

AAPG HEDBERG CONFERENCE
“New Technologies and New Play Concepts in Latin America”
NOVEMBER 5-9, 2001, MENDOZA, ARGENTINA

3D Geostatistic model of clastic sequences. Neuquen Basin, Argentina

V. MARTEAU, J. LAURI-Perez Companc S.A. Neuquén, C. LARRIESTRA-Larriestra, Curia y Asociados S.R.L. and C. ZAVALA-Conicet, U.N.S., Bahía Blanca.

Introduction

The objective of this work was to construct a tridimensional model of reservoirs belonging to the Clastic Member of the Rayoso Formation (Cretaceous of the Neuquén Basin), in order to be used in the development of an oil field. The tridimensional model was related to the geological model based on field work, which was object of several different interpretations. Recently Zavala et al. (this volume) introduced a new paleoenvironmental interpretation, corresponding to a saline lake partially affected by channelled underflows.

Methodology

The tridimensional model was built using the geostatistic technique of spatial estimation known as kriging 3D, with electrical logging well data. The correlation scheme was constructed using data of about 700 wells, allowing the subdivision of the clastic member into eleven small cycles. The registers used for the estimations were: gamma ray for lithology, effective porosity for petrophysical variations within the reservoirs, and water saturation for fluid content.

For the purpose of modeling only, the profiles were normalized until obtaining the best fit to a normal distribution (or Gauss). Normalizing processes involve the anomalous value analysis in the distribution tails, close anomalous values and normal score transformation.

In a following step, the structural analysis employing experimental variograms allowed to define the best theoretical model of variogram for each used variable. This operation was carried out following the methodology after Kupfersberger y Deutsch (1999).

Each cycle was modeled individually using exponential-type variograms for the gamma ray, and spherical for the porosity and saturation, resulting in vertical ranges between 7-12 meters. The horizontal ranges were between 700 – 1400 meters, in the less varying direction. The vertical/horizontal ratio fluctuates between 100 and 120, these values are coherent with the type sand bodies expected in this environment (Kupfersberger y Deutsch, 1999).

The tridimensional grids were calculated with cells of 100x100x0.45 meters, located in the most interesting portion of the oil field. After the calculus, the global analysis of the model and the study of individual beds that compound the reservoirs in the Rayoso Formation were done.

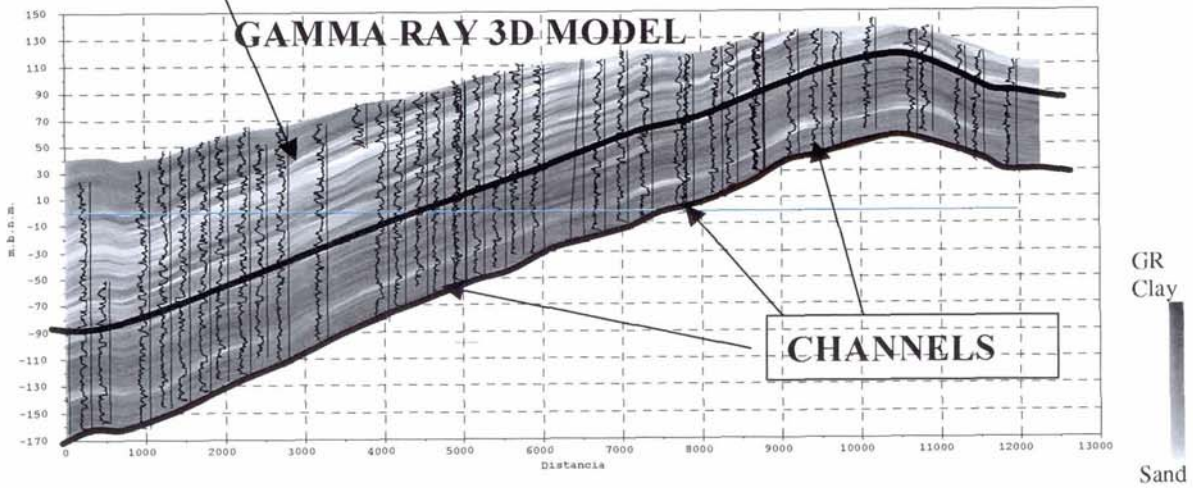
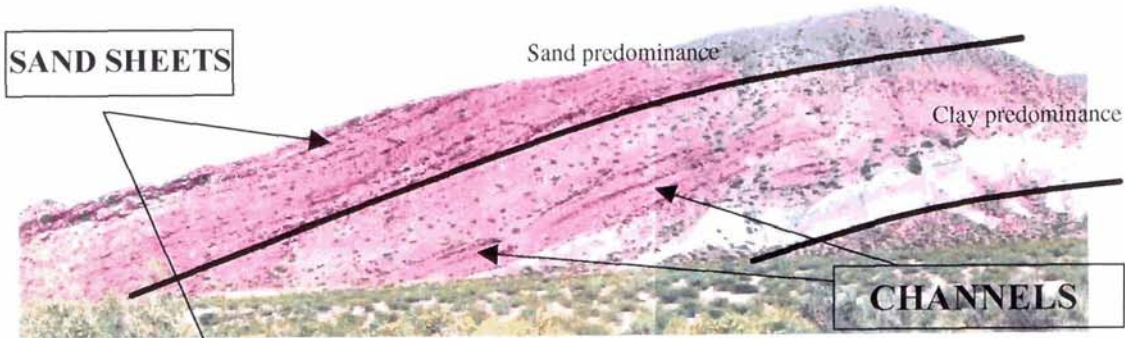
Results

The attached figure compares an outcrop example to a SW-NE tail of the oil field, where the occurrence of different kinds of psamitic beds are shown. In effect, the lower unit is mainly pelitic, with minor quantity of moderately channelled sandstone bodies. On the other hand, the frequency of these bodies in the upper unit increases as well as they're lateral continuity. Towards the top of this unit, two kinds of basic forms were developed corresponding to channelled and sheet sands. The exercise has helped focus the drilling of successful development wells in a mature field, extending the life of the reservoir.



Neuquén Basin

Rayoso Fm. Clastic Member outcrop



References

Kupfersberger, H. y Deutsch, C., 1999 "Methodology for integrating analog geologic data in 3D variogram modeling", AAPG Bulletin, V83,8,pp 1262-1278.

Zavala, C, Marteau, V, and Ponce, J., this volume. Origin, sequence stratigraphy and hydrocarbon potential of the Rayoso Formation (Aptian -Albian) in the central Neuquén Basin (Argentina). AAPG HEDBERG CONFERENCE "New Technologies and New Play Concepts in Latin America" November 5-9, 2001, Mendoza, Argentina.