**The Luizi structure: remote sensing study of a possible impact crater in Central Africa.**

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**Introduction:** Looking at the world distribution map of impact structures, it is clear that many craters remain to be discovered on the old shield of Central Africa. The ~ 12.6 km diameter semi-circular Luizi structure (28°00' E, 10°10' S) occurs on the Kundelungu Plateau of Katanga, Democratic Republic Congo, about 110 km NNE of the main city of Lubumbashi (Fig. 1). The amphitheater-like depression characterized by a centripetal internal drainage into the east flowing Luizi River, a tributary of the Luapula River has been known by geologists since 1918. In 1990, based on the circular morphology, an impact origin was proposed for this structure [1]. Unfortunately, is located in a rather remote region, difficult to visit in a country in turmoil and unrest for more than 25 years. The local geology consists of thick-bedded arkoses striking concentrically with dips of ~ 5-20º near the structure margin and 60 to90º in the center [2]. The surrounding Kundelungu plateau is formed by Neoproterozoic (570 ± 5 Ma) red sandstones and siltstones. The Luizi structure is superimposed on NNW-SSE trending faults of the Lake Mweru-Luapula graben (Fig. 1), which is part of the Cenozoic East African Rift System [3]. The region contains three kimberlite pipes, named Katalwa, Mafwa and Talala [4] that indicate an ancient volcanic activity. The currently available geological and geochronological suggest that the formation of the Luizi structure postdates the late Neogene rift faulting [3]. This assumption remains to be demonstrated.

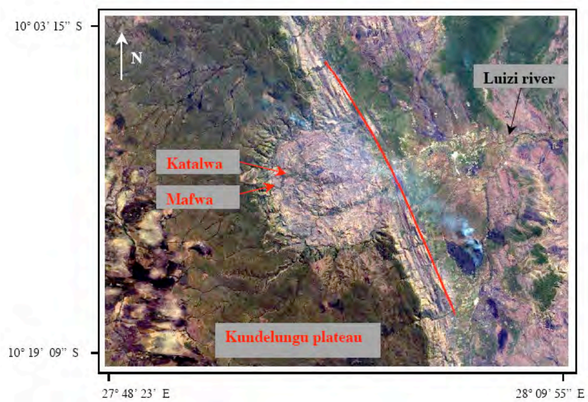


*Fig. 1 Color composite Landsat image of the Luizi structure showing the NNW-SSE Lake Mweru graben (red line) and the two kimberlite pipes located inside the structure.*

**Methodology and results:** In this study, morphometrics derived from a digital elevation model (DEM) generated from an ASTER satellite image were used to test the impact crater origin based on remote sensing analyses. A detailed morphological analysis of the structure was carried out by combining planer information and elevation data. The DEM provides a view of the topography by linking the height of a defined location to its corresponding pixel in the satellite image. The hillshade method was used to provide a digital perspective view due to the enhancement of the relief by fictitious illumination [4]. This method is a good example of combining the use of planar and elevation data. The ASTER image was acquired on the $18^{th}$ of June 2006. Fig. 2 shows the obtained scene with the corresponding UTM projection on WGS84 Datum. The scene covers the whole Luizi structure as well as a part of the Luapula valley (right side), the Kundelungu plateau and the 'Parc National de Kundelungu' (left side).

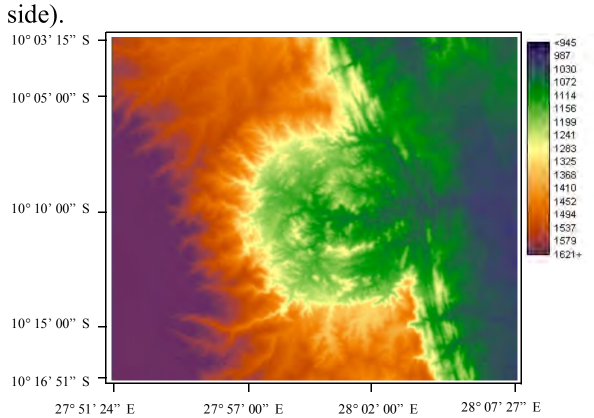


*Fig. 2 Subset of the ASTER derived DEM, with adjustment of the contrast settings to maximize possible variations occurring within the Luizi structure.*

Hillshading improves perspective view and contrasts the topological variation of the area as shown in Fig. 3. Several hillshading images were then combined and averaged to highlight the features that are suspected to be relevant to an impact crater. The results are visible on Fig. 4. The red circle represents the uplifted zone, the central peak area. The red dotted line marks an inner depression zone within the central peak and the external purple circle estimates the location of the crater rim based on topography.

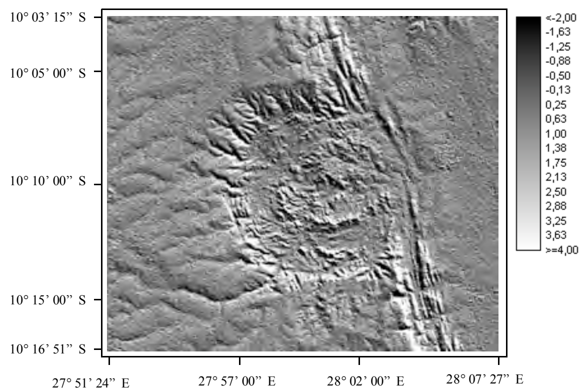


*Fig. 3 Result of the hillshading method with as parameters setting: 30° for the azimuth as also the elevation angle of the fictitious light source.*

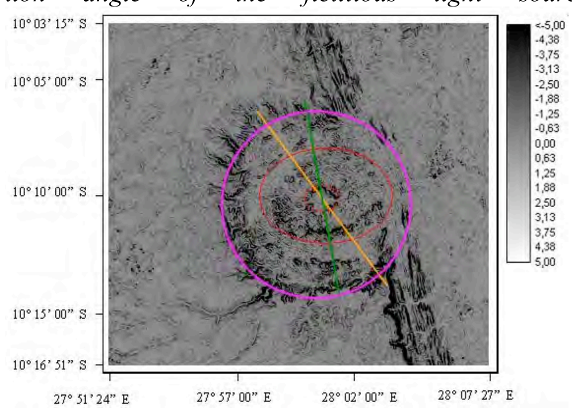


*Fig. 4 Combined result of 6 hillshade images with different azimuth setting, this is the result after statistical filtering to reduce the noise that was inherited within the original combined image.*

A number of cross-sections were defined cutting across the Luizi structure. The two sections presented on Fig. 5 and on Fig. 6 provide the best visualization of the existence of characteristic impact-crater morphological features: rim, uplift and central depression.

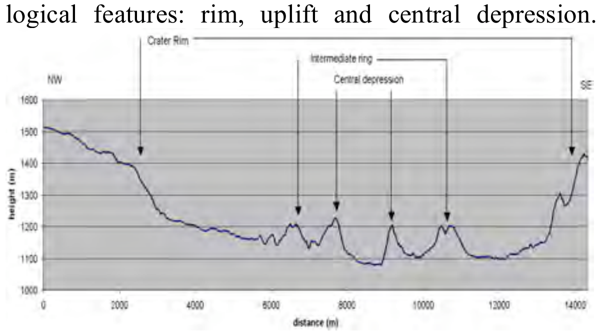


*Fig. 5 Resulting profile in a NW-SW oriented cross-section along the yellow line in Fig. 4.*

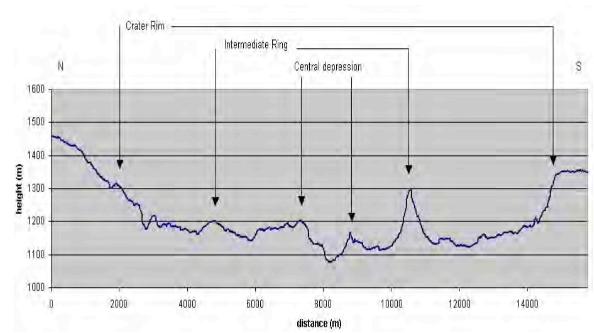


*Fig. 6 Resulting profile in a NS oriented cross-section along the green line in Fig. 4.*

The profiles can be further utilized to define more precisely the location of the crater rim. Once this location is defined, the diameter and crater parameters of the Luizi structure can be calculated. The average of the profiles provides a diameter of ~ 13 km. The rim height measured on the ASTER image is around 400 m, which agrees with the calculated value of 540 m based on the equation $h_R = 0.036\ D^{1.014}$ originally established for lunar craters [5]. The same crater equations provide a diameter of the central uplift around 5200 m while the profiles defined on the ASTER image range between 6100 and 8700 m. These results are acceptable considering that the Luizi structure is located in a zone of intense tropical erosion and major river drainage. The Luizi structure shows several morphological similarities with the ~ 13 km in diameter Serra de Cangalha impact structure in Brazil, in particular the presence of a depression within the central uplift [6].

**Conclusion:** The remote sensing study of the Luizi structure support a possible impact crater origin. This preliminary study needs to be confirmed by field investigations and the discovery of shock features and/or geochemical anomalies before the Luizi structure can be added to the list of African impact craters.

**References:** [1] Dumont & Ladmirant, (1996) Royal Museum for Central Africa Int. reports, 3p.; [2] Dumont & Hanon, (1993) Royal Museum for Central Africa, Annual report, 153-158; [3] Master, Dumont, Ladmirant, (2001) Abstract MAPS 36, A124-125, [4] Kouli & Seymour, (2006) Geomorphology, 77, 1-16; [5] Melosh, (1989) Oxford Univ. Press, 245 p.; [6] Reimold et al. (2006) Meteoritics & Planet. Sci. 41, 237-246.