Chapter 3. Tectonic Landforms

3.1. Structure of the Earth's globe

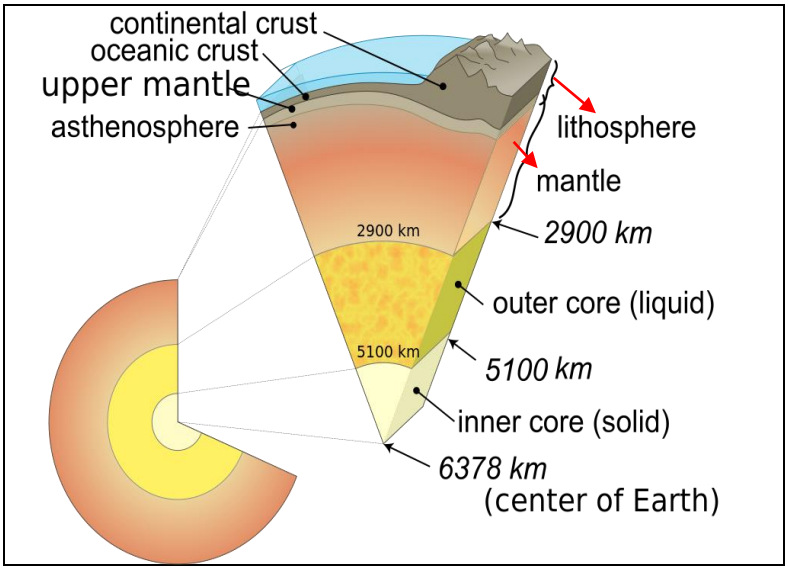

Figure 3.1. Diagram of the internal layering of Earth showing the lithosphere above the asthenosphere

The average thickness of the continental crust is around 35km.
The average thickness of the oceanic crust is around 6km.

3.2. Tectonic plates

A tectonic plate or lithospheric plate is a fragment of the lithosphere that results from its being cut up like a jigsaw puzzle by a system of faults, ridges, rifts and subduction rifts (حفر الاندساس). Lithospheric plates move a few centimeters a year in different directions, leading to the formation of divergence, subduction, collision and slip zones.

We distinguish 16 principal tectonic plates:

- **Major plates:** These plates comprise the bulk of the continents and the Pacific Ocean.

For purposes of this list, a major plate is any plate with an area greater than 20 million km^2

African Plate - Antarctic Plate - Eurasian Plate - Indo-Australian- Plate Australian - Plate Indian - Plate North American - Plate Pacific - Plate South American Plate

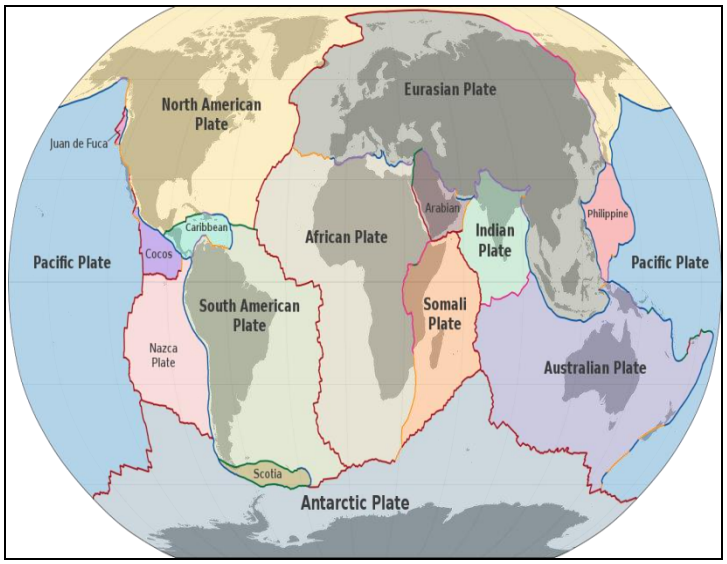

Figure 3.2. Map of Earth's 16 principal tectonic plates

- **Minor plates**

These smaller plates are often not shown on major plate maps, as the majority of them do not comprise significant land area. For purposes of this list, a minor plate is any plate with an area less than 20 million km^2 but greater than 1 million km^2.

Amurian Plate - Arabian Plate - Burma Plate - Caroline Plate -Cocos Plate - Nazca Plate New Hebrides Plate- Okhotsk Plate - Philippine Sea Plate - Scotia Plate -Somali Plate

Divergent boundaries (extensional boundaries).

Separation between two contiguous tectonic plates. The separation zone, or rift, is filled in by basaltic lava.

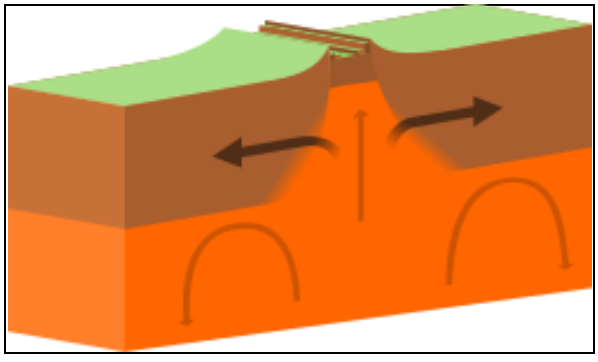

Figure 3.3. Divergent boundary

Convergent boundaries (active margins) occur where two plates slide toward each other to form either a subduction zone (one plate moving underneath the other) or a continental collision.

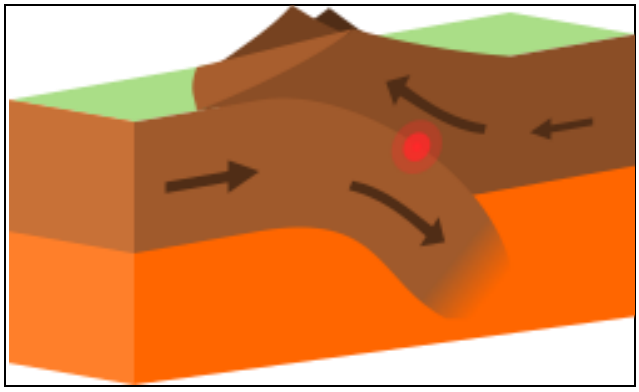

Figure 3.4 Convergent boundary

Subduction zones are of two types: ocean-to-continent subduction, where the dense oceanic lithosphere plunges beneath the less dense continent, or ocean-to-ocean subduction where older, cooler, denser oceanic crust slips beneath less dense oceanic crust.

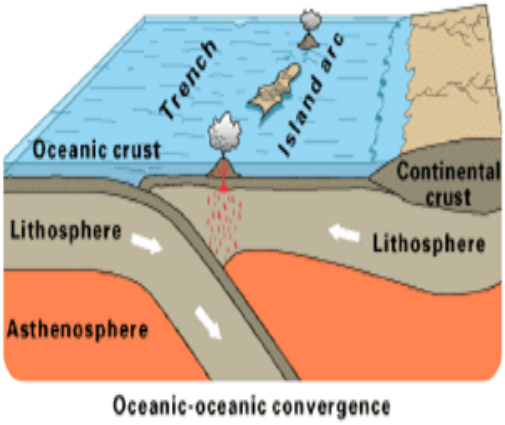

Figure 3.5. Ocean-Ocean Convergent Plate Boundaries

3.3. Orogeny is a mountain building process that takes place at a convergent plate margin when plate motion compresses the margin. An *orogenic belt* or *orogen* develops as the compressed plate crumples and is uplifted to form one or more mountain ranges. This involves a series of geological processes collectively called **orogenesis**.

Continental relief- The surface of the five continents (Europe, Africa, America, Asia and Oceania) is highly irregular: mountain ranges, plains and plateaus are the main landforms. All are the result of the Earth's long geological history.

The layout of oceans and continents is constantly evolving (albeit slowly on a human scale). This mobility is explained by our planet's internal movements. Volcanoes and earthquakes are the most spectacular phenomena.

Figure 3.6. The mains structural areas and the relief of continents

Major landforms:

A. Plains - Plains are flat or slightly undulating surfaces, usually crossed by a river or large body of water (such as the Mississippi, Amazon, etc.). In Algeria: (Wadi Chleff). (The rivers flow flush with the ground). They are surrounded by higher relief. Their altitude varies, with relatively gentle slopes. There are high plains in mountainous regions, but most of them are at low altitude, often by the sea: these are the coastal plains.

Figure 3.7. Mitidja Plain in Algeria

B. Plateaus

In Algeria, the High Plateaux are situated between the Tellian Atlas in the north and the Saharan Atlas in the south, at altitudes ranging from 900 to 1,200 m.

To the east: this territory comprises the wilayas of Bordj Bou Arreridj, Setif, Oum El Bouaghi, Batna, Khenchela and Tebessa.

C. Mountains

A mountain is a topographic form of positive relief, forming part of a group - a mountain range - or an isolated feature. It is characterized by its altitude and, more generally, by its relative height or slope.

Mount Everest, altitude 8848m in the Himalayas (the highest peak on Earth). In Algeria, the highest point is 2908m above sea level at Mont Tahat in the southern Tassili region of the Hoggar.

Figure 3.8. Tahat in the southern Tassili region of the Hoggar Algeria.

D. A hill

A hill is a generally moderate and relatively small relief that rises above a plain or plateau and distinguishes itself in the landscape. Hills can be isolated or grouped together in hill fields.

Figure 3.9. Isolated Hill

Figure 3.10. Groupe of Hills

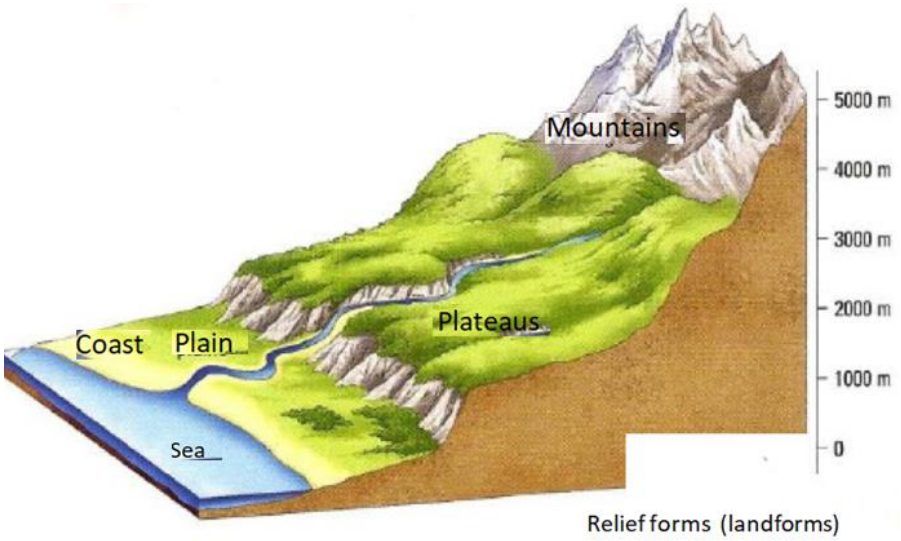

Figure 3.11. Relief formes

4. Horst and Graben

In geology, geomorphology and physical geography, a horst refers to an uplifted compartment. This uplift is the result of a combination of faults. A horst is bordered by its geological counterpart, i.e. grabens, collapsed ditches.

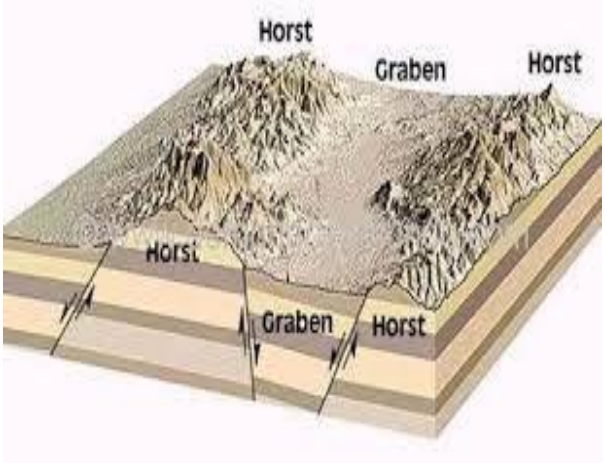

Figure 3.12. Horst and Graben

5. Rift Valleys (The East -African Rift Valley)

Tectonic activity splits continental crust much in the same way it does along mid-ocean ridges.

The East African Rift Valley is an example of a divergent boundary in an area of continental crust. It is one the geologic wonders of the world, a place where the earth's tectonic forces are presently trying to create new plates by splitting apart old ones.

The entire tectonic fault extends some 6,000km in length from north to south, and 40 to 60 kilometers in width, from Syria to Mozambique, via the Red Sea and the great African lakes.

Figure 3.12. The East -African Rift Valley