World Academy of Science, Engineering and Technology
International Journal of Geological and Environmental Engineering
Vol:16, No:05, 2022

The Implementation of Poisson Impedance Inversion to Improve Hydrocarbon Reservoir Characterization in Poseidon Field, Browse Basin, Australia

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Abstract : The lithology prediction process, as well as the fluid content is the most important part in the reservoir characterization. One of the methods used in this process is the simultaneous seismic inversion method. In the Posseidon field, Browse Basin, Australia, the parameters generated through simultaneous seismic inversion are not able to characterize the reservoir accurately because of the overlapping impedance values between hydrocarbon sand, water sand, and shale, which causes a high level of ambiguity in the interpretation. The Poisson Impedance inversion provides a solution to this problem by rotating the impedance a few degrees, which is obtained through the coefficient c. Coefficient c is obtained through the Target Correlation Coefficient Analysis (TCCA) by finding the optimum correlation coefficient between Poisson Impedance and the target log, namely gamma ray, effective porosity, and resistivity. Correlation of each of these target logs will produce Lithology Impedance (LI) which is sensitive to lithology sand, Porosity Impedance (ϕI) which is sensitive to porous sand, and Fluid Impedance (FI) which is sensitive to fluid content. The results show that PI gives better results in separating hydrocarbon saturated reservoir zones. Based on the results of the LI-GR crossplot, the ϕI-effective porosity crossplot, and the FI-Sw crossplot with optimum correlations of 0.74, 0.91, and 0.82 respectively, it shows that the lithology of hidrocarbon-saturated porous sand is at the value of LI ≤ 2800 (m/s)(g *cc), ϕI ≤ 5500 (m/s)(g*cc), and FI ≤ 4000 (m/s)(g*cc). The presence of low values of LI, ϕI, and FI correlates accurately with the presence of hydrocarbons in the well. Each value of c is then applied to the seismic data. The results show that the PI inversion gives a good distribution of Hydrocarbon-saturated porous sand lithology. The distribution of hydrocarbon saturated porous sand on the seismic inversion section is seen in the northeast – southwest direction, which is estimated as the direction of gas distribution.

Keywords : reservoir characterization, poisson impedance, browse basin, poseidon field
Conference Title : ICGES 2022 : International Conference on Geological and Earth Sciences
Conference Location : Singapore, Singapore
Conference Dates : May 05-06, 2022