CHARACTERIZATION OF THE MARQUEZ DOME BURIED IMPACT CRATER USING GRAVITY AND MAGNETIC DATA;

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Introduction. The buried impact crater, Marquez Dome, located in Leon County in east central Texas, is an approximately 15 kilometer diameter structure whose central uplift is now partially exposed due to headward erosion of the post-impact cover. The central uplift is approximately 3 kilometers in diameter and the rocks within it have been uplifted more than 1200 meters above their regional level[1]. The crater rim remains buried and previous attempts[1,2] to determine its location have had to rely on seismic reflection data and geologic well logs. These attempts have been somewhat successful in mapping the extent of the disturbed zone around Marquez Dome, but more limited in their ability to image the shallow buried rim. In an attempt to define accurately the whole Marquez Dome structure and assist in the selection of drilling sites, a geophysical investigation involving gravity and magnetic data over the central uplift and the surrounding area has been undertaken.

Geological setting. The Marquez Dome structure is located in the East Texas Basin which was created by a late Triassic rifting event. The basin existed in a near-shore environment and was the site of almost constant sedimentary deposition. Depositional units include a mixture of terrigenous sands, fluvio-deltaic silts, shales, shelf carbonates, and evaporites. The units vary in thickness but in the area surrounding Marquez Dome are basically tabular and exhibit a gentle 2 to 3 degree dip to the southeast[2].

Geophysical signature. The disturbance to this well layered stratigraphy in the early Tertiary, caused by impact, crater formation, and subsequent in-filling, should produce an identifiable gravity anomaly that will give an indication of the crater's true extent. A previous regional gravity study has already identified a 2.5 mGal positive Bouguer gravity anomaly associated with the central peak[1]. The same disturbed stratigraphy also yields a magnetic anomaly. Preliminary magnetic data show a total intensity magnetic anomaly associated with the central uplift (see Fig. 1). The anomaly may be distorted by the iron-rich Carrizo sandstone that subcrops less than 2 kilometers to the east of the center of the uplift.

Field data collection. A program to collect gravity and magnetic data over and around Marquez Dome is currently underway. Based on the magnitude of the gravity anomaly over the central uplift and the magnitude of gravity and magnetic anomalies over other impact craters of similar size in sedimentary targets, precisions of +/- 0.1 mGals and +/- 1 nT are used in the acquisition of the data. Contour maps will be examined for evidence of any concentric trends that correspond to the central uplift, annular basin, or the crater rim. Data will also be plotted as profiles that traverse the structure. These profiles will serve to emphasize any changes in the gradient of the fields

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that may correspond to the location of the crater rim or the flanks of the central uplift. Preliminary magnetic and gravity maps, based primarily on surveys of the area of the central uplift, are shown in Figures 1 and 2. Additional measurements of the region surrounding the central uplift are in progress.
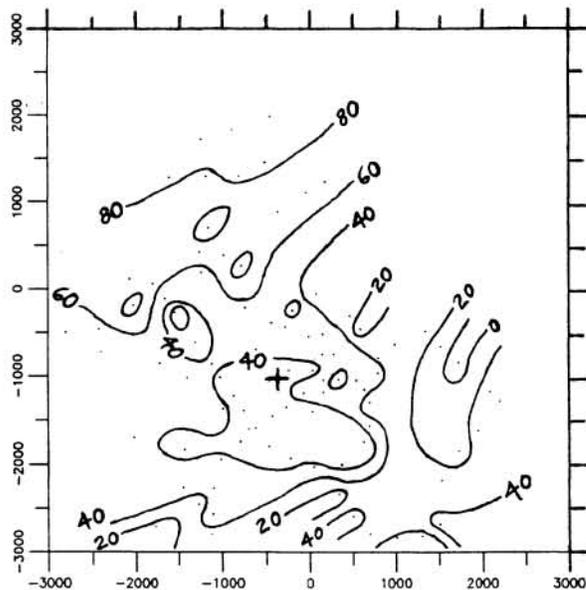

Figure 1.
TOTAL INTENSITY MAGNETIC ANOMALY MAP OF THE MARQUEZ DOME CENTRAL UPLIFT. MAP COORDINATES ARE IN METERS. THE CENTER OF THE CENTRAL UPLIFT IS MARKED BY (+). OBSERVATION STATIONS ARE MARKED BY (.). CONTOUR INTERVAL IS 20 nT.
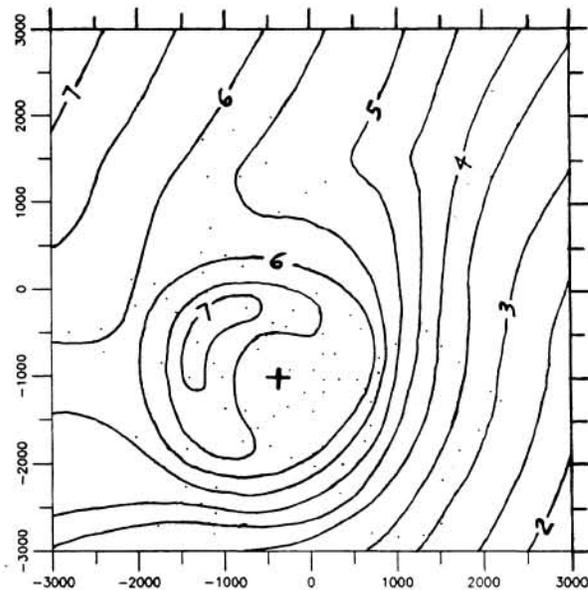
Figure 2.
BOUGUER GRAVITY ANOMALY MAP OF THE MARQUEZ DOME CENTRAL UPLIFT. MAP SYMBOLS ARE THE SAME AS FIGURE 1. CONTOUR INTERVAL IS 0.5 mGal.

References. [1]Sharpton, V.L., and Gibson, J.W.Jr. (1990) The Marquez Dome Impact Structure, Leon County, Texas. In *Lunar and Planetary Science XXI*, pp. 1136-1137. Lunar and Planetary Institute, Houston. [2]Gibson, J.W.Jr. (1990) MS Thesis, The University of Houston.