Cyclicities in the Miocene Nyalau Formation and Their Implications

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Detailed sedimentological observations in the Miocene Nyalau Formation exposed at the 22nd miles Bintulu-Miri Road Quarry allowed the recognisation of two major sequences present there. The exposed part of the lower sequence measures 13 m of its stratigraphic thickness and is overlain by a more than 60 m thick upper sequence. The upper sequence rest on a major truncation surface above the lower sequence.

Sediments of the lower sequence can be grouped into seven lithofacies; Facies I comprising of lenticular and flaser bedded fine-sandstones, Facies II of 20-30 cm thick broadly channelised medium sandstone, Facies III rippled fine-sand facies, Facies IV amalgamated, bioturbated, carbonaceous sandstone facies, Facies V of amalgamated small-chanelled sandstone facies, Facies VI of cross-laminated medium sandstone and Facies VII of massive fine-sandstone facies. Abundant ophomorphe are found in Facies V and VI. Rare lignite horizon are found in the lower sequence usually associated with Facies IV.

Minor (less than ½ m) firming upwards cycles are found in the amalgamated small-channel sandstone facies and the lenticular-flaser sandstone facies (Facies I and V). Paleocurrent directions are bimodal, indicating movement to both east and west. The environmental interpretation of the lower sequence is a peritidal complex which received occasional small influx of fine-grained sediment.

In the upper sequence, seven main lithofacies can be observed; Facies VIII comprised of black shale sequence with subordinate dark grey fine-sandstone, Facies IX of thin-bedded, bioturbated, rippled carboneous fine-sandstone. Isolated 2 m thick channel sandstone with abundant ophomorphe constitute Facies X. Facies XI of rippled medium sandstone onwards Facies X. Facies XII comprised of 30 cm - 1 m thick coarse sandstone with abundant rooflets and rare thin vertical burrows. Thick massive clean sandstone constitute Facies XIII. The uppermost part of the upper sequence is a channelised facies, composed of 2-3 m thick coarse sandstone channels. The upper sequence is interpreted as a deposition of shoreline with a fluvial channel complex which recovered abundant influx of coarser sediments.

The overall interpretation of this part of the Nyalau Formation is that this part records a regressing shoreline, marked by an increase input of sediments into the basin.

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