Sedimentary Facies Analysis of Miocene Clastic Strata in Kalewa-Mawleik Area, Sagaing Region, Myanmar*

Moe Zat¹ and Day Wa Aung²

Search and Discovery Article #51560 (2019)**
Posted April 22, 2019

*Adapted from oral presentation given at 2018 AAPG Asia Pacific Region, The 4th AAPG/EAGE/MGS Myanmar Oil and Gas Conference, Myanmar: A Global Oil and Gas Hotspot: Unleashing the Petroleum Systems Potential, Yangon, Myanmar, November 13-15, 2018

**Datapages © 2019. Serial rights given by author. For all other rights contact author directly. DOI:10.1306/51560Zat2019

¹Mawlamyine University, Myanmar (moezat9.geol@gmail.com)
²University of Yangon, Yangon, Myanmar

Abstract

The present study would offer the Sedimentary Facies of Miocene clastic sedimentary rock units of Letkat Formation (Early Miocene), Natma Formation (Middle Miocene) and Shwethamin Formation (Late Miocene) exposed in the southwestern Chindwin Basin, situated in Kalewa-Mawleik Townships, Sagaing Region, Myanmar. The study is mainly focus on outcrop-based sedimentary facies analysis. During Early Miocene, Letkat Formation was deposited in a fluvial-river system of the lowstand systems tract deposits (LST) deeply incised into the underlying Yaw Formation during relative sea-level fall, also be regarded as an incised fluvial channel-fill (IVF). The fluvial sequence of the lower part Letkat Formation is characterized by high bed-load gravelly and sandy, multi-story sand bodies of braided channel-complexes with general lack of the overbank fines. The middle part of the formation is constructed with the shallow and broad amalgamated sandy channels with thick laminated sheets (LS) probably deposited as a result of unconfined sheet flooding. The upper part is becoming dominated with thick overbank-floodplains fines (OF) interbedded with the isolated major channels, minor channels or crevasse channels, and thin crevasse splays or laminated sand sheets. The lower part Natma Formation is becoming dominated with thick overbank-floodplains fines (OF) interbedded with the isolated major channels, minor channels or crevasse channels, and thin crevasse splays or laminated sand sheets in the fluvial system. The upward change in sand-body architectures within the sequence and lateral interconnected and amalgamated channel and meander belt systems with poorly preserved floodplain deposits. The lower part of Shwethamin Formation is characterized by high bedload gravelly and sandy, multi-story sand bodies of braided channel-complexes. The middle part is constructed with the shallow and broad amalgamated sandy channels whereas the upper part is dominated with thick overbank-floodplains fines.
Sedimentary Facies Analysis of Miocene Clastic Strata in Kalewa-Mawleik Area, Sagaing Region, Myanmar

Moe Zat¹ and Day Wa Aung²

¹. Lecturer, Department of Geology, Mawlamyine University
². Professor and Head, Department of Geology, University of Yangon
OUTLINES

I.  Introduction

II.  Stratigraphy

III.  Sedimentary Facies Analysis

IV.  Conclusion
I. Introduction
Regional Geologic Setting

Scale 1 : 100000

Regional geologic setting of the study area
(From Geological Map of Myanmar, 1977)
Distribution of Rock Units

EXPLANATION

LITHOLOGIC SYMBOLS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
</table>
| IR     | Irrawaddy Formation
| ST     | Shwetamin Formation
| NM     | Natma Formation
| LK     | Letkat Formation
| Y      | Yaw Formation

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
</table>
| MIO - PLIO. | Thin to medium-bedded, coarse to gritty sandstones
| Unconformity | |
| Natma Formation | Medium to thick-bedded, medium to coarse-grained, occassionally pebbly sandstones and clays interbedded
| Yaw Formation | Thick sequence of bluish grey nodular shale to thinly laminated silty shale and thin to medium-bedded, fine-grained, rippled sandstone

GEOLOGIC SYMBOLS

- Gradational Contact
- Unconformity
- Dip and strike of beds

GEOGRAPHIC SYMBOLS

- High Point
- Car Road and Cart Track
- Pagoda
- Village
- River and Stream

MAP INDEX

Study Area

Geology by Moe Zat, May 2014
## II. Stratigraphy

Stratigraphic Sequences of Miocene Rocks in the Western Part of Southwestern Chindwin Basin, Kalewa-Mawleik Area

<table>
<thead>
<tr>
<th>Age</th>
<th>Stratigraphic Units</th>
<th>Dominant Lithology</th>
<th>Maximum Thickness (m)</th>
<th>Depositional System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Late Miocene</td>
<td>Shwethamin Formation</td>
<td>Sand, minor silty shale</td>
<td>200</td>
<td>Fluvial system</td>
</tr>
<tr>
<td>Middle Miocene</td>
<td>Natma Formation</td>
<td>Shale, silty shale, minor sand</td>
<td>340</td>
<td>Fluvial system</td>
</tr>
<tr>
<td>Early Miocene</td>
<td>Letkat Formation</td>
<td>Sand, subordinate pebble-conglomerate, minor silt/clay</td>
<td>?</td>
<td>Fluvial system</td>
</tr>
</tbody>
</table>
Letkat Formation

- Mainly composed of the conglomerate and micaceous sandstones immediately overlying the Yaw Formation
Letkat Formation

Upper

Nwataung Sandstone Member

Lower

Thitchauk Conglomerate Member
Thitchauk Conglomerate Member

- Comprises quartz pebble conglomerate and clean quartzose sandstone.
Nwataung Sandstone Member

- Composed thin to massive, fine to medium-grained, yellowish to grey colored micaceous sandstones.
Natma Formation (Kalewa Formation)

- Comprises massive, medium to coarse-grained, occasionally pebbly sandstone and light color, softness and frequent development of ash gray and mottled clay and shale.
Shwethamin Formation

- Consisting of yellowish brown, friable, medium to coarse-grained, massive sandstone, occasionally interbedded with silty shale.
III. Sedimentary Facies Analysis
Lithofacies of Letkat Formation (Early Miocene)

1. Trough cross-stratified sandstone (St) with basal erosional surface facies (Se)
2. Pebbly gritty sandstone facies (Gm)
3. Sand-mud interlayer facies (Fl)
4. Thinly laminated fine sandstone facies (Sl)
5. Planar cross-stratified sandstone facies (Sp)
6. Horizontal to low-angle stratified sandstone facies (Sh)
7. Bluish grey silty shale with silt and sand lens facies (Fsc)
1. Conglomeratic gritty sandstone facies (Gm)

Bars or lag deposit of the braided river channel
2. Trough cross-stratified sandstone (St) facies

Channel deposit of braided river
3. Sand-mud interlayer facies (Fl)

Overbank or waning flood deposit of fluvial channel
4. Thinly laminated fine sandstone facies (Sl)

Planar bed flow (lower and upper flow regime) of fluvial channel
5. Planar cross-stratified sandstone facies (Sp)

Transverse bars or dunes of fluvial channel
6. Horizontal to low-angle stratified sandstone facies (Sh-Sl)

Shallow, high-energy (upper flow regime) conditions of fluvial channel
7. Grey shale with silt and sand bands facies (Fsc)

Overbank/ Floodfines
Lithofacies Association of Letkat Formation

1. Sandy fluvial channel facies association (Ch)
2. Sand bar facies association (Sb)
3. Gravel bar facies association (Gb)
4. Overbank/flood fines facies association (OF)
1. Sandy fluvial channel facies association (Ch)
2. Sand bar facies association (SB)
3. Gravel bar facies association (GB)
4. Overbank/flood fines facies association (OF)
Lithofacies of Natma Formation (Middle Miocene)

1. Massive nodular clay with fine-grained sandstone facies (Fsc)
2. Medium to thick-bedded, coarse-grained to gritty trough–cross bedded sandstone (Gt) with basal erosional surface (Se) facies
3. Planar cross-stratified sandstone facies (Sp)
4. Thinly bedded siltstone or silty fine sandstone and shale facies (Fl)
5. Massive, variegated silty clay facies (Fm)
1. Massive silty nodular clay intercalated with fine-grained sandstone facies (Fsc)

Overbank/floodfines of fluvial channel
2. Medium to thick-bedded, coarse-grained to gritty trough cross-bedded sandstone (Gt) with basal erosional surface (Se) facies

Channel lag deposit of the braided river
3. Planar cross-stratified sandstone Facies (Sp)
4. Thinly bedded siltstone or silty fine sandstone and shale facies (Fl)

Subaqueous levee deposits
5. Massive, variegated silty clay facies (Fm)

Backswamp
Lithofacies Association of Natma Formation

1. Sandy fluvial channel facies association (Ch)
2. Sand bar facies association (Sb)
3. Overbank/flood fines facies association (OF)
1. Sandy fluvial channel facies association (CH)
2. Sandy bar facies association (SB)
3. Overbank/ flood fines facies association (OH)
Lithofacies Shwethamin Formation (Late Miocene)

1. Gritty to pebbly sandstone facies (Gm)
2. Trough cross-bedded sandstone facies (St)
3. Planar cross-bedded sandstone facies (Sp)
4. Horizontal laminated sandstone facies (Sh)
5. Thinly laminated fine sandstone and siltstone facies (Fl)
6. Massive, variegated silty clay facies (Fm)
1. Conglomeratic gritty sandstone facies (Gm)
2. Trough cross-stratified sandstone facies (St) with basal erosional surface (Se) facies

Basal portion of a sandy fluvial meandering channel
3. Planar cross-stratified sandstone facies (St)

Transverse bars or dunes of active fluvial channel
4. Horizontal laminated sandstone facies (Sh)

Shallow, high-energy (upper flow regime) conditions of fluvial channel
5. Thinly laminated fine sandstone facies (Sl)

Crevasse splay of meandering river
6. Variegated silty shale with silt and sand bands facies (Fm)

Backswamp deposit of meandering river
Lithofacies Association of Shwethamin Formation

1. Sandy fluvial channel facies association (Ch)
2. Sand bar facies association (Sb)
3. Gravel bar facies association (Gb)
4. Overbank/flood fines facies association (OF)
1. Sandy fluvial channel facies association (Ch)
2. Sand bar facies association (SB)
3. Gravel bar facies association (GB)
4. Overbank/flood fines facies association (OF)
IV. Conclusion
Letkat Formation (Early Miocene)

Braided system

Meandering system

Point bar

Abandoned channel

Lake
Shwethamin Formation (Late Miocene)
During Early Miocene, the Letkat Formation was deposited in a fluvial-river system of the lowstand systems tract deposits (LST) deeply incised into the underlying Yaw Formation during relative sea-level fall, also be regarded as an incised fluvial channel-fill (IVF).
The fluvial sequence of the lower part Letkat Formation is characterized by high bed-load gravelly and sandy,
Incised valleys form during Fallingstage

Highstand System Tract: isolated towards amalgamated channel fills

Transgression: tidally influenced, meander channels and lagoonal deposits

Lowstand System Tract: amalgamated channel fills

Fallingstage System Tract: fluvial incision, terrace deposits, paleosols in interfluve areas

multi-story sand bodies of braided channel-complexes with general lack of the overbank fines
The middle part of the formation is constructed with the shallow and broad amalgamated sandy channels.
Incised valleys form during Fallingstage

Highstand System Tract: isolated towards amalgamated channel fills

Fluvial aggradation

Transgression: tidally influenced, meander channels and lagoonal deposits

Fluvial aggradation towards MFS

Lowstand System Tract: amalgamated channel fills

Paleosol formation and/or fluvial aggradation

Fallingstage System Tract: fluvial incision, terrace deposits, paleosols in interfluve areas

Paleosol formation

with thick laminated sheets (LS) probably deposited as a result of unconfined sheet flooding
Incised valleys form during Fallingstage

Highstand System Tract: isolated towards amalgamated channel fills

Transgression: tidally influenced, meander channels and lagoonal deposits

Lowstand System Tract: amalgamated channel fills

Fallingstage System Tract: fluvial incision, terrace deposits, paleosols in interfluve areas

Legend:
- Braided, amalgamated channels
- Meandering channels
- Estuarine deposits
- Terrace deposits
- Lagoonal deposits
- Sequence boundary
The upper part is becoming dominated with thick overbank-floodplains fines (OF)
Incised valleys form during Fallingstage

Highstand System Tract: isolated towards amalgamated channel fills

Transgression: tidally influenced, meander channels and lagoonal deposits

Lowstand System Tract: amalgamated channel fills

Fallingstage System Tract: fluvial incision, terrace deposits, paleosols in interfluve areas

Legend:
- Braided, amalgamated channels
- Meandering channels
- Terrace deposits
- Estuarine deposits
- Lagoonal deposits
- Sequence boundary

Fluvial aggradation

Fluvial aggradation towards MFS

Paleosol formation and/or fluvial aggradation
interbedded with the isolated major channels, minor channels
The lower part Natma Formation is becoming dominated with thick overbank-floodplains fines (OF)
interbedded with the isolated major channels, minor channels
Incised valleys form during Fallingstage

Highstand System Tract: isolated towards amalgamated channel fills

Fluvial aggradation

Transgression: tidally influenced, meander channels and lagoonal deposits

Fluvial aggradation towards MFS

Lowstand System Tract: amalgamated channel fills

Paleosol formation and/or fluvial aggradation

Fallingstage System Tract: fluvial incision, terrace deposits, paleosols in interfluve areas

Paleosol formation

crevasse channels
The upward change in sand-body architectures within the sequence and lateral interconnected and amalgamated channel and meander belt systems with poorly preserved floodplain deposits.
The upward change in sand-body architectures within the sequence and lateral interconnected and amalgamated channel and meander belt systems with poorly preserved floodplain deposits.
The lower part of Shwethamin Formation is characterized by

Incised valleys form during Fallingstage

Highstand System Tract: isolated towards amalgamated channel fills

Fluvial aggradation

Transgression: tidally influenced, meander channels and lagoonal deposits

Fluvial aggradation towards MFS

Lowstand System Tract: amalgamated channel fills

Paleosol formation and/or fluvial aggradation

Fallingstage System Tract: fluvial incision, terrace deposits, paleosols in interfluve areas

Paleosol formation
Incised valleys form during Fallingstage

Highstand System Tract: isolated towards amalgamated channel fills

Transgression: tidally influenced, meander channels and lagoonal deposits

Lowstand System Tract: amalgamated channel fills

Fallingstage System Tract: fluvial incision, terrace deposits, paleosols in interfluve areas

Fluvial aggradation

Fluvial aggradation towards MFS

Paleosol formation and/or fluvial aggradation

high bedload gravelly and sandy
multi-story sand bodies of braided channel-complexes
The middle part is constructed with the shallow and broad amalgamated sandy channels.
whereas the upper part is dominated with thick overbank-floodplains fines.
Incised valleys form during Fallingstage

Highstand System Tract: isolated towards amalgamated channel fills

- Fluvial aggradation

Transgression: tidally influenced, meander channels and lagoonal deposits

- Fluvial aggradation towards MFS

Lowstand System Tract: amalgamated channel fills

- Paleosol formation and/or fluvial aggradation

Fallingstage System Tract: fluvial incision, terrace deposits, paleosols in interfluve areas

- Paleosol formation

Legend:
- Red: Braided, amalgamated channels
- Yellow: Meandering channels
- Light blue: Estuarine deposits
- Dark blue: Lagoonal deposits
- Black: Terrace deposits
- Gray: Sequence boundary
THANK YOU FOR YOUR KIND ATTENTION