

## MAPPING CHICXULUB CRATER STRUCTURE WITH GRAVITY AND SEISMIC REFLECTION DATA

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The Chicxulub crater buried under the Yucatán Platform of Mexico affords one of the most favourable opportunities on Earth for structural studies of a large complex impact crater due to its preservation and accessibility. The crater was buried soon after rim erosion in an environment with only minor subsequent tectonic disturbance. It is also of interest as the Chicxulub impact apparently ended the Cretaceous Period, and the crater's ejecta blanket is known globally at hundreds of localities. The buried crater is half overlain by a coastal plain and half by a shallow sea, allowing exploration by both marine- and land-based techniques as well as hybrid combinations. The radial symmetry of the crater allows application of data acquired in either terrain to the entire structure using the common data sets of magnetic- and gravity-field anomalies.

Gravity data sets covering the Yucatán Platform (e.g., 1, 2) reveal an ~180 km-diameter low with internal concentric structure (e.g., 3, 4) that is the expression of the Chicxulub crater impact lithologies and crater fill. The gravity signature is complicated by regional anomalies and early modifications to the crater rim, and the northern half of the crater is not well imaged due to the scarcity and imprecision of marine data. Also, an ~20 km-wide gap in survey coverage (due to shallow water) occurs between the land data and the nearest seismic profile of Camargo and Suarez (5, Fig. 1), which roughly corresponds to the beginning of offshore coverage.

During September and October, 1996, a marine gravity survey was successively conducted on 32 and 10.5 m vessels to survey this gap and offshore seismic lines of the Imperial College/BIRPS/U of Texas seismic project. Offshore coverage was ~2,400 line-km followed by ~1,500 line-km inshore with ~1.3 and ~1.9 mGal unadjusted crossovers, respectively; data precision was strongly influenced by sea conditions.

Preliminary results from the marine surveys confirm the provisional ties of gravity gradient features to the seismic line. The perimeter fault, crater-fill margin, slump faults, and collapsed transient cavity margin may all be linked to gradient

features. Unfortunately, the clearest crater expression in the gravity field is on the east side where the seismic lines lose resolution at the basin margin. To the west the strong peripheral gradient splits with one component corresponding to the perimeter slump fault and a larger feature corresponding to the basin margin. This splitting is interpreted as resulting from prompt backwash of crater ejecta into the northwestern part of the crater. Regional gradients also obscure the crater signature to a greater extent to the west. Asymmetry of the central high is indicated, although a weak feature may extend to the NE; the surrounding sharp low continues until it abuts the regional high to the NW. Additional land surveys support the correlation of the cenote ring to gravity gradient features, and suggest that a weak high may correlate to the rim uplift in some places.

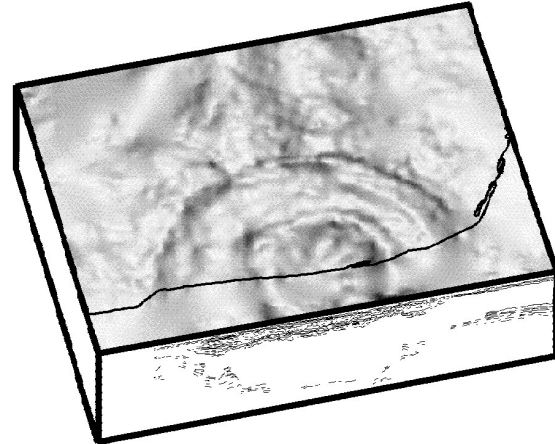


Fig. 1: Perspective view of horizontal gradient of Bouguer gravity anomaly with juxtaposed Chicxulub crater structure as revealed by nearest offshore seismic reflection profile.

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