

CONFIRMATION OF THE IMPACT ORIGIN OF THE SANTA MARTA CRATER, BRAZIL

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Introduction: An outstanding circular structure has been known for some time to occur in the southeastern portion of Piauí State, northeastern Brazil, centered at 45°14'W, 10°10'S. Its impact origin was first proposed by [1], who named it 'Gilbués', based solely on the interpretation of satellite remote sensing data. Subsequently, [2] renamed it as 'Santa Marta', as the structure is part of the homonymous mountain range and located quite far from the town of Gilbués. The structure has a slightly elongated shape, with a NE-SW major axis ~9.7 km long and NW-SE minor axis ~8.9 km; it has an elevated plateau in the central part that appears to be part of the central uplift. We present evidence of the impact origin of Santa Marta, based on the occurrence of macroscopic and microscopic shock features in sandstones and polymict breccias from the interior of the structure.

Geology of the Santa Marta Crater: Santa Marta is located in the domain of Parnaíba and São Francisco sedimentary basins. Stratigraphic units that occur at Santa Marta are related to the Piauí Fm. (Pennsylvanian) of the Parnaíba Basin, whereas the São Francisco Basin is represented by Urucuia and Areado groups, both Cretaceous. Three morpho-structural domains have been recognized: rim, annular basin and an irregularly shaped flat central plateau [3]. Strata of the Piauí Fm. (red sandstones with siltstones intercalations) occur in the NNE portion of the structure. Those belonging to the Urucuia and Areado groups (conglomerates, sandstones, red and purple siltstones, red and white shales and breccias) are exposed at the elevated regions of Santa Marta, especially at the center of structure and at its NW portion.

Shock features: Polymict breccias were found in several locations at the central elevation and also in the annular basin. They comprise fragments ranging in size from few mm to several cm embedded in a red quartzose matrix; at several locations the breccias exhibit shatter cones. This same macroscopic shock feature was found in sandstone in the central elevation (Fig. 1a). Microscopic shock deformation features were found in sandstones and also in polymict breccias. Abundant PDF with one and two sets of planes were found in shatter cones formed in red and white sandstones (Fig. 1b), as well as PF (planar fractures) and FF (feather features).

Conclusion: The discovery of shock features in sandstone and breccia confirms the meteorite impact origin of Santa Marta, making it the 7th impact crater in Brazil.

References: [1] Master, S. & Heymann, J. (2000) *Meteoritics & Planetary Science* 35 Supplement. [2] Vasconcelos, M.A.R. et al. (2010) *GSA Special Paper* #465. [3] Uchôa, E.B. et al. (2013) 44th LPSC.

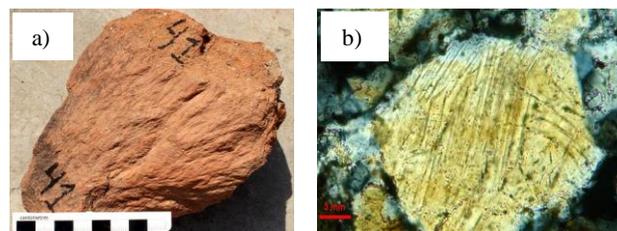


Figure 1: (a) Shatter cones in sandstone; (b) PDF in quartz