ABSTRACT

The area Mandardisa, is a hilly area of North Cachar Hills of Assam and bounded by latitude 25°40' N - 25°45' N and longitude 93°05' E - 93°10' E and is covered by Survey of India Toposheet No. 83G/2.

The area of present study is a sedimentary terrain and form a part of the Paleogene shelf deposit in North East India. Since the area is composed of sedimentary rocks, study of these sedimentary rocks play an important role in constructing the geological history of the past.

Outcrops of Tertiary rocks are exposed in and around Mandardisa, N. C. Hills. These are well represented by Barail Group of rocks. Moreover, scanty exposures of rocks of Surma Group are also present in the area. The study is confined within Barail Group of rocks due to inaccessible, unsafety and difficult terrain.

Introduction, location, communication and accessibility, physiography and drainage, climate, flora, fauna and inhabitants, lithology, purpose of investigation and previous literature have been incorporated in Chapter 1.

Physiographically the area is characterized by relatively low dissected by interspersed valleys. Hills are denuded. Major drainage system of the area is controlled by Lumding and Chota – Langphar rivers.

The methods of investigations are mainly field and laboratory studies. The field investigations include preparation of geological map, collection of samples and field study of different lithounits. Laboratory investigations include studies like grain size, petrography, heavy minerals, geochemical study and palaeocurrent with the help of thin section studies and geochemical analysis.

The data generation under different investigations include – (i) granulometric study of sandstones, (ii) framework mineralogical study of sandstones, (iii) study of heavy mineral assemblages, (iv) XRF and ICP – MS analyses of sandstones and shales, (v) palaeocurrent study and (vi) statistical treatment and interpretation of various data sets.

The Chapter 2 deals with the regional geology, geology of the study area, lithostratigraphic units and lithofacies of the study area, and tectono– sedimentary setup of the area. The geological setting of the area has been shown.

The Tertiary rock exposures in the study area belong to the Barail Group. The rock exposures dominantly composed of monotonous sandstones of various sizes with intercalated shales represented the Barail Group. The Surma Group of rocks is exposed in the area, represented by an alternate sequence of grey laminated shales, siltstones and
sandstones. A conglomerate bed occurs in between the Barail and the Surma groups in the area separating the two groups.

Based on the field observations, lithological characters and structural configuration, a stratigraphical succession is proposed in the study area. The lithunits of the study area show some similarities with Liaong (Lower) Formation of the Barail Group.

In the study area facies is marked by bedded, massive, planar trough crossbedded while the top portion is covered by laminated fine grained sandstones.

Objectives, methods of investigations which include both field investigation and laboratory investigations are included in Chapter 3.

In Chapter 4 the results of the size analysis of sandstones have been discussed which mainly include the relative proportions of particles of various sizes in the sediments, their mechanism of transportation and deposition, sandstone types and energy conditions of depositing media.

The textural studies of the sandstones have been carried out. The frequency curves show the distribution to be unimodel in nature. The general pattern of the cumulative curves indicate the presence of mostly of one dominant mode. They are broad with gentle slope. The statistical parameters show that the sandstones are well sorted mainly positively skewed and leptokurtic. From the bivariant plots of the sandstones it is found that most of the plots are in the river field (fluvial), although there are some concentrations in the beach and delta front. Textural classification shows that sediments are mostly sand.

The C-M pattern shows influence of river tractive current in the distribution. The mode of transportation seems to be saltation with some rolled sediments. Log-probability curves exhibit dominance of saltation followed by minor rolling and suspension fractions. Some samples show saltation sub-populations.

In Chapter 5, detailed petrographic studies and in Chapter 6 heavy mineral studies and provenance from palaeocurrent analysis are incorporated.

On the basis of the mineralogical composition of sandstones, provenance, different diagenetic effects, tectonic setting and palaeoclimatic condition have been evaluated. From the analysis it is seen that sediments were derived from metamorphic, igneous and subordinate sedimentary source rocks transported mostly from Indo-Burma ranges along with from Shillong plateau. The mineralogical studies indicate dominance of quartz. A recycled orogen provenance has been reflected in various tectonic plots. The sandstones are mainly quartzose arenite to sublitharenite and matured. The climatic plots concentrate mainly in the humid to sub-humid sector.

The heavy minerals present in the sandstones are zircon, tourmaline, rutile, garnet, kyanite, sillimanite, epidote and staurolite. The overgrowth and outgrowth seen in
The sandstones in the study area are characterized by current beddings and these are used as to determine palaeocurrent directions from the foreset beds and the palaeocurrent direction was from SW towards NE direction.

In Chapter 7, geochemical studies of sandstones and shales have been carried out. The major oxide ratios and trace element concentrations are suitable for classification and determination of provenance, palaeoweathering, palaeoclimate and tectonic settings etc.

From the major oxide ratios and trace elements the provenance of the sandstone and shale are found to be felsic rocks. The CIA values indicate high rate of chemical weathering for shale and sandstone in the source area. In the study area shale shows humid climatic condition and sandstone shows arid to humid climatic conditions. The bivariate plot shows shallow marine depositional environment for shale. According to geochemical classification the sandstones are litharenite to wacke type, also the sandstones are of close to Active Continental Margin (ACM) tectonic setting.

In Chapter 8, the studies carried out and the results obtained that have been discussed in earlier chapters are summarized in this chapter and conclusions are drawn.

The sandstones of the study area are well sorted. The rock types are mainly quartzose arenite to sub litharenite. Metamorphic and igneous rocks are the source of the sediments. A recycled orogen provenance is also indicated. There was high rate of chemical weathering and chemical maturity is also high. The present study gives a picture of the distribution of various facies as well as the water level conditions throughout the area. Palaeocurrent analysis shows that the direction of current was from SW towards NE and sediments were derived from Indo-Burmese subduction complex in the east and some sediments from Shillong plateau and also derived from a fold thrust province or collision suture zone. Considering the tectonic setting, sandstones are of Active Margin Type and lithounits show some similarity with Laisong Formation.