

Channel sand bodies in Middle Siwalik sediments in Jamrani Area, Nainital District, U.P.

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Abstract

Eight river channel sand bodies are recorded and studied in the upper part of the Middle Siwalik group in Jamrani area. These sand bodies are characteristically lens shaped in cross-sectional view and exhibit fining upward sequence. Their shape, internal characters and orientation in space and time indicate that these sand bodies were formed due to scouring and filling by migrating streams.

Introduction

The Siwalik rocks in the Jamrani area (Long. 79°36'36", Lat. 29°16'15") include Lower Siwalik sediments containing claystone, siltstone and fine sandstone and Middle Siwalik sediments made up of medium to coarse-grained sandstones and mudstone. River channel sand bodies are developed in the upper part of the Middle Siwalik sediments. A recent study of the petrography, palaeocurrent and depositional environments of the Siwalik rocks of the study area (Misra, 1981) has provided new data about the shape and internal structure of such channel sand bodies.

Stratigraphy, Lithology and Petrographic characters

The Middle Siwalik sequence is about 1100 m thick (Misra, 1981) in the study area. The contact with the underlying Lower Siwalik sequence is gradational. Sediments are mostly coarse-grained and essentially made up of sandstones with occasional clayey and pebbly intercalations.

The sandstones are texturally and mineralogically immature and poorly to moderately sorted. Chief detrital constituents are quartz (35 to 56 per cent), rock fragments (16 to 38 per cent), feldspar (5.8 to 18 per cent) and mica (1.2 to 8.8 per cent). The sandstones are characterised by carbonate cement of secondary origin.

River channel sand bodies

The channel sandstones produced by migrating fluvial channels are convex sand bodies pinching out laterally and lens-shaped in cross-sectional view. Usually the base of such channel sand bodies is erosional (Reineck and Singh, 1980, p. 71).

The uppermost part of the Middle Siwalik group is well exposed at Jamrani and channel sand bodies are very conspicuous. Eight river channel sand bodies were studied on the right bank of the Gola river at Jamrani. The dimension and orientation data are listed in Table I. Figure 1 illustrates the channel shape and sedimentary characters. The lateral and vertical building of the river channel sand bodies through space and time are clearly evident from Figure 1.

Channel morphology

Channel bodies are sandy and contain coarser sediments in the basal part. Nearly all the sand bodies are characteristically lens-shaped in cross-sectional view (Fig. 2). The channels exhibit erosional basal contact with the underlying clays/muds and grade upwards and laterally into silty/clayey material. The base of the sand bodies are pebbly and the grain size decreases progressively upwards. Generally all the channels are filled up by layers conforming approximately to the chan-

TABLE I
Dimension and orientation of channel sand-bodies

| | Width (W) in meters | Depth (D) in meters | W/D | Orientation (Azimuth) |
|------|------------------------|------------------------|------|--------------------------|
| ch-8 | 42.50 | 10.00 | 4.25 | 204° |
| ch-7 | — | 10.50 | — | 204° |
| ch-6 | 36.50 | 10.00 | 3.65 | 201° |
| ch-5 | 17.35 | 7.00 | 2.48 | 202° |
| ch-4 | 13.52 | 7.15 | 1.89 | 204° |
| ch-3 | — | 4.00 | — | 202° |
| ch-2 | 10.00 | 4.95 | 2.02 | 202° |
| ch-1 | 15.00 | 5.00 | 3.00 | 204° |

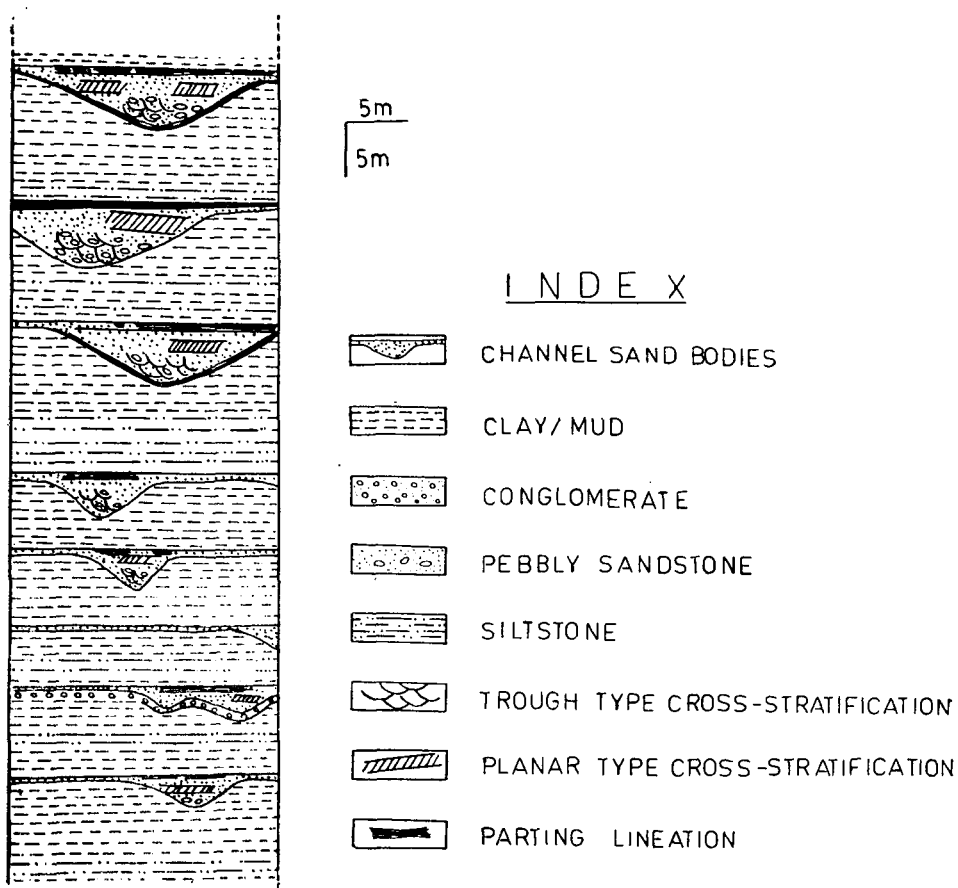


Figure 1. Stratigraphic section measured at right, the bank of the Gola River, Jamrani, showing dimension and orientation of channel sand bodies.

nel shape with concavity upward. The channel sand bodies are 4 to 10.5 m deep and apparent width ranges from 10 to 36 m. The width/depth ratio ranges between 1.9 to 8 (Table I).

The basal part of channel sandstones exhibits prominent cross-stratification. Claystone/mudstone pebbles are concentrated along the foresets of large scale trough cross-stratifications. These pebbly sediments are overlain by medium to fine-grained sand, showing smaller scale planar cross-stratifications, followed by very fine sand, showing parallel lamination. Higher up in the channels, silt and clay occur, showing parallel laminations. The parting lineations are prominent in silty/clay layers which also occasionally show scour and erosional marks.

Discussion

Channel sand bodies occurring in the upper part of the Middle Siwalik group contain coarser and pebbly material in the basal part and show erosional contact with the underlying clays/muds (Figs. 1 and 2) marked by the presence of pebbles



Figure 2. Field photograph showing channel sand body (Ch - 2) right bank of Gola River, Jamrani.

from the underlying rocks representing channel lag deposit (Allen, 1965; Singh, 1975; Miall, 1977; Reineck and Singh, 1980). The channel sand bodies show prominent fining upward sequence which is characteristic of many of the fluvial channels. All the channel sand bodies intersect the underlying mud/clay indicating the channel-fill deposit. The morphology, lithology and sedimentary structures present in the channel sand bodies suggest that these bodies may have formed as a result of erosion and deposition of a stream channel that migrated laterally.

As the channels have been studied only in two dimensions, there is a possibility that the channels are of similar shape and dimensions and because of different cross-sections in which they are exposed, they look different; or there may be variability in the shape of channels themselves but, due to lack of three-dimensional study, this is an open question.

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