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Westward Extension of Prolific Eagle Ford/Haynesville (Eqv.) Production into Mexico

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Summary

In 2015 the United States Energy Information Agency assessed the Burgos Basin of Mexico to have 6.9 billion barrels of oil equivalent (BBO) and 43 trillion cubic feet (TCF) of risked recoverable resources in the Eagle Ford Formation. Likewise they assessed risked resources of 11 BBO and 119 TCF for the Pimienta Formation (Haynesville equivalent) for the same area. As a result of this report there has been renewed interest in the mapping and delineation of these unconventional reservoirs from South Texas into Mexico across the border. This talk outlines the reservoir characteristics and geoscience prerequisites for successful oil and gas exploration in the area. In addition, details of what a company would have to consider moving into the area such as the current market demands, land availability, availability of equipment, environmental issues and security will be outlined and discussed.

Introduction

The study area covers about 16,000 km2 (Figure 1) and falls within the northern extent of the Burgos Basin. The study takes into consideration datasets and techniques such as 2D seismic, advanced pre-stack inversion, petrophysics and basin geological literature to assess areas of potential hydrocarbon accumulations. This talk addresses some of the preliminary findings of the study and outlines other business considerations in order to move forward with unconventional exploration drilling in the area.

Theory and Method

The Upper Cretaceous Eagle Ford shale extends directly into northern Mexico from South Texas. The lesser known Upper Jurassic Pimienta formation, a prolific Gulf Coast source rock correlating with the Cotton Valley-Sossier-Haynesville sequence of East Texas, is regionally more extensive and uniform and is also a target over the same area. The Eagle Ford's total organic compound (TOC), mineralogy, porosity, and reservoir pressure appear favorable in the area although data is constrained to fewer than 30 shale wells drilled to date. The Eagle Ford consists of organic-rich shale of mainly carbonate-silica lithology at optimal depths (2000 to 3,000 m) and thermal maturity with few faults and a flat surface topography. On the other hand, the Pimienta shale may have more than 200 m of gross shale thickness, double the typical Eagle Ford thickness in South Texas with just as favorable reservoir characteristics.

A review of published geological literature of the basin has reveals reservoir characteristics suitable for continued exploration of the subject formations from Texas into Mexico. This includes maps of hydrocarbon type and distribution within the study area to enable explorers to target areas based on their hydrocarbon needs. The seismic discussed shows areas of significant structuring in the south of the study area as well as a potential for multiple targets from single surface locations. The seismic can also be used to map reservoir characteristics such as brittleness and TOC for a given dataset, and some examples are given. The structuring is discussed in terms of added natural fracturing to the reservoir and its potential to decrease the amount of mechanical fracturing necessary.

As the financial terms of upcoming bid rounds are still being considered by the governing bodies of Mexico, the gas market is vibrant in the country as a majority of the gas is currently imported. Issues of land availability and equipment will be outlined and discussed as well as considerations for environmental sustainability and operations security.

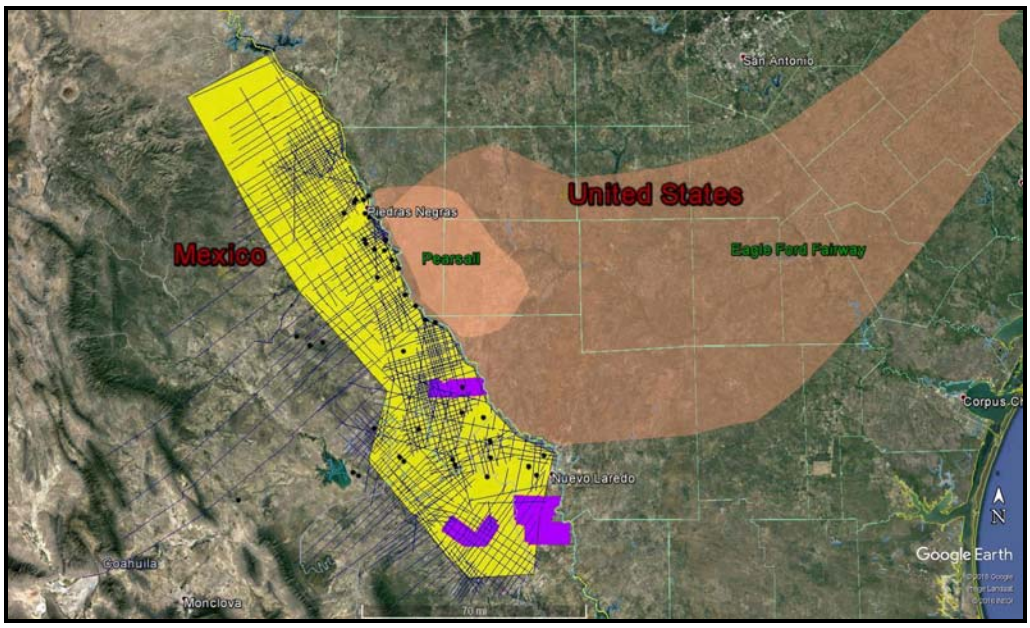

Figure 1: Study area outline in yellow, 2D /3D seismic (black and purple) and existing well control.

Examples

Below is an example of the data improvements from the 2001 seismic dataset and the 2016 reprocessing effort. Note the continuity of seismic markers and the noise reduction achieved by the application of more recent processing (Figure 2). The results of the petrophysical analysis of the Eagle Ford and the pre-stack inversion to map reservoir characteristics such as TOC are shown below (Figures 3 and 4).

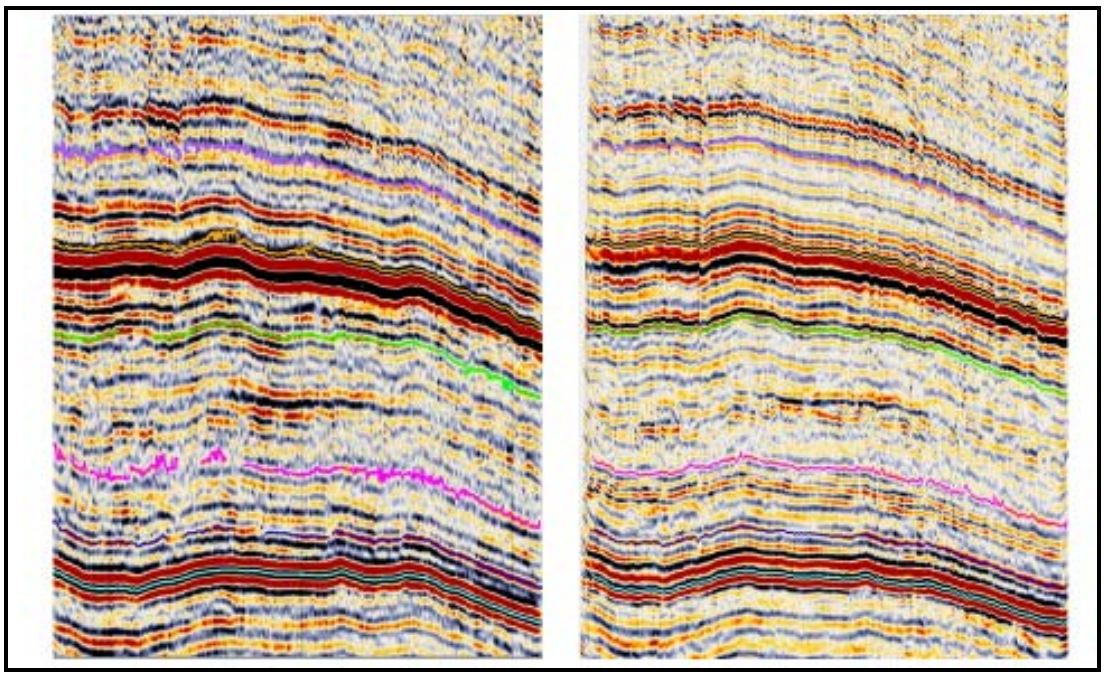

Figure 2: Left, 2001 original 2D seismic processing. Right, recent reprocessing of same line.

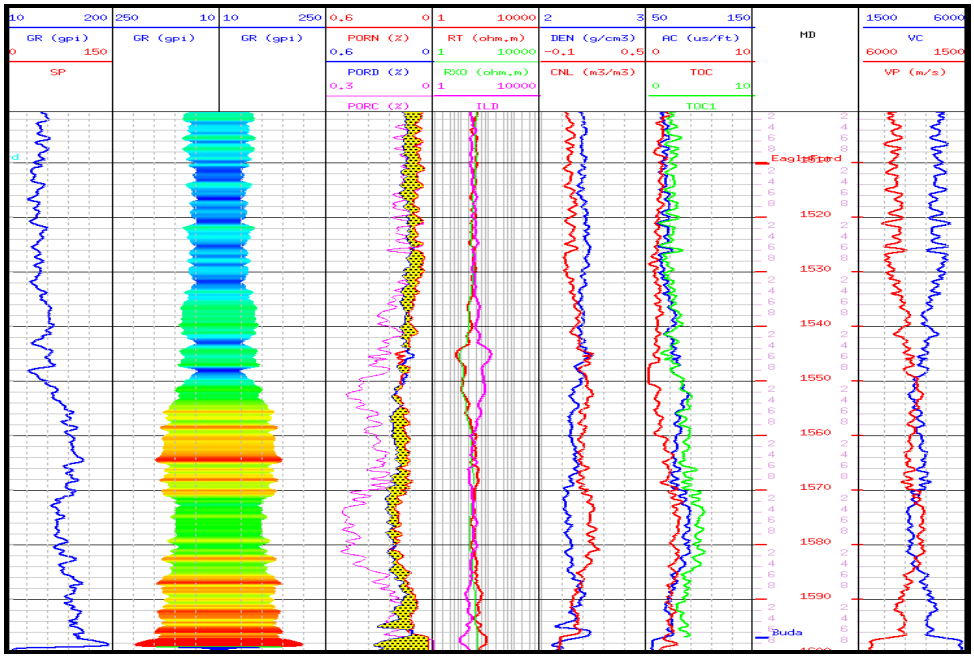

Figure 3: Calculation of total organic carbon from Eagle Ford control well.

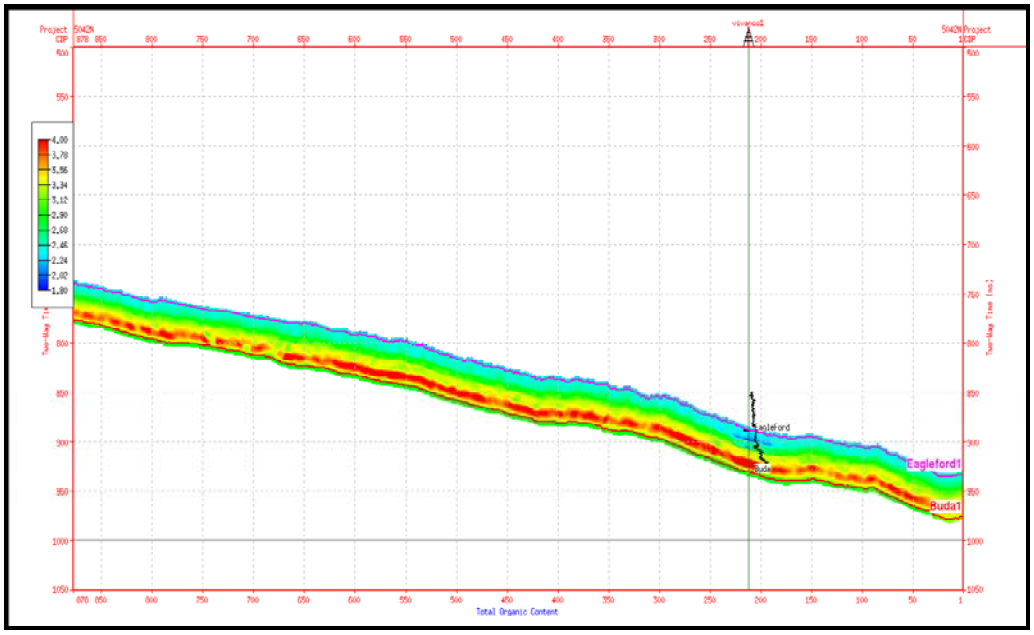

Figure 4: Display of total organic carbon derived from pre-stack seismic inversion.

Conclusions

This global scale opportunity for oil and gas is in the billions of barrels range – unparalled in today's marketplace. The keys to moving forward with this opportunity are the high grading of the reservoir opportunities for land acquisition as well as the application of advanced geoscience technology to implement a successful drilling program. Furthermore, a company moving into Mexico to explore for these reservoirs needs to consider issues around the oil and gas market demands, land availability and tenure, availability of oil and gas equipment, environmental issues and security.

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