

CONTROLS ON VARIATION IN SEDIMENTATION RATES OF FLUVIAL FACIES

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Chronologic framework established by magneto-sedimentological studies of paleochannel and floodplain facies of the Siwalik Group (Chinji, Nagri, Dhok Pathan and Soan formations (18.3 to 1.5 + 0.2 Ma) in Potwar plateau, northern Pakistan, provides a mode to identify, evaluate and quantify both temporal variability (unsteadiness) in sediment accumulation over a stratigraphic sequence and spatial variability (non-uniformity) in sedimentation across the depositional system. Episodes of sedimentation, erosion and non-deposition occur over a range of time scales and the frequency and duration of particular episodes are dependent on intra-and extrabasinal controls on sedimentation.

The mean sedimentation rate of 0.39 mm/yr for 21 polarity intervals in between C5r2n and C₃Ar is generally consistent for the Siwaliks. Elevated magnitude of sedimentation rate (0.44 mm/yr) for the sandstones dominated Nagri Formation is generally in consistency throughout the Siwaliks. Time and thickness are complexly related in the Siwalik Group rocks because rates of sedimentation are variable due to variation in sediment input into the depositional basin from the orogenic belts. The boundaries of formations of the Siwalik Group are time transgressive and vary in age from hundreds of thousands of years, though it is difficult to assess the absolute degree of diachroneity. The apparently different ages for formations in various parts of the basin might be due to use of differing methods of defining formation boundaries by workers and may not be a real sedimentological effect; however there are also several potential sources of error in paleomagnetic age calibration technique. The present study has revealed that; 1) increase in sedimentation rate is directly proportional to the interconnctedness ratio of major channel sandstone bodies and inversely proportional to proportion of mature paleosols in a sequence; 2) sedimentation rate has generally been observed low in a succession where the proportion of fine-grained channel fills is high; 3) rate of variation in sedimentation is a function of channel stacking pattern; 4) avulsion frequency is a major control on variations in sedimentation rate; 5) increase in sedimentation rate occurs when rivers flow transverse to the structural axes of the drainage basins.