ASEG-PESA 2015
Geophysics and Geology together for Discovery
24th International Geophysical Conference and Exhibition
15–18 February 2015 Perth, Western Australia

Application of Rock Physics and Seismic Inversion for the Determination of Reservoir Architecture and Connectivity for Coal Seam Gas Field Development

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SUMMARY

Fluvial systems host coal seam gas reservoirs in various fields of Queensland. However, the lateral heterogeneity of reservoirs properties within these reservoirs can be significant and determining the distribution of these reservoirs is a challenge. This study attempts to predict coal distribution by applying rock physics and post-stack seismic inversion on data set of Scotia field of the Surat Basin. According to rock physics analysis, coal beds have significantly low density. Consequently, this gives low P-impedance as compared to surrounding lithology. Therefore, inverted P-impedance and density volumes can be used to predict coal distribution and connectivity of different coal seam reservoirs. Theoretically, density volumes may provide accurate prediction, but this requires execution of comprehensive pre-stack inversion workflow. We only used a model based P-impedance inversion technique to create P-impedance volumes in order to better image the reservoir and connectivity. Extracted horizon slices by using cutoff based on rock physics analysis, successfully highlights architecture of coal beds. Computed average P-impedance within zone of interest can provide information regarding promising zones for exploration of coal seam gas. Blind test for P-impedance prediction at well locations reveals reasonable match for coal prediction using this method.