Geology and petrographic study of the area from Chiraundi Khola to Thulo Khola, Dhading/Nawakot district, central Nepal

by

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(Mapping and Analysis stream)

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I certify that Mr. Gyanendra Gurung, student of Central Department of Geology, Tribhuvan University, Kirtipur has worked satisfactorily for his Master's Degree dissertation under my supervision. This dissertation entitled **"Geology and petrographic study of the area from Chiraundi Khola to Thulo Khola, Dhading/Nawakot district, central Nepal"** embodies the candidate's own work and I hereby recommend the dissertation for approval.

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The M. Sc. dissertation entitled **"Geology and petrographic study of the area from Chiraundi Khola to Thulo Khola, Dhading/Nawakot district, central Nepal"** has been submitted and successfully presented by Mr. Gyanendra Gurung to the Central Department of Geology, Tribhuvan University. This is to certify that his dissertation has been accepted as a partial fulfillment for the requirement of M.Sc. in Geology.

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Of course my parents, and my family all merit special thanks for their belief in me and for giving me unconditional support throughout my life.

Gyanendra Gurung, August 2003

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List of acronyms

HHC	Higher Himalayan Crystallines
HHZ	Higher Himalayan zone
IUGS	International Union of Geological Sciences
MBT	Main Boundary Thrust
MCT	Main Central Thrust
MFT	Main Frontal Thrust
MT	Mahabharat Thrust
NHNF	North Himalayan Normal Fault
PPL	Plane polarised light
P/T	Pressure/Temperature
SCMR	Subcommission on the Systematics of Metamorphic Rocks
STDS	South Tibetan Detachment system
XPL	Crossed polarised light

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Chapter I

Introduction

1.1 Introduction

The Himalaya are renowned as an excellent example of effects of continent—continent collision. The closure of the Tethys sea and the subsequent collision the Indian plate into a collage of plates made up Central Asia some 45~50 Ma (Le Fort, 1975). The orogenic related processes of deformation, crustal thickening, metamorphism, melting and foreland basin evolution still continues till today. Thus, the Himalaya is an ideal laboratory to study such geologic phenomena.

In the early years, geological research in the Himalaya had been limited, and the preliminary information that exited about the geology of Nepal, consisted of few notes. These largely dealt with the cursory visits of Hooker (1854), Medlicott (1875), Auden (1935), and Heim and Gansser (1939). After Nepal opened its border in 1950, a nine-year long reconnaissance geological survey of Toni Hagen covered virtually the whole country. Hagen's work will remain, despite the criticism, a pioneer thesis on the geology of Nepal Himalaya (Stöcklin, 1980). After that period of time, there have been a large number of studies by many researchers in various parts of Nepal, and they have all added to the pool of knowledge on Himalayan geology.

The occurrence of widespread thrusting within the Himalaya was largely based on the observations of Pilgrim and West (1928) and Auden (1937), and the orogen's inverted metamorphism, an increase in metamorphic intensity towards higher structural levels, appeared to have resolved by tectonic activity. Inverted metamorphism suggests the presence of wholly overturned strata or heat sources that counteract the influence of the asthenosphere (England and Molnar, 1993).

However, there is controversy and confusion over the definition, nature, and position of the Main Central Thrust (MCT) and its associated history and deformation throughout the Himalayan range. Le Fort (1975), and Pêcher and Le Fort (1986) regarded the higher grade of metamorphism shown by the package of rocks of the MCT Zone as the thermal effect associated with the thrusting of the hot Higher Himalayan Crystalline (HHC) slab over the cold Lesser Himalaya. Bird (1978) argued that mantle lithosphere delamination beneath the Himalaya was a plausible consequence of continental collision and proposed that heating and melting as a cause for thrusting within the Himalaya.

1.2 Location and Accessibility of the study area

The study area lies in central Nepal and comprises the southeastern region of the Dhading District, and southwestern portion of Nuwakot District. The study area extends from Chiraundi Khola in the southwest to Thulo Khola in the northeast (Fig. 1.1, and Fig. 1.2). It has a complex network of drainage system (Fig. 1.2). It falls within central Nepal, which is an excellent area to evaluate manifestations of the variations of the Himalaya. It has a major intracontinental thrust, known as the MCT. The MCT is located at the base of the Himalayan break, and it places lower-grade Lesser Himalayan metasedimentary rocks beneath the high-grade metamorphic rocks of the Kathmandu Complex.

The study area can be easily approached by the Prithvi Highway, which crosses the area from east to west. Besides this, the newly constructed Galchhi—Devighat road connects the area with the northern part. The network of foot trails throughout the area connecting different villages has made the area accessible on foot.

1.3 Aim and objectives

This study was conducted specifically to understand the stratigraphy and the existing metamorphism in the study area. The specific objectives are as follows;

- Preparation of route maps along the Kolphu Khola,
- Preparation of geological map of the study area,
- To study the petrography and structure of the area, and
- To understand the metamorphism of the area.

1.4 Methodology

Before embarking on field, literature was extensively reviewed. Rock specimens collected in the field were later studied in laboratory and thin sections were prepared for petrographic study using the laboratory facilities in the Central Department of Geology.

Detailed fieldwork was carried out by conducting geological traverses along rivers, trails, and road cuts. Specimens representative of existing lithology were at different locations. The boundaries between different formations were marked on a 1:25,000 scale topographic map during geological traverses.

1.5 Organisation of dissertation

The dissertation is organised into nine chapters. This chapter includes an outline of the study area, objectives, and methodology. Chapter 2 describes geology of the Himalaya, emphasizing a broad overview of the study area. This chapter reviews the existing literature on the Lesser Himalaya, and Higher Himalaya.

The lithostratigraphy of the study area is discussed in Chapter 3. The characteristics of uppermost rocks of the Nawakot Complex, and the lowermost formations of the Kathmandu Complex are described in this chapter. The petrographic study is presented in Chapter 4. Chapter 5 deals with the metamorphism of Galchhi. It discusses the metamorphic grade of the study area, and provides some insights on the metamorphic buildup of Galchhi. The geological structures that were identified in field are described in Chapter 6. Finally, Chapter 7 summarizes the whole dissertation.

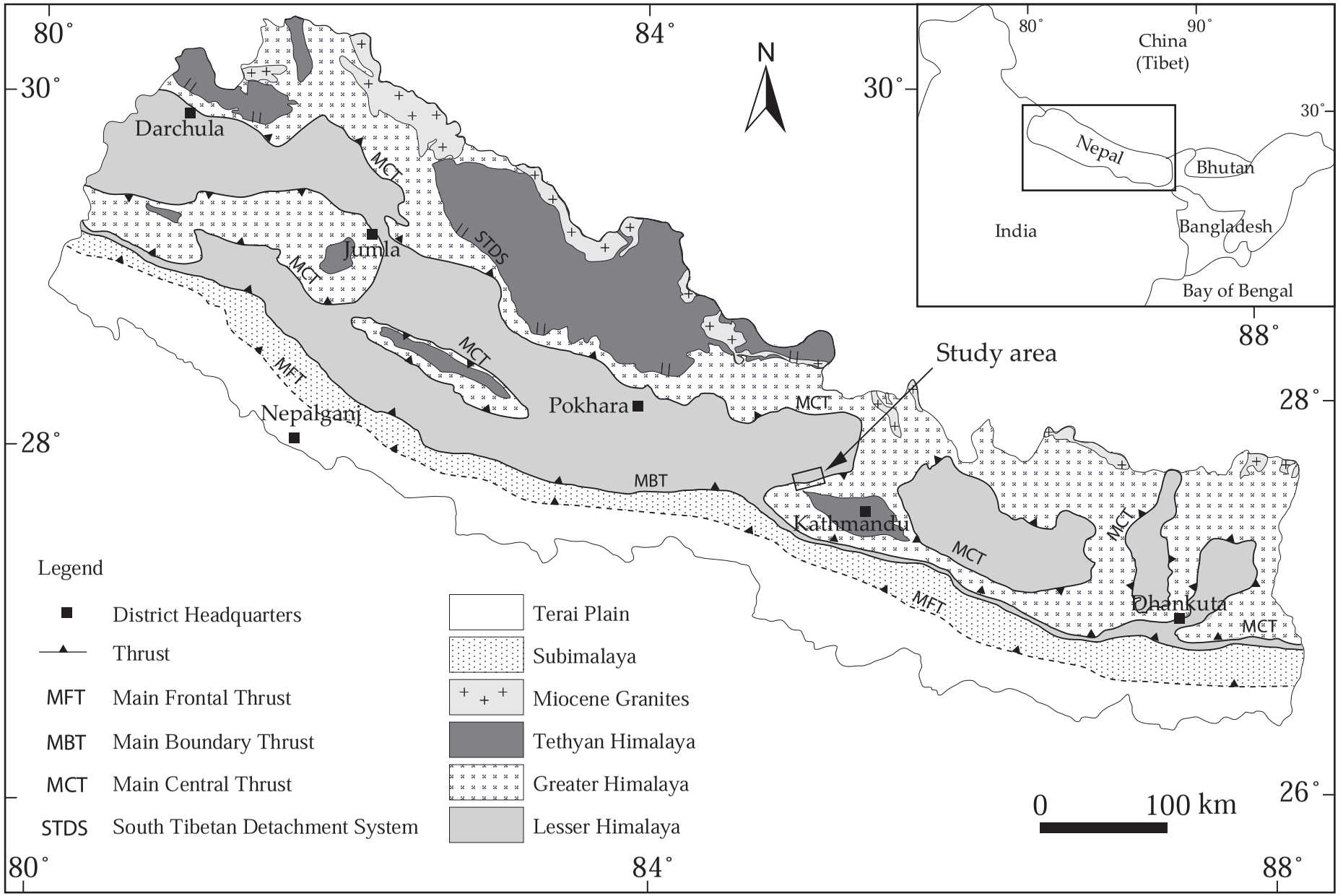

Figure 1.1 Location Map of the study area. *(Source: Pearson et al, 2002)*

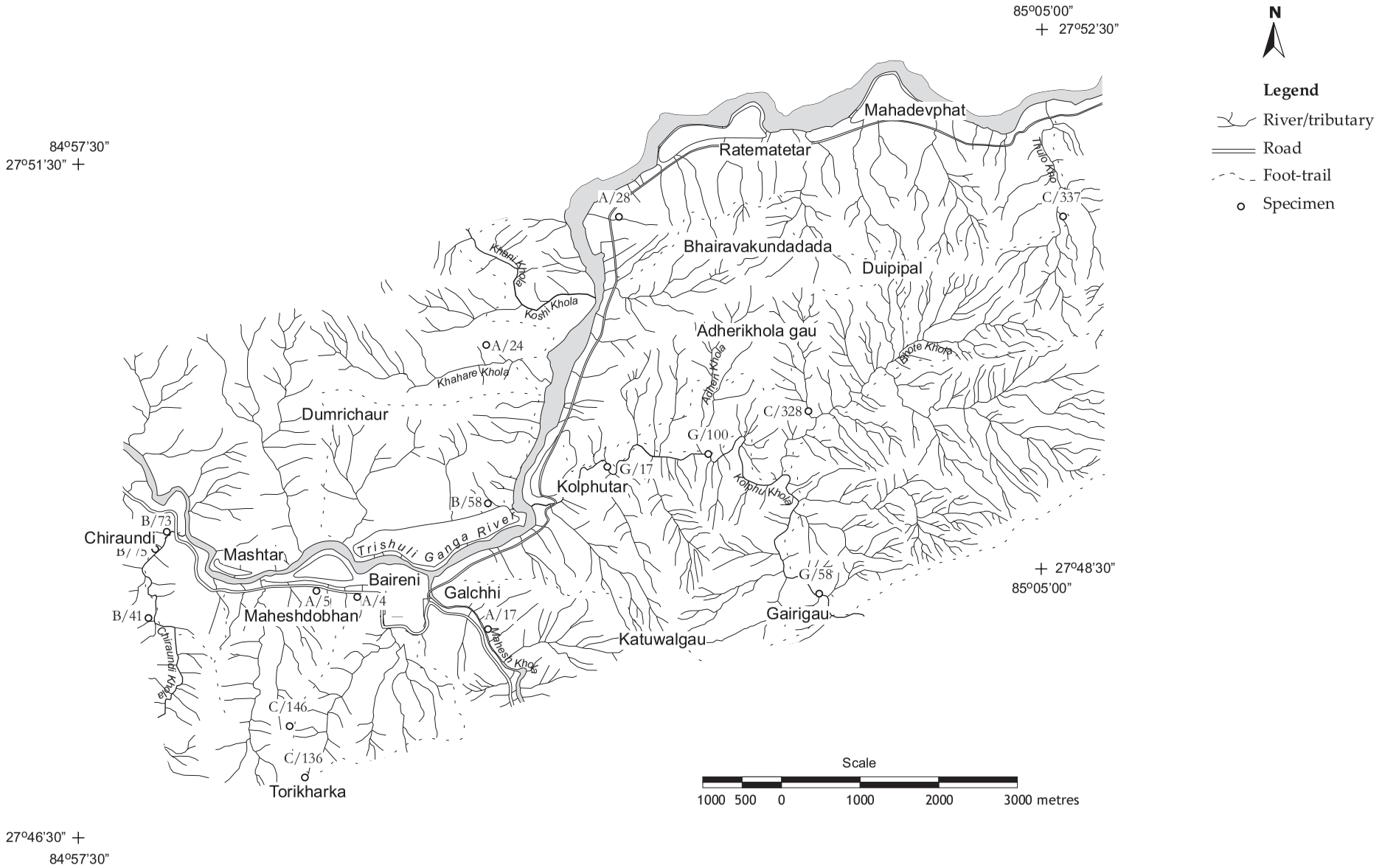

Fig. 1.2 Drainage map of the study area