

2. The structure

2.1 Influence of lithology

a. Influence of lithology

The majority of geological, hydrological, and soil behavior factors are influenced by lithology. Through erosion, it impacts groundwater quality, rock mechanical strength, soil permeability and therefore water penetration, and landscape shape.

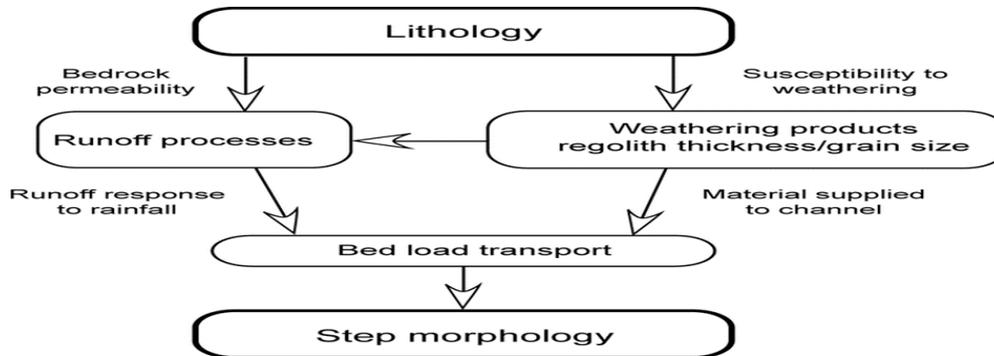


Figure8 : The role of lithology on step morphology in headwater channels.

b. Influence on the mechanical behaviour of rocks

Resistance: Lithology directly influences compressive and tensile strength, as well as sensitivity to water saturation.

Deformation: It determines the deformation modulus and elastic modulus of rocks.

Fracture mode: Lithology also influences how a rock fractures under stress.

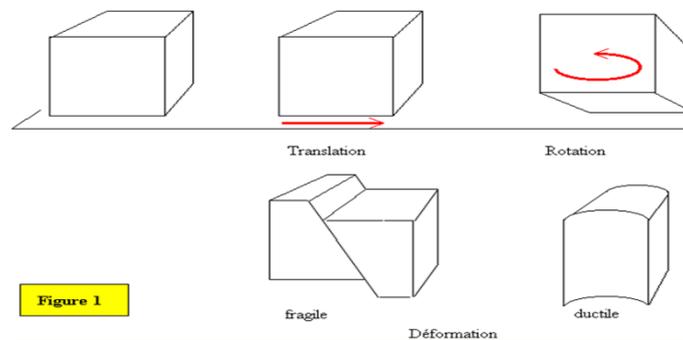


Figure9 : Influence on the mechanical behaviour of rocks

c. Influence on the water cycle and hydrology

Permeability and infiltration: The nature of rocks (limestone, sandstone, clay, etc.) determines porosity and permeability, influencing the ability of soil to allow water to infiltrate or promote runoff.

Groundwater quality: Lithology plays a key role in the chemical composition of groundwater, as it determines which dissolved minerals come into contact with the water.

Water resource management: Understanding lithological influence is essential for sustainable water resource management, as it impacts groundwater depth and water quality.

The role of lithology on step morphology in headwater channels.

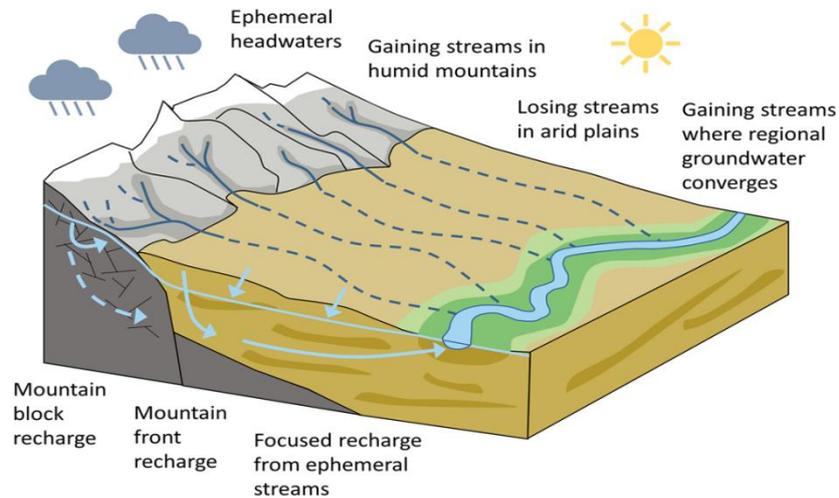


Figure10 : Influence on the water cycle and hydrology

d. Influence on topography

Relationship with topography: Rocks of different lithologies interact differently with erosion, creating varied reliefs (mountains, valleys, etc.).

Outcrops: Geological maps often use colours to represent different types of lithology, allowing rock outcrops and the relationships between different formations to be quickly identified.

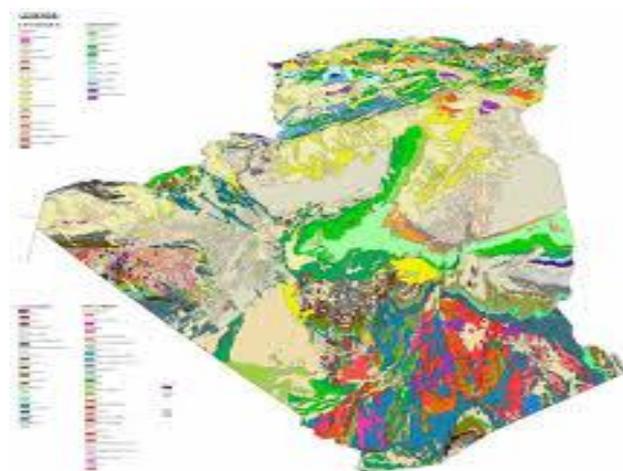


Figure11 : geological maps of Algeria

e. Influence on landscape morphology

Erosion: The lithological nature of geological formations is essential to understanding erosion processes and the resulting landscape features.

Coastal morphology: In coastal areas, lithology, combined with slopes and wave action, shapes the current morphology of the bay.

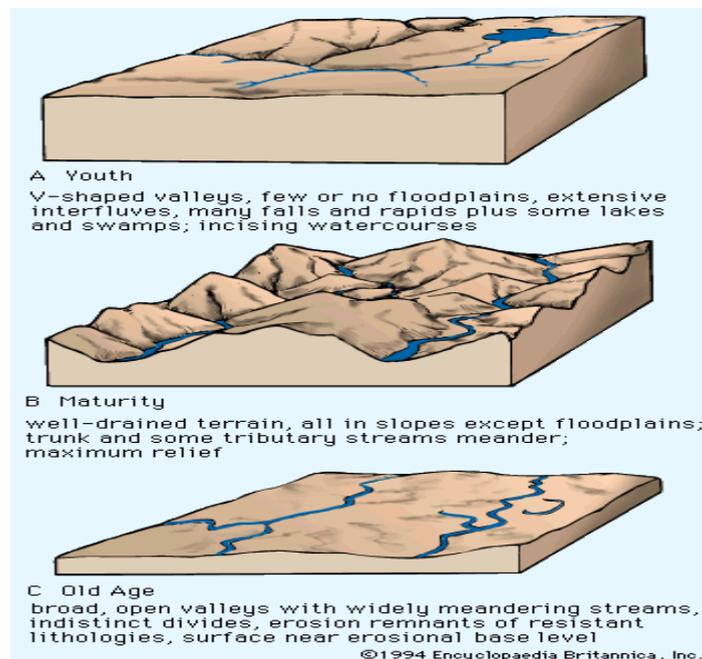


Figure12 : Continental landform

❖ **The agents that affect terrestrial movements**

The earth surface is constantly changing due to geomorphic natural forces that shape and reshape land forms, the agents are divided into internal and external ones.

The endogenic process is due to the release of internal energy from the interior of the Earth. They give rise to the landforms within the Earth or on the surface.

The exogenic process is due to the effect of climatic factors on the landforms produced by the endogenic process

1. Internal agents (endogenic forces)

Endogenic forces: These are land-building forces that play an important part in the creation of the earth's crust.

1.1 **Tectonic movement** : cause the formation of mountains, floods and faults.

1.2 **Volcanic activity** : creates volcanic mountains and new land surfaces

1.3 **Earthquakes** : produce sudden changes in the landscape through crustal movement.

They build and uplift the Earth's crust.

2. External agents (exogenic forces)

Exogenic processes are those that occur on Earth's surface as a result of exogenic forces and agents. These processes include mass wasting, weathering, erosion, and deposition. All exogenic processes are called denudation, which means "to peel away" or "to reveal."

2.1 Water : rivers and waves carve valleys and shape coasts

2.2 Wind : forms dunes and erodes rocks in deserts

2.3 Glaciers: Carve U shaped valleys and deposit sediments

2.4 Humans activity : modify the landscape through construction, agriculture and deforestation

They wear down and real shape the land built by internal forces

The earth landscape is the result of balance between :

Constructive internal forces(building landforms)

Destructive external forces(eroding and leveling them)

2.2 General structure of the globe

The core constituting about 31% of Earth's total mass, the core is primarily composed of iron metal.

The liquid outer core, which is separated from the mantle by the Gutenberg discontinuity.

The solid inner core, which is separated from the outer core by the Lehmann discontinuity.

The mantle representing approximately 68% of the Earth's mass, the mantle is a hot layer beneath the crust. It can be further subdivided into the upper mantle and lower mantle, both influencing geological processes.

The crust comprising less than 1% of Earth's total mass, the crust encompasses the oceanic crust and continental crust. The continental crust typically consists of rock, while the oceanic crust is denser.

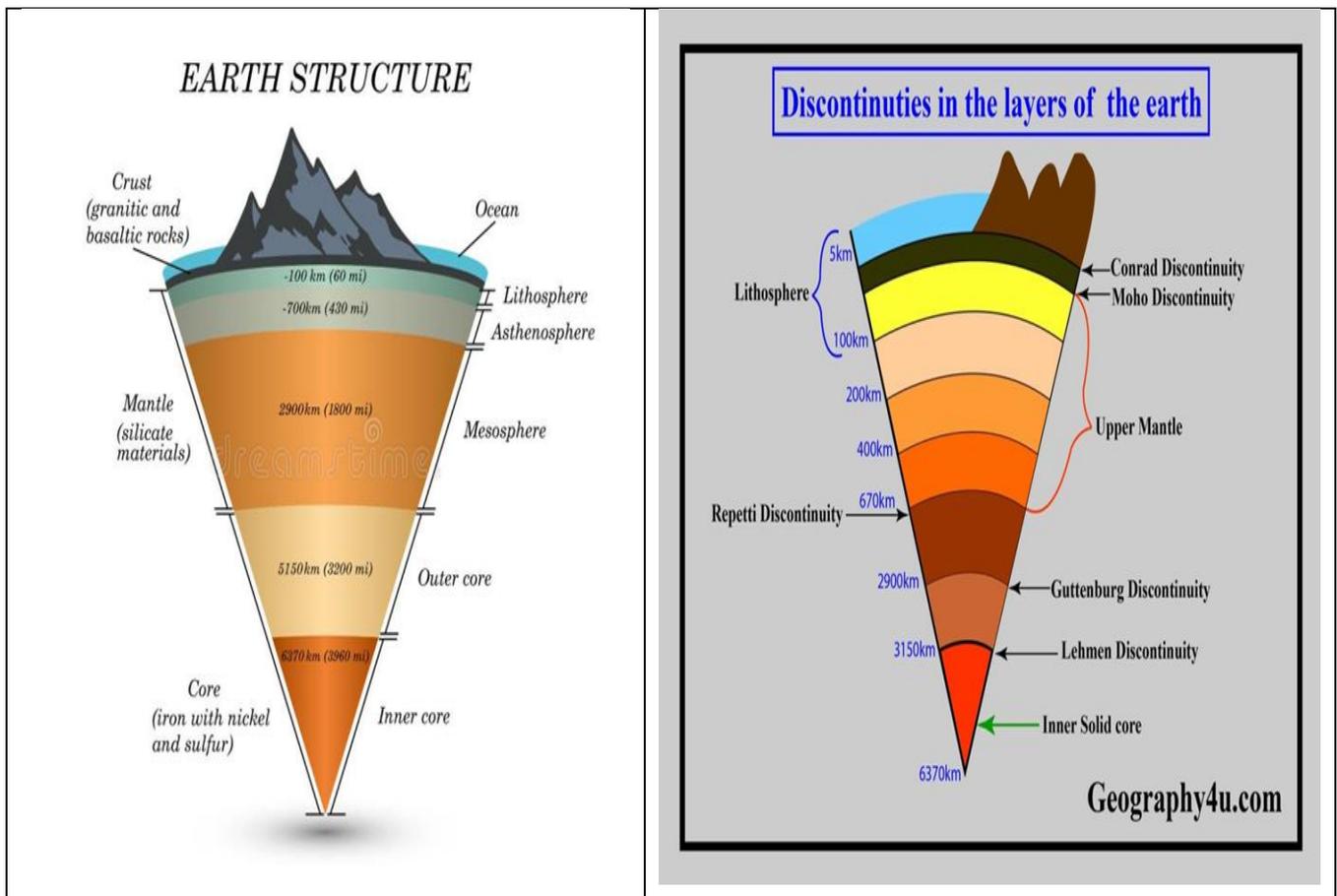


Figure13 : Internal structure of the globe

2.3 Classification of rocks

Rocks are classified into three main types based on their formation process: igneous, sedimentary, and metamorphic rocks. Each type of rock has its own characteristics and is formed through different geological processes.

Igneous rocks: These rocks form from the solidification of molten material called magma or lava. Igneous rocks are classified based on their texture and mineral composition. Texture refers to the size and arrangement of mineral grains in the rock, and it can be classified as intrusive or extrusive. Intrusive igneous rocks form when magma cools and solidifies beneath the Earth's surface, resulting in a coarse-grained texture, such as granite. Extrusive igneous rocks form when lava erupts onto the Earth's surface and cools rapidly, resulting in a fine-grained texture, such as basalt. Igneous rocks can also be classified based on their mineral composition, such as felsic (rich in feldspar and silica), intermediate (moderate in feldspar and silica), mafic (rich in magnesium and iron), and ultramafic (very low in silica).

Sedimentary rocks: These rocks form from the accumulation, compaction, and cementation of mineral and organic particles or the precipitation of minerals from water. Sedimentary rocks are classified based on their texture, composition, and formation environment. Texture refers to the size and shape of the sedimentary particles, and it can be classified as clastic, chemical, or organic. Clastic sedimentary rocks are formed from the accumulation and lithification (compaction and cementation) of mineral and rock fragments, such as sandstone and conglomerate. Chemical sedimentary rocks form from the precipitation of minerals from water, such as limestone and rock salt. Organic sedimentary rocks are formed from the accumulation and lithification of organic material, such as coal. Sedimentary rocks can also be classified based on their composition, such as siliciclastic (rich in silicate minerals), carbonate (rich in carbonate minerals), and evaporite (rich in minerals that precipitate from evaporating water). The formation environment of sedimentary rocks, such as marine, lacustrine, fluvial, desert, or glacial, can also be used for classification.

Metamorphic rocks: These rocks form from the alteration of existing rocks through heat, pressure, and chemical changes without melting. Metamorphic rocks are classified based on their texture, mineral composition, and metamorphic grade. Texture refers to the size, shape, and arrangement of mineral grains in the rock, and it can be classified as foliated or non-foliated. Foliated metamorphic rocks have a layered or banded texture, such as schist and gneiss, while non-foliated metamorphic rocks have a random arrangement of mineral grains, such as marble and quartzite. Metamorphic rocks can also be classified based on their mineral composition, such as mica-rich, quartz-rich, and calcite-rich rocks. Metamorphic grade refers to the intensity of the metamorphic process and can be classified as low-grade, medium-grade, and high-grade based on the temperature and pressure conditions during metamorphism.

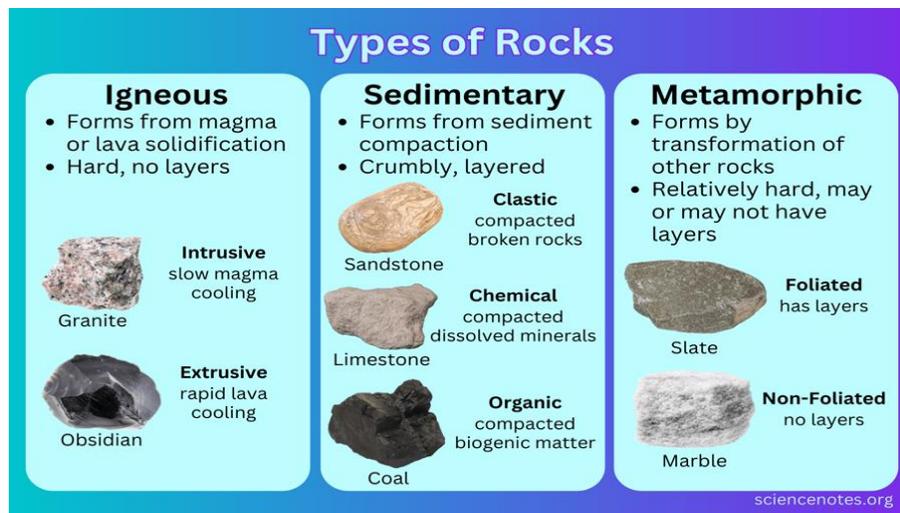


Figure 14 : Types of rocks

❖ Rock cycle

Rock cycle is a continuous process through which old rocks are transformed into new ones. Igneous rocks are primary rocks, and other rocks form from these rocks.

Igneous rocks can be changed into sedimentary or metamorphic rocks.

The fragments derived out of igneous and metamorphic rocks form into sedimentary rocks. Sedimentary and igneous rocks themselves can turn into metamorphic rocks.

The crustal rocks (igneous, metamorphic and sedimentary) may be carried down into the mantle (interior of the earth) through subduction process and the same meltdown and turn into molten magma, the source for igneous rocks

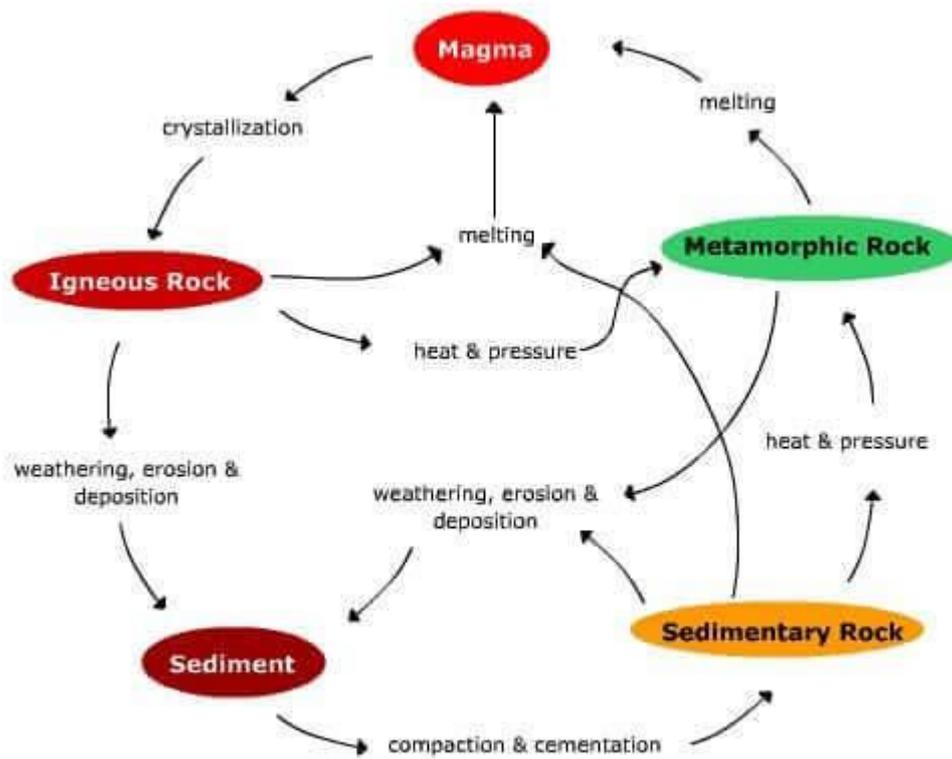


Figure15 : Rock cycle