A FIELD REPORT

ON

THE GEOLOGICAL STRUCTURAL SURVEY OF WAITHOU CHING, THOUBAL DISTRICT, MANIPUR

Submitted to:

DEPARTMENT OF GEOGRAPHY,

LILONG HAOREIBI COLLEGE

In partial fulfilment for the requirement of B.Sc 1st Semester Geography, Core-2 GG502 Practical Course, 2023-24

Submitted by:

Name: ……

MU Roll No. …….

Semester: ……..

DEPARTMENT OF GEOGRAPHY

LILONG HAOREIBI COLLEGE, LILONG,

THOUBAL DISTRICT, MANIPUR

2023-24

PREFACE

Change has been witnessed throughout the long development of geography and there have been a number of different phases or trends in the discipline. Throughout all these changes over the centuries, however, a few things have remained constant. For one, the subject matter of geography has not really changed. Something else that has not changed is the fact that geography has always been a discipline of observation. Observation is simply the most basic way of understanding the fundamental components of geography and geographers have been the observers for centuries.

Observation has formally been incorporated into geography through 'field survey". Field survey is nothing more than systematic observation by a geographer of his or her subject matter. Field survey is defined as collection and gathering of information at the local level by conducting primary surveys. These are an essential component of geographic enquiry and are carried out through observation, interviews, sketching, measurement, etc. Social and economic studies are conducted in definitive geographical parameters. Geography being a field science also, a geographical enquiry almost always needs to be supplemented through well-planned field surveys. Such surveys enhance our understanding about patterns of spatial distributions, their associations and relationships both at macro as well as micro level.

Field surveys help in comprehending the prevailing situation and processes in totality and at the ground level. Field surveys facilitate the collection of local level information that is not available through secondary sources. To summarize, Field surveys are required so that the problem under investigation is studied in depth as per the predefined objectives. Anyone can do field survey and every good geographer does. Virtually anyone can do it because field survey is, at its most fundamental, just going out and looking at the land. All the training we need is: 'knowing what to look for'. Knowing what to look for involves training in our respective area of specialization; physical or human.

This report is prepared in accordance to the field survey conducted by the 1st Semester Students of B.Sc. (Core) Geography, 2023-24 batch of Lilong Haoreibi College, Lilong Ushoipokpi, Thoubal District, Manipur on 4th May, 2024 under the co-guidance of the Geography Department namely, Md. Iliyas, HoD, Geography Dept, A. Robertson Singh (Asst Prof), Shoaib Rahaman (Asst Prof), Md. Sarukh Khan Singamayum (Guest Faculty), M. Eshak Khan (Guest Faculty). The report, as in the following, presents the geological study of the Waithou Ching (Hill), Thoubal district, Manipur.

ACKNOWLEDGEMENT

Firstly, I would like to thank the Principal of Lilong Haoreibi College, Prof. A. Sattar Shah for allowing the students to conduct a field visit for the fulfilment of the course Core-2, GG502 Practical and also for sanctioning the necessary fund. My special gratitude goes to Md. Iliyas, Head of Department, Department of Geography for not only making prior arrangement for the survey but also for accompanying us and providing guidance, moral support and proper understanding of what we were taught by explaining further.

I also express my sincere gratitude to Asst. Profs., A. Robertson Singh, Shohaib Rahman, M. Eshak Khan and Sarukh Khan Singamayum for accompanying us, providing moral support, guidance and expressing concern to us. I also want to thank the whole team of the tour bus. The driver did a wonderful job by ensuring that we reached all the places planned and we came back safely.

I extend my appreciation to my fellow students for their cooperation, discipline and adhering to the instructions. All this made the survey successful. Finally, I want to thank the Almighty for the safe journey, good health, protection and care during the whole tour and survey.

Name:……..

Lilong Haoreibi College
Lilong Ushoipokpi-795130
Manipur, India

CERTIFICATE

This is to certify that Shri/Md/Miss ……..…… a student of B.Sc. 1st Semester Geography of Lilong Haoreibi College, Lilong in the session of 2023-24 under the Manipur University, bearing Roll no. ……..….. and Registration no…… has participated in the field study tour entitled as ***"The Geological Structural Survey of Waithou Ching"*** *at Thoubal District, Manipur which was organised by the Department of Geography Lilong Haoreibi College in partial fulfilment for the requirement of Practical Course Core-2 (GG502).*

Date:
Place:

Md. Iliyas
Assistant Professor (HoD)
Department of Geography,
Lilong Haoreibi College, Lilong

JOURNEY REPORT

It has been of immense pleasure to have been a part of the Field Visit organized and conducted by the Dept. of Geography, Lilong Haoreibi College, Lilong, Thoubal District, in partial fulfilment of the BSc. 1st Semester Geography course, Core-2, GG502 Practical, under the guidance of our teachers Md. Iliyas (Asst. Prof. & HoD), A. Robertson Singh (Asst. Prof.), Shohaib Rahaman (Asst. Prof.), Md. Sarukh Khan Singamayum (Guest Faculty) and Md. Eshak Khan (Guest Faculty) at Waithou Ching, Thoubal, Manipur. A lot of field experience was gained during the study.

The Survey was conducted on the 4th May, 2024. The Students of B.Sc. 1st Semester, Geography (2023-24) assembled together at the premise of the Lilong Haoreibi College in the morning of the day at around 9 A.M. We departed at around 9:30 AM for our journey to our study area which is only about 2 Km from the location of the college. The team observed the terrain, rock types, geological settings etc. and proper zones for further observations were selected. Measurements of direction of strike lines and direction and amount of true dips of the folds were made using Brunton Compass. All the information and findings of the survey have been recorded properly for documentation into a full report.

CONTENT

Group Photo of the Survey Team

Chapter-1

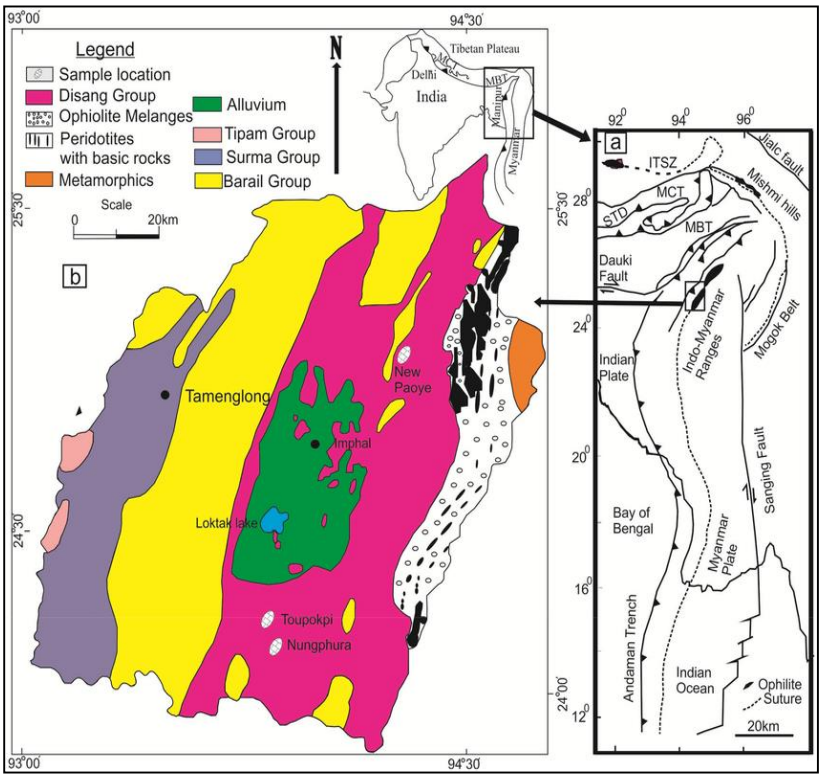
INTRODUCTION

1.1 Introduction

Manipur is one of the border states of India. It became a full-fledged state in 1972. It is situated between 23° 50' N and 25° 41' N latitudes and 93° 02'E and 94° 47'E longitudes. The state is bounded on the north by Nagaland, on the south by Mizoram and the chin hills of Myanmar (erstwhile Burma), on the west by the Cachar district of Assam and on the east by Myanmar. The total area of the state is about 22,327 Sq. Km. At present, the state has 16 districts.

1.2 Geology of Manipur

The entire region consisting of the Manipur Hills, Naga Hills and Mizo Hills consist of the Tertiary Strata and was formed in the early part of tertiary period. The mountain building processes are still active in this region.



Geological Succession in Manipur

Geologically, the state of Manipur belongs to the Alpine system of Fold Mountains which were formed during the tertiary period due to folding of sedimentary rocks deposited in the shallow Tethys Sea. The state consists of six geological formations, namely, the Ukhrul limestones, the Disang group, the Barail group, the Surma group, the Tipam group and the Imphal Alluvium.

1.3. Physiography

Based on physiographic characteristics, Manipur may be divided into the following division:

1. Manipur Hills

2. Manipur Valley

3. Barak Basin

1.3.1. Manipur Hills

The Manipur Hills constitute the central part of the Indo-Burmese Mountain system. These hills are the southward extension of the Naga Hills. They consist of a series of Parallel ranges which extend from the Naga Hills in the North to nearly 24° North parallel in the south where they join the Chin and Mizo Hills. The Hill ranges fall into two groups- the Manipur Eastern Hills and the Manipur Western Hills which are southward extensions of the Tuensang and the Kohima Hills of Nagaland respectively. The Manipur eastern hills form a compact and continuous mountain chain which runs along Indo-Burma order for about 200 Km. These hills are about 50 Km wide in the northern part and only 30 km in the southern part. The important peaks in this hilly area are Khayangbung (2833m), Siroi (2586 m) and Kachaobung (2498 m). The Manipur western hills consist of parallel ridges and valleys and occupy the whole western part of the state. These hills present a very rugged topography as the river Barak and its tributaries have carved out deep and narrow valleys. The hills are relatively higher in the north and west. There are many peaks which rise above 2500 metres, from the sea level. The important peaks include Tenipu or Iso (2994 m), Koubru (2652 m), Iso (2660 m) and Tamphaba (2264 m).

1.3.2 Manipur Valley

The Manipur valley is also known as the Imphal valley. It is an extensive basin about 60 Km long and 30 km wide, and is bounded by the Eastern and the Western hills of Manipur. The basin has been formed at the site of an ancient lake, which was gradually filled up with sediments. The remnant of that is the Loktak Lake which covers an area of 96 sq. km. The basin is drained by the Manipur River and its tributaries- Imphal, Eril, Thoubal and others. It covers an area of about 1800 sq. km and has a flat topography. Its height varies from 800 to 1000 metres from the sea level. There are a number of occasional hills which rise above the general level of the valley.

1.3.3. Barak Basin

This basin lies beyond the Manipur Western Hills on the western margin of the state. It is a very small plain covering an area of 250 sq. km. It has been formed by the deposition of sediments brought by the river Barak and its tributary-Jiri. In fact, this plain is an extension of the Surma Valley of Assam.

1.4. Drainage

Manipur is drained by three rivers systems: The Barak river system, the Manipur river system and the Chindwin river system. The ranges of the Manipur western hills constitute the water-divide between the first two river systems whereas the ranges of the Manipur Eastern Hills act as the water-divide between the latter two systems.

1.4.1. Barak River system

The river Barak and its tributaries-Irang, Makru, Tuivai and Jiri form the Barak river system. These rivers flow through the northern and western hill tract of the state and form part of the Ganga-Brahmaputra drainage system which empties itself into the Bay of Bengal. The river Barak is the longest and the most important river in the norther and western Manipur Hills. This river originates on the southern spurs of Mt. Japvo in Nagaland. It follows a south-west course as rivers Sangulok and near Karong it turns suddenly to the North West. Subsequently, it takes a south-west course. In the Cachar plains the river flows from east to west. Here it is known as Surma. The important tributaries of the Barak River in Manipur are Makru, Irang, Tuivai and Jiri. The river Irang is the major left bank tributary of this river. It rises in the northern part of the Western Manipur and flows parallel to the Barak River in its upper course. River Makru and Jiri are the right banktributaries of the river. These rivers originate in the hills to the south of the Barail Range and flow in sub-parallel pattern.

1.4.2. Manipur River system

The rivers of the Manipur river system form part of the Irrawaddy river system which flows into the Andaman sea. The river of this system includes Imphal, Iril, Thoubal, Nambul and Nambol. These rivers originate in the hills to the north- west, north and north-east of the Central valley of Manipur. Some of these rivers fall into the Loktak Lake.

1.4.3. Chindwin river system

The rivers of the Chindwin river system also form part of the Irrawady river system of Burma. They originate in the Manipur Eastern Hills and flow through the eastern part of Manipur into the Chindwin. Among these rivers mention may be made of Akonglok and Yu. Most of these rivers become dry during the winter but during the rainy season they flow with great velocity and cause sudden flood.

1.4.4. Lake and marshes

There are several lakes and marshes in the southern part of the Manipur Valley of which Loktak is the largest. This lake covers an area of about 65 sq. km in the dry season and 95 sq. km in the rainy season. It is an extensive shallow expanse of water covered with aquatic plant life, weeds and water hyacinths. The islands like Thanga, Ithing and Karang and others which rise steeply from the surface of the water provide the best fishing ground in the state. Located to the south of the lake is the Keibul Lamjao game sanctuary. It is famous for the brow antlered deer which is found only in Manipur. Besides Loktak, other lakes in the states are the Waithou, Ikop, Kharungpat and Loukoipat, Pumlenpat, Khoupum, etc.

Numerous marshes locally known as pats occur throughout the valley. These include Urapat, Sangapat, Laphupat, Leingangpat and Anganpat. They remain dry for most part of the yea but are full of water during the rainy season.

1.5. Climate

Manipur has a sub-tropical monsoon climate with dry winters and hot summers. It varies from one part of the State to the other depending on location physiography and other factors. In fact, there are six main factors which determine the climate of this state. These are physiography, the alternating sub-continental pressure cells of North-west India and Bay of Bengal, the pre-dominance of moist maritime tropical air masses, the periodic western disturbances, the local mountain and valley winds, forest cover and the water bodies, particularly the loktak lake and the marshes. The extent, alignment, elevation of the hills and the position of their slopes have great effect on the climate of this state. The great variations in topography result in variations in climatic condition from one part of the state to the other. The Barak Basin and the foothills of the Manipur Eastern Hills have relatively a warmer climate than the Central Valley and the nearby hills. Similarly, the western part of the state is more moist than the eastern because of its location on the windward slope of the hills.

The development of high pressure over the north-western part of India and low pressure over the Bay of Bengal in the early part of the year keeps the state dry

gradually north-west India becomes an area of low from the Bay of Bengal. The state of Manipur receives its share of rainfall from these inflowing monsoon winds during the long rainy season. This seasonal reversal of the pressure system over the Indian sub-continent results in the periodic reversal of the wind direction the most important characteristics of the monsoon climate.

1.5.1. Temperature

The mean annual temperature in Manipur decreases from west to east. Thus, Jiribam in the Barak Basin has a temperature of 23.6° and Churachandpur in the Manipur Western Hills records a temperature of 21.7. In the Central valley, Imphal registers the mean annual temperature of 20.4°C. The temperature further decreases towards the east where Tengnoupal has the lowest mean annual temperature in Manipur decreases with the increase in height.

January is the coldest month in Manipur where the mean monthly temperature varies between 11.8°C and 19.4°C. In July, which is the hottest month, the mean monthly temperature fluctuates between 25.1°C and 31.1°C. The annual range of temperature is the lowest at Thanlon 10.6°C and the highest at Jiribam 15.5°C. In general, winters are not very cold and the summers are not very hot in the state as they are in the interiors of our country.

1.6. Soils

The soils of Manipur have developed under the varied conditions of geology, relied, climate and vegetation and as a result they differ greatly in their physical and chemical properties. The soils of this state may be classified into two broad categories-residual soils and transported soils. The first group is derived from the rocks present in the area and the latter is brought by running water from elsewhere. The transported soils are an admixture of eroded rock materials but the residual soils generally preserve the characteristics of their bedrocks. The soils of the Manipur Hills are mostly residual and those of the Central valley transported. Based on Topography and vegetal cover these soils fall into four broad categories-non-laterized soils, laterized red soils, alluvial soils and organic soils.

The non-laterized red soils occur in most part of the Manipur hills which have a sub- humid climate with alternate wet and dry seasons. These soils are classified into two sub- groups: ferruginous red soils and ferruginous red gravelly soils. The ferruginous soils are found in the major portion of the Manipur western hills. These soils vary in colour from one part to the other depending on the amount of hydrated oxides of iron. The surface horizon is generally yellowish red to reddish brown in

colour. In areas of steep slopes these soils are shallow but in the areas of gentle slopes they sufficiently deep. Derived from red shales and sandstones these soils are loamy in texture and granular in structure. These are rich in phosphate and potash and contain a high percentage of nitrogen. The ferruginous red gravelly soils are found in the Manipur eastern hills. In the northern and southern parts of these hills small gravels are found interspersed with sand and silt. These soils become sandy loan on the eastern slopes and clayey loam on the western face of the Manipur eastern hills. The soils are usually thin and yellow and red in colour. These soils are fairly rich in phosphate, potash and nitrogen.

The laterized red soils are found in the Barak Basin and the western part of the Manipur Western hills where the rainfall is very high. These soils have two sub-group old alluvium and laterite soils.

The old alluvium occurs in the Barak Basin. These are the redeposited laterites brought by the river Barak and Jiri and their tributaries from the nearby lateritic hills. The surface horizon is compact and less permeable. These soils contain a high proportion of phosphorous, potash and nitrogen.

The lateritic soils are found on the western slopes of the Manipur western hills. These are the original laterites formed at higher altitudes. They are coarse in texture and red in colour. These soils are formed under conditions of high rainfall with a marked dry season. They are rich in phosphate and nitrogen but relatively poor in potash. The fertility is low.

The transported soils are categorised into two groups-recent alluvium and organic soils (peat soils). Recent alluviums occur in an area of 1600 sq. km in the Manipur valley, the most populous and agriculturally rich part of the state. These soils are derived from the materials deposited by river Manipur and its tributaries. The alluvial soils are clayey loam in texture and grey to pale brown in colour. These contain a high proportion of phosphate and potash and a moderate quantity of nitrogen and organic matter.

The organic soils are found in the low-lying parts of the Manipur valley, particularly in and around the Loktak and other lakes and marshes. These are dark grey in colour and clayey loam in texture. They are rich in phosphorous and nitrogen but are poor in potash. They are also rich in organic matter.

1.7. Aim and Objective of the Study

(i) To visit Waithou Ching, Thoubal, Manipur with concerned teachers and identify the rocks and structures.

(ii) To measure the direction of strike lines.

(iii) To measure the direction and amount of true dip of folds by using Brunton Compass.

1.8. Methodology and Sources of Data

Primary data collected from the field visit has been use for the study. Data collection was done through direct observation and measurement through geographical instruments such as Brunton Compass.

Chapter 2

STRUCTURAL GEOLOGICAL MEASUREMENT

2.1 Introduction

Waithou Ching (Hill lock) located at the Thoubal hills of Manipur was selected as the study site for collection of data through observation of rock and structures as well as measurements of direction of Strike lines and direction and amount of true dips of folds.

2.2. Why Structural Geological measurement

Structural geology is a natural science which has traditionally been closest to geography. The study of geography also attempts to deal with concrete recognisable phenomena occurring on the surface of the earth, classifying them in various categories. Geography is essentially the study of the Earth surface especially morphology of the surface which is the manifestation of the rock structure in different forms. The analogy "the landscape is the function of structure, process and time or stage" clearly demonstrates the closest relationship between geography and geological Structural study of any specific area or region. The term structure refers geological structure and the words process and stage refer to geography. Both study trying to know the lithological rock types, structural characteristics of bedding plane, strike and dip, folding, faulting, and joints etc. Other similarities are the distribution of various kinds of rock and minerals their mode of occurrence, chemical and physical components, hardness and softness, specific gravity and several other things which are concrete and recognizable.

There is often a close relationship between geography and the topography of the area. Rock exposure shape landforms. Certain rock type and structure produces distinct relief features. Dip and inclination of tabular rock bodies influences the pattern of exposure on uneven land-surface. Geographers or Geologists study and describe the nature, origin and development or evolution of the present landforms and their relationships with the underlying rock structure. In mountainous or hilly areas relief is a good guide for understanding and mapping of tectonic structure.

2.3. Identification of rock group

The primary objectives of the study team at Waithou Ching included identification of the rock types and measurement of the direction of strike lines, amount and direction of true dips of folds using Brunton Compass.

Based on geological and structural map of Manipur, the study area lies in the Disang rock formation group. It is of very great thickness of almost non-fossiliferous alluviums. These alluvium with a thickness of 200 to 300 metres over the underlying Dishang shales contain clay, sandstone, mudstone, sandy clay and shingle. Alternation of sandstone and shale with more argillaceous horizon in the middle and miner conglomerate. Traditional character from flysch to molasse sediments.

2.4. Measurement of Strike and Dip

Strike is the direction in which a horizontal line can be drawn on a plane and therefore it will always be a straight line. An infinite number of strike line can be drawn on a bedding plane, equidistant and parallel to each other. The strike may be of bedding of strata, joint, fault plane and similar surface. In regional context minor variation may be ignored due to some tectonic activity and the strike may be expressed simply as East-West or Northeast- Southwest.

Dip is the direction towards which the structural surface is inclined or tilted. True dip is the angle that it makes with a horizontal plane in direction perpendicular to the strike of the plane. Apparent dip is the angle measured in any other direction which is not perpendicular to the strike. The amount of dip varies from 0° to 90°. After measurement, it was recorded that the amount and direction of dip of Waithou Ching of Thoubal hill is 64°E. It means that bed dip is at an angle of 116 in the North North-Easterly line direction. The dip angle is moderately dip.

2.5 Photos captured during the measurement