Sedimentology and Architecture of Early Post-Rift Submarine Lobe Deposits: The Los Molles Formation, Neuquén Basin, Argentina

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Abstract

The sedimentary architecture of submarine lobe-dominated successions in early post-rift settings are poorly understood despite commonly being proven hydrocarbon reservoir systems, in part because these types of systems are rarely exposed. Exhumed early post-rift deposits in the Neuquén Basin, Argentina, have been investigated in the Jurassic Los Molles Formation, to help understand and predict the subseismic distribution of facies around inherited syn-rift structures. Two distinct depocenters, La Jardinera and Come Yeguas, are located between NW-SE trending extensional syn-rift footwall highs.

The well exposed submarine lobe-dominated successions have allowed sedimentological and architectural changes in the Los Molles Formation to be constrained by use of correlation panels constructed along a 12 km strike section in La Jardinera and a 2.5 km cross strike section towards syn-rift faults in Come Yeguas. The early post-rift deep-water stratigraphy is characterized by the onlap and pinchout of sandbodies, which in combination with hardground development on footwall highs indicates that deposition occurred across fault-block highs.

The basin physiography during deep-water deposition was, therefore, demonstrable conditioned by inherited syn-rift structures that influenced the timing and location of bypass, erosion and deposition of sand-rich sediment gravity flows. The infill architecture of the two depocenters record different stratigraphic architectures and stratal patterns of sand-rich strata, inferred to be the result of the contrasting responses of marine clastic sedimentation to the inherited syn-rift topography, differential subsidence, sea-level variations and sediment supply. This study provides criteria to decipher relationships between the organization of lobe deposits and inherited syn-rift structures that can be integrated to improve the prediction of reservoir bodies in underexplored early post-rift successions.