

## MULTI-DISCIPLINARY PORE PRESSURE PREDICTION : RECONCILIATE GEOPHYSICS AND BASIN MODELING TO CONTROL RISKS AND UNCERTAINTIES IN DRILLING OPERATIONS

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According to many operating companies, a very large part of unscheduled downtime during drilling is related to pore pressure and fracture gradients. In that respect, the ultimate objective of pore pressure prediction is to control the risks and uncertainties related to drilling operations.

Anomalous pressures in geological formations can originate from many physical phenomena – such as: sedimentation rates, fluid expansion mechanisms, etc. – which can be accurately modeled using advance 3D Basin Modeling Techniques, applied at local scale. Thanks to their ability to rigorously simulate the multiple phenomena occurring within a geological basin (especially compaction disequilibrium, hydrocarbon generation, fluid buoyancy), basin modeling tools can be applied for modeling the coupling effect of pressure, overburden, effective stress, fracturation gradient, porosity, fluid density, temperature, permeability.

On the other hand, pore and confining pressure generally have opposite effects on acoustic elastic properties of the rock (compressional velocity in particular): velocity generally increases with confining pressure and decreases with pore pressure. Consequently the joint analysis of interval velocity variations and compaction trends gives allows assessing pore pressure. Geophysics has therefore been widely used over the past decades for predicting over-pressured zones. Such zones are detected with seismic (interval velocity) and sonic transit

time. In most cases the strong increase in transit time in the over-pressured interval indicates the degree of overpressure. This change in the transit time is generally detected in the seismic interval velocity also.

In practice, pore pressure predictions are performed using one of these two independent approaches without any attempt to combine them, while their combined used would gives a better confidence in the predicted pore pressure values, despite the high uncertainty due to lack of data.

The objective of the study presented in this paper is to reconcile these two complementary approaches. It shows one way of integrating the two techniques throughout the prediction process.

### REFERENCES

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