THE RICO STRUCTURE: A POSSIBLE IMPACT STRUCTURE IN NORTH-CENTRAL TEXAS, USA, Leanne Wilberg, Science instructor, P.O. Box 30541, Dallas, Texas, 75230, The Hockaday School of Dallas

A possible impact structure in north-central Texas is centered 3 km north of the town of Rico, Texas at latitude 32° 00' 30" N and longitude 98° 02' 00" W (Figure 1). Locally, Cretaceous sedimentary strata of the Glen Rose, Paluxy and Walnut formations dip less than 1° southeast. On Landsat images, the outer limit of the feature is a subtle circle 9 km in diameter. Field studies indicate that the outer part of the 9 km-diameter feature is relatively undisturbed. At the core of the structure, a pronounced central uplift is surrounded by a ring depression containing a series of concentric troughs and ridges. The uplift, together with the surrounding ring depression can be seen as a distinct photographic anomaly on aerial photographs. This intensely disturbed core has been shown to be structurally similar to a crater of artificial explosive origin and to several terrestrial impact features (Liberg, 1980 and Wilberg, 1981).

Within the central uplift of the Rico Structure (0.8 km in diameter), limestone of the Glen Rose Formation has moved inward and upward producing gently plunging folds with radial axial traces (Figure 2). Within the ring depression surrounding the uplift, linear and arcuate drainage patterns associated with normal faults occur in a series of ring-like troughs (Figure 3). Limestone of the Walnut formation has been downsagd along arcuate faults 1.2 km to 1.5 km from the center of the structure (Figure 4). Field checks of possible folds in the ring depression which may be oriented with axes tangent to the perimeter of the central uplift are inconclusive.

The event causing the disturbance pre-dates the development of joints cross-cutting the surface of the Bosque River (Wilberg, 1981). On satellite images, joints cross-cutting the Rico Structure are unaffected by the localized disturbance.

Gravity and magnetic profiles across the core of the Rico Structure reveal no subsurface mass. Residual Bouguer anomalies ranging from 0.5 mgal to 1.0 mgal on gravimetric profiles correlate with faults in the ring depression surrounding the uplift at the core. Correlated electric logs of oil and gas wells in the area show that the subsurface limit of deformation at the Rico Structure is shallower than 150 m below the present ground surface.

Despite structural similarities to terrestrial impact and explosion cratering analogs, unequivocal evidence of an impact origin for the Rico Structure has not been discovered. X-ray diffraction of quartz-rich sandstone from the flank of the central uplift reveals no micasite. Likewise, no brecciated rock, shattered cones or microscopic shock features have been identified.

It is not known how deeply the Rico Structure is eroded or how close the present deformed strata are to the energy release surface (Wilberg, 1981). Nevertheless, significant erosion in the southwestern and northeastern parts of the core has altered a once symmetrical and concentric configuration (Figure 5). Severe erosion in the extreme center of the central uplift may have removed shock evidence of impact. The relationship of the highly disturbed 3 km-diameter core to the relatively undisturbed 9 km-diameter circle seen on Landsat images remains to be explained.


Figure 1

CAPTIONS FOR FIGURES:

Figure 1- Geologic map showing drainage courses of Bosque River and its major tributaries together with topographic ridges between them. Arrows mark outer limit of Rico Structure seen on Landsat images. Hatchures mark intensely disturbed core area.

Figure 2- Generalized sketch of form lines of folds in central uplift of Rico Structure (from aerial photograph).

Figure 3- Drainage map of core of Rico Structure prepared from stereo-paired aerial photographs. Short diagonals indicate zones of anomalous linear and arcuate drainage associated with surface faults. Hatchured area represents central uplift of Rico Structure.

Figure 4- Reconstructed block diagram and cross section C-C' of Figure 4. Dip of blocks and topographic slopes are exaggerated. Topography as shown in Rüller and Miller, 1961, Figure 7-15.

Figure 5- North-south cross section through core of the Rico Structure showing differential erosion (lower part of figure) of a once symmetrical and concentric structure (upper part of figure).

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Figure 2

Figure 3

After Miller and Miller, 1961

Figure 4

Figure 5

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