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Reservoir Prediction from Hydrocarbon Migration Using RMS Amplitude

Differences observed in acoustic impedance, expressed as root mean square (RMS) amplitude, can be used to identify changes in lithology of an otherwise uniform reflector horizon. Subtle variations in rock type can have a major influence on hydrocarbon migration, accurate mapping of charge routes through time is of critical importance when undertaking exploration in complex plays such as those in the deepwater, offshore Nile Delta. Using RMS amplitude to control preferential migration on palinspasticly restored horizon geometries, can increase the accuracy in identifying present day reservoir locations.

Accurate identification, quantification and risking of prospects set within complex channel systems are challenging tasks. Palinspastic restoration of a Nile Delta case study revealed the geological evolution of the system. The restoration was achieved by the sequential backstripping of the present day depth model. Upon removal of each successive layer, the remaining surfaces within the model were adjusted to account for faulting, decompaction and isostatic adjustment. Using the complete palinspastic history gave significantly different results than simply analysing isopachs alone. Lateral variations in sediment thickness resulted in non-uniform changes to the surfaces. Down-dip sediment dispersal on the back-stripped horizon delineated the palaeo-accommodation space for a range of depositional thicknesses and revealed potential sediment pathways. Up-dip hydrocarbon migration analysis on the corrected surface allowed the prospects to be ranked in order of volume and risk. On correlation with proved fields, this technique can be extrapolated to frontier areas and used in risk reduction in high cost deepwater exploration.

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