# Time vs Depth Imaging: Improving Seismic-well Correlation and AVO Modeling for a Heterogeneous Shallow Marine Reservoir: Example from Krishna-Godavari Basin

**Tandra Roy[1], Pavel Vasilyev[1], Dhananjay Tiwari[1], Bijay K. Behera[2], and D. Srinivas[2]**
*[1]WesternGeco International Ltd., BSEL Tech Park, Navi Mumbai, India , troy@slb.com*
*[2]Gujarat State Petroleum Corporation, Gandhinagar, Gujarat, India*

This paper reviews the concept, process and workflow for comparison of time and depth imaging for improved identification of reservoir scale geobodies using seismic pre-stack inversion. The study area is located in the Krishna-Godavari basin along the east coast of India, which covers the deltaic and inter-deltaic areas of the Krishna and Godavari rivers and extends into the offshore. The basin evolved through crustal rifting and subsequent drifting during Mesozoic time, followed by major fluvial and marine Tertiary sedimentation (Sharma et. al., 2010). The present study involves Cretaceous sedimentary sequence of the basin.

As the survey encompasses very shallow to deep water, a 3D Q-marine seismic survey was acquired using a special survey design having a short nominal near offset in order to favor further processing. An undershoot technique was also used to record seismic information beneath the numerous installations that are present within the area. The raw field data were extremely noisy due to the presence of rigs, vessels and fishing activities that were going on during acquisition as well as the nature of multiples that varied considerably from shallow to deeper water.

The preprocessing of the data incorporates extensive noise attenuation and QC followed by the Generalized Surface Multiple Prediction (GSMP) method to remove complex surface related multiples. A combination of XT and Tau-p domain deconvolution was used to attenuate shallow water multiple reverberations.

Prior to this study, a total of eleven exploratory wells were drilled in the area, but due to the complex stratigraphic uncertainty only two wells encountered reservoir facies. To better assess reservoir distribution, seismic inversion and lithocube volumes are used as the main drivers for delineating and modeling of the reservoir geobodies (Sharma et. al., 2010). The current seismic volume needed to be better suited for seismic inversion studies.

Kirchhoff Pre-stack Time Migration CMP gathers clearly exhibited the presence of complex moveout in the area and thereby strongly suggested the need for depth imaging. Kirchhoff Isotropic Pre-stack Depth Migration gathers showed improved imaging of energy and the amplitude vs offset relationship was better defined. However the ‘hockey-stick’ effects in the depth domain gathers and well-log information clearly exhibited presence of anisotropy in the area. Epsilon and delta values were calculated using two vertical wells present in the area and final VTI Anisotropic depth migration solved the complex moveout problem present in the area leading to a better well-tie and increased confidence in inversion results.