(HFF) is quite active recording frequent tremors and earthquakes. At present, the Himalayan Front Fault

Physiographic Divisions of the Himalayas

For a systematic study of the physiography and relief, the Himalayas may be divided into the following four divisions from north to south:

1. The Trans-Himalayas;
2. The Greater Himalayas;
3. The Lesser Himalayas; and
4. The Shiwaliks or the Outer Himalayas.

1. The Trans-Himalayas

The Trans-Himalayas are about 40 km wide. They contain the Tethys sediments. The rocks of this region contain fossils bearing marine sediments which are underlain by "Tertiary granite". It has partly metamorphosed sediments and constitutes the core of the Himalayan axis. It has a great accumulation of debris in the valleys of defeated streams which could not maintain their southerly course across the rising barrier of the Himalayas (**Fig. 2.10**).

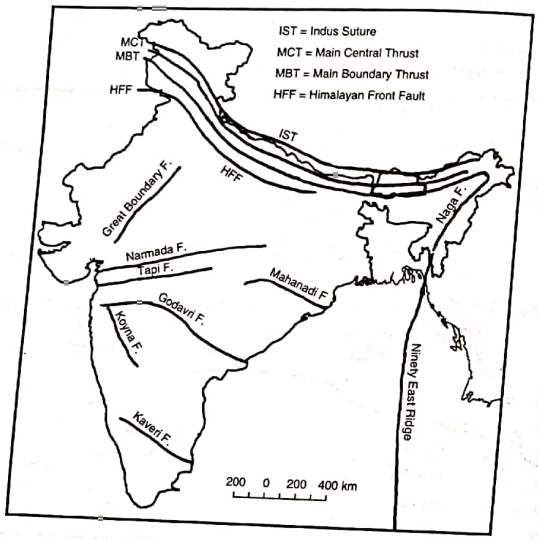

Fig. 2.10 Major Faults of India

2. The Greater Himalayas

The Greater Himalayas rise abruptly like a wall north of the Lesser Himalayas. The MCT separates the Greater Himalayas from the Lesser Himalayas. The Greater Himalayas are about 25 km wide with an average height above 6100 m (Wadia, D.N.). Almost all the lofty peaks of the Himalayas, Mt. Everest, Kanchanjunga, Nanga-Parbat, Gasherbrum, Manaslu, Dhaulagiri, Annapurna, Gosainthan, Cho-Cyu, Nanda-Devi, Kamet, Badrinath, Nanda Devi, etc., lie in this zone. The Greater Himalayas are composed of crystalline, igneous or metamorphic rocks (granite, schists, and geneiss). The basal complex of the Himalayas is Archaean. At places, due to heavy thrust, older rocks are found overlying the newer rocks. The Greater Himalayas are almost a contiguous range. The range has very few gaps mainly provided by the antecedent rivers. The Greater Himalayas receive less rainfall as compared to the Lesser Himalayas and the Shiwaliks. Physical weathering

is pronounced. Erosion is, however, less effective over the Greater Himalayas as compared to the Lesser Himalayas. Being lofty, they have very little forest area.

3. The Lesser Himalayas

The width of the Lesser Himalayas is about 80 km with an average height of 1300–4600 m. It consists, generally, of unfossiliferous sediments or metamorphosed crystalline. The main rocks are slate, limestone and quartzites. Along the southern margin of the Lesser Himalayas lies the autochthonous belt of highly compressed Upper Palaeozoic to Eocene rocks, often containing volcanic material. Examples of autochthonous belts are found between Murree and Panjal thrust in Kashmir, Giri thrusts in the Shimla region and Krol and MBT in Garhwal region. This region is subjected to extensive erosion due to heavy rainfall, deforestation, and urbanisation.

4. The Shiwaliks or Outer Himalayas/Sub-Himalayas

The Shiwaliks extend from Jammu Division of Jammu and Kashmir State to Assam. In width, Shiwaliks vary from 8 km in the east to 45 km in the west with an average elevation of about 900–1500 m above sea level. It is not a continuous range. It is broader in the west and narrows down in the east. Between the Shiwaliks and the Lesser Himalayas are longitudinal valleys called Doons/Duns. Some of the important Duns are Dehra Dun, Potli, Kothri, Kathmandu, Chumbi, and Kyarda. The Shiwaliks are mainly composed of sandstones, sand-rocks, clay, conglomerates and limestones, mostly belonging to the Upper Tertiary Period.

Longitudinal Divisions of the Himalayas

The Himalayas have also been divided by Sir S. Burrard into four divisions, namely (i) The Western Himalayas, (ii) The Kumaun Himalayas, (iii) The Nepal Himalayas, (iv) The Assam Himalayas. Prof. S.P. Chatterjee (1973), divided the Himalayas into the following six transverse divisions from west to east [**Fig. 2.11, Fig. 2.12(a)** and **Fig. 2.12(b)**]:

1. The Kashmir Himalayas
2. The Himachal Himalayas
3. The Kumaun Himalayas
4. The Central Himalayas
5. The Eastern Himalayas

1. The Kashmir Himalayas

Sprawling over an area of about 350,000 sq km in the state of Jammu and Kashmir, the range stretches about 700 km in length and 500 km in width. With an average height of 3000 m, it has the largest number of glaciers in India. The Ladakh region of the Kashmir Himalayas is characterised by cold desert conditions. Ladakh is one of the loftiest inhabited regions of the world (3600- 4600 m). The gorge of Gilgit is 5200 m in height above the sea level of the water at its bed. Surrounded by the Greater Himalayas and the Lesser Himalayas is the Kashmir Valley. Having a height of 1585 m above the sea-level, the total area of the Kashmir Valley is about 4920 sq km. It is a structural longitudinal "Dun" (D.N. Wadia). A special feature of the the Vale of Kashmir is the *Karewa* (lacustrine) deposits consisting of silt, sand and clay. These karewas are mainly devoted to the cultivation of saffron and have orchards of apple, peach, almond, walnut and apricot. Kashmir Himalayas are characterised by high snow covered peaks, deep valleys, interlocked spurs and high mountain passes. Pir-Panjal, Banihal (Jawahar Tunnel), Zoji-La, Burzil, Khardungla, Pensi-La,

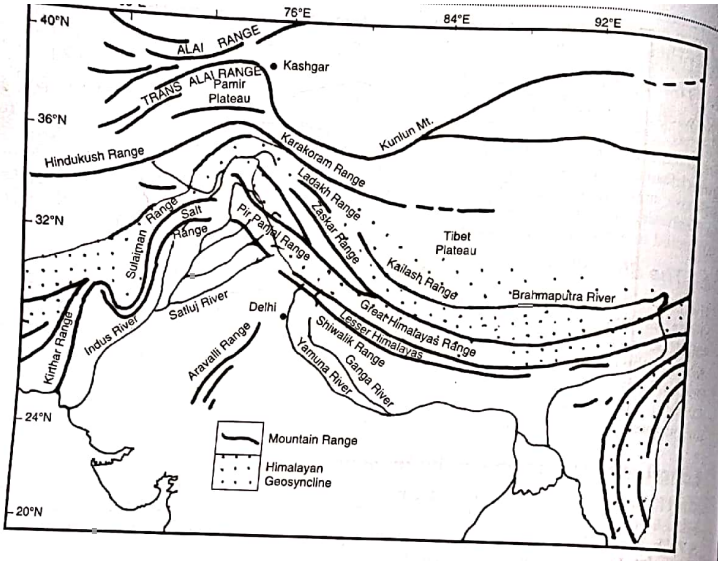

Fig. 2.11 *Physiographic Divisions of the Himalayas*

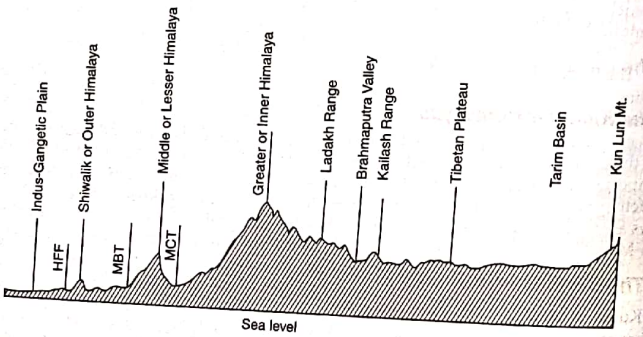

Fig. 2.12(a) Himalayan Complex

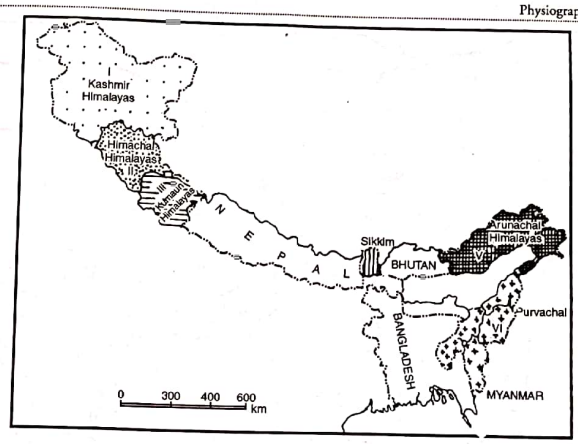

Fig. 2.12(b) Himalayan—Longitudinal Divisions

Saser-La, Lanak-La, Jara-La, Taska-La, Chang-La, Umasi-La, and Qara-Tagh-La (Karakoram) are the important passes of the Kashmir Himalayas **(Fig. 2.13)**.

The Himadri: Called the abode of gods, this section of the Himalayas has many snow capped peaks, such as Nanga-Parbat (8119 m), Nanda Devi 7817 m), Trisul (7140 m), Nunkun (7135 m), Kamath (7756 m), etc.

2. The Himachal Himalayas

Stretching over Himachal Pradesh, it occupies an area of about 45,000 sq km. All the three ranges (the Greater, the Lesser, and the Outer Himalayas) are well represented in this region. The northern slopes of the Himachal Himalayas are clothed with thick forests and show plains and lakes, while the southern slopes are rugged and forest clad. Rohtang, Bara-Lacha, and Shipki-La are the important passes which join Himachal Pradesh with Tibet (China). The beautiful and highly productive valleys of Kangra, Kullu, Manali, Lahul, and Spiti lie in Himachal Pradesh. These valleys are well known for orchards and scenic beauty. Shimla, Dalhousie, Chamba, Dharamshala, Kullu-Manali are the important hill stations of this region.

3. The Kumaun Himalayas

The Kumaun Himalayas lie between the Satluj and the Kali rivers, stretching to a length of 320 km and occupying an area of about 38,000 sq km. Its highest peak is Nanda Devi (7817 m). Among the other peaks Kamet (7756 m), Trisul (7140 m), Badrinath (7138 m), Kedarnath (6940 m), Dunagiri (7066 m), Jaonli or Shivling (6638 m), Gangotri (6615 m), and Bandarpunch (6320 m) are important. Gangotri, Milam, and Pindar are the main glaciers of Uttarakhand. The important hill

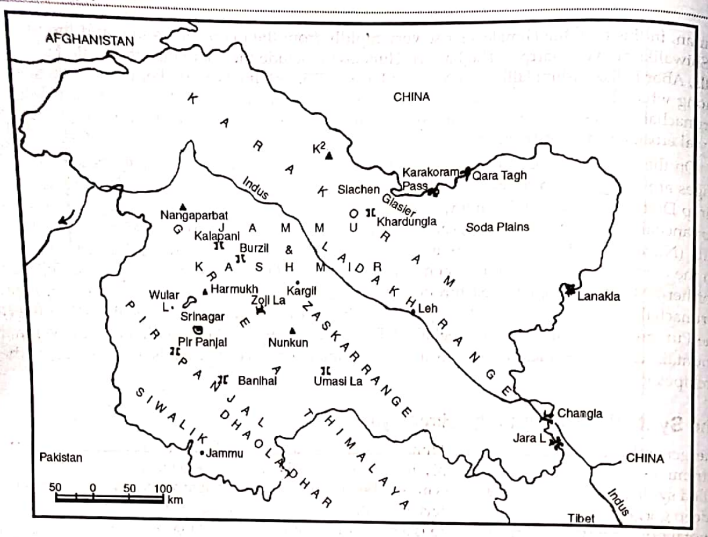

Fig. 2.13 Passes of the Kashmir Himalayas

stations include Mussorrie, Nainital, Ranikhet, Almora, and Bageshwar. The Kumaun Himalayas are connected to Tibet by a number of passes namely, Thaga-La Muling-La (5669 m), Mana Pass, Niti Pass, (5068 m), Tun-Jun-La, Shalsal Pass, Balcha Dhura, Kungrinbingri Pass, Lampiya Dhura, Mangsha Dhura and Lipu Lekh.

4. The Central Himalayas

This range stretches from river Kali to river Tista for about 800 km occupying an area of about 116,800 sq km. A major part of it lies in Nepal except the extreme eastern part called Sikkim Himalayas and in the Darjeeling District of West Bengal. All the three ranges of the Himalayas are represented here. The highest peaks of the world like Mt. Everest (8850 m), Kanchenjunga (8598 m), Makalu (8481 m), Dhaulagiri (8172 m), Annapurna (8078 m), Manaslu (8154 m) and Gosainath (8014 m) are situated in this part of the Himalayas. It has very few passes. The passes of Nathu-La and Jelep-La (4538 m in Sikkim) connect Gangtok (Sikkim) with Lhasa (Tibet, China).

Kanchenjunga: Situated on the border of Sikkim and Tibet, it is the third highest mountain peak in the world. It is 8,598 m above sea level and remains snow covered throughout the year. Some of the important rivers of India like Kosi and Tista have their origin in this mountain.

5. The Eastern Himalayas

These lie between the Tista and the Brahmaputra rivers, covering a distance of about 720 km with an area of 67,500 sq km. The Eastern Himalayas occupy the state of Arunachal Pradesh (India) and

Bhutan. In this part, the Himalayas rise very rapidly from the plains of Assam, and the foothills of Shiwaliks are very narrow. The Eastern Himalayas include the Aka Hills, the Dafla Hills, Miri Hills, Abor Hills, Mishmi Hills, and Namcha Barwa (7756 m). It has a number of mountain passes among which Bomdi-La, Bom La, Tunga, Yonggyap, Diphu, Pangsau, Tse-La, Dihang, Debang (Arunachal Pradesh) are the most important. In the Eastern Himalayas, due to heavy rainfall, fluvial erosion is quite pronounced.

On the southern border of Arunachal Pradesh, the Himalayas take a southerly turn and the ranges are arranged in a north-south direction. Passing through the states of Arunachal Pradesh (Tirap Division) Nagaland, Manipur, Tripura, and Mizoram, the Himalayas are locally known as Purvanchal. The main hills of the Eastern Himalayas are Patkai-Bum (Arunachal Pradesh), Naga-Hills (Nagaland), Manipur Hills, Blue Mountains (Mizoram), Tripura Range, and Brail range. On the border of Nagaland and Myanmar lies the Arakanyoma. These hills are heavily forested. Northern Myanmar is connected through Diphu, Hpungan, Chaukan, Pangsau, and Likhapani (Arunachal Pradesh). Southwards, a pass joins Imphal (Manipur) with Mandalay (Myanmar). The Purvanchal is joined by the Meghalaya Plateau in the west. The extension of the Myanmar mountain chain continues southward up to Andaman and Nicobar Islands and even up to the Archipelago of Indonesia.

The Syntaxial Bends of the Himalayas

The general east-west trend of the Himalayas terminates suddenly at its western and eastern extremities and the ranges are sharply bent southward in deep knee-bend flextures which are called syntaxial bends. The western syntaxial bend is near Nanga Prabat where the Indus has cut a deep gorge. The geological formations here take sharp hairpin bends as if they were bent round pivotal points obstructing them. There is a similar hair-pin bend in Arunachal Pradesh where the mountains take a sharp bend from the eastern to southern direction after crossing the Brahmaputra river. The tectonic strike also undergoes a deep knee-bend from an easterly to southerly trend **(Fig. 2.14)**.

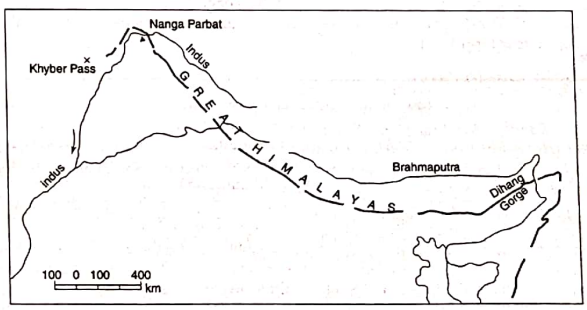

Fig. 2.14 The Syntaxial Bends of Himalayas