SECOND EDITION

WORLD GEOGRAPHY

For UPSC Civil Services and State Services Examinations 2025

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WILEY

About the Author

Jayakrishna Sanapa, a faculty member specializing in Geography at Vision IAS, earned his Master's in Geography (M.Sc) from the University of Madras in Chennai, Tamil Nadu. Additionally, he holds a master's in business administration (MBA), conferred in 2000 by Sri Krishna Devaraya University in Anantapur, Andhra Pradesh. Commencing his academic journey as a Ph.D. in Geography, he focused on articles concerning "The Land Use and Land Changes in Forest Areas" submitted to Banaras Hindu University (BHU), Varanasi. With a keen sensitivity to tribal issues, he authored an article titled "Assimilation or Alleviation," shedding light on the challenges faced by tribes in Arunachal Pradesh. This work found publication in the International Journal of Innovative Research in 2018.

His professional experience includes serving as the Regional Sales Manager for the Andhra Pradesh State Marketing Department. During this tenure, he extended his services to the Northeastern states and concurrently delivered guest lectures at various universities such as Maulana Azad National Urdu University (MANUU) and Acharya NG Ranga Agriculture University in Hyderabad.

Transitioning into academia, he pursued a career as a full-fledged faculty member, teaching Geography and Environmental Studies across India. He has shared his expertise in numerous Civil Services Institutes in Kerala, Karnataka, Tamil Nadu, Uttar Pradesh, Maharashtra, Telangana, and Andhra Pradesh. Presently associated with the Vision IAS institute in Delhi, he has been dedicatedly training aspiring UPSC candidates for over 15 years.

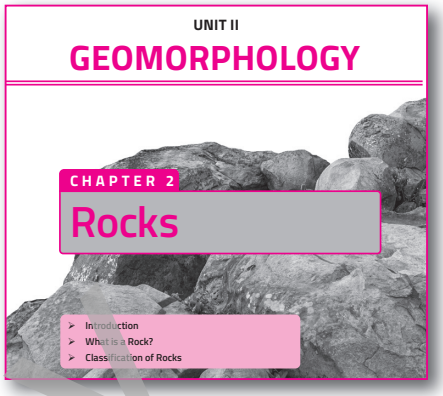
Renowned for his crystal-clear teaching techniques and articulate language, he brings a wealth of knowledge and expertise to this book, making it a valuable repository of impeccable concepts for learners.

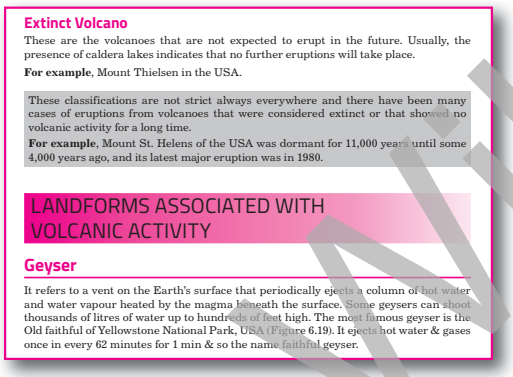
Learning Tools

A. Pedagogy

Chapter Opener

The introductory chapter emphasizes the chapter title and provides clearly outlined learning objectives.




Extinct Volcano

These are the volcanoes that are not expected to erupt in the future. Usually, the presence of caldera lakes indicates that no further eruptions will take place.

For example, Mount Thielsen in the USA.

These classifications are not strict always everywhere and there have been many cases of eruptions from volcanoes that were considered extinct or that showed no volcanic activity for a long time.

For example, Mount St. Helens of the USA was dormant for 11,000 years until some 4,000 years ago, and its latest major eruption was in 1980.

LANDFORMS ASSOCIATED WITH VOLCANIC ACTIVITY

Geyser

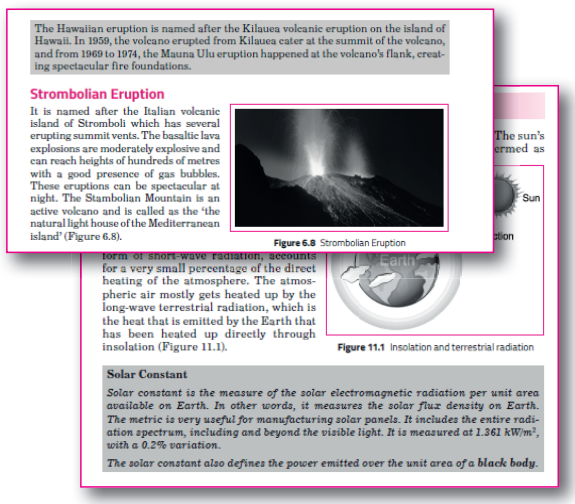
It refers to a vent on the Earth's surface that periodically ejects a column of hot water and water vapour heated by the magma beneath the surface. Some geysers can shoot thousands of litres of water up to hundreds of feet high. The most famous geyser is the Old faithful of Yellowstone National Park, USA (Figure 6.19). It ejects hot water & gases once in every 62 minutes for 1 min & so the name faithful geyser.

Concept Explanation

This will lead you to the answer of the teaser in the beginning in simple language along with examples.

Important Points

Throughout the book, important tips will be given in the box marked with a grey screen.


The Hawaiian eruption is named after the Kilauea volcanic eruption on the island of Hawaii. In 1959, the volcano erupted from Kilauea cater at the summit of the volcano, and from 1969 to 1974, the Mauna Ulu eruption happened at the volcano's flank, creating spectacular fire foundations.

Strombolian Eruption

It is named after the Italian volcanic island of Stromboli which has several erupting summit vents. The basaltic lava explosions are moderately explosive and can reach heights of hundreds of metres with a good presence of gas bubbles. These eruptions can be spectacular at night. The Stumbolian Mountain is an active volcano and is called as the 'the natural light house of the Mediterranean island' (Figure 6.8).

Figure 6.8 Strombolian Eruption

form of short-wave radiation, accounts for a very small percentage of the direct heating of the atmosphere. The atmospheric air mostly gets heated up by the long-wave terrestrial radiation, which is the heat that is emitted by the Earth that has been heated up directly through insolation (Figure 11.1).

Figure 11.1 Insolation and terrestrial radiation

Solar Constant

Solar constant is the measure of the solar electromagnetic radiation per unit area available on Earth. In other words, it measures the solar flux density on Earth. The metric is very useful for manufacturing solar panels. It includes the entire radiation spectrum, including and beyond the visible light. It is measured at 1.361 kW/m², with a 0.2% variation.

The solar constant also defines the power emitted over the unit area of a ***black body****.*

Content described through maps, flow-charts, tables, and figures

- Maps are solely based on scales and projection as per the guidelines given by Survey of India.

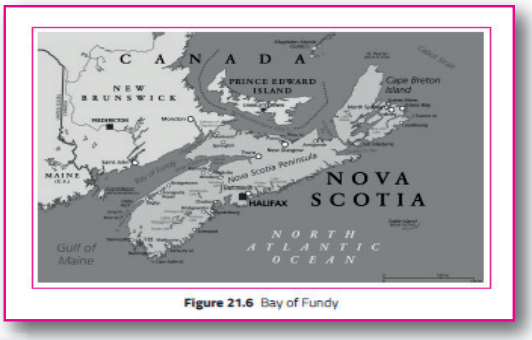


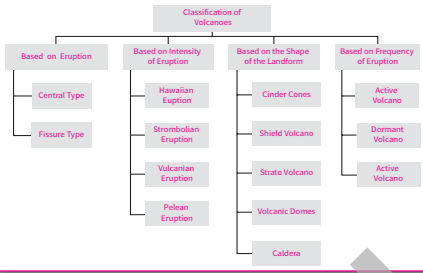
Figure 21.6 Bay of Fundy

Table 8.3 Plate boundaries and landforms

Parameter	Oceanic–Oceanic Divergence	Continental–Continental Divergence	Oceanic–Oceanic Convergence	Oceanic–Continental Convergence	Continental–Continental Convergence	Transform Boundary
Landform	Mid-oceanic ridge	Rift valley,	Trench,	Trench,	Highfold	Transform
Earthquake	Shallo					
Volcanism	Yes					
Examples	Mid-At ridge, I Pacific Carlsb ridge					

CLASSIFICATION OF VOLCANOES

Volcanoes are classified based on various characteristics, including their shape, size, and eruption style. The primary classifications are:



- Content is briefed through flow charts and tables.

B. Assessment

The book presents a variety of questions, each rooted in different concepts covered within the chapter. The questions in the book are categorized into two groups to further aid comprehension and skill development.

Model Questions

UPSC CSE Preliminary Examination

1. San Andreas is an active fault line found along the western coast of North America formed due to interaction of North American plate and?
   (a) Juan-de-fuca plate
   (b) Cocos plate
   (c) Alaska plate
   (d) Aleutian plate
2. The trench represent the plate consumption, in which of the following oceans more trenches are found?

UPSC CSE Mains Examination

1. What are Plate boundaries? Critically examine the changes along the plate margins with examples.
2. Write a short note about the following?

Previous Years' Questions

UPSC CSE Preliminary Examination

1. Choose the correct statements with respect to the Savannah/Sudan type of climate:
   1. These are grasslands within the tropical region and are also known as tropical gras
   2. Les due

UPSC CSE Mains Examination

1. Discuss the consequences of climate change on the food security in tropical countries. (UPSC 2023)
2. How does the Cryosphere affect climate change? (UPSC 2017)

- Practice with **model questions** for both prelims and mains exams.
- Questions from **previous years'** prelims and mains exams.

C. Answer Keys

Conclusion of the chapter includes an answer key that provides solutions for multiple-choice questions (MCQs).

Answer Key

Model Questions: UPSC CSE Preliminary Examination

1. (b) 2. (c) 3. (c) 4. (c) 5. (b) 6. (c)

Previous Years' Questions: UPSC CSE Preliminary Examination

1. (d) 2. (c) 3. (c) 4. (d) 5. (d)

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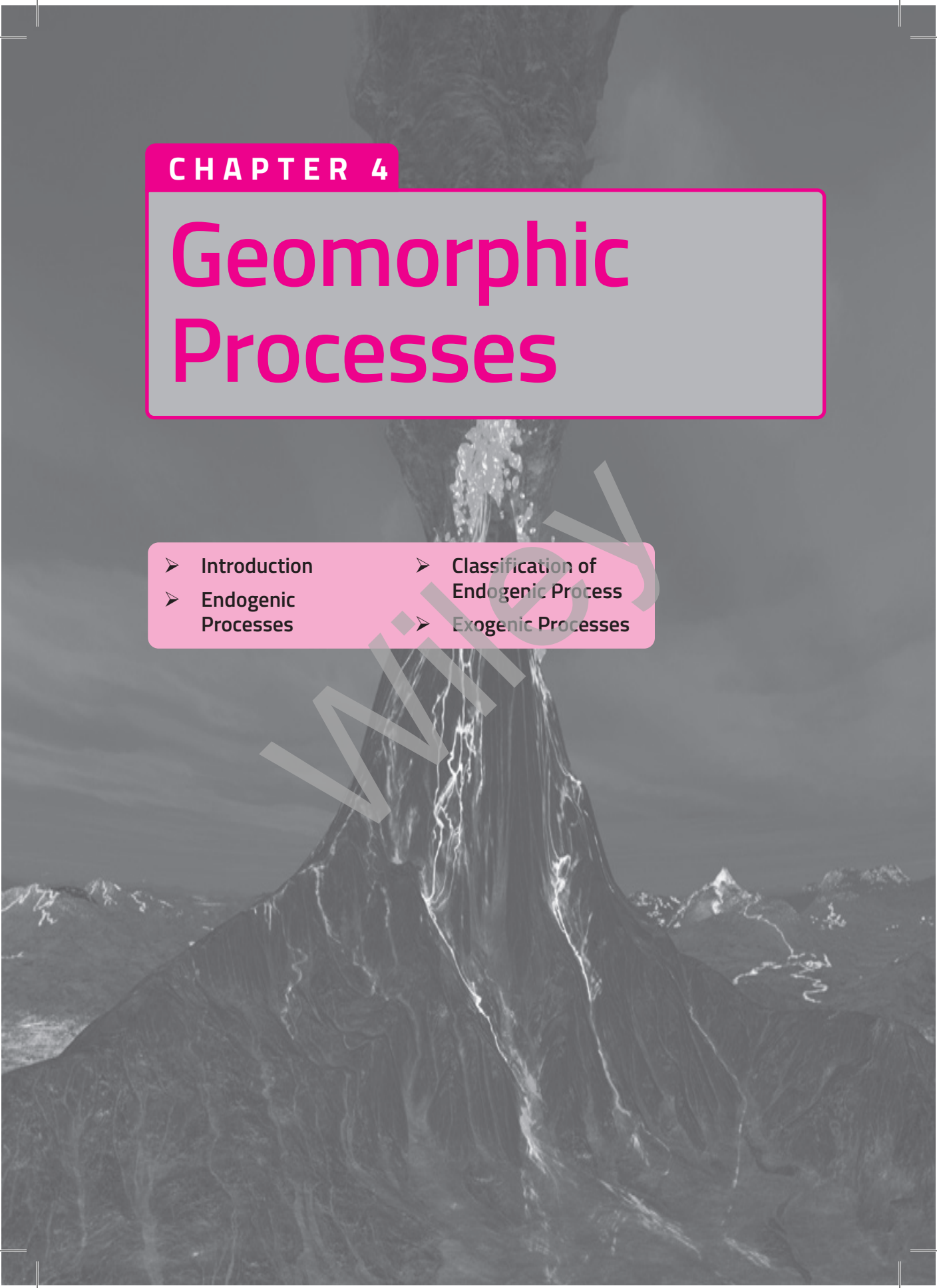


CHAPTER 4

Geomorphic Processes

- Introduction
- Endogenic Processes
- Classification of Endogenic Process
- Exogenic Processes

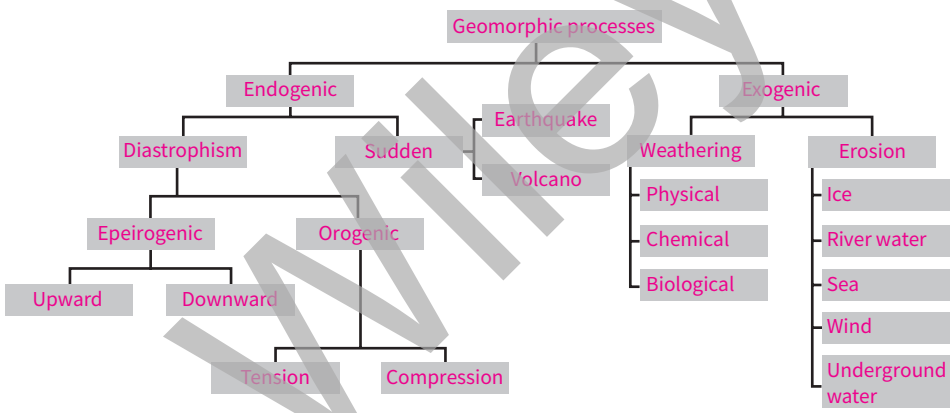
INTRODUCTION

'The Geomorphic processes are the manifestations of the physical and chemical actions on the configuration of the Earth's surface'.

Geomorphic processes include the physical and chemical interactions between the Earth's surface and the natural forces like wind, water current, etc. that bring about both sudden and slow changes and form various landforms. They can also be understood as the various kinds of mechanical stresses that operate on Earth materials to produce various forms of strain that give rise to various landforms of different sizes and shapes, either immediately or over long periods of time.

Geomorphic processes are broadly classified into two categories, which are further classified into different categories.

1. Endogenic process
2. Exogenic process



ENDOGENIC PROCESSES

The endogenic processes derive their energy from within the Earth.

The major sources of this energy are:

- Radioactive disintegration,
- Rotational force of the Earth,
- Tidal forces,
- The primordial heat of the Earth.

These energies are not evenly distributed over the Earth's interior; hence, we see geothermal energy gradients at various places. These gradients can cause both volcanism and diastrophism. The uneven distribution of internal energies, thickness, and strength of the Earth's crust later translates into the uneven surface of the outer crust visible to us.

CLASSIFICATION OF ENDOGENIC PROCESS

The endogenic process is broadly classified into two types:

- Diastrophic process
- Catastrophic process

Diastrophic Process or Diastrophism

Diastrophism originated from the Greek word 'diastrophe', which means distortion or dislocation. Diastrophism is also called **tectonism**, and it refers to large-scale deformation of the Earth's crust by natural processes that form continents, ocean basins, mountain systems, plateaus, rift valleys, and lithospheric plate movement (plate tectonics), folding, etc. Diastrophic movements are the slow movements but acting continuously.

Diastrophic movements are further classified into two types:

- **Orogenic movements** are the horizontal movements that form mountains by large-scale folding and wrapping.
- **Epeirogenic movements** are the vertical movements that uplift large parts of the Earth's crust and create continents. They also submerge the continents.

Orogenic Processes or Mountain-Building

Oros in Greek language means mountains and orogenic means mountain-building. The force behind orogenic process is basically the tectonic forces that act horizontally to the Earth's surface (Figure 4.1).

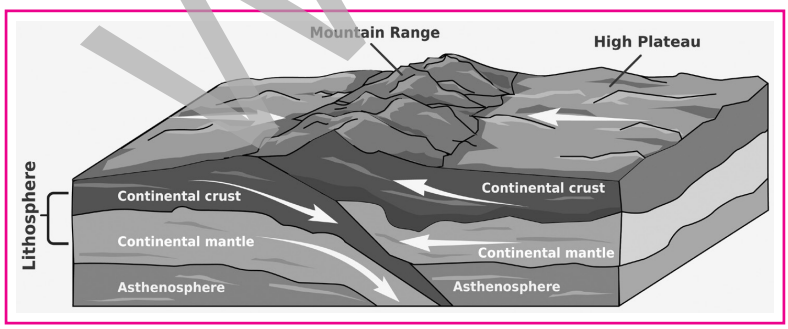


Figure 4.1 Orogenic process

Introduction to Mountains

A mountain is a tall and elevated relief feature on the surface of the Earth; it can be in several forms like:

- **Mountain chain:** It consists of a series of parallel mountains of different time periods.
- **Mountain range:** It consists of a series of several hills, peaks, and valleys of same time.
- **Mountain cordillera:** It refers to a large and several mountain groups and systems.

For example: Rockies cordillera and Andes cordillera.

Classification of the Mountains

Mountains can be classified based on their origin, height, and location.

Based on their height, mountains can be classified into:

- **High mountains:** having height more than 2,500 m.
- **Rugged mountains:** having height between 1,500 and 2,500 m.
- **Rough mountains:** having height between 1,000 and 1,500 m.
- **Low mountains:** height between 700 and 1,000 m.

Based on their location, mountains can be classified into:

- Coastal mountains
- Continental/inland mountains
- Submarine mountains

Based on their origin, mountains can be classified into:

- Fold mountains
- Block mountains
- Relict mountains
- Volcanic mountains

Volcanic mountains orogeny forces act horizontally to the surface and result in either folding of the land or faulting of the land.

Fold Mountains

Mountain building occurs when two tectonic plates collide either forcing material upwards to form **fold mountains** as the Andes, Alps, or Himalayas or causing relative motions between the plates to form **fault mountains** like the Sierra Neveda of the US (Figure 4.2).

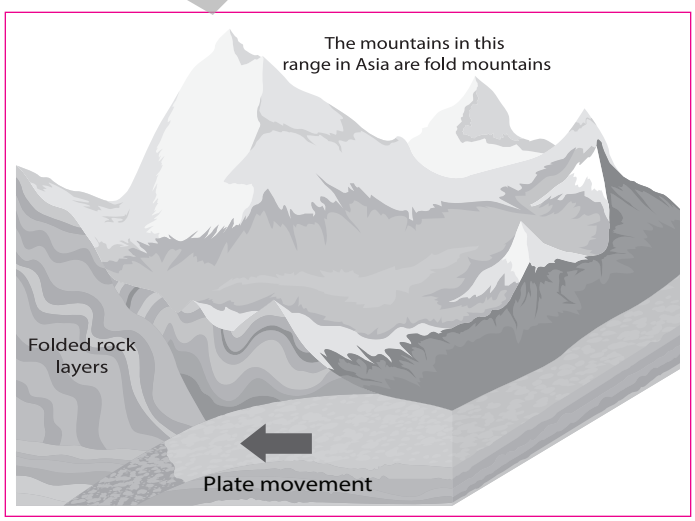


Figure 4.2 Fold mountains

The convergence of tectonic plates causes compressive forces, which later result in the up wrapping of the crust, forming the fold mountains. The folding process also causes formation of synclines and anticlines (Figure 4.3). The upward convex fold is called **anticline**, and a concave downward fold is called **syncline** (Figure 4.4).

Symmetrical folds are made when both the limbs of the fold mountains are inclined at an equal angle to the axial plane.

Asymmetrical folds are made when one limb has an angle that is not equal to the angle of another limb.

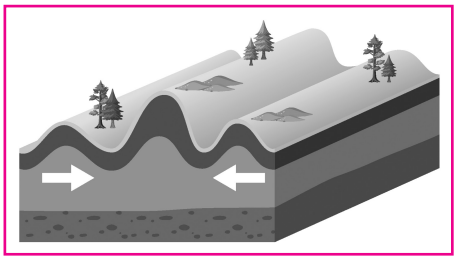


Figure 4.3 Formation of fold mountains

Figure 4.4 Synclines and anticlines

Isoclinal folds are formed when almost parallel, steep limbs are formed due to very strong compression on both sides (Figure 4.5).

Isoclinal folds that have been overturned to the extent that their limbs are nearly horizontal are called **recumbent folds**.

Recumbent folds are seen when the compressional force is more on one side, which results in parallel limbs and the overall fold being parallel to the ground.

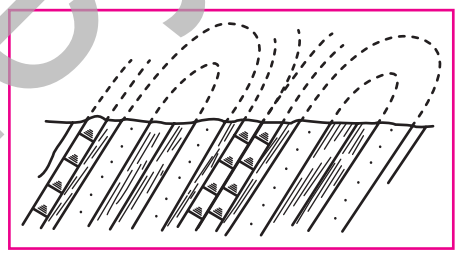


Figure 4.5 Isoclinal folds

When the recumbent fold keeps facing compressive forces, the limbs get broken and displaced, and we get **nappes** (Figures 4.6).

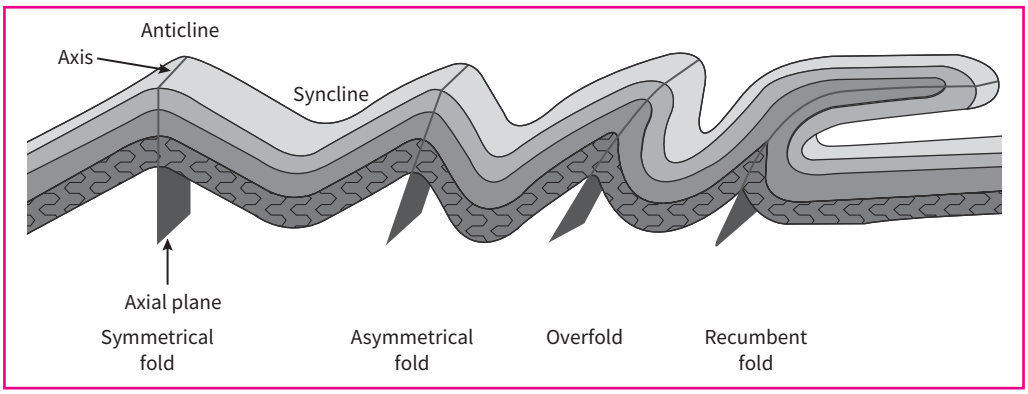


Figure 4.6 Folding process of recumbent folds

Characteristic Features of Fold Mountains

- They are the youngest and highest mountains in the world.
- They are characterised by longer length and short width and have both convex and concave faces.

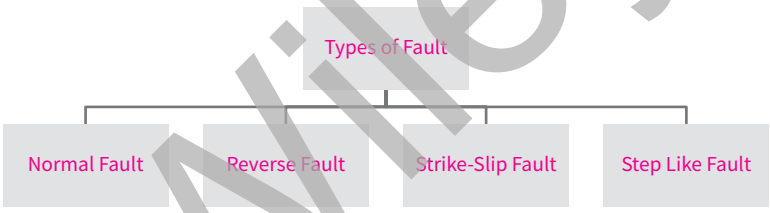
  For example: Himalayas are 2,400 km in length and only 400 km wide.
- These mountains are composed of sedimentary, igneous, and metamorphic rocks, but the sedimentary rocks are the predominant ones and contain fossils.

  For example: The sediments on the **Tethys Sea** floor are found in the Himalayas.
- The fold mountains can be young as well as old, like the Himalayas and Aravalli, respectively.

Block/Fault Mountains

Faults can form by both compression and tensional forces. They are commonly formed due to the tensional forces on the Earth's crust. They are also called **block mountains**. They are formed by the displacement of large blocks of the Earth's crust in such a manner that some parts of the Earth's crust get pushed vertically up, while an adjacent part collapses down. Faults can be seen along convergent, divergent, and transform boundaries.

Faults can be classified into different categories based on how they are formed.



- **Normal Fault:** In this case, the block mountains are formed because of either rising of the block or the subsidence of the block. The raised block is called **Horst**, while the sagged block is the **Graben** (Figure 4.7).

  For example: Horst–Vosges Mountain of Germany and Graben–Black Forest region of Germany.
- **Thrust Fault/Reverse Fault:** This type of fault is seen when the limbs override each other at an angle of 45°, or less because of severe compression (Figure 4.7).

  For example: Sierra Madre of North America.

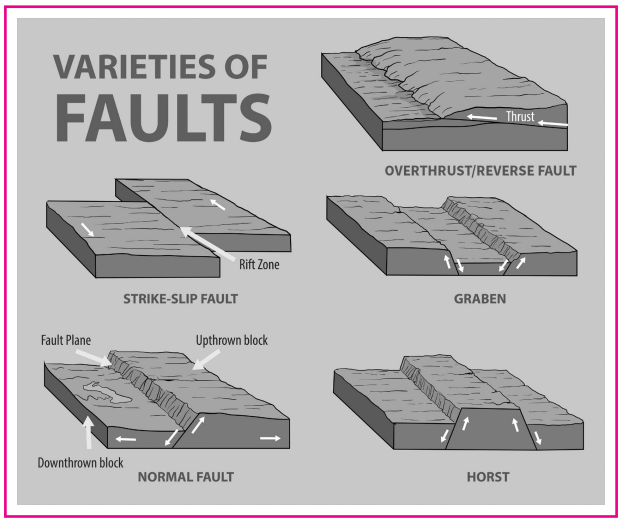


Figure 4.7 Varieties of Faults

- **Strike Slip Fault:** This kind of fault is seen when we have parallel movement of the plates like along a transform boundary (Figure 4.7).

  For example: The San Andreas fault. The recent Turkey–Syria Earthquake of 2023 is due to strike slip fault.

- **Step-Like Fault:** This type of fault is seen when there is vertical displacement, but to varying degrees. The resultant landform resembles successive steps (Figure 4.8).

  For example: The North Anatolian fault.

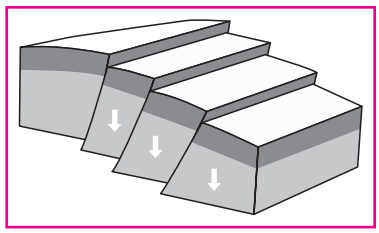


Figure 4.8 Step like fault

Characteristics Features of the Block Mountains/Fault Mountains

- These are generally flat-topped mountains having steep slopes.
- These formations are the result of combination of compressional, tensional, and transform forces.

Relict Mountain

Also called as Residual mountains, formed due to erosion or destruction of the ancient landscape, they are the result of changed climatic condition.

For example: Urals of Russia; Aravallis in India.

Volcanic mountain are formed due to the process called Volcanism and the detail discussion is given in Chapter 6.

Epeirogenic Processes

Epeiros in the Greek language means continents, and epeirogeny means formation of continents. The movements caused by this process are responsible for the building of the continents.

These are the vertical forces that are responsible for either submergence or emergence of the continents, meaning they include the events where the Earth's crust undergoes upliftment or subsidence. **For example:** Zealandia, a newly discovered (2017) submerged continent was a result of this process.

Epeirogenic movements can be either temporary or permanent, **for example,** during glaciation, the ice mass on the crust causes its subsidence, which largely regains its position after the glacier melts later is a temporary epeirogeny. Permanent epeirogeny can be seen in cases like normal fault, reverse fault, etc.

Sudden Endogenic/Catastrophic Processes

The catastrophic forces lead to catastrophs, and they occur all of a sudden, leading to heavy destruction. The best examples are the earthquakes and volcanoes.

Further explanation of these topics will be comprehended in chapters 5 and 6.

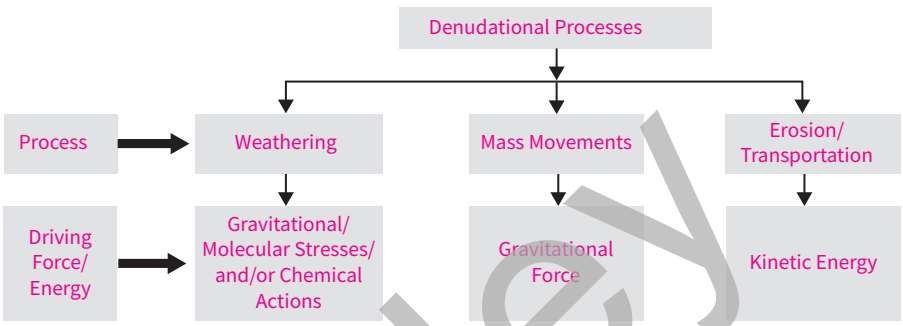
EXOGENIC PROCESSES

Exogenic forces are the external forces that cause wearing away or degradation of Earth's relief and filling up the depressions being made on the Earth's surface. The process of wearing down, erosion, or removal of Earth material is called **gradation**,

while **aggradation** is the process through which the eroded Earth material fills up the gaps on the Earth relief. Gradation leads to a reduction in the height of elevated lands and landforms.

These opposing processes of gradation and aggradation have been continuing since very long time and have resulted in the variations in relief on the Earth's surface as we see them today. The exogenic processes derive their energy ultimately from the sun and from atmospheric factors.

Denudation is the general term to denote all the geomorphic processes such weathering, mass wasting/movements, erosion, transportation, etc. There are different driving forces for every denudation process.



Owing to the variations in distributions of thermal gradients by latitudinal and seasonal variations, vegetation, land, and water distribution over the Earth, the exogenic geomorphic processes are also differently spread all over the Earth. Further, there can be local-level variations due to differences in altitudes, aspects, insolation, wind velocities and directions, precipitation patterns, etc.

Even for the regions with same climatic factors, different results of geomorphic processes can be seen owing to differences in the type and nature of rocks. The nature of rocks here refers to features like faults, folds, inclination of beds, hardness, chemical nature, permeability, etc. Different types of rocks show different degrees of resistance to geomorphic processes.

Weathering

Weathering is an **in-situ process** that includes both chemical and physical processes for disintegration or denudation of the rock material. Weathering includes gradual destruction of the rocks by dissolving them, wearing them away, or breaking them down into progressively smaller pieces.

Weathering processes are majorly categorised into three types:

- Physical (mechanical) weathering,
- Biological weathering, and
- Chemical weathering.

Very rarely does any one kind of weathering happens alone, but very often does one kind dominates over the rest.

Physical Weathering

This happens due to the action of physical forces like the gravitational forces, including overburden pressure, loading and shearing stresses, water pressures, and expansion forces due to temperature changes. Physical weathering can be seen in following various ways, such as:

Thermal Expansion and Contraction

Much of physical weathering is caused due to this factor. The minerals present in the rocks expand in summer and contract in winter, and even during day and night. The temperature differences cause thermal stress-release cycles. These cycles cause contraction and expansion repeatedly across long times, which gives rise to fatigue in rocks (Figure 4.9).

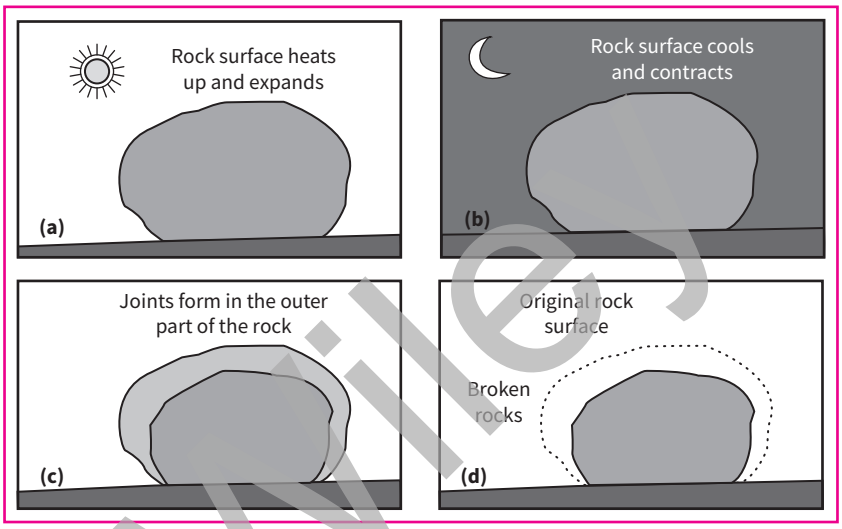


Figure 4.9 Thermal expansion and contraction

Frost Wedging

Under frost wedging, water seeps into cracks in a rock and later undergoes expansion on freezing. This enlarges the cracks and causes stress in the rock. The frequency and intensity of freezing and thawing processes directly impacts the efficacy of frost wedging, and finally, the rock breaks down along the crack (Figure 4.10).

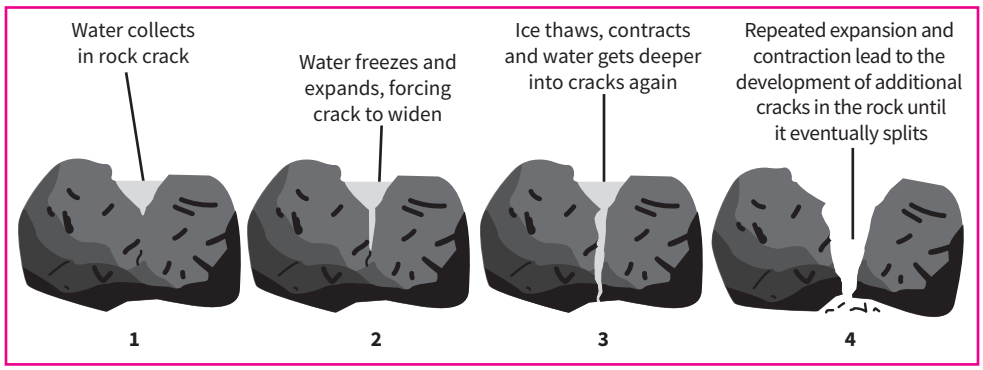


Figure 4.10 Frost wedging

Erosion and Deposition

Erosion refers to the geological process in which Earth materials are worn away and transported by natural forces such as gravity, wind, or water. It is different from weathering as erosion is an ex-situ process, while weathering is an in-situ process. The eroded material in transit is called **transportation**. Wherever the transportation stops, it is called **deposition**. The eroded materials from higher elevations normally get deposited in the low-lying areas (Figure 4.16).

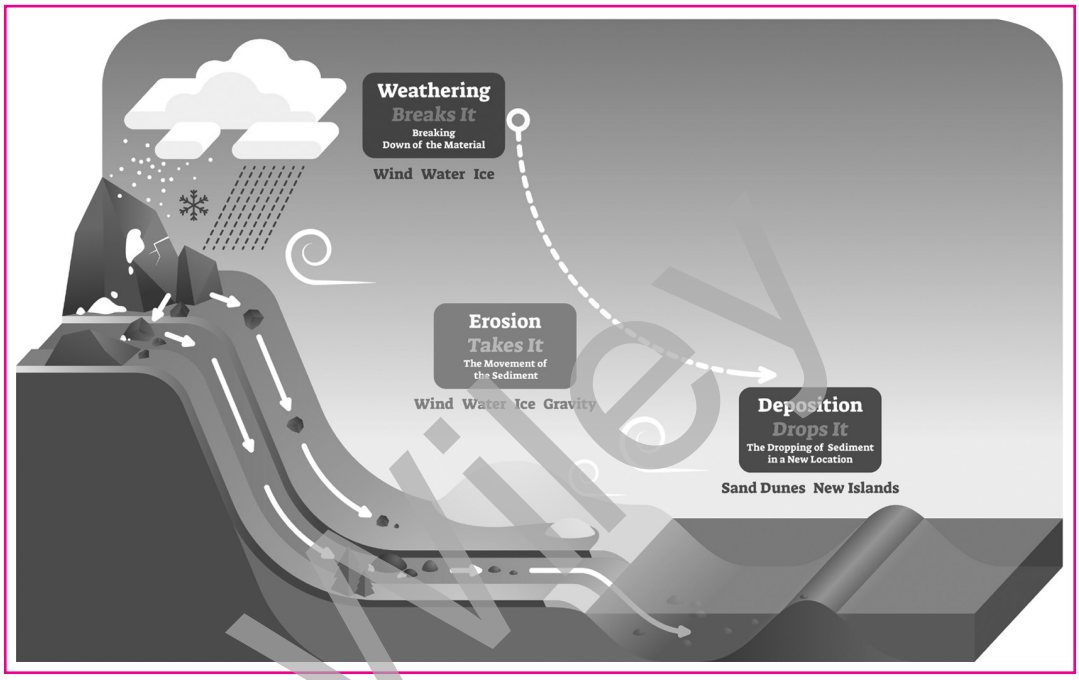


Figure 4.16 Erosion and deposition

A more in-depth discussion of landforms will take place in Chapter 9.

Model Questions

UPSC CSE Preliminary Examination

1. Consider the following statements:

1. The forces bringing about changes in the configuration of the surface of the earth are known as geomorphic processes.

2. All processes that move, elevate, or build up portions of the earth's crust come under diastrophism.

Which of the statements given above is/are correct?

(a) 1 only **(b)** 2 only

(c) Both 1 and 2 **(d)** Neither 1 nor 2

2. Which of the following processes are associated with diastrophism?

1. Orogenic processes
2. Epeirogenic process
3. Earthquakes
4. Plate tectonics

Select the correct answer using the code given below.

(a) 1 and 4 only
(b) 2 and 4 only
(c) 1, 2 and 3 only
(d) 1, 2 and 4

3. Consider the following statements about endogenic and exogenic forces:

1. Diastrophism and volcanism are endogenic geomorphic processes.
2. Weathering, mass wasting, erosion and deposition are exogenic geomorphic processes.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

4. Consider the following statements regarding chemical weathering:

1. Wetting and drying of rock may result in chemical weathering.
2. Oxidation of rock results in chemical weathering.

Which of the statements given above is/are not correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

5. Consider the following statements regarding weathering:

1. It gives rock lower strength and greater permeability, rendering it more susceptible to mass wasting and erosion; reduces strength and increases permeability of rock and therefore decreases resistance to fluid and gravitational stresses; precursor to erosion.
2. It produces minor landforms, produces landforms in soluble rock (especially limestone) and otherwise creates microrelief .
3. It releases minerals in solution which become concentrated to form hard coatings on rocks and hard resistant layers in soil that inhibit seepage and resist erosion.

Select the correct answer using the code given below.

(a) 1 & 2 only
(b) 2 & 3 only
(c) 1 & 3 only
(d) 1, 2 & 3

6. Which of the following is/are endogenic geomorphic process?

1. Diastrophism
2. Volcanism
3. Weathering

Choose the correct answer from the given codes:

(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 3 only

7. Consider the following:

1. Weathering is not a prerequisite for Mass wasting.
2. Biological weathering is dominant in the Arid regions.

Which of the statements given above is/are correct?

(a) Only 1
(b) Only 2
(c) Both 1 and 2
(d) Neither 1 nor 2

8. The recent Turkey earthquake is the best example of which of the following fault?

(a) Normal fault
(b) Strike Slip fault
(c) Reverse fault
(d) Step like fault

9. Which of the following pairs is/are correctly matched?

1. Asymmetric fold	**A.** one limb more inclined than the other
2. Monoclinal fold	**B.** both the limbs are equally inclined
3. Isoclinal fold	**C.** both limbs are inclined to the same direction
4. Recumbent fold	**D.** one limb is inclined and the other is vertical

(a) Only one pair is correct.
(b) Two pairs are correct.
(c) Three pairs are correct.
(d) All the pairs are correct.

10. Consider the following statements?

1. Black Forest is the Graben, and the Vosges Mountain is the Horst located in France.
2. The East African valley is the best example for the Rift.
3. San Andreas is the Fault line located in between the North America and the South America.

Which of the above statements is/are correct?

(a) 1 and 2 only **(b)** 2 only

(c) 2 and 3 only **(d)** 1, 2 and 3

11. Zealandia, a recently discovered continent off the coast of the New Zealand is the example of which of the Endogenic force?

(a) Epeirogeny emergent force

(b) Orogeny Compressive force

(c) Epeirogeny submergent force

(d) Orogeny tensional force

UPSC CSE Mains Examination

1. What are the earth movements? Explain the various processes associated with Earth movements.

2. "The relief is the product of the competition between the endogenic forces and the exogenic forces." Explain.

3. What are the different sorts of forces that act on the earth's surface?

4. What is the weathering? What is the difference between physical and chemical weathering?

5. What is diastrophism? What is difference between orogenic and epeirogenic processes?

6. What is weathering? Describe different types of weathering with examples.

7. Endogenic and Exogenic forces are both complimentary to each other in the Geomorphic processes. Explain.

8. Write brief notes on the following processes:

(a) Exfoliation and Thermal weathering.

(b) Hydration and Hydrolysis.

9. What is Erosion? Explain different types of erosions with examples.

10. Endogenic forces are responsible for the creation of Relief. What are endogenic forces? Explain their sources and types.

Previous Years' Questions

UPSC CSE Preliminary Examination

1. Consider the following information: **(UPSC CSE 2024)**

Region	Name of the mountain range	Type of mountain
1. Central Asia	Vosges	Fold mountain
2. Europe	Alps	Block mountain
3. North America	Appalachians	Fold mountain
4. South America	Andes	Fold mountain

In how many of the above rows is the given information correctly matched?

(a) Only one **(b)** Only two

(c) All three **(d)** All Four

UPSC CSE Mains Examination

1. Briefly mention the alignment of major mountain ranges of the world and explain their impact on local weather conditions, with examples. **(UPSC CSE 2021)**
2. Differentiate the causes of landslides in the Himalayan region and Western Ghats. **(UPSC CSE 2021)**
3. How can the mountain ecosystem be restored from the negative impact of development initiatives and tourism? **(UPSC CSE 2019)**
4. Why are the world's fold mountain systems located along the margins of continents? Bring out the association between the global distribution of Fold Mountains and the earthquakes and volcanoes. **(UPSC CSE 2014)**

Answer Key

Model Questions: UPSC CSE Preliminary Examination

1. (c) **2.** (d) **3.** (c) **4.** (d) **5.** (d) **6.** (a) **7.** (a)

8. (b) **9.** (b) **10.** (b) **11.** (c)

Previous Years' Questions: UPSC CSE Preliminary Examination

1. (b)