

**Early Aptian Fluvial Lowstand and Eolian Transgressive Sandstones (Troncoso Mbr-Huitrin Fm):
Main Reservoirs in the Central Argentine Andes (Neuquén Basin).**

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The Neuquén basin, located in the west-central Argentine Andes, during the L. Jurassic and E. Cretaceous was a backarc depocenter, where over 2,000 m-thick section of organic-rich shales and shelfal carbonates and clastics were accumulated under open marine conditions. However, by the Early Aptian (ca 112 Ma) dried-out and entirely exposed due to a relative sea level fall and temporary disconnection from the Pacific Ocean through the magmatic arc.

The depositional site was extremely restricted down to the axial portion of the basin and controlled by the slope geometry of the preceding sequence. The pre-existing open marine conditions were interrupted changing to an shallow evaporitic pan surrounded by widespread mudflats. A huge volume of clastics were sourced by an ephemeral fluvial system from the south and southeast margins. Older shelfal and slope sediments were subaerially exposed and deeply incised by fluvial erosion. This interval identified as the lowstand systems tract, reaches a maximum thickness of 120 m and displays a clear coarsening and thickening upward pattern. However, local variations are common related to the lateral shifting and space compensation within the depositional system (autocyclic processes).

The existence of a more widespread eolian sand dune interval (up to 45-m thick), covering the previously exposed platform demonstrates that, after the E. Aptian sea level fall, a flooding event occurred. As a consequence of the base-level rise, not only the topographic relief diminished but also the sediments supplied by the rivers. This transgressive systems tract consists of a marginal fringe, where a less than 20 m-thick interval made up of fluvial sandstones and mudstones, displays an overall thinning-upward arrangement and a backstepping pattern of the sandstone bodies. Basinward, the depositional style was governed by an extensive mudflat surrounding an evaporitic pan occupied by hypersaline marine waters.

Although the base level kept rising, the negative hydrological balance in the backarc embayment was strong enough to maintain hypersaline conditions. Under this restricted regime, the new highstand systems tract consisted of a basin-wide anhydrite package followed by an halite section, unconformably resting on the older sequences. Noticeably, the hypersaline sea expanded more than 200 km beyond the depositional edge of the precedent lowstand deposits. In the Andean region these evaporites (anhydrite and halite) provide a very effective regional top seal.

Fluvial sandstones are characterized by very good petrophysical characteristics, particularly toward the top of the lowstand systems tract. Maximum known net thickness is close to 100 m with average net porosity of 16%. Incised-valleys contain fluvial sandstones and conglomerates with gross thickness of 14 m, net porosity 23% and core permeabilities over 100 mD.

The eolian facies consists of fine-to-medium-grained feldspathic arenites, scarce matrix (avg 7%), with authigenic kaolinite and illite pore-fillings and pore-linings, and dolomitic cement dominant (5-30%). Secondary porosity is characterized by intergranular meso and micropore-system (avg 18%), displaying enlarged and oversized pores resulting from the dissolution of the dolomitic cement. Commonly, core average permeabilities are around 50-80 mD, with maximum values of 700-800 mD.

The depositional loci of the Troncoso sandstone developed in the northwest portion of the Neuquén basin and, for that reason, is one of the main target in the fold belt, specially when involved in the structures present along the leading-edge. In the foreland, near to the deformed and uplifted zone, the eolian-fluvial sandstones are the most important reservoirs in combined/stratigraphic traps, where oil recoverable reserves are over 500MMB.

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Fluvial and Eolian Reservoirs in Lowstand and Transgressive Systems Tracts of an Early Aptian Depositional Sequence (Huitrin Fm). Neuquén Basin, Argentina.

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