

Introduction to Physical Geography

Introduction to Physical Geography

Key concepts, major components, and foundational processes

1. What Is Physical Geography?

Aspect	Description
Definition	The branch of geography that studies natural environments and the processes that shape the Earth’s surface.
Scope	Landforms, climate, soils, vegetation, water bodies, and the interactions among them.
Goal	Explain <i>how</i> and <i>why</i> the natural world changes over time and how those changes affect human societies.

2. Core Sub?Disciplines

Sub?discipline	Primary Focus	Typical Tools
Geomorphology	Formation, evolution, and classification of landforms.	GIS, remote sensing, field mapping, digital elevation models (DEMs).
Climatology	Atmospheric processes, weather patterns, long?term climate trends.	Weather stations, climate models, satellite radiometers.
Biogeography	Distribution of plants, animals, and ecosystems.	Species occurrence databases, ecological niche modeling.
Hydrology	Movement, distribution, and quality of water (surface & groundwater).	Stream gauges, hydrological models, water?balance equations.
Pedology (Soil Science)	Soil formation, classification, and functions.	Soil surveys, laboratory analyses, pedotransfer functions.

3. Fundamental Earth Systems

1. **Lithosphere** – Solid Earth (crust & upper mantle).
 - *Processes:* tectonics, volcanism, weathering, erosion.

Introduction to Physical Geography

- *Key concepts*: plate boundaries, rock cycle, mountain building.

2. Hydrosphere – All water on, under, and above the surface.

- *Processes*: precipitation, runoff, infiltration, ocean circulation.
- *Key concepts*: water cycle, watershed, ocean currents.

3. Atmosphere – Gaseous envelope surrounding Earth.

- *Processes*: solar radiation absorption, convection, precipitation formation.
- *Key concepts*: atmospheric layers, pressure systems, climate zones.

4. Biosphere – Living organisms and their ecosystems.

- *Processes*: photosynthesis, respiration, nutrient cycling.
- *Key concepts*: biomes, succession, biodiversity hotspots.

5. Cryosphere – Frozen water components (glaciers, sea ice, permafrost).

- *Processes*: accumulation, ablation, albedo feedback.
- *Key concepts*: glacial geomorphology, ice age cycles.

4. Spatial Scale & Temporal Scale

Scale	Spatial Extent	Temporal Extent	Example Topics
Local	< 10?km	Days–Years	River channel migration, micro? climate.
Regional	10?km–1,000?km	Decades–Centuries	Mountain?range uplift, regional rainfall patterns.
Continental	1,000?km–10,000? km	Millennia–Millions of years	Plate tectonic plateaus, desert belt formation.
Global	Whole planet	Millions–Billions of years	Supercontinent cycles, global climate change.

Understanding a phenomenon often requires linking observations across several scales.

Introduction to Physical Geography

5. Major Physical Processes

5.1 Weathering & Erosion

- **Mechanical (physical) weathering** – freeze/thaw, thermal expansion.
- **Chemical weathering** – hydrolysis, oxidation, carbonation.
- **Erosion agents** – water, wind, ice, gravity.

5.