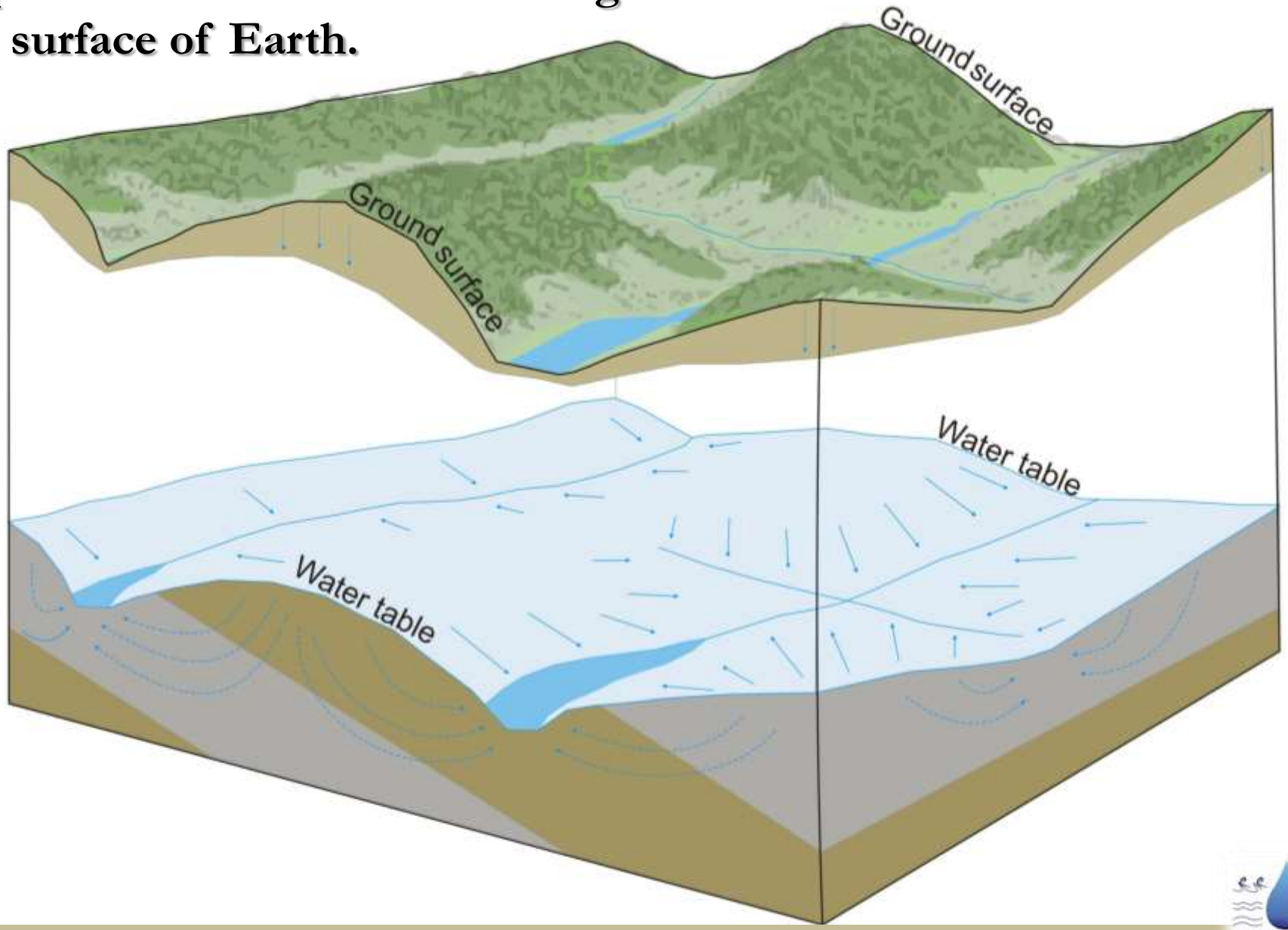
Processes that shape the earth

To consider the movement of groundwater, it is important to understand the irregularities of the surface of Earth.

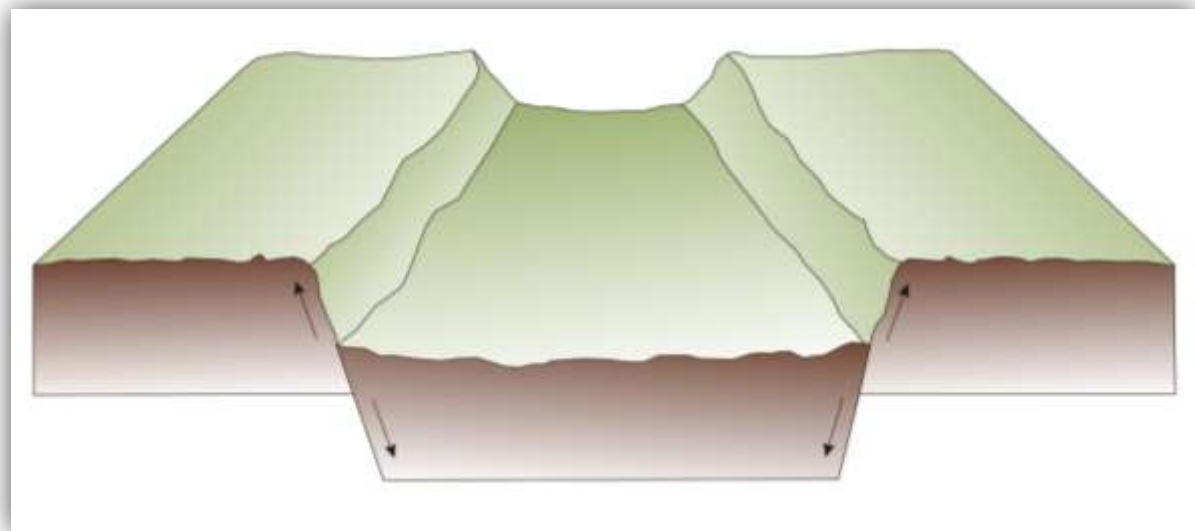


The earth's surface

- The high grounds or 'hills' and the low grounds or 'valleys' are commonly perceived by all.

- Hills and valleys result from movements in the earth and the long term processes of breaking-down the earth surface at some places and building it up at others. This is called *Diastrophism*.

Formation of landforms



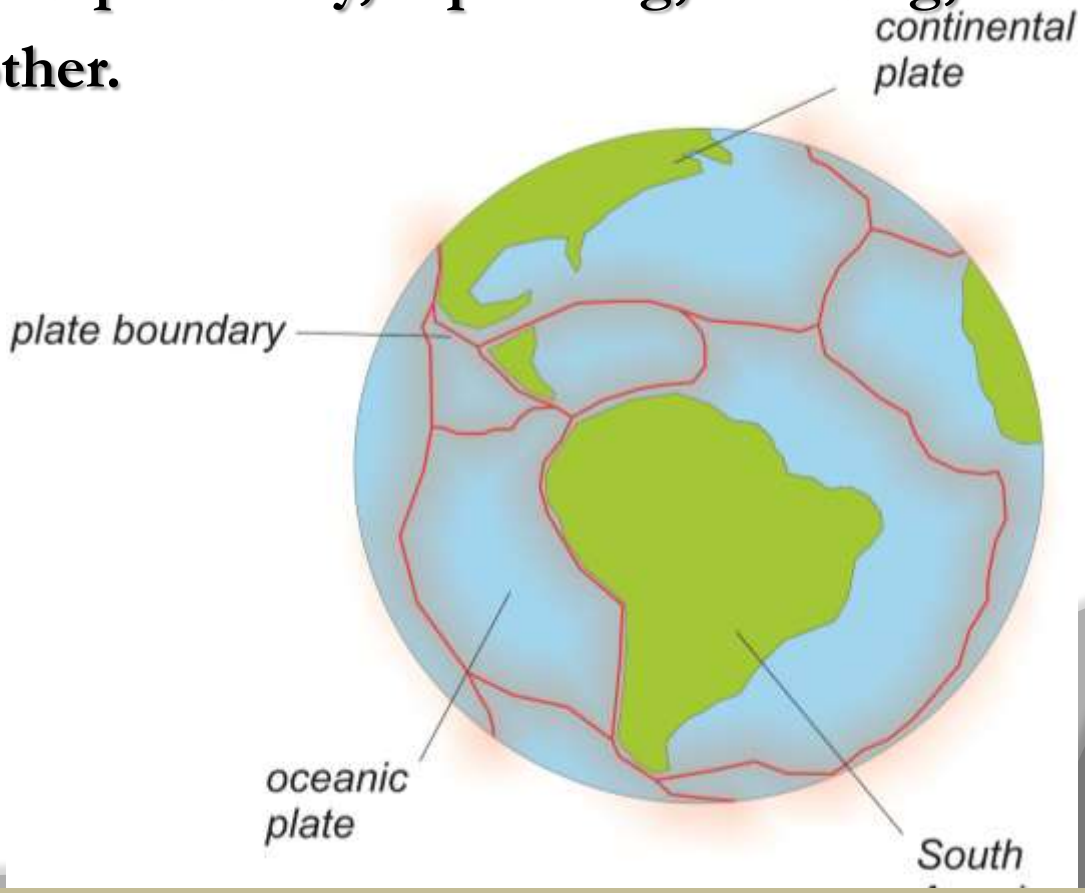
- The primary irregularities of surface / relief are formed by tectonic movements in the area.

- The moment the surface is exposed to the atmosphere various agencies of Diastrophism start operating.

A regional profile

The tectonic system and formation of landforms

The tectonic system involves the movement of the lithosphere, which is broken into a mosaic of separate plates. These plates move independently, separating, colliding, and sliding past one another.



Continents and plate boundaries

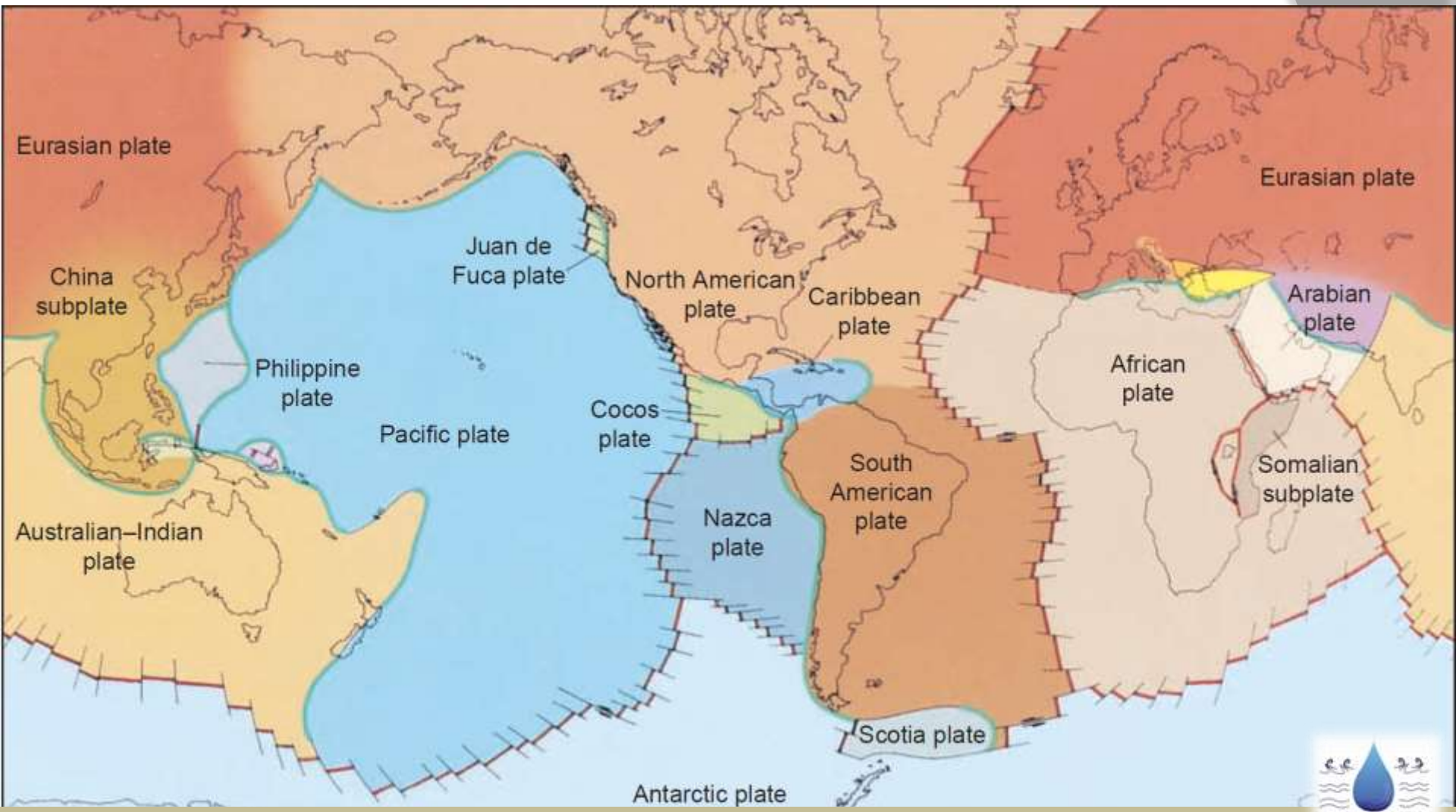
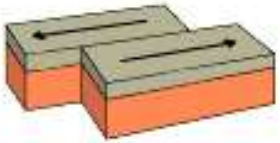
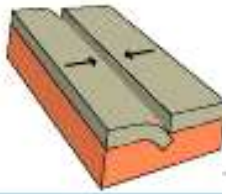
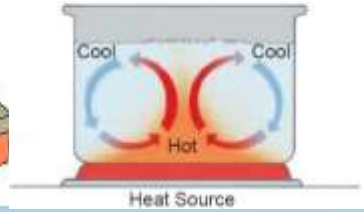
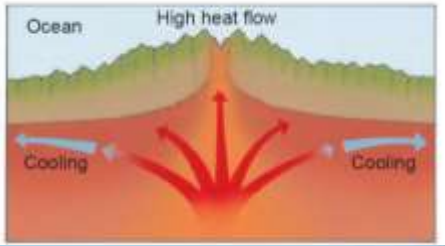


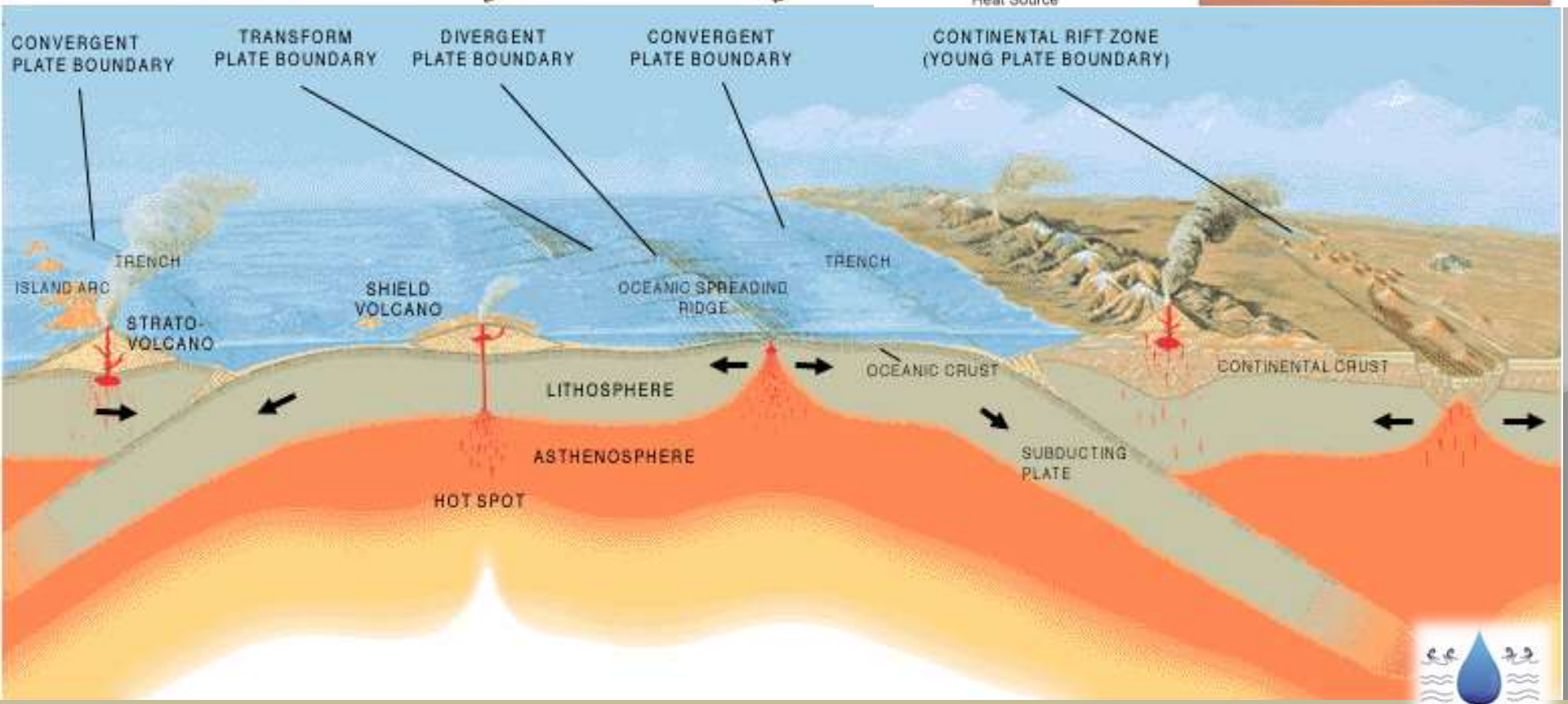
Plate movements











Higher the relief, higher is the rate of erosion, lower is weathering and lower the relief higher is the weathering and lower the erosion.

- Areas where the erosion is low and weathering is more, we get a thick sequence of altered rock
- Such areas have gentle slopes and low land forms

- Higher relief means faster erosion and slow weathering. Such areas have steeper slopes and more or less rugged landforms

Development of landforms

- A combination of erosion and weathering along with the relief helps in understanding the development of land forms and surfaces
- The agents, erosion and weathering, are also the agents of deposition
- Thus, complex play of various agents, form and shape the earths surface

The strength or rigor of the agencies of wear and building depends on:

- **Tectonics**
- **Climate**

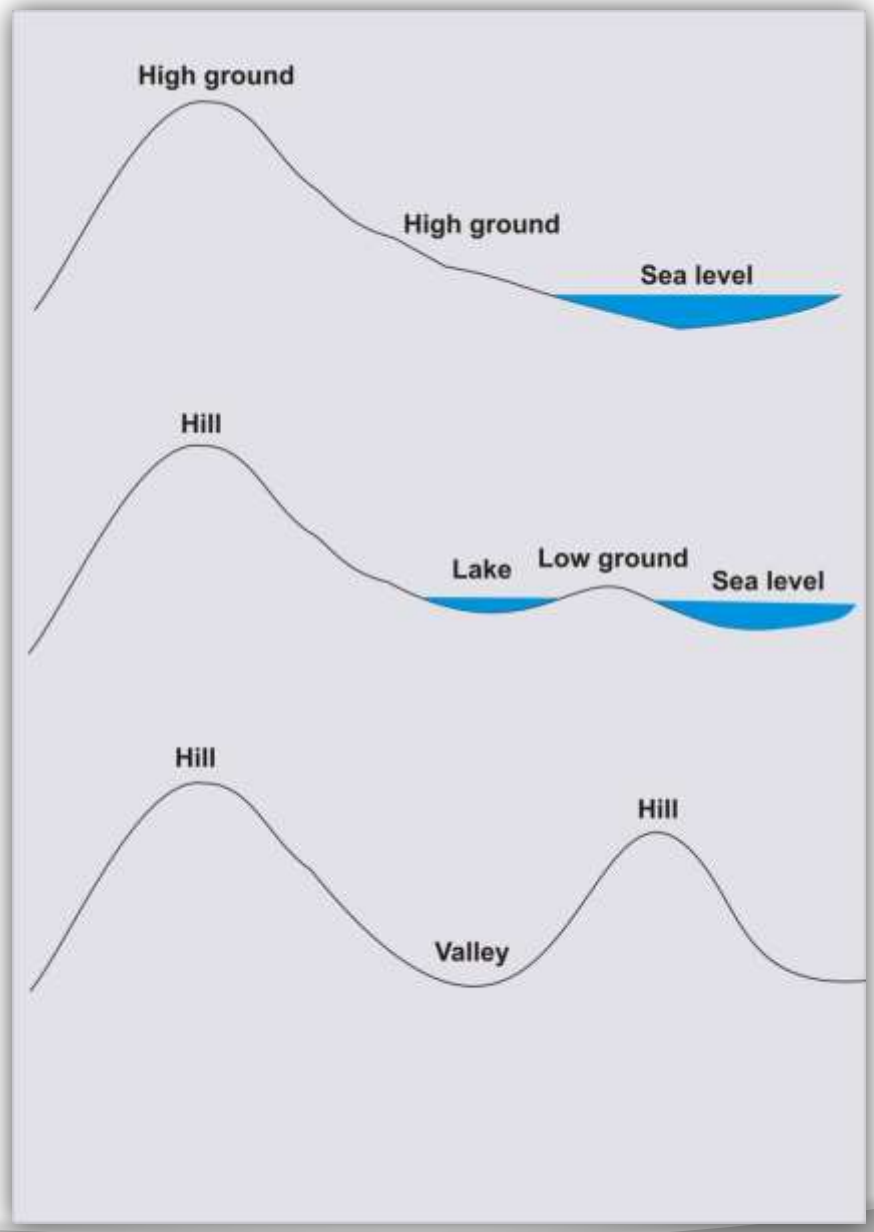
Processes

- The processes that wear down the irregularities are:
  - One which destroys the rock;
  - Other which removes the broken material
- The first action is called **Weathering**
- The second action is called **Erosion.**
- The processes operate simultaneously and at times are difficult to differentiate

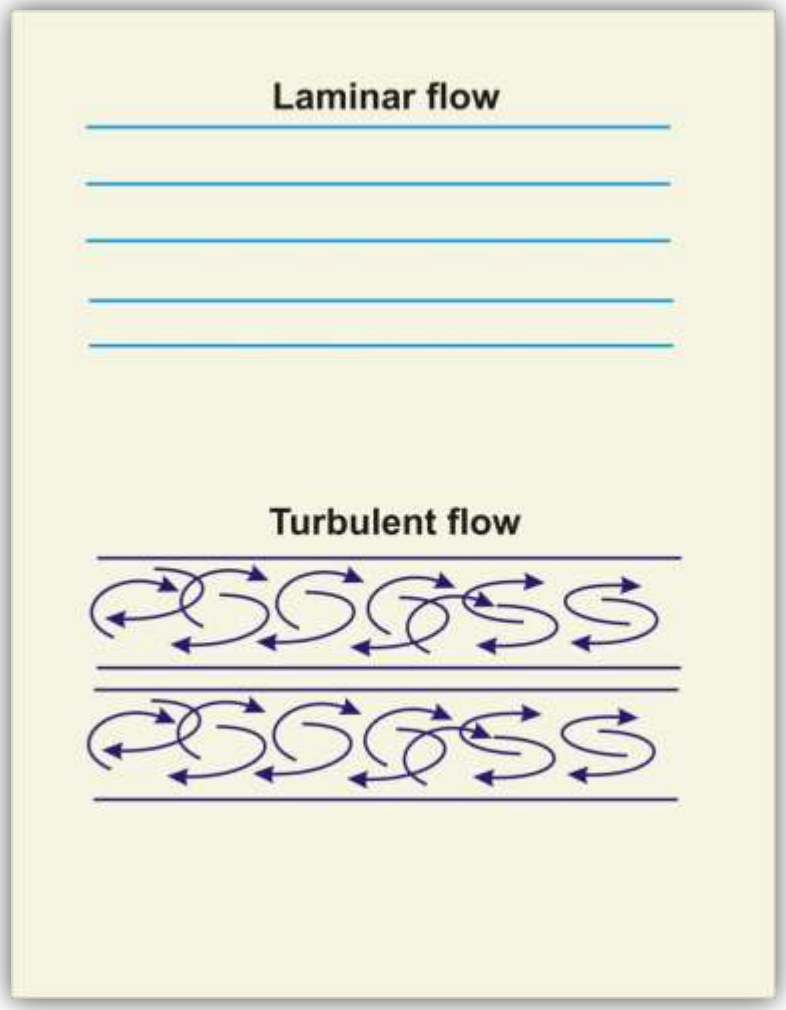
- Erosion and weathering set a particle free of its parent rock

- The particles or materials in solution start their journey towards a place where they can be more stable

- The transport from place of origin to place of rest is carried out by different agents
- Moving water, Air, Ice are main agents



- **The processes which scour the earth's surface, simultaneously build the surface elsewhere**



- Water works at various locales: rain water, streams ,sea waves etc.
- Moving water has modes in which it flows.
  - A) Laminar flow
  - B) Turbulent flow
- These two are interchangeable.

Modes of transport

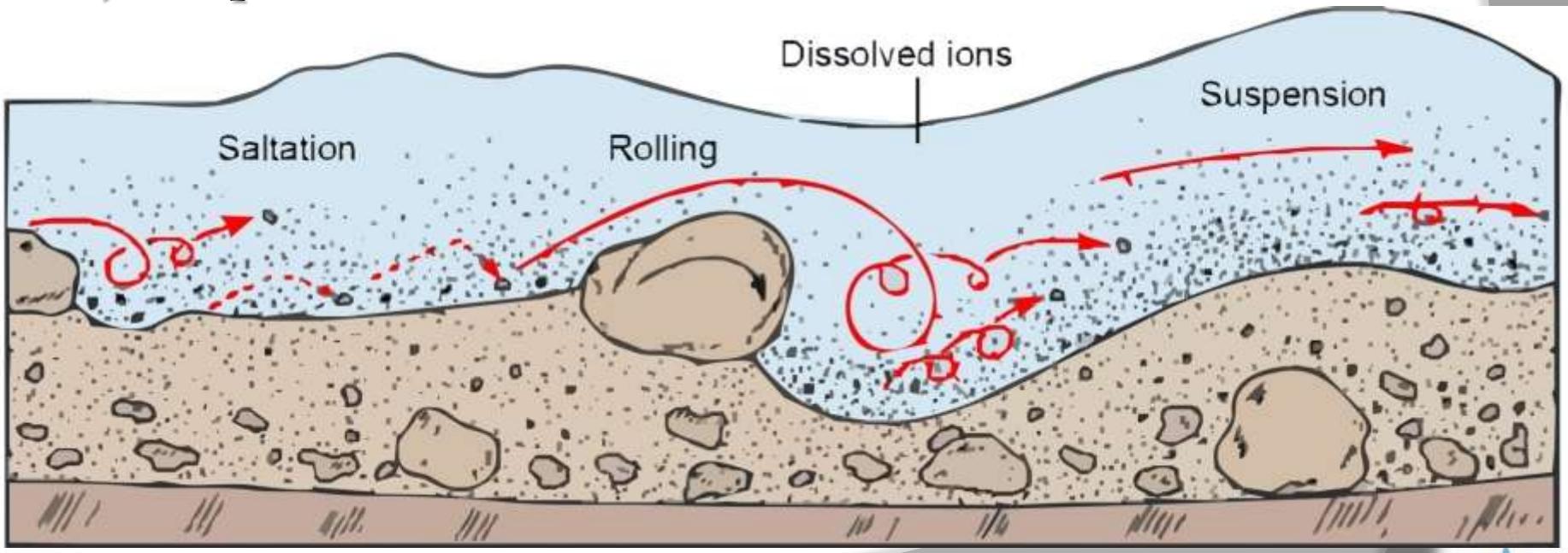
- These agents move material in:

a) suspension,

b) saltation and;

c) creep.

⊙ While creeping the material may move by sliding or rolling



- As the flows of agents vary, their capacities also change. Thus they may transport or deposit their load. In many instances they tend to erode their deposited material.

Thus Erosion and Deposition are interchangeable processes.

Types of processes

- There are two kinds of erosion and weathering

1. Mechanical
2. Chemical

- In mechanical process, the rock destroyed does not change, other than getting broken in to smaller size
- In chemical process, the rock essentially breaks into different chemical units where some may go into solution

Mechanical processes

- Mechanical process is common in extreme climates

e.g. very cold or very hot and dry weather

- Those rocks which are formed at high temperature and pressure are generally out of equilibrium at normal surface temperatures. So they tend to break up chemically faster than those that are formed at comparatively lower temperatures and pressures.

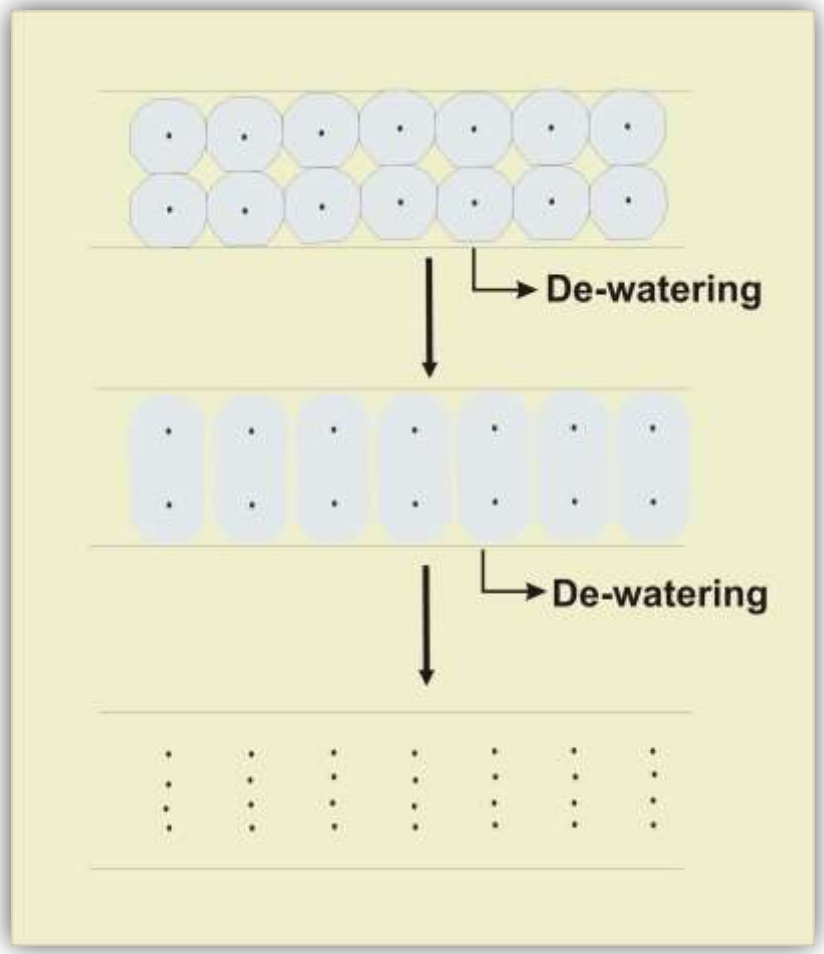
Chemical processes

Chemical weathering is the breakdown of minerals by chemical reactions with the atmosphere or hydrosphere.

The three main types of chemical reactions are (1) dissolution, (2) hydrolysis, and (3) oxidation

- As material is successively deposited at a place, the first deposited material is loaded with material deposited later.

- Due to this piling there is a pressure exerted on earlier deposits due to which they tend to become compact.



- Shale (fine grained sediments) undergo a large amount of compaction.
- Sandstones and conglomerates do not show much compaction.

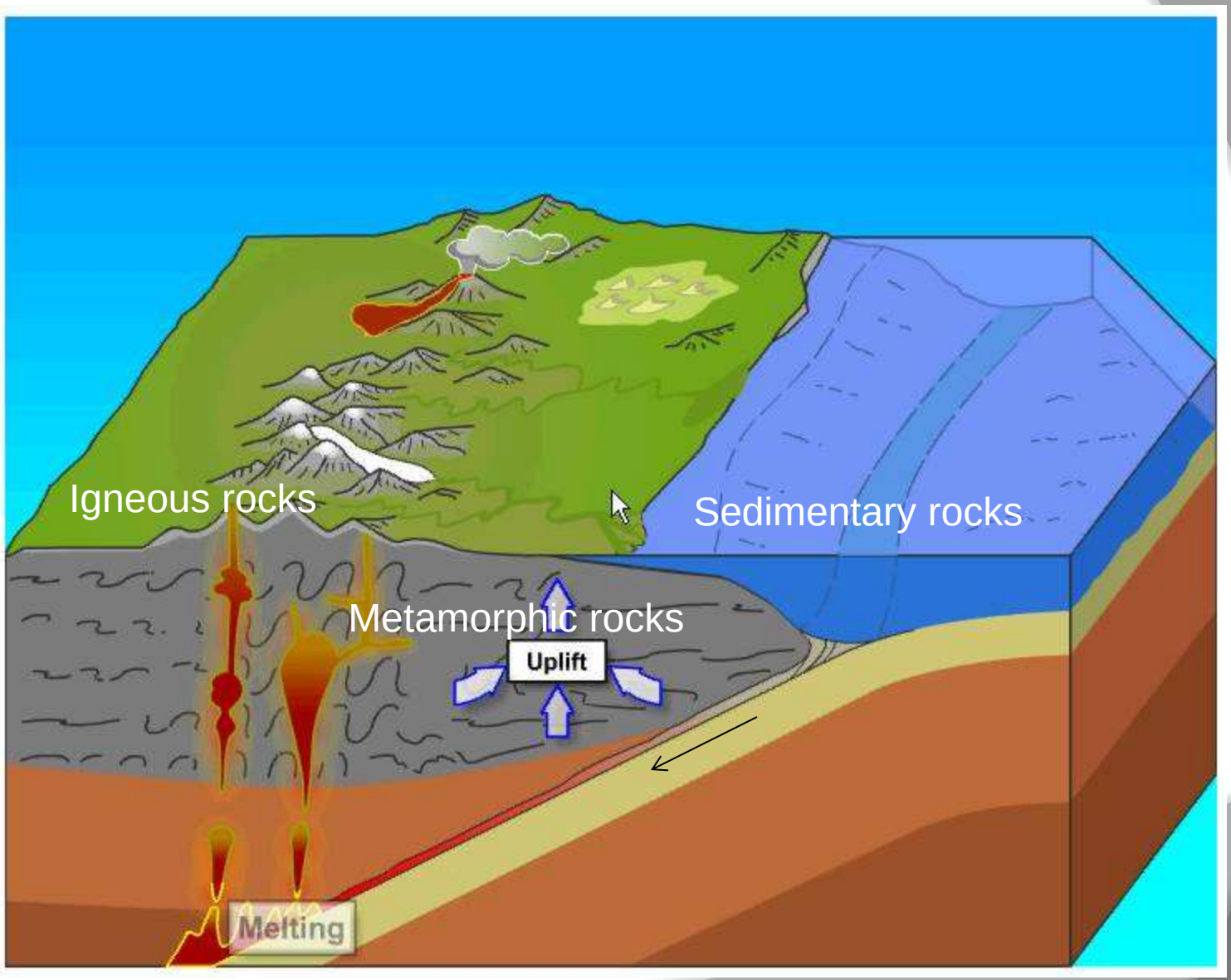
- Once a deposit is covered by subsequent one, it is often sealed and the chemistry of the fluids contained in the pores changes; new minerals are formed, earlier formed minerals are destroyed. This process is called Diagenesis

- As the rock pile increases the field of diagenesis changes to metamorphism

- After a limit of temperature and pressure, the rocks tend to melt and form molten rock material in the interior of the earth.

- This material then cools down to form Igneous rocks.

The rock cycle.....



Source: www.geolsoc.org.uk

THANK YOU