[PS]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

Leanza, H.A. 2009, Las principales discordancias del Mesozoico de la Cuenca Neuquina según observaciones de superficie: Revista del Museo Argentino de Ciencias Naturales., n.s.

Mutti, E., 1992, Turbidite sandstones: AGIP – Instituto di Geologia Università di Parma, 275 p., San Donato Milanese.

Zavala C.; Maretto H. y Arcuri M., 2002, Las facies clásticas de la Formación Lotena (jurásico medio) en las áreas de Loncopué y Loma La Lata. Cuenca Neuquina. Argentina: V Congreso de Exploración y Desarrollo de Hidrocarburos. IAPG. Actas en CD. Mar del Plata.

Zavala C. y Arcuri M., 2002, Caracterización de la Formación Lotena mediante estudios de campo y subsuelo: Informe interno YPF.

Incised valley in Lotena Fm., a new geological model proposed based on the integration of surface and subsurface information

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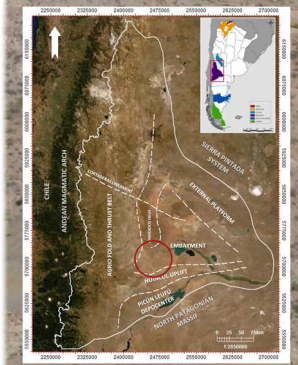
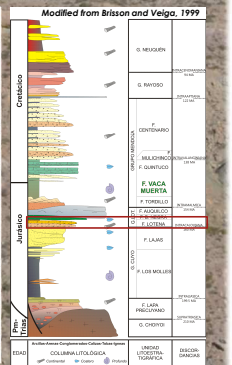
INTRODUCTION

The study area is located in the southwest portion of Neuquina basin, in the northern area of the "Huincul" uplift and the culmination of "Chihuidos" High. The objective of this work is to define the prospective potential 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 regional extension sedimentary system composes by continentals, carbonatic-clastic shallow marine and evaporitic marine facies, denominated by Groeber (1946) as Loteniano-Chacayano cicle. This group is delimited on the base by the Intracallovian unconformity (~154 Ma) and on top by the Intramalmic unconformity (~144 Ma).

The coarse grain levels of Lotena formation shows relationship with hyperpycnal and dense flows. Facies associations are similar to turbiditic coarse grain systems dominated by subaqueous dense flows (Mutti 1992). This lithologies probably they've been accumulated in a subaqueous environment, and they've been originated by long-life high-density underflows of fluvial origin (Zavala *et al.* 2002).





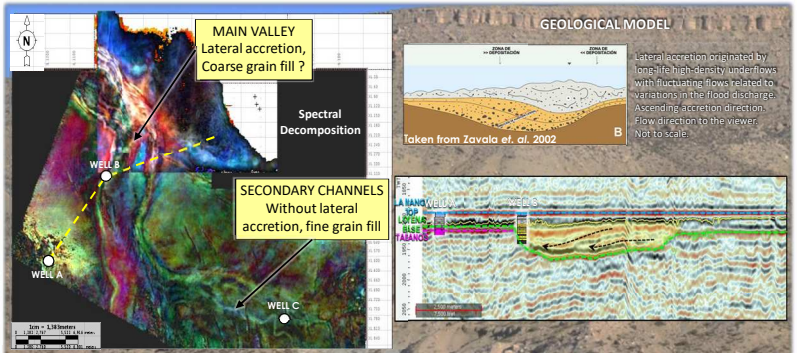
REFERENCES

Leanza, H. A. (2009). Las principales discordancias del Mesozoico de la Cuenca Neuquina según observaciones de superficie. Revista del Museo Argentino de Ciencias Naturales., n.s.

Mutti, E. (1992). Turbidite sandstones. AGIP – Instituto di Geologia Università di Parma, 275 p., San Donato Milanese.

Zavala C., Maretto H. y Arcuri M. (2002). Las facies clásticas de la Formación Lotena (jurásico medio) en las áreas de Loncopué y Loma La Lata. Cuenca Neuquina. Argentina. V Congreso de Exploración y Desarrollo de Hidrocarburos. IAPG. Actas en CD. Mar del Plata.

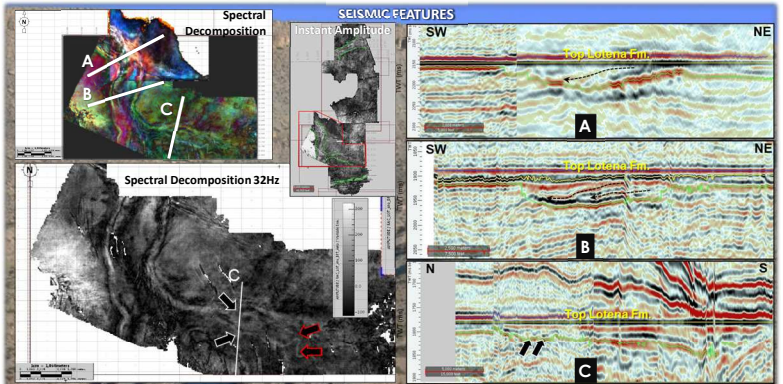
Zavala C. y Arcuri M. (2002). Caracterización de la Formación Lotena mediante estudios de campo y subsuelo. Informe interno YPF.

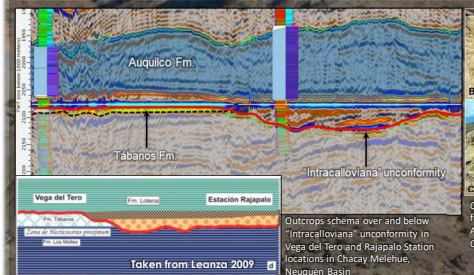


The sedimentary model proposed in the study area consists of deposits of fluvial origin, transported by concentrated long-term flows and deposited in a subaqueous environment, filling an incised valley, similar to the one defined by Zavala et al, (2002) for the outcrops of this formation in the vicinity of Loncopué city, Neuquén province. Sedimentology indicates that 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 intervals display multiple amalgamation surfaces, with a lateral continuity that exceeds 15 kilometers.

The technical support of this model lies on the integration of subsurface data. The seismic interpretation shows that the Intracallovian unconformity generates an important incised valley eroding the Tabanos Formation and the top of Cuyo Group, generating a paleotopography over which the Lotena formation begins to be deposited. These seismoestratigraphic relationships defined on the subsurface of the study area have their analog along Raja Palo and Vega del Tero outcrops described by Leanza (2009) in the northern area of Neuquén province, near to Chos Malal City, and are validated from well correlations, cutting data, oil shows and completion results. The correlation got between the analyzed data, give support to the mentioned conclusion and make strengthen the geological model generated, and probably would have a connection with the fluvial systems described by Schiuma et. al. (2002) for the Barda Gonzalez field.

SEISMIC FEATURES





Outcrops schema over and below "Intracalloviana" unconformity in Vega del Tero and Rajapalo Station locations in Chacay Melehue, Neuquén Basin

Outcrops of Lotena formation in Loncopue, Neuquén Basin. Taken from internal YPF report (Maretto, Zavala y Arcuri)
A) Conglomerates from hiperconcentrated flow. B) and C) Channelized fill with an erosional base showing lateral accretion.

OUTCROP ANALOGS

CONCLUSIONS

It was possible to map a channelized geobody with an erosional base at Lotena formation´s time, with 45 km of extension, an average width of 5 km and a maximum thickness calculated at 100 m.

It was possible to predict a coarse grain fill for the valley based on the endings of seismic reflectors and validated with cutting and well log data from pre-existed wells.

Based on inferred fill y sismostratigraphic features, it was possible to relate the geobody with outcrop analogs located in the northwest of Neuquina basin.

The proposed geological model, defined on the basis of the foregoing, together with the structural analysis, leads to delimit an area of hydrocarbon prospective interest for Lotena formation, which, if it is proven, will be one of the first positive result for this formation in the near zone of "Dorso de Los Chihuidos" High.