

Reservoir Modeling of a Distal Isolated Carbonate Platform, Offshore Sarawak – Stratigraphic Compartmentalization and Implications on B11 Field Development

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Detailed geophysical and reservoir geological studies triggered by development drilling surprises and unexpected production behaviour of a large carbonate gas field, offshore Sarawak, unravelled stratigraphic complexities caused by a combination of syn-depositional tectonics and high-frequency sea level changes. As a result, a novel depositional model for distal, isolated carbonate platforms situated along the north-western Borneo palaeo-shelf margin emerged.

Extensive use of seismic volume interpretation was employed to unravel the heterogeneous intra-carbonate architecture. In this respect, spectral decomposition and a combination of elastic/constrained-sparse-spike/stochastic seismic inversions were used to map in 3-D the distribution and geometry of depositional sequences. Petrophysical core analysis revealed a distinct electric log response for each rock fabric present in the build-up. Based on these facies-dependent porosity vs. sonic travel-time relationships, seismic velocity and acoustic impedance models were used to generate 3-D-carbonate facies reservoir models that were successfully validated by subsequent infill drilling. As a result, stratigraphic compartmentalisation was proven to be present in Central Luconia carbonate build-ups. With the newly developed reservoir modelling workflow production history matching was easily achieved and the unexpected wells decline understood. This new subsurface understanding is in contrast to earlier and widely used models whereby Central Luconia carbonate were interpreted as simplistic 'layer-cake' type tanks that do not require an in-depth understanding of the subsurface in order to be successfully developed.