GEOPHYSICS POSTER 3

ESTIMATING POISSON'S RATIO FROM ELASTIC IMPEDANCE: A CASE STUDY FOR HYDROCARBON PLAYS IN MALAY BASIN

Ang Chin Tee & Shaidin Arshad

PETRONAS Research Sdn Bhd, LOT 3288 & 3289, Off Jalan Ayer Itam, Kawasan Institusi Bangi, 43000 Kajang, Selangor, Malaysia

It is now common for a 3D datasets to be processed as partial offset volumes to exploit the AVO information in the data. The amplitudes of near-offset stack relate to changes in acoustic impedance (AI) and can be tied to well logs using synthetics. Unfortunately, there have been no simple equivalent processes for far-offset stacks. However, the symmetry can be recovered using the elastic impedance (EI). EI provides a consistent and absolute framework to calibrate and invert non-zero offset seismic data just as AI does for zero-offset data (Connolly, 1999).

An EI log acts as a platform to calibrate the inverted data to any desired rock property (SI, σ, μ, λ etc) with which it correlates (Connolly, 2010). Many studies on EI have been done on Gulf of Mexico, and a strong correlation was found between EI at 30° and hydrocarbon pore volume. This relationship was then used to estimate the in-place volumes for the field from the inverted 30° seismic volume. EI is also widely used to discriminate lithology and to distinguish fizz water from commercial gas concentrations (Gonzalez, 2004).

Estimating the Poisson's ratio from seismic is also crucial. Theoretically, one can invert a 90° angle stack which has amplitude that is proportional to changes in Poisson's ratio. However, this approach is difficult due to the sensitivity to residual moveout and bandwidth variations.

On the other hand, EI has values equal to AI at normal incidence. If K = 0.25, then EI is equal to (Vp/Vs)2 at 90° which is closely related to Poisson's ratio. This allows the construction of high angle stack, and then being calibrated and inverted using the equivalent EI log.

Since the absolute level of EI(90°) is depending on the value of K being used, one should study for the optimum angle of EI that correlates with Poisson's ratio at well locations. In this paper, we will perform this study for hydrocarbon plays in Malay Basin and validate the result by estimating the correlation coefficient. With the known optimum angle, we can estimate Poisson's ratio from seismic with the information from EI.

REFERENCES

CONNOLLY P., 1999, Elastic Impedance, The Leading Edge April 1999, 438-452.

CONNOLLY P.A., 2010, Robust Workflows for Seismic Reservoir Characterisation, 2010 SEG Spring Distinguished Lecturer.

GONZALEZ E.F, MUKERJI T., MAVKO G. & MICHELENA R.J., 2004, Far Offset P-to-S "Elastic Impedance" For Lithology and Partial Gas Saturation (Fizz Water) Identification: Applications With Well Logs, 5th Conference & Exposition on Petroleum Geophysics, India.

Warta Geologi (Newsletter of the Geological Society of Malaysia), Vol. 37, No. 1, January-March 2011