VERDINE-BEARING OOLITIC SAND FROM CORES, OFF GANGES-BRAHMAPUTRA MOUTH, BAY OF BENGAL

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Three sediment cores (116 to 125 cm long) collected from outer continental shelf from water depths of 120 to 150 m off Ganges-Brahmaputra mouth in the Bay of Bengal show oolitic sand horizons at subsurface levels around 25, 50 and 100 cm, alternating with highly assorted terrigenous clayey silt. Sediment texture, mineral and biogenic assemblage indicate near shore reefal environment for the oolitic sands. Green grains in oolitic sediments have been identified as phyllite V of verdine facies. It is inferred that the verdine-bearing oolitic sands are deposited during early Holocene transgressive phase.

Introduction

Low stands of Holocene sea level have been documented from the eastern continental shelf of India (Merh, 1987; Banerjee and Sengupta, 1992; Sengupta et al. 1992; Mahapatra et al. 1992; Rao and Rao, 1994; Vaz 1996a, b., Wiedicke et al. 1999 and Bandyopadhyay and De, 2000) and the evidences include occurrence of relict sediments, comprising ooids and shallow water bioforms, and algal activity on ooids, on submerged terraces or shelf breaks. Verdine facies in surficial sediments of southern part of eastern continental margin has been reported earlier (Rao et al. 1995; Bandyopadhyay and De, 2000; Vaz 2000). This communication reports the first record of verdine in subsurface oolitic sediments in the outer shelf area off Ganges-Brahmaputra mouth in the Bay of Bengal.

The shelf in the northern part of the Bay of Bengal is about 105 km wide and the shelf break occurs between 150 m and 200 m isobaths. Textural analysis of three sediment cores A (116 cm), B (125 cm) and C (120 cm) collected from eastern levee of 'Swatch of No Ground' area at water depths of 122, 140 and 148 m respectively (Fig.l) show gradual coarsening of sediments with increase sand content downdepth.

Oolites

All the three cores contain good concentration of biota-rich calcareous oolitic sand horizons, 10-20 cm thick around -25, -50 and -100 cm, alternating with ferruginous clayey silt. Shallow water bioforms like forams, pteropods, diatoms, ostracoda and bivalves are present in calcareous sand. Forams include both planktic *(Globorotalia menardi, Globogerinoides sacculifer, G. rubber, Pulleniatina obliquilocula, Neogloboquadrina dutertri)* and benthic *(Cibicides, Miliolidae, Buliminella, Rotalidae, Bolivina earlandi and B. marginata)* forms. Ooids constitute 60-70% of the sand grains in the calcareous horizons. Oolites grow around the nucleus of carbonate grains and forams; and are highly pitted by endolithic microorganisms like blue-green, green and red algae, and heterotropic fungi (Bandyopadhyay and De, 2000).

Fine sand to silt size green grains occur in oolitic sediments, and their concentration does not exceed 10% of the sand fraction. The grains are easily friable and spongy in habit. Green grains also occur as internal moulds of forams. Under SEM, the surfaces of the grains show platy to uneven breakage and solution cavities, while the substrate on broken surface is clayey. XRD patterns of green grains separated by Franz Isodynamic Separator (0.6-0.8 m A; lateral slope 15° and longitudinal slope 25°; Odin, 1988) followed by hand picking under binocular microscope show

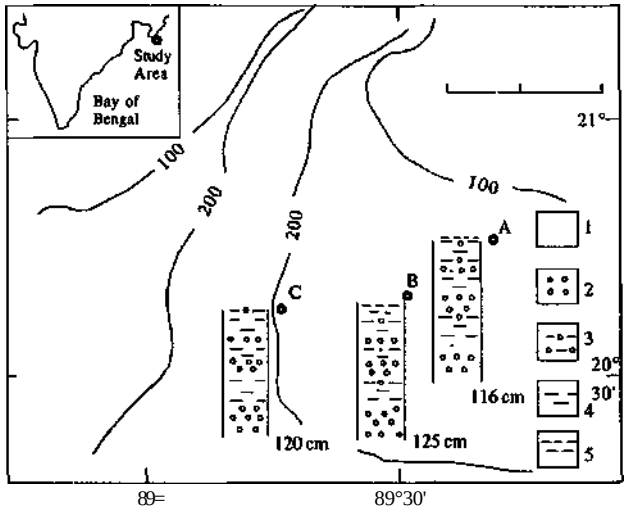

Fig.l. Location of the area and sample stations(A, B, C) with core logs.-1 - Sand, 2 - Oolitic sand, 3 - Oolitic clayey silt, 4 - Clayey silt, 5 - Clay .

two peaks at (d)7.2 A and (d)10 A (Fig.2). The former has been identified as phyllite V mineral of verdine facies, which is quite distinct from that of chlorite (Odin 1988), and the other represents illite. Analysis ofinfra-red curves of green grains reveal spectrum and abundance, identical of phyllite V (Odin 1988), though presence of carbonates and organic carbon are also indicated. DTA of separated grains gives endothermic peaks at 525-600°C, which confirms to verdine. EDX gives the following chemical composition for the green grains: $Si0_2$ 41-43%, $A1_20_3$ 11-16%, MgO 18-27%, Fe_20_3 16-21%, N a ^ 1-2% and FC,0 1.3-1.4%.

Discussion

Earlier studies have reported the occurrence of calcareous oolitic sands on terraces and elevated platforms from the eastern continental shelf of India (Mahapatra et al 1992; Sengupta et al 1992). Pits, formed as a result of algal microboring, characterize ooids of the present area. High concentration of boring on ooid grains by fungal hyphae and siphonaceous algae reflects nearshore zone of innermost shelf, strictly within 25 m water depth (Swinchatt, 1969). Phyllite V of verdine facies, which is being reported for the first time from the region in the subsurface ooid rich calcareous sediments form in shallow (20-60 m) and warm (around 25°C) marine condition (Odin, 1988). Thus, the sediments of the area were deposited at nearshore marine environment, and the sea transgressed thereafter.

A stable environment is required for oolitization process, while highly assorted terrigenous sediments in between

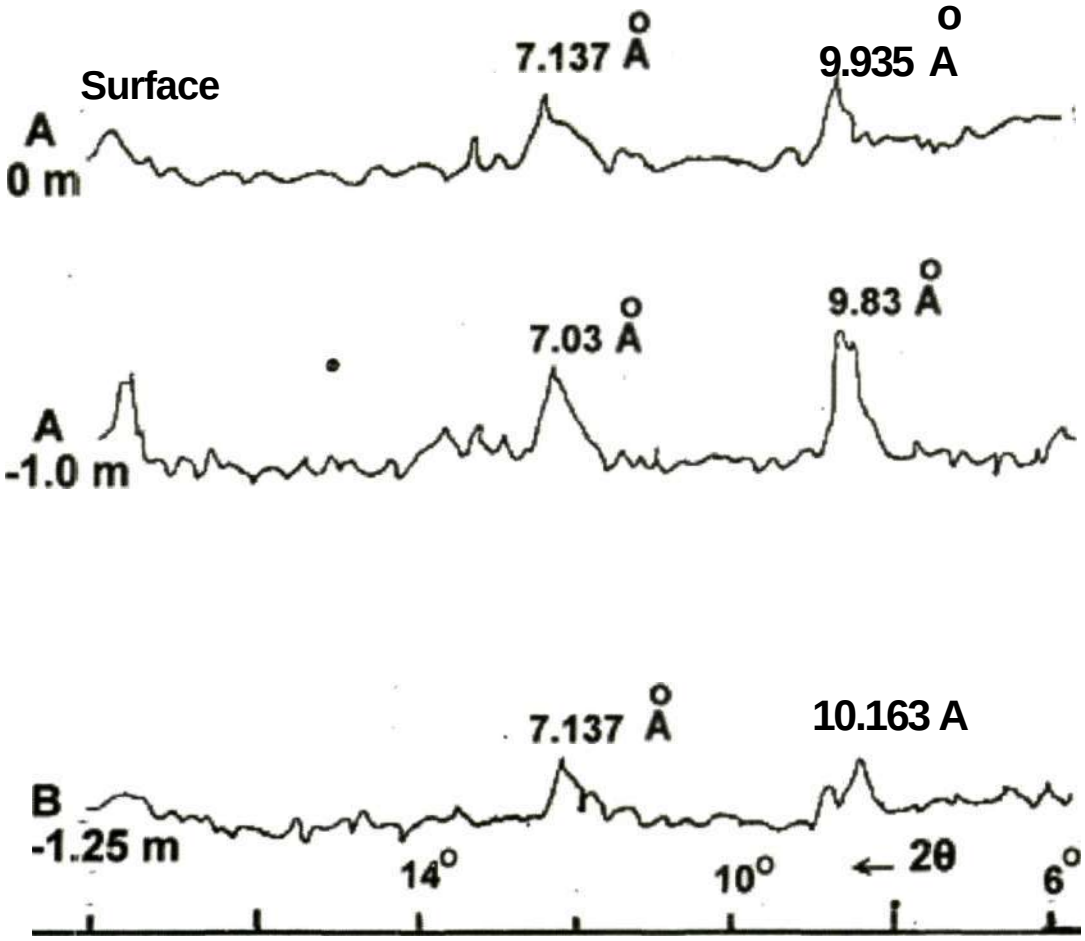

Fig.2. X-ray diffractogram of verdine [(typical (d)7.2 A peak) and illite (d)10 A peak].

oolitic zones suggest unstable nature of the provenance, evidently the Himalayas. This reflects the alternating stable-unstable condition of the provenance. Since verdine never forms in regressive phase and not known to occur in pre-Holocene period (Odin, 1988), it may be inferred that the oolitic sediments at 1 m + subsurface levels were deposited during early Holocene transgressive phase. Ooids from 67 cm and 50 cm subsurface from the area have been dated 18580 YBP and 16500 YBP respectively (Wiedicke et al. 1999). However, the present study shows evidence of early Holocene sediments even at 125 cm below surface.

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