THE OMEONGA STRUCTURE, DEMOCRATIC REPUBLIC OF CONGO: GEOLOGICAL AND PETROGRAPHICAL RESULTS, AND IMPLICATIONS FOR ITS ORIGIN. L. Ferrière[1], P. K. Kaseti[2], F. R. T. Lubala[2], and C. Koeberl[1], [1]Natural History Museum, Burgring 7, A-1010 Vienna, Austria (ludovic.ferriere@nhm-wien.ac.at), [2]Department of Geology, University of Lubumbashi, P.O. Box 1825, Lubumbashi, Democratic Republic of Congo.

Introduction: Two large circular structures, namely the Luizi and the Omeonga structures, are located in the Democratic Republic of Congo (DRC; Fig. 1), and are easily visible using satellite imagery. The Luizi structure, with a rim diameter of ~17 km, lies in the southeastern corner of the DRC, and was recently recognized as a complex meteorite impact crater [1]. Its impact origin is supported by the occurrence of well developed shatter cones and of microscopic shock-metamorphic features in minerals, including planar deformation features (PDFs) in quartz and rare shock deformations in feldspars [1].

Fig. 1: Location map of the Luizi and Omeonga structures in the Democratic Republic of Congo.

Until recently, due to the political situation and logistical challenges of working in the DRC, no field data, neither samples, were available from the Omeonga structure; the suggestion that it may have formed by hypervelocity impact was only based on remote sensing data [e.g., 2]. However, on Earth the confirmation of a new impact structure must be supported by unambiguous evidence of shock-deformations and/or traces of extraterrestrial material (e.g., [3]); thus we decided to organize a field campaign.

In the present contribution, the results of our geological field observations, together with petrographic investigations, are presented. Additional objectives of our work was to validate remote sensing interpretations and also to study the drainage patterns associated with the structure.

Previous work: The Omeonga structure, centered at 3°37'50"S, 24°31'00"E, is located in the center of the DRC, in the Sankuru District (Kasai-Oriental Province), about 1,000 km east of Kinshasa and only 10 km south-south-east from the territorial capital of Katako-Kombe. It is named after the village of Omeonga, located within the structure, at ~7 km south-west from its center. This structure was added to the list of possible/probable meteorite impact structures in 2005-2006 [4], but had been suspected as a possible impact structure for many years before that. Recently, an Italian team claimed that they were the first to detect this structure in 2009-2010, and alleged a hypervelocity impact origin based only on remote sensing data and a compilation of available old stratigraphic and geological information [2]. The structure is easily recognizable in satellite images (Fig. 2) because of its almost perfect annular ring filled with water (as also discussed by [2]). The Lonya river (erroneously called "Unia river" by [2]) defines the limits of a circular feature of ~38 km in diameter (Figs. 2-3).

Results and discussion:

Remote sensing study: The structure clearly exhibits the expected morphology of an eroded complex impact crater, with a rim (here emphasized by the Lonya river; Figs. 2-3) and a central uplifted zone. The drainage is characterized by a dendritic radial pattern with rivers flowing from the central part of the structure to the annular ring.

Fig. 2: Google Earth view of the Omeonga structure.

Field data: Field investigations were conducted by two of us (L.F. & P.K.K.) in July 2011. Field conditions were very challenging as it took us two full days with motorbikes to reach the structure from the closest airport at Kindu.

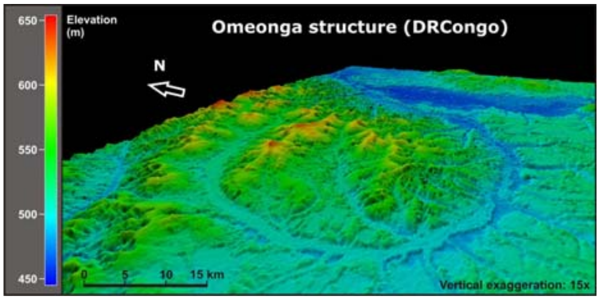

Fig. 3: Digital Elevation Model (DEM) [based on Shuttle Radar Topography Mission data] of the Omeonga structure.

The field area is covered by grass savanna and tropical forest that mainly extend along rivers. Even though a large part of the structure was investigated, because of the very poor nature of outcrops, only limited geological data were recorded. Altogether, 32 samples were collected: mainly sandstones (white, gray, yellow, red, pink, and brown in color), lateritic conglomerates (with pebble-size quartz clasts), clays, limestones, and sands, likely of Pleistocene and Pliocene age. Unfortunately, the geological contacts between the different sampled rocks/units were, in most cases, hardly recordable, because only very limited outcrops of (altered) rocks were usually visible along rivers, and mostly only after removing the covering soil layer. Neither shatter cones nor breccias were found. Thus, based only on our field investigations, it is not possible to either confirm or disprove the meteorite impact origin of the Omeonga structure. However, a volcanic or a kimberlitic origin can definitely be excluded based on the nature of the collected rocks (and also because of the large size of the structure).

Petrographic study: Petrographic investigations of the collected samples have so far not resulted in the detection of conclusive microscopic shock-metamorphic features (Fig. 4). Even though some quartz grains display unusual in-situ fracturing, and a few others show one set of planar fractures, only two grains with one set of possible PDFs were detected. Full microscopic observations will be presented at the meeting.

Our investigations, although not conclusive, seem to be in favor of an impact origin for the Omeonga structure.

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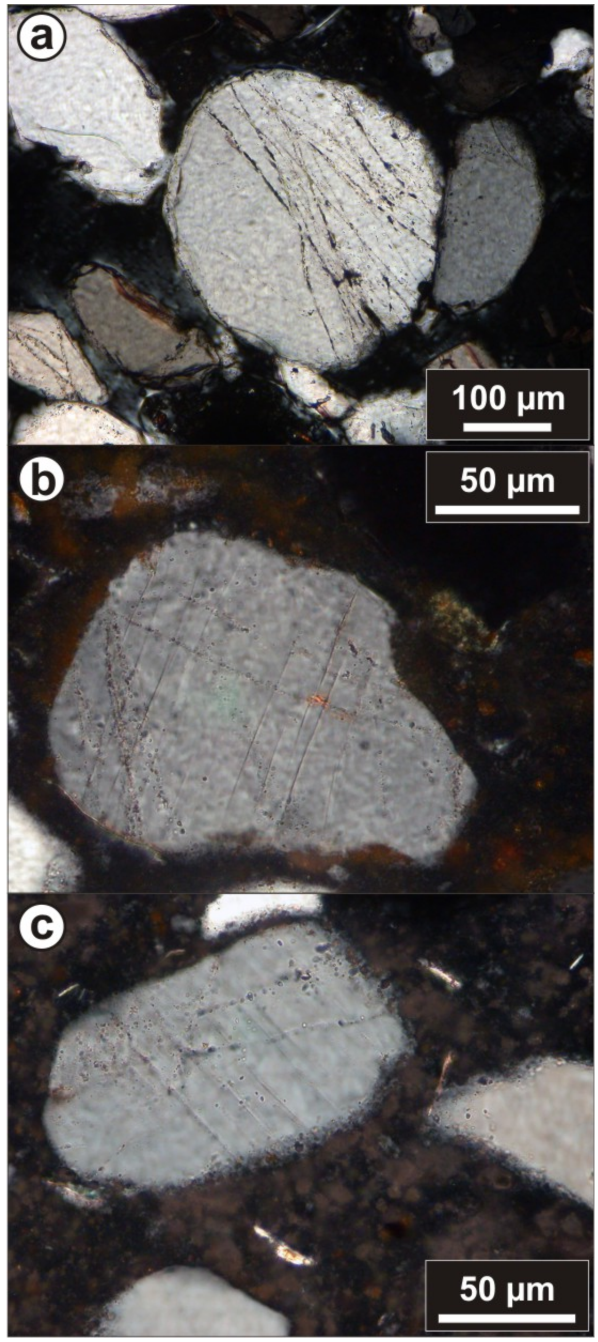

Fig. 4: Photomicrographs (crossed polars) of quartz grains in sandstone samples from the Omeonga structure, with: (a) intense in-situ fracturing, (b) one set of planar fractures, and (c) one set of possible planar deformation features.

References: [1] Ferrière L. et al. (2011) *Geology, 39*, 851–854. [2] Monegato et al. (2011) *Meteoritics & Planet. Sci., 46*, 1804–1813. [3] French B.M. and Koeberl C. (2010) *Earth-Science Reviews, 98*, 123–170. [4] Rajmon D. (2009). Impact database 2010.1. (http://impacts.rajmon.cz).