The sedimentology of Miocene shallow marine clastics of the Sandakan Formation of Eastern Sabah

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Oceanic spreading of the South China Sea began in the Paleogene and ceased around 17 Ma, when the Dangerous Grounds block collided with Northern Borneo. In Western Sabah this led to the uplift of the Crocker Formation, comprising turbidites floored by ophiolitic basement. To the east the collision is thought to have initiated the development of the extensive mélanges found there. Extension of the Southeast Sulu Sea in the very early Miocene, by rifting of the pre-existing ophiolitic terrane, led to limited oceanic spreading. Eastern Sabah was at the hinge of this spreading zone, and a combination of these extensional forces, together with compression caused by the collision of the Dangerous Grounds block, was accommodated by wrench faulting, opening a series of tertiary sedimentary basins. These overlie the mélange of distal Crocker turbidites, and are filled with a mixture of siliciclastics and volcaniclastics.

The Sandakan Basin lies on the east coast of Sabah and contains some excellent exposures, resulting in part from the steep topography of the region and from the recent development of housing estates and road construction. These often spectacular outcrops allow examination of the Miocene succession, which has not previously been feasible. A total of 4 months has been spent collecting sedimentological data throughout the c. 25 km by 15 km basin. Over 70 measured sections have been measured across the basin and this, in conjunction with numerous macrofossil, microfossil and ichnofacies studies, has allowed the differentiation of the interbedded sands and

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clays, previously described as shallow marine succession into facies associations ranging from continental to shallow shelfal in origin. Three main facies groups are identified which can be grouped together into a large barrier island and estuarine system: 1) Tidal Flat and Tidal Channels — consist of thick, sticky mudrocks with abundant mangrove detritus resulting from deposition on a tidal flat. These mud-rich sediments pass vertically into erosive tidal channel deposits; 2) Barrier Island Systems consisting of trough cross bedded channels, low angle planar cross bedded shoreface deposits, both containing common *Ophiomorpha* and *Skolithos* trace fossils. This facies forms many of the imposing scarps in the region; 3) Fluvial Channels and Estuarine/Lagoonal Deposits are identified in some sections though these deposits are volumemetrically insignificant in the basin. Paleoseismicity is suggested by synsedimentary deformation, often confined in discrete horizons which can be traced over several kilometres. Detailed paleontological studies of these rocks will allow development of this facies scheme and further division of these systems into sub-environments.

These well exposed marginal marine facies present an exceptional opportunity to develop a sequence stratigraphic framework of the Sandakan Basin through the Miocene. Examination of the eustatic/tectonic control of the system will then be applied to hydrocarbon-bearing strata in adjacent basins. Futhermore this study will constrain paleogeographic reconstructions of the region