

Tectonic Implication of Letpangon-Thandaung Area, Pyin-Oo-Lwin Township, Mandalay Region Marlar Aye Shwe*, Maung Maung, Maung Maung*****

Abstract

The study area is situated about 15 miles south of Pyin Oo Lwin Township, Mandalay Region. It lies between latitude 21° 43' N to 21° 51' N and longitude 96° 20' E to 96° 26' E of one-inch topographic maps 93- C/5 and 93 C/6. The present area is situated about 17 km long in N-S direction, 11 km wide in E-W direction. The Paleozoic strata from Late Precambrian to Middle Devonian - Permian units are exposed in this area. This study is mainly emphasized on the tectonic implication of the area. The tectonic setting of Myanmar Region is related to the subduction of the northeast moving Indian Plate beneath the Sibumsu that initially activated at the Mesozoic. In the area, the feature of strike is a regional overthrust with a sinuous outline, running N-S. The type of folds are Myebon and Pondaung anticlines of younging downward antiforms and Son-baw-aing syncline of younging upward synform. Several brittle and ductile deformations have been recognized both on an outcrop and regional scale.

Keywords: Paleozoic, implication, overthrust, regional scale, outcrop

Introduction

Location, Size and Accessibility

The Letpangon-Thandaung area is situated in Pyin Oo Lwin Township. It is located between latitudes 21°43' N to 21°51' N and longitudes 96°20' E to 96 °26' E. It is bounded by 25 to 35 vertical grids and 01 to 18 horizontal grids in one-inch topographic maps 93- C/5 and 93- C/6. This area extends about 17km from north to south and 11 km from east to west. It covers a surface area of about 187 square kilometers. It can be easily accessible by car through the whole year. The location map of Letpangon-Thandaung area is shown in figure (1).

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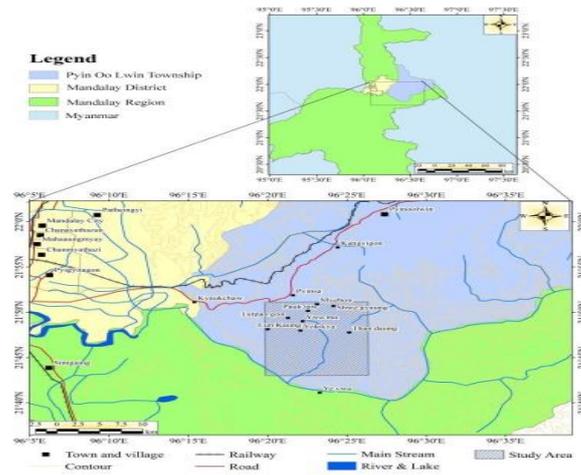


Figure (1) Location map of the Letpangon-Thandaung area

Purpose of Study

The objectives of the present investigation are to describe the tectonic implication in the study area.

Methods of Study

The research work is mainly based on the field works and laboratory works for the better understanding of the area.

Previous Work

I.G.C.P (1980) cooperated with D.G.S.E and published a stratigraphic succession of Pre-Paleozoic and Paleozoic units of Maymyo south area. Much progress in geology of the surrounding areas had been attempted by many workers who include Thet Naing (1991), Hla Myint (1984), Myint Thein (1984), Win Win Kyi (1990), Ko Ko Gyi (1991) and Zaw Min Thein (1993).

Stratigraphy

The rock sequence of the study area is divided into, from older to younger, the Chaung Magyi Group, the Ngwetaung Group, the Sitha Formation, the Kyaingtaung Formation, the Nyaungbaw Formation, the Zebingyi Formation and the Maymyo Formation. The geological map of Letpangon-Thandaung area is shown in figure (2).

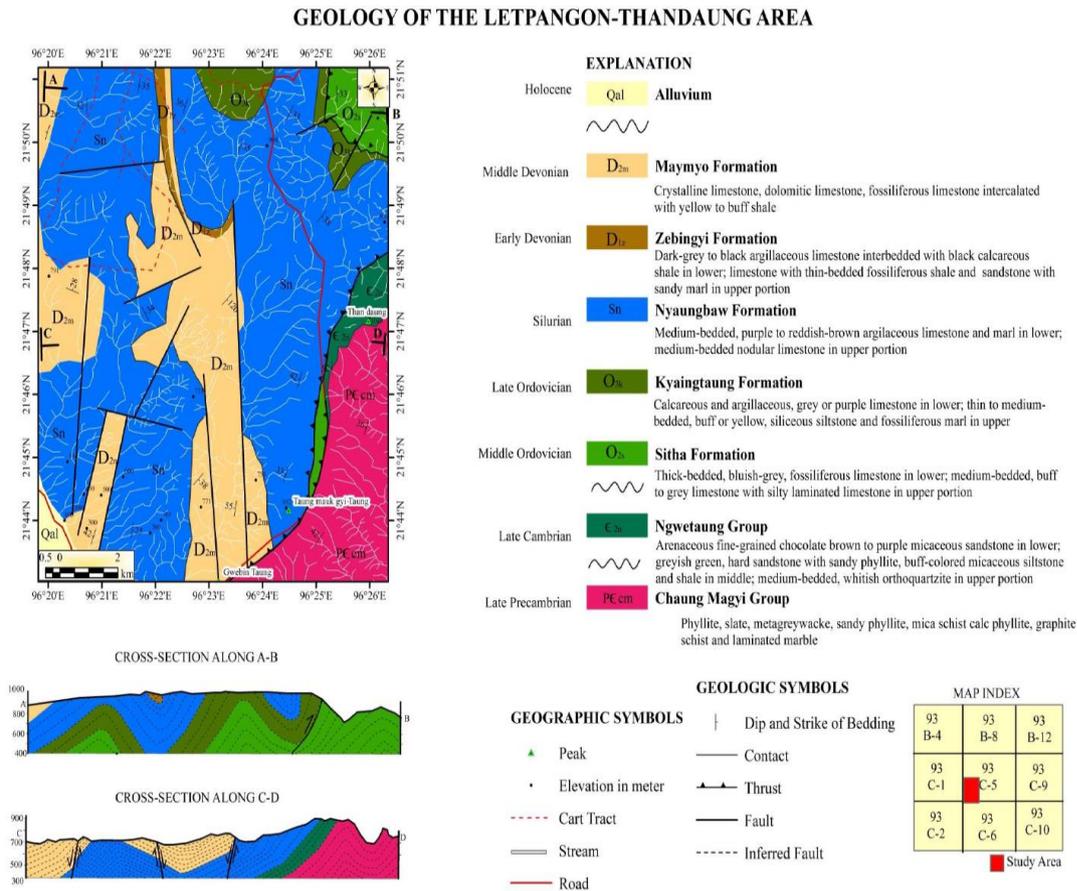


Figure (2) Geological map of the Letpangon-Thandaung area

Tectonic Implication

The study area lies in the western margin of the Shan-Tanintharyi Block. Giant Shan-Burma Boundary fault separates the Shan Plateau to the east and the central lowland to the west. Just west of the fault a linear belt of Pre-Cambrian basement and Mogok Belt are well exposed. To the west, the Paleozoic units are affected by a swarm of N-S running faults, resulting in a step-like topography. The Sedaw Plain forms a stair-way progressively rising from west to east. The present area occupies mostly the Pyntha - Anisakan Plain.

Regional Tectonic Setting

The tectonic setting of Myanmar Region is related to the subduction of the northeast moving Indian Plate beneath the Sibumasu that initially activated at the Mesozoic (Maung Thein, 2000). On the basis of Regional Geological Map of (MGS, 2014), almost all the structural trends of the study area and its surroundings are N-S and NNE-SSW directions. The study area is marked by KyaukKyan Fault about 70 km east and Sagaing Strike Slip Fault just 25 km west of the area. The prominent Shan Scarp Fault is passing through just a few kilometers west of the study area (Fig. 3). Momeik Fault trending WSW-ENE is also located about 150 km north of the study area.

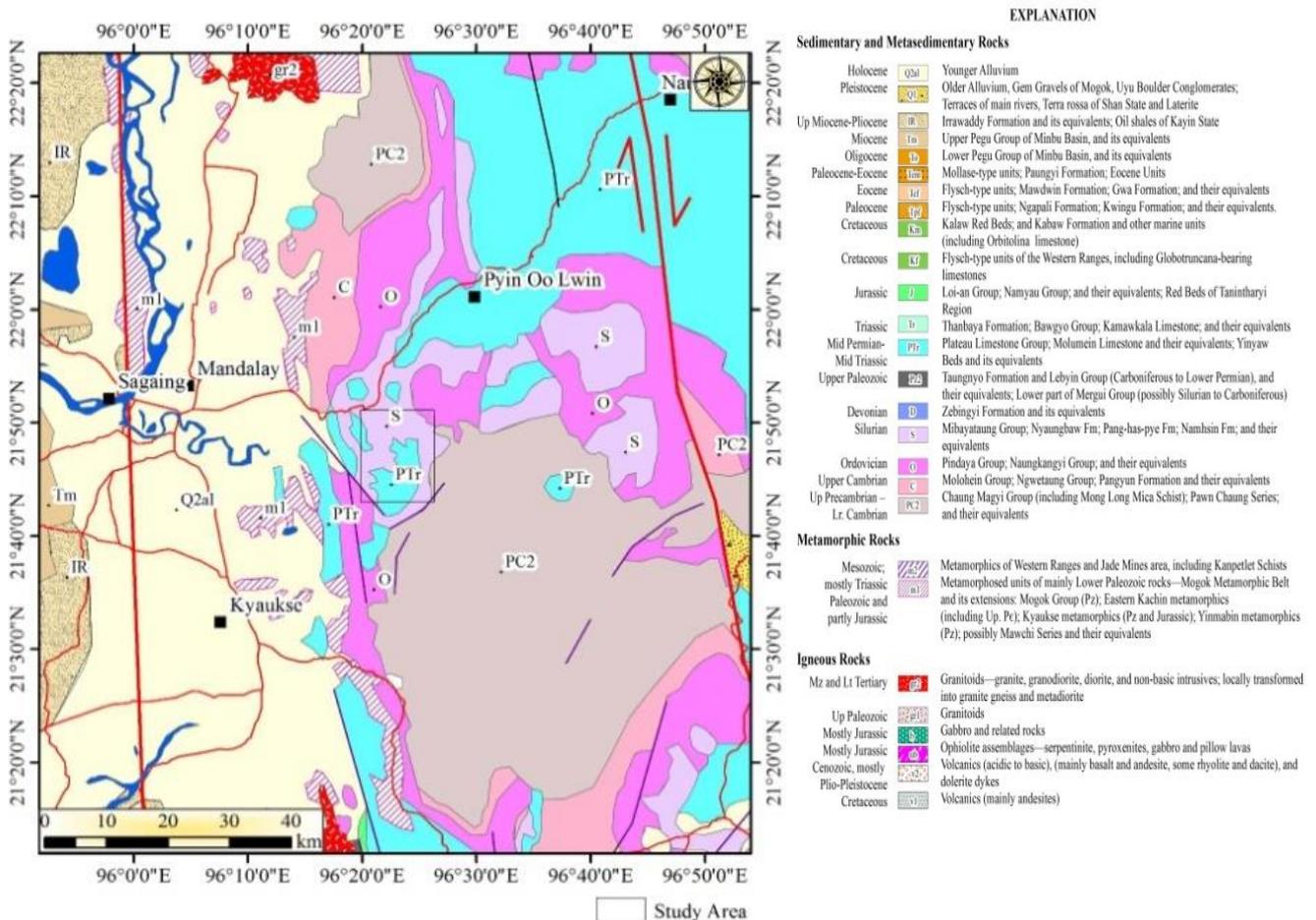


Figure (3) Regional geologic setting of the study area and its environs
(Geological map of Myanmar, MGS, 2014)

Lineament Analysis

In the area, the feature of strike is a regional overthrust with a sinous outline, running N-S. The overthrust separates the Pre-Cambrian and Cambrian rocks on the east and the overlying the Paleozoic rocks on the west. Thandaung overthrust marks the discordant base of the Paleozoic sequences above the Pre-Cambrian units. Two cross faults are later formed cutting transversely the major fault. In the area, two anticlines and one syncline are recognized. They are Myebon anticline, Pondaung anticline, and Son-baw-aing syncline. The type of folds are Myebon and Pondaung anticlines of younging downward antiforms and Son-baw-aing syncline of younging upward synform. Kyaingtaung Formation is mainly occupied in the core of the Myebon anticline. Sitha Formation is mainly occupied in the core of the Pondaung anticline. Pondaung anticline seems to extend towards the southeast and is possibly disappeared by the overthrust. Zebingyi Formation is mainly occupied in the core of the Son-baw-aing syncline. Types of Folds are generally symmetrical or asymmetrical. The anticlinal axes roughly trend nearly N-S, and NW-SE whereas the synclinal axes NW-SE respectively.

Deformation Structures

Several brittle and ductile deformations have been noted both on an outcrop and regional scale. The important features of though strike slip and normal faults are mainly emphasized the early deformation structures.

Outcrop-scaled Deformation

The Nyaungbaw Formation (approximately elevation, 3082 ft) is in distinct contact with the Cambrian Ngwetaung Group (3447 ft) exposed in Thandamauk Taung. In the Nyaungbaw Formation, the nodular beddings are distinct and which are remarkably deformed to produce a system of shear plane (Fig.4. A, B) as the overlying Paleozoic sequences may have emplaced over the Pre-Cambrian basement by a gaint thrust over the entire eastern terrain. The Nyaungbaw Formation was sliced by the thrust large and small are caught along, the major thrust zone. Most folds are polyharmonic folds occurring chevron type tight folds (Fig.5). The distinct shear planes juxtaposed some folds and are parallel to the axial surface of minor folds. Some shear planes wedged-out and bedding slip also occur. Therefore, they are interpreted as shear folds in which bedding slip may be due to the attachment of shear along the weak planes of bedding (Fig.6. A, B). Curve hinge line and variation of direction in axial planar surface of some folds also suggests that they are sheath folds (Fig.7). Some folds are intensely folded (Fig.8) and conjugate. They may be commonly associated with thrusts and sheath folds in the early phase of deformation. The folds are interpreted as "Shear folds" due to the style of deformation is represented by the tight, polyharmonic, and chevron type folds. The geometry of folds showing sheath-like folds indicate the intense major shear zones. The notable lineament of tectonic boudins in the Kyaingtaung Formation are resulted from ductile shearing of original limestone bands. These bands are stretching, necking, and rolling progressively from west to east in the thrust zone (Fig. 9 and Fig. 10).



(4-A)



(4-B)



Figure (5)

Figure (4 A,B) Structural disturbance in the nodular limestone of the Nyaungbaw Formation

Localized minor fold due to the major intense shearing in the Nyaungbaw Formation



(6-A)



(6-B)



Figure (7)

Figure(6-A&B) Shear plane in the argillaceous limestone of the Nyaungbaw Formation

Sheath like folds in the purple shale of the Nyaungbaw Formation

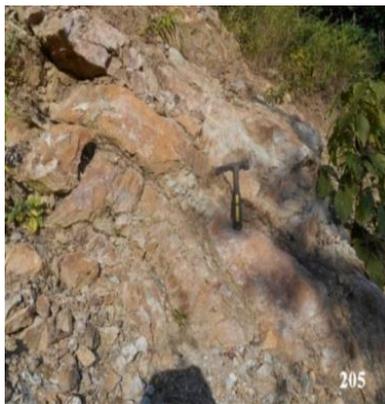


Figure (8)

Minor Intense fold in the Nyaungbaw Formation (facing: due east)



Figure (9)

Progressive development of limestone boudins in deformed Kyaingtaung Formation



Figure (10)

Progressive rotation of original boudins in deformed Kyaingtaung Formation

Progressive development of limestone boudins suggests an east - directed thrusting. The silty limestone of the Kyaingtaung Formation frequently occurs the minor thrusts. Several bands of nodular limestone of the Nyaungbaw Formation are affected by a system of an imbricated minor thrust. In the Sitha Formation, shear zone and tension gashes (Fig. 11) are more abundant. Calcite-filled tension gashes in echelon are associated with them. It seems to indicate that the relative easterly drive of the overthrust caused tension fractures in the rocks above the thrust.



Figure (11) Notable tension gashes filled with secondary calcite vein in the silty lamination in the Sitha

Re

The configuration of main fault trace is very sinuous regionally. On both sides of the fault trace, there is a sharp contrast in drainage pattern. Geographically, the Thandaung overthrust commonly lies in the structurally highest area of a fold as the most strongly compressed portion. The slip along the thrust in the area seems to diminish and finally disappear into steep flank of Dattaw Chaing structural basin. Fault topographic features of Kywethaye and Poye Chaung as Pondaungtaung show shutter-ridges blocking valley, and offset streams deviated around shutter - ridges. The fault facets disappear and become rounded spurs on both sides of the Sinbyu Chaung due to prolonged dissection of the scarp fronts. Regionally, the western thrust sheet carrying Paleozoic carbonate sequences slides and rests discordantly over the Pre-Cambrian and Cambrian basement in the east. The Ngwetaung Group is also deposited on the Pre-Cambrian basement in a manner of decollement. Due to wave-like and folded thrust sheet, a series of anticlines and synclines were developed in the southeast folded terrain.

Faults

Longitudinal fault (F1, F2, F3, F4 and F5)

Dedot Fault (F1) is located along the axis of Son-baw-aing syncline trending N-S. It is a vertical fault and down thrown on the west. Leikkya Fault (F2) is situated just west of Leikkya village. It runs nearly N-S and it is a high angle normal fault with its downthrown side on the west. Wetka Chaung Fault (F3) is named after the Wetka stream which is situated at the western part of the study area. It trends nearly N-S and a normal fault with downthrown side on the east. F4 and F5 are located nearly Nyaungpalan Sakan camp lying southwestern part of the area. The offset ridges and rock strata, fault scarp, the straight alignment of stream and fault breccia occurred along the fault.

Cross fault (F6, F7, F8, F9, F10, F11 and F12)

Naungwe-Letpangon Fault (F6) is situated in the northwestern part of the study area. This fault runs east-west in direction and offsets stratigraphic boundaries. Yokkya Fault (F7) is situated near the Yokkya village in the middle part of the present area. It trends north-northeast and south-southwest in direction. Nyaungpalan Sakan Fault (F8) is located near Nyaungpalan Sakan camp lying in the south western part of the area. Its trend is nearly east-west in direction. Kywethaye Chaung Fault (F9) is located southeast of Shwegyaung village. It is a tear fault and it trends N 30° E in direction. The recognition of fault is marked by the offset of stratigraphic boundaries and straight alignment of stream. Poye Chaung Fault (F10) is situated two miles northeast of leikkya village and is roughly parallel to the Kywethaye Chaung Fault. It is vertical tear fault and trending N 25° E. Ywama Fault (F11) is a small cross fault and it trends N 33° W in direction. The recognition of fault is marked by dislocated stratigraphic units. F12 fault is located

in the central part of the present area and trending in E-W direction. Straight alignment of stream and slicken side are recognized along the fault.

Summary and Conclusion

The study area is situated 15 miles south of Pyin Oo Lwin Township, Mandalay Region. The Paleozoic strata from Late Precambrian to Middle Devonian-Permian units are exposed in this area. The tectonic setting of Myanmar Region is related to the subduction of the northeast moving Indian Plate beneath the Sibumsu that initially activated at the Mesozoic. The study area is marked by Kyauk Kyan Fault, Sagaing Strike Slip Fault, Shan Scarp Fault and Momeik Fault. In the area, the feature of strike is a regional overthrust with a sinuous outline, running N-S. Two anticlines and one syncline are recognized in the area. The type of folds are Myebon and Pondaung anticlines of younging downward antiforms and Son-baw-aing syncline of younging upward synform. Several brittle and ductile deformations have been noted both on an outcrop and regional scale.

The early phase deformation is characterized by such features as sinuous outline of trace, sharp contrast in drainage and topography, minor thrusting, tectonic boudins, drag folds, shear zones, tension gashes and shutter-ridges blocking valleys with fault facets that appear rounded-spurs. Normal faults can produce in the later phase of the deformation when compressional forces released. Several geodynamic models can account for the Eastward Vergent of the early phase or compressional tectonic in Shan-Thai Block during Devonian.

Acknowledgments

First of all, we would like to express our heartfelt gratitude to Dr Tint Moe Thuzar, Rector, Dr Khin Myot, Pro-rector, Dr Khin Maw Maw Soe, Pro-rector, and Dr Myint Myint Oo, Pro-rector, Yadanabon University for their permission to carry out the research and their encouragement. We are greatly indebted to Dr. Hnin Hnin Htay, Professor and Head of Geology Department and Dr. Naing Lin, Professor, Geology Department, Yadanabon University for their exhortation and helpful comments on this research. Finally, I would like to thank for all teaching members from Geology Department, University of Yadanabon for their cooperation.

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