

GROUND DYNAMICS: ROCK DEFORMATION

TEMA 2

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2.3. Failure combinations. Reliefs associated with faults

3. THE FOLDINGS AND THEIR TYPES

3.1. Elements of a fold

3.2. Types of folds

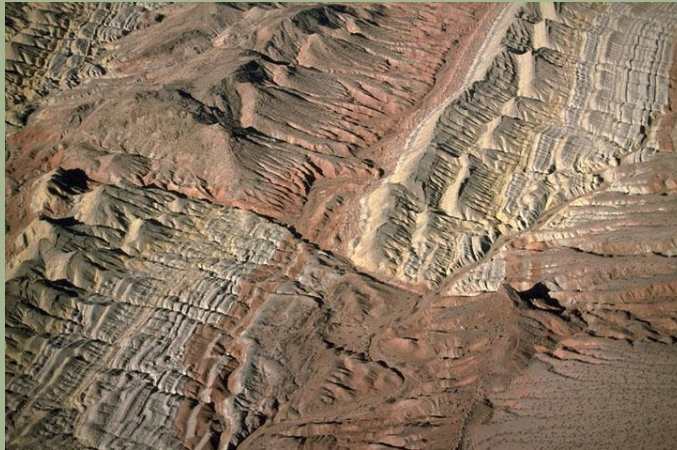
3.3. Combinations of folds. Reliefs associated with folds



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1. THE DEFORMATION OF ROCKS

In the earth's crust the presence of deformed rocks (folded or fractured) is frequent, indicating that, at some point, they were subjected to intense forces.



The deformation of the rocks results from the movements that occur in the earth's crust as a result of plate tectonics.

Rock deformations can be studied especially well in sedimentary rocks.



1.1. TYPES OF EFFORTS AND BEHAVIOR OF ROCKS

All material on which a force acts tends to deform first and if the effort is very intense or prolonged over time it can become fractured.

The stresses to which the rocks are subjected are determined by the relative movements between the tectonic plates.

They may be:

- Compression when the forces that cause them are opposite and convergent.



compresión

- Of distension or traction when the forces are opposite and divergent



distensión
o tracción

- Shear when forces are parallel, divergent or convergent

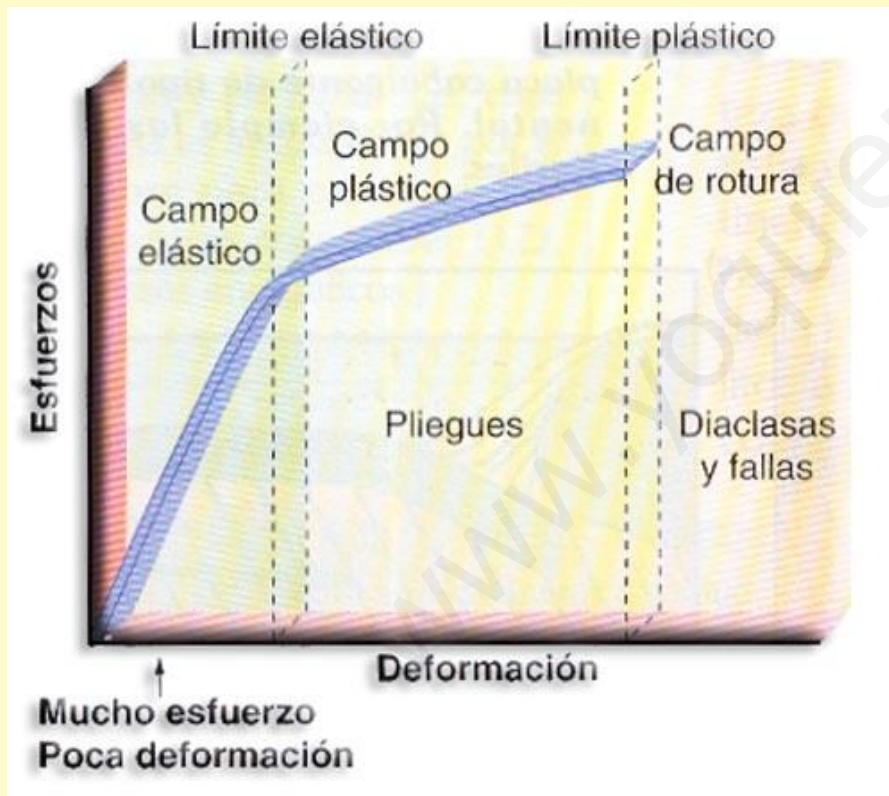


cizalla

The deformation depends on the forces that act, the time they act and the behavior of the material on which they act.

Materials may have a behavior:

- **Elastic:** if it deforms but, when the forces cease, it recovers its initial form
- **Plastic:** if it deforms but, when the forces cease, it does not recover its initial form and remains deformed
- **Fragile:** if it deforms breaking.



All materials subjected to stress tend to deform elastically, if the forces increase or persist, it behaves in a plastic way, but exceeding a threshold it fractures.

The behavior varies according to different factors:

- the pressure
- temperature
- time

2.THE FAULTS AND THEIR TYPES

In fragile deformations the materials fracture. There are two types of fractures: diaclasses and failures

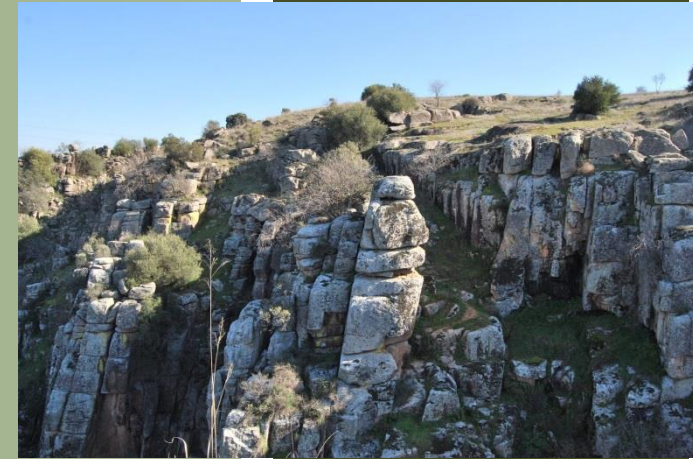
DIACLASAS: *they are fractures of the rocks without displacement of the broken blocks. They are important elements of the relief because erosion can progress through them. They can be produced by:*



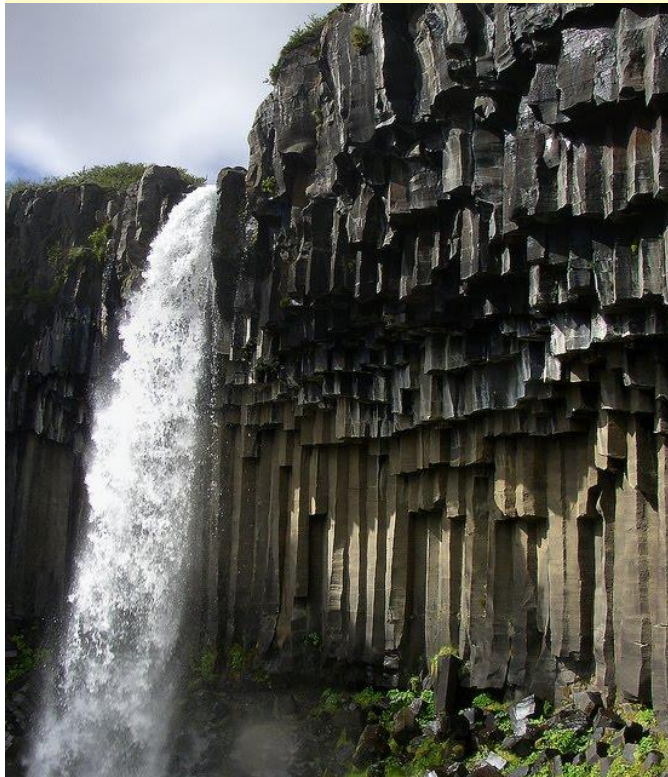
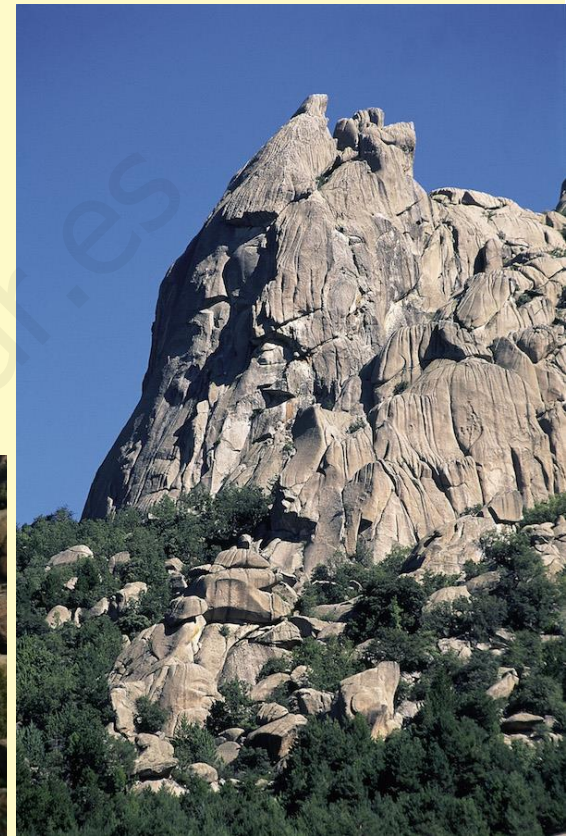
Dehydration
(for example the
clays)



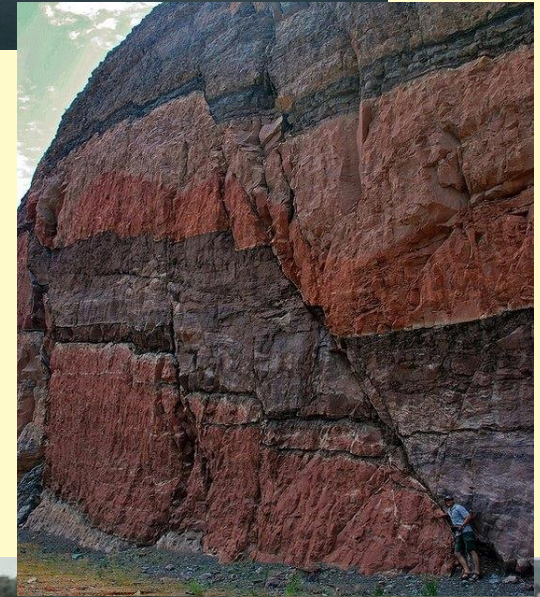
Cooling a magma:
for example spherical
disjunction or in basalt
columns



Decompression:
associated with plutonic rocks
when erosion lowers the weight
that deep materials support (for
example granite diaclassing).
They can be orthogonal (and
form towers) or spheroidal
(forming domes)



- **FAULTS:** The faults are fractures of the rocks according to planes of weakness. They occur when the plastic deformation threshold of the materials has been exceeded. As a result, one block moves with respect to the other.



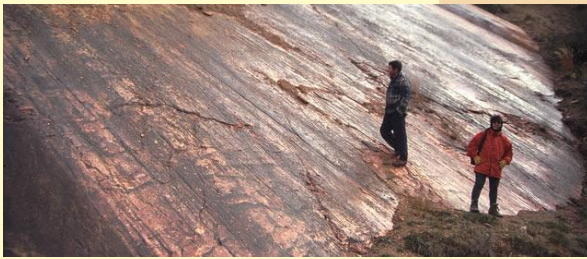
The movement of the blocks of a fault releases energy that propagates as seismic vibrations. The active faults are the places where the foci or hypocenter of the earthquakes are located.



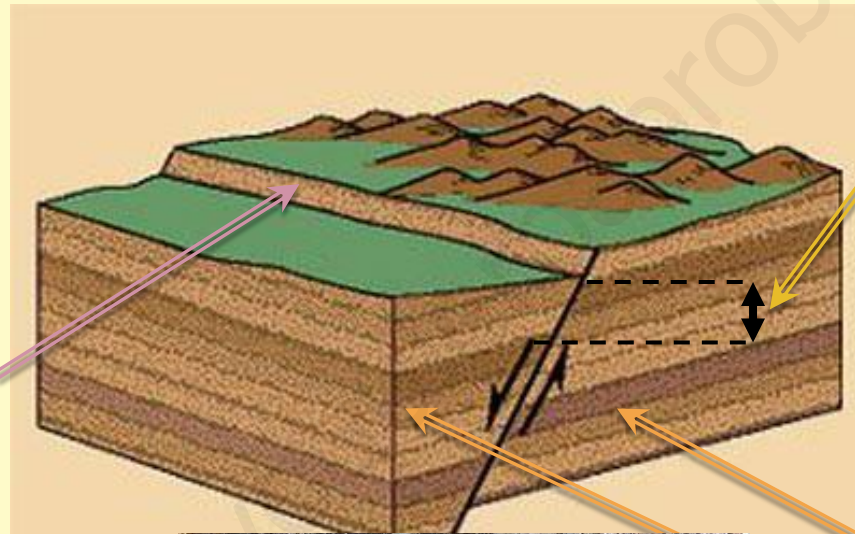
2.1. ELEMENTS OF A FAILURE

In the failures we can recognize the following elements:

Failure plane: it is the surface along which the displacement of the rocky blocks occurs
On its surface you can recognize:



Failure mirror: areas polished by the friction of the displaced blocks



Failure jump: is the displacement (measured in the vertical) that occurs between two points that were previously contiguous in the blocks

Failure lips: these are the blocks that have moved along the plane: According to the relative movement they have suffered, we can identify a:

- block / lip raised and other
- sunken block / lip.



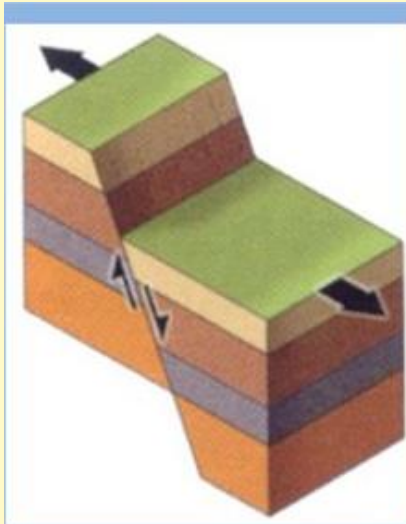
Failure stretch marks: parallel grooves that indicate the direction of movement of the blocks when a stronger element scratches on the fault plane

Ver archivo:
Fallas



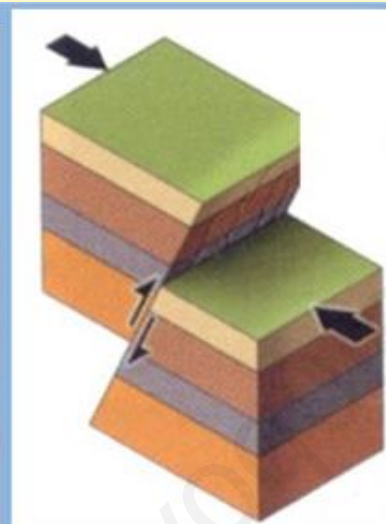
2.2. TYPES OF FAILURES

The main types of failures are:



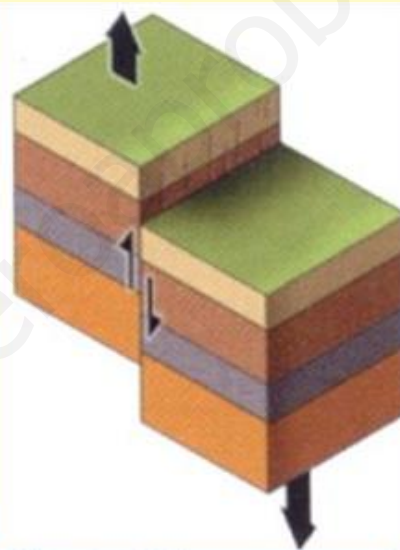
Falla normal o directa

Se origina por fuerzas distensivas. El bloque de techo descende.



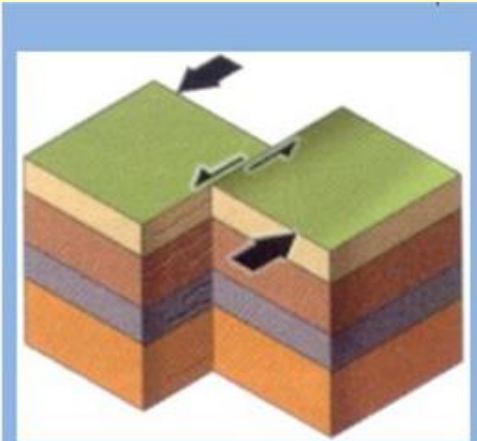
Falla inversa

Se origina por fuerzas compresivas. El bloque de techo asciende.

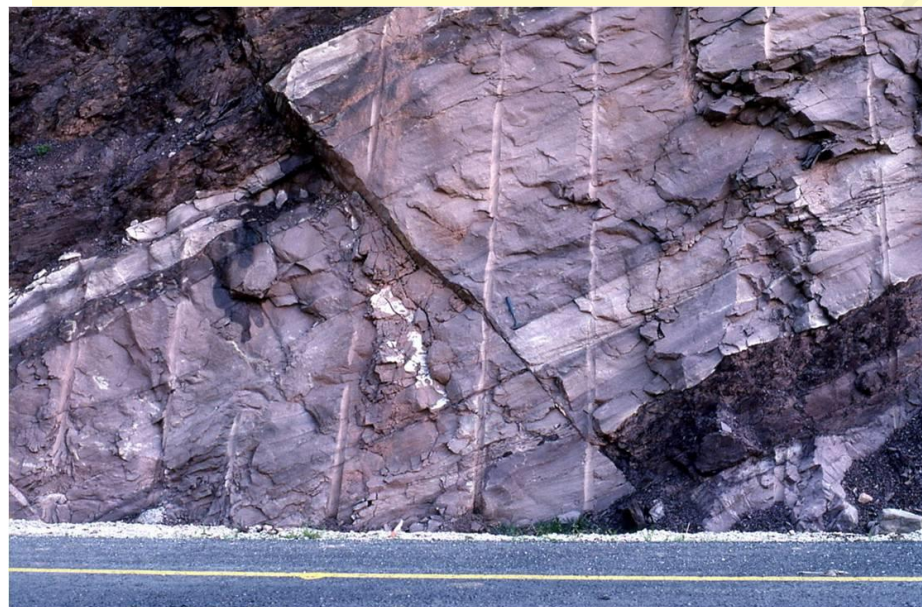
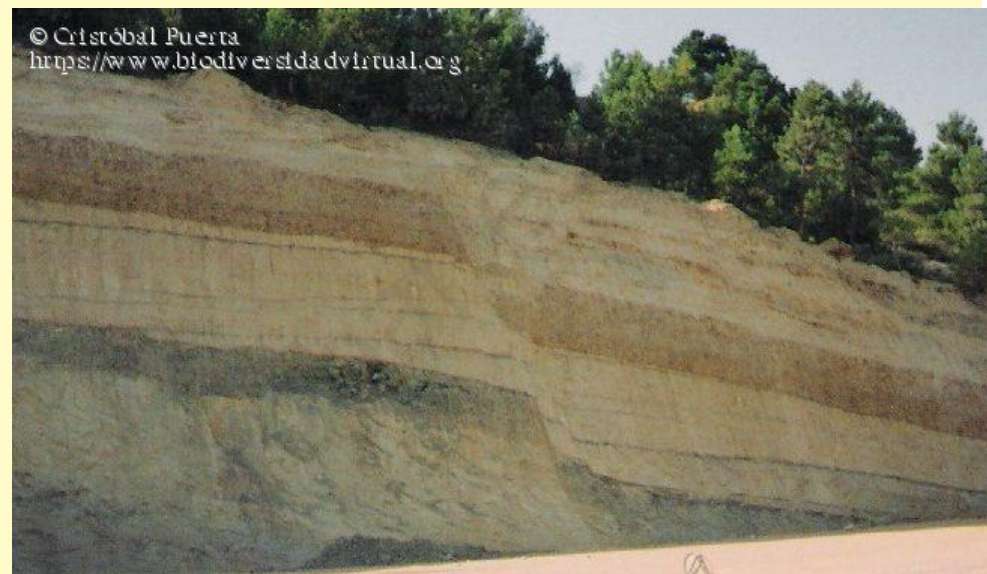


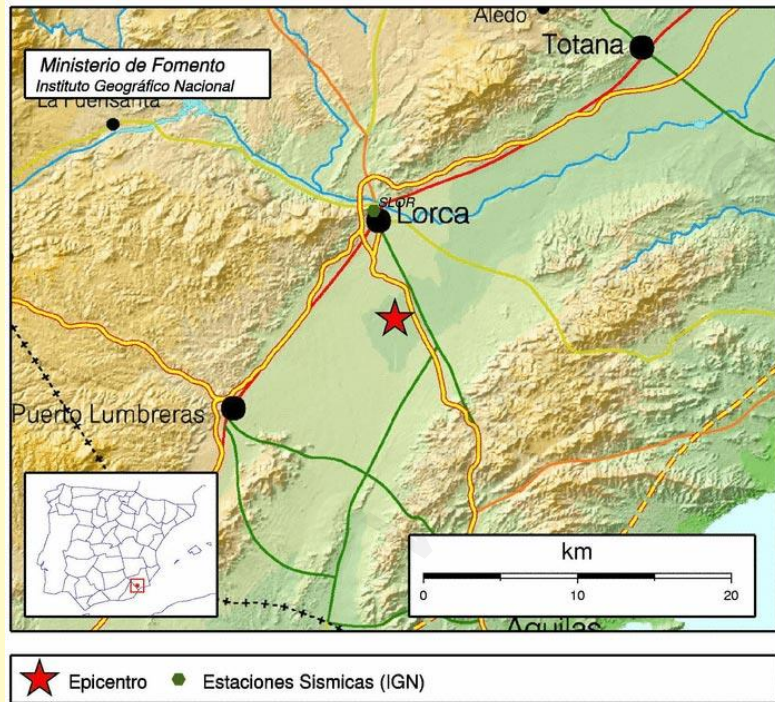
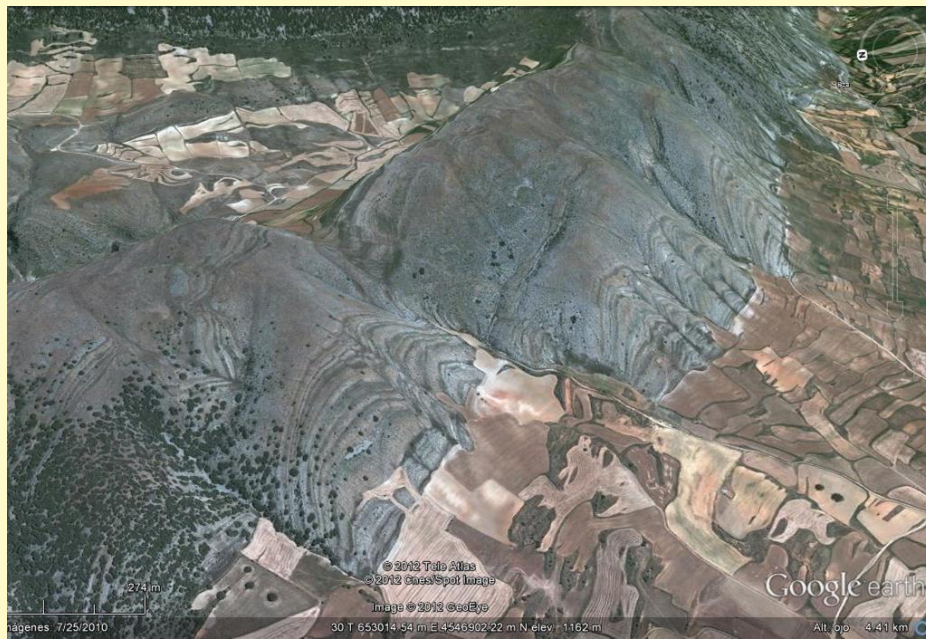
Falla vertical

Se originan por fuerzas de cizalladura. El nombre de la falla designa el tipo de movimiento (vertical u horizontal)



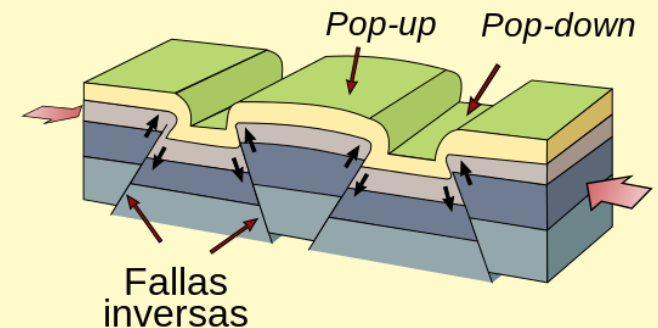
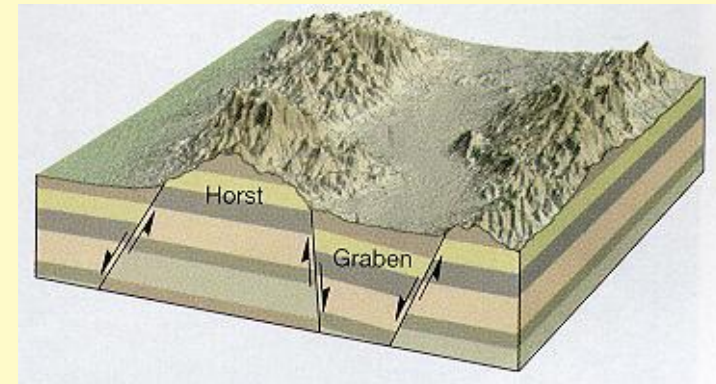
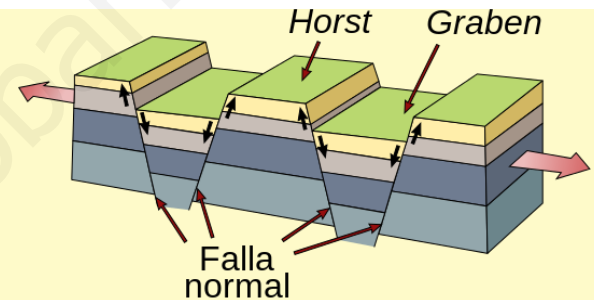
Falla horizontal o de desgarre

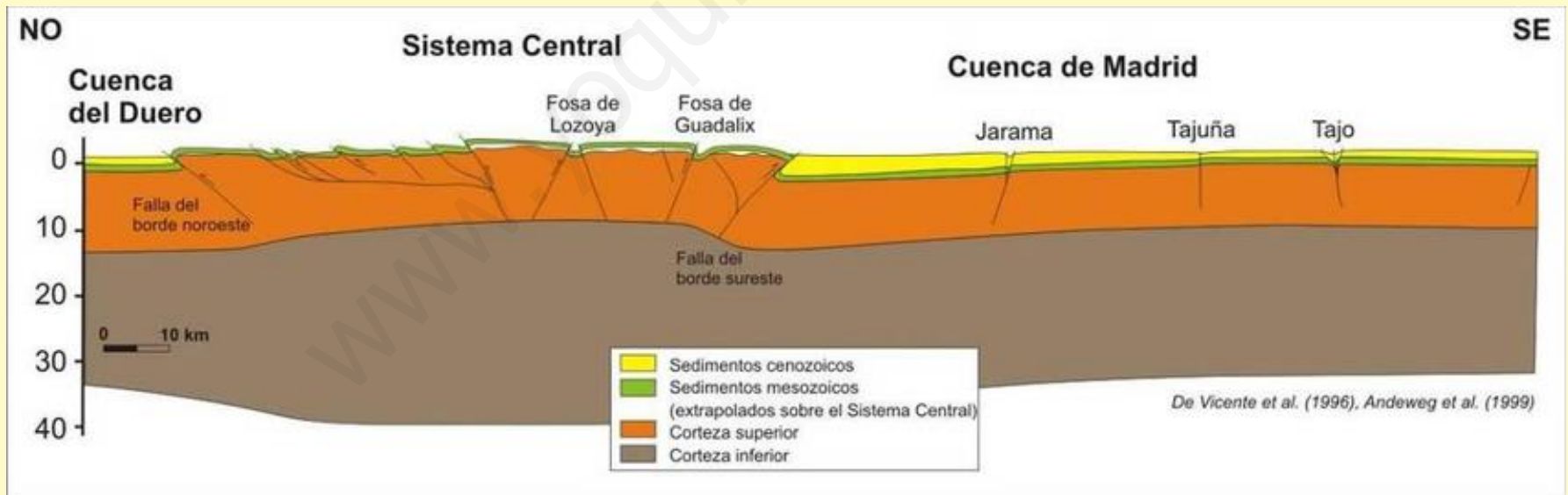
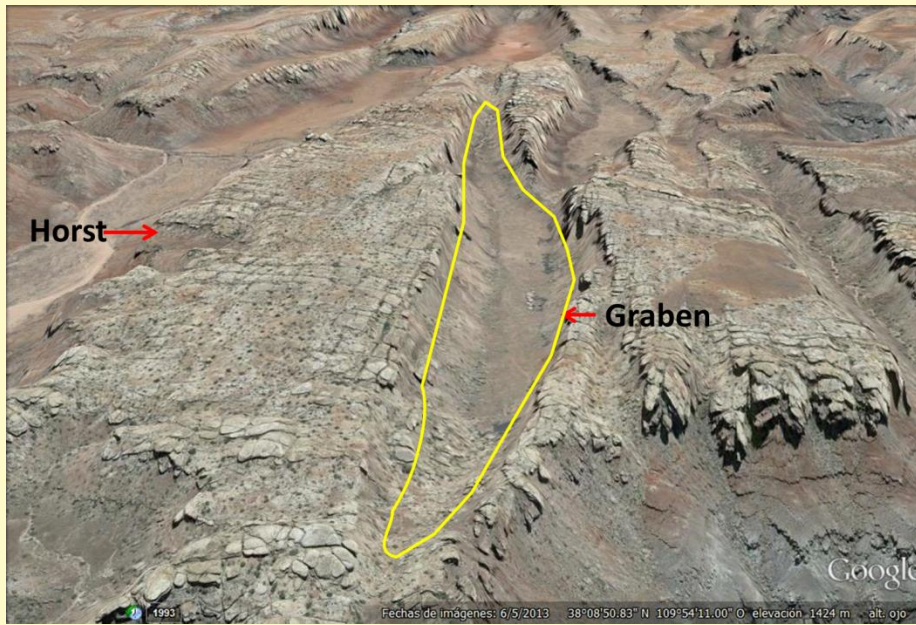




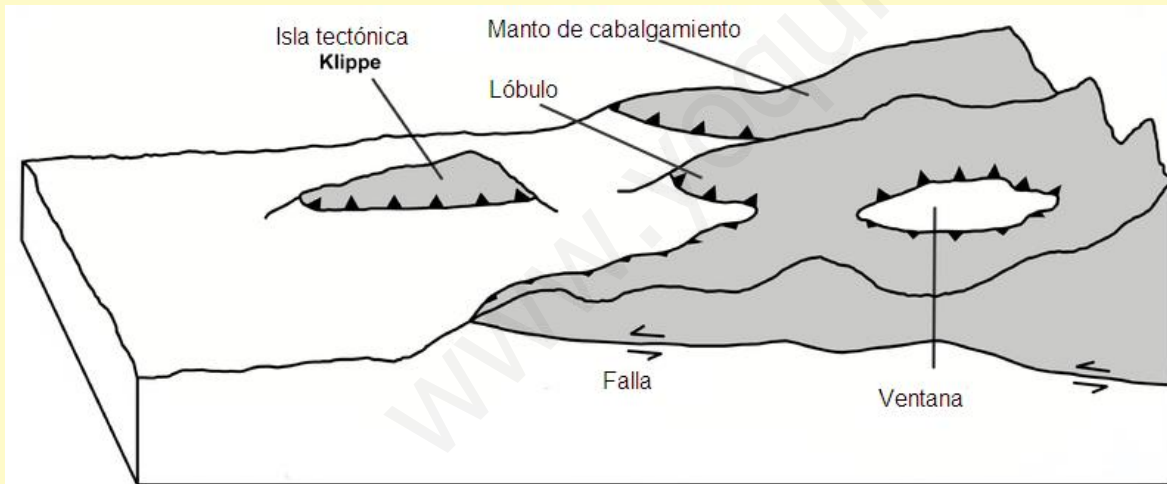
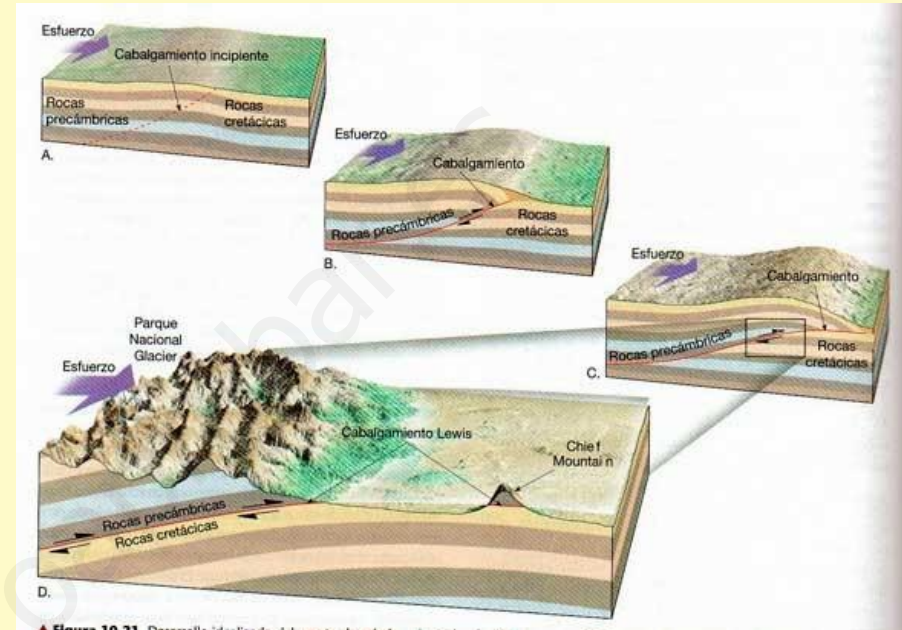
2.3. FAILURE COMBINATIONS. RELAYS ASSOCIATED WITH FAILURES

- If **efforts are distensive** they are formed by associations of normal failures:
 - *TECTONIC PHASES (GRABENS):* they consist of a sunken block from which the other blocks rise more or less staggered.
 - *TECTONIC PHASES (HORST):* it consists of a raised block from which the other blocks descend more or less staggered
- If **efforts are compressive** associations of inverse failures are formed that generate:
 - Elevated blocks or POP-UP
 - Sunken blocks that generate POP-DOWN depressions.

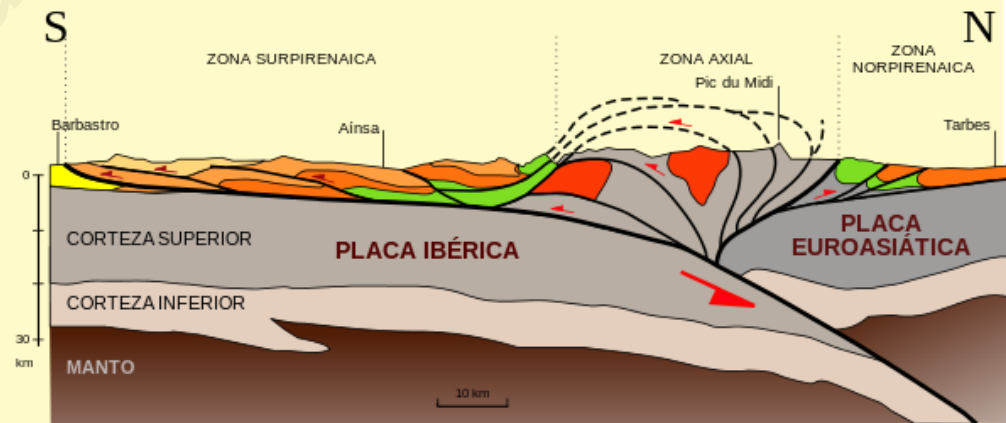
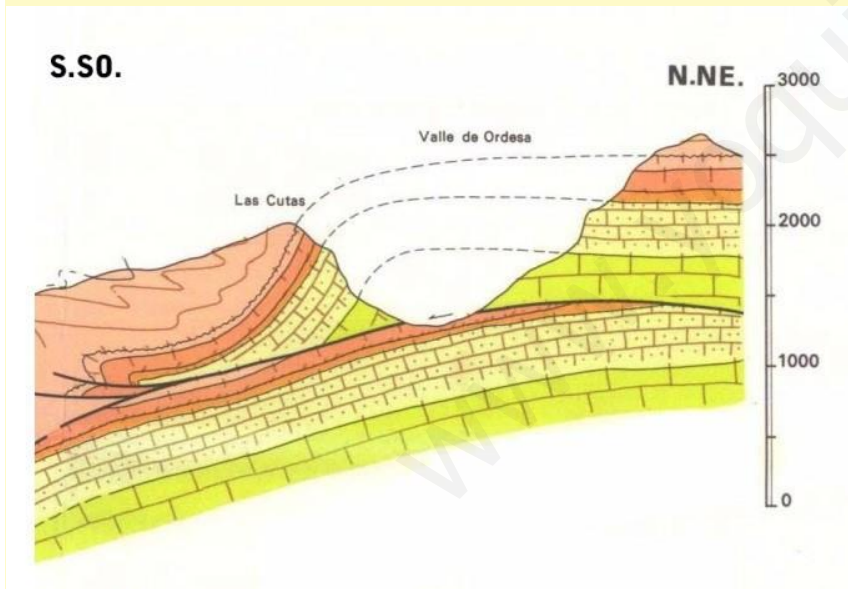
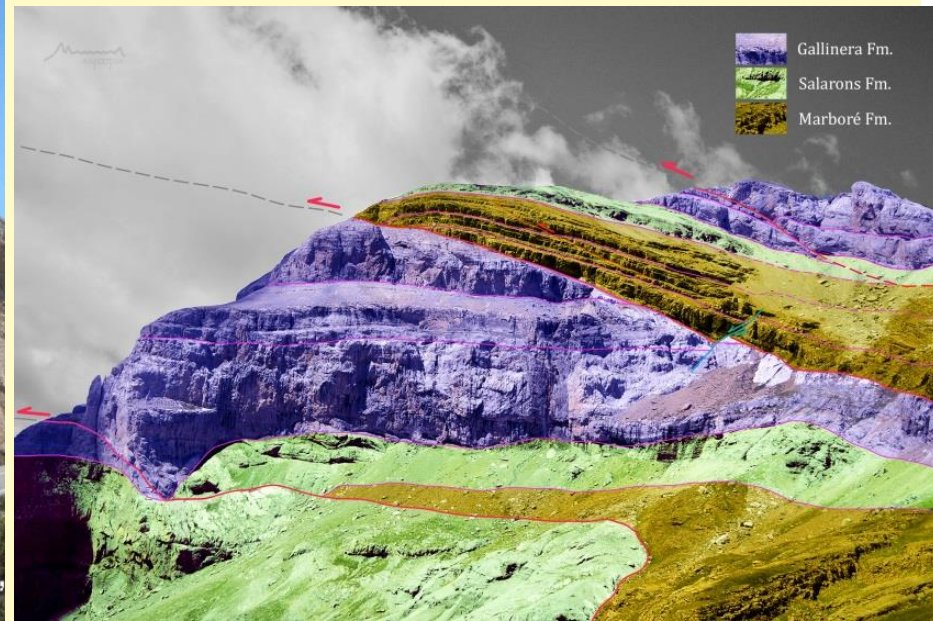




- When in the reverse faults the inclination of the fault plane is with very little inclination, almost horizontal, and the raised lip is mounted on the sunken there has been a **HORSE**. The stratigraphic series is repeated in the riding.
- If the ride has kilometric dimensions, it is spoken of MANOR OF RUNNING.



In them you can recognize the front, the lobes, the klippe and the windows

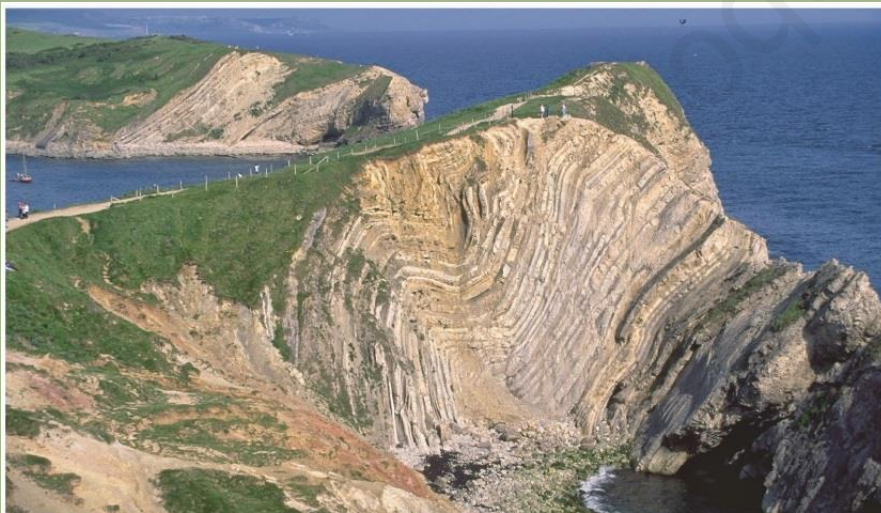
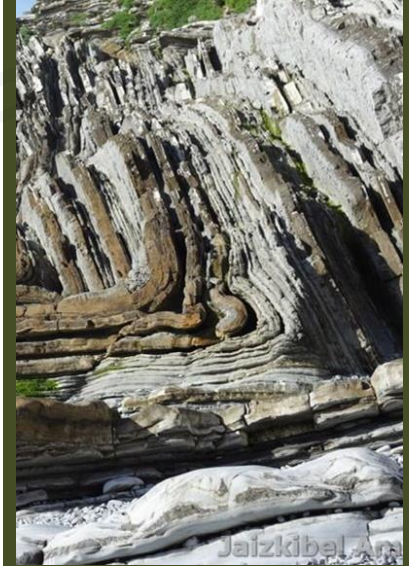


3. THE FOLDINGS AND THEIR TYPES

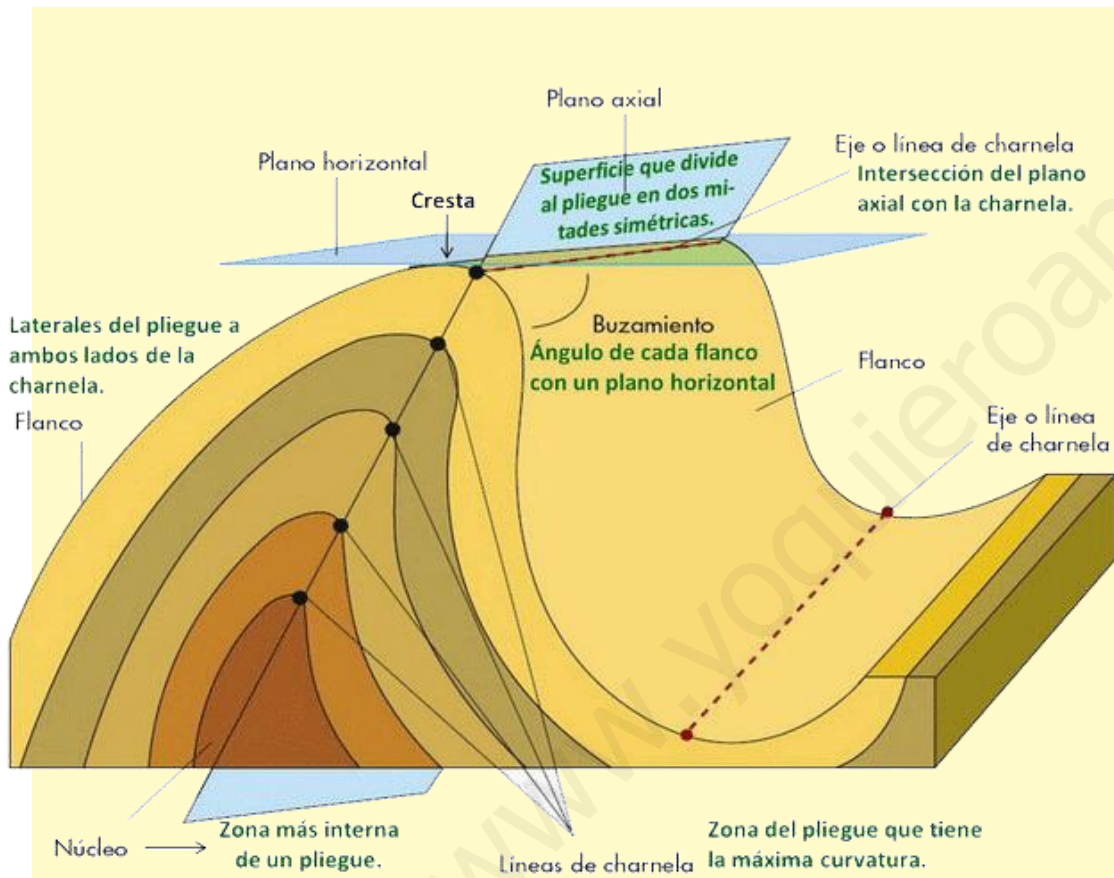
Folds are deformations of the rocks in a wavy way

They are caused by stress, usually compressive, slow and in conditions of high temperature, pressure.

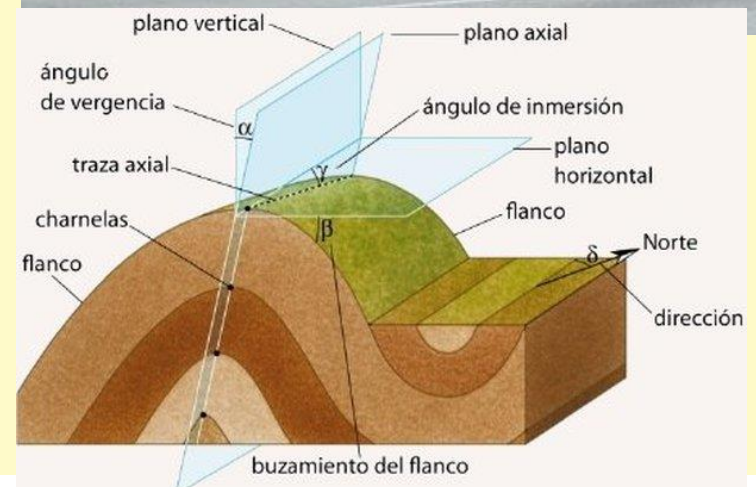
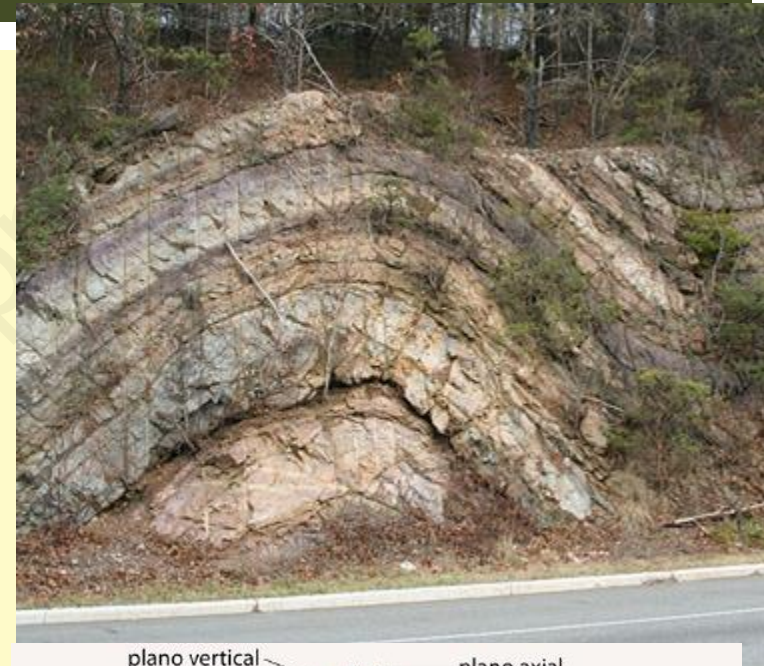
These conditions allow these deformations that correspond to a plastic behavior of the rocks to originate.



3.1. ELEMENTS OF A FOLD



Ver archivo:
Pliegues

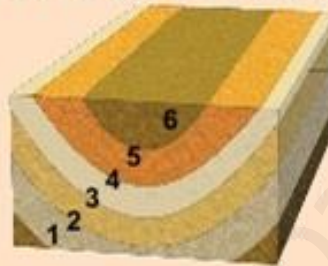


3.2. TYPES OF FOLDINGS

Según la antigüedad de los materiales del núcleo

SINCLINAL

En el núcleo
tiene los
materiales más
modernos



ANTICLINAL

En el núcleo
tiene los
materiales más
antiguos



Según la posición de su plano axial



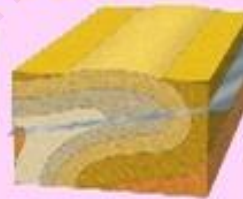
RECTO

el plano axial
buzar 90° , es
vertical



INCLINADO

el plano axial
forma un
ángulo con la
vertical entre
 85° y 10°



TUMBADO

el plano axial
buzar menos
de 10° , es casi
horizontal.

Por su simetría



SIMÉTRICO

el ángulo que
forman los dos
flancos con la
horizontal es
aprox. el mismo.



ASIMÉTRICO

los dos flancos
tienen
inclinaciones
claramente
distintas.

Other types of particular folds are:

Monoclinal



On knee



In "zig-zag", accordion, chevron



In chest

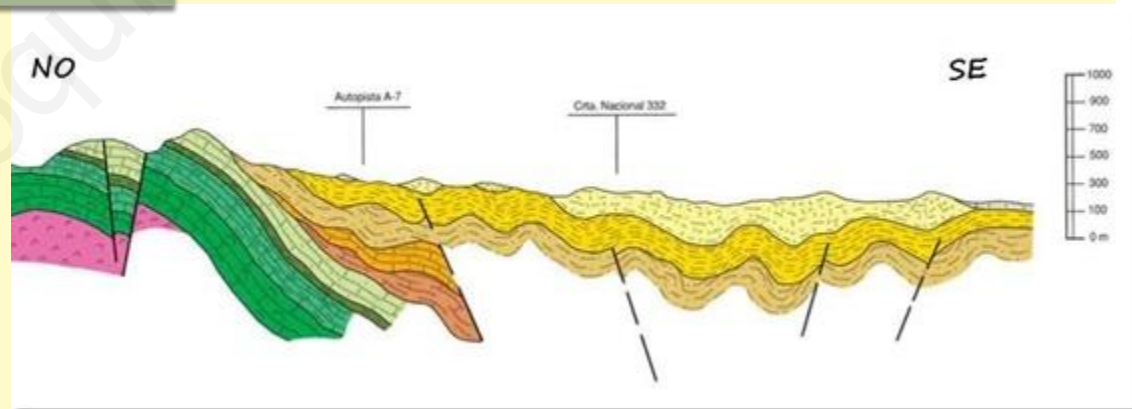


3.3. COMBINATIONS OF FOLDINGS. RELIEFS ASSOCIATED WITH FOLDINGS

When many folds are associated, the assembly can also present a deformation:

ANTICLINORY: set of associated folds whose axial planes converge in depth (it is a fan-shaped association). The set is shaped like an anticline.

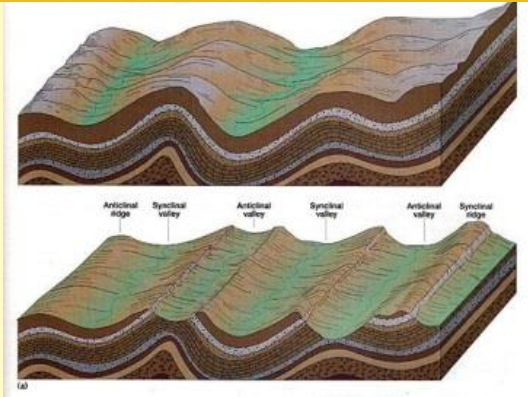
SYNCINORY: set of associated folds whose axial planes converge upwards (above them). The set is shaped like a syncline.



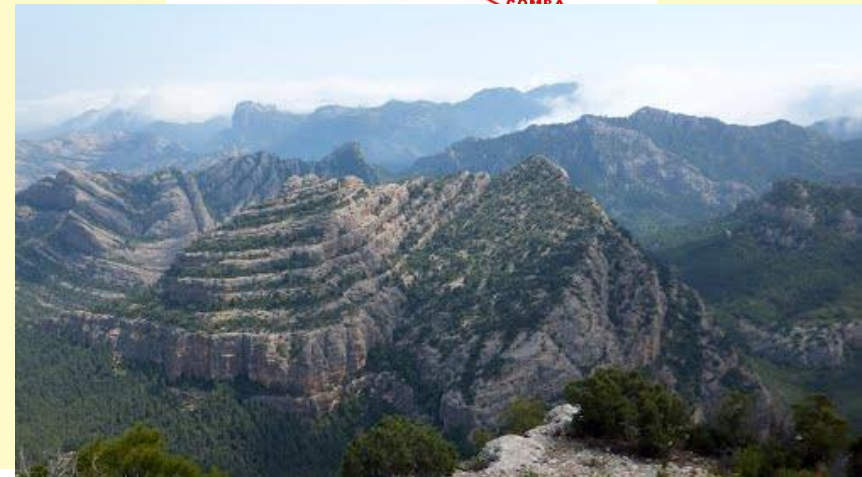
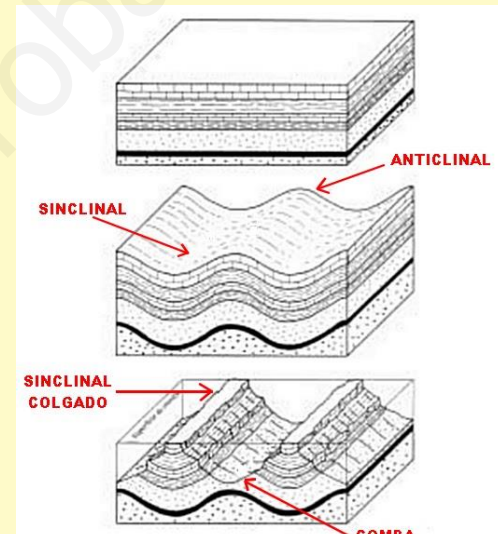
Geological court of the syncline (more properly a synclinorio) of Benissa

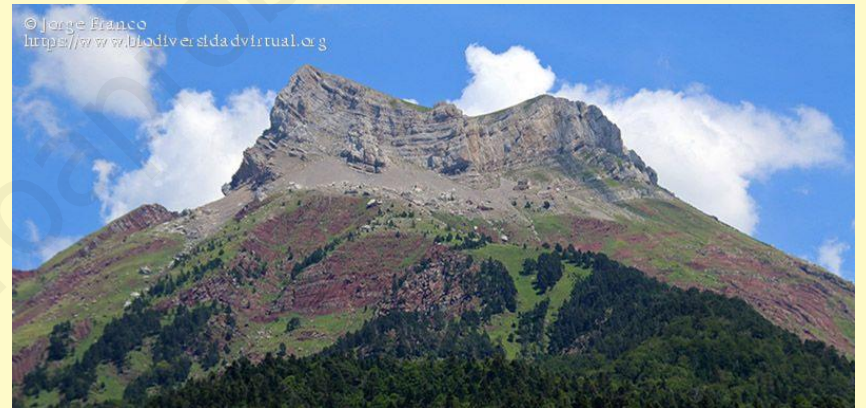
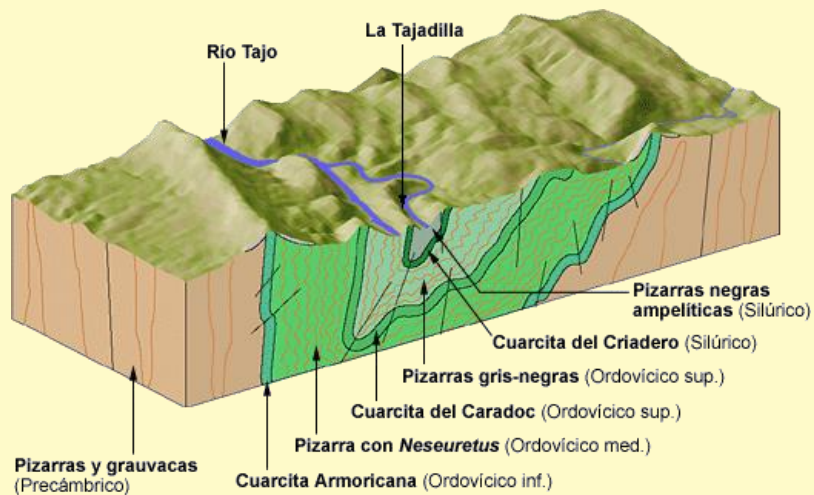
When hard and soft rocks alternate, the former stand out in the relief when erosion has occurred. The following situations may occur:

Conforming relief: in which the antiforms coincide with the highest areas and those that are deformed with the depressions of the terrain.



Inverted relief: in which the reports coincide with the highest areas of the terrain.





Corte geológico del sector oriental de los Montes de Toledo

