Nannopaleontological Evidences at Paleogene and Neogene Boundary of Minbu Basin, Central Myanmar

Ni Ni Lwin*, Phyo Wai Lin**

Abstract

The present research is emphasized on the some lithostratigraphic and nannoplankon biostratigraphic evidences between Paleogene and Neogene. The present study area is situated in the Minbu Township, Magwe Region. It lies in the north latitude (20°02´45"to 20°06´50"N) and east longitude (94°35´20" to 94°40´05"E) fall in the topomap no.84 L/12.The Paleogene/Neogene demarcation lies between the top of lower Pegu Group (Okhmintaung Formation) and the base of upper Pegu Group (Pyawbwe Formation). There is distinct erosional surface (disconformity) at top the top of Okhmintaung Formation (Paleogene). So the lithostratigraphic evidence between Paleogene and Neogene boundary is unconformable in the study area. Some index nannofossils such as *Sphenolithus conicus, S. belemnos?, S.dissimilis, S. moriformis , Helicosphera truempyi, H. ampliapeta, H. obliqua, H.euphratis, H,cateri, Discoasterdeflandrei, D.druggii, Cyclicargolithus abisectus,Cy. floridanus, Ponsphaera multipora and Coccolithus pelagicus, etc.* are observed in the present study area. But, the index zone NP 25 representative species *Sphenolithus ciperonsis* has not been observed in the study area. This indicates that the nannoplankton biostratigraphic evidences of late Oligocene (Paleogene) is missing in this area.Based on the combined lithostratigraphic and nannoplankton biostratigraphic evidences, it can be suggested that a marine regression at the end of the Paleogene which was followed by a marine transgression in the Minbu area. This depositional change is coincided with the global sea level drop or regression at the Paleogene / Neogene boundary. Based on the lithology and occurrence of nannoplankton, the paleodepositional environment of the study area can be considered as normal marine environment.

Key words: nannoplankon, biostratigraphic, lithostratigraphic, disconformity,Paleogene, Neogene, regression,transgression

Introduction

Tertiary rocks of Myanmar have been paid much attention because of high potential of hydrocarbon prospect. Paleogene and Neogene boundary falls between lower and upper Pegu Group. The group consists of thick molassic sequence of sandstone, shale and minor limestone lenses. Therefore, the group itself is favourable for the reservoir. It has been considered to be a source rocks for oil and gas exploration. The lower Pegu Group yields Paleogene faunal assemblages and the upper contains Neogene assemblages.

Location of the study area

The present research is carried out at in the Minbu Township, Magwe Region, Central Myanmar.It is situated between the north latitude 20°02´45" and 20°06´50"N and east longitude 94°35´20" and 94°40´05"E. It lies between UTM vertical grid 59 to 67 and UTM horizontal grid 17 and 24 of UTM map 2094\12. The study area also falls in one inch topographic map sheet of 84L\12.The location map of the study area is shown in **Figure. 1**.

* Dr., Associate Professor, Department of Geology, Bago University

** Assistant lecturer, Department of Geology, University of Yangon

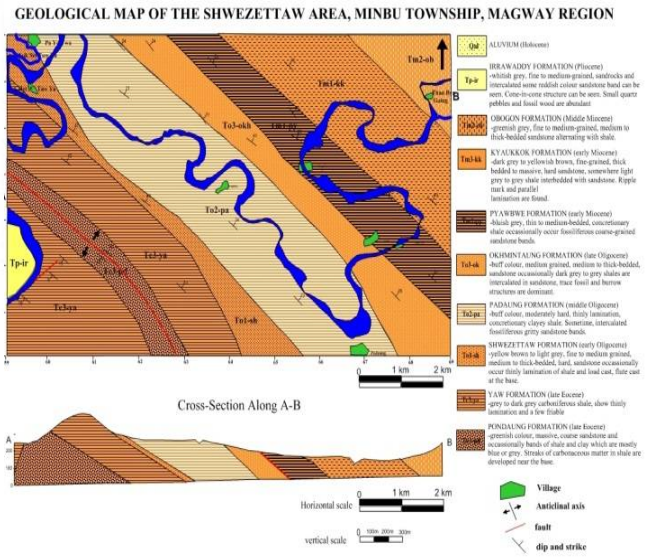

Figure. 1. Location Map of the Study Area **Figure. 2. Geological map of the study area**

Sample collection

Sample collection is made at Pyawbwe type- section; north of Pyawbwe village, and along Mann chaung, near Uyin village, Minbu Township, Magwe Region. Geological map of the study area is shown in **Figure. 2.**

Lithostratigraphic Evidences at the Paleogene and Neogene Boundary

Distribution

The well known Paleogene and Neogene units, Pegu Group, are well exposed along the western margin of Minbu Basin and Prome Embayment, from the western part of Pakokku Township. It extends southward through the western part of Minbu Township into Mindon Township.

Okhmintaung Formation (lower Pegu Group, Paleogene)

Lithology

The Okhmintaung Formation is well-exposed along a stream beside the north of Pyawbwe village and along the Mann chaung near the Uyin village. The Okhmintaung Formation generally consists of massive to thick bedded sandstone, few siltstone, minor amount of grift, thin conglomeratic sandstones and thin –bedded mudstone.Gastropod and shell fragments are present in the sandstone bed. Evaporites, gypsum and large burrow structure are characterized in the upper part of this formation.

Figure. 3. Vertical burrows in calcareous sandstone of Okhmintaung Formation, west of Uyin village

Figure. 4. Gritty sandstone of on the upper part of Okhmintaung Formation showing vertical burrow with radial grazing trace

Figure. 5. Cross Bedded sandstone with gypsum in the upper part of Okhmintaung Formation, along Mann chaung near Uyin villlage

Figure. 6. Distinct erosional surface from the uppermost part of Okhmintaung Formation, near Pyawbwe village

Pyawbwe Formation (upper Pegu Group, Neogene)

Lithology

The Pyawbwe Formation is well-exposed along a stream beside the north of Pyawbwe village and along the Mann chaung between the Uyin and Kodaung villages. The Pyawbwe Formation is generally consists of shale, sandy shale and sandstone. Shale is predominant and poorly bedded, nodular to laminated, soft, grey to bluish grey and micaceous. Intercalated sandy shale is thick bedded (10-30 cm thick) laminated to nodular, grey to yellowish, micaceous. The lower part of the Pyawbwe Formation is composed mainly of thin bedded to nodular, hard, bluish grey to brown grey shale with intercalated thin-bedded, yellowish grey, fine-grained sandstone bed.

Figure.7. Stratigraphic relationship between underlying Okhmintaung Formation and the overlying Pyawbwe Formation, Pyawbwe type section, near Pyawbwe village

Figure.8. Light grey, concretionary shale from the Lower part of Pyawbwe Formation, near Pyawbwe village

Figure. 9. Light grey, slightly concretionaryshale from the Lower part of Pyawbwe Formation, near Uyin village

Figure. 10. Thickening upward sequence in the middle part of Pyawbwe Formation exposed in the stream near the Pyawbwe village

Lithostratigraphic Evidences

Lithologically, Pyawbwe Formation (Neogene) is underlain by the Okhmintaung Formation (Paleogene). In the Minbu area, the stratigraphic contact between Paleogene and Neogene is observed in the north latitude 20˙ 2´22" and east longitude 94˙36´48". Erosional surface indicates the evidence of unconformity. The strata on either side of unconformity are parallel, so it is a type of disconformity. This disconformity between Paleogene (Okhmintaung Formation) and Neogene (Pyawbwe Formation) is co-inside with the time-boundary of the Paleogene and Neogene. Sedimentological break is present between Paleogene and Neogene of Minbu area, Central Myanmar.

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Figure. 11. Erosional surface contact between Okhmintaung and Pyawbwe Formations, northeast of Pyawbwe village

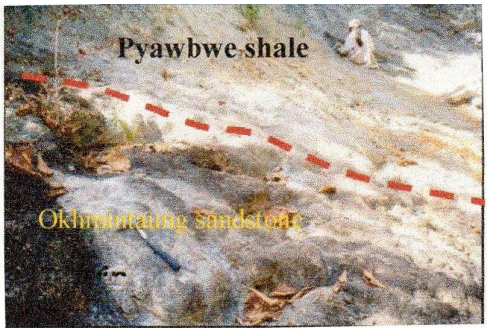


Figure. 12. Closed up view of stratigraphic contact between Okhmintaung and Pyawbwe Formations, northeast of Pyawbwe village

Nannopaleontological Evidences at the Paleogene and Neogene Boundary

Nannoplankton biostratigraphy

The research work with the objectives relating to nannoplankton biostratigraphy is proposed to be carried out. The nannopaleontological study of the Pegu Group (Paleogene – Neogene) exposed at the Minbu area is carried out. Some index nannofossils have been encountered, namely *Helicosphera truempyi, H. ampliapeta, H. obliqua, H.euphratis, H, cateri, Discoaster deflandrei, D. druggii, Sphenolithus conicus, S. belemnos?, S.dissimilis, S. moriformis ,Cyclicargolithus abisectus,Cy. floridanus, Ponsphaera multipora and Coccolithus pelagicus,* etc. But, the index zone NP 25 representative species*Sphenolithus ciperonsis* has not been observed in the study area.This indicates that the late Oligocene (Paleogene) is missing in Minbu area.

Table (1) International Calcareous Nannofossil zonations

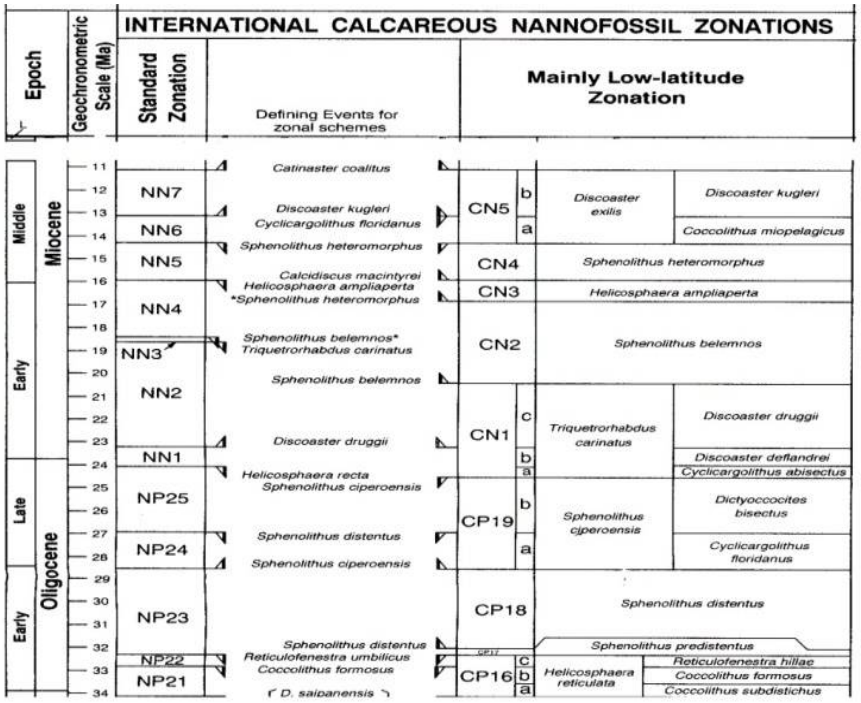
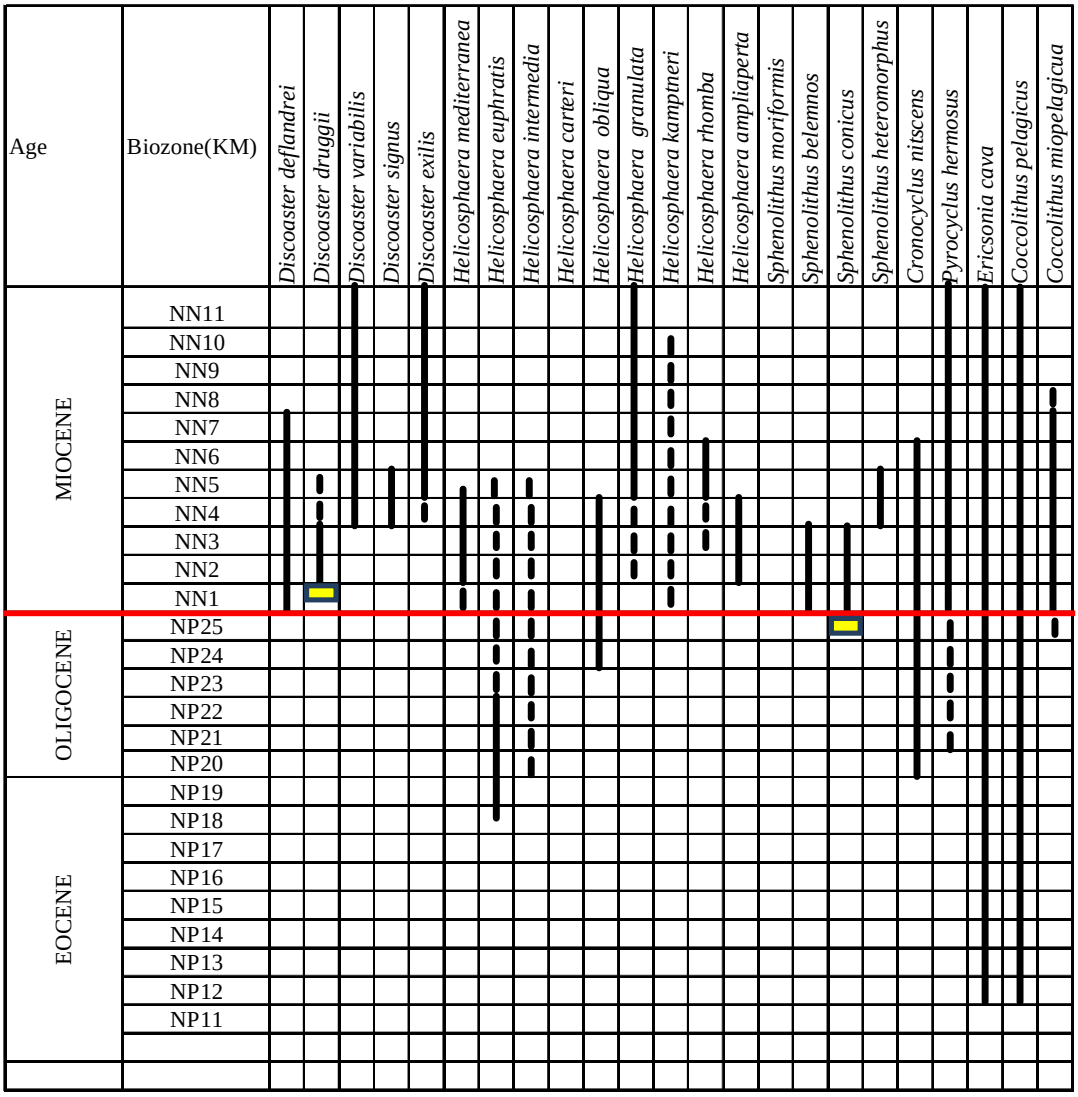


Table (2) Stratigraphic range of the species encountered in the Paleogene and Neogene units of Minbu Area



Nannoplankton Biozones

NP25 - SPHENOLITHUS CIPEROENSIS ZONE

Caterory: Interval Zone

Definition: FO of *Helicosphaera oblique* to FO of *Sphenolithus conicus and / or S. belemnos*

Authors: Bramlette & Wilcoxon (1967), emend. Martini &Worsley (1970)

Age late Oligocene

Correlation: *Cyclicargolithus abisects* and *Discoaster deflandrei* sudzone. CN1a and CN1b of Okada &Burky (1980)

Remark NP25 is usually regarded as the uppermost zone in the Oligocene. Bukry (1973a) distinguishes a lower part of this zone with common *Dictyoccocites bisectus* (CP19b). The upper part (CN1b) corresponds to the following Zone NN1. The index zone species *Sphenolithus ciperonsis* has not been observed in the present study area.

NN1 - TRIQUETRORHABDULUS CARINATUS ZONE

Caterory: Interval Zone

Definition: LO of *Helicosphaera recta* to FO of *Discoaster druggii*

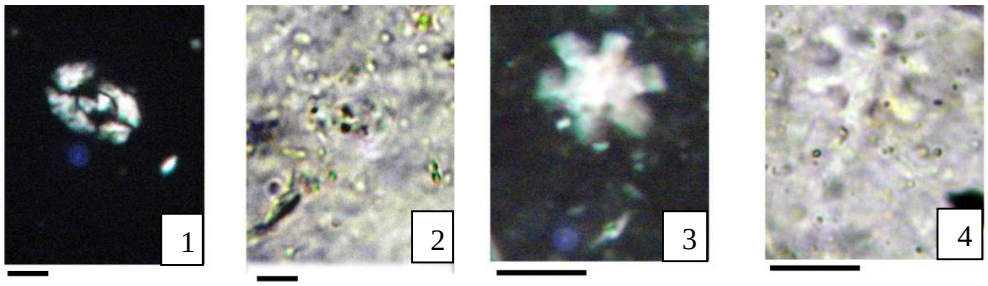
Definition: LO of *Helicosphaera recta* and / or *Sphenolithus ciperoensis* to FO of *Discoaster druggii.*

Authors: Bramlette.&.Wilcoxon (1967), emend. Martini & Worsley (1970)

Age: early Miocene and / or latest Oligocene

Correlation: *Cyclicargolithus abisects* and *Discoaster deflandrei* sudzone. CN1a and CN1b of Okada & Burky (1980)

Remarks: NN1 is usually regarded as the lowermost zone in the Miocene. Bukry (1973a) distinguishes a lower part of this zone with common *C. abisectus* (CN1a) and a middle part with low diversity and relatively common *D. deflandrei* (CN1b). The upper part (CN1c) corresponds to the following Zone NN2. *Cyclicargolithus floridanus* and *T. carinatus* usually present throughout the range, the former being especially common. In poorly preserved material and in samples with common detritus, it can be difficult to distinguish poorly preserved *T. carinatus* from other elongated calcite particles. *D. druggii* can be difficult to distinguish from other *Discoaster* when the fossils are overgrown. But even then, the slightly tapering ends of the arms.



Helicosphaera recta ***Discoaster drugii***

Figure. 13. Nannoplankton zone (NN 1) zoned fossils

Discussion on the Biostratigraphic evidences of the Paleogene – Neogene Boundary

Lithologically and sedimentologically, in the Minbu area, it is obvious that there is a sedimentation break between the underlying Okhmintaung Formation (Paleogene) and Pyawbwe Formation (Neogene). Samples collected from the Minbu area indicate absence of nannobiozone NP25 biozone in Okhmintaung Formation (Paleogene) and presence of NN1 biozone in Pyawbwe Formation (Neogene). Acccording to the lithostratigraphic and nannoplankton biostratigraphic evidences, it can be suggested that a marine regression at the end of the Paleogene which was followed by a marine transgression in the Minbu area, **Figure. 14., 15. and 16.** This depositional change is coincided with the global sea level dropor regression at the Paleogene / Neogene boundary.

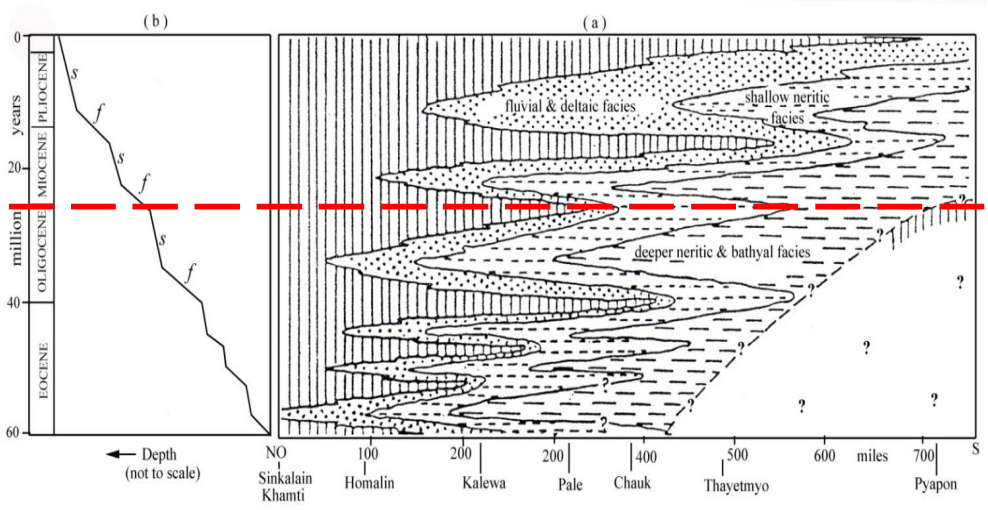


Figure. 14. –a- Schematic north- south time length cross- section along the central belt _ b_ Hypothesized time-depth curve for (a)

f. faster suibsidence resulting in transgression, s . Slower subsidence and silting–up resulting in regression

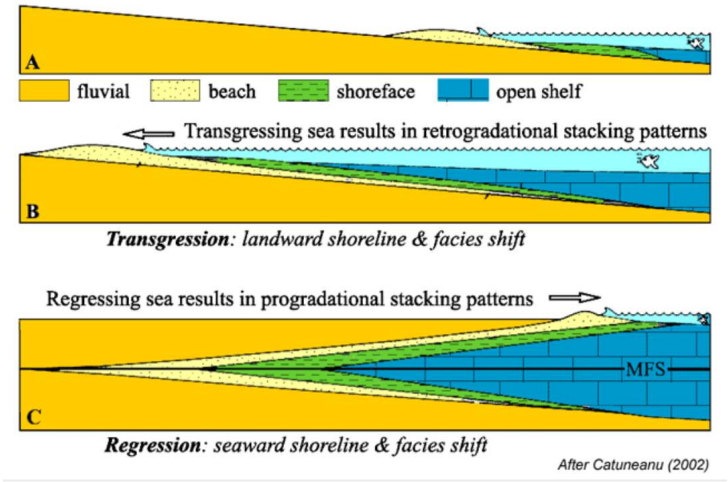


Figure. 15. Marine Transgression and Regression Model (after Catuneanu, 2002)

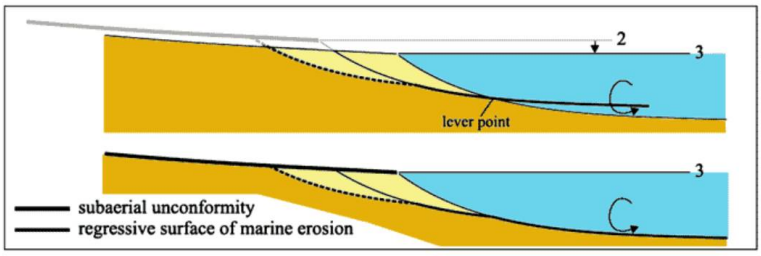


Figure. 16. Model marine Regression (occurrence of uncomformity) at the end of Paleogene of study area.

Paleodepositional Environment

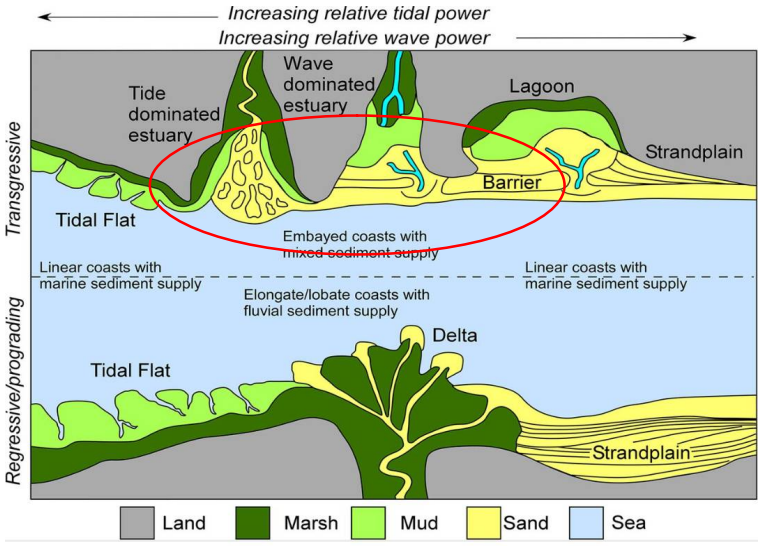


Figure. 17. Model for Paleodepositional Environment (source-pubs.geoscienceworld.org)

Based on the lithology and occurrence of normal marinenannoplankton, thepaleodepositional environment of the study area can be considered as normal marine environment. Presence of calcareous benthic and arenaceous foraminifers together with nannoplankton and planktic foraminifers indicate a shallow marine shelf near shore or inner shelf environment. *Braarudosphaeraceae* are completely strong indicators of nearshore conditions (Siesser, 1993). In Okhmintaung Formation (Paleogene), the thick sandstone beds with intercalated mudstone also exhibit tidal channel deposit. In the Pyawbwe Formation (Neogene) the mudstone with thin intercalated sandstone exhibit subtidal environment.

Conclusions

Lithologically, Pyawbwe Formation (early Miocene/ Neogene) is underlain by the Okhmintaung Formation (late Oligocene/Paleogene). In the Minbu area; there is disconformity between Paleogene and Neogene. Llithologically, sedimentologically and paleontologically, it is obvious that a sedimentological break was observed between the Paleogene and Neogene of the Minbu area, which is represented by the absence of NP25 nannobiozone. This depositional change is coincided with the global sea level drop or regression at the Paleogene/Neogene boundary. The obvious evidence suggests a marine regression at the end of the Paleogene which was follwed by a marine transgression in the Minbu area. Based on the lithology and occurrence of normal marine foraminiferas and nannoplankton, the paleoenvironment of the study area can be considered as shallow marine shelf near shore or inner shelf environment.

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