

Seismic and Rock Properties

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Summary

Full-field unconventional reservoir characterization employs elastic properties from seismic to image pay zones, calculate stresses and understand rock strengths in order to optimize development plans. The link between seismic data and the subsurface properties of interest often relies on a few calibration wells, in which many competing petrophysical factors influence the elastic logs which in turn govern the seismic response. Statistical methods generally form the basis of the connection between elastic data and petrophysical properties. These can range from simple crossplots to neural networks or more complicated statistical models, but all rely on having sufficient data to create a robust and trustworthy link.

Rock physics is the study of combinations: minerals, rock fabrics and fluids elements coming together to form elastic properties. The process of building a rock physics model has gradually gained acceptance among geophysicists as a way to increase understanding and to expand our limited well log data set. The expanded rock physics data set informs us of unexplored possibilities as well as making our statistical elastic property - petrophysical property connections robust.

In this talk we shall discuss some relevant rock physics models for unconventional reservoirs and how they can impact both understanding of the images we see from seismic and the accuracy of 3D property characterization. These models will include common properties such as mineralogy and fluid content, but will also explore the relevant influence of pore pressure, thermal maturity, and fractures.