

## **TIME TO DEPTH SEISMIC CONVERSION FOR COMPLEX GEOLOGICAL STRUCTURES, USING VERTICAL STRETCH AND IMAGE-RAY METHODS VS KIRCHHOFF PRESTACK DEPTH MIGRATION METHOD.**

*Ruben Mauricio Vargas Pabon*  
Industrial University of Santander. Santander, Colombia.

Layers or formations on Earth are compressed by natural tectonic actions, producing structural complexity, making it difficult to interpret the events that took place there. The search of reliable deep seismic images in complex geological structures, (with the purpose of finding reserves oil and gas), is very important for the hydrocarbon industry. Tools and techniques have been defined in seismic processing to help geologists during the interpretation stage. Depending on the velocity contrasts of the layers, different methods can be used to get high image quality. The different techniques to do depth conversion, are tools used to generate effectiveness, quality during the processing of seismic data. It is necessary to know the response of the techniques by using synthetic data, to compare the performance of these techniques in structurally complex geological areas. The tools used in this project were: pre-stack depth migration (PSDM), vertical stretch and image-ray methods. Depth seismic images were generated for each of them, starting from the time domain. The synthetic Overthrust model was used, modeling 75 wells and 301 geophones. The spacing between geophones was 25 meters, and the distance between wells was 100 meters. When performing the depth migration using the three different techniques, it was necessary to start by obtaining a PSTM image to do the depth conversion. Depth conversion starts with the transformation of seismic data, from a time scale (which is the domain where they are acquired) to a depth scale, to provide an image of the subsurface structure. An important aspect was the velocity analysis RMS across horizons migrated to PSDM. The RMS velocity functions were chosen by picking from the gathers derived from the prestack time migration. Vertical stretch is a reliable and fast technique in areas where the velocity do not have lateral changes, that is to say where the structural geology is not complex. It was possible to obtain a greater continuity in the horizons in the central part of the model for the PSDM technique in comparison to the other two techniques, because this technique uses iterations and migration to obtain images. The rays being straight trajectories and orthogonal to the wave fronts are sensitive to lateral changes in the velocity, so in the central area of the synthetic model used, which is composed of reverse and inverse faults, the image ray method presents difficulty.

KEYWORDS: IMAGE-RAY, PSDM, VERTICAL STRETCH.