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Modelling Late Miocene sea level change in Baram Delta, offshore Sarawak, East Malaysia: an exploratory attempt

ABDUL HADI ABD. RAHMAN
Department of Geology
University of Malaya
50603 Kuala Lumpur

The Baram field is a small oilfield situated in the north-eastern flank of the Baram Delta Province, offshore Sarawak, East Malaysia. A mathematical model of progradational basin filling was created using a commercial software for the Late Miocene succession of the field to investigate the possible controls of sea level change on the development of the siliciclastic sequence and their bounding surfaces. This model was based on four lines of evidence, namely core data, fieldwide wireline logs, seismic sections and average thickness variations across the field.

The cored intervals of the Upper Cycle V (Late Miocene) of Baram field display reservoir successions dominated by thick swaley cross-stratified (SCS) sandstones and other shallow marine, wave and storm-dominated facies interbedded with laminated shelfal mudstones. The vertical facies organisation of these successions suggest deposition during shoreface progradation associated with a fall of relative sea level.

Well log analysis and correlation of the Upper Cycle V succession reveal a stacking pattern comprised of three scales of depositional cyclicity, i.e. the parasequences (~10 to ~30 m thick), the parasequence sets (~45 to ~130 m thick) and the major cycles (~600 to ~800 m thick).

Fieldwide, dip-oriented seismic sections show very well-developed horizontal to slightly upward convex layers traceable over great distances, which suggests a ramp-type margin, in which the basin floor dipped gradually seaward and lacked a distinct shelf-slope margin.

These evidences suggest that the Upper Cycle V deposition and build-up stratigraphy may have been strongly controlled by superimposed short-term, medium-term and long-term sea level changes. It is thus interpreted that the parasequences and parasequence sets represent the ~20 K precessionary and ~100 K eccentricity Milankovitch cycles, respectively. This interpretation places the lower boundary of the Upper Major Cycle (Upper Cycle V) to ~6.3 Ma, which correlates well with a major global eustatic sea level fall.

The Clastic Modelling Program allows the construction of two-dimensional models for the late Miocene succession of the Baram field. The model obtained correlates close to the wireline log models. These models illustrate that high frequency sea level fluctuations

enable sands to be spread over large areas within a shallow, low lying shelf. These exploratory models render further support to the interpretation of high-frequency relative sea level oscillations in the Upper Miocene shallow marine clastics of the Baram field, and possibly for the whole of Baram Delta.