Mesoproterozoic tidalites from southern part of Lalsot Basin, North Delhi Fold Belt, Rajasthan, India

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Tidalites are recorded from part of the metavolcano-sedimentary succession of the Mesoproterozoic Bayana Formation (Alwar Group), in the southern part of the NNE-SSW trending Lalsot Basin, North Delhi Fold Belt (NDFB), Rajasthan, India.

The studied succession of the Bayana Formation is ~850m thick and is constituted of three major facies associations, namely – (i) subaerial bar/fan facies association in the lower part, characterized by subaerial accumulation of sediment gravity flow deposits; (ii) tidally modified mouth bar facies association in the middle part, characterized by subaqueous emplacements of the sediment-gravity flow deposits and their reworking by tidal currents; and (iii) tide-wave facies association, characterized by subtidal-intertidal sedimentation with intermittent wave reworking in a relatively stable and open marine setting. The overall facies sequence and their architecture suggest – (a) initial progradational sedimentation due to more supply of coarser clastics in the tectonically unstable basin marginal part, followed by (b) retrogradational sedimentation in a transgressive marginal marine depositional system under relatively stable phase.

Tidalites are present within the sandstone-mudstone heterolithic units in the middle and upper parts of the studied succession. Tidal signatures include – (i) herringbone cross strata, (ii) tidal bundles of various types including bidirectional cross-strata, laterally accreted strata bundle with mudstone-draped sandy foresets, reactivation surfaces separating the strata bundles, sigmoidal strata bundles, (iii) tidal bedding like flaser and lenticular beddings, and (iv) tidal rhythmites. Thick-thin pairs of rhythmic foreset bundles/lamina correspond to neap–spring tidal cycles. The architecture of tidalites within alternate sandstone-dominated and mudstone-rich units attests to sedimentation in a shifting subtidal to intertidal flat setting. Tidal sedimentation was affected by intermittent strong to weak reworking by open marine waves/storms. Wave reworking is manifested by wave ripples and combined-flow ripples superposed on tidal bundles.

This study records a transitional basinal setup from initial unstable, tectonically active conditions to more stable platformal setup with mature tidal flats. This signifies a record of the interaction between changing sea levels, variation in sediment supply and creation of net accommodation space caused by tectono-sedimentary changes in the south-eastern part of the North Delhi Fold Belt (NDFB) during the Mesoproterozoic time.
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