

## Carbonate Build-Ups in Central Luconia: new Insights from 3D

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Shell's exploration effort in the Central Luconia province offshore Sarawak has concentrated on Middle to Upper Miocene carbonate build-ups, this has up-to-now resulted in the discovery of some 38 Tcf of gas reserves. An analysis of the exploration history shows that the critical success factors in exploring this carbonate play are related to hydrocarbon retention and hydrocarbon migration / charge focus. One aspect of the former is the existence of potential thief-beds within the overlying clastic sequences, the latter being dominated by the underlying basin structure as well as the timing of trap formation.

The result of the Basin Framework Study covering the whole of NW Borneo provides a better understanding of the basin-wide tectonic and stratigraphic history of Central Luconia. This stratigraphic framework was used in the interpretation of the recent semi-regional 3D seismic datasets. The high-quality data allows a sequence-stratigraphic interpretation of the intra-carbonate architecture and of the surrounding inter-build-up lows. The effects of eustatic fluctuations can be recognised within the build-ups and matched to the time-equivalent characteristics in the non-build-up areas in the basinal lows. This allows correlation of well-defined bio-stratigraphic markers and sequence boundaries into the less age-constrained build-ups.

Examples of this sequence-stratigraphic interpretation will be shown:

- Faulting and its impact on the start of carbonate build-ups
- Identification and significance of sequence boundaries within the carbonate build-ups (Karst, Annealing)
- Identification and significance of sequence boundaries between the carbonate build-ups (High-stand carbonate shedding, thief zones)
- Stages of drowning of build-ups

The advancements in establishing an absolute time frame for the growth and cessation of the build-ups leads to an improved understanding of the risks in exploring these build-ups. It is expected that this approach, with 3D seismic being the enabler, will impact the overall carbonate portfolio and lead to further success within this mature gas province.

In existing fields the recent identification of multi-level karst systems using multi-attribute volume interpretation techniques and subsequent modelling of the karst properties lead to significant insights into the field production behaviour with immediate consequence on infill drilling operations and longer term reservoir management strategy.