

PS Structural Interpretation and Geochemical Modeling of the Barco - Los Cuervos Formation and Analysis of Coal Bed Methane in Northeast Colombia*

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Abstract

The lower Tertiary formations in Northeastern Columbia constitute one of the most important coal reserves in Colombia. The objective of this study is to determine if this formation has potential to be a coal bed methane (CBM) reservoir as an unconventional resource. The structural interpretations of eleven 2D seismic lines in the study area show several characteristics of a CBM reservoir. The coal-bearing formation is a lower tertiary unit influenced by thrust fault systems. A compressive regime has led to the formation of a large syncline structure illustrated by seismic lines. The seismic lines show an interesting phenomenon in which the seismic amplitude is strongly reduced as a result of gas saturation of the coal beds. Several sweet spots were located at the axis of synclines. 1D and 2D geochemical models show that the lower Tertiary formations enter the gas window between 15 million years ago to the present. The main risk of these CBM prospects is the presence of an effective seal formation on top of the coal-bearing units, which in some areas is not thick enough to trap gas. The structural maps of the lower Tertiary formations shows potential plays in several zones of the study area, these possible plays are the result of the tectonic influence of the thrust fault systems.

STRUCTURAL INTERPRETATION AND GEOCHEMICAL MODELING OF THE BARCO - LOS CUERVOS FORMATION AND ANALYSIS OF COAL BED METHANE IN NORTHEAST COLOMBIA

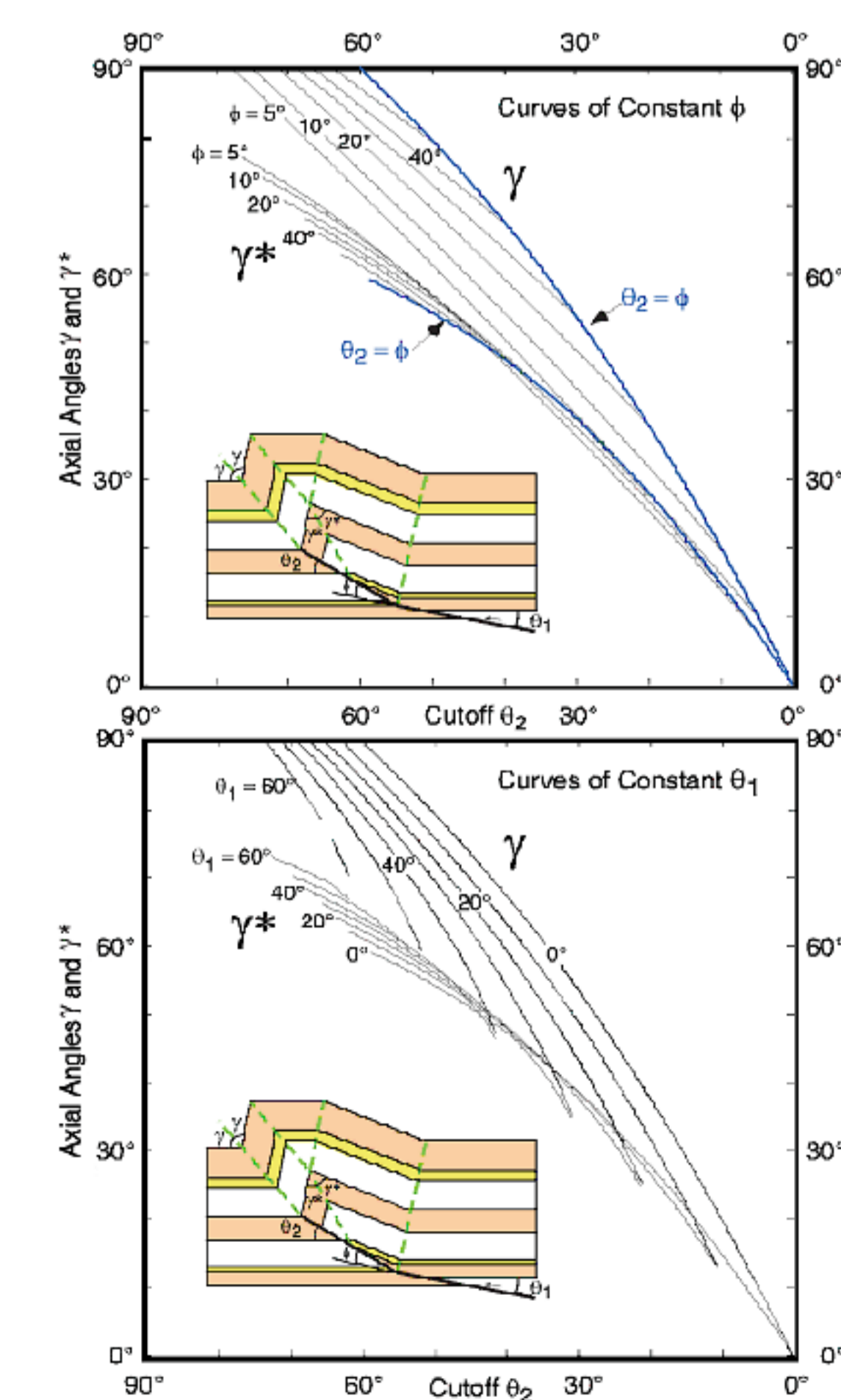
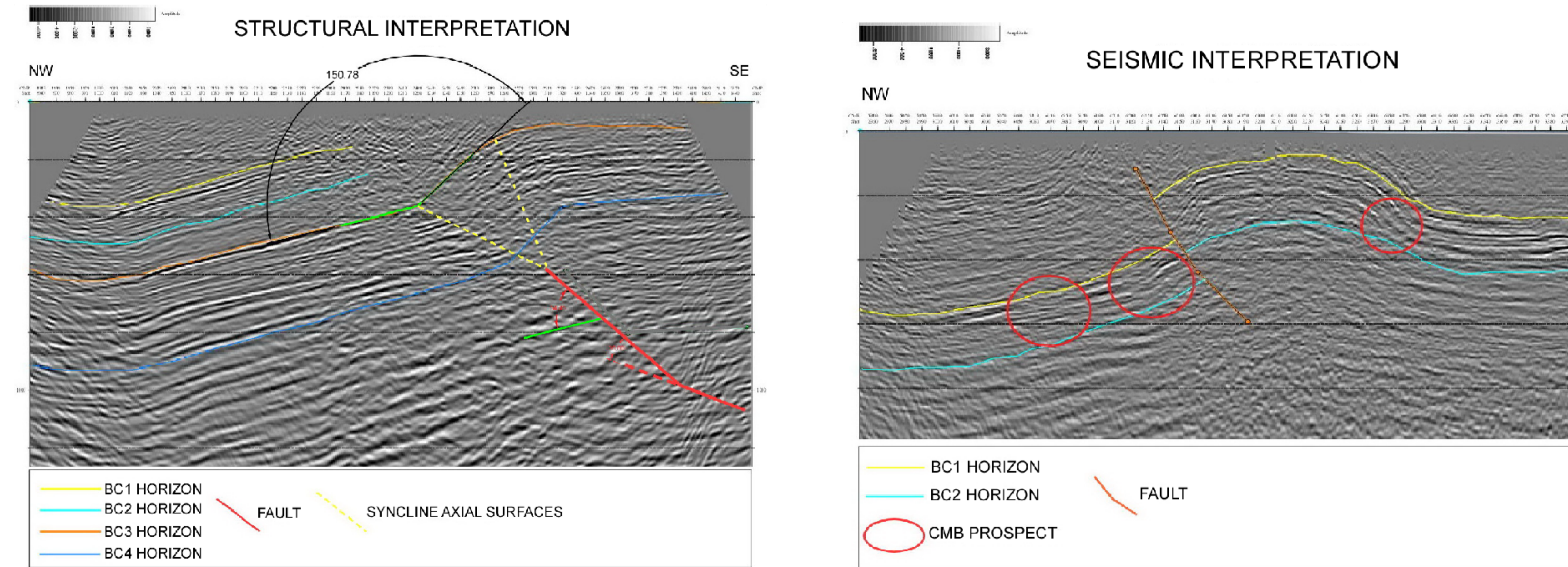
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The Barco - Los Cuervos Formation in the Cesar Valley Sub Basin constitutes one of the most important coal reserves in Colombia. The objective of this study is to determine if this formation has potential to be a coal bed methane reservoir as an unconventional resource.

Keith et al. 2003, define coalbed methane (CBM), as gas trapped in the coal beds, when the organic matter is transformed into coal, methane is created. This gas is bound to the surface of the coal by the lithostatic pressure or by hydrostatic pressure.

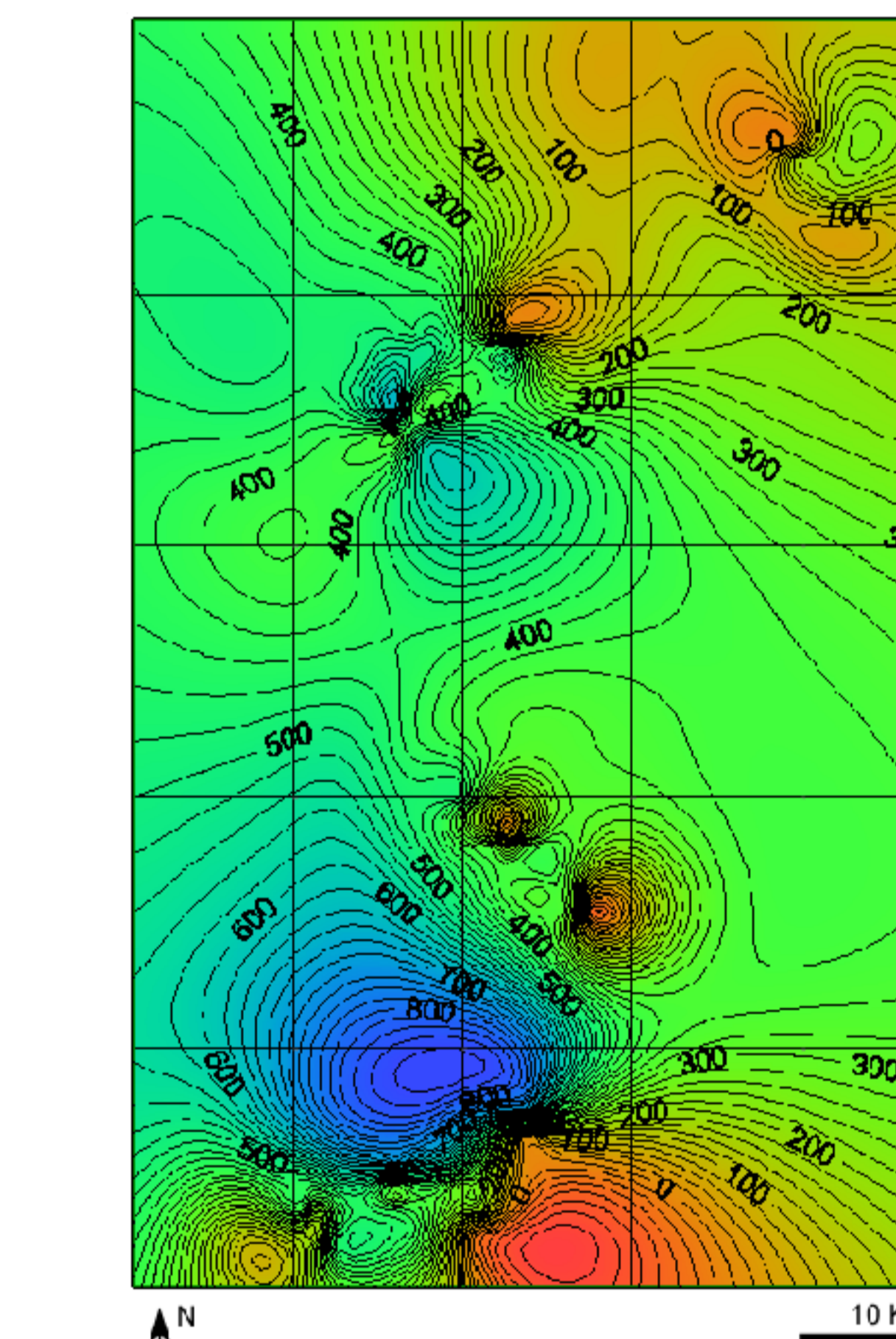
The gas content usually increases with the coal range, the coal bed depth and with the reservoir pressure. In order for the gas to be released from the coal beds, the partial pressure of the coal bed must be reduced, and one way to do this is by removing the water of the reservoir.

The structural interpretations of eleven 2D seismic lines in the Sub Basin show several characteristics of a coal bed methane reservoir. The Barco - Los Cuervos Formation is a tertiary unit influenced by the Cesar Thrust System. A compressive regime has led to the formation of the HT-2 syncline which covers the whole study area, also the seismic shows an interesting phenomenon in which the seismic amplitude is strongly reduced, this may be caused by the gas saturation of the coal beds.

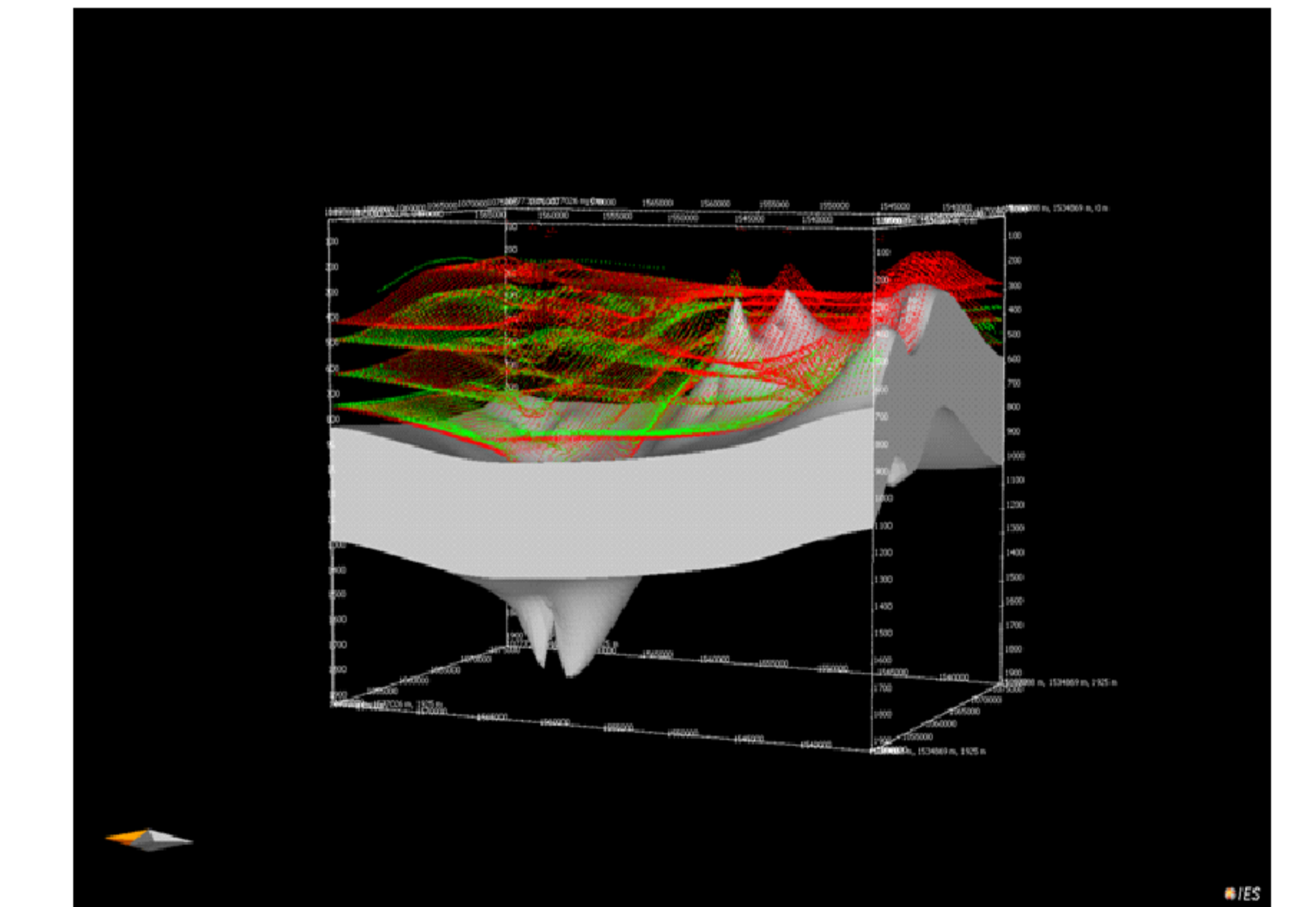


Fold propagation folds with constant thickness develop as a fault propagates upward from the bend. An active, syncline axial surface is pinned to the fault tip. As strata pass through this axial surface, they are folded into the forelimb. Suppe and Medwedeff (1990).

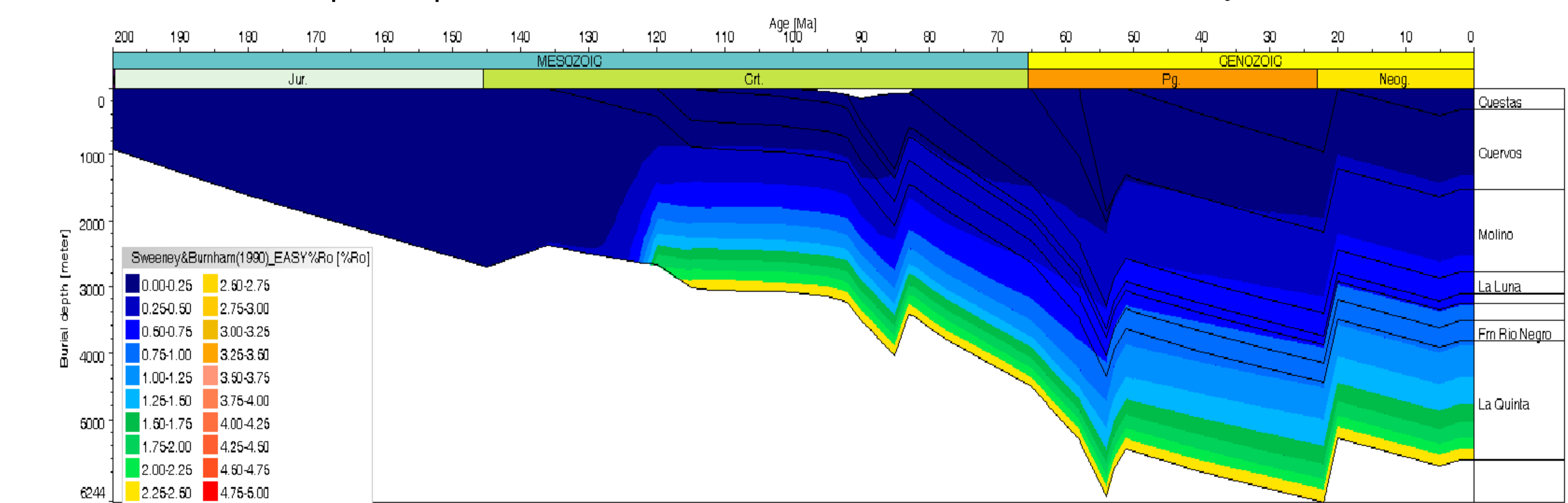
The 1D, 2D and 3D geochemical modeling show that the Barco - Los Cuervos Formation was in the gas window since 15 Million years ago but no accumulations were found because the lack of efficient seals. But it is important to take in account that the seismic lines don't cover the entire HT-2 syncline, so in other parts of the structure we could find structural traps as well as efficient seals. The structural maps of the Barco - Los Cuervos top shows potential plays in several zones of the study area, these possible plays are the result of the tectonic influence of the Cesar Thrust System.



Structural depth map of the BC2 Horizon



3D Geochemical model showing the CBM accumulations in the study area



1D Geochemical model showing the burial history with %R₀ index

References

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Suppe, J. and D.A. Medwedeff, 1990, Geometry and kinematics of fault-propagation folding: *Eclogae Geologicae Helveticae*, v. 83/3, p. 409-454.