

GEOLOGICAL, GEOPHYSICAL AND IMAGING DATA OF SÃO MIGUEL DO TAPUIO (SMT) ASTROBLEME, BRAZIL.

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Introduction: SMT is located on the eastern margin of the Parnaíba Paleozoic Basin in the NE Brazil, 5 km to the northwest of SMT village. Shatter cones, circular morphology and central uplift confirm that the structure is the result of a meteorite impact [1]. The precise age of the impact is not known, but the geological and sedimentary/statiographic evidences suggest a Carboniferous age. The structure is 25 km in diameter and consists of a collar of upturned sedimentary rocks of the Cabeças Formation surrounding a centrally uplifted core of similar geology. SMT is easily recognized by the deformation and erosion of the resistant Cabeças Formation sandstone, which is clearly visible in satellite imagery and radar.

Imaging data: A RGBI (3, 2, 1, 8 bands) image of Landsat 7 was constructed overlain on a 3D digital terrain model to study the morphology and the geometric character of the structure. The structure shows a strong circular pattern with the presence of two important concentric rings, where the main ring represents the central uplift zone. The external ring is separated of the inner ring by the presence of a plateau where the topographic high can reach 300m; the rocky group that forms the central uplift presents an average height of 500m and a diameter of 5 km. The whole diameter of the structure can reach 25km. Microscopic and mineralogical characteristics of shatter cones samples are barely evident however the macroscopic evidence is unquestionable.

Geophysics: The aerogeophysical survey was carried out in the eastern boundary of Parnaíba basin in 1988 [2]. The 53,900 km² covered area has been investigated using magnetometry, resulting in 23,385 line km of survey data. The dataset was collected on N-S flight lines with spacing of 3.0km, sample rate of 100m, and nominal survey elevation of 500m. The SMT airborne geophysical data was interpolated using the kriging method with 0.5km regular spacing. The magnetic map was filtered to eliminate high frequency noise due to the high sample rate along flight lines. The selected filter works in the frequency domain as a general strike-reject filter and rejects azimuthal trends [3]. The selected direction was the same as the N-S flight lines. As a result, the high frequency noise was seriously attenuated, yielding microlevelled grids. The SMT impact structure can be identified in the total magnetic field image. The aeromagnetic data shows two semi-circular patterns clearly observed in the eastern border of the structure. The outer and the inner semi-circular features are both represented by magnetic highs. The spatial distribution of the magnetics highs is coincident with the morphologic and geological characteristics observed in the remote sensing products. These patterns reflect the iron-rich sandstones bedding of Cabeças Formation. A gravity profile was conducted in SW-NE direction which defined a negative Bouguer anomaly nearly coincident with the SMT core.

References: [1] Castelo Branco, R.M.G. 1997. O astroblema de São Miguel do Tapuio, borda Leste da Bacia do Parnaíba: considerações geológicas e geofísicas. XVII SGNo, Bol. de Res. Exp., p.330-334. [2] Brasil. MME/CPRM, 1995. Catálogo Geral de Produtos e Serviços, Geologia, Aerogeofísica. RJ, 359 pp. [3] Cordell, L. *et.al.* 1992. U.S. Geological Survey Potential Field geophysical software V. 2.0, USGS, Open File Report 92-18.