



Weathering

- Weathering is the **process** that **changes** solid **rock** into **sediments**.
- **weathering** refers to the group of destructive processes that change the physical and chemical character of rock at or near Earth's surface.
- With weathering, rock is disintegrated into smaller pieces.
- Once these sediments are separated from the rocks, **erosion** is the **process** that **moves** the **sediments** away from its **original position**.
- The **four forces** of erosion are **water, wind, glaciers, and gravity**.

1. **Water** is responsible for most erosion. Water can move most sizes of sediments, depending on the strength of the force.
2. **Wind** moves sand-sized and smaller pieces of rock through the air.
3. **Glaciers** move all sizes of sediments, from extremely large boulders to the tiniest fragments.
4. **Gravity** moves broken pieces of rock, large or small, down slope.

- While plate tectonics forces work to build huge mountains and other landscapes, the forces of weathering and mass wasting gradually wear those rocks and landscapes away, called denudation.
- **Denudation** is the process by which the land areas are continually being reduced and their shape modified by weathering and erosion.

Types of weathering

These are three types of weathering namely

- i) Mechanical weathering
- ii) Chemical weathering
- iii) Biological weathering

MECHANICAL WEATHERING

- Mechanical weathering, also called **physical weathering**, breaks rock into **smaller pieces** by the action of **temperature**, by impact from **rain drops** and by the **abrasion** from mineral particles carried in the wind.
- Rock has changed physically without changing its composition. **The smaller pieces have the same minerals, in just the same proportions as the original rock.**

Main types of physical weathering

1. **Freeze-thaw**, also called Ice wedging occurs when water continually seeps into cracks, freezes and expands, eventually breaking the rock apart.



2. **Abrasion** occur when one rock bumps against another rock.



3. Insolation

- In hot climates, when a rock surface is exposed to a considerable daily range of temperature as arid and semi-arid regions, the expansion that occurs during the day and the contraction at night, constantly repeated, weaken the structure of the rock.

The physical breakdown of rock by their expansion and contraction due to diurnal temperature changes is one of the most keenly debated topics in rock weathering research. Known as [insolation weathering](#).



CHEMICAL WEATHERING

- Chemical weathering is the other important type of weathering.
- Chemical weathering is different from mechanical weathering because the rock changes, not just in size of pieces, but in composition.
- That is, one type of mineral changes into a different mineral.

CHEMICAL WEATHERING BY WATER

- There are many agents of chemical weathering.
- **Water** is the most important agent of chemical weathering. Two other important agents of chemical weathering are **carbon dioxide** and **oxygen**.
- **Hydrolysis** is the name of the chemical reaction between a chemical compound and water.
- When this reaction takes place, water dissolves ions from the mineral and carries them away.

CHEMICAL WEATHERING BY CARBON DIOXIDE

- Carbon dioxide (CO₂) combines with water as raindrops fall through the atmosphere. This makes a weak acid, called **carbonic acid**. Carbonic acid is a very common in nature where it works to dissolve rock.
- **Sulfuric** and **nitric acids** are the two main components of acid rain, which accelerate chemical weathering.

CHEMICAL WEATHERING BY OXYGEN

- Oxidation is a chemical reaction that takes place when oxygen reacts with another element. Oxygen is very strongly chemically reactive. The most familiar type of oxidation is when iron reacts with oxygen to create rust. Minerals that are rich in iron break down as the iron oxidizes and forms new compounds. Iron oxide produces the red color in soils.

Influences on Weathering

- **ROCK AND MINERAL TYPE**
- Different rock types weather at different rates. Certain types of rock are very resistant to weathering. Igneous rocks, especially intrusive igneous rocks such as granite, weather slowly because it is hard for water to penetrate them. Other types of rock, such as limestone, are easily weathered because they dissolve in weak acids.

CLIMATE

- A region's climate strongly influences weathering. Climate is determined by the temperature of a region plus the amount of precipitation it receives. Climate is weather averaged over a long period of time. Chemical weathering increases as:
- Temperature increases: Chemical reactions proceed more rapidly at higher temperatures. For each 10 degrees C increase in average temperature, the rate of chemical reactions doubles.
- Precipitation increases: More water allows more chemical reactions. Since water participates in both mechanical and chemical weathering, more water strongly increases weathering.
- A cold, dry climate will produce the lowest rate of weathering. A warm, wet climate will produce the highest rate of weathering. The warmer a climate is, the more types of vegetation it will have and the greater the rate of biological weathering. This happens because plants and bacteria grow and multiply faster in warmer temperatures.