

POSSIBLE IMPACT STRUCTURES IN CENTRAL AFRICA: James B. Garvin,  
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The search for impact features larger than 10 km in diameter using remote sensing techniques has led to many important discoveries, especially in parts of the world where the regional geology is well mapped and candidate features are reasonably accessible [1]. However, to date only one 10 km (or larger) impact crater is known in Central Africa, namely the Bosumtwi structure in Ghana (D=10.5 km, 1.3 myr old) [1]. According to simple calculations using the terrestrial cratering rates established by Grieve and others [2,3], there should be 5-10 impact features larger than 10 km and less than 200 myr old in Central Africa. While exploring the geology of West Central Africa using SIR-A, Large Format Camera (LFC), and Landsat data, a few candidate impact features have been identified. Figures 1 and 2 illustrate 2 of the 3 features discussed herein. Limited availability of geologic maps at scales better than 1:500,000 makes detailed evaluation of these structures in terms of an impact origin extremely tenuous. Geologic maps from the 1950's [4] and ONC charts [5,6] are the only data other than the remote sensing datasets (SIR-A, LFC, and MSS) readily available which cover the "local" geology of potential impact features in Central Africa.

The first circular structure (Fig. 1), hereafter designated the "Mora Ring", was discovered in SIR-A imagery (data take 28) of northern Cameroon just east of the Mandara Mts. and west of the Maroua Tertiary volcanics. It lies equidistant between Mora, a city at the edge of the alluvium from Lake Chad and the Cameroon basement rocks (granites, mica-schists), and the town of Gétale in the lower savannas abutting granitic uplands [4]. It is topographically expressed as 2 rings surrounding a central hill complex [5]. Faults in the adjacent basement appear to be truncated (Fig. 1) at the outer ring of the feature. The outer ring (or rampart) diameter is > 7 km, and has tens of meters of relief. It is generally polygonal (nearly pentagonal) in outline. The central hill complex is over 100 m above the depressed "moat" that forms its base. While its morphology is reminiscent of ring dikes or eroded cone sheets, the Mora Ring appears to represent a unique occurrence in this region of Cameroon. Aside from an impact origin, it could represent an eroded volcanic complex or a differentially weathered pluton. Finally, it may be a large, isolated ring dike like those in central Nigeria. The structure is probably younger than the nearby Paleozoic granites, although a confident relative age is difficult to assess. If volcanic, the Mora Ring must be Tertiary in age [4]. The feature lies at 11 deg. N, 14 deg. E.

The second potential impact site is Lac Iro, a sub-circular ephemeral(?) lake in southeastern Chad just north of the Bahr Salamat at 10.1 N, 19.4 E. Fig. 2 is a band 4 MSS image of the lake, which is up to 13 km in diameter. The lake lies within Quaternary alluvium in the Chari Embayment [7], and is 130 km NE of Fort Archambault. Small granitic intrusions are adjacent to the lake, as are outcrops of Paleozoic basement [4]. The lake appears to deflect the Bahr Salamat river. The MSS image in Fig. 2 does not give a clear indication of the structural effects caused by drainage into the lake. LFC coverage of Lac Iro (frame 148) further demonstrates its extreme circularity and the irregular SW shore, perhaps eroded due to regional runoff from the SW to the NE. Little is known of the local geology of this isolated region of Chad, but oil exploration results could provide much-needed information on the origin of the Elgygytyn-sized lake [7]. Perhaps the "granites" mapped in the Lac Iro vicinity are suevite complexes?

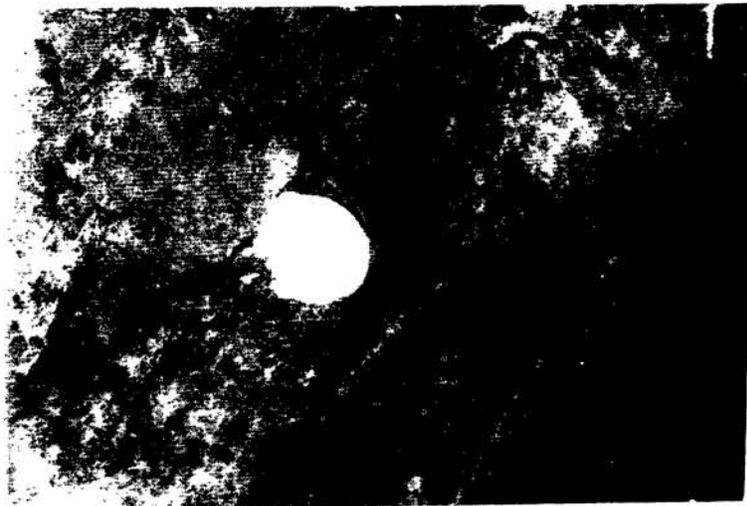
Finally, R.A.F. Grieve called the author's attention to Lake Tele in the Congo at 1.3 N, 17.2 E. This 8x6 km lake has a pronounced radial drainage pattern (6 streams drain into the lake) reminiscent of confirmed impact features [6]. Lake Tele lies west of Epena in between two branches of the Likouala River. The lake is somewhat ovoidal in outline and lies within the Quaternary (Pliocene) alluvium which dominates much of this region of the Congo [4]. No information on the possible modes of origin for the lake can be found on readily available geologic maps of Central Africa. It could equally well represent an eroded impact, a volcanic caldera since buried and collapsed, or a basement subsidence structure. Landsat MSS coverage reveals little more than ONC charts [6], and the highest local topography in the surrounding region is only 300 m. Imaging radar and LFC coverage would be of value in future geologic evaluation of this enigmatic and isolated lake in the swamps and savannas of central Congo.

This report will hopefully spark interest in exploring Central Africa for astroblemes, especially those of Cenozoic age. If identified, such structures may be linked to dramatic climatic fluctuations (and subsequent vegetational patterns) in this region of Africa during the past 25 myr. At present there are no confirmed impact features (with D > 10 km) within the area bounded by Nigeria, Niger, Chad, Cameroon, C.A.R., Congo, Zaire, and Gabon. A few impact structures well-enough preserved to be seen on Landsat or AVHRR images should exist [2]. Efforts are underway to examine cloud-free AVHRR scenes for all of Central Africa to identify all potential impact sites. [This research is in part sponsored by NASA RTOP 677-43-20].

References: [1] Grolier M. (1985) *NASA IN-87267*, 348 pp. [2] Grieve R.A.F. (1984) *PLPSC 14th*, part 2, *JGR 89*, B403-B408. [3] Shoemaker E.M. (1984) in H. Holland et al. eds, *Patterns of Change in Earth Evolution*, Springer, NY, 15-46. [4] Nickles M. (1952) *Geologic Map of French West Africa*, 1:2,000,000. [5] ONC K-3 (1982) Scale 1:1,000,000, 3rd edition. [6] ONC L-3 (1982) Scale 1:1,000,000, 3rd edition. [7] Martin G. H. (1978) *Oil Gas EUROR Mag. Intl. Ed.*, vol. 4, no. 1, 44-49.



**Fig. 1:** SIR-A image of the Mora Ring in northern Cameroon at 11 N, 14 E. This image is courtesy of the NSSDC. Image resolution is around 30 m, and the outer ring diameter is 7.5 km.



**Fig. 2:** Landsat MSS (Band 4) image of Lac Iro, Chad at approx. 10 N, 19.4 E. Resolution is 80 m and the lake is 13 km across.