

TOPOGRAPHIC AND GEOLOGICAL MAPS, TOOLS OF GEOMORPHOLOGY

PRACTICAL WORK N° 1

I. DEFINTION

1) The topographic map : A topographic map is defined as the representation, on a plane, of a portion of the Earth's surface including its shapes and its relief.

The Establishment of topographic maps: The creation of a map requires two fundamental processes :

A. *planimetry.*

B. *And leveling*

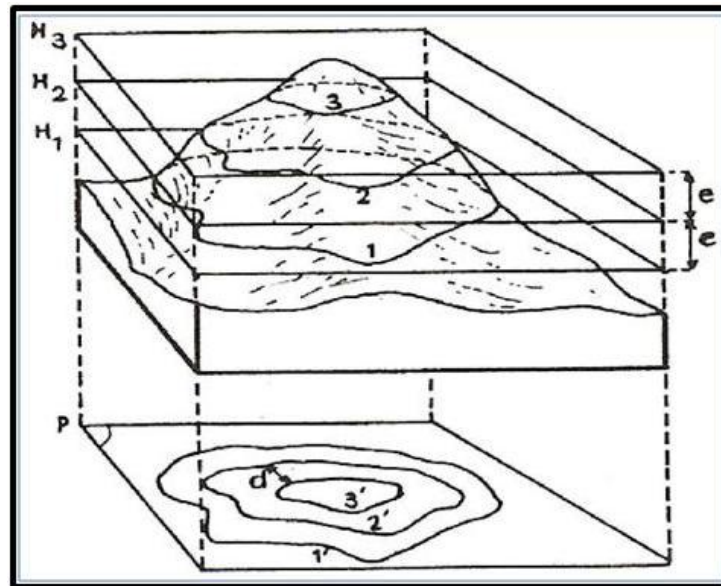
A. The planimetry :

- It is about the representation of the different aspects of the earth's surface on the topographic map using rational characteristic symbols whose meaning (signification) is specified in the legend of the map.
- ✓ **The blue** represents the hydrography.
- ✓ **Black** is used for everything that stems from human action, including toponymy (place names).
- ✓ **the green** associated with the vegetation
- ✓ **the orography** (contour line) is represented in bistre, a color close to brown.

B. Levelling: Facilitates the representation of the terrestrial relief :

○ **Contour lines system :**

- **The contour line:** is defined as the set of points on a topographic surface that share the same (Equivalent) altitude, that is to say the meeting point (intersect) between the topographic surface and a horizontal plane.
- **Method of creating contour lines :**
 - Let's take into account a series of horizontal planes (H1, H2 and H3) which are parallel figure below.
 - The points of intersection of the hill (Mound = Mountain) with these planes are indicated on the plane (P). These projections are called(named) contour lines.



Principle of establishment of contour lines

2) Geomorphology : concerns the examination of the natural elements observed on the Earth as well as the study of the processes that have led(result) to their current or historical distribution.

- She strives to define the forms according to their nature as well as their spatial dimensions.
- It offers a naturalistic approach based on the recognition(identification) and reasoned classification of objects.
- Then, it is based on the sciences of physical, chemical or biological processes to interpret the evolution of phenomena.
- And finally, it is a knowledge (science) that takes into account (regard) the complex interactions taking place at various scales on our planet.

➤ *For: Jacqueline Beaujeu-Garnier – (Geographical Information, Men and Lands of the North -1963- France).*

- ✓ *The idea of natural risks is a new physical geography that would focus only on the exceptional, the catastrophic, which would **examine anomalies** rather than the normal functioning of geosystems?*

II. THE TOPOGRAPHIC MAP

1. Topographic map reading: study of cartographic symbols (cartographic language).

A. the legend

- The landscape (topography) includes both natural and anthropogenic elements, that is, visible and invisible elements, whether of human or natural origin.

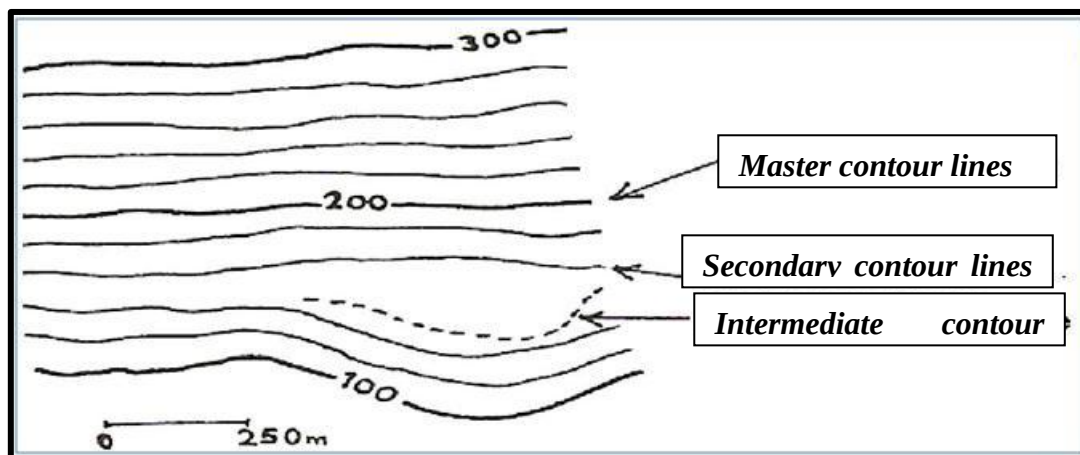
a) the visible natural elements

- **Orography:** presentation of relief forms (cornice, cliff, ridge, valley, etc.).
- **Hydrography** (distribution of surface waters): seasonal fluctuation of the legend (discontinuous watercourses).

- **Biogeography** ("natural" components: flora and fauna)

b) The invisible natural elements

- **Hypsometry** (contour lines, isobaths below sea level)
 - **Equidistance**: constant altitude difference separating two consecutive contour lines; depending on the relief, the equidistance varies between 5 and 20 m on maps on a scale of 1 : 50,000.
 - **Master contour lines** :
 - **Secondary contour lines** :
 - **Intermediate contour lines** :



Different types of contour lines

c) visible anthropogenic elements

- **Communication channels**
- **Buildings, dams(barrage), canals, historical remains**
- **Crops(culture).**
- **Energy transmission lines**

d) the invisible anthropogenic elements

- **Population**
- **Administrative limits**
- **Geographical coordinates (altitude, longitude, latitude)**

B. the Scale

- **A Proportion that illustrates the ratio between the lengths(distance) on the map and in the real world (terrain).**

$$S = L_m / L_{ter}$$

With **S :** **Scale ;**
 L_m : **Lengths on the map ;**
 L_{ter} : **Lengths on the terrain.**

- A scale of 1/50000 indicates that 1 cm on the map represents 50,000 cm or 500 m in reality.

- **Small scale:** significant reduction, the real object is small in size on the map (1/500,000 and more). We have a big denominator.

- **Large scale:** low reduction (1/50,000 and less). Low denominator.

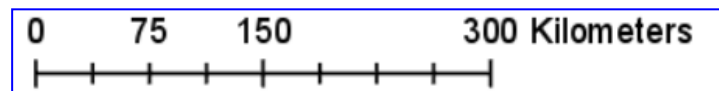
Example:

if two points are 5km apart on the ground and 10cm apart on the map, the scale of the latter is :

$$E = 10\text{cm} / 5\text{km} = 10\text{cm} / 5000\text{m} = 10\text{cm} / 500.000\text{cm} = 1/50.000$$

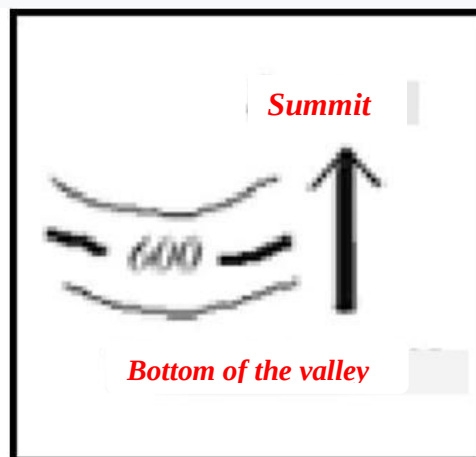
- ❖ We are talking about a 1/50.000 scale map or a fiftieth thousand (50.0000) map.
- ❖ In a cartographic document, the scale is presented in the following way :

a. **graphical representation: straight line subdivided into segments :**



b. **Digital: shaped digital ratio: 1/10,000, 1/20,000**

- The altitude of the contour lines is often specified throughout their course. Theoretically, the bottom of the figures indicating this altitude is oriented towards the foot of the slope.
- Bottom of the valley



C. the Orientation

- **Three (3) norths are used**

- * **the cartographic north** (y). Nord Lambert in France
- * **the geographical north** (indicated by the meridians therefore by the edge of the map)
- * **the magnetic north** (declination).

- **North (geographical):** trace of the axis of rotation of the terrestrial globe on the surface of the planet.

This is the place where the meridians of the earth meet.

- **North (magnetic):** place of convergence (meeting) of the lines of force of the Earth's magnetic field.

III. TOPOGRAPHIC ANALYSIS

- **What is topographic reading?**
 - It's a question of controlling the situation, organizing and managing the cartographic information to answer the questions we have?
- **How to Position the map.**
 - Geographical context (mountainous, coastal, plains area).
- **Presentation of the main formations (sets) of relief.**

This is done using two(2) tools:

 - the esquisse.
 - and the topographic profile.
- **Topographic Sketch (esquisse):** simplified representation of the map in aerial view to accent the main aspects of the relief.
- **Topographic Profile:** it is an illustration of the topography in accordance with a vertical plane.
- ❖ **The description of the topography**
 - It is a question of know the different relief units.
 - Section of the map presenting a uniform relief (valley, plain, plateau), including a description of a unit as:
 - dimensions,
 - placement,
 - orientation, average altitude,
 - importance and density of the hydrographic network.

Example :

- a mound: flat-topped topographic relief ;
- a hill (isolated low-altitude relief with a rounded top) can be, morphologically, anticline structure),

A Note :

- The description consists of a reading of the card (description). Its objective is to ask questions and address issues that will be determined by the geomorphological study.

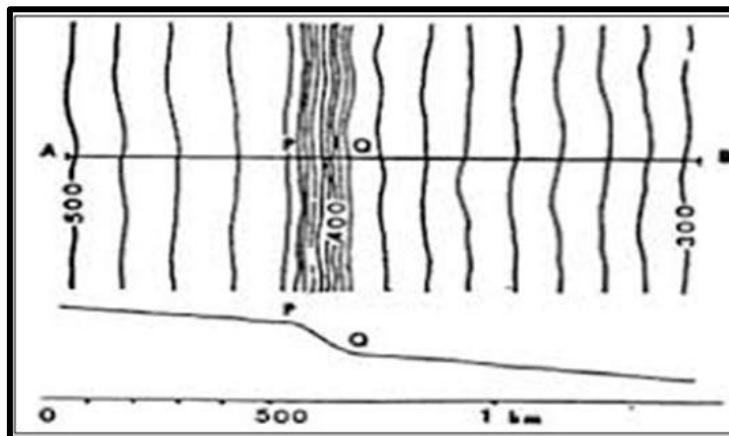
- The topographic comment is therefore elaborated according to this scheme :

- 1 - General geographical location (introduction)
- 2 - presentation of the important sets (structures) : sketch(esquisse) and drawing(graph).
- 3 - description of the topography (profile)

IV.THE TOPOGRAPHIC VOCABULARY

□ **The elementary forms of the Slope:** inclined surface dominating the talweg of a valley. The slope of a slope is characterized by :

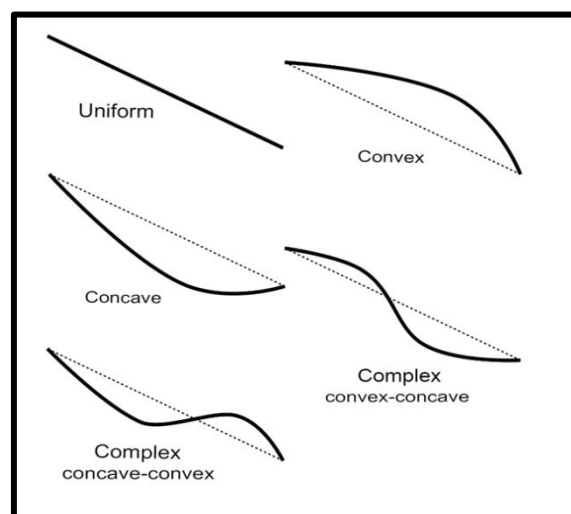
- *its value (degrees(°))*
- *or percentage (%) and its shape (concave, convex, rectilinear(uniform), convex-concave).*



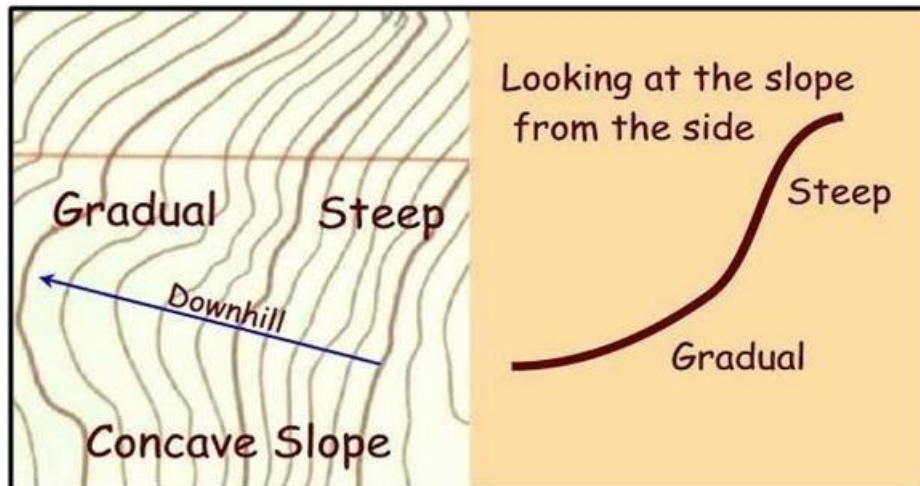
slope reapture

- A slope :

* A slope is the region that connects a ridge(crest) line to a depth (profundity)line, and can be subdivided into several(different) components.



Different types of slopes

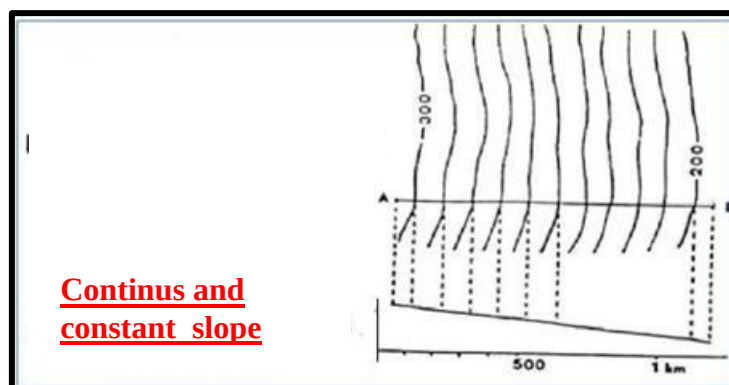


Steep and gradual slope

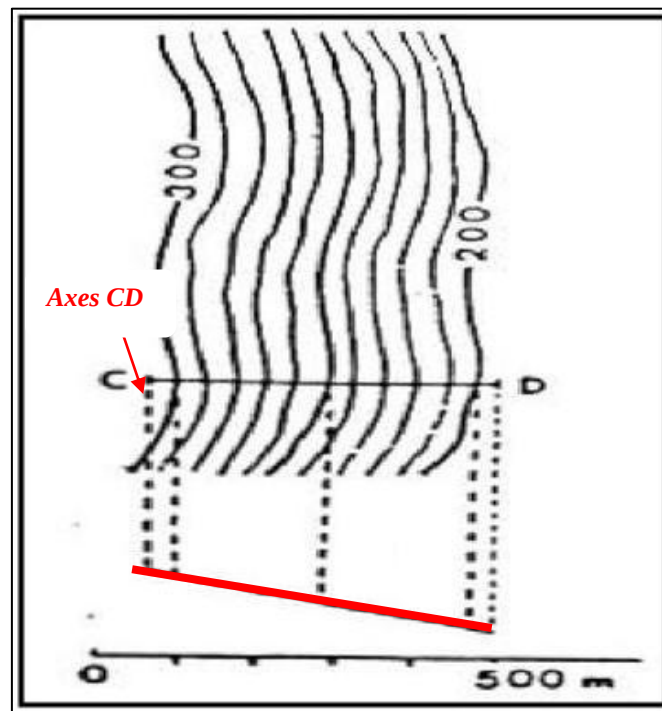
a) Constant slope :

- *When the contour lines are evenly(uniformly) spaced :*

- the steeper the slope (winkles), the closer the contour lines are
- the lower (small) the slope, the more the contour lines are separated.



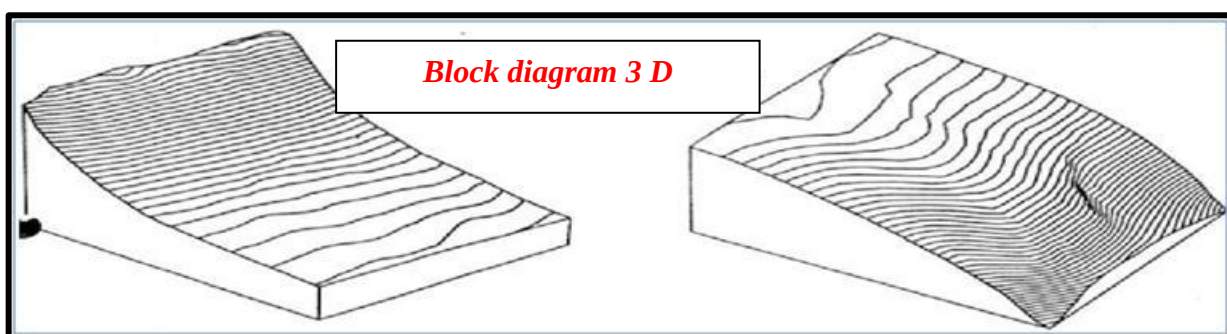
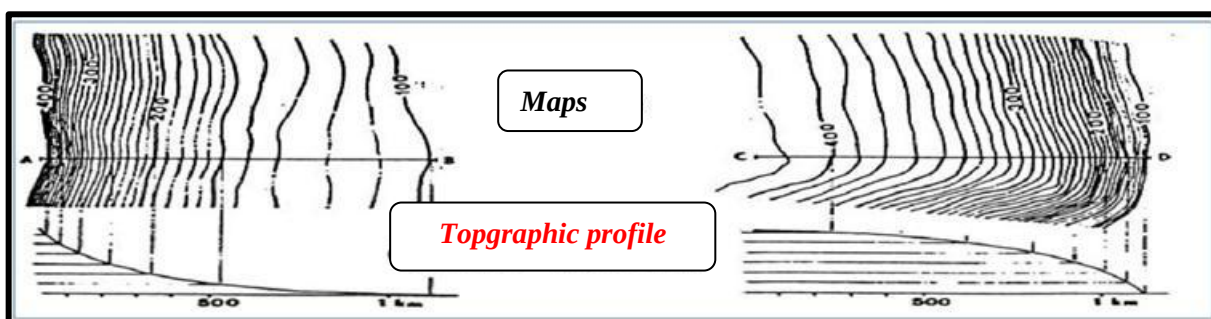
Constant slope



The rectilinear slope

b) **Regularly variable slope**

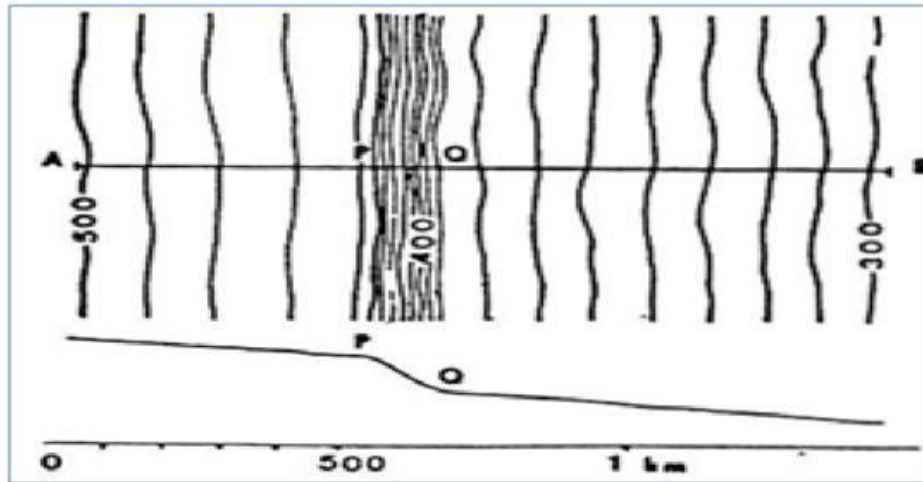
- ✓ **An concave slope** : is characterized by contour lines that are increasingly spaced apart as they go downwards.
- ✓ **An convex slope** : is characterized by increasingly tight contour lines going down



Concave slope and convex slope

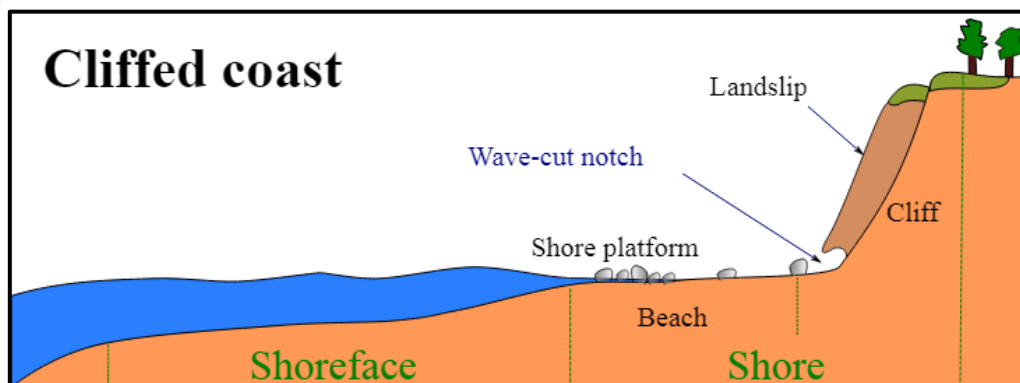
c) **Steeply varying slopes :**

- Slope break(cruch), steep and cliffs(scarp).
- The contour lines spacing changes abruptly(brusquely).



slope repture

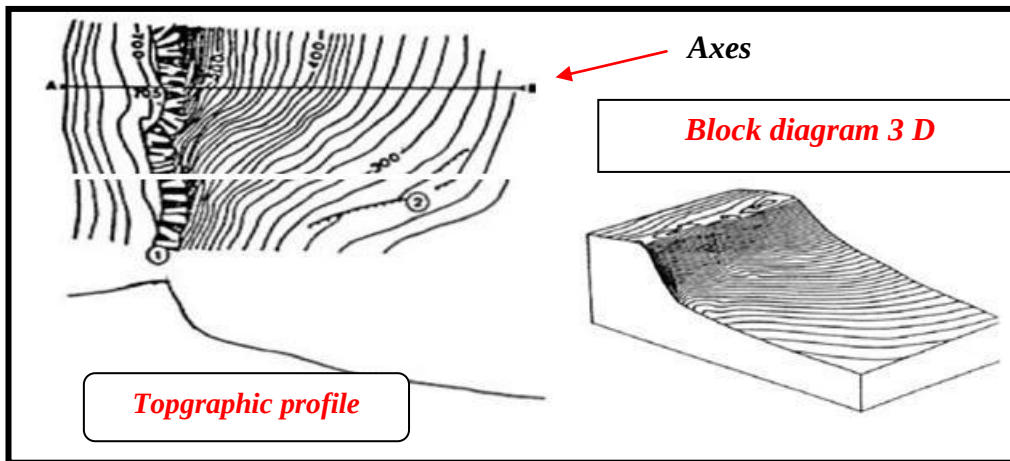
- * **Slope break:** sudden change in the value of the slope of a slope without changing direction.
- * **Flat:** space limited by two slope breaks within a slope.
- * **The cliffs:** When the slope of the terrain is extremely steep, the density of the contour lines is very important.



The cliffs:

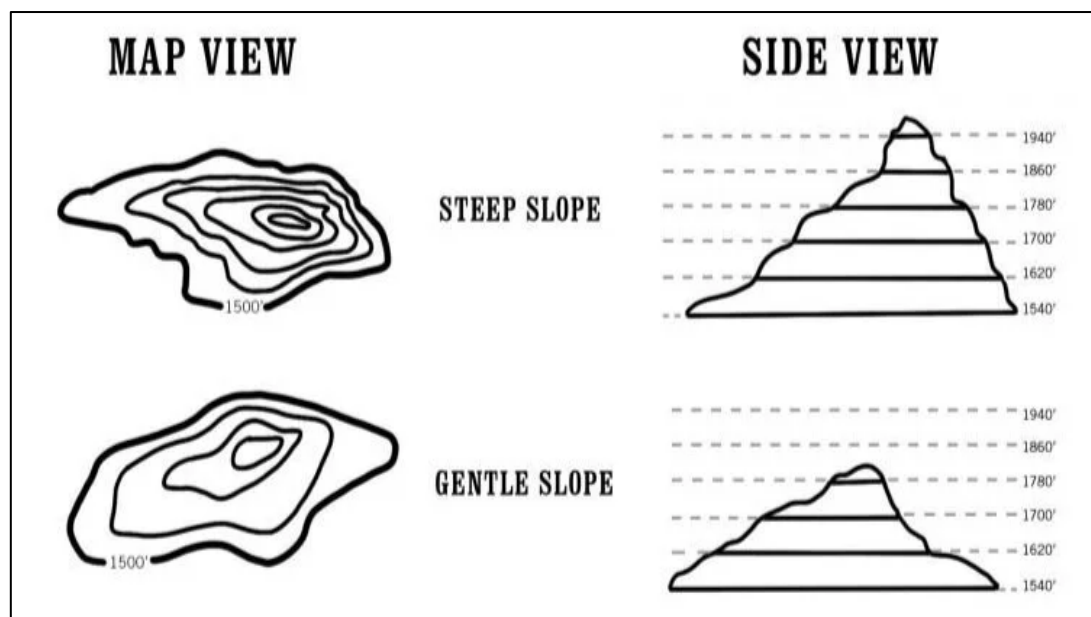


Cliffed coast



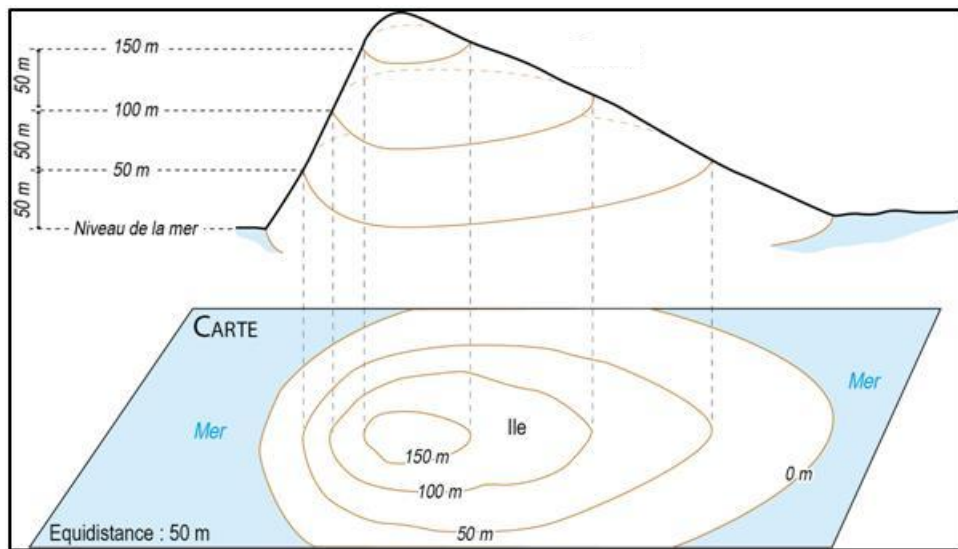
Steep and cliffs.

d) Gentle slope and steep slope



e) Summit(Hill) :

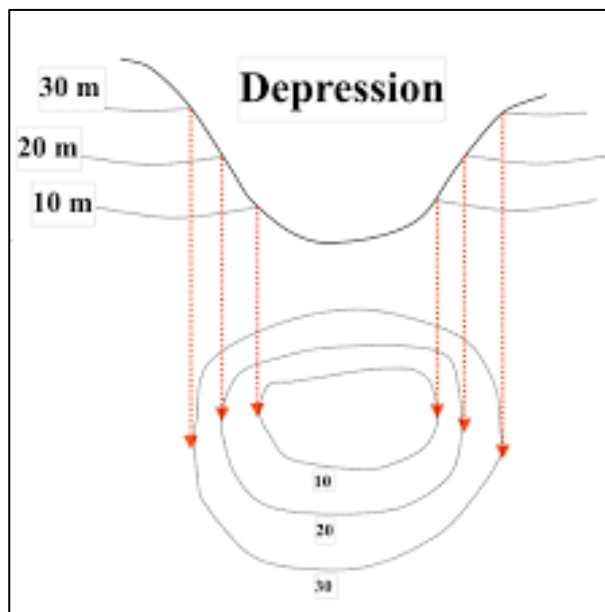
* The **contour lines** are arranged in concentric circles, the central point having a higher elevation than that of the curves that surround it.



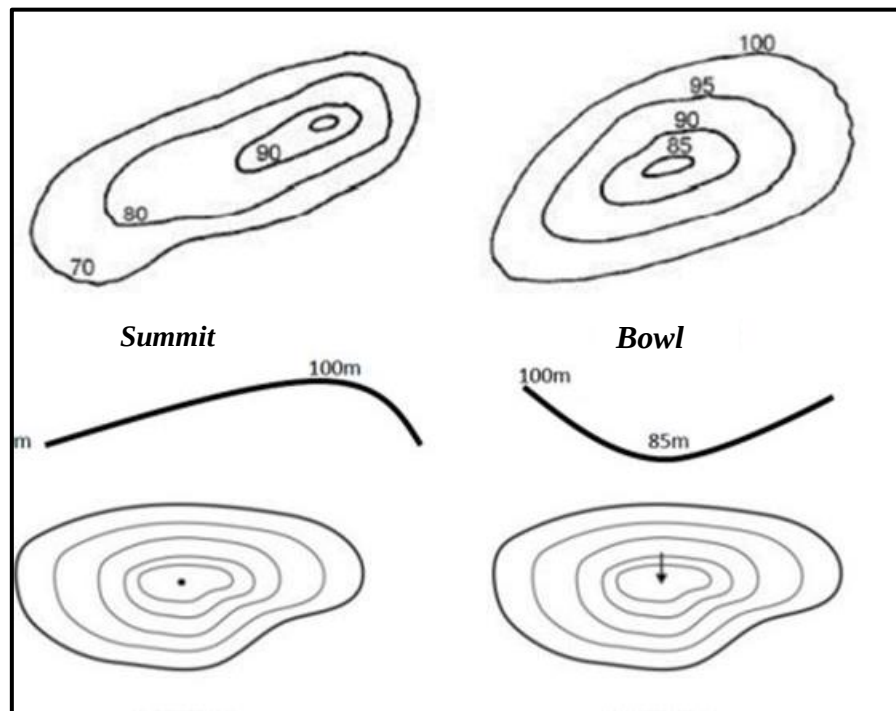
Summit, Mountain, Peak

f) Bowl :

* depression formed towards the bottom in which all the slopes converge.



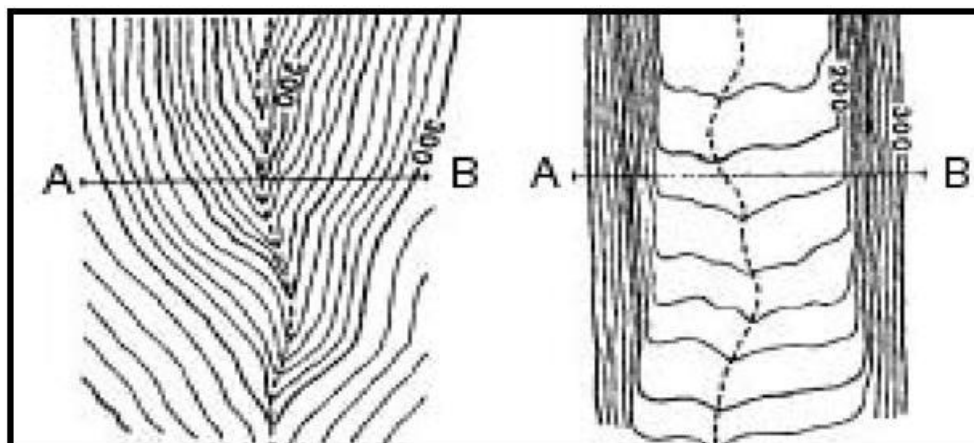
Bowl



Summit(Hill) and Bowl :

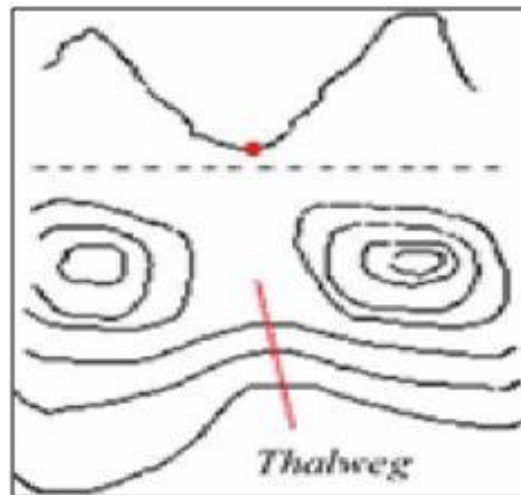
g) Shape of the valleys :

- ***The thalweg line:** This is the line connecting the lowest(minimum) points of a valley.
- **Valley:** geographical depression resulting from the intersection of two slopes along a line where the lowest (minimum) points are located. We call this line the talweg.
- **The V-shaped Valley:** The contour lines show an angular inflection when passing through the thalweg.
- **A flat-bottomed or U-shaped valley;** The drawing of the contour lines recalls the shape of the valley, tight on the slopes, they are spaced apart in the flat part

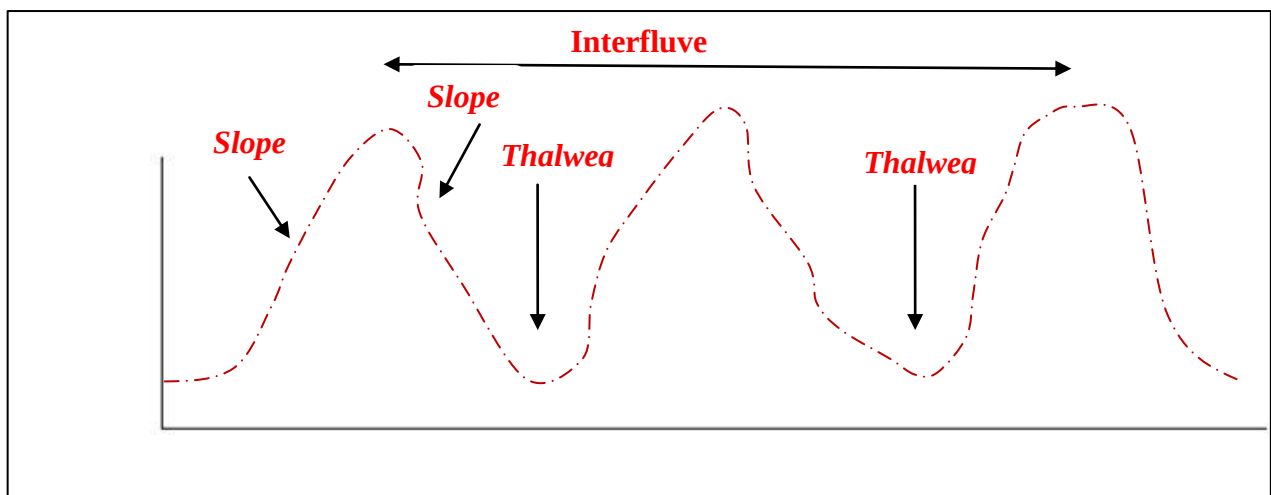


Shape of the valleys

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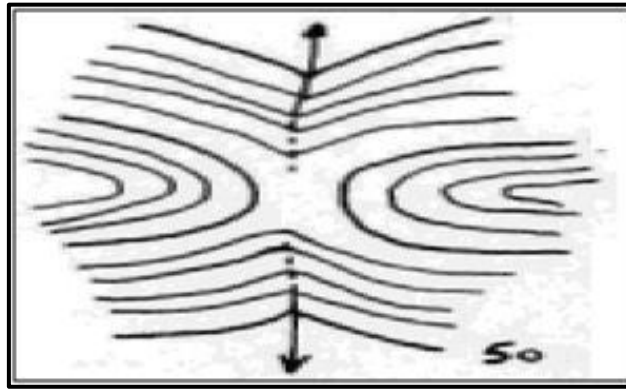
- **Interfluvium:** relief between two valleys.



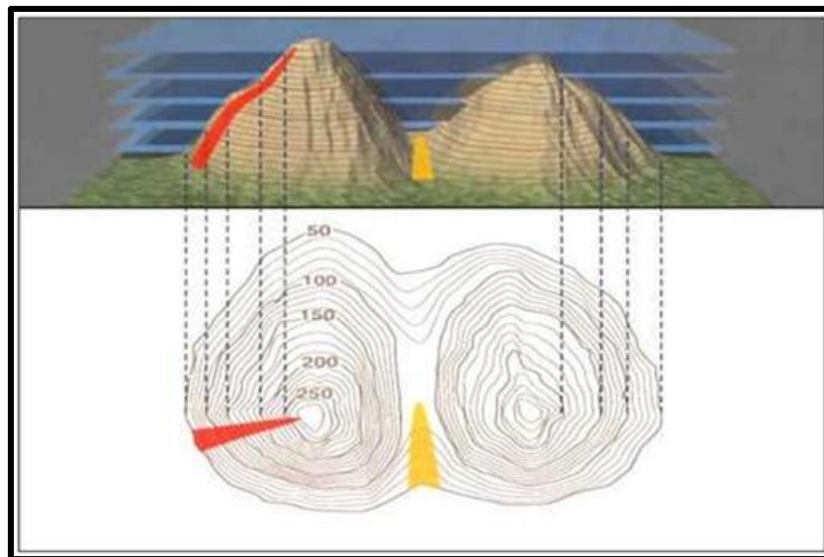
Interfluvium and Thalweg

h) The pass (Saddle):

It consists of the slope of a ridge line when it crosses two thalwegs with opposite orientations.



The pass (Saddle):



The topographic pass

i) Cliff ledge (Cornice) :

- Very steep slope at the top of the embankment.
- In the field of topography, a natural ledge is defined as a topographic structure marked by a resistant rock profile with a very steep slope, a vertical drop or a wall.

j) Dome:

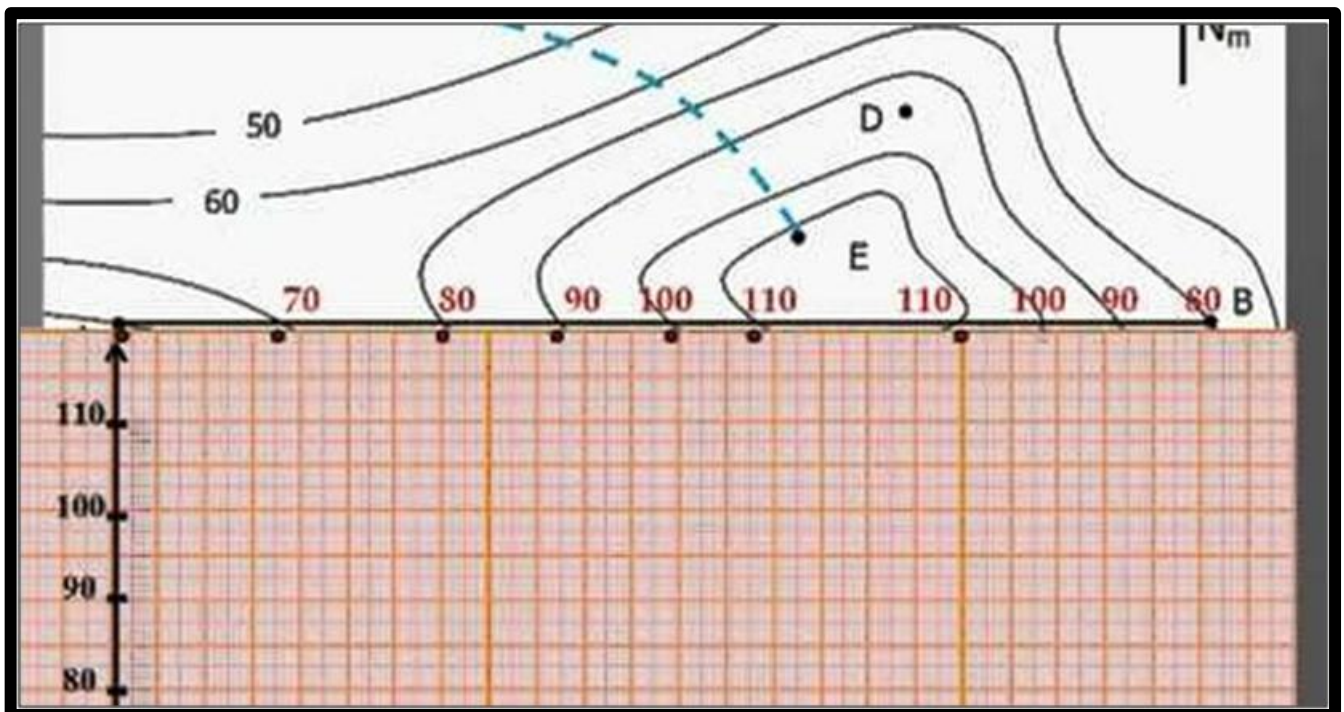
- In the field of topography, a dome is a relief structure, having a hemispherical or rather flattened shape, resulting either from the accumulation of substances such as viscous lava, or from erosion.

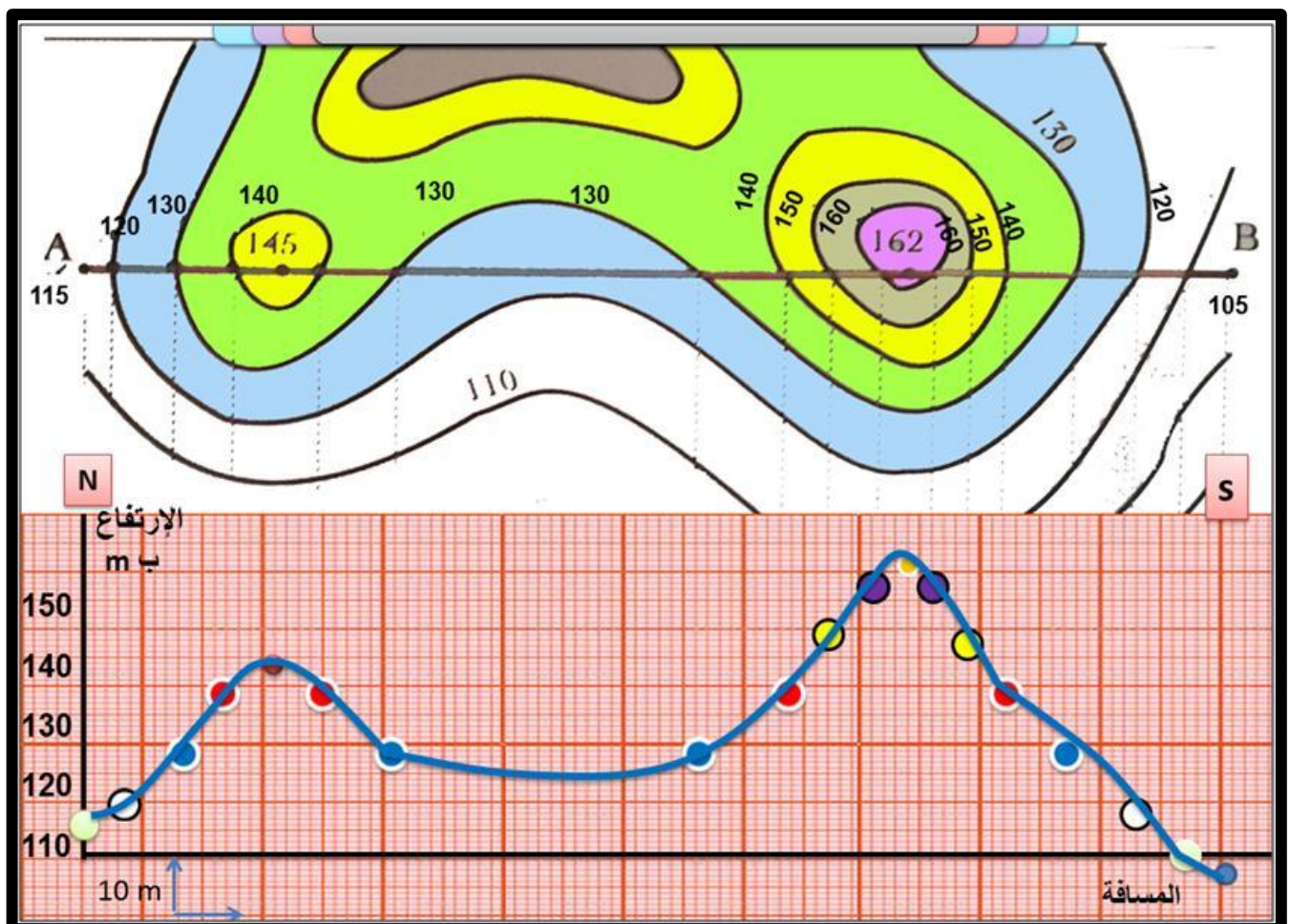
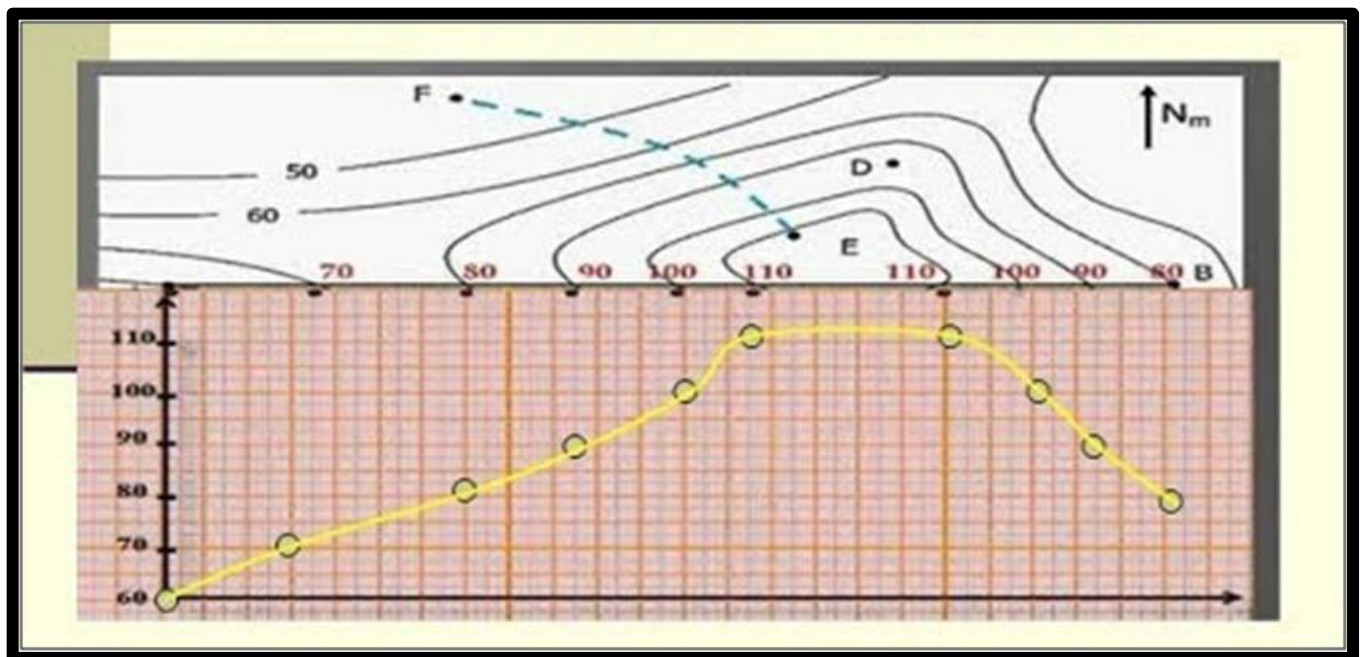
V. THE ESTABLISHMENT OF A TOPOGRAPHIC PROFILE :

A METHOD FOR MAKING A TOPOGRAPHIC PROFILE

the steps to be taken :

- We draw a line (axis)AB (Figure below) on a map at scale E (given).
- Next, on a rectangle of grid paper, we draw two perpendicular axes.
 - The X-axis will represent the scale of the distances,
 - while the Y-axis will illustrate the scale of the heights (altitude).
- Determine the reference point for the height axis (scale) based on the lowest and highest altitude.
- Position the top edge of the graph paper in alignment with the cutting line AB.
- Indicate on this document the points A 'B' which correspond to A and B, then note the altitudes of these points as well as those of the points where the contour lines intersect the line AB; as these are destined to disappear, trace them gently.
- These points are reduced (projected) to their corresponding altitude taken from the previously plotted height axis.
- These points thus lowered will be connected to each other.





Bibliography :

- ✓ de Jean-Claude Thouret - *Géographie physique appliquée, risques naturels*. In Max Derruau (dir.) - *Composantes et concepts de la géographie physique*. 1996. Armand Colin, pages 167-180.