Building a geological pressure model using global analogues

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There are many different elements to a play requiring analogues to aid in de-risking. Analogues are often focused on a similar basin-scale tectonostratigraphic framework but there are many aspects to a geological pressure model that must be de-risked, for example, sand-shale geometries, reservoir plumbing, TOC within shales, thermal evolution, and sedimentation rate. There are many examples of analogous processes and relationships that can de-risk the pore pressure from settings that would not be considered analogous if only based on the basin-scale framework. There are several examples of analogous pairs of basins where one is more heavily drilled, and thus provides a rich database, and the other has minimal-to-no wells, yet shows significant potential for exploration. One such pair would be the deepwater areas of Middle Norway (data-rich) and Labrador (data-poor) where the tectonostratigraphic framework is very similar on both sides of the Atlantic Margin. Other examples from French Guiana, Guyana, and Suriname include the Zaedyus, Jaguar, and Liza discoveries based on experience in West Africa.

Constructing a pore pressure profile in deepwater plays involves several stages. Firstly, the lithofacies must be understood, partly from seismic reflectivity data and partly from analogue settings. Secondly, reservoirs often have different pressures to their associated shales; they can be lower via lateral drainage or higher due to lateral transfer. Thirdly, modelling of shale pore pressure in frontier locations is often undertaken using seismic interval velocities, often the only data type available, yet these data may not be suitable if the shales have undergone diagenesis. A frequent problem in wildcat situations, with little to no well calibration, is the reliance on seismic interval velocities for pressure prediction. Lastly, pore pressure is assumed to be generated via vertical loading by sediment and undercompaction of shales; in reality, other processes such as fluid expansion and load transfer can increase the pore pressure beyond that predicted by standard techniques.

This presentation aims to show how the integration of global analogues can aid in building a pore pressure profile; de-risking the magnitude of the pore pressures that are predicted; and provide confidence in the sub-surface facies model that helps define the pore pressure model. Generation of a pressure profile requires that all elements discussed above must be considered.

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