Lithostratigraphy of the Western Part of Laymyethna Area, Ayeyarwaddy Region

Tun Tun Min[1], Saw Ngwe Khaing[2] and Nyein Chan Aung[3]

Abstract

The study area, southeastern flank of the Western ranges, is located at the western part of Laymyethna. Thick sequence of flysch-like sediments and such subordinate rocks as quartzite, submarine mafic lava flow and *Globotruncana*-bearing micritic limestone of Middle Triassic to Eocene age are mainly made up of the Western Ranges. They are subjected to a low-grade metamorphism and locally associated with mafic to ultramafic rocks. This major lineament occurs as a major strike-slip fault in Western Ranges and it is also known as Kabaw Fault. The Kabaw Fault forms a major tectonic break between the Western Ranges and the Central Basin. Undifferentiated Flysch Unit (Late Cretaceous to Paleocene), Paunggyi Formation (Paleocene), Undifferentiated Molassic Unit (Eocene to Early Oligocene), Okhmintaung Formation (Late Oligocene), Pyawbwe Formation (Early Miocene) and Irrawaddy Formation (Late Miocene to Pliocene) are well exposed in the area.

Keywords: Western Ranges, flysch, lineament, Kabaw Fault

INTRODUCTION

The study area is located about 42 km from western part of Hinthada and western part of Laymyethna, southeastern flank of the Western ranges (Fig.1). It is located between the latitudes 17°33' N and 17°42' N, and longitudes 94°54' 30″ E and 95°04' E. The study area lies on one inch topographic maps of 85 O/2 and 85 K/14. Topographically, western part of the area is the highest and mountainous region and eastern part is a flat lowland (Fig.2). In the study area, main streams flow from NW to SE direction. In the western part, the short tributaries and steep sided, narrow V-shaped gullies are most common characters of the streams. All streams are sub-angular to dendritically flowing in the study area (Fig.3).

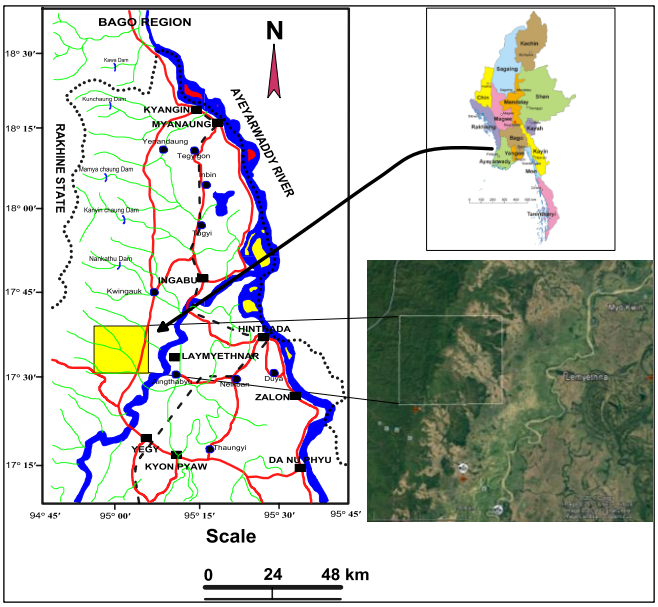

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Figure (1). Location map of the study area.

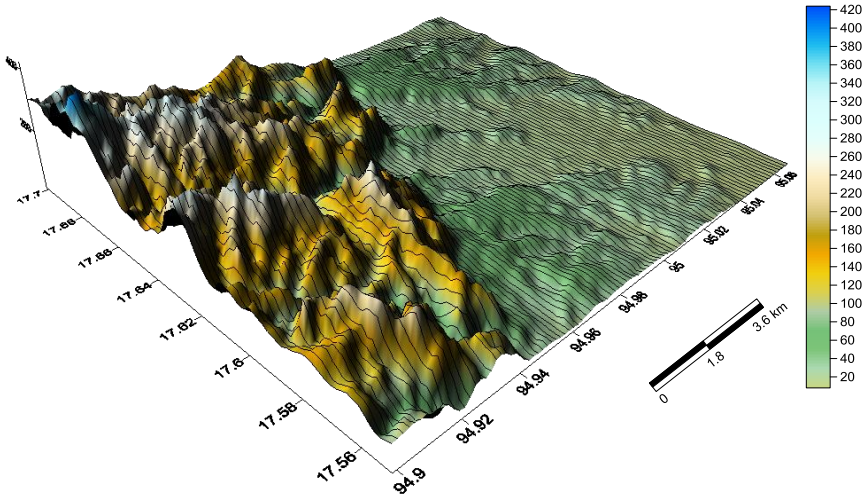

Figure (2). Topographic map of the study area.

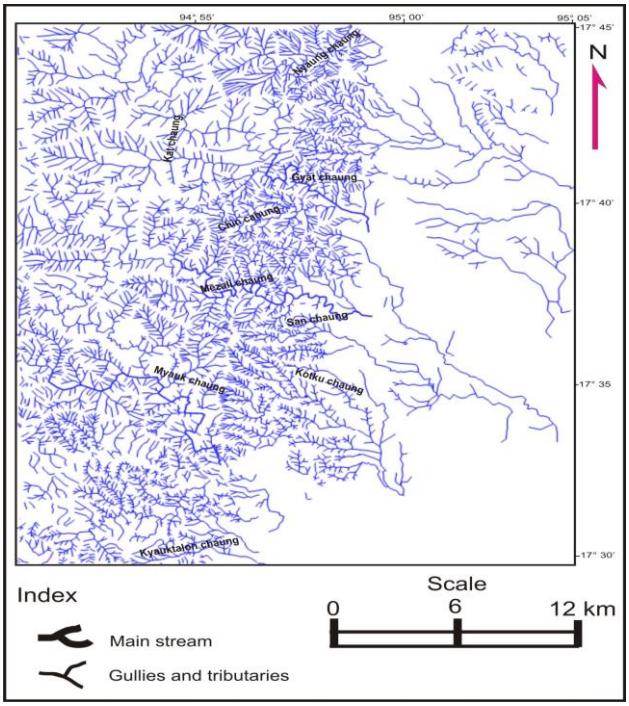

Figure (3). Drainage pattern map of the study area.

REGIONAL GEOLOGICAL SETTING

The western Ranges are mainly composed of a thick sequence of flysch-like sediments and such subordinate rocks as quartzite, submarine mafic lava flow and *Globotruncana*-bearing micritic limestone of Middle Triassic to Eocene age (Win Swe, 1981). They are subjected to a low-grade metamorphism and locally associated with mafic to ultramafic rocks. The Western Ranges can be divided into two parallel belts; the western belt consists of flysch type sediments, largely of early Eocene age, all folded and thrust, and the eastern belt is largely much older rocks (Mitchell, 1993). Uplift of the Western Ranges probably began in the late Eocene or early Oligocene (Mitchell, 1993). The lowlands are

divided into a western and an eastern part. Most of the filling (sandstone and shales) took place through the eastern part. The total thickness of Tertiary and Quaternary sediments in the southeastern part of the lowlands could be in excess of 10 km (Rodolfo, 1969) and might reach 17 km (Mitchell, 1975).

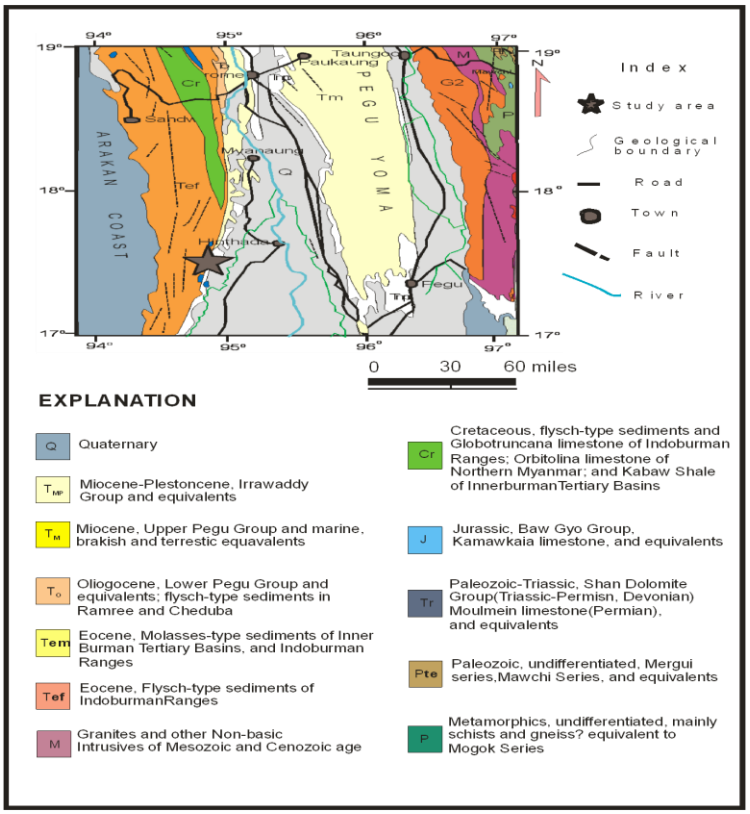

Figure (4) Regional geological map

LITHOSTRATIGRAPHY

Stratigraphic succession of the rock units can be described as follow;

Rock units	**Geological Age**
Sedimentary Rocks	
Alluvium	Holocene
Irrawaddy Formation	Late Miocene-Pliocene
~ ~ ~ ~ ~ Unconformity ~ ~ ~ ~ ~	
Pyawbwe Formation	Early Miocene
~ ~ ~ ~ ~ Unconformity ~ ~ ~ ~ ~	
Okhmintaung Formation	Late Oligocene
Undifferentiated Molassic Unit	Eocene-Early Oligocene
Paunggyi Formation	Paleocene
~ ~ ~ ~ ~ Unconformity ~ ~ ~ ~ ~	
Undifferentiated Flysch Unit	Late Cretaceous-Paleocene
Igneous Rock	
Serpentinite	Late Cretaceous to Early Eocene

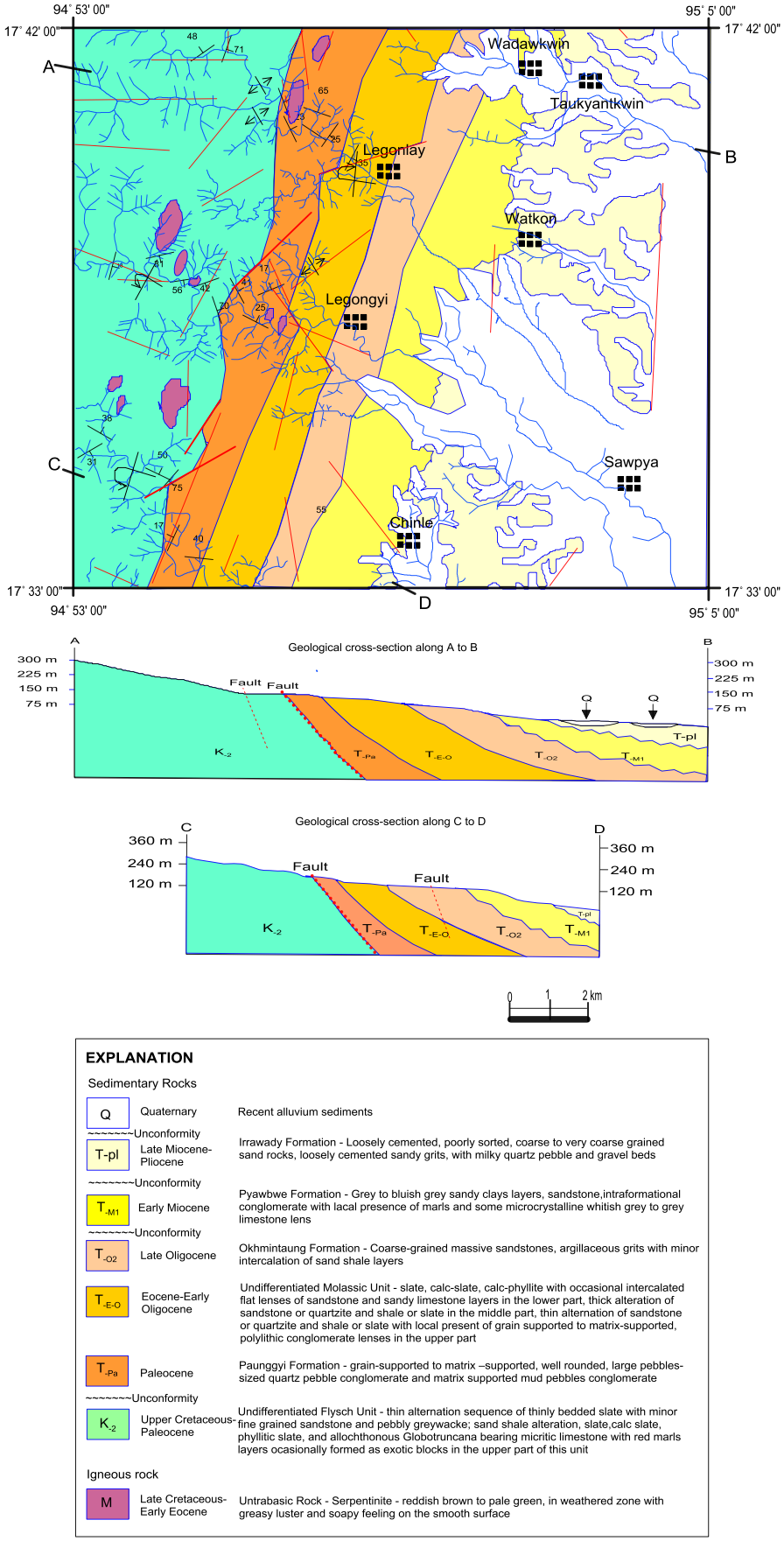

Figure (6). Geological map of the study area.

Undifferentiated Flysch Unit

In the study area, there are numerous flysch type sediments. Thin alteration sequence of thinly bedded slate with minor fine grained sandstone and pebbly greywacke along the western part of the area represents the Undifferentiated Flysch Unit of Late Cretaceous age (Aung Khin and Kyaw Win, 1969; Kyaw Win and Thit Wai, 1971). Localized shear metamorphism occurs in this unit. The sequence of this unit can be recognized as (1) pebbly greywacke, (2) sand/shale alteration (Fig.7), (3) slate (Fig.8), (4) calc-slate, (5) phyllitic slate, and (6) talc-chlorite phyllite.

Allocthonous *Globotruncana* bearing, micritic limestone with red marl layers is occasionally formed as exotic blocks in the upper part of this unit.

There is no fossil evidence within the area. Most of the previous workers have accepted that the Undifferentiated Flysch Unit is Late Cretaceous to Paleogene in age. Upper part of the unit is unconformably in contact with Paungyi Formation.

Figure (7) Sandstone with shale intercalation found in the Undifferentiated Flysch Unit (Loc. N 17° 41′ 06.2″, E 94° 58′ 24.1″, Facing; N)

Figure (8) Undifferentiated Flysch Unit of thin bedded slate exposed in the Gyat Chaung (Loc. N17° 40′ 55.3″, E94° 58′ 13.9″, Facing; E)

Paunggyi Formation

Paunggyi formation is lying unconformably on the Undifferentiated Flysch Unit. This unit is composed of thick accumulation of grain-supported, sub-angular to sub-rounded rock materials with a wide range of variation in size, ranging from small pebbles to large boulder (Fig.9).

The upper portion of the formation is locally characterized by grain-supported to matrix-supported, well rounded, large pebbles-sized quartz pebble conglomerate and matrix supported mud pebbles conglomerate (Fig.10).

The formation occurs along the eastern margin of the Undifferentiated Flysch Unit. There is no fossil evidence found in the study area.

Figure (9) Sub-angular to rounded quartz pebble of the Paunggyi Formation. (Loc. N17° 40′ 46.5″, E94° 58′ 20.3″, Facing; 165°)

Figure (10) Massive, poorly sorted rock materials cemented by calcareous sandy matrix in Paunggyi Formation. (Loc.N17° 41′ 06.8″, E94° 58′ 26.5″, Facing; 70°)

Undifferentiated Molassic Unit

This unit is mainly composed of slate, calc-slate, calc-phyllite with occasional intercalated flat lenses of sandstone and sandy limestone layers in the lower part (Fig.11), thick alteration of sandstone or quartzite and shale or slate in the middle part, thin alteration of sandstone or quartzite and shale or slate (Fig.12) with local present of grain supported to matrix-supported, polylithic conglomerate lenses in the upper part. Thick bedded, medium to coarse grained, poorly sorted sandstone with subordinate shale layer are found in the uppermost part (Kyaw Win and Thit Wai, 1971).

One of the significant features is horizontal burrows presented at the bedding plane surface of the fine sandstone. The burrows range from 4 to 5 mm in approximate width.

These molassic units show parallel to sub-parallel, regional strike to that of the older flysch unit with moderate to gentle inclination of beds. This unit gradually changes upward into Okhmintaung Formation of the Late Oligocene.

The Undifferentiated Molassic Unit is Eocene to Lower Oligocene in age (Kyaw Win and Thit Wai, 1971).

Figure (11) Sandy limestone layer of Undifferentiated Molassic Unit (Loc.N17° 37′ 27.5″, E94° 57′ 53.8″, Facing; 180°)

Figure (12) Sandstone and shale interbedded of the Undifferentiated Molassic Unit (Loc. N17° 38′ 02.6″, E94° 57′ 16.0″, Facing; 100°)

Okhmintaung Formation

"Okhmintaung Sandstone" is first proposed by Lepper (1933) for the sandy unit of Okhmintaung Hill (N 19° 33′& E 94° 54′) in Magway Region. The lithostratigraphic unit "Okhmintaung Formation" is later used by Aung Khin and Kyaw Win (1969).

The formation is mainly made up of poorly sorted, coarse-grained massive sandstone (Fig.13), argillaceous grits with minor intercalation of sandy shale layers (Fig.14) and occasional flat lenses of grain-supported polylithic conglomerate and clay-pebble conglomerate. Lower part of the formation is contact with the upper part of the Undifferentiated Molassic Unit. The upper boundary is unconformably contacted with the lower part of the Pyawbwe Formation. Regional strike of the formation shows NNE-SSW trend with moderate to gentle inclination to SE. Okhmintaung Formation is stated as Late Oligocene in age.

Pyawbwe Formation

Pyawbwe Clay was first introduced by Lepper (1933) in which comprising of argillaceous unit. This unit is well exposed near Pyawbwe Village (N 20° 1′& E 94° 38′) in Magway Region. Later, Aung Khin and Kyaw Win (1969) proposed into formal lithostratigraphic unit as "Pyawbwe Formation".

Figure (13) Poorly sorted, coarse grained massive sandstone of the Okhmintaung Formation (Loc. N17° 41′ 24.9″, E94° 59′ 15.3″, Facing; 230°)

Figure (14) Thick bedded sandstone with shale intercalation of Okhmintaung Formation (Loc. N17° 41′ 31.7″, E94° 59′ 29.8″, Facing 150°)

Pyawbwe Formation is relatively softer than the other units. Therefore, it has the rolling topography. Thick accumulation of fine clastic sediments mainly composed of grey and bluish grey sandy clay layers with concentration, sandstone and intra-formational conglomerate can be designated as Pyawbwe Formation. Regional strike of the Pyawbwe Formation show NNE-SSW, with gentle inclination towards SE. Pyawbwe Formation overlies unconformably upon the Okhmintaung Formation. The age of the Pyawbwe Formation is noted as Early Miocene.

Irrawaddy Formation

Irrawaddy Formation is rest upon the upper surface of the Obogon Formation (Aung Khin and Kyaw Win, 1969) Gritty to pebbly loose sand rock with abundant silicified fossil wood fragments is first assigned as "Fossil Wood System" by Theobald in (1873). In (1895),

Noetling gave the name “Irrawaddy System” to this type of lithology. Later, Pascoe (1959) has modified it and use “Irrawaddy Sandstone”. The lithostratigraphic name “Irrawaddy Formation” was proposed by Aung Khin and Kyaw Win (1969).

Irrawaddy formation is most widely distributed in the eastern part of the study area (Fig.15). The formation is well recognized by loosely cemented sandy grits (Fig.16), with milky quartz pebbles and gravel beds and subordinate sandy shale with thick to very thick bedded nature. This formation is designated as Upper Miocene to Pliocene in age.

Figure (15) Grey to bluish grey sandy clay layers of the Irrawaddy Formation (Loc. N 17° 40′ 4.5″, E94° 59′ 58″, Facing; SE)

Figure (16) Loosely cemented sandstone with planar cross stratification of the Irrawaddy Formation (Loc. N17° 36′ 22.4″, E95° 03′ 17.6″, Facing; 300°)

Serpentinite

In the study area, the ultrabasic rocks of serpentine bodies are exposed as linear bodies (Fig.17). The serpentinites are exposed near the boundary with tectonic contact (near the contact of regional thrust faults) and metamorphic rocks (Kyaw Htun 1999 and Hla Htay 2009) and highly sheared deformation. They show reddish brown to pale green in weathered zone with greasy luster and soapy feeling on the smooth surface (Fig.18). On the fresh surface the color is usually dark greenish to deep green.

Figure (17) Reddish brown to pale green serpentinite rock body (Loc.N17° 40′ 01.3″, E94° 59′ 26.3″, Facing; 50°)

Figure (18) Outcrop nature of the serpentinite exposed in the middle part of the study area (Loc.N17° 37′ 50.7″, E94° 58′ 05.3″, Facing; N°)

CONCLUSION

There are six stratigraphic rock units composed in the study area. The sequence of the oldest flysch unit (Late Cretaceous to Paleocene) can be recognized as (1) pebbly greywacke, (2) sand/shale alteration, (3) slate, (4) calc-slate, (5) phyllitic slate, (6) talc-chlorite phyllite. Grain-supported to matrix-supported, well rounded, large pebbles-sized quartz pebble conglomerate and matrix supported mud pebbles conglomerate are mainly composed in Paungyi formation (Paleocene). Molassic unit (Eocene-early Oligocene) can be divided into three subunits. Slate, calc-slate, calc-phyllite with occasional intercalated flat lenses of sandstone and sandy limestone layers in the lower part, thick alteration of sandstone or quartzite and shale or slate in the middle part, thin alteration of sandstone or quartzite and shale or slate with local present of grain supported to matrix-supported, polylithic conglomerate lenses in the upper part. Poorly sorted, coarse-grained massive sandstone, argillaceous grits with minor intercalation of sandy shale layers and occasional flat lenses of grain-supported polylithic conglomerate and clay-pebble conglomerate were composed in Okhmintaung formation (Late Oligocene). In rolling topography, thick accumulation of fine clastic sediments mainly composed of grey and bluish grey sandy clay layers with concentration, sandstone and intra-formational conglomerate can be designated as Pyawbwe Formation (Early Miocene). Irrawaddy formation (Upper Miocene to Pliocene) is well recognized by loosely cemented sandy grits, with milky quartz pebbles and gravel beds and subordinate sandy shale with thick to very thick bedded nature. The serpentinites (Late Cretaceous to Early Eocene) are exposed near the boundary with tectonic and metamorphic rocks and highly sheared deformation.

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