

## Comparison and contrasts between different tidal sand-bodies: the case of the Jurassic Neuquén Basin, Argentina

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Tide-influenced and tide-dominated depositional environments (mainly estuaries, delta fronts and shelf sand-bodies) produce stratal packages that are architecturally complex. Because tidal deposits are very common in many hydrocarbon fields, we need better documented ancient examples and better constrained modern analogs. Large- and medium-scale cross sets (meters to tens of meters thick) produced by tidal currents can occur in variety of environments, from delta front, tide-influenced channels and distributary channels to the open shelf and straits, but they will have different architectures and paleocurrent distribution.

Particular attention has been recently given to the recognition and characterization of compound tidal dunes and tidal sand ridges and bars. Differentiating between tidal compound dunes and tidal sand ridges is critical for a correct reservoir characterization, because these two types of sand-bodies can have similar height, but are characterized by different crest orientations at the basin scale, different orientation of the accretion surfaces and different internal heterogeneities. Another key factor that controls the characteristics of tidal sand-bodies is the presence or absence of mud. Mud-rich systems will strongly differentiate from mud-poor ones; the former will be characterized by stronger heterogeneities, commonly by a bi-modal grain-size distribution and by the presence of fluid-mud deposits. On the other hand, little attention has been paid to mud-poor systems.

The present work focuses on the specific case of mud-poor tidal sand-bodies of the Bajocian Lajas Formation in the Neuquén Basin of Argentina. The Neuquén Basin is located in west-central Argentina, approximately 33°-40° south, on the eastern side of the Andes and in central Chile. The entire succession of the basin, up to 6000 m thick, records a time span from Late Triassic to Early Cenozoic. The Lajas Formation was deposited after the initiation of the Pacific Plate subduction, in the early Jurassic, underneath the western margin of Gondwana, which led to back-arc subsidence within the Neuquén Basin.

The study succession, exposed in a 6 km long outcrop belt at Lohan Mahuida, is characterized by stacked, cross-stratified tidal sand-bodies that alternate with finer grained, wave-influenced lithosomes. The sand-bodies are developed on the outer part of a narrow shelf, possibly close to the shelf edge, as they are directly underlain by deep-water turbidites. The tidal sand-bodies have a thickness range between 3.5 and 15 m and width of at least 2 km.

The present work provides a new understanding for clean-water tidal systems, where the classical mud drape tidal indicator may not be present or not well developed. Nine stratigraphic sections have been measured, and more than 30 detailed sedimentological logs have been described on specific sand-bodies. Hundreds of paleocurrent indicators have been collected, in order to understand tidal-current patterns and to determine the accretion style of the sand-bodies (for example, forward versus lateral accretion). High-resolution photomosaics provide correlation and definition of the architecture of the sedimentary bodies.

**Keywords:** tidal, compound dunes, tidal sand ridges, tidal bars, Jurassic, Neuquén Basin