Incised Valley in Lotena Fm, A New Geological Model Based on the Integration of Surface and Subsurface Information*

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Abstract

The study area is located in the southwest portion of the Neuquén basin, north of the Huincul ridge and the culmination of Chihuidos High. The objective of this work is to assess the prospectivity of the Lotena formation through the integration of seismic interpretation, well profiles and outcrops. The Lotena, Barda Negra and La Manga formations, all together define the Lotena Group, a sedimentary system of regional extension composed of continental, mixed shallow marine and evaporite marine facies. This group is limited at the base by the Intracallovian unconformity (-154 Ma) and at the top by the Intramalmic unconformity (-144 Ma). Correlations of 12 wells with electric logs and cutting data were used to understand the variation of lithology and thickness of the Lotena formation based on maps and stratigraphic elements identified in the seismic interpretation, and attributes calculation on 3D seismic cubes in an area of 1400 km². The obtained model has a strong correlation with outcrop descriptions and was schematized in 2D sections to show facies organization and variations in a regional perspective. The sedimentary model proposed for the study area consists of fluvial deposits, transported by concentrated long-term flows and deposited in a subaqueous environment, filling an incised valley. The technical support of this model lies on the integration of subsurface data. Seismic interpretation shows that the Intracallovian unconformity generates an important incised valley eroding the Tabanos Fm and the top of Cuyo Group, showing truncated reflectors at the base, producing a paleotopography over which the Lotena Fm begins to deposit defining onlaps over the unconformity. These seismic stratigraphy relationships, have their analog along the Raja Palo and Vega del Tero outcrops towards the north, near Chos Malal, and are consistent with the thickness variation observed in well correlations, the change in lithology described in cuttings, oil shows and completion results. The correlation obtained from the integration of different kinds of data give support to the incised valley geological model. This new model, defined on the basis on the elements described above, together with the structural analysis, leads to delimit an area of interest for hydrocarbon exploration for the Lotena Fm which, if proven, would open a new play in the Dorso de Los Chihuidos área.

References Cited


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INTRODUCTION
The study area is located in the southwest portion of Neuquina basin, in the northern part of the "Chiquet" uplift and the culmination of "Chihuixos" High. The study area comprises the Lotena, Barda Negra and La Manga formations, all together defining the Lotena Group, a regional extension sedimentary system composed of continental, carbonatic-clastic shallow marine and evaporitic marine facies, denominated by Groeber (1946) as Loteniano-Chacayano cycle. This group is delimited on the base by the Intracallovian unconformity (-154 Ma) and on top by the Intramalvic unconformity (-144 Ma).

The Lotena Group forms an incised valley on its northern area of the "Huincul" uplift and the culmination of "Chihuixos" High. The objective of this work is to define the prospective potential of the Lotena formation, especially in areas with no outcrops. The Lotena formation, which is of Jurassic age, onshore Neuquina basin, is characterized by a well-defined seismic expression, and it is one of the most prospective formations in the Neuquina basin.

GEOLOGICAL MODEL
The sedimentary model proposed in the study area consists of deposits of fluvial origin, transported by concentrated long-term flows and deposited in a subaqueous environment, filling an incised valley, similar to the one defined by Zavala et al. (2002). The existence of this structure is supported by correlation of seismic and well data. The main coarse-grained intervals were accumulated by long-life high-density underflows. The existence of transitional passages between different coarse-grained facies suggests fluctuating flows related to variations in the flood discharge. These clastic relationships defined on the subsurface of the study area have their analog along Raja Palo and Vega del Tero outcrops, which were the main source for the valley fill. The correlation got between the analyzed data, give support to the mentioned conclusion, making the Lotena formation a good candidate for exploration in the Neuquina basin.