

STRATAGEM
— forward stratigraphic modelling for Block E, offshore
Sarawak

MARK NEWALL, J. JONG & L.P. SHA

Sarawak Shell Berhad
Miri, Sarawak, Malaysia

STRATAGEM is a Shell proprietary software package that simulates stratigraphic patterns in both clastic and carbonate depositional environments. The 2D forward modeling requires input data on subsidence history, sediment supply, eustatic sea-level variations and some other parameters. The predicted stratigraphic patterns are thus the results of the inter-relationship of sea-level variations, type and rate of sedimentation and tectonic history of the study area. The modeling can be calibrated with imported seismic and well data to allow a qualitative test of conceptual models of the geological evaluation of the basin.

As part of Block E evaluation, *STRATAGEM* modeling was carried out on selected regional seismic lines. The main aims of this modeling are: 1) to test the validity of seismic interpretation, 2) to compare sediment supply patterns from different directions 3) to investigate the potential existence of turbidite reservoirs, and 4) to help identify areas of potential source rock development.

These regional seismic lines, located in various geological provinces, were selected to review the input parameters from different directions. Subsidence data was derived from palinspastic reconstruction of interpreted lines and Haq sea-level curve was used for eustatic sea-level change (Haq *et al.*, 1988). The sediment input was varied for each line to mimic the seismic geometry observed. The outcomes of *STRATAGEM* modeling can be summarised as follows:

- In terms of stratigraphic patterns, the models illustrate the clear difference between mainly rapid progradational/

retrogradational in the stable Central Luconia Province and relatively aggradational patterns in the West Baram Delta, controlled by high subsidence rate and active growth-faulting.

- The simulations indicate a steady increase of sediment supply since the Middle Miocene with a few fluctuations. The supply patterns generally reflect the relative sea-level variations with sediment sourced from the Southwest.
- The models suggest the presence of two main phases of turbidite development; an older ponded turbidite package, probably associated with a major lowstand in the Late Miocene (Cycle V), in the southern part of Block E and a Late Pliocene and younger turbidite system, which progressively shifted from southern Block E to the Northwest Sabah Trough. This development coincides with the migration of the depocentre, which was probably located in the southern part of Block E during the Late Miocene to Early Pliocene times to the current deep-water depocentre, the Northwest Sabah Trough (Jong and Sha, 1999).
- Source rock depositional modeling of the regional lines suggests the presence of both land plant-derived and marine kerogens. In general, the source richness (TOC) is low indicating mainly lean source rock. The models also show a slightly higher concentration of TOC and relatively higher percentage of oil-prone kerogen (higher Hydrogen Index values) within the foreset depositional environment.

In summary, *STRATAGEM* forward stratigraphic modeling of Block E generated a realistic geometry of sedimentary successions. It can be used as a sensitivity tool in estimating potential reservoir and source rock development.