ABSTRACT

The fluvial styles recorded in the Paleoproterozoic Kolhan sediments of eastern India in the Chaibasa-Noamundi basin reflect variations in the rate of generation of the accommodation space. Six lithofacies arranged, in two genetic sequences, have been recognized within the succession. The lower sequence records little available accommodation space with a high degree of reworking, which resulted in sheet-like, high-energy, bed load-dominated, braided fluvial deposits that lacked recurrent facies patterns. Channel deposits in the lower sequence reflect mixed-load, braided fluvial systems on stable channel banks with a low-moderate gradient. The channels retained an overall braided character with no evidence of meandering, despite indications that large fluctuations in discharge occurred within the mixed-load streams. The swift response of the fluvial systems resulted from rapid runoff rates caused by the absence of vegetation. As accommodation space increased upwards, the rate of reworking of the sediments was reduced, and fining and thickening-upward sandstone-shale sequences formed. This led to the formation of alternating sheet sandstones and sand-streaked siltstone-shales. The sheet sandstones record evidence of high-energy, unconfined ephemeral fluvial flash-flood deposition, internal erosion, and growth surfaces, while the shale-siltstones are interpreted to as representing sand flat deposits.

The Kolhan Basin (mostly clastic rocks with some carbonate rocks) represent more than a single phase of deposition and the internal erosion surfaces are indicative of channel avulsions. Variations in the style and order of the bedding contacts show that the deposits are products of subaqueous dune, bar, and channel migration. The paleo-river evidently had high width: depth ratio.

The change in the fluvial style combined with local evidence of desiccation suggests an evolution towards a more semi-humid climate in the upper sequence in contrast to a warm humid climate in the lower sequence. This climatic change could account for the reduced bed-load input in the overlying succession culminating in the ephemeral deposition style. Provenance studies indicate a multiple source of the sediments: Singhbhum Granite and the Iron Ore Group of rocks(felsic plutonites and metasedimentary + volcanic rocks).

The pear shaped Kolhan Group in the studied sub-basin of Chaibasa-Noamundi is represented by a sequence of clastic (±carbonate) association along with development of thin and discontinuous patches of basal conglomerates draped by sandstone beds. The IOG (Iron Ore Group) – fault, marks the western 'distal' margin of the Kolhan Basin, and show evidences of passive subsidence subsequent to the initial rifting stage. The basin is thought to evolve as a half-graben under the influence of an extensional stress regime. This assumption of a tectonic setting for the

NE-SW trending Kolhan Basin can be related to the basin opening as a consequence of an E-W extensional stress system that prevailed during the development of the Newer Dolerite dyke (Saha, 1994). The Paleoproterozoic age of the Kolhan Basin is based on the consideration of the conformable stress pattern responsible both for the basin opening, and on the development of the conjugate fracture system along which the Newer Dolerite dykes intruded the Singhbhum Archaean craton. The half-graben development and fault growth evolved differently through time and produced different basin-filling patterns.

Keywords: Half Graben, IOG (Iron Ore Group), Singhbhum Granite, Kolhan sedimentation, Chaibasa-Noamundi basin, braided fluvial deposits, ephemeral deposition and accommodation space, Eastern India.