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Seismic-scale petrophysical interpretation and gas-volume estimation from simultaneous impedance inversion

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Abstract

© 2017 by The Society of Exploration Geophysicists. Simultaneous impedance inversion was performed to obtain the seismic-scale P- and S-wave impedances as well as the bulk density volumes from seismic angle stacks at a siliciclastic turbidite offshore gas reservoir. To translate these variables into seismic-scale total porosity (ϕ), clay content, and water saturation (S_w), we used a deterministic rock-physics model established at the well. A crucial input into this model is the bulk modulus (K_f) of the brine/gas system. We need to link it to S_w at the seismic scale. This link can be one of simple mixing laws, such as harmonic and arithmetic. Alternately, it can be derived at the well by using upscaled variables and ensuring that they obey the well-data-driven rock-physics model. These different K_f - S_w relations produce different interpretations for ϕ and S_w thus allowing one to assess the variability in the estimates of the gas volume in place that is proportional to the product of ϕ and $(1 - S_w)$.

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Keywords

Rock physics

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