

THE “NYIKA PLATEAU STRUCTURE”, MALAWI (CENTRAL AFRICA) REDISCOVERED: NOT AN ASTROBLEME. S. Master^{1,2} and M. J. Duane³, ¹Department of Earth & Planetary Sciences, Harvard University, 20 Oxford Street, Cambridge, Massachusetts 02138, USA, master@geochemistry.harvard.edu, ²Permanent Address: EGRU, Univ. Witwatersrand, Johannesburg, RSA. ³Department of Geology, University of Kuwait, Kuwait, Duane@kuc01.kuniv.edu.kw.

In 1972, D. J. Mossman [1] described a possible meteorite impact crater site, about 80 m in diameter, in the Nyika Plateau region of the border between Zambia and Malawi. The exact position of the crater, and even the country where it occurred, was unknown. The account [1] was based entirely on very sketchy notes, and secondhand information, obtained during a brief visit made in June 1961, a year or two after the supposed impact event, which allegedly took place in 1959. We rediscovered the structure during a visit to the Nyika Plateau in July 1995 [2]. Guided only by the knowledge that it occurred within an area of “fir” plantations, we narrowed the search down to the Chilinda Pine Plantation [3], (Latitude 32°12’S, Longitude 33°47’43”E) in the Nyika National Park (NNP) of northern Malawi. The “Nyika Plateau Structure” coincides with the site of the Chilinda mudslide of 23rd April 1960, which occurred on a forested hillside behind and above Chalet 4 in the Chilinda Restcamp, situated within the Chilinda Pine Plantation (NNP). Eyewitness testimony and abundant documentary evidence, including several published papers, refute Mossman’s claim of an impact origin for the Nyika Plateau Structure, which is an example of a type of mudslide in clayey waterlogged soils that commonly occurs in the Nyika Plateau.

Mossman [1] gave the following account of events associated with the formation of the Nyika Plateau structure: “Creation of the Nyika Plateau crater was witnessed early in 1959, on an otherwise calm night, by several African natives and by a Caucasian forester. The forester, in charge of an adolescent fir plantation in the midst of which the object landed, reported (personal communication): that the fall was accompanied by a bright light and a loud explosion and was directly followed by a short-lived windstorm; a portion of the plantation was destroyed in the vicinity of the crater; trees were scorched and flattened radially outward for about 100 m; a small landslide resulted on a low hill a short distance from the cratered site. The writer’s observations, recorded casually... in June 1961 on site are: ...the crater is located on an approximately two degree slope and is roughly circular;...young fir trees nearest the crater have been flattened radially outward and some of those nearest the crater are dead; the crater itself is about 80 m in diameter and slopes symmetrically to a depth of about 6 m at the center; a search with a hand magnet revealed a few tiny angular particles (not retained) which might be meteoritic dust.”

The Chilinda Pine Plantation is the only artificial plantation in the area outlined in Mossman’s map; a natural juniper forest is the only other patch of forest in this uplifted area of rolling grasslands on the Nyika Plateau. Although much of the southern part of

the Nyika Plateau is underlain by the Nyika Granite, which gives rise to a landscape typified by rounded tors, the area around the Chilinda plantation is underlain by poorly-outcropping felsic gneisses of the Palaeoproterozoic Ubendian Belt [4], which are covered by thick clayey humus-rich soils (humic latosols) in freely-drained areas, and organic hydromorphic peats in bogs or “dambos” [5,6]. Radiocarbon dating of a 3 m bog-soil profile at the head of the Chilinda landslide site indicates ages spanning the period c. 10,500 B.P. (bottom of B Horizon, c. 3.2 m depth) to 4,200 B.P. (top of A2 Horizon, c. 0.2 m depth) [6]. Our mineralogical analyses (XRD) of the organic-rich soils from within the Chilinda “crater” show that the inorganic fraction of the soil is dominated by quartz (55-75%), together with orthoclase (5-20%), muscovite mica and kaolinite (15-30%), and traces of haematite (<2%). Trace element analyses by XRF showed no concentrations of siderophile elements.

We found two witnesses who still remembered the events associated with the formation of the structure on the Nyika Plateau- Mr. Maseru Muhone (who was 11 years old at the time), and Mr Saulose Mtumbuka (who was then 28 years old). Mr Mtumbuka (retired Head Capitaio, NNP), related in an interview (on 20 July 1995) that the event happened at night, c. 2 AM, when all the workers at the plantation, including himself, were asleep in their village about 1 km away. There was a sound like a gunshot, which woke up the frightened villagers, and a rumbling, which was *very much like an earthquake*, continued sporadically for about an hour. *There was no wind, and no flash of light.* The next morning, villagers discovered a landslide which covered a road crossing the Chilinda stream. “The white earth from below was brought up. There were broken trees in it, but only the trees planted by God. None of the trees that I had planted were damaged. Musungu (white men) from America said it was a mudflow. But other people said that a star had dropped from the sky”. In 1983, Elias [7], after questioning several Chilinda residents, including Mtumbuka, who were there at the time of the Chilinda mudslide, reported that “they say there was no explosion or bright light and they do not know the story of a star falling.”

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The landslide was described as a mud-flow by R. Willan, a forester, who visited the site of the landslide a week after it happened, in the company of Dr. C. R. Hursh (an American hydrologist and forester), and Messrs Sargent and Adlard of the Department of Forestry [8]. They were responding to a letter from forester John Kanyika, who had witnessed the landslide damage on the morning of the 23rd April 1960, after a night when his wife had been woken up by a peculiar rumbling noise. Kanyika stated in his letter that: "...no Pinus trees have been damaged at all." [8]. The mudflow or mudslide occurred at about 2 AM local time (0:00 GMT) on 23 April 1960, following a week of very heavy rainfall [8], on a sloping hillside dambo [9] (a marshland with indigenous *Hagenia abyssinica* vegetation), up to the edge of which a stand of *Pinus patula* had been planted [3]. The slope of the hillside at the head of the "crater" varies from 25° to 40° (and not 2°, as reported by Mossman [1]). The Chilinda mudslide was mapped in detail by Schroder [6], and a photograph, taken on 23 April 1960, was published by Johnson [10]. The idea of a meteorite impact was introduced later by outsiders (possibly Mossman's party [1], or Elias (1983) [7]), whose enquiries were turned into a local legend about a star that fell from the sky [7,11].

We confirmed that the "crater" was a typical, scalloped, non-circular scar produced by the mudslide [e.g. 12], and that there were no flattened trees among the neat rows of pines, which are still standing upright at the very edge of the structure. There is no evidence that any material was thrown out laterally or upslope of the landslide scar. Contrary to Mossman's description [1], the "crater" does not "slope symmetrically to a depth of about 6 m at the centre", but rather falls downslope by a series of scallop-shaped steps, separated by steep risers or scarps. The detailed plane-table map of Schroder [6], which shows these steps, also reveals the almost rectangular shape of the landslide scar, from which the "bogburst" mudslide issued in the downslope direction, bending sharply as it followed the incised valley of a tributary to the Chelinda Rumpi stream, in whose bed the toe of the mudslide finally came to rest. The head of the landslide scar is at an elevation of 2305 m, while the toe rests in the Chelinda Rumpi stream at an elevation of 2240 m, some 650 m distant laterally from the head. Schroder [6] estimated the depth to length ratio of the Chilinda "bog-burst" to be very low (0.011), which is consistent with a flow of high fluidity [13]. Gunshot-like sounds have been heard during the initiation of landslides in other areas, e.g. the December 1991 Ponta Delgada flood-induced landslide, Madeira [14]. We conclude that the "Nyika Plateau Structure" is not an astrobleme, and is nothing more than the well-documented Chilinda mudslide of 23 April 1960, which was probably triggered in a waterlogged dambo, following a week of heavy rain, by an earthquake [e.g. 15], since this region is very active

seismically, and numerous similar landslides scar the Nyika Plateau [6,8]. Previous efforts (in 1987) by McHone [16], as well as our own attempts (in 1995) to locate seismic records of the Chilinda landslide were unsuccessful.

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