SOME LESS COMMON SEDIMENTARY STRUCTURES FROM THE POINT BAR AND NATURAL LEVEE DEPOSITS OF GOMTI RIVER, UTTAR PRADESH, INDIA

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ABSTRACT

Antidune cross-bedding, micro-delta cross-bedding and wave ripples are found at a few places in the natural levee and point bar deposits of Gomti River. Environmental significance of these sedimentary structures in fluvial sediments is discussed.

INTRODUCTION

Gomti river is a typical river of alluvial plain, confined throughout its length in the alluvium. A detailed study of sedimentological characteristics of Gomti River has been initiated; some results have already been published (SINGH, 1972a, b; MISRA, SINGH & KUMAR, 1972). Point bar and natural levee deposits of Gomti River show well-developed sedimentary structures. In the present discussion three less common sedimentary structures are described.

Antidune cross-bedding

Antidunes are ripple-like features produced in upper flow regime under conditions of rapid flow ($F > 1$). They possess low relief and move both upstream and downstream.

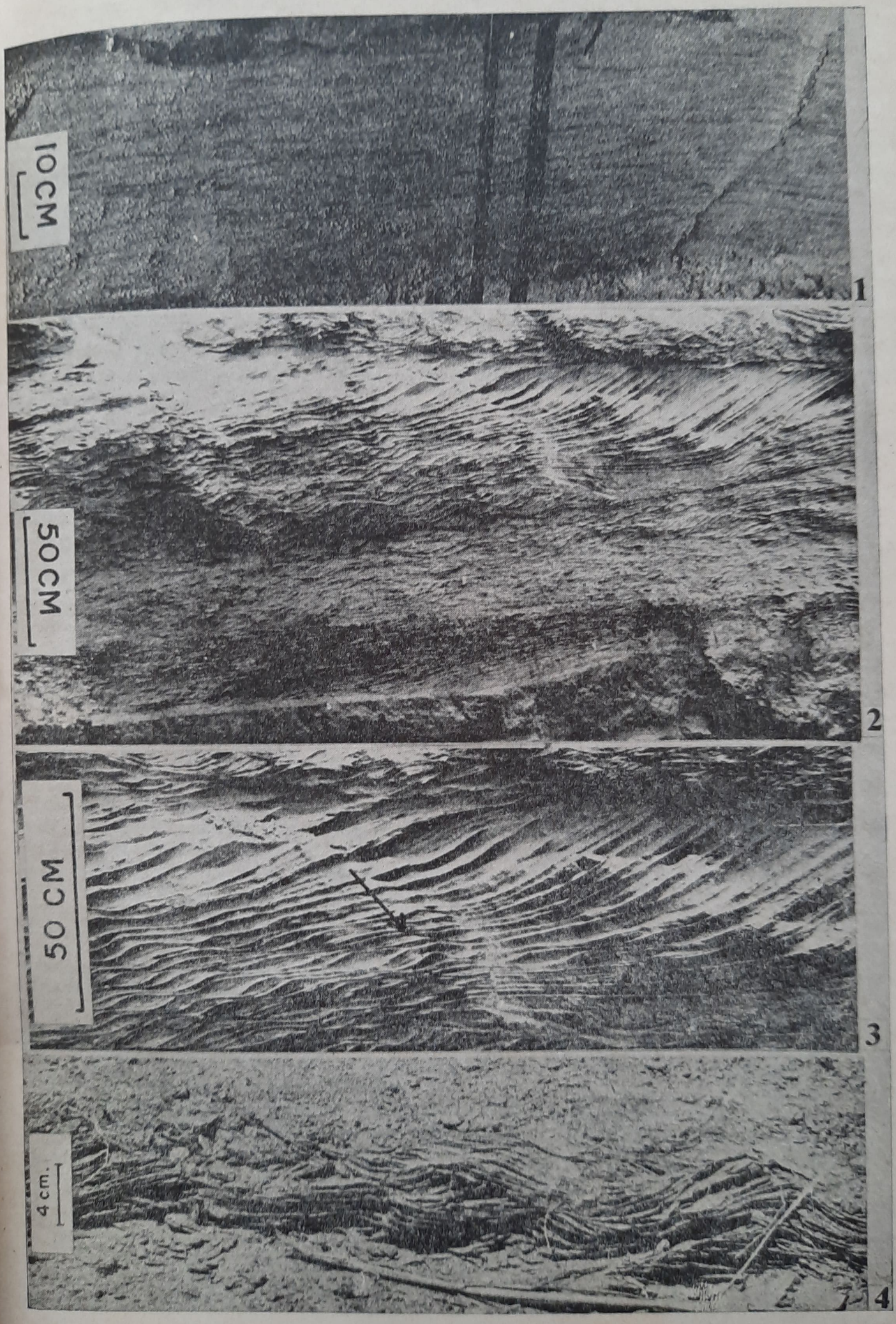
If antidunes have been active at some place and enough sediment is available they leave behind a characteristic bedding-type. It is a cross-bedding made up of thin lenticular units inclined at low angles both upstream and downstream. Within the lenticles lamination is generally very faintly developed. This faint development of lamination is most probably due to extremely high rate of sedimentation during deposition in antidunes. MIDDLETON (1965) produced antidune cross-bedding in flume experiments. Pl. 1, Fig. 1 shows antidune cross-bedding from the upper point bar deposits of Gomti River. It was observed only in one point bar in the vicinity of Lucknow.

Horizontal bedding of upper flow regime is rather common in upper point bar deposits of Gomti River (see SINGH, 1972b). However, it seems quite likely that locally antidune cross-bedding can be common in the upper part of the point bar deposits.

Micro-delta cross-bedding

Large-scale cross-bedding is rather uncommon in Gomti River deposits. Wherever present it shows solitary occurrences (Pl. 1, Fig. 2). Thus, they have been regarded as deposits of migrating micro-deltas. An especially well-developed micro-delta cross-bedding with backflow ripples are developed in the form of climbing ripples (Pl. 1, Fig. 3). This was recorded in a natural levee deposit.

This micro-delta existed and migrated only for a short distance; then it became unstable


10CM
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and changed into small current ripples producing climbing ripple lamination. Genesis and characteristics of backflow ripple are discussed in detail by BOERSMA, VAN DE MEENE AND TJALSMA (1968).

Wave ripples

In general terms, fluvial environment may be regarded as one lacking wave activity and with that also the wave ripples. However, during present study well-preserved symmetrical wave ripples with their characteristic internal structure were found at two localities in the natural levee deposits (Pl. 1, Fig. 4). The foreset laminae of wave ripples are arranged in bundle-wise fashion, and laminae possess off-shoots, i.e. foreset laminae of one ripple continue into the adjacent ripple. There are several depressions in the natural levee areas which retain water even after floods when water level sinks down. In such depressions, under suitable wind conditions, small waves are formed, which produce wave ripples in the bottom sediments. Such wave ripples possess a good potential of preservation within the natural levee environment.

Thus wave ripples, if found in fluvial environment are associated with natural levee and flood plain deposits.

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EXPLANATION OF PLATE 1

1. Antidune cross-bedding. This bedding is made up of 2-3 cm thick lenticular units which are inclined both in upstream and downstream directions. Direction of flow—left to right.
2. Micro-delta cross-bedding. A single unit is sandwitched within the ripple bedded sediments. In the downcurrent direction micro-delta grades into ripple bedded sediments. Direction of flow—right to left.
3. A detailed view of micro-delta cross-bedding. Note the development of backflow ripples in the lee-face (arrow). Direction of flow—right to left.
4. Internal structure of symmetrical wave ripples. Ripples are made up of foreset laminae arranged in bundle-wise manner, and laminae itself show offshoots.