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ORAL PRESENTATION

Validation of Fault Seal Mechanisms: An Outcrop and Subsurface Perspective

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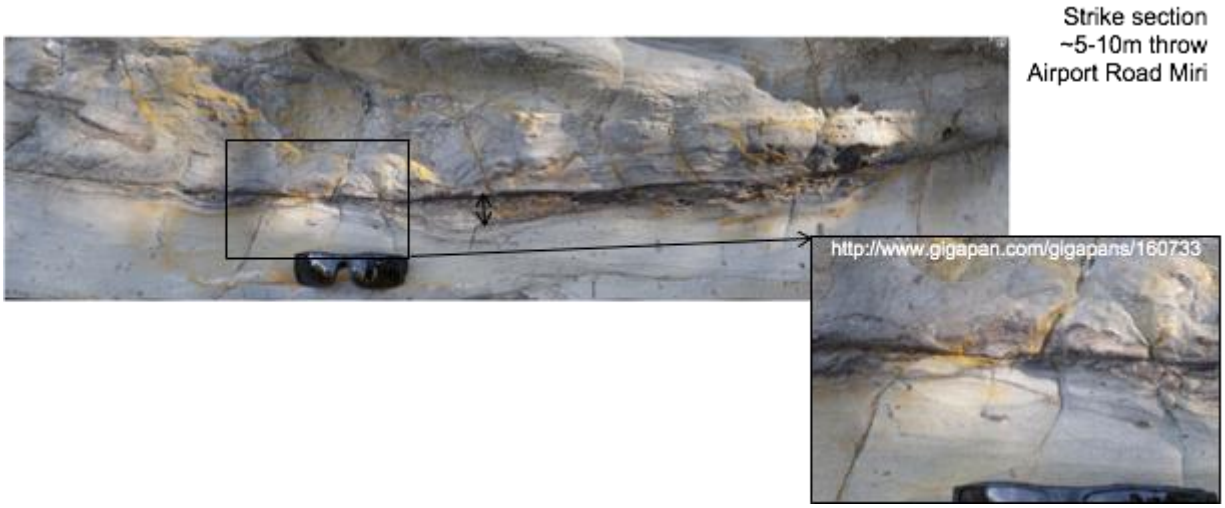
Assessing exploration risk requires an analysis of trap, seal, and charge as well as reservoir issues. When risking fault bounded structures, across-fault juxtaposition and / or fault membrane seal are key issues. Generally, this work is done on a single "best-guess" technical model.

A very large number of studies have considered membrane sealing. Many engage in back calculating the pressure capacity by using a Shale Gouge Ratio (SGR) algorithm, and then providing a forecast of hydrocarbon column height. Importantly, this back-fitting of SGR and seal capacity is almost always conducted using single "best" technical models with no direct modelling of uncertainty. It is suggested that fault and stratigraphic uncertainties are significant and need to be explicitly included in the modelling of fault seal risk and inferred column heights.

In general, the application of SGR methods in reservoir / seal systems that have moderate Vshale values artificially increases predicted column heights and enhances the pre-drill estimates of success relative to a simpler and more direct juxtaposition analysis of cross-fault leakage. In well run risking processes these large columns are generally discounted through other geologic risk factors. When shorter columns are found during drilling, they are often "explained" by issues of charge or trap breach.

Whilst geologists commonly use cross sections to describe structures and traps it is vital in fault seal analysis to consider the strike variability of fault rock properties. A series of faults in Miri, Sarawak, have been systematically mapped in great detail to measure the strike variability of fault rocks. This work greatly helps to understand the limitation of membrane seal algorithms.

To illustrate the implications to subsurface risking, a validation will be presented in which observed hydrocarbon water contacts are compared with probabilistic models for both juxtaposition and SGR. A comprehensive review of a set of fields in The Timor Sea shows that probabilistic juxtaposition models more accurately predict hydrocarbon water contacts than calibrated SGR single "best" technical models. Stochastic trap analysis generates smaller, lower risk targets that are more likely to accurately predict final exploration outcomes.



SPEAKER BIOGRAPHY

Titus is a structural geologist with extensive experience in the study and characterisation of faulted and fractured reservoirs in over 30 countries. Providing services and tools that improve oil and gas discovery and production as well as ground water industries. A key part of this is the development of new algorithms to describe structures and fluid flow. Most recently he has started an active Research and Development program to develop technology to characterise groundwater flow across and through faults.

Another key part to his practice involves 2D and 3D Structural restorations. These projects are either in offshore frontier exploration based on deep seismic data, or onshore complex fold and thrust belts based on borehole and outcrop data.