

Tidal Indicators in Gravel-Dominated Marginal-Marine Depositional Environments: Examples from the Megatidal Bay of Fundy, Canada

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Summary

The recognition of tidal influences on sediment deposition can aid in inferring depositional environments and predicting reservoir architecture. Tidal indicators are common in mud- and sand-dominated substrates (i.e., tidal bundles, sigmoidal cross-bedding, reverse flow indicators); however, in gravel-dominated systems, these structures are largely absent. Gravel-dominated marginal-marine depositional environments in the megatidal (>8 m tidal range) Bay of Fundy, Canada provides insights into tidal influences on gravel-dominated coastlines. Tidal effects on the morphology and sedimentology are manifest as: a consistent onshore to offshore topography of the intertidal zone; incision of fluvial and tidal channels; and, the occurrence of these deposits with well-developed salt marshes. Indirect morphological and sedimentological manifestations of tidal influence on coarse-grained sedimentation include control on the height of gravel bars developed within the intertidal zone; extensive mud deposition in the lee of gravel bars; and the potential preservation of thick gravel deposits, particularly in transgressive systems. The only direct sedimentological indicators of tides are bidirectional bedforms developed where onshore-directed high-angle cross bedding and offshore-directed trough cross bedding are interbedded.

In the rock record the reliable recognition of tidal influence on the deposition of conglomerates requires identifying at least two or three sedimentological characteristics that preserve evidence of tidally influenced deposition. These include: (1) reverse flow indicators – mainly high-angle dune cross bedding; (2) a sharp increase in bedding dips, in the shallowing-direction, in upper shoreface to foreshore deposits; (3) anomalously thick gravel sequences, particularly in transgressive settings; and, (4) association of gravel beaches and deltas with salt-marshes deposits.