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Sequence stratigraphy of the Middle Miocene-Pliocene, southern offshore Sandakan Basin, Eastern Sabah, Malaysia

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The southern Sandakan Basin may be divided into three structural provinces. The northern province is characterized by north-south growth faults, the central province by wrench related northeast-southwest flower structures and the southern province by a zone of relatively unstructured sediments. A sequence stratigraphic study of the Middle Miocene to Pliocene section within these provinces resulted in the recognition of numerous Type 1 sequence boundaries. They are usually identified by landward truncation and associated onlaps in the northern and central provinces and pronounced shelf edges in the basinward southern province. The intervening sequences and their component systems tracts (highstand, trangressive and lowstand) have been regionally correlated from landward coastal plain to basinward bathyal facies.

The study has resulted in the identification of three units, each bounded by Type-1 third-order sequence boundaries and comprising one or more sequences. Unit 1 (Middle Miocene-Lower Late Miocene) is defined by moderate progradation, moderate aggradation, thick but areally restricted shelfal deposits, steeply-dipping oblique-sigmoidal clinoforms, well-defined basal onlaps and pronounced shelf edges. Unit 2 (Middle Late Miocene) is charcterised by high progradation, low aggradation, thin but areally extensive shelfal deposits, gently-dipping shingled- sigmoidal clinoforms, well-defined toplaps and pronounced shelf edges. Unit 3 (Upper Late Miocene–Pliocene) is represented by high aggradation, low progradation, thick shelfal members and sigmoidal clinoforms, and lacks shelf edges.

The positions of the prominent Unit 1 and 2 shelf edges indicate a progressive progradation towards the southeast. Later Pliocene progradation is probably towards the east as suggested by N-S growth faults in the northeastern part of the study area, and is interpreted to have occurred within a ramp setting.

Comparison of the locally derived coastal onlap chart with a recognized global sea-level chart highlighted some differences. The main difference is major Upper Miocene progradation in the study area versus Upper Miocene aggradation in the global sea-level chart, testifying to the importance of the interplay between local tectonics and sedimentation rates in individual basins.

The sequence stratigraphic interpretation led to the recognition of two leads in the southern province, both associated with lowstand system tract sediments. The first is a slope fan deposit in Unit 1, and is interpreted from a high amplitude event with associated gull-wing features onlapping the sequence boundary at the slope setting. The second is a basin floor fan in Unit 2 identified by gently mounded seismic events with bidirectional downlaps, located on a sequence boundary in a basin floor setting. Both are considered potentially attractive targets for petroleum exploration but require further definition for detailed mapping.

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