

Meteoritic shower in coastal Orissa

An incidence of meteoritic shower was recorded at 6.30 p.m. on 27 September 2003 in a wide area from Kaptipada, Mayurbhanj district to Suniti, Kendrapada district, Orissa over a stretch of nearly 120 km (Figure 1). The celestial body appeared in the evening sky for nearly 50 s in the form of a bright star with a dazzling tail, visible in the entire coastal tract covering Mayurbhanj, Balasore, Bhadrak, Jajpur, Kendrapada, Jagatsingpur, Cuttack, Khurda, Puri and Ganjam districts. The meteor had a NNW–SSE visible flight with luminous streak of white to bluish incandescence and ended up with a series of blasts and illumination similar to that of full moon to twilight. Although there are reports of several fragments falling sporadically in different sites in the estuarine areas of Kendrapada district, only three fragments with a cumulative weight of 6.92 kg have been collected. There have been 12 incidences of meteoritic showers in India, with the largest being at Kheri Maham, Haryana¹ on 7 May 1986. Orissa has witnessed two earlier events of meteorite fall^{2,3}. Here we deal with the preliminary investigation of the meteoritic shower. Meteoritic remnants were recovered from four locations.

Fireballs of the meteorite gutted a thatched house at Surusuria village ($21^{\circ}29'50''$: $86^{\circ}31'25''$), Kaptipada Block, Mayurbhanj district. The area falls under Survey of India Toposheet No. 73 K/11. No surfacial evidence of meteoritic impact could be recorded. However, eight small (< 2 mm), ellipsoidal, feebly magnetic grains with fine white encrustations possibly representing meteorite remnants were collected from the ashes of the burnt house.

About 120 km southeast of Surusuria village, the meteorite got fragmented with noise resembling detonations and fell in the estuarine area of Kendrapada district under Survey of India Toposheet Nos 73 L/10 and 11. Meteoritic samples have been recovered from three locations spread over an area of ca. 50 km².

At Subarnapur village ($20^{\circ}32'22''$: $86^{\circ}42'00''$), Oupada Panchayat under Patamundai Block, Kendrapada district, a near cylindrical pit of 27 cm depth and 11 cm diameter was noticed in the wet alluvium (Figure 2 a). The dip of the pit is 79° towards S15°E. Rudimentary sub-

horizontal circular striations at 3–5 cm depth in the pit suggest the possible swirling motion of the falling meteorite. A bulge in the pit is also formed due to the unevenness of the meteorite. The clay at the pit mouth shows some effects of hardening. Neither any burning nor any sign of desiccation in the clay could be noticed.

The meteorite recovered is polyhedral in shape (Figure 2 b) with orthogonal dimensions of 11 cm × 5 cm × 4.5 cm and weighs 0.72 kg. It has a dark, roasted-grey thin crust (0.3 mm) with angular to sub-rounded edges. The surface is smooth, slightly convex with distinct thumb-like impressions (regmaglypts). On the basis of smoothness of the surface, sharpness of the edges and presence of regmaglypts, at least three generations of faces indicating two stages of fragmentation are deciphered. The meteorite is strongly magnetic and has specific gravity of 3.682.

A near-vertical impact pit of about 1 m depth with 45 to 60 cm diameter was formed within a paddy field filled with knee-deep water, about 100 m northeast of a thatched house in West Suniti ($20^{\circ}27'45''$: $86^{\circ}42'10''$), Mahakalpada

Block, Kendrapada district. The meteorite recovered weighs 5.7 kg and is semi-spherical in shape with dimensions 19 cm × 12 cm × 12 cm (Figure 2 c). The meteorite shows the development of a thin (0.2–0.3 mm) pitch-dark-coloured fusion crust. The surface is smooth with some pits and regmaglypts. Unlike the Subarnapur meteorite, this has no sharp edges. The broken surface is grayish-white in colour and crystalline in nature, showing segregation of circular aggregates (chondrules). Minor veinlets of Fe–Ni metal are observed.

Preliminary petrographic study reveals the presence of chondrules of olivine and orthopyroxene with diameter as large as 0.07 mm, occurring in a matrix of crystalline segregates, Fe–Ni metal and sulphides. A chondrule of prismatic orthopyroxene with excentric radiating structure is also envisaged. Fe–Ni metal occurs as discrete veinlets and clusters within the mosaic of silicates as well as bordering the chondrules. Polished-section study reveals the presence of iron–nickel and troilite (FeS) occurring as discrete anhedral grains. Often these grains encircle the chondrules in concentric pattern.

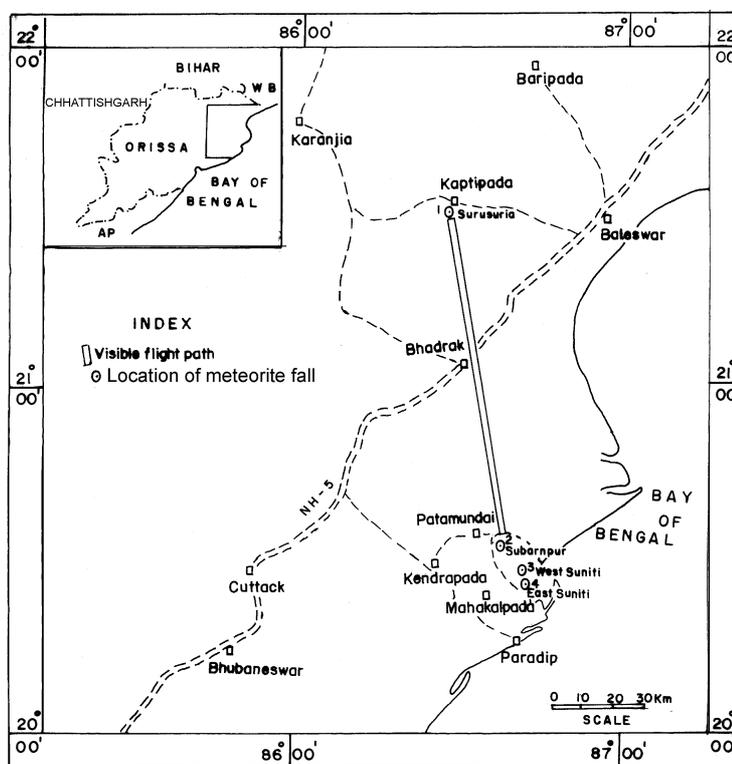


Figure 1. Location map of meteoritic shower in coastal Orissa.



Figure 2. *a*, Impact pit at Subarnapur village. *b*, Subarnapur meteorite (note the sharp edges and regmaglypts on the surface). *c*, West Suniti meteorite. *d*, East Suniti meteorite impact pit.

Another meteorite of weight 5.4 kg (as reported in the press) fell on the embankment of a pond adjacent to Kendrapatia river, Suniti village ($20^{\circ}27'30'' : 86^{\circ}43'15''$) about 2 km east-southeast of the West Suniti pit towards the Bay of Bengal. An irregular cylindrical pit 20 cm long, 13 cm wide and 37 cm deep was formed (Figure 2*d*), with plunge of 58° towards $N10^{\circ}E$. It shows downward tapering. Along the dip direction of the pit, patches of clay with dry grass are seen strewn in a semicircular pattern. The maximum distance of these ejecta from the mouth of the pit is about 10 m along the dip direction. A fragment of the meteorite recovered from this site measures $5\text{ cm} \times 7.5\text{ cm} \times 5\text{ cm}$ and weighs about 0.5 kg. It preserves a smooth dark fusion crust and the grayish-white broken part shows clusters of metallic minerals.

Besides these three examined sites, three more meteorite fragments were reportedly recovered by the locals from Sana Marichapalli ($20^{\circ}30'05'' : 86^{\circ}40'45''$), Patamundai Block; Narasinghpur ($20^{\circ}29'55'' : 86^{\circ}44'00''$), Rajnagar Block,

and Mahasani ($20^{\circ}37'30'' : 86^{\circ}36'40''$), Aul Block, Kendrapada district.

The presence of fractures and veinlets, three generations of surfaces, distribution of impact sites in two clusters and eyewitness accounts suggest at least two stages of fragmentation of the meteorite during its aerial flight. The first phase possibly occurred over Surusuria, where the meteoritic fragments were mostly consumed before hitting the ground. The final phase of fragmentation occurred in its NNW–SSE trajectory, about 120 km away, over Kendrapada district. The meteorite landing sites form an elliptical area with longer axis measuring about 10 km and shorter axis about five km, with the heavier fragments falling at the far end of the ellipse. The orientations of the impact pits suggest that the meteorite was in the zone of retardation before the final fragmentation over Suniti. Based on these observations, it is suggested that future search for the meteoritic remnants could be restricted to this elliptical area. Preliminary laboratory investigation indicates that the meteorite is of chondritic variety.

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