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Changing sedimentary environment during the Late Quaternary: Sedimentological and isotopic evidence from the distal Bengal Fan

Pratima M. Kessarkar[a], V. Purnachandra Rao[a,*], S.M. Ahmad[b], S.K. Patil[c], A. Anil Kumar[a], G. Anil Babu[b], Sukalyan Chakraborty[a], R. Soundar Rajan[b]

[a]*National Institute of Oceanography, Dona Paula 403 004, Goa, India*
[b]*National Geophysical Research Institute, Hyderabad 500 007, India*
[c]*Indian Institute of Geo-magnetism, Alibagh 402 201, Maharashtra, India*

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Abstract

The sediments recovered from two gravity cores of the lower and distal Bengal Fan were investigated for sedimentological properties and Sr–Nd isotopes. Each core exhibits two distinct units, the lower unit 2 and upper unit 1 sediments. The unit 2 sediments are predominantly olive black/grey in colour with abundant finer silt-size fractions, low organic carbon and $CaCO_3$, quartz and mica in the coarse fraction, dominant illite and chlorite in the $<2\,\mu m$ fraction and uniform rock-magnetic properties. Biogenic constituents are extremely rare or restricted to the lower part of unit 2. The unit 1 sediments, on the other hand, are moderate brown/yellowish brown in colour with intermittent thin dark-coloured sediment layers. Higher clay, organic carbon, $CaCO_3$, and biogenic constituents in the coarse fraction, and enriched smectite and kaolinite in the $<2\,\mu m$ fraction are typical. Magnetic susceptibility values are higher and correlate well with acid-insoluble residue content. Higher Rb, Sr, Sm and Nd concentrations, $^{87}Sr/^{86}Sr$ ratios and more radiogenic ε_{Nd} values are characteristic for unit 2 sediments compared to unit 1 in both the cores. The unit 2 sediments represent Pleistocene hemiturbidites, older than 13 ^{14}C kyr BP with their source from the northern Bay of Bengal (NBOB), derived from the Himalayas and transported by the Ganges–Brahmaputra (G–B) River system. Unit 1 sediments are calcareous pelagic sediments, which started depositing ~12 ^{14}C kyr BP, with its clastic sediments derived from the Himalayas and SE Indian/Sri Lankan margins. The change in lithofacies from unit 2 to unit 1 suggests that the sediment deposition by turbidity current activity ceased in the distal Bengal Fan at ~12 ^{14}C kyr BP, perhaps because of the rapid rise in sea-level during the melt water pulse 1A and Holocene.

Keywords: Turbidites; Pelagic sediments; Provenance; Late Quaternary; Distal Bengal Fan

*Corresponding author. Fax: +91 832 2450609.
E-mail address: vprao@darya.nio.org (V.P. Rao).

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1. Introduction

The Modern Bengal Fan came into existence with the deposition of turbidite sediments since the Oligocene/Early Miocene (Cochran, 1990; Stow et al., 1990). Recent investigations on the deep-sea fan are directed largely to understand the (a) morphology and seismic stratigraphy of the submarine fan and growth and migration of submarine channels connecting the fan system,

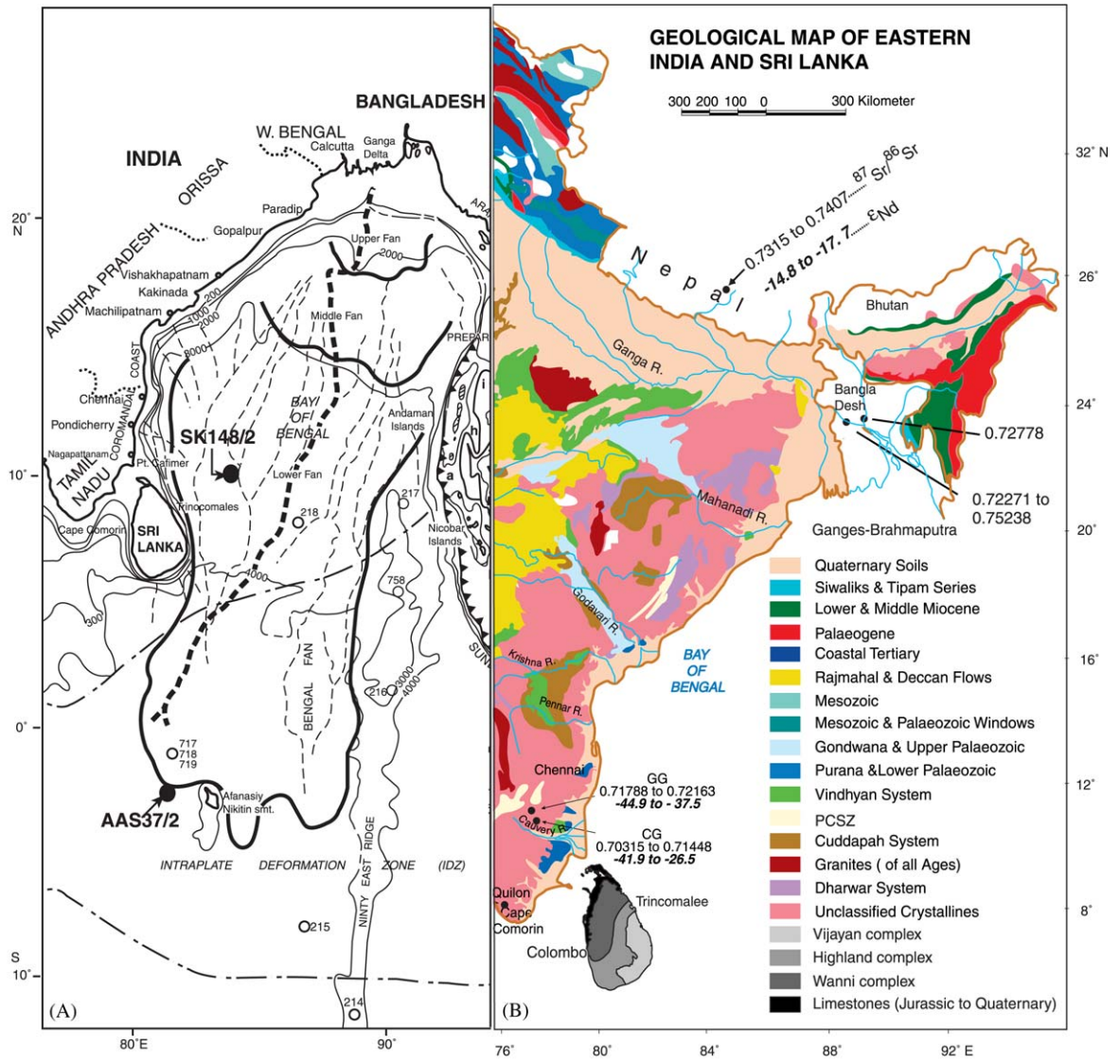

Fig. 1. (A) Locations of the sediment cores on the Bengal Fan. Boundaries of the Upper, Middle and Lower Fan regions, active turbidity current channel—thick dashed line, other turbidity channels—thin dashed lines, DSDP and ODP core sites are also shown (modified after Emmel and Curray, 1984). (B). Geology of Eastern India and Sri Lanka (Anonymous, 1965), Sr and Nd isotopes of the geological formations and Ganges river discharge are also given. GC-granitic gneiss and CG-charnokite gneiss (after Peucat et al., 1989; Galy et al., 1999; Dowling et al., 2003).