

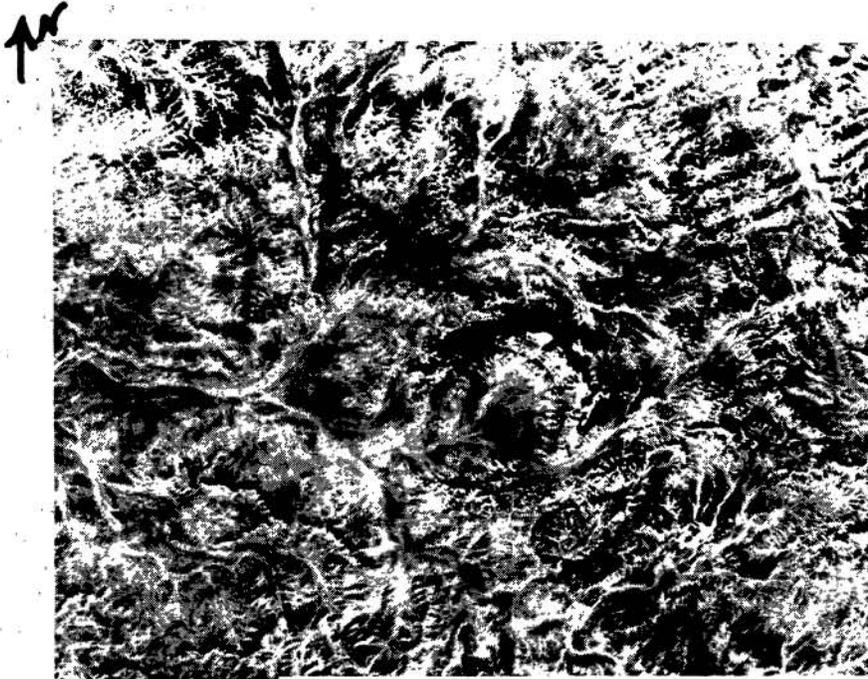
SUSPECTED IMPACT CRATER NEAR AL MADAFI, SAUDI ARABIA
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A ~6 km diameter cryptoexplosion structure (Fig. 1) has been identified in NW Saudi Arabia at 28 40'N, 37 11'E, and has been analyzed using stereo airphotos, geologic maps, and Landsat imagery. The feature lies 65 km ENE of Tabuk, and less than 20 km south of a group of Quaternary hills referred to as "Al Madafi" on the the 1:500,000 scale geologic maps [1]. As the cryptoexplosion feature is adjacent to no other named feature, it will hereafter be designated the "Al Madafi" structure on the basis of usual naming conventions for possible impact craters.

The Al Madafi structure has been recognized as a curiosity since 1971 when it was noticed in 1:60,000 scale stereo airphotos. Blodget [2] described the feature as a "near-circular eroded dome" amidst the flat-lying shales and sandstones of the Tabuk formation which dominates this region except for local Quaternary wadi gravel deposits. There are no salt diapirs in this region, and the nearest extrusive igneous outcrops are at least 45 km to the south (Quaternary basalts [2]). However, these volcanics are clearly very recent and most likely postdate the formation of Al Madafi; Tabuk formation (Devonian and Ordovician) strata are clearly disrupted by the structure, which is itself deformed by Cenozoic-age faulting and recent deposition of wadi gravels. On the basis of observations from airphotos [2] and aeromagnetics, and on measurements made in comparison with other 6 km diameter impact features on Earth (e.g., Goat Paddock, WA [3]), an impact origin for Al Madafi is plausible. From current knowledge of this region of NW Saudi Arabia [5], formation mechanisms involving salt diapirism, erosion of ring dikes, or degradation of volcanic calderas are not likely. In such an event, and because of its similarity to martian impact craters (e.g. presence of a wind "shadow" of lag materials), the favored mode of origin is hypervelocity impact into a sedimentary target. Critical features in this assessment are the polygonal appearance of the "rim" of the structure, the inner rim-wall terraces, the drainage control around the feature, the hummocky area extending beyond the rim, and the steeply dipping "slump terraces" within the oval central region. These features are very suggestive of a complex impact crater morphology not unlike that observed at Goat Paddock, a 6 km Eocene impact feature in a mobile belt zone of WA (Fig. 2) [3]. The Al Madafi structure can be recognized in Landsat imagery and strongly resembles known impact features in North African deserts such as Tin Bider [4]. Our preliminary analysis of Al Madafi indicates a Cenozoic age (rim freshness), and we urge a brief field check to better evaluate our hypothesis of its impact origin. An analysis of the spectral signatures of the surface units in the Al Madafi region using Landsat TM data is currently in progress.

REFERENCES: [1] Bramkamp et al. (1963) Wadi As Sirhan Quad,

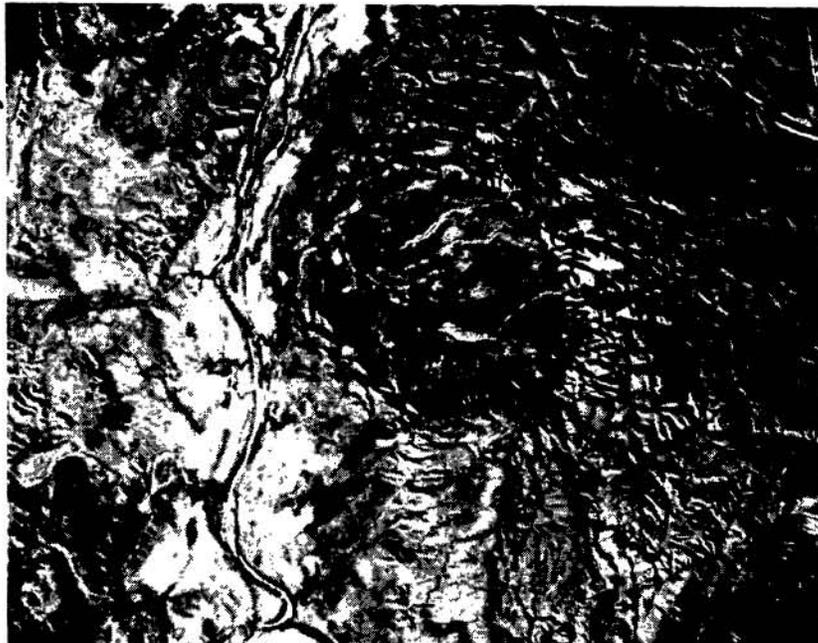
1:500,000 Geologic Map. [2] Blodget H. W. (1971) NASA X-644-71-204, p. 14-21. [3] Harms J. et al. (1980) Nature 286, 704-706. [4] Lambert P. et al. (1981) Meteoritics 16, 203-227. [5] Glen Brown, USGS/Reston, pers. communication, Nov. 1986.



1.

Fig. 1:

Al Madafi,
airphoto
mosaic.
"Rim"
diameter is
~6 km.



2.

Fig. 2:

Goat
Paddock,
WA.
Large
Format
Camera
Frame
1231.
Resolution
is < 10 m.
(D = 6km).

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