A METEORITE IMPACT CRATER AND ASTROBLEMES IN INDIA. V. K. Nayak, Department of Applied Geology, University of Saugar, saugar-3 (M.P.), India.

The details of a meteorite impact crater at Lonar (19°58´N : 76°31´E) and astroblemes at Ramgarh (25°20´N : 76°37´30²E) and Shiva in the Indian subcontinent are furnished and their significant features highlighted.

Lonar Impact Crater

More than three decades of researches of the Lonar crater I Buldhana District, Maharashtra State, have confirmed its meteorite impact origin (Nayak, 1972; Fredriksson et al., 1973a; Fudali et al., 1980). The Lonar crater, 1830 m diameter, 150 m deep with a shallow saline lake in the floor, is unique in being the only terrestrial impact crater in basalts of the Cretaceous-Eocene age. It provides the closest analog with the Moon’s craters (Fredriksson et al., 1973b; Fredriksson et al., 1978; Schaal, 1976). The nature of target basaltic rocks, various degrees of shock metamorphic signatures, nature of shocked and unshocked basalts, macro and micro breccias, glass spherules and impactites have provided definitive evidences for impact origin of the Lonar crater (Kieffer et al., 1976). The characteristics shock metamorphic features are compared and correlated with those of the lunar craters in a planetary context (Nayak, 2001). Such a comparative exercise of the Lonar crater with the lunar craters will not only help to unravel the extra-terrestrial geoscientific mysteries of the planets but also the evolution of the solar system.

Ramgarh Astrobleme

A spectacular annular structure at Ramgarh in Kota District, Rajasthan, covers an area of 16 sq km within the Late Proterozoic Bhandar Group of rocks of the Vindhyan Supergroup. It has an outer diameter of 4 kms depth to diameter ratio 0.05 and about 200 m height of the rim from the surrounding plain. A raised rim, quaquaversal dips, somewhat inverted topography and uplifting of rocks have been reported. The origin of this enigmatic feature is still a debated subject. An appraisal of various views and suggestions proposed from time to time was presented (Nayak, 1997). These are: meteorite impact, kimberlite and carbonatite intrusions, tectonism, combined action of tectonic and volcanic activity, subsidence, cryptovolcanism and dome etc. These explanations for the formation of the Ramgarh structure are mainly based on its geological, geomorphological, lithostratigraphical and structural characteristic. Besides, Ramgarh has also been described in the Astronaut’s Guide as an impact crater with ring of hills an small central peak from the Landsat image (Grieve et al., 1988). Balasundaram and Dube (1973) observed shear fracturing, granulation and anomalous birefringence in quartz grain and concorded with Crawford’s (1972) suggestion of impact origin of Ramgarh. However, definitive meteoritic impact signatures are lacking and at present the structure should be considered as ‘Ramgarh Astrobleme’. It is suggested that a well-planned multi-disciplinary effort is imperative to resolve the origin of the Ramgarh Astrobleme and thus make a significant contribution to the Earth’s cratering history.

Shiva Astrobleme

A potential KT impact scar at the India-Seychelles rift margin has been interpreted as ‘Shiva Crater’ (Chatterjee and Rudra, 1996). It is an oblong shaped structure, 600 km long, 450 km wide and 12 km deep within the Deccan Traps and the underlying Precambrian granite. The impact interpretation of Shiva is based on subsurface stratigraphy, geophysical data, Bombay offshore oilfield and associated alkaline intrusives within the Deccan Traps. The KT boundary age of the Shiva structure was inferred from its Deccan lava floor, Palaeocene age of the overlying sediments, isotope dating (~65 Ma) of presumed melt rocks and the Carlsberg rifting event. Besides, seismic reflection data and India-Seychelles plate reconstruction at 65Ma indicate a buried oblong shape impact structure of Phanerozoic age. The structure shows the morphology of a complex impact crater and basin, a district uplift as series of peaks, an annular trough and a slumped rim. Chatterjee and Rudra (1996) conjectured the oblong shape of the structure as a result of an oblique impact of a speculated 40 km diameter meteorite on the western continental shelf of India, in a SW-NE trajectory at about 65MA. The significance of the synchronous and near antipodal positions of the Shiva crater and the Chicxulub crater in the Yucatán Peninsula, Mexico, are highlighted. Although, Chatterjee and Rudra (1996) have strongly argued an impact origin of the Shiva structure but definitive evidence of shock metamorphic signatures are lacking. At present, therefore, the Shiva structure should be considered as ‘Shiva Astrobleme’.
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References