SENSORES REMOTOS

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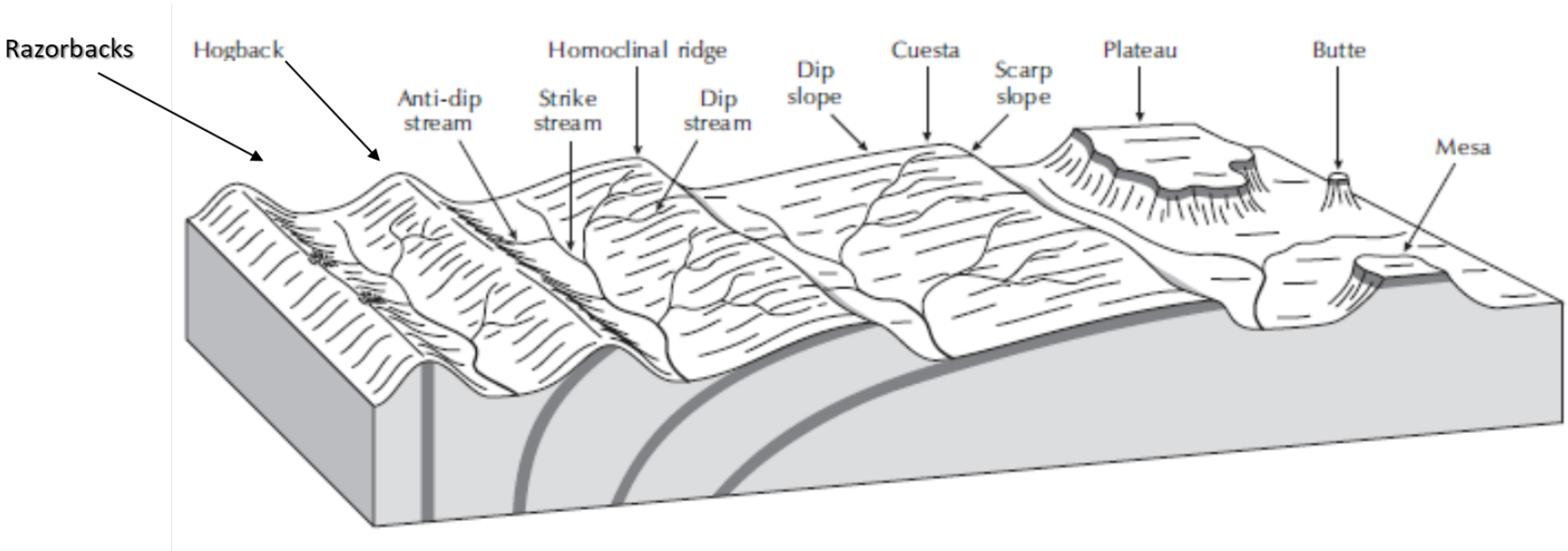
UNIVERSIDAD NACIONAL DE COLOMBIA
SEDE MEDELLÍN

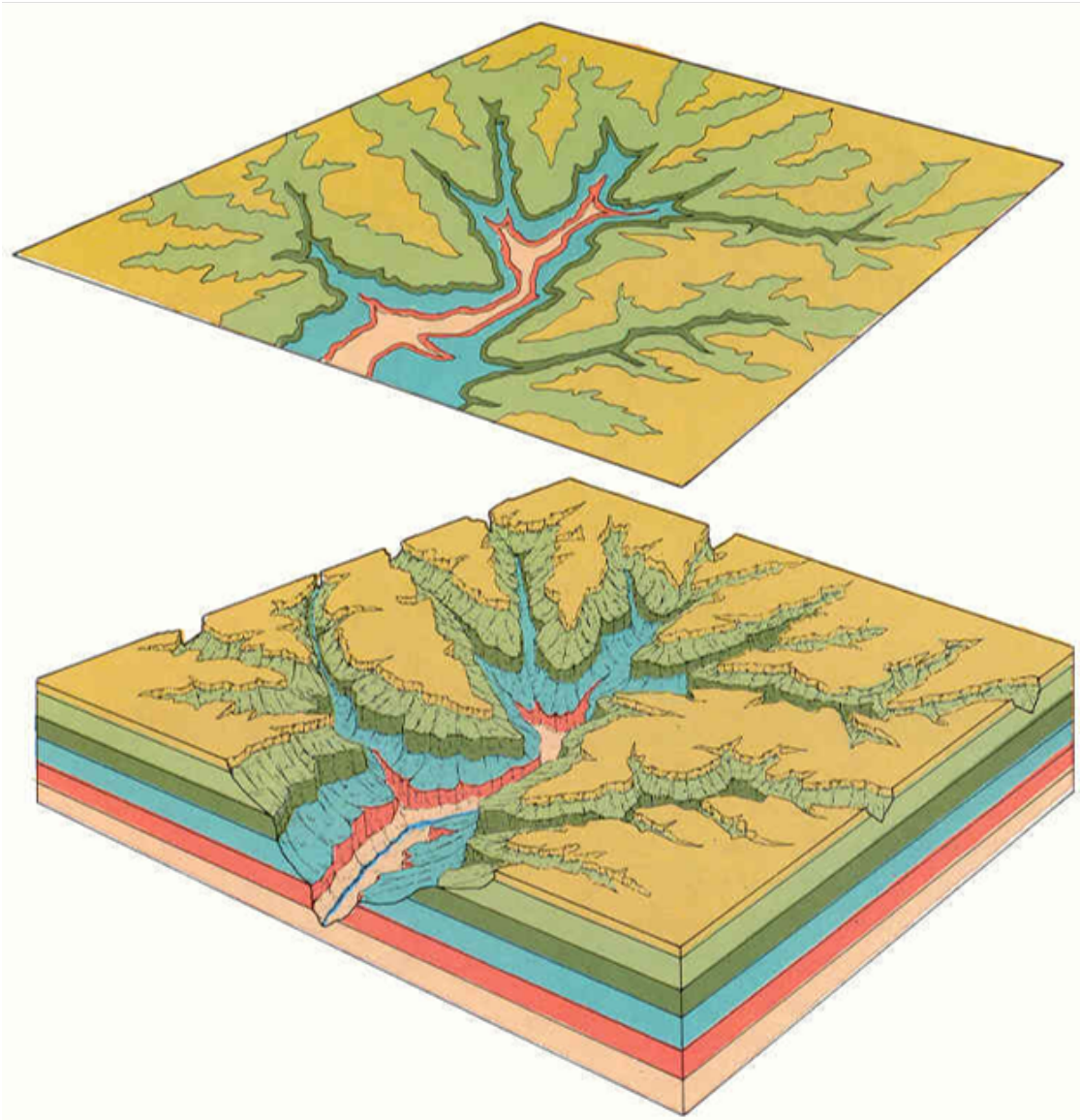
Geoformas

Structural	Erosional	Depositional	Dissolutional (Karstic)	Residual planation Surface
Depression	Depression	Depression	Depression	Dome
Mesa	Vale	Swale	Dome	Inselberg
Cuesta	Canyon	Floodplain	Tower	Monadnock
Creston	Glacis	Flat	Hill (um)	Tors
Hogback	Mesa	Terrace	Polje	(=boulders
Bar	Hill	Mesa	Blind vale	field)
Flatiron	Crest	Glacis	Dry vale	
Escarpment	Chevron	Delta	Canyon	
Graben	(rafter)	Estuary	(=collapse	
Horst	Ridge	Coral reef	vale)	
Anticline	Dike	Atoll	...	
Syncline	...	..	...	
Excavated	..	....	...	
anticline	..	...		
Hanging				
syncline				
Combe				
Cluse				
Ridge				
Cone				
Dike				

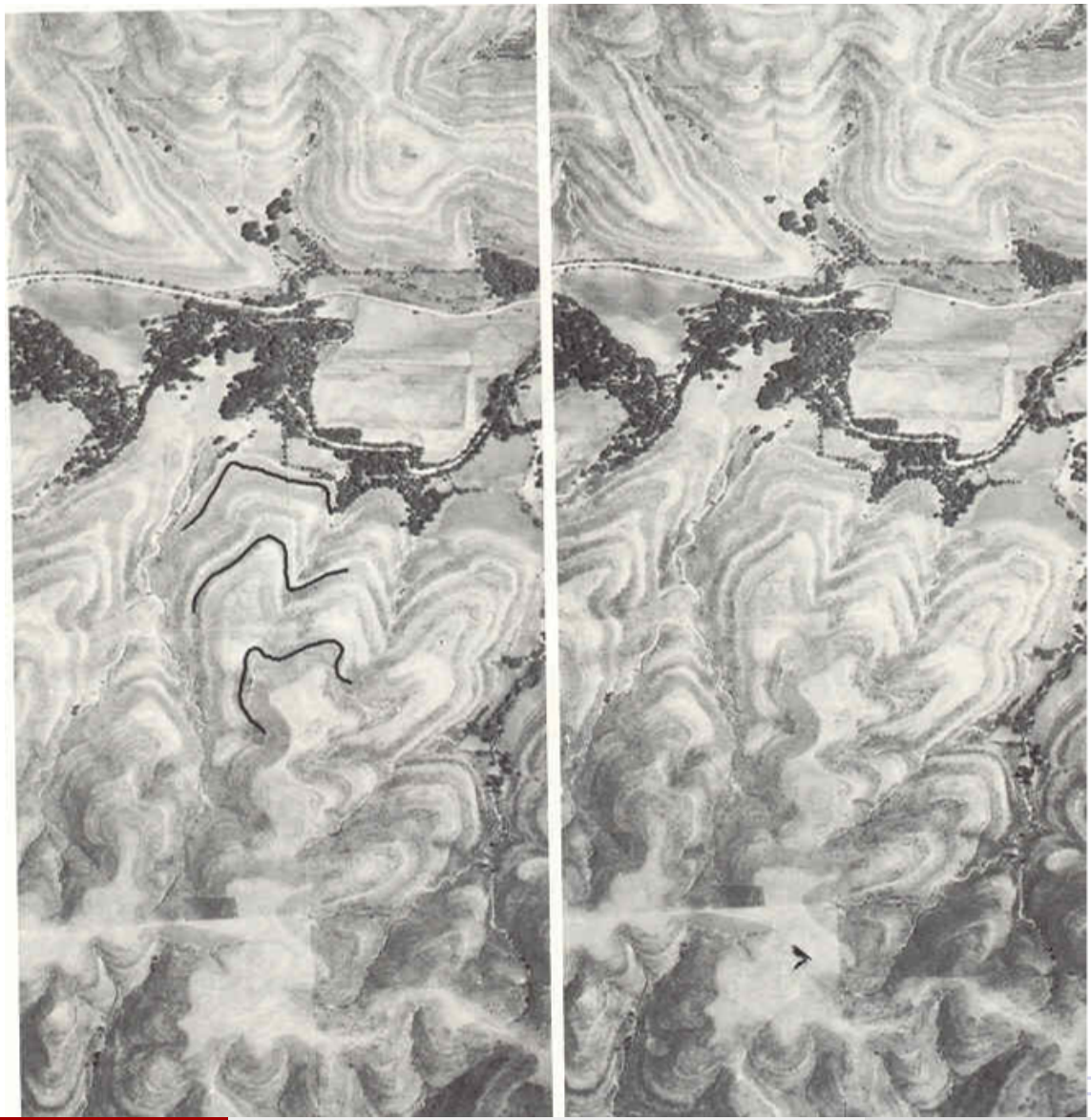
Geoformas buzantes



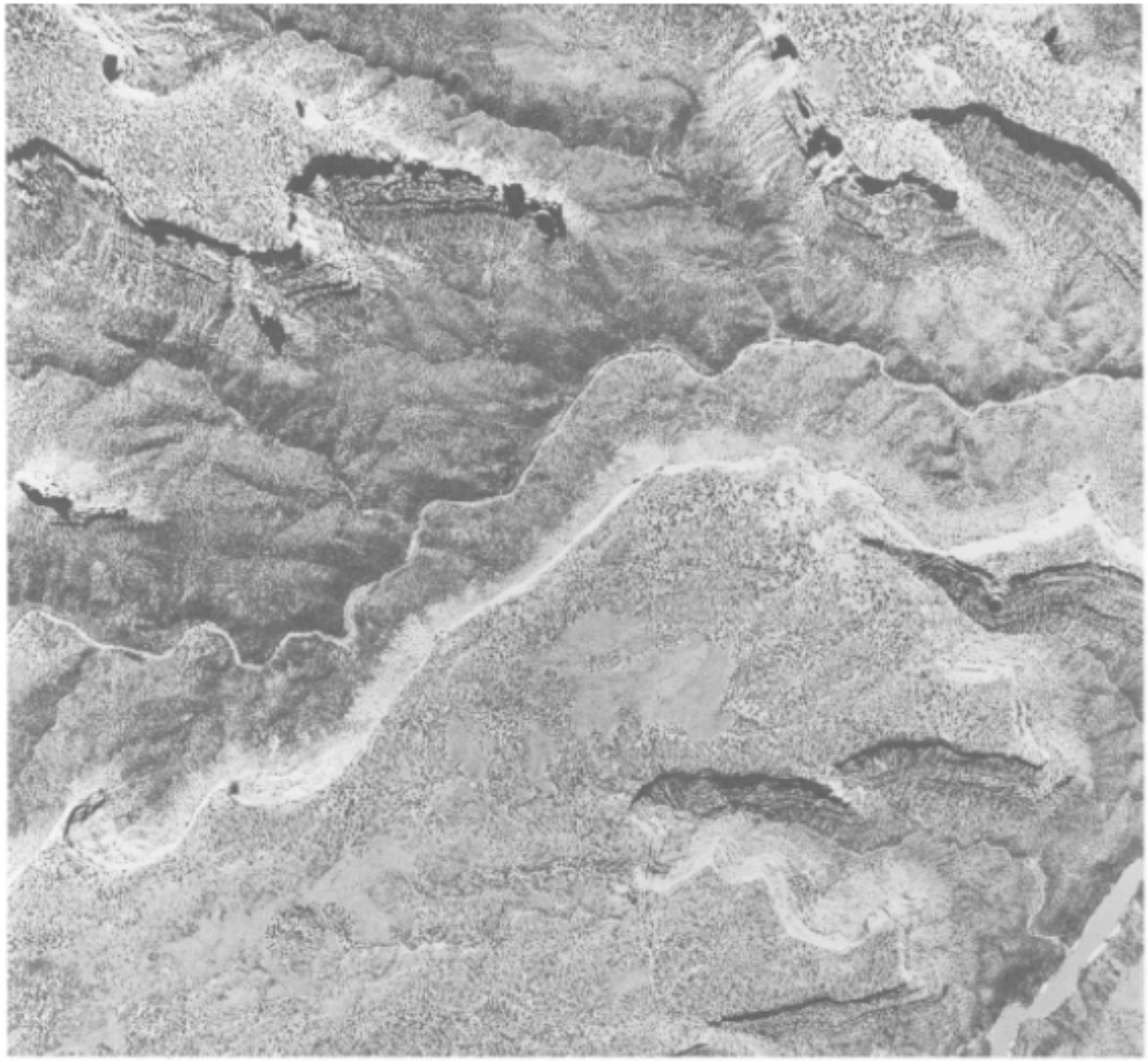
Estratos horizontales - poco buzantes



Estratos horizontales - poco buzantes



Estratos horizontales - poco buzantes



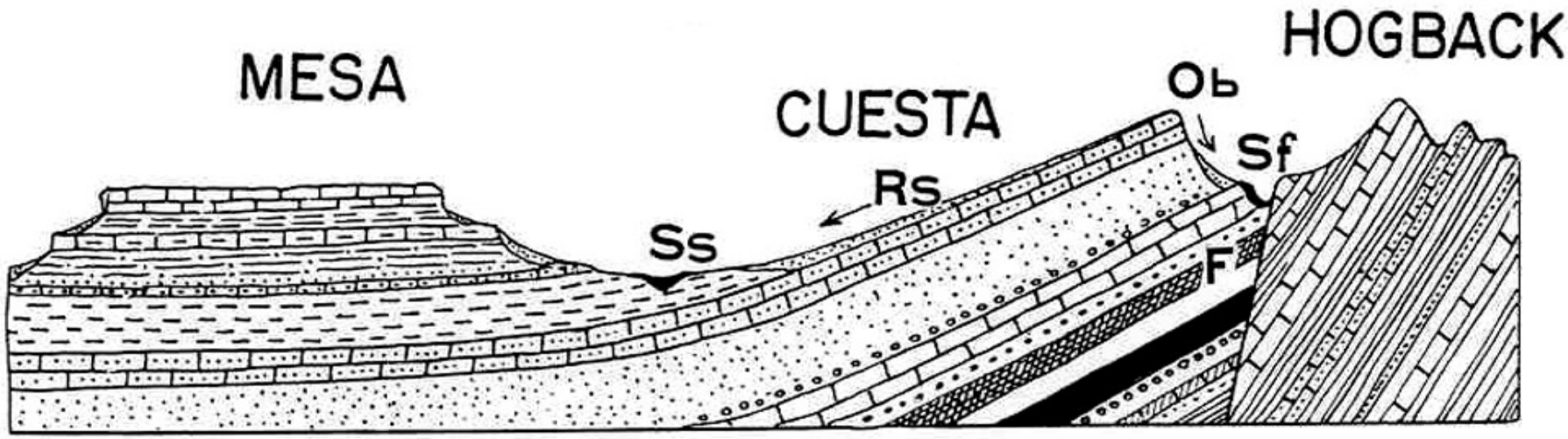
Plateaux

Mesa

Butte

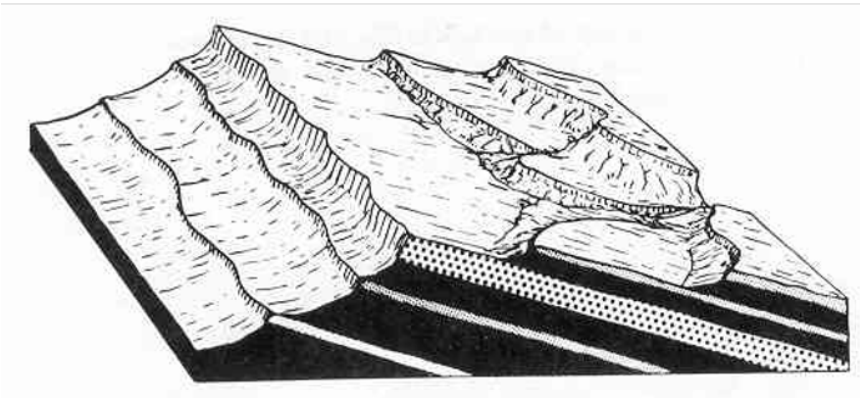
Butte

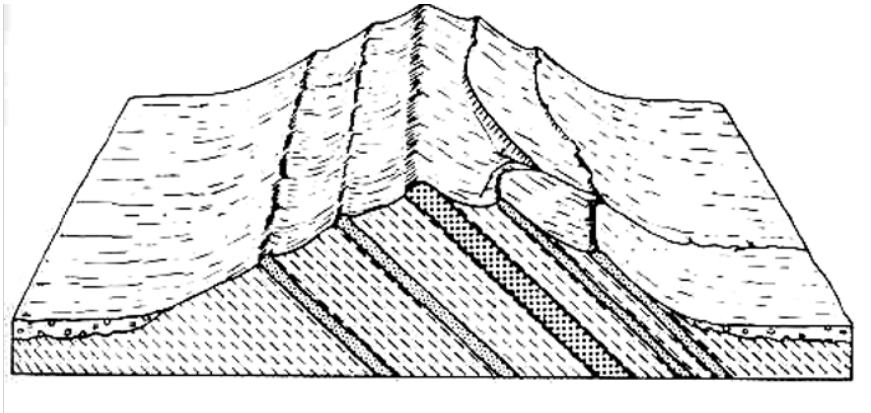
Estratos buzantes



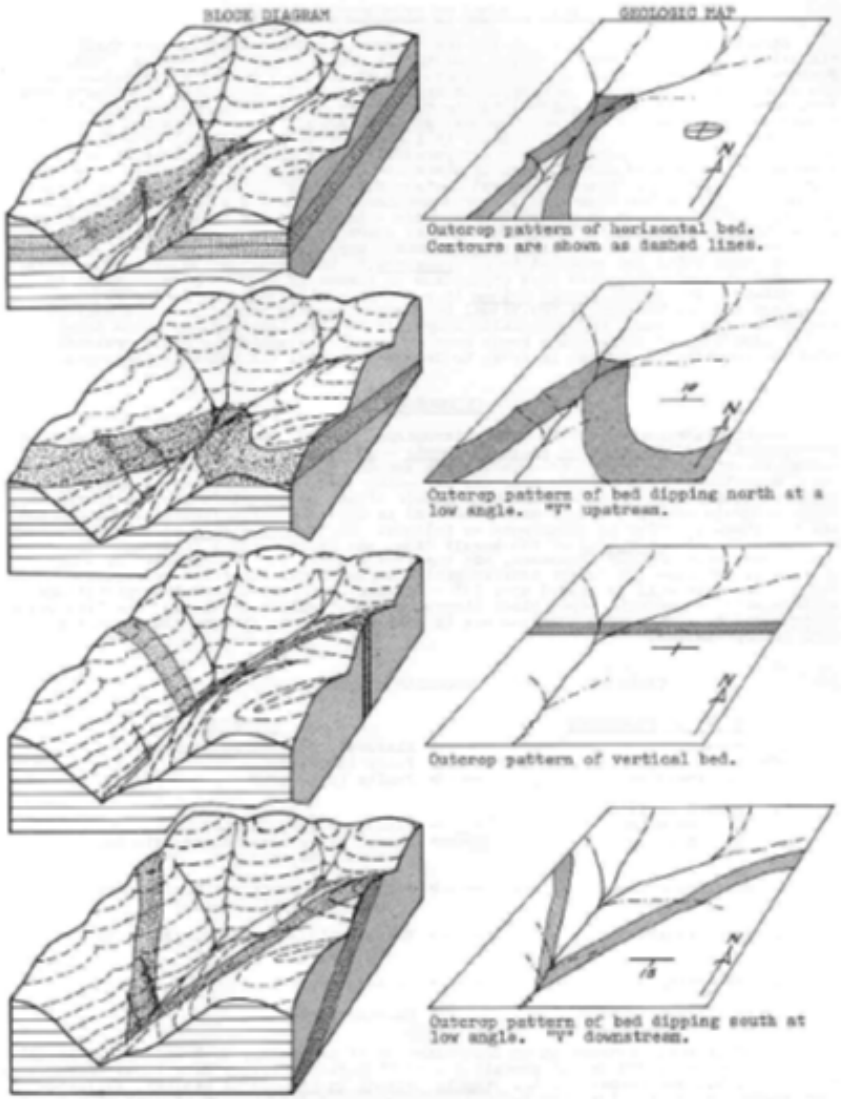
Estratos buzantes

- Morfología del terreno formando cuestas (pendientes estructurales)
- Capas con buzamientos entre 5 y 35º
- Cuando capa intersecta valle fluvial forma V (indica dirección de buzamiento)
- Buzamiento suave – V grande
- Buzamiento fuerte – V pequeña





Regla de la V



V Cerrada = estrato horizontal

V = señala el buzamiento

No V = estrato vertical

V = señala el buzamiento

Influencia de las estructuras en los drenajes

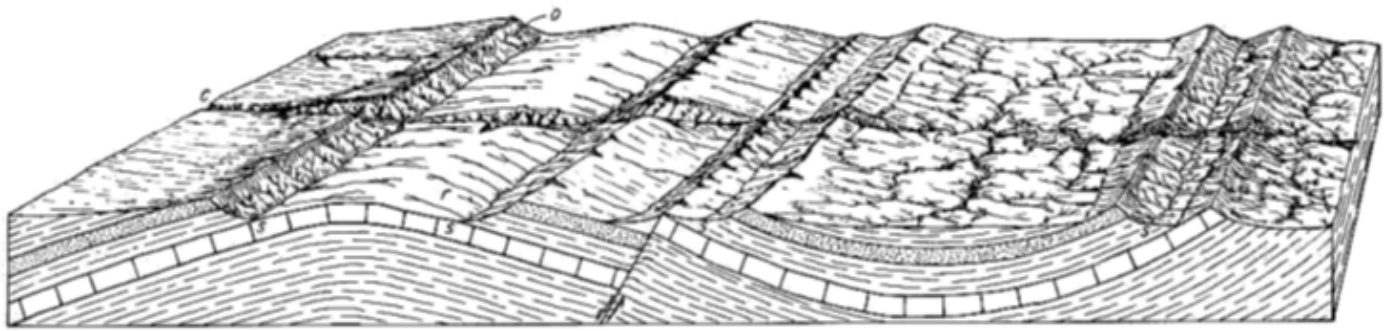
Consecuente (c) : que desarrolló el cauce sobre la superficie original siguiendo la pendiente regional.

Subsecuente (s) : que desarrolló su curso ajustado a lo largo del rumbo o línea menor resistencia.

Resecuente (r) : tributarios a drenajes subsecuentes que siguen la pendiente regional o sentido del buzamiento (REnewed conSEQUENT).

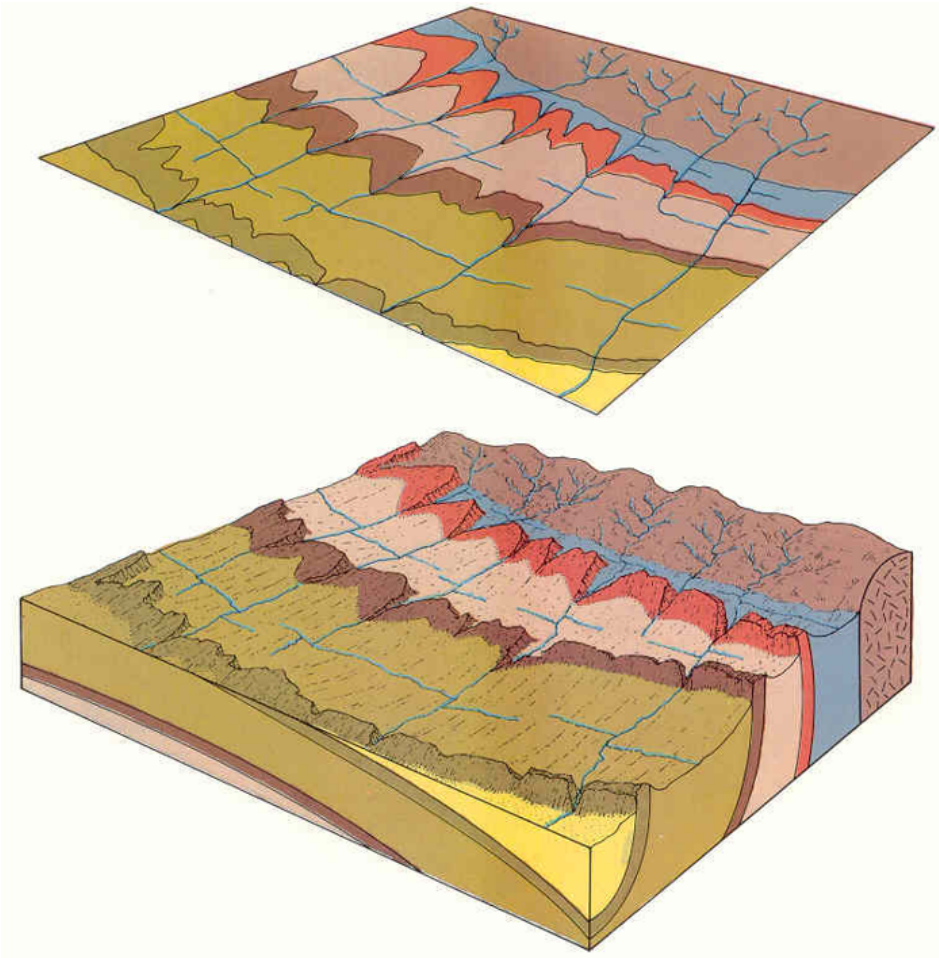
Obsecuente (o) : tributarios que fluye en dirección opuesta a la pendiente regional o el buzamiento o drenajes resecuentes (Opposite to conSEQUENT).

Insecuente (i) : que sigue un curso sin control aparente.

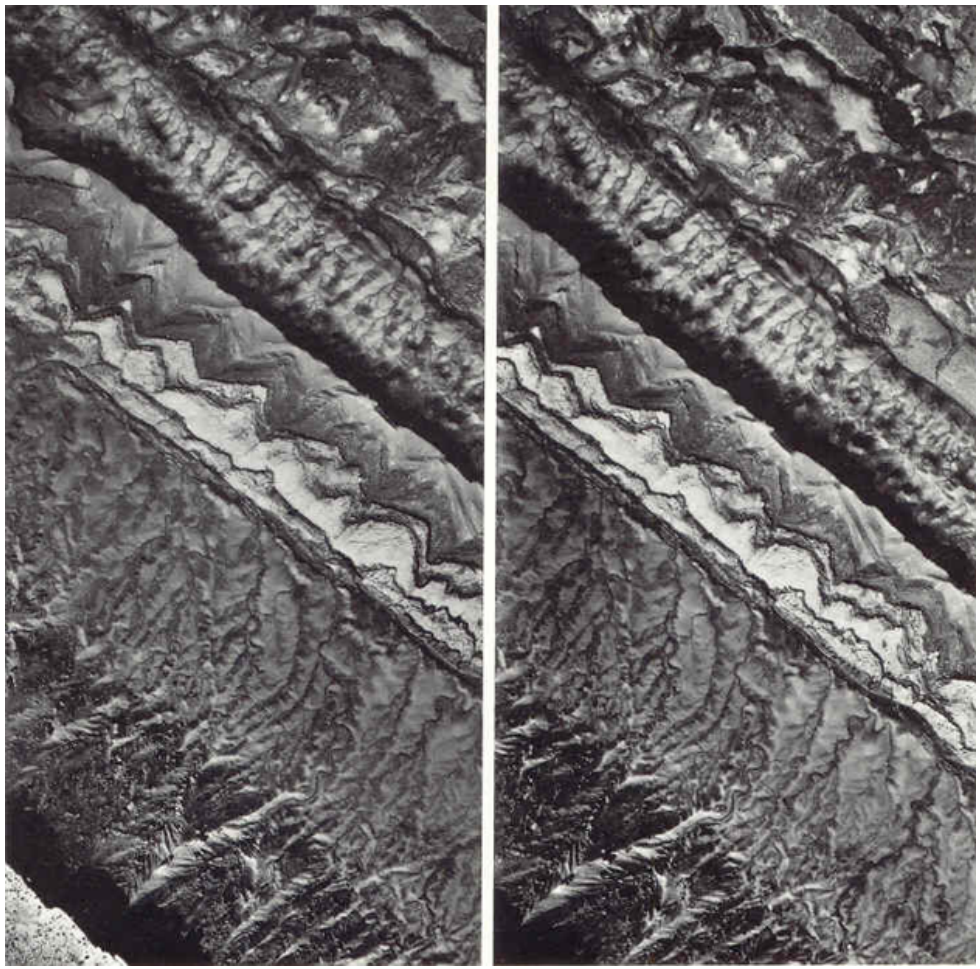


Fuente: Dirik (2005)

Estratos verticales



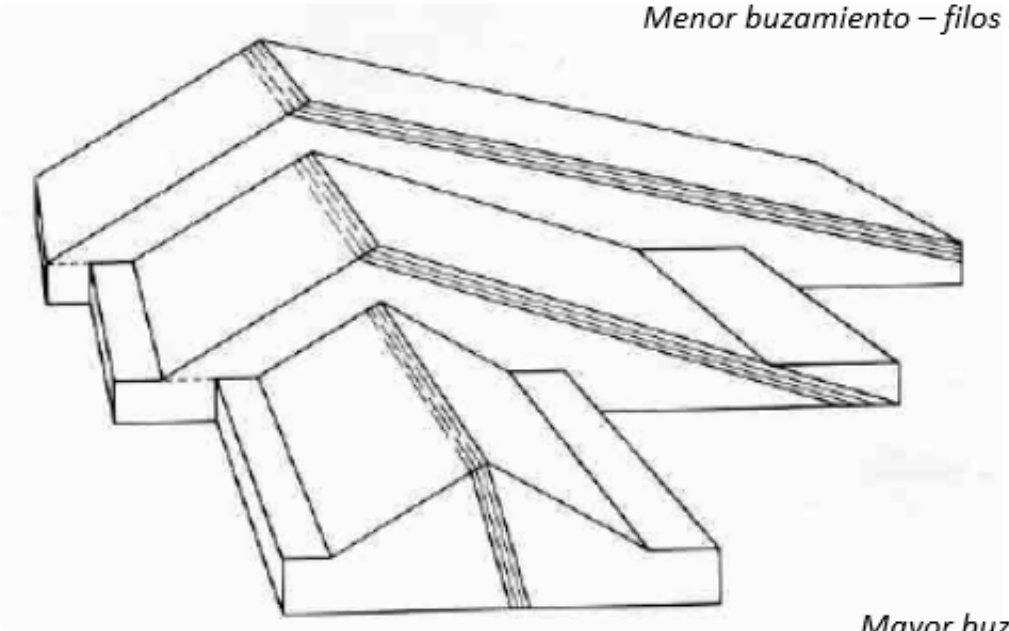
Estratos verticales



Buzamiento vs Altura

Filos asimétricos

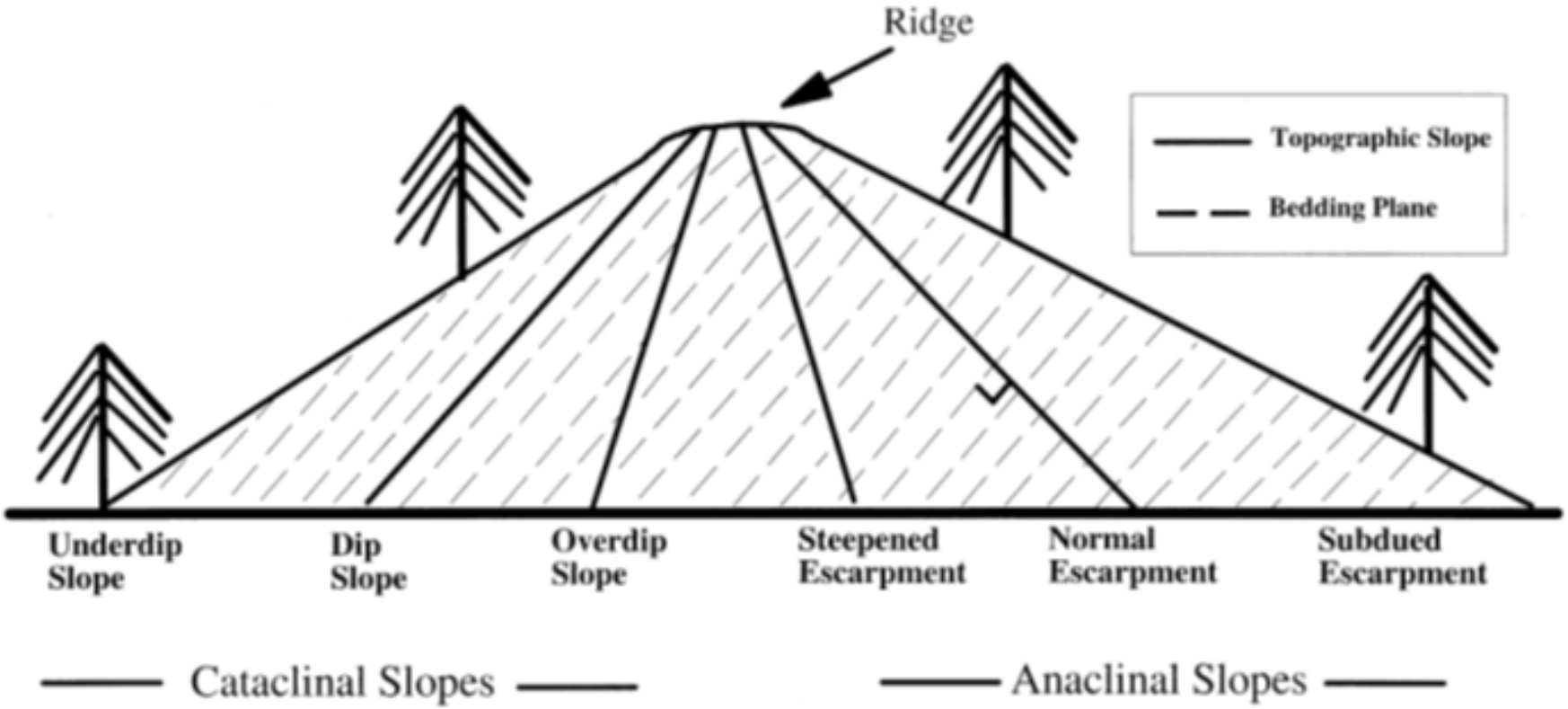
Menor buzamiento – filos mas altos



Filos simétricos

Mayor buzamiento – filos mas bajos

Relación ladera vs estructuras



Fuente: Meentemeyer & Moody (2000)

Relación ladera vs estructuras

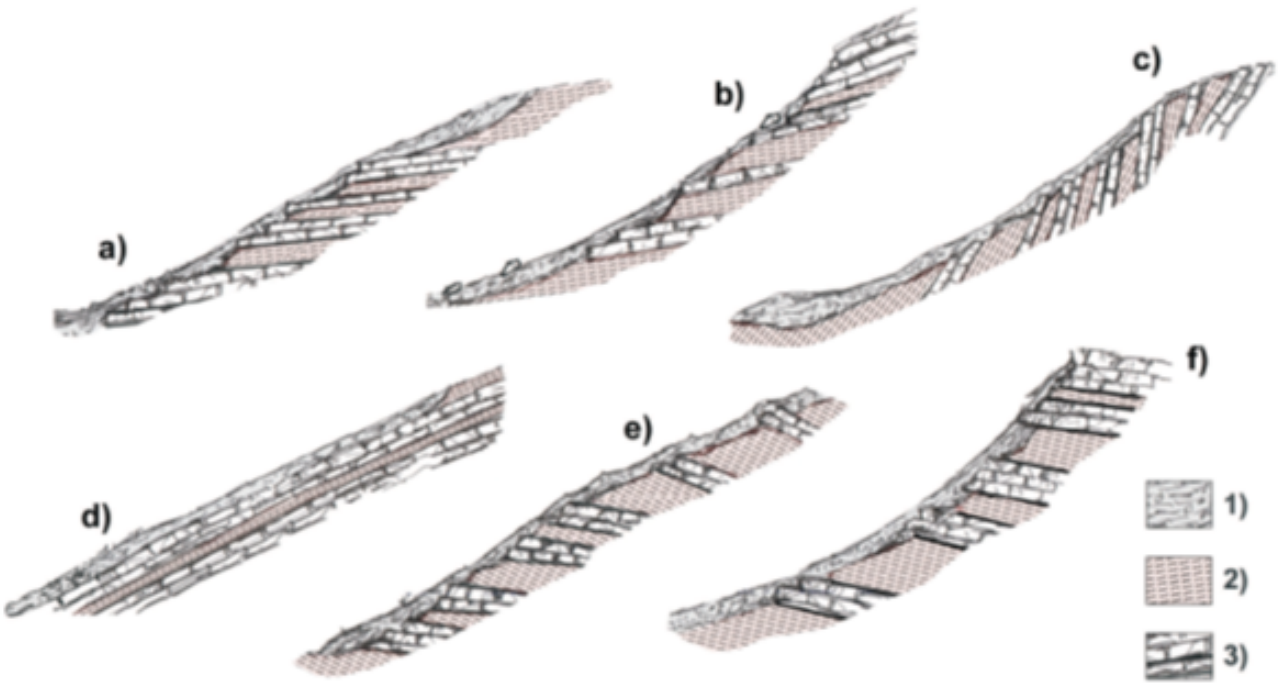
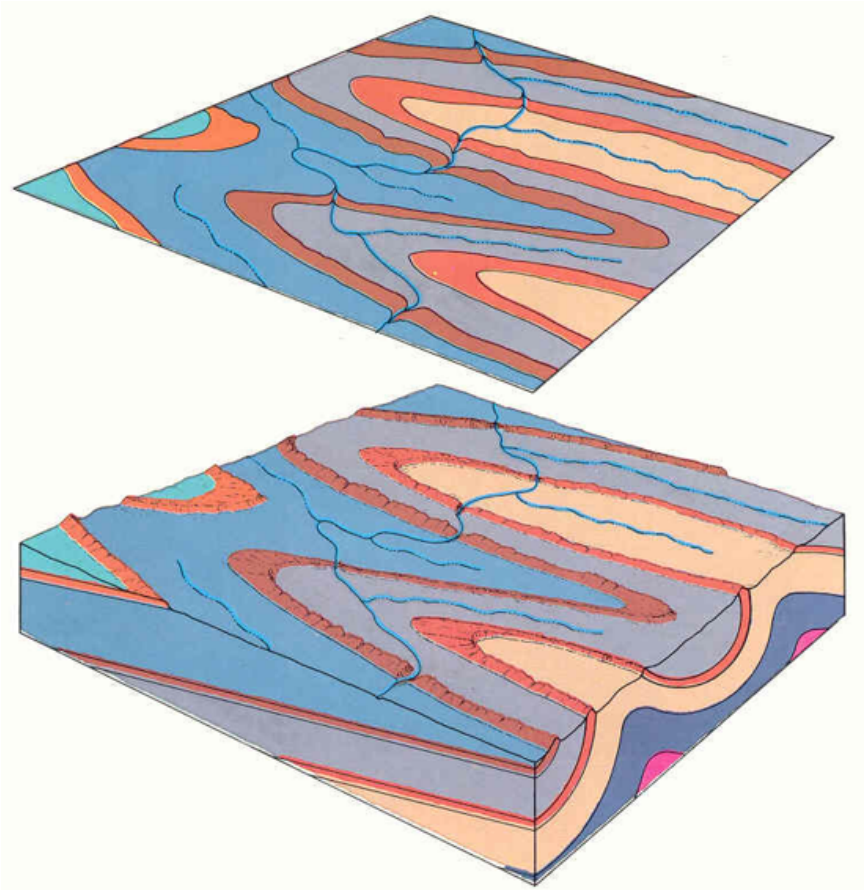


Fig. 11. Basic recurrent LSMs in TC (clayey sequence prevailing at the top) and BC (clayey sequence prevailing at the bottom) sequences: TC **(a)** and BC **(b)** related to overdip slopes ($\alpha > \beta$); BC **(c)** linked to underdip slopes ($\alpha < \beta$); pure dip slopes **(d)** with $\alpha \sim \beta$; TC **(e)** and BC **(f)** related to anaclinal slopes. Legend: (1) landslide body; (2) clayey level; (3) stony level.

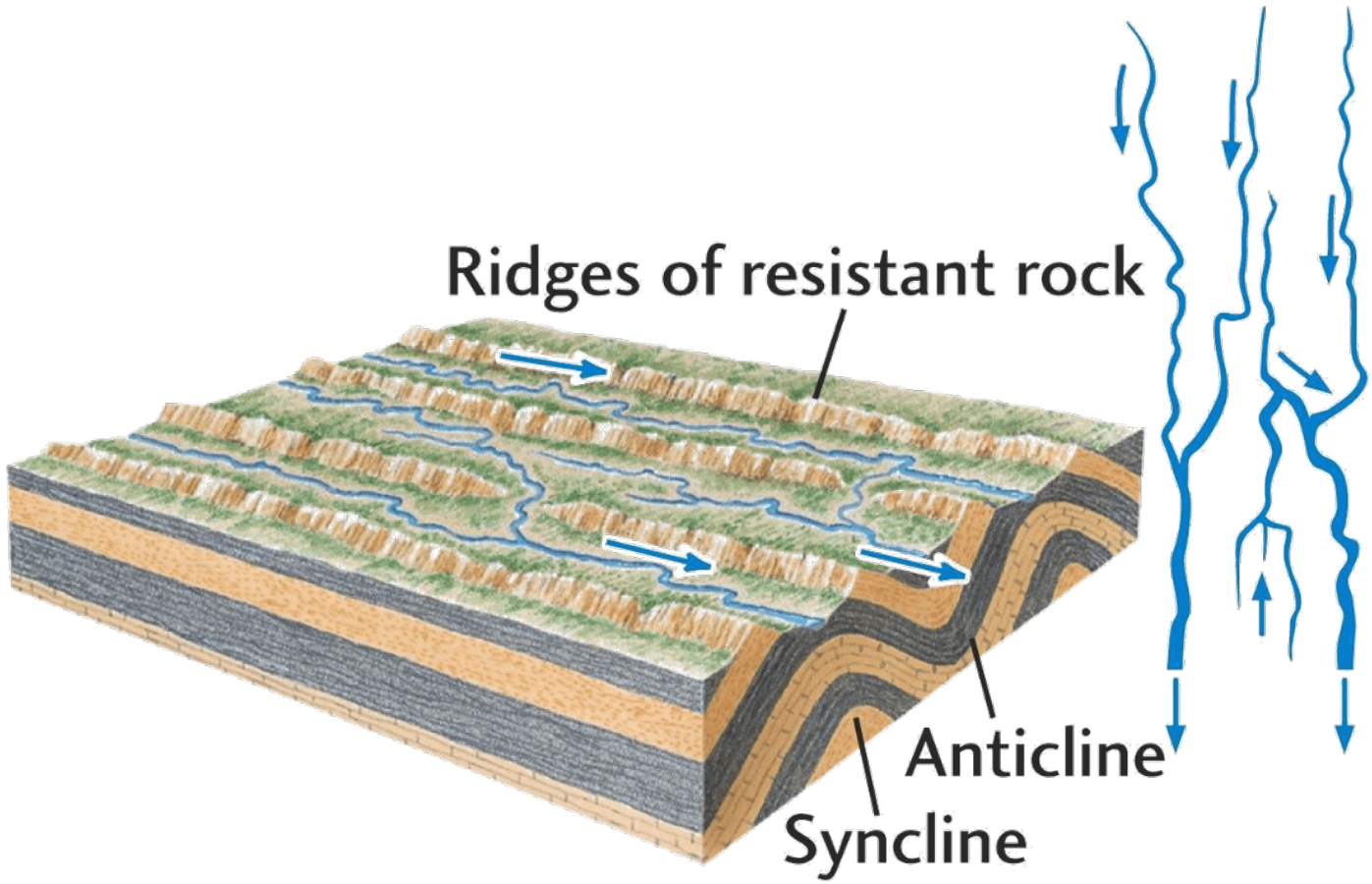
Fuente: Grelle et al (2011)

Pliegues

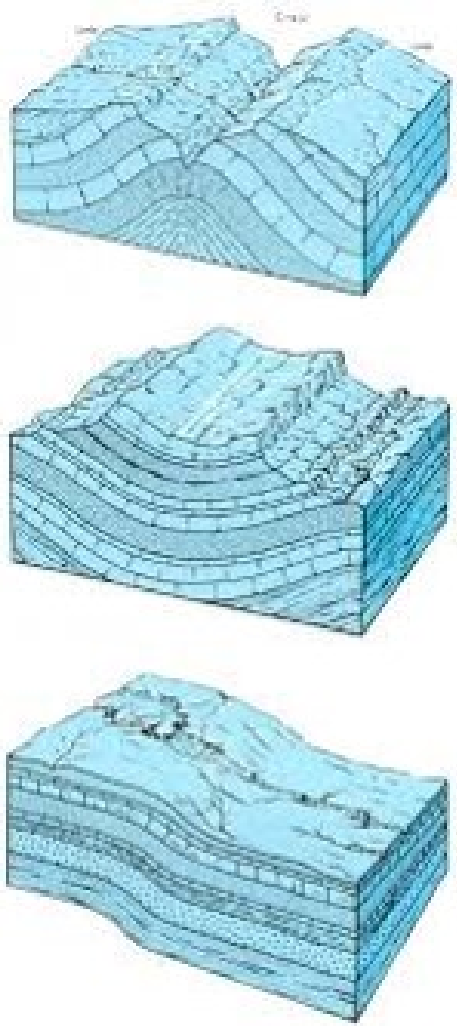


Pliegues

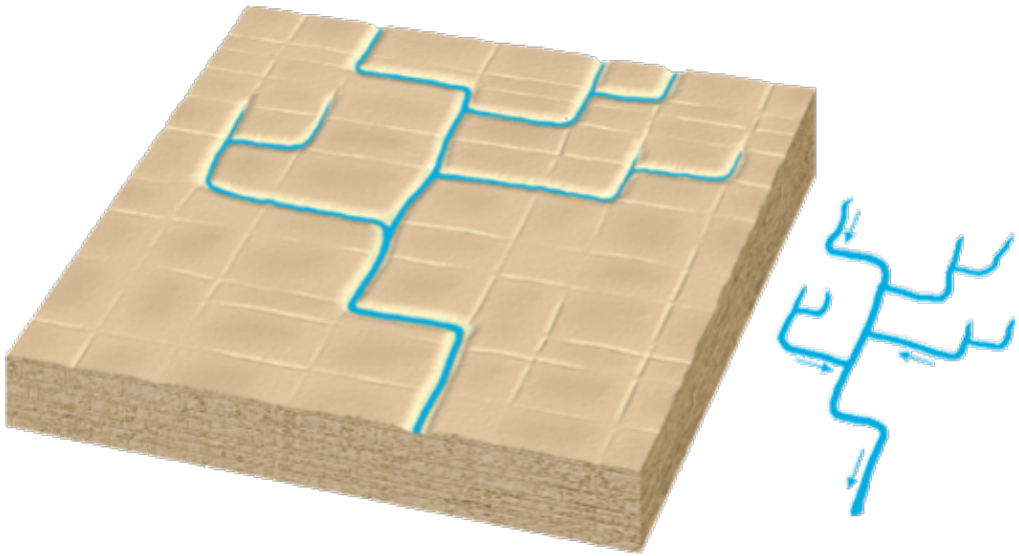
Pliegues y drenajes

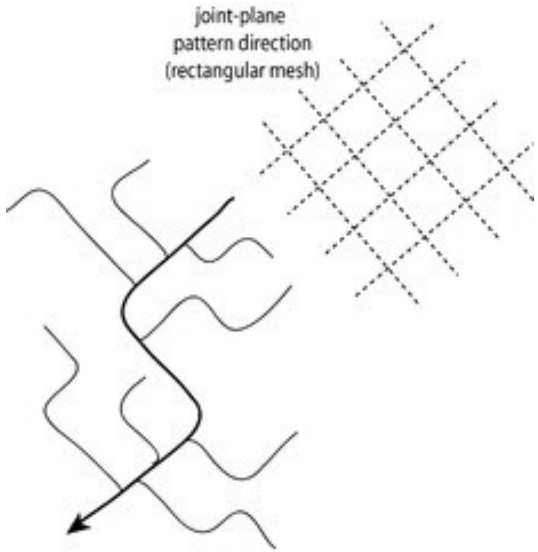


Pliegues y valles

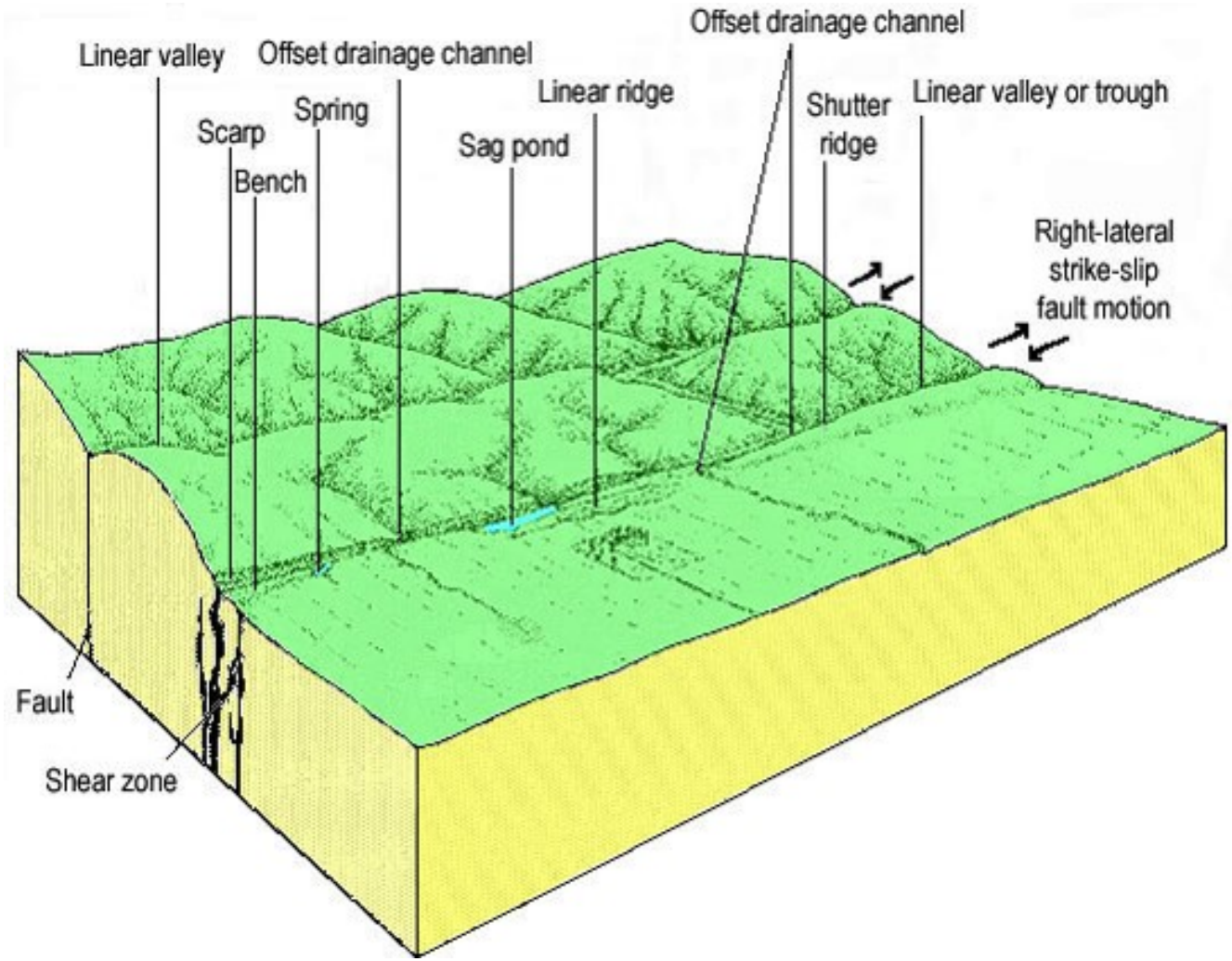


Fracturas y drenajes



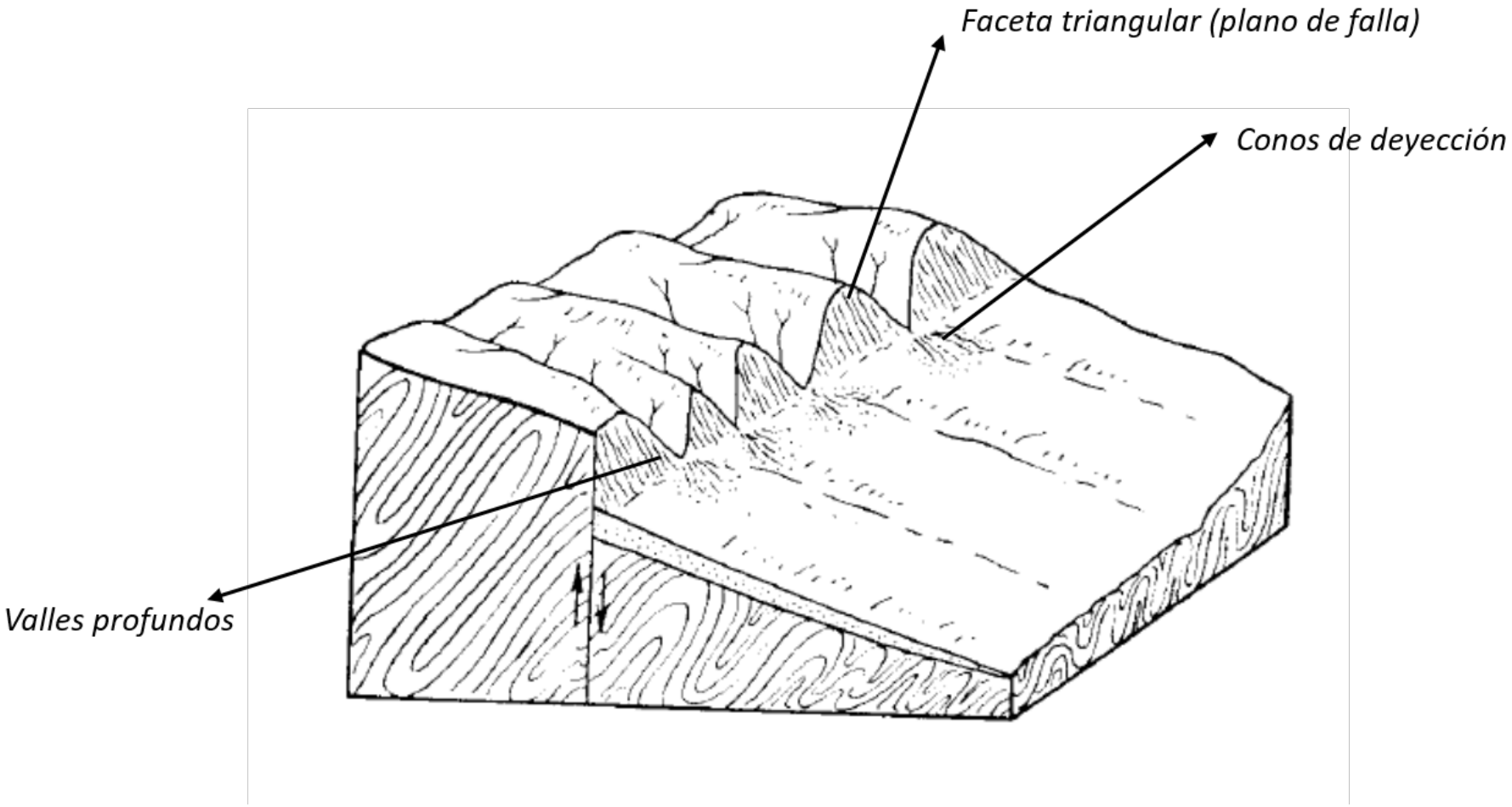


Fallas

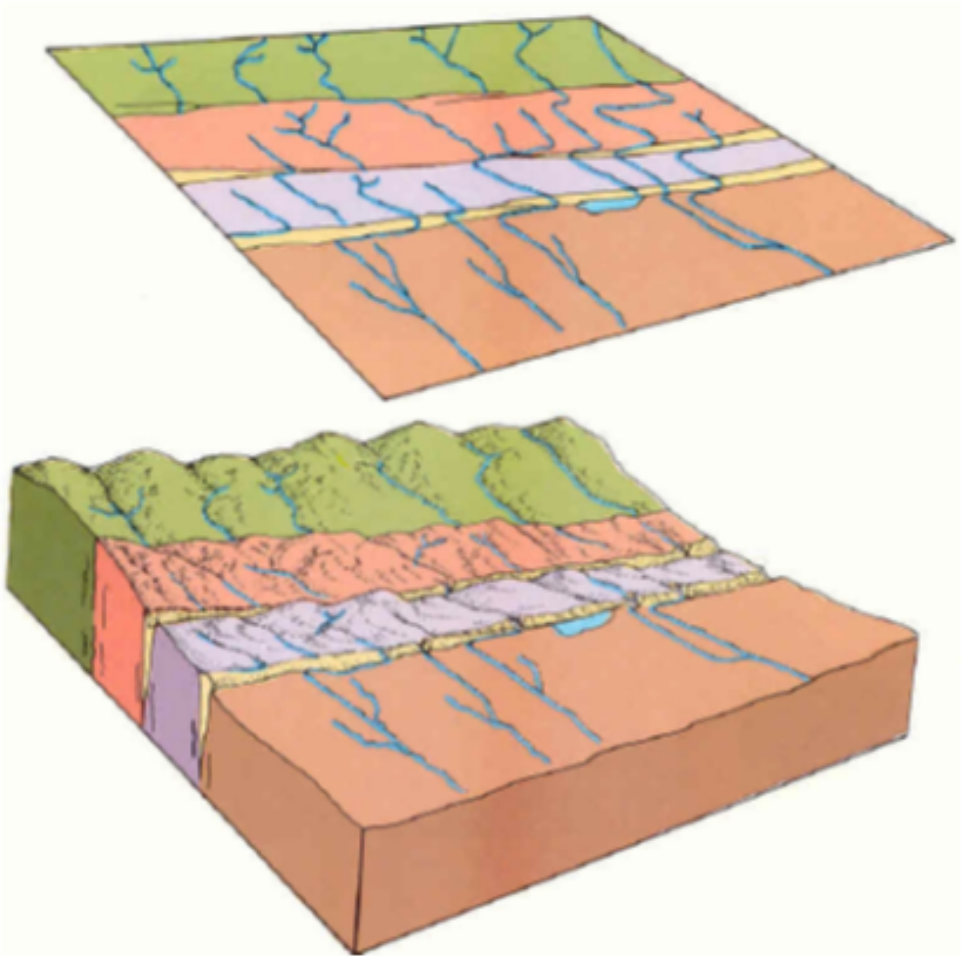

Linear valley
Offset drainage channel
Offset drainage channel
Scarp
Spring
Linear ridge
Shutter ridge
Linear valley or trough
Bench
Sag pond
Right-lateral strike-slip fault motion
Fault
Shear zone

Componente vertical

Facetas

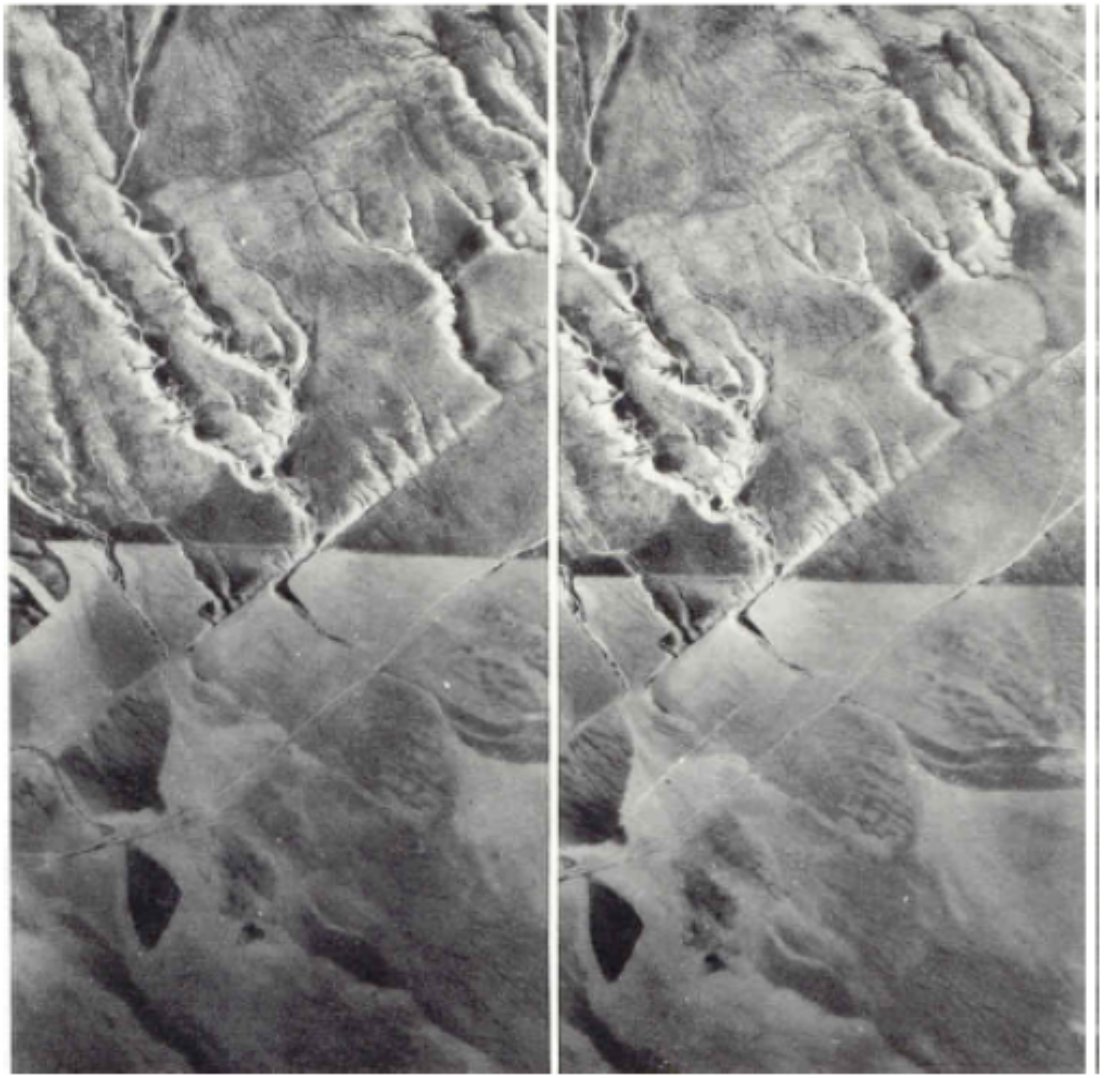


Fallas de rumbo



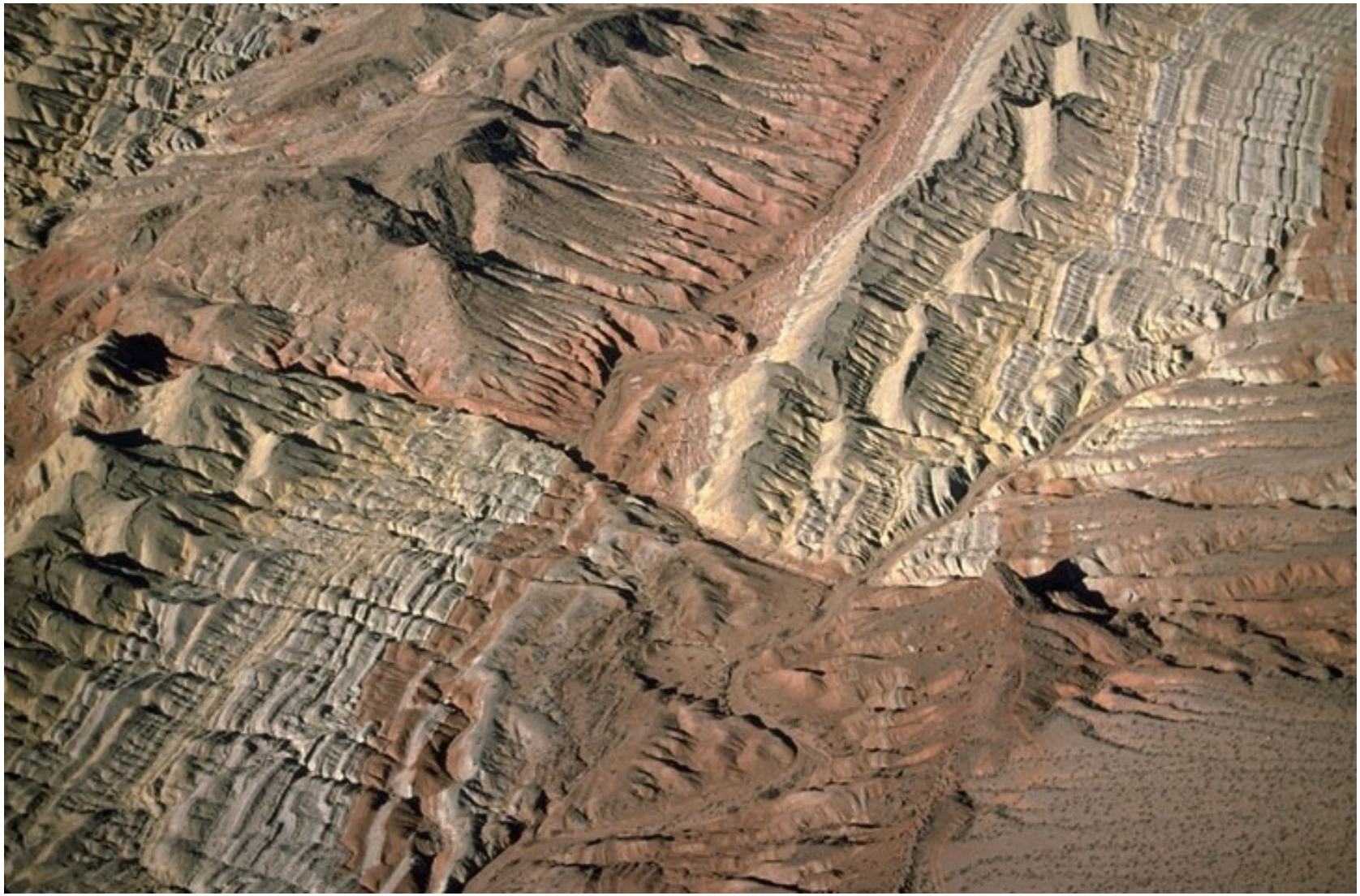
Fuente: Kadir Dirik, 2006

Fallas de rumbo



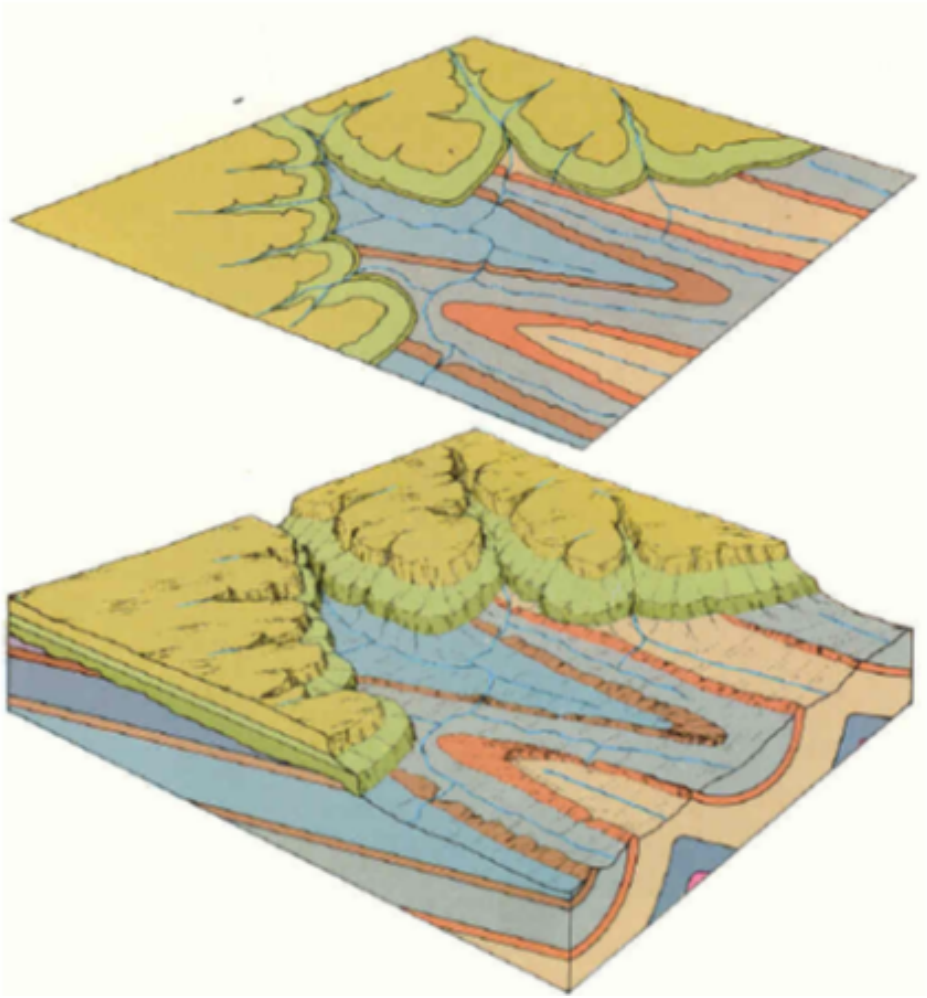
Fuente: Kadir Dirik, 2006

Fallas de rumbo



http://marlimillerphoto.com/SrF.html

Inconformidad



Fuente: Kadir Dirik, 2006

Inconformidad

Fuente: Kadir Dirik, 2006

Rocas sedimentarias con estratos delgados

Humid

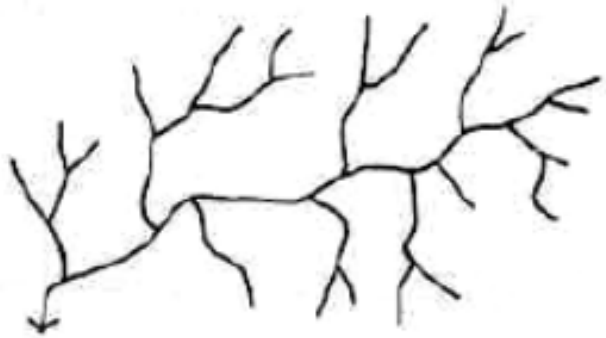
Topography

Uniform slopes

Thin, interbedded sedimentary materials do not have terraced slopes, although faint banding may be observed. Sandstones have steeper slopes than shale or limestone masses. Hilltops throughout such regions have approximately the same elevations.

Drainage

Dendritic: Medium



The drainage pattern in thin, interbedded sedimentary rocks is dendritic and of medium texture, similar to shale drainage in humid climates. The presence of shale in the interbedding, however, increases surface runoff, resulting in a more dissected topography.

Fuente: Way, 1973

Rocas sedimentarias con estratos espesos

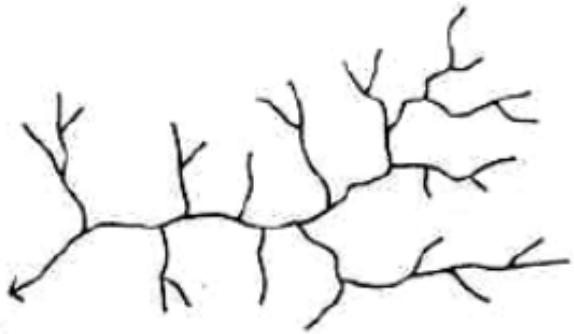
Topography

Terraced hillsides

Hillsides in thick, interbedded sedimentary rock regions appear terraced; hilltops are at the same elevations. In sandstone-shale combinations the more resistant sandstone remains as a cap rock with steep sideslopes; the underlying shale has a more gradual sideslope. In limestone-shale combinations the limestone occupies the hilltops and uplands and may have solution features.

Drainage

Dendritic: Medium to coarse

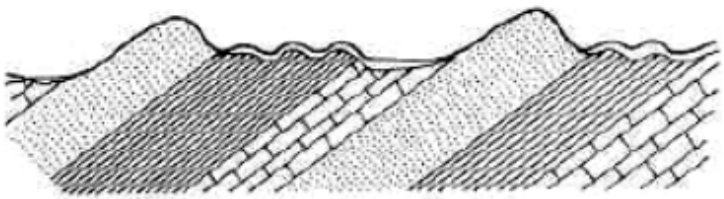
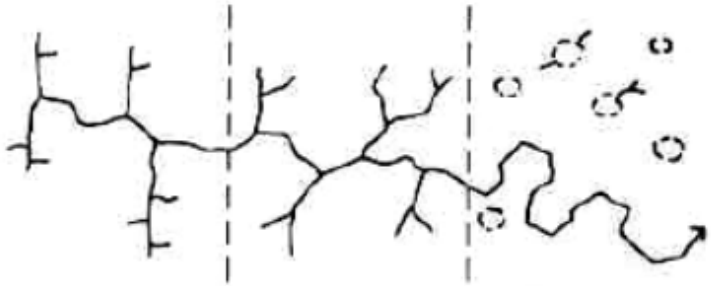


The drainage pattern is commonly a medium dendritic system and tends to be controlled by the most resistant rock in the series, commonly sandstone. Thick, limestone cap rocks may be characterized by solution sinkhole topography, with major streams following angular alignments.

Fuente: Way, 1973

Rocas sedimentarias con estratos buzantes

Humid

Topography	*Drainage*
Parallel ridges	Trellis and dendritic
	
In sandstone-shale combinations sandstone forms resistant, sharp, parallel ridges; shale forms soft, rounded hills in the lowlands. Limestone-shale forms low, rounded hills in shale formations, and karst topography with rounded or oval sinkholes in limestone areas. Thin beds give the ridge topography a saw-toothed appearance.	In most situations a trellis drainage pattern of medium to fine texture exists, controlled by the tilted rock structure. Interbedded limestone and shale may have a dendritic pattern and solution topography with internal drainage. Stream courses are generally located in shale lowlands; if they are located in limestone lowlands, some angularity should occur as a result of jointing influence.

Fuente: Way, 1973

Rocas sedimentarias con grano fino

Humid

Topography

Soft Hills

A smooth, sag-and-swale topography occurs, appearing as soft hills and mounds. Sharp breaks in slopes are neither common nor stable. The attitude of the bedding layers does not affect the appearance of the topography, and it is difficult to observe bedding planes, because of the deep soil profiles found in this climatic zone.

Drainage

Dendritic: Medium to fine

The soft materials exert no control over the drainage system, allowing a medium to fine dendritic pattern to develop freely. No angularity is found, and tributaries enter streams of the next order at acute angles.

Fuente: Way, 1973

Rocas sedimentarias con grano fino

Arid

Topography

Steep sideslopes

The topography is characterized by steep sideslopes and is highly dissected, reflecting the soft nature of the rock. Ridgelines are rounded, and faint bedding planes may be observed along the sides of hills.

Drainage

Dendritic: Fine

Shale regions show a very finely dissected pattern, dendritic in nature, reflecting rapid runoff and the impervious nature of the shale.

Fuente: Way, 1973

Rocas sedimentarias con grano medio

Humid

Topography

Massive, steep slopes

Sandstones tend to be relatively resistant to weathering because of the strength of their cementing agents. Therefore, in humid climates they produce a massive, bold topography with steep sideslopes. The residual soils tend to be very shallow along the ridgelines but thicker at lower elevations, owing to the accumulation of colluvium. Since sandstone is usually the most resistant sedimentary rock in humid climates, it tends to occur as an overlying cap rock. Where sandstones encounter other sedimentary rocks, there is generally a sharp boundary.

Drainage

Dendritic: Coarse

In humid climates the drainage pattern for sandstones is generally dendritic although, depending on the influence of the jointing pattern, it may also be somewhat angular or even rectangular. The drainage system texture is usually coarse but may also be medium, with minor tributaries joining the next higher stream order at right angles.

Fuente: Way, 1973

Rocas sedimentarias con grano medio

Arid

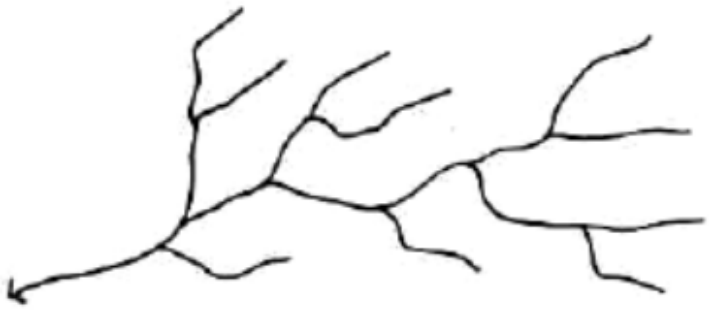
Topography

Flat table rocks

Sandstone deposits in arid climates are resistant to the forces of weathering and form dominant formations in the landscape. Fracture or joint patterns, having the appearance of rectangular blocks, can be readily observed since there is little soil cover. Cliffs may occur where sandstones overlie weaker sedimentary rocks, and wind erosion and blowing sand may modify these vertical elements, rounding and carving them into streamlined shapes. If the beds are flat, the hilltops tend to be of equal elevations.

Drainage

Angular dendritic



In arid climates the lack of residual soil cover allows the joints in sandstone to have maximum control over the drainage pattern. Thus, it is usually an angular dendritic or even rectangular pattern, medium to coarse in texture. Many streams are intermittent, so large areas of no apparent drainage may be observed.

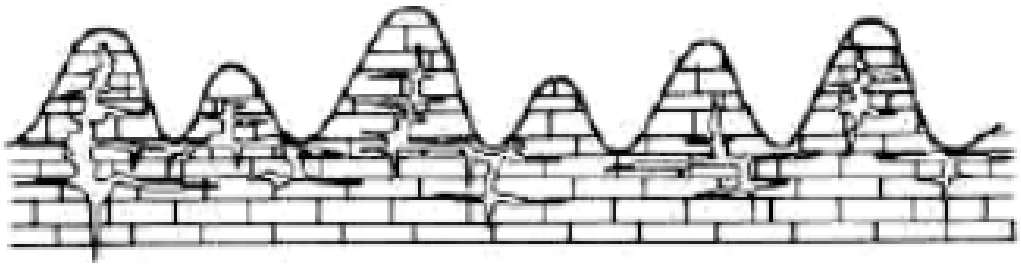
Fuente: Way, 1973

Calizas

Tropical limestone

Topography

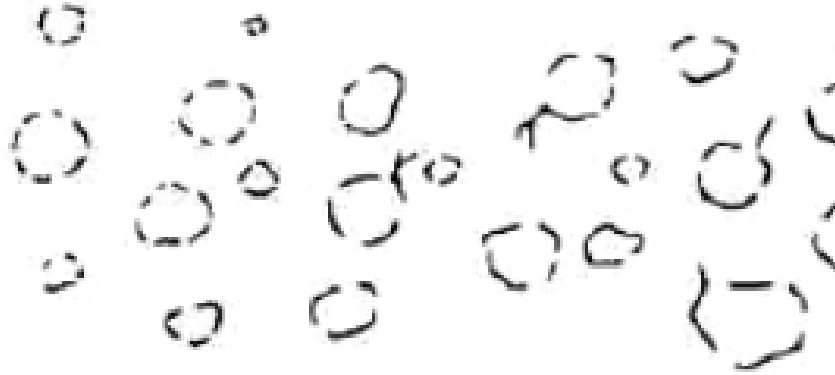
Tropical karst



A very rugged, tropical karst topography is developed with conical hills and large depressions (up to 1000 feet deep and 1 mile in diameter).

Drainage

Internal



All drainage is internal through the permeable soil and bedrock.

Fuente: Way, 1973

Rocas graníticas

Humid

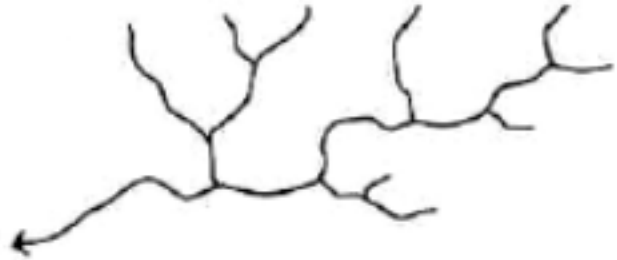
Topography

Bold, domelike hills

The topographic relief of granitic intrusions typically shows as massive, rounded, domelike hills. The tops of the hills are softly rounded; the sideslopes are steeper. The weathering processes of pressure-release and exfoliation tend to maintain the domelike appearance. Debris and large boulders weathered into rounded shapes accumulate in drainage courses and depressions.

Drainage

Dendritic: Medium



A dendritic drainage pattern of medium texture is common in humid climates and indicates the uniform materials of which the forms are made. The domelike hills cause curvilinear alignments to develop, and these are important evidence in the identification of granite. Intersections of tributaries occur at right angles or may be slightly acute upstream.

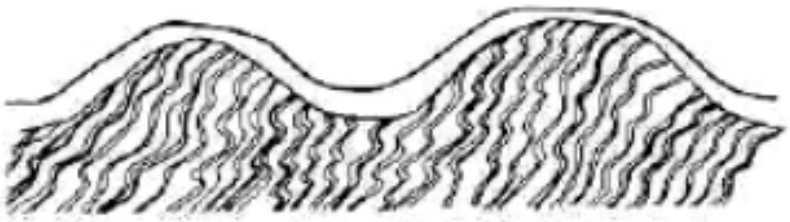
Fuente: Way, 1973

Esquistos

Humid

Topography

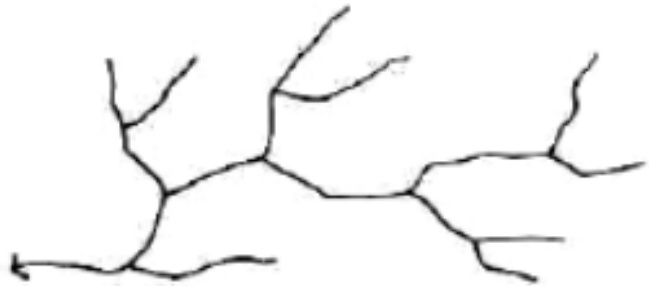
Rounded crests, steep sideslopes



In humid climates schist formations develop deep residual soils reflected by rounded hills with steep sideslopes. The overall appearance of the topography is that of smooth, undulating hills.

Drainage

Rectangular dendritic: Medium to fine



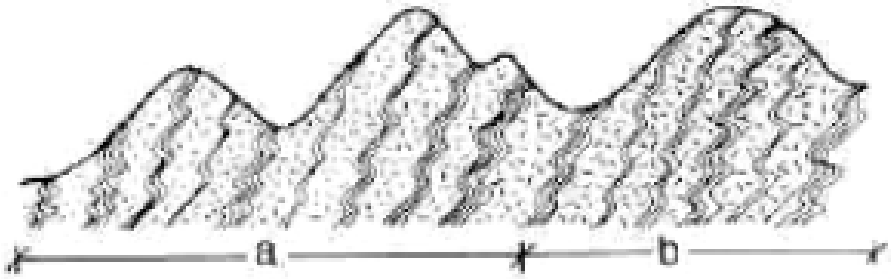
A rectangular, dendritic drainage system of medium to fine texture, having many long, deep, parallel gullies, develops in humid climates. The drainage pattern is developed and controlled by the parallel foliation structure of the parent material, whose weaker materials are more easily eroded to form valleys and whose more resistant materials form ridges.

Fuente: Way, 1973

Gneiss

Topography

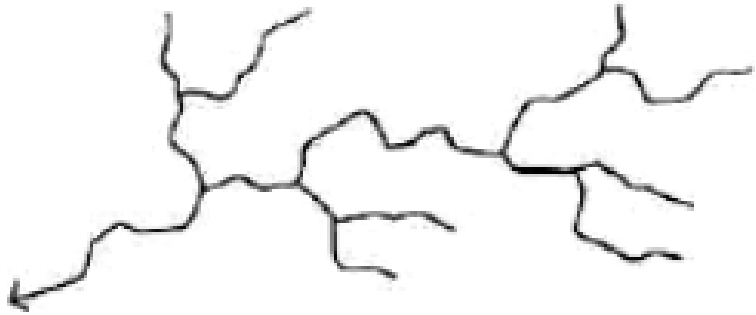
Sharp, steep-sided, parallel ridges



Gneiss formations develop parallel, sharp-ridged hills with steep sideslopes; this topography is the result of differential weathering of the foliations within the rock structure (a). Glaciated regions (b) develop the same topography, except that ridgetops may be rounded as a result of glacial scouring.

Drainage

Angular dendritic: Fine to medium



The weathering of the rock foliation initiates and controls the placement of the drainage system which is angular and dendritic. In regions where parallel ridges and valleys are developed, the system appears rectangular. The texture is generally fine or medium.

Fuente: Way, 1973

Gneiss vs Graníticos

	Granitos	Gneis
Morfología	Textura homogénea, uniforme	Bandeado discontinuo e irregular por la orientación de los minerales
	Formas redondeadas, de aspecto rugoso	Formas en pico: aristas, crestas, vertientes rectilíneas cortadas a pico, lomas alargadas con aristas.
Suelos	Arenosos	Arcillosos
Drenaje	Pinzado, rectangular	Dendrítico más denso, con arroyos que se adaptan a la orientación de los minerales, los valles pueden ser paralelos
Vegetación	arbórea/arbustiva clara	arbórea/arbustiva densa

Fuente: López (1978)