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GEOTECTONICS OF THE KATHMANDU BLOCK

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सारांश

काठमाडौं भूक्षेत्रको संरचना बारे मूल्यांकन गर्न यो क्षेत्रको पूर्व र पश्चिम इलाकामा लीथो-लोजी, स्ट्राटीग्राफि र स्ट्रक्चरको अध्ययनबाट उत्तरमा एउटा ठूलो एन्टीक्लीनोरियम, दक्षिणमा सिन्क्लिनोरियम हुनुको साथै काठमाडौं एन्टीक्लाइन पनि विचमा भ्रंशित (Faulted) भएको पहिचान भयो। साथै कायान्तरण को मात्रा (Degree of metamorphism) ग्रानाईट र मुख्य मध्यवर्ति प्रधात (Main Central Thrust) क्षेत्र तिर बढ्दै गएको पाइयो।

ABSTRACT

To evaluate the geotectonics of the Kathmandu Block on the basis of lithology, stratigraphy and structures, observations were made along the two traverses lying east and west of the block. There exist an anticlinorium to the north and a synclinorium to the south of Kathmandu Valley which itself is a faulted anticline. The grade of metamorphism increases towards granites and the Main Central Thrust.

INTRODUCTION

The Kathmandu block is delineated in the east by Sunkosi river, in the west by Trisuli river, in the north by Main Central Thrust and in the south by the Main Boundary Thrust. Two traverses were taken, one following the Hetauda-Kathmandu-Dolalghat and Kodari, the other Narayanghat-Mugling, Trisuli-Syabrubensi and Rasuwa. A large number of workers have investigated the geology of Nepal

in the west. The metamorphic minerals are garnet, kyanite and sillimanite. Two typical sections of the western end are given in Fig. 1 & 2., and only northern part of eastern end is given in Fig. 3.

Lithology

Between the Main Central Thrust (MCT) and the Main Boundary Thrust three clearly identifiable horizons of metamorphic group are found:

a. Green phyllite and schist which is sometimes quartzose and is the lower member of metamorphic group.
b. Limestone, dolomite, carbonaceous shale and epidiorite sill. This is the middle member.
c. Calcareous quartzite along with minor phyllite. This is the uppermost member.

The nature and distribution of rock types of Kathmandu Block may be summarised as follows:

1. The green schist and phyllite are exposed to the north of the Main Boundary Thrust in a discontinuous form. Towards north this is again exposed south of Balephi Khola (more quartzose in nature) and in Ram che (with garnet).
2. Limestone and dolomite lie below the carbonaceous shale marker at Hetauda (Nadgir et al, 1973) where it is of cement grade limestone and changes to cherty dolomite in Narayanghat and becomes stromatolitic in the Trisuli section near Gaighat and again exposed as cherty dolomite along strike at Trisuli section few km west of Gajuri
3. Carbonaceous horizon is seen at Bhainse, north of Kathmandu, in the gorge of Indrawati near Dolalghat and also few kilometers north of Barhabise in the eastern section; whereas in the western section it is clearly visible 1 Km south of Syabrubensi.
4. On the top lies the pure white quartzite sometimes calcareous, which forms the main hill of Simpani Bhanjyang (north of Hetauda) where it is intruded by Palung granite at Mahabir and this formation continues up to Kathmandu.

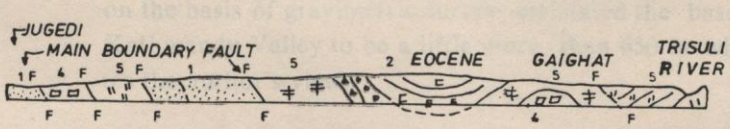

Fig. 1

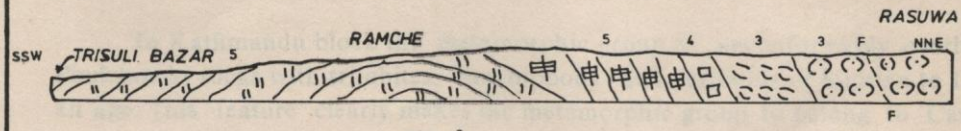

Fig. 2

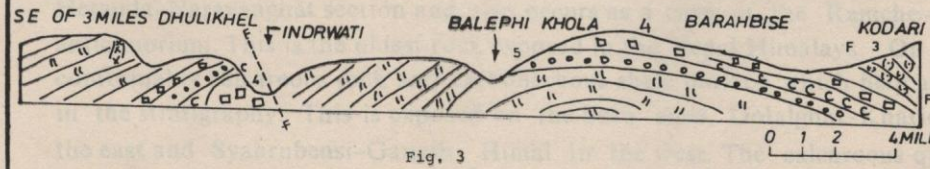

Fig. 3

1 = CHURIA FORMATION
2 = EOCENE "
3 = ARENACEOUS "
4 = CALCAREOUS "
5 = ARGILLACEOUS " (PRECAMBRIAN)

FINE GRAINED GREEN BROWN SANDSTONE
GREY-GREEN-PURPLE SLATE & DOLOMITE
WHITE QUARTZITE
BIOTITE-GARNET-KYANITE GNEISS
AUGENGNEISS
GREY-CHERTY-DOLOMITE & CARBONACEOUS
PISTACHIO GREEN SLATE & AMPHIBOLITE
GARNTE-CHLORITE SCHIST
BIOTITE CHLORITE SCHIST
LEAD GREY PHYLLITE

Fig. 1 Geological sections of Kathmandu Block

5. Silurian-Devonian iron bearing rocks are found also in a synform near Phulchowki in the south of Kathmandu Valley.
6. Purple shale with quartzite beds of Eocene age (?) are found in a synform of the metamorphics in the north of Narayanghat at Danggarhi.
7. The tectonic valley of Kathmandu contains fluvio-lacustrine deposit upto approximately a depth of 900 m in the central part of the valley where it is drilled upto 457 m and found to consist mainly of sand, gravel, black clay and peat beds. Moribayashi & Maruo (1980) on the basis of gravimetric survey estimated the basement depth of Kathmandu Valley to be a little more than 650 m which corroborates the author's view.

Stratigraphy

In Kathmandu block the metamorphic group is unconformably overlain by Phulchowki rocks with trilobites, brachiopods and crinoids of Silurian to Devonian age. This feature clearly makes the metamorphic group to belong to Cambrian to Pre-Cambrian.

Among the metamorphics the green schist is found as a bottom member at Hetauda-Narayanghat section and also occurs as a core of the Ramche-Barhabise anticlinorium. This is the oldest rock exposed in the Nepal Himalaya. On it lies unconformably calcareous rock and carbonaceous shale horizon which help as markers in the stratigraphy. This is exposed on the both ends, Dolalghat-Kharidhunga in the east and Syabrubensi-Ganesh Himal in the west. The calcareous quartzite is granitised in Palung area (where higher grade metamorphic minerals like garnet and kyanite are developed adjacent to the granite), Shivpuri area (as augen-gneiss) and also near MCT where it imperceptivly increases to higher grade rocks which finally becomes an augen gneiss with geothermal springs near it (e. g. Tatopani near Kodari and Timure, south of Rasuwa).

Structures

A big anticlinorium with nearly a E-W trend exists north of Kathmandu Valley which passes through south of Barhabise in the east and near Ramche in the west. The southern flank of this fold dips into Trisuli and Sunkosi rivers whereas,

the northern flank passes below MCT. A faulted anticline with E–W trend is passing through the middle of the Kathmandu Valley.

South of the Kathmandu Valley, a big synclinorium exists. On this synclinorium there are synforms where Silurian to Devonian sediments at Phulchowki and Eocene rocks north of Narayanghat were deposited.

METAMORPHISM AND GRANITIZATION

In Palung area the calcareous quartzite bearing horizon is intruded by leucocratic, black tourmaline bearing granite which has resulted in the formation of high grade minerals like kyanite and garnet in the periphery of the granite. Similarly, granitization is seen in Shivpuri area (north of Kathmandu Valley) where garnet has developed in the country rock. Near MCT the rock slowly changes to augen gneiss along with sillimanite and other high grade minerals.

MINERALIZATION

Palung granite seems to be responsible for the mineralizasion of copper in the vicinity of Bhutkhola and Bhimphedi areas, lead at Todke near Narayanghat and hydrothermal alteration of favourable green schist horizon to talc at Bander Khola and Gaighat. The Shivpuri granite has given rise to some mica bearing pegmatites and quartz veins in the country rock NE of Kathmandu (Gosainkund region). The MCT might be responsible to change dolomite to magnesite and talc at Kharidhunga and also mineralization of the lead–zinc and magnetite in the limestone of Ganesh Himal and copper at Tipling. This belt is also associated with medium temperature (60°c) thermal springs.

CONCLUSIONS

The geotectonics of Kathmandu Block appears to be more simple in form and nature if analyed on regional scale, and does not constitute a highly complicated tectonics (nappes and blocks) as envisaged by earlier workers.