CHICXULUB MULTIRING IMPACT CRATER: UNDERGROUND STRUCTURE AND MAGNETIC ANOMALY SOURCES

JAIME URRUTIA FUCUGAUCHI[1], Mario Rebolledo Vieyra[2] Ligia Perez Cruz[1]

[1]Proyecto Universitario de Perforaciones en Oceanos y Continentes, Instituto de Geofisica, UNAM, 04510 Mexico
[2]Centro de Investigaciones Cientificas de Yucatan, Centro para el Estudio del Agua, Quintana Roo, Mexico

Models of the Chicxulub multiring crater are constructed from gravity and magnetic anomaly modeling, drilling wells, geophysical logging and paleomagnetic data. Inversion models for gravity and magnetic data provide contrasting results, indicating that the anomaly sources for both data types differ and that better constraints on the anomaly sources are needed. Comparison of the gravity and magnetic inversion models provide some useful indications, which are here examined considering the magnetic data. Melt and melt-rich breccias show characteristic strong remanent magnetizations with reverse polarity. Magnetic susceptibility measurements from borehole cores and samples in the crater show that suevite breccias have a variable strong magnetic signature, which is related to relative contents of basement and melt clasts and melt-rich matrix. The crystalline component estimated from clast analyses in the suevite breccias has on average higher magnetic susceptibilities (up to $1200x10^{-5}$ SI) than that of the impact melt (~$500x10^{-5}$ SI) and crystalline basement ($400x10^{-5}$ SI). Reduction to the pole and downward analytical continuations document the discrete composite character of the anomaly, with dominant large amplitude inverse dipolar anomalies. This correlates with the reverse polarity observed in the melt and melt-rich suevite breccias, providing constraints on magnetic anomaly sources. The second-derivative of magnetic anomaly depicts five concentric rings with the external ring correlating with the cenote ring. The analytical signal and the radially averaged spectrum yield an estimate of the depth to the magnetic sources, ranging from 1000 to 6000 m. Using these data, new 2-D magnetic models are developed, which suggest that the fragmented character of the northern sector of the crater might be controlled by a system of regional vertical faults. The main central anomaly is related to the central basement uplift (in addition to the high magnetic breccias and melt), which in the central area of the crater is ~2500 m deep.

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Jaime Urrutia Fucugauchi, Proyecto Universitario de Perforaciones en Oceanos y Continentes, Instituto de Geofisica, UNAM, 04510 Mexico juf@geofisica.unam.mx