytical Signal Amplitude with six magnetic domains. (c) Image of Th element with lineaments, and (d) ternary RGB image showing the ten gamma spectrometric domains. The white lines show the study area.

conditions (Blum, 1999). The gamma-ray spectrometry lineaments are approximately 10 km long and delimit the western edge of the Água Bonita Graben, (Fig. 3c). These geophysical products provide superficial data of the Earth's crust; therefore, these lineaments may represent fractures mapped in the field. From the lineaments and ternary images, ten gamma-ray spectrometry domains were defined (G1 to G10), which are approximately coincident with the units identified in the geological map (Fig. 3d). The domains were described according to radiance intensity of the three elements as: (G1) high K, low U, low Th; (G2) high K, high U, high Th; (G4) average K, average U, low Th, (G5) average K, average U, average Th; (G6) average K, high U, low Th; (G7) low K; high U, high Th, (G8) low K, low U, high Th; (G9) low K, low U, average Th; and (G10) high K, average U, low Th.

The G3 domain was individualized, but it is unclear whether its response results from gamma-ray radiation or from noise caused by the trend of the flight lines, which could not be completely eliminated even after micro-leveling the data. In general, the gamma-ray spectrometry domains coincide with the geological map of the region, in particular the G5 domain when compared to Água Bonita Formation (Fig. 3d). The major contribution of the gamma-ray spectrometry data is the separation of Xambioá Formation into two facies, schists and paragneiss, as seen in the geological map of Figure 1.

Depending on the quality and line of the PGBC airborne geophysical data, acquired in 1975, the products generated are compatible up to 1:250,000 scale. Even after rigorous processing, the data still show noises and trends along the acquisition lines, and therefore, its products should be analyzed with caution, especially the gamma-ray spectrometry products.

Acquisition and processing of gravity data

The ground gravity data were acquired using a Lacoste & Romberg G613 gravimeter. The altimetric data and location were obtained by the differential global positioning system (DGPS), with a Hiper Lite+ RTK receiver from Topcon®, configured to work with the Universal Transverse Mercator (UTM) system and datum WGS 1984. The equipment used belongs to the Institute of Geosciences, of the Universidade de Brasília. The survey was conducted along the four main unpaved roads that cross the Graben, in addition to secondary roads, totaling 147 stations. Measurements were performed every 800 meters approximately, along TO-181 highway, and every 1,500 meters on the other roads. The station 060379 of the Brazilian Fundamental Gravimetric Network (Brazilian National Observatory – ON) located in a schoolyard in Porangatu City; 65 km away from the study site was used as the reference gravity station. However, due to the distance, the gravimetric station was transferred to Raul de Jesus Lima Square, in Araguaçu City, and therefore was used as the base station for the survey. The study site already had 14 gravity stations established in the last decades during gravity surveys that took place in Central Brazil, involving numerous national research projects (Soares, 2005; Soares et al., 2006). The pre-processing of the gravimetric data, performed during the survey, included converting the readings to mGal, instrumental drift and tidal corrections. The tidal correction was performed using the software Tides from the School of Geology and Geophysics, University of Oklahoma (Ahern, 1993). After processing, the DGPS data showed horizontal and vertical precision of 0.9 and 2.5 cm, respectively, which were used to calculate the orthometric height. The gravity data were processed using the extension Gravity of the software Oasis Montaj, Geosoft®. Latitude or theoretical gravity was determined using the formula from 1967 (Blakely, 1996) and the density used to calculate Bouguer anomaly was 2.67 g/cm^3.

The Bouguer anomaly map was generated by integrating the pre-existing gravity stations (Soares, 2005; Soares et al., 2006) with those acquired in this work (Fig. 4). The gravity anomalies increased from west to east, while the gravity lows and highs occupy the midwest and the northwest region of the Graben, respectively. The Bouguer anomaly map shows an elongated gravity low parallel to the Água Bonita Formation boundary, oriented towards N35E, measuring approximately 16 km long and 5 km wide, with Bouguer anomaly values between −66 and −71 mGal, which may represent the depocenter of the Água Bonita Formation. The gravity high is also oriented towards NE-SW, measuring approximately 12 km long and 5 km wide and Bouguer anomaly values between −22 and −36 mGal, where the rocks of the Rio dos Mangues Complex occur. The gradient from high to low gravity anomalies is 1.82 mGal/km (Fig. 4).

The gravity station 15 (Fig. 4) was excluded from the modeling because its values were very different from the adjacent values, which was considered to be due to the topographic depression where it is located.

Integration of geophysical and geological data

Power spectrum data

Power spectrum calculation (Spector & Grant, 1970) main objective is to estimate the depth of potential anomalies by analyzing the graphs obtained using the software Oasis Montaj from Geosoft®. This procedure was performed for anomalous magnetic field data (PGBC).

The grid file of the anomalous magnetic field was first trimmed to include only the anomalies inside the study area. The depths of the magnetic anomalies ranged between 1 km and 3 km (Fig. 5), calculated by fitting straight lines to the radial power spectrum plot (Fig. 5) and subsequently, projecting them onto the depth estimating plot. This result may suggest the existence of a geological basement step along the trough of the Graben. Although there are inherent limitations to the method, this result was used as the initial parameter to build the two-dimensional (2D) gravity model due to the lack of other parameters and other data source.

Euler deconvolution

Euler deconvolution (Reid et al., 1990) is an algorithm for quantitative interpretation used to locate geophysical anomalies,

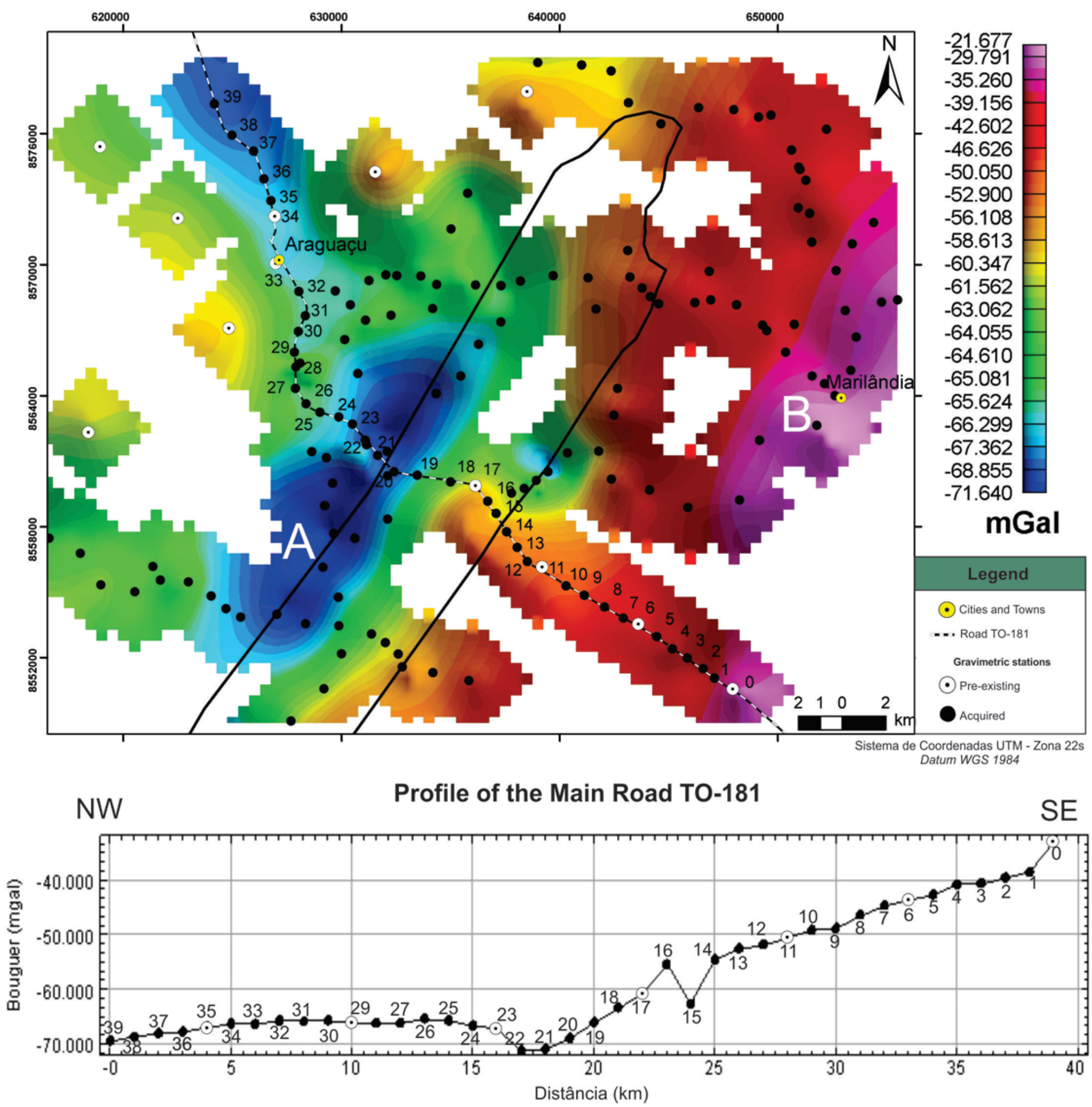

Figure 4 – Bouguer anomaly map resulted from the integration of pre-existing stations (white dots) and stations acquired in this work (black dots). Detail shows the stations along the TO-181 state highway. The black line shows the boundary of the Água Bonita Formation. (A) low gravity and (B) high gravity.

horizontally and in depth, according to the Euler homogeneity equation:

$$(x - x_0)\frac{\partial}{\partial x}T + (y - y_0)\frac{\partial}{\partial y}T + (z - z_0)\frac{\partial}{\partial z}T = -\eta T$$

where: T = regional field and η = structural index.

Euler deconvolution method does not assume any particular geological model, it is therefore, necessary to test different models in order to adequate the source to the real one (e.g. Correia et al., 2010). Tests varying the structural index, processed window source distance and depth tolerance must be carried out (GEOSOFT, 2008). This procedure was performed with the total magnetic intensity gravity and gravity data at the boundaries of the study site. However, only the results for the anomalous magnetic field were satisfactory, so the gravimetric data were discarded. We believe that this is due to the small number of gravimetric stations in the study area.

Euler deconvolution processing of the total magnetic intensity data combined 4 structural indices, values from 0 to 3, with window size 5 and 10. The best result was reached for structural

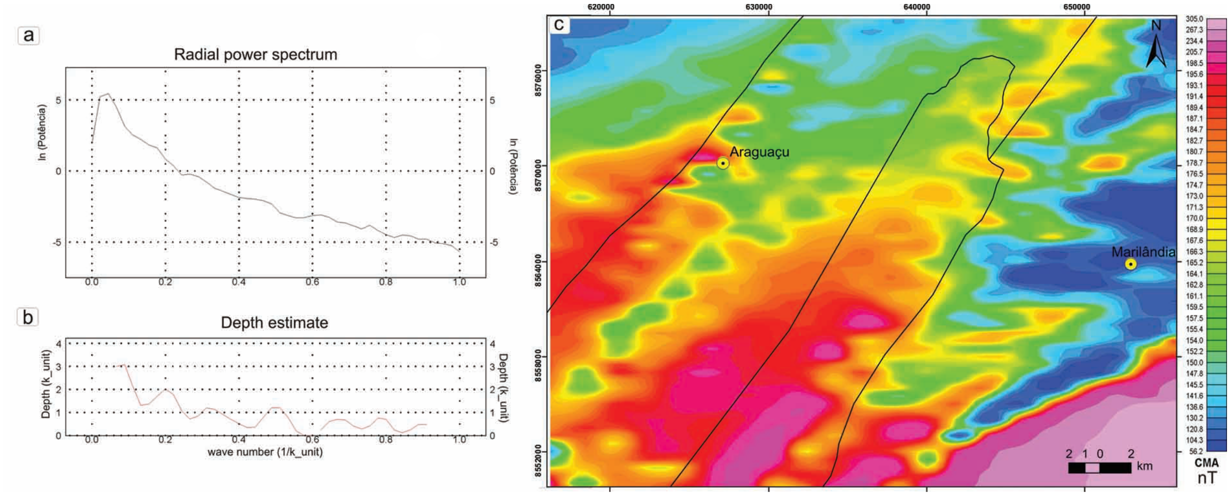

Figure 5 – Power spectrum of the anomalous magnetic field data. (a) Radially Averaged power spectrum diagram. (b) Depth Estimate diagram. (c) Map of the anomalous magnetic field in the study area. The result shows maximum depths of 3 km.

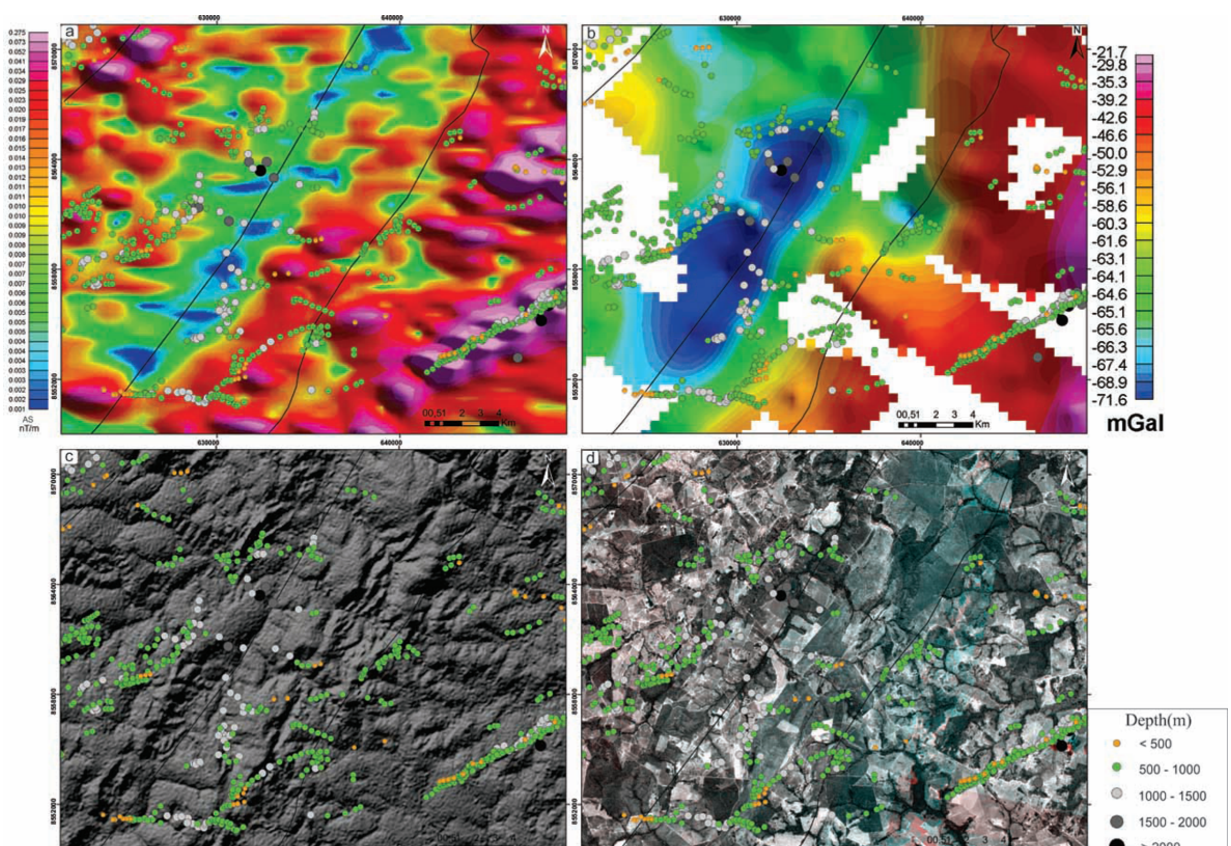

Figure 6 – (a) Analytic signal, (b) Bouguer anomaly map, (c) SRTM Image and (d) Alos satellite stereoscopic image. The colored dots are Euler deconvolution depth estimates. Black line indicates the Água Bonita Graben surface boundary.

index 1, window 10 and 20% tolerance. The located anomalies were divided into 5 categories according to their depths: smaller than 500 m, from 500 to 1000 m, from 1000 to 1500 m, from 1500 to 2000 m and greater than 2000 m.

This result, superimposed onto the maps of total magnetic intensity and Bouguer anomaly, shows that the boundary of Água Bonita Graben, in depth, is located to the west of the boundary determined by the geological map (Fig. 6a and 6b). Similarly, when overlapped to the SRTM and stereoscopic images from Alos satellite, it is verified that the result of Euler deconvolution follows structural lineaments with NE-SW orientation, parallel to the superficial boundary of the Água Bonita Graben (Fig. 6c and 6d).

Bi-dimensional modeling

The proposed 2D gravity modeling followed the methodology proposed by Talwani et al. (1959) in order to suggest a model to describe the geometry of the central Água Bonita Graben; therefore, the procedure was carried out along the gravity profile following the TO-181 (Fig. 4) highway. The 2D modeling represents Earth in only two dimensions, that is, the variations are restricted to depth (Z direction) and profile direction (X direction), while Y goes to infinity, and since the Graben is elongated and approximately five times longer in the Y direction compared to the X direction, the assumption was considered valid. The geological context was represented by two-dimensional bodies, whose density values were found in the literature (e.g. Luiz & Silva, 1995). The Moho discontinuity, in São Miguel do Araguaia region, to the south of the study site is located at approximately 40 km deep (Soares 2005).

In the 2D model, oriented from west to east, the lithotypes mapped in the field are represented by two-dimensional constant density geometric bodies: Orthogneisses and amphibolites of Rio dos Mangues Complex (2.86 g/cm^3); sandstones of Água Bonita Formation (2.30 to 2.76 g/cm^3); mylonitic rocks (2.82 g/cm^3) at the edge of the Graben; biotite-muscovite paragneisses (2.52 to 3.00 g/cm^3) and quartz-biotite-muscovite schists (2.80 to 3.00 g/cm^3) of the Xambioá Formation (Fig. 7). The Água Bonita Graben was represented as an asymmetric structure, whose deepest western portion reached approximately 4 km. This geological unit has, in addition to sandstone rocks, superficial sandstone wedges of lower density, which are seen as frequent sand accumulations in the Graben. The density of 2.9 g/cm^3 was attributed to the Graben's basement, greater than the density of Xambioá Formation and Rio dos Mangues Complex as well, which border the Graben to west and east, respectively. In the model, the fit of the calculated and measured curves resulted in an error of 1.754 mGal (Fig. 7).

DISCUSSION AND CONCLUSION

The combination of geological and geophysical data allows us to propose that the extensional structure was generated in a restricted environment, with an irregular edge, associated with the Transbrasilian lineament. This lineament resulted from the terminal collision between the Amazon and São Francisco Cratons, in the late Neoproterozoic and continued up to the Eo-Paleozoic. Based on the integration of the results, we suggest that the Água Bonita Graben is the result of a combination of pure and simple shear mechanisms, more simple than pure in restricted transtensional environment because the regional dip of detrital sedimentary sequences inside the Graben of 8°–12°, in the direction 300°–330° suggests that the Graben is slightly tilted to the NW. The bi-dimensional gravity model shows a depocenter to the West, approximately 4 km deep, suggesting that the Graben is asymmetric and more subsided on the W and SW portion. Thus, there is a depression/sinking greaterlarger depression in the W part and slight rotation or inclination of its axis towards NW. N60°W oriented neotectonic faults observed on the geophysical maps and mapped in the neighboring regions of the Água Bonita Graben cut both the Graben edges and trough, indicating a set of smaller blocks inside.

Despite the restriction of the airborne geophysical data; the noise, 2-km spacing between the flight lines, and the low density of gravity data covering the Graben; the interpretation presented in this paper provide the first contribution to the in-depth knowledge of this structure, further work should be pursued in the region to detail the interpretations and model discussed here.

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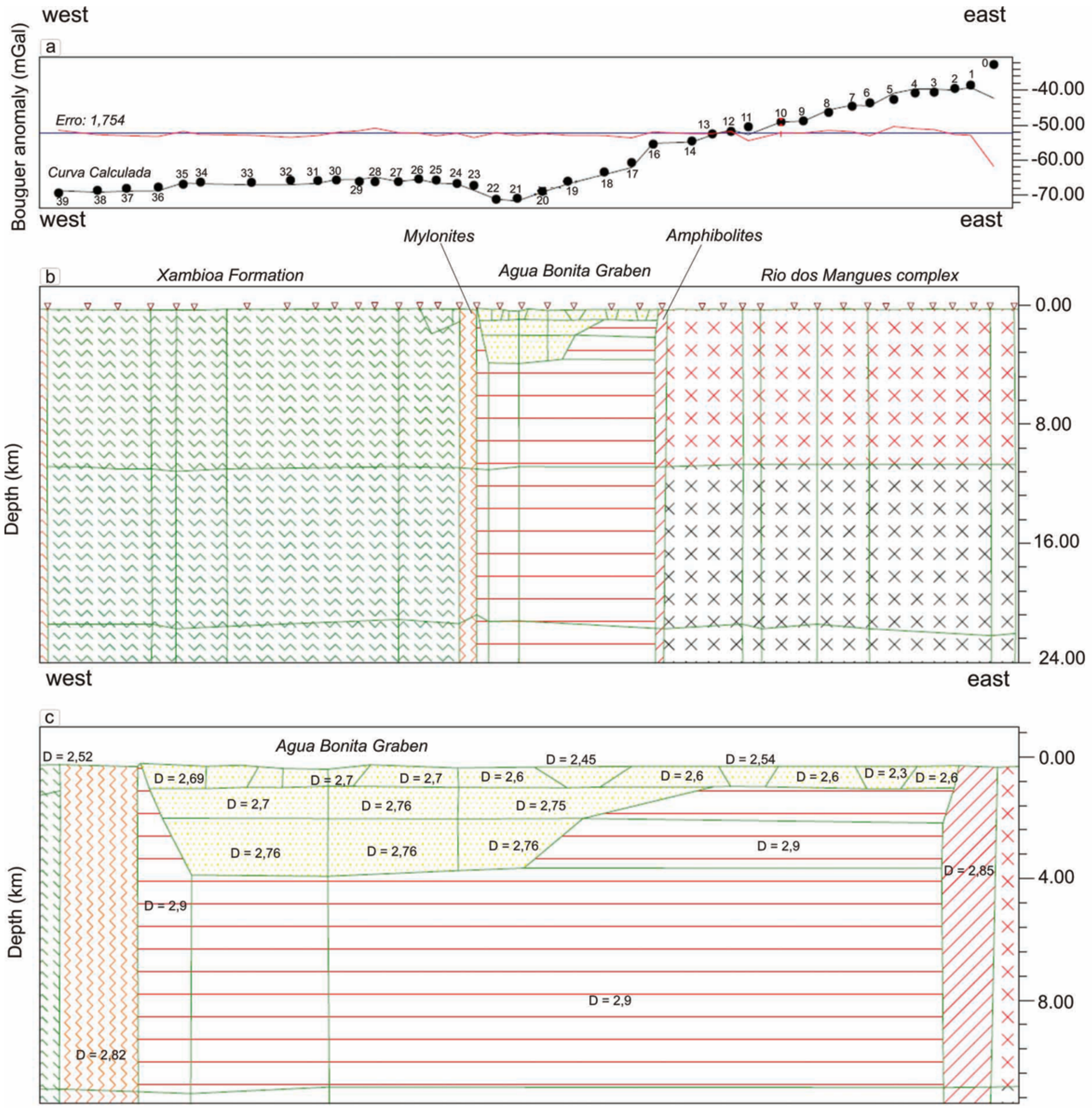

Figure 7 – (a) Observed Bouguer gravity data (black dots), calculated gravity anomaly (black line) and error curve (red line). (b) 2D model of bi-dimensional blocks representative of the geology of central Água Bonita Graben (c) detailed 2D model for the GAB with block density values (g/cm^3).

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NOTES ABOUT THE AUTHORS

Diogo Luiz Orphão de Carvalho. Graduated in Geologia (2008), M.Sc. in Applied Geosciences (2011) from Universidade de Brasília. Currently working in Mineral research at Vale S.A. Areas of interest are: mineral prospection, geological mapping, structural geology and land Gravimetry.

Roberta Mary Vidotti. Associate Professor at the Instituto de Geociências of Universidade de Brasília. Graduated in Geology at Universidade Federal Rural do Rio de Janeiro (1987), specialized in Geology and Marine Geophysics at Universidade Federal Fluminense (1987). M.Sc. in Geophysics from Observatório Nacional (1992) and Ph.D. in Geophysics at the University of Leeds (1997). Has experience in Applied Geophysics, with emphasis on gravimetric, magnetic and gamma-ray spectrometry methods applied to regional geology, geotectonic, sedimentary basins and mineral prospecting.

José Oswaldo de Araújo Filho. Associate Professor 4 at the Instituto de Geociências of Universidade de Brasília. Graduated in Geology at UFBA, 1967. Master of Science in Geology from the University of Georgia, Athens, GA, USA, 1975; Master of Philosophy in Geology (M.Ph.) at Columbia University in New York, USA, 1987 and Ph.D. in Geology at the University of Illinois, Urbana-Champaign, IL, USA 1999. Areas of interest are: Structural and Geotectonic Geology, Structural analysis, analysis of fracture applied to geology, micro-tectonic, origin and evolution of folded Proterozoic belts of central Brazil, georheology, sandbox deformation models.

Paulo Roberto Meneses. Professor at the Instituto de Geociências of Universidade de Brasília (2008). Graduated in Geology at Universidade de Brasília (1973), M.Sc. in Remote sensing at the Instituto Nacional de Pesquisas Espaciais (1977) and Ph.D. in Geosciences (Geochemistry and Geotectonics) at Universidade de São Paulo (1986). Has experience in the area of Geosciences, with emphasis in remote sensing, processing of multi and hyperspectral images, geological photointerpretation, environmental analysis.