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GEOPHYSICAL EVALUATION OF THE ZAGAMI IMPACT CRATER STRUCTURE USING HIGH RESOLUTION AEROMAGNETIC DATA AND THE IMPROVED EULER DECONVOLUTION APPROACH

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Abstract

The research is aimed at delineating the post-impact structural characteristics across the Zagami impact crater located in Northern Nigeria (7° 05' 00'' E, 11° 44' 00'' N [1]) using a high resolution aeromagnetic data and the improved Euler Deconvolution method.

The applicability of the improved Euler deconvolution method in imaging impact crater structure vis-à-vis delineation of source depth of the ellipsoidal magnetic anomaly and/or basement depth beneath the crater is addressed in this paper [2]. The analyses of the data have provided characteristic Euler deconvolution signatures and structural indices associated with impact craters. We have calculated the effect of the impact on the overall using the classical crater scaling relation of Holsapple and Schmidt.

The crater shape was found to be ellipsoidal. The depth to the top of the basement is estimated to be about 400 m using the aeromagnetic data. Structural disturbances that were probably caused by the impact on the crater, resulting in brecciation, fracturing, alteration and shocked zone filled with weak-magnetic materials and fluids.

The magnetic fields associated with the central crater anomaly and the associated faults indicate a predominantly very shallow source with depth ranging from 0.4 to 0.6 km. The depth solutions clustered around the edge of the crater and on top of the linear features display small standard deviation errors.

The source of the magnetic signatures associated with the central anomaly observed on the aeromagnetic map is suspected to be due to a combination of factors among which are a shock remagnetization (SRM) acquired at the time of impact; thermal (TRM) and chemical remanent magnetization (CRM) acquired soon after the impact. The Euler solutions obtained indicate shallow magnetic sources that are interpreted as possibly post-impact faults and a circular structure. The depth of these magnetic sources varies between 0.8 and 1.5 km, while the Precambrian basement depth was found at ~1.2 km. We thus find out that the Euler depth solutions obtained in this study are consistent with the results obtained using other methods.

From this study, our understanding of the structural features present around the impact structure has been enhanced. It was possible to improve our knowledge on the geodynamic structures beneath the impacted area.

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References

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