

Paper Number: 1023

3D Morphometry vis-à-vis offshore placer resources off Chilka – Puri, Odisha, east coast of India

Mitra, S. K.¹, Nagendran, G.² and Roychaudhuri, S.¹

¹ Geological Survey of India, Kolkata-700047, India, sumit0224@rediffmail.com

² Geological Survey of India, Chennai, India

³PSS-P&M-2, CHQ, Geological Survey of India, Kolkata, India

The incisions emerging from outer continental shelf act as conduit for the sediments being carried into the Bengal Fan. Preliminary survey followed by multibeam swath bathymetry off Chilka has indicated the presence of such incision head at the continental shelf margin at a water depth of about 100 to 200 m.

Based on the variation in the topography of the geomorphic features, the entire continental shelf margin with upper continental slope may be broadly divided into a North-Eastern Sector and a South-Western Sector. In the south-western sector, the continental slope is traversed by a number of valleys and intermittent spurs with tributaries (slope gullies). The north-eastern sector is characterized by very broad, open type depressions near the shelf-break.

The continental shelf margin is characterized by circular, concave seaward, deep depressions with radial disposition of innumerable V-shaped incisions between relatively steep spurs of varying lengths. These slope gullies act as feeder incisions and flows in SE direction coalescing to form submarine valleys which ultimately converge down the continental slope to form submarine channels.

The network of furrows and spurs observed near the shelf-break seem to have been formed due to gravity slumping of a huge pile of unconsolidated sediments at a relatively high angle. The deep furrows are the result of incision by the dense sludge, down the slope, which may be the continuation of the N-S lineament defined by the orientation of Kushbadra and Bhargavi Rivers. These sub aqueous slides trigger the turbidity currents with dilute suspension of sediment. The abrasion due to turbidity currents at the toe results in the undercutting of slope and causes subsequent slump of the sediments from the top edge of the slope. The broad base having sharp peaked spurs / ridges with triangle faceted dendritic drainage pattern on both sides developed down the slope may be attributed to the differential erosion that occurred along the continental margin and upper continental slope. The reason for the seaward concave depression developed on the continental shelf margin may be attributed to be formed by the Coriolis force heading north.

Geomorphological set up of the continental shelf off Chilka coupled with extended structural features of land might have resulted in enrichment of heavy mineral off Chilka area. Accordingly, evaluation of multi-mineral placer resources for about 100 sq km area (Off Brahmapur – Arakakud) off Chilka, Odisha

had been carried out in the inner shelf region on 1 km x 1 km grid pattern for assessment of heavy mineral potential of the area. The estimated resource by close grid sampling revealed that 13.414 million tonnes of heavy mineral occurs within 338 million tonne of placer mineral bearing sand (up to 2 m bsf). Out of these heavy minerals, ilmenite resource is estimated to be 5.902 million tonne, while that of sillimanite, garnet, zircon, monazite and rutile had been estimated as 5.409, 1.207, 0.134, 0.094 and 0.040 million tonne respectively.

References:

[1] Nagendran G. et al. (2010) Unpublished Progress Report. of M&CSD, ER, GSI (Cruise: ST-197) (F.S. 2008-2009).

[2] Sengupta R et al (1996) Int. Semi. Geol. Geophys. Indian Ocean, NIO, Goa. Abs. Vol. p.177.

[3] Sengupta R et al. (2005) MGMI, Calcutta Branch, Proceedings 2005, Kolkata, pp. 285-295.

