

Cylindrical and Overlapping Technique for Better Karst Delineation

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The paper presents solutions designed to characterize the karst network for a Central Luconia carbonate gas field which has experienced unpredicted high water production and early water breakthrough. The assumption was derived that one of the main reason for unpredicted water breakthrough is strong aquifer (based on material balance analysis) and high internal carbonate reservoir heterogeneity. A decision was made to implement more comprehensive reservoir characterization practices to design reservoir models and, prevent and mitigate current and future field problems related to geologically complex carbonate field architecture. The practice includes three major components: Forward Stratigraphic Modelling (FSM), karsts network mapping, and uncertainty management. The workflow and work processes of karst mapping is discussed in this paper.

The delineation of the karsts features were carried out with several methodologies which complimented each other. Application of various seismic attributes were carried out to capture the possible locations of both the vertical karst features and lateral karst network.

Observation on a flattened seismic cube was also another key method is delineating these prominent seismic anomalies for the carbonate field. The next method that was also capable in characterizing these karst features was the *Cylindrical and Overlapping Technique* which allowed the vertical karst features to be captured in the carbonate microplatform very well. After having a good estimation of where the karst features are located, karst geobody extraction was done; in order to have a 3D volume of karst geobody features.

Overall, the karst features have created a very complex diagenetic overprint on the reservoir rocks which have affected the permeability and porosity properties. With the methodology applied, the karsts network was better understood and the presence of karsts can now be predicted in other areas of the reservoir. The issues of mud-loss and early water breakthrough could also be addressed; thus, allowing better history matching scenarios and also improving the creditability of the static and dynamic model. Hence, the presence of karsts can be clearly correlated to the issues of mud-loss and early water breakthrough.

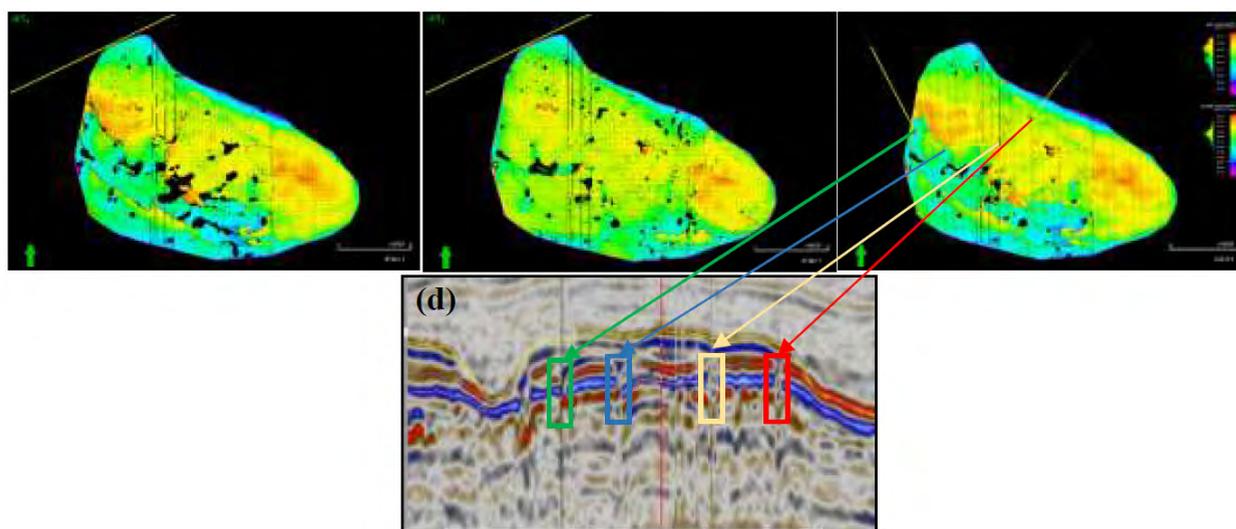


Figure: The Cylindrical & Overlapping technique employed in delineating the numerous vertical features in one of the field's carbonate microplatform.