

Estruturas em rochas

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Algumas rochas apresentam estruturas intrínsecas que podem se refletir em escala maior - geomorfologia

Estratificação
Estruturas cruzadas
Derrames magmáticos
Estruturas de fluxo

Foliação
Xistosidade
Lineação
Estrutura gnáissica
“Clivagem ardosiana”
Crenulação



- As estruturas **Não-Tectônicas** ou (primárias) são formadas por processos sedimentares, ígneos e metamórficos. EX: estruturas sedimentares em geral, vesículas em rochas ígneas
- Os processos deformacionais (deformação de rochas) formam estas estruturas **tectônicas** (secundárias) .

Falhas, fraturas e dobras ocorrem em ROCHAS ÍGNEAS SEDIMENTARES E METAMÓRFICAS .

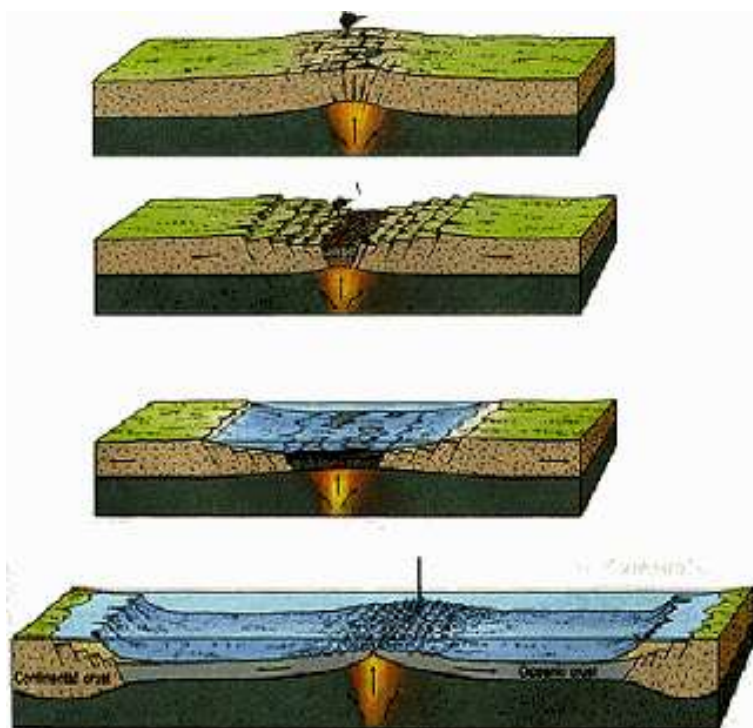
São mais freqüentes em ROCHAS METAMÓRFICAS

FRATURAS: rachaduras ou vazios nas rochas, onde não há deslocamento entre as camadas ou foliação. Acontece em estado rúptil.

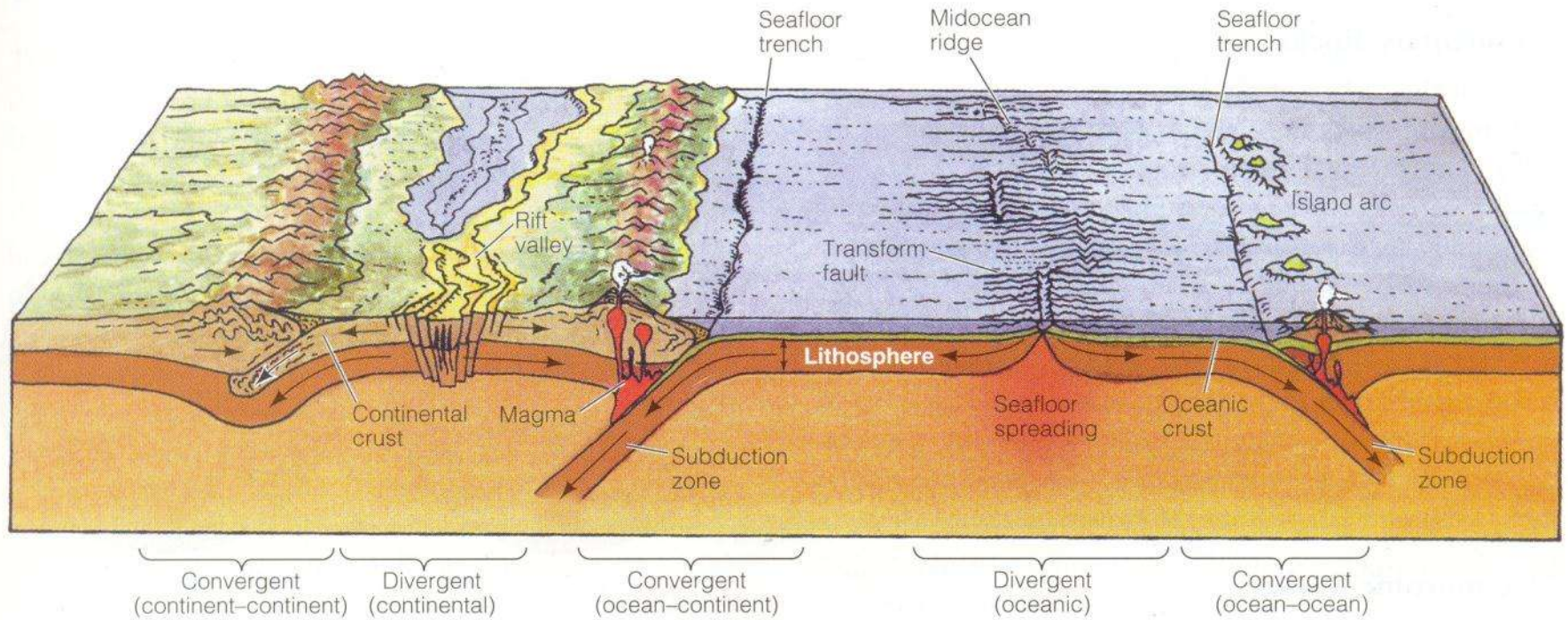
FALHAS: existe deslocamento relativo entre camadas (estratos) e foliações. Acontece em estado rúptil.

DOBRAS: deformação nas rochas que resulta no encurvamento. Acontece em estado dúctil.

Dinâmica do Planeta



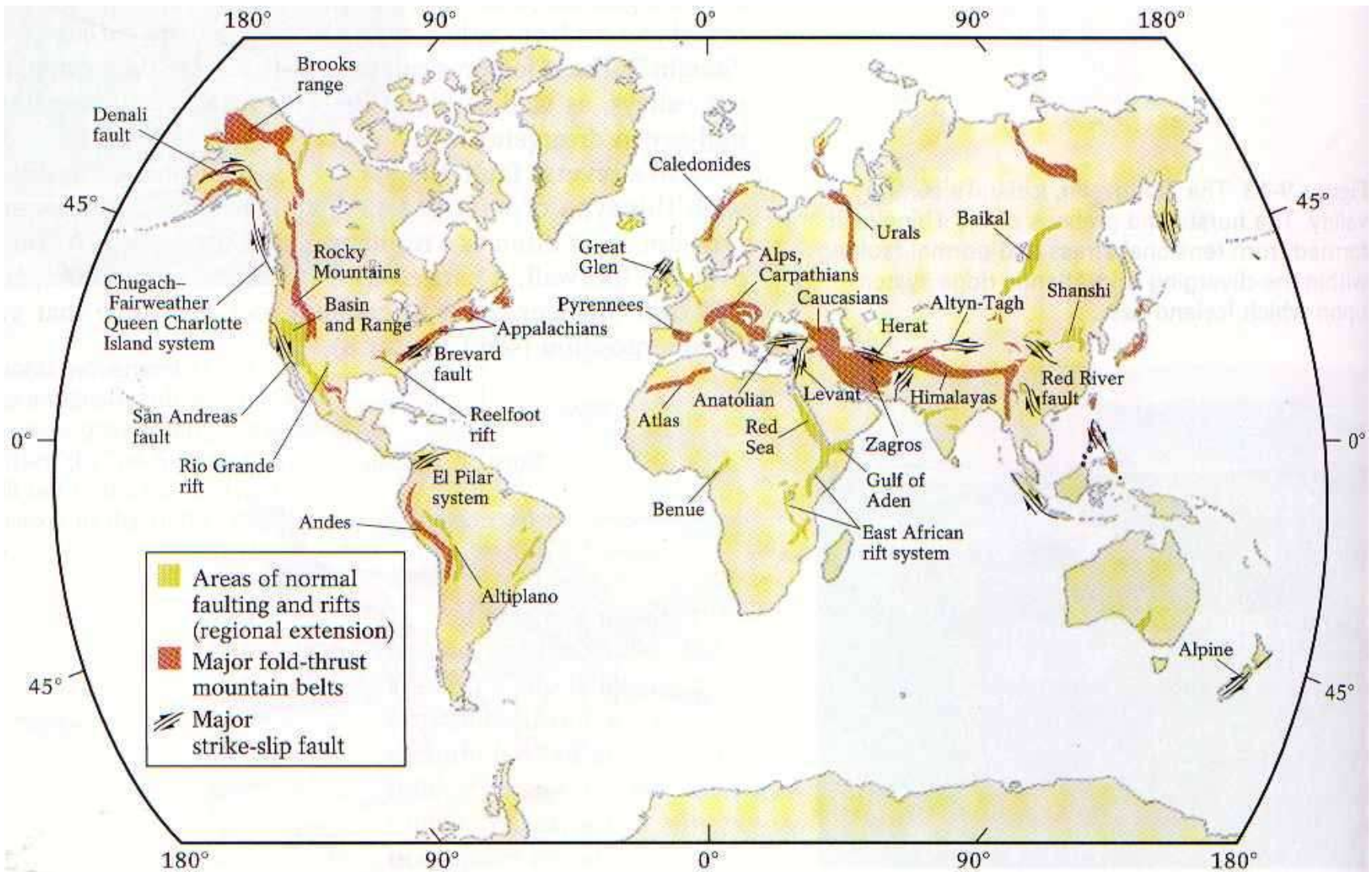
Grandes ambientes tectônicos de formação de falhas e dobras



▲ FIGURE 1.17

The various types of plate margins: divergent (spreading or rifting); convergent (subduction and collision zones); and transform (lateral motion). In an oceanic setting, divergent margins are marked by midocean ridges, like the Mid-Atlantic Ridge. In a continental setting, divergent margins are marked by rift valleys, like the East African rift. Ocean-ocean and ocean-continent convergent margins where subduction occurs are marked by deep trenches and lines of volcanoes. Continental collision zones, as in the Himalaya, are marked by mountain ranges. Transform margins vary in their topographic features; they are sometimes marked by a long linear valley.

Grandes cadeias de montanhas: resultados de subduções e colisões entre oceanos e continentes: Formação principal de dobras e falhas inversas e, ainda, falhas normais em ambientes associadas.



Margens de placas e formação de falhas e dobras

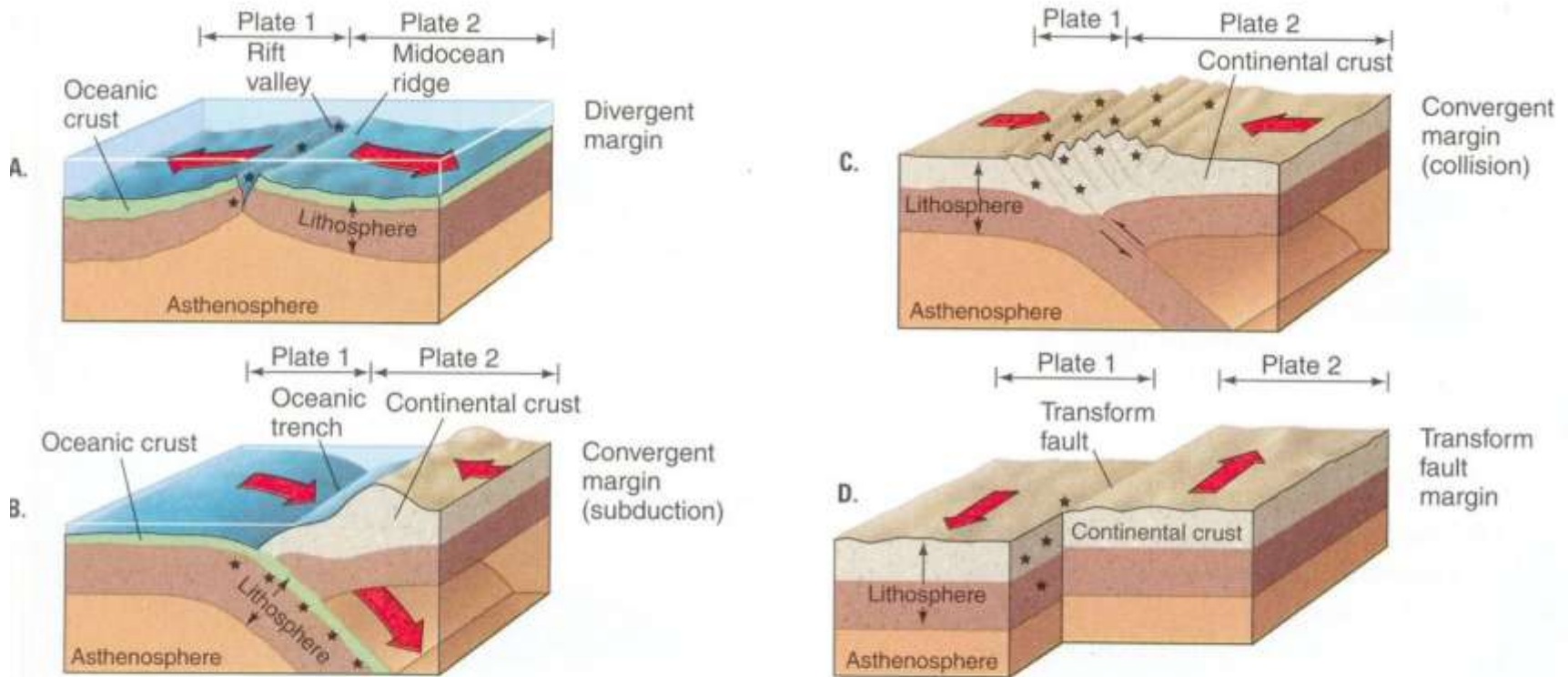


Figure 2.11 Plate Margins The various kinds of plate margins. Stars (★) indicate earthquake centers. A. Divergent margin or spreading center; its topographic expression is a mid-ocean ridge. B. Convergent subduction margin; its topographic expression is an oceanic trench. C. Convergent collision margin; its

topographic expression is a mountain range. D. Transform fault margin; it does not produce a consistent topographic expression but is often marked by a long, thin valley due to preferential erosion along the fault.

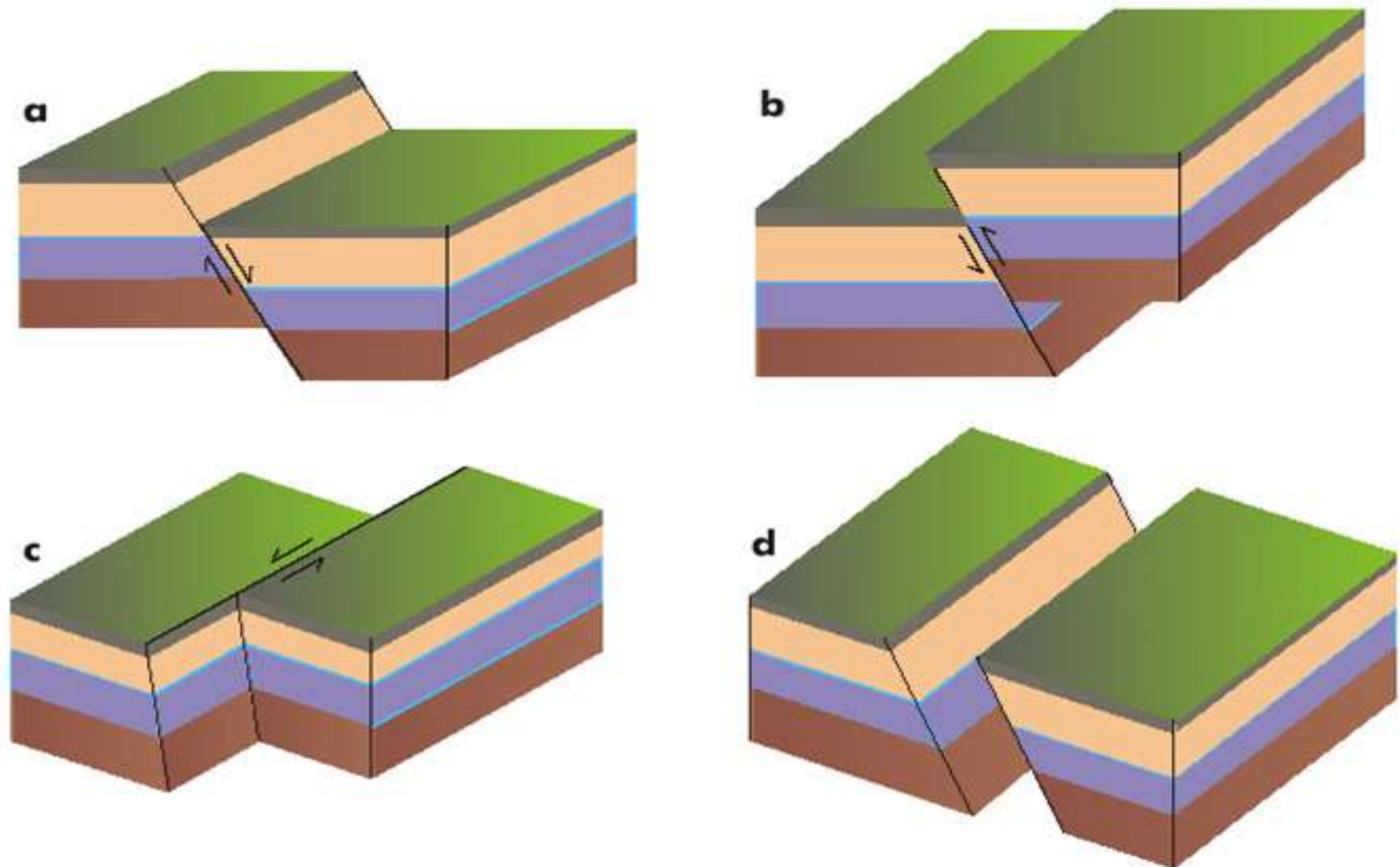
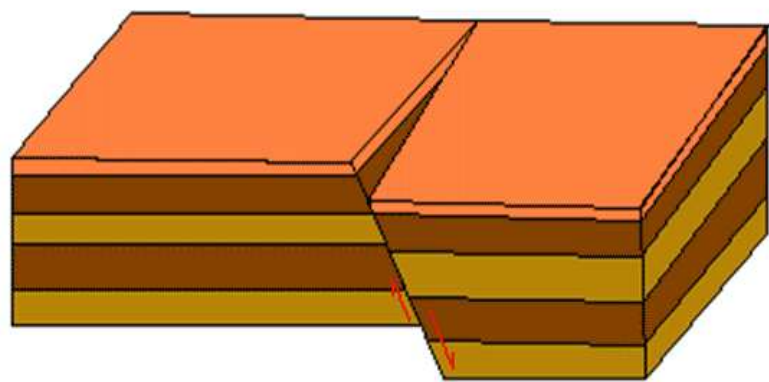
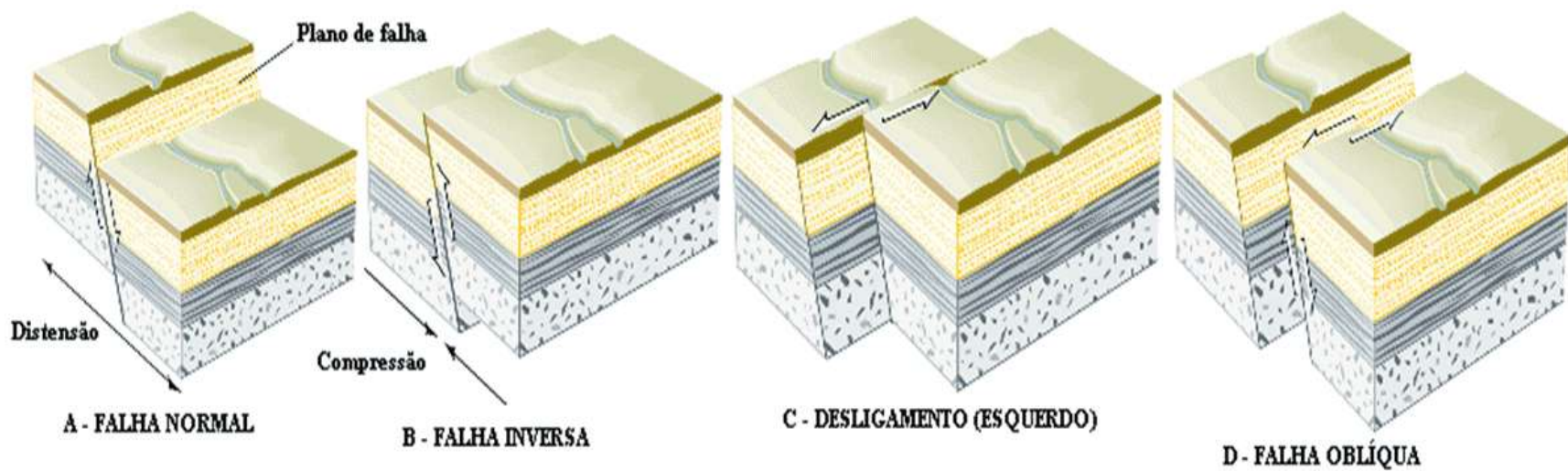
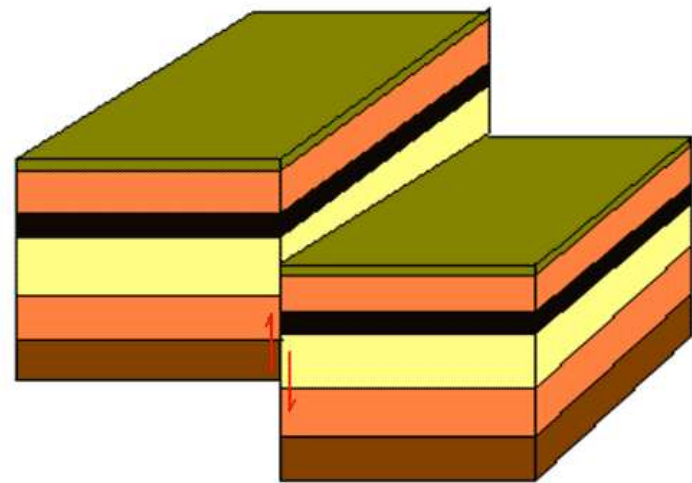


Fig. 19.32 Classificação de falhas com base no movimento relativo entre blocos adjacentes. a) falha normal; b) falha inversa; c) falha transcorrente e d) oblíqua.



E - FALHA EM CHARNEIRA



F - FALHA VERTICAL

Graben = bacia sedimentar
Horst = Montanha/Serra

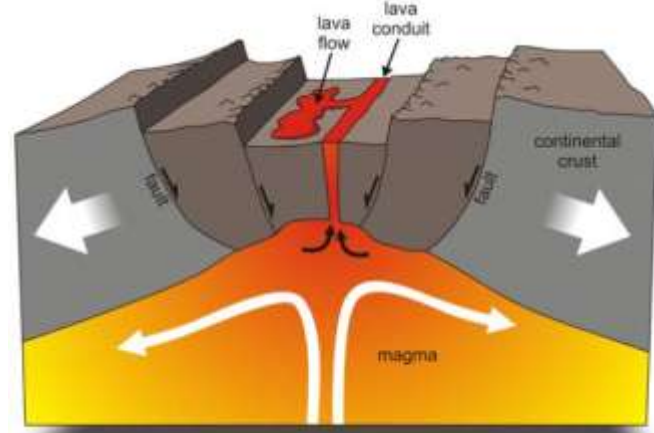
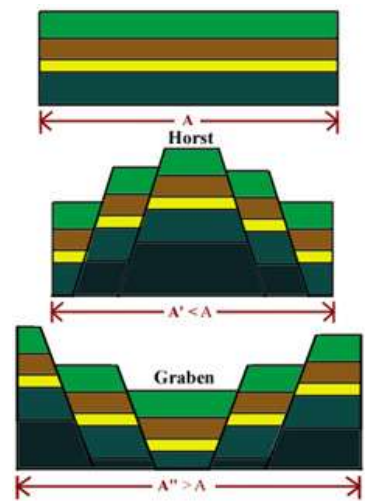
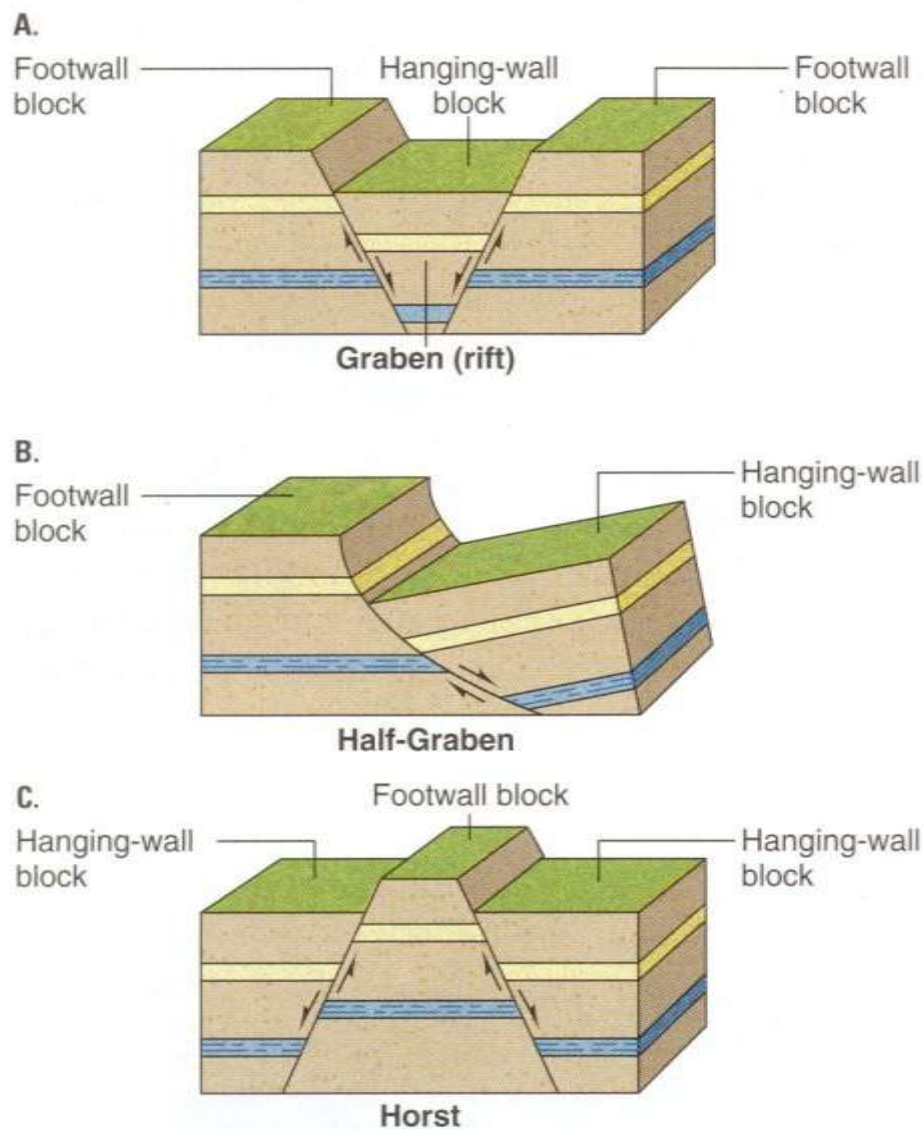
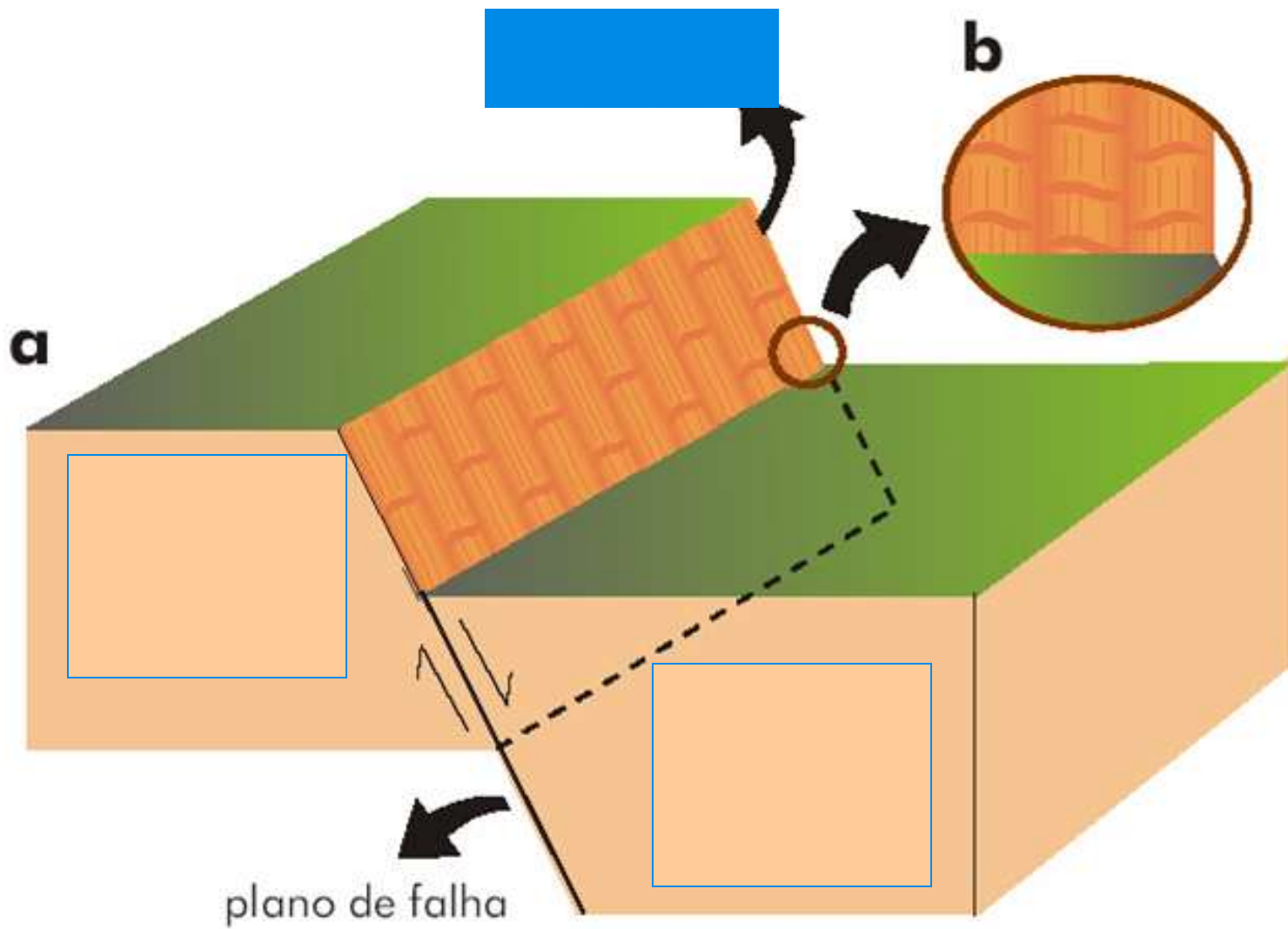
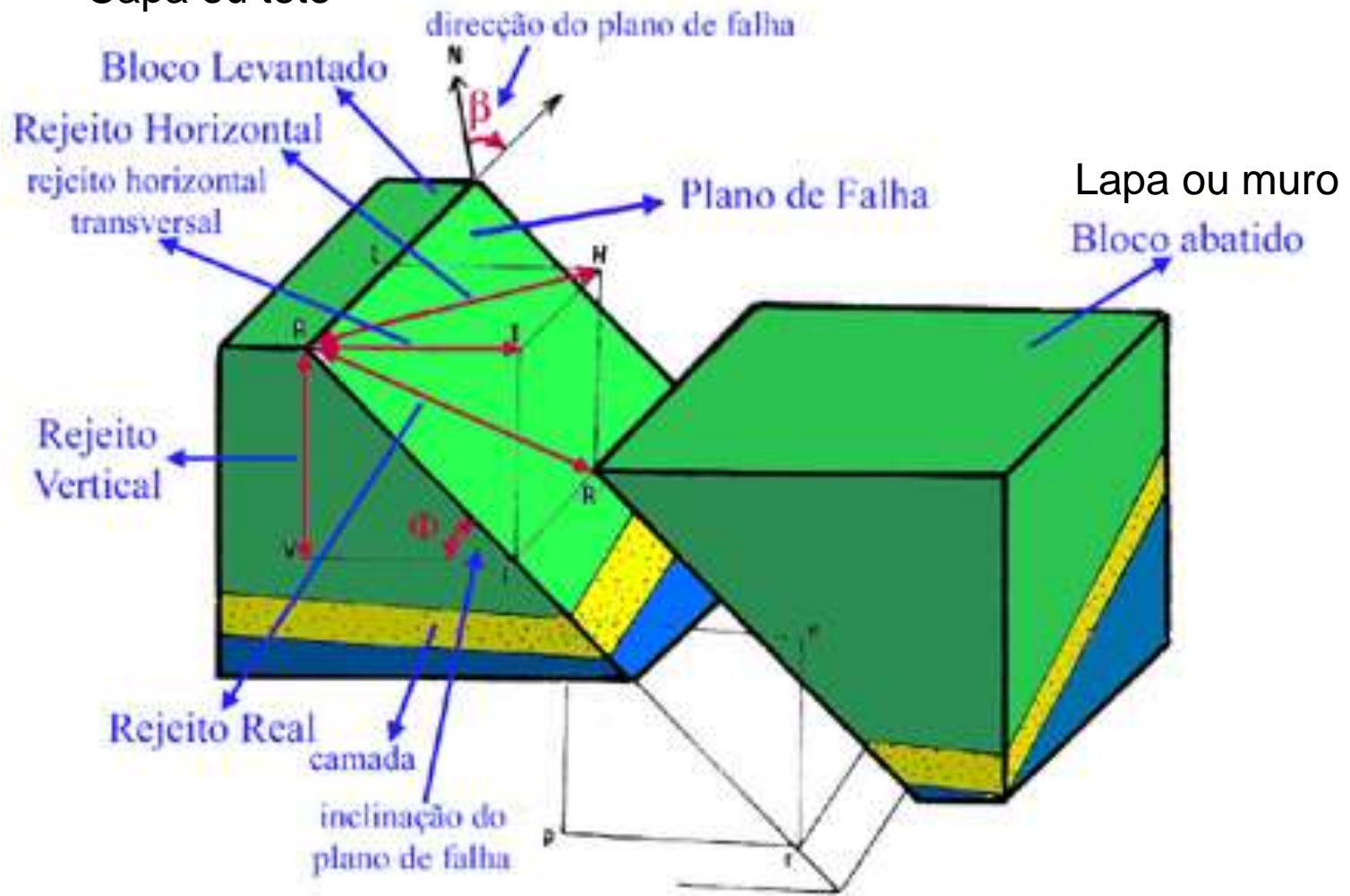


Figure 9.14 Horsts and Grabens Horsts and grabens form when tensional stresses produce normal faults.



Capa ou teto



Falhas normais

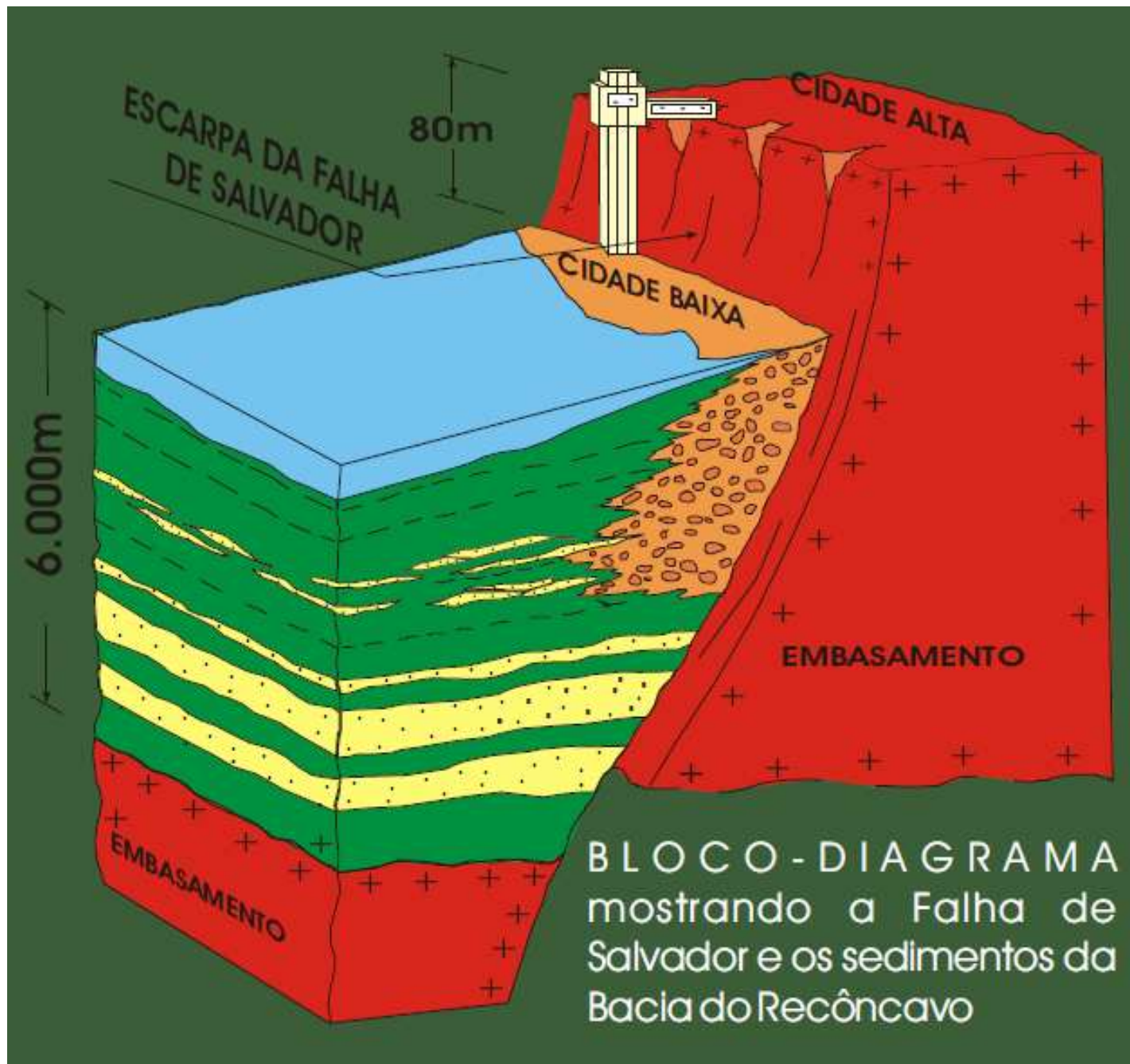


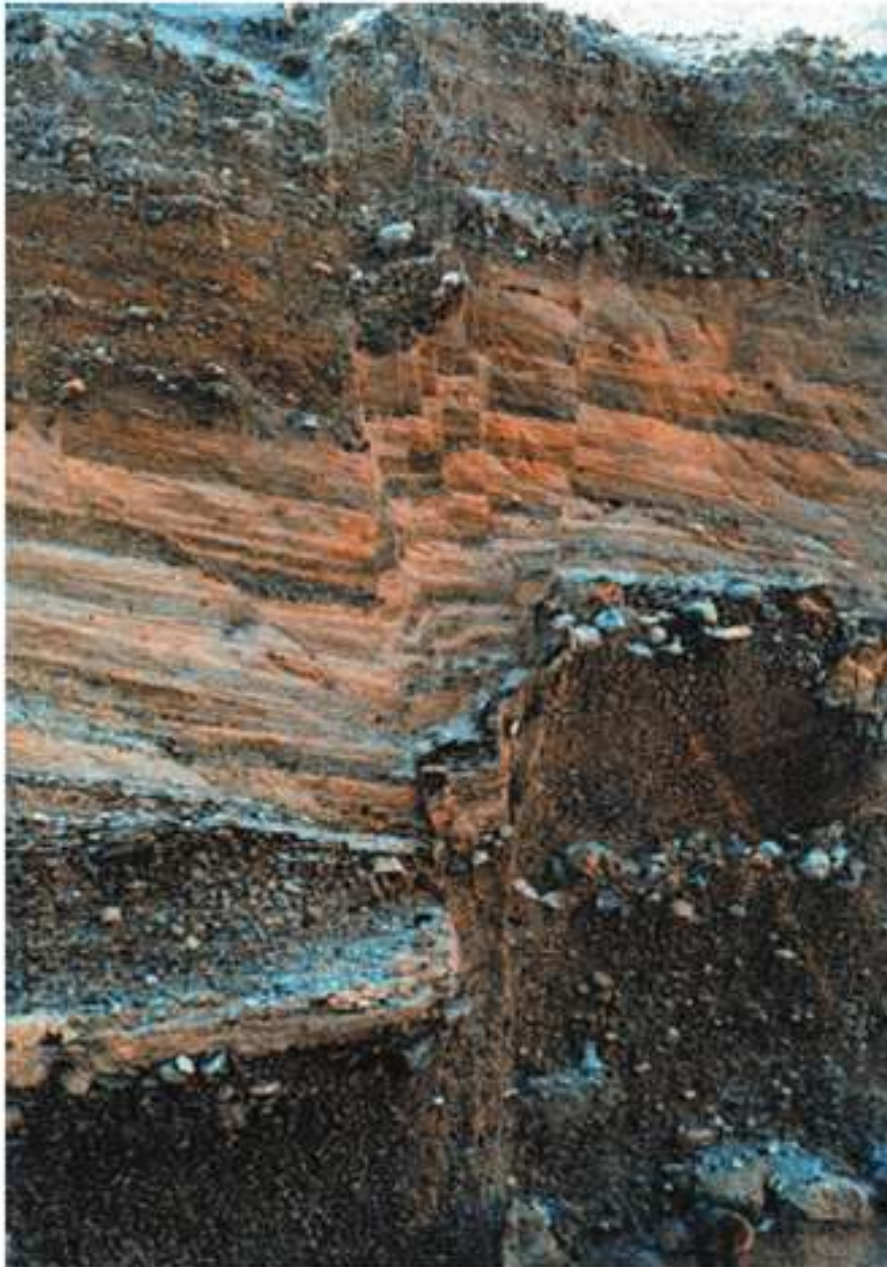
Falha inversa



Falhas Transcorrentes







19.28 Falhas, a maioria normal, afetando arenitos e conglomerados da Formação Itaquaquecetuba, em Itaquaquecetuba, SP. Foto: C. Riccomini.



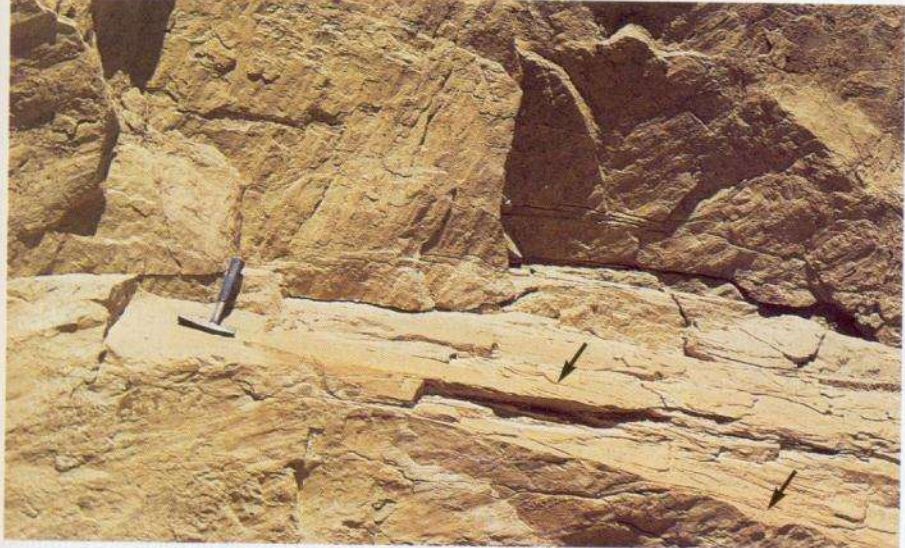


Figure 9.20 Slickensides and Breccias The effects of faulting. A. Slickensides on a fault surface, Borrego, California. The hanging-wall rocks have been removed by erosion, thus exposing the fault on the footwall. B. Fault breccia, Titus Canyon, Death Valley. Angular gneiss fragments (dark) broken by faulting are set in a matrix of rock flour and calcite.

A.

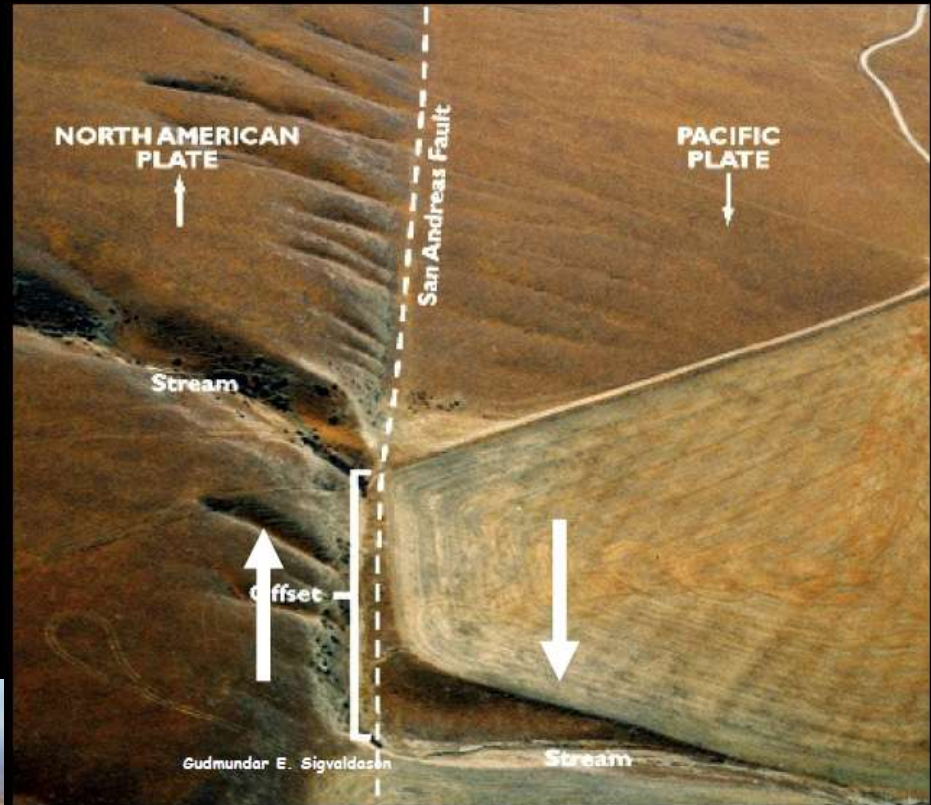


B.

Evidências de falhas em rochas ígneas, sedimentares e metamórficas:

- deslocamento de camadas sedimentares e foliações metamórficas ao longo do plano de falha
- Estrias e brechas

Falha transcorrente



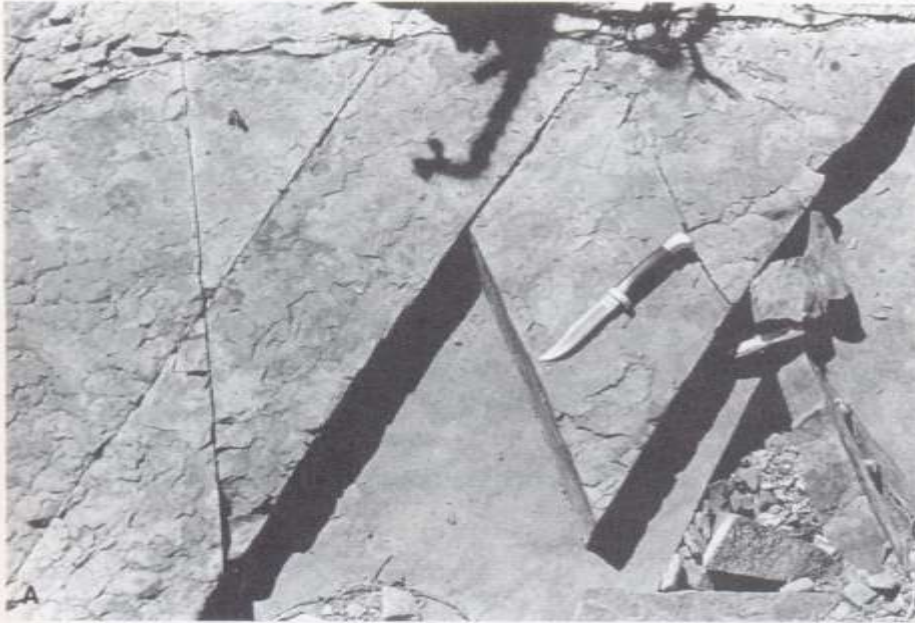


Figure 5.6 (A) Shear fractures in Cretaceous sandstones in the Tucson Mountains, Arizona. (B) Slickenlines on shear fracture cutting Jurassic siltstones in the Tucson Mountains, Arizona. The slickenlines are best expressed in the quartz vein coatings of the fracture surfaces. (Photographs by G. H. Davis.)



Fraturas

Fraturas ou diáclases

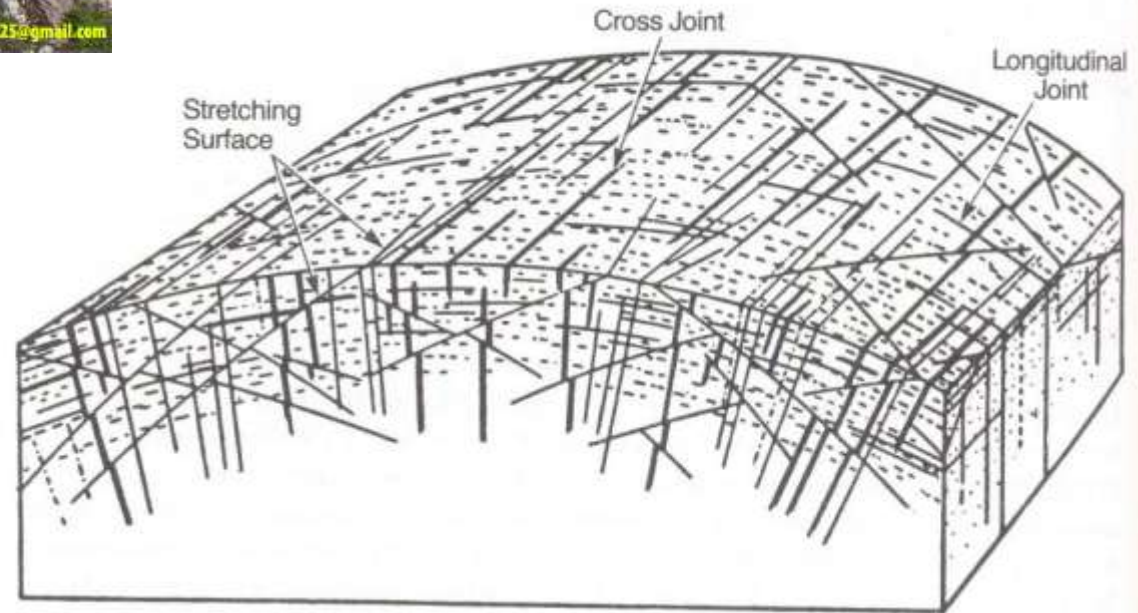
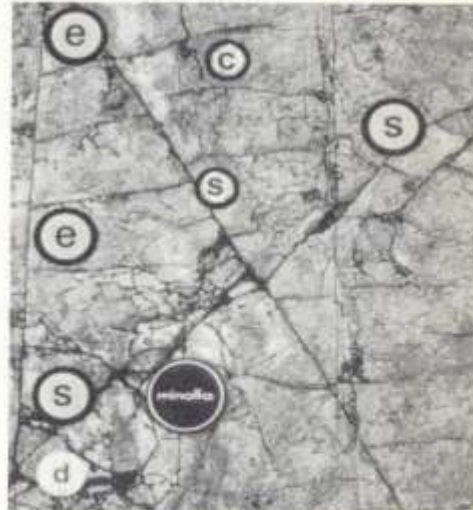
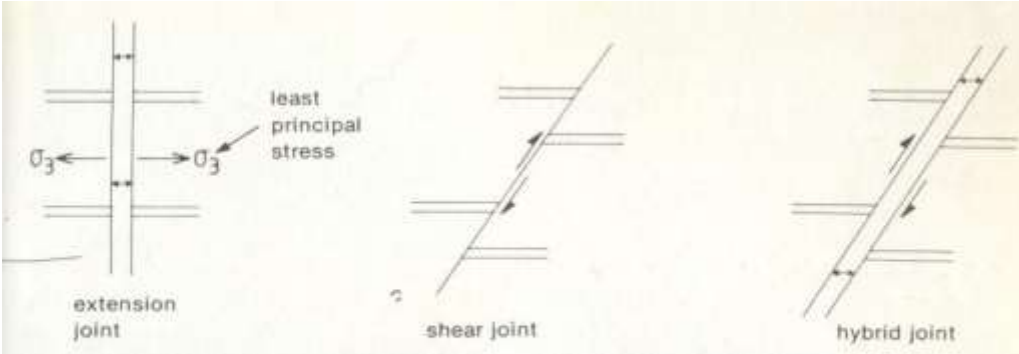


Figure 5.70 Block diagram showing ideal primary fracture pattern in a granitic pluton. [From Cloos (1922).]



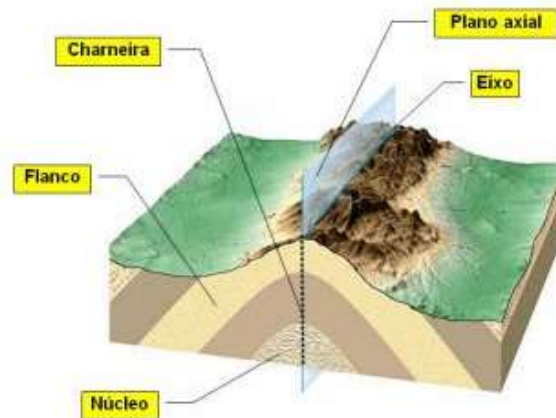
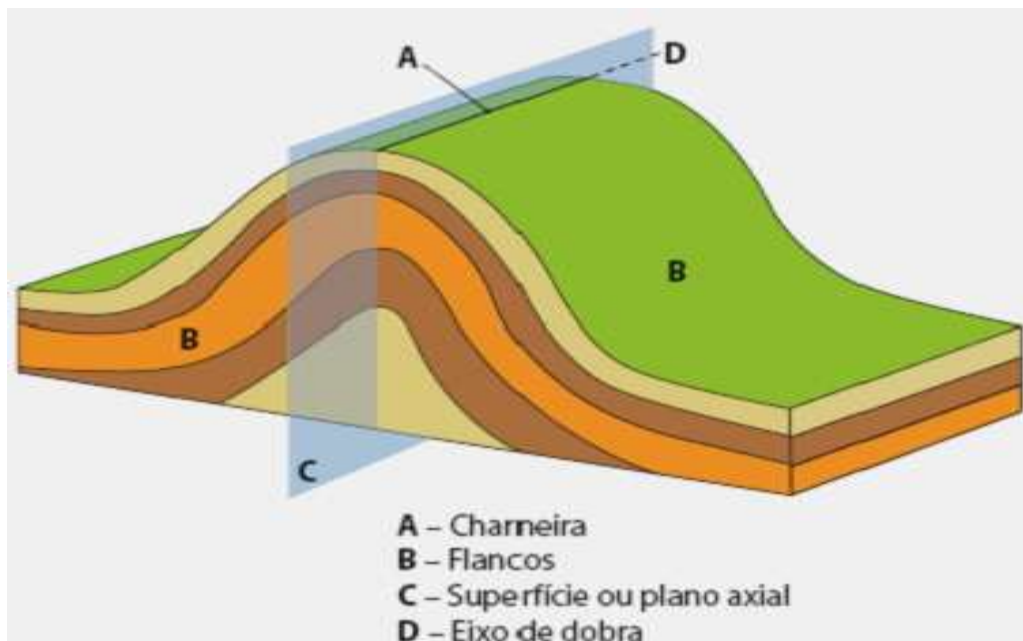
Fraturas ou diáclases

Dobras



Folded strata Carboniferous and Permian strata in Ingeborgfjellet, Van Mienfjorden, Spitsbergen

Elementos geométricos de uma dobra



Zona de charneira – Zona que contém os pontos de máxima curvatura da superfície dobrada;

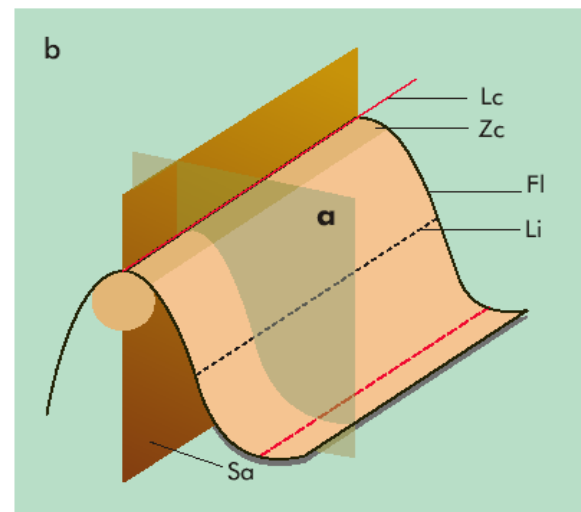
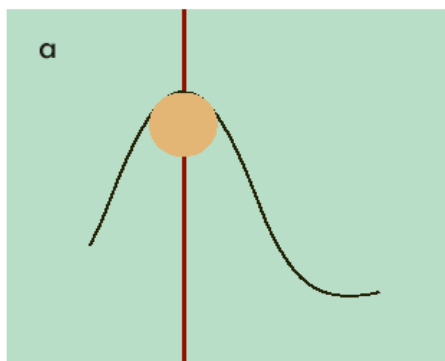


Fig. 19.6 Elementos geométricos de uma superfície dobrada cilíndrica (a) e plano de perfil de uma dobra (b): Sa- Superfície axial; Lc- Linha de charneira; Li- Linha de inflexão; Zc- Zona de charneira e FI- Flanco.

➤ - De acordo com a disposição espacial das dobras, estas podem ser denominadas dobras **antiformes**, com concavidade voltada para baixo, dobras **sinformes**, com concavidade voltada para cima, ou dobras neutras, cuja abertura se orienta lateralmente (com eixo vertical).

- De acordo com a idade das rochas que as constituem, estas podem ser designadas por **anticlinais**, quando as rochas mais antigas se encontram no núcleo da antiforme, ou por **sinclinais**, quando as rochas mais recentes se localizam no núcleo da sinforme.

Principal classificação de dobras

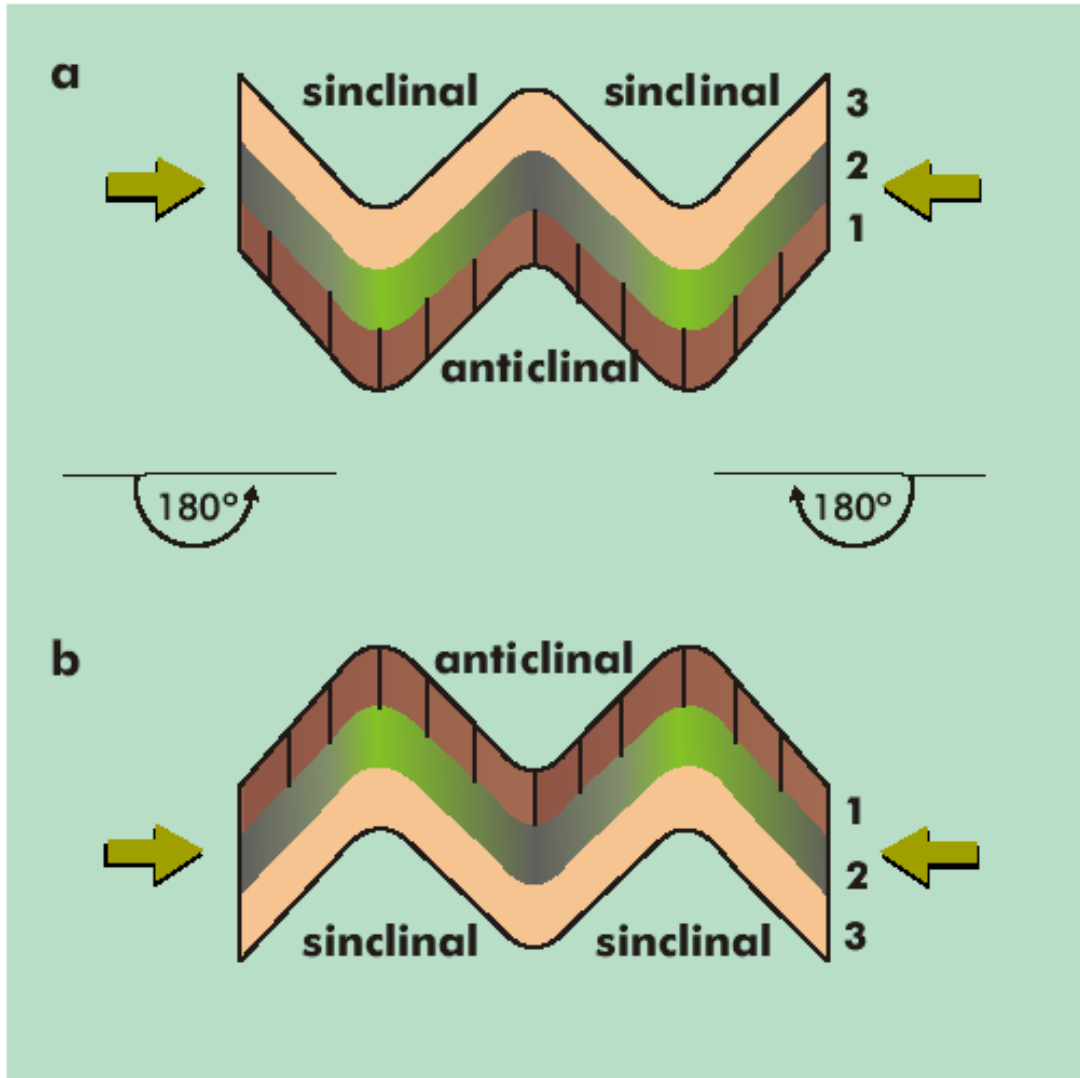
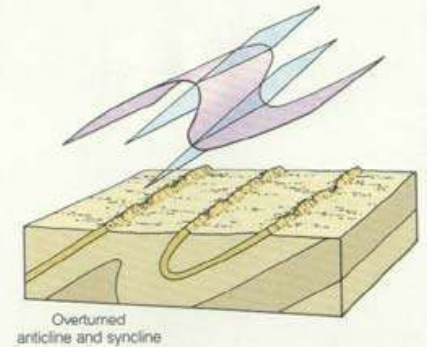
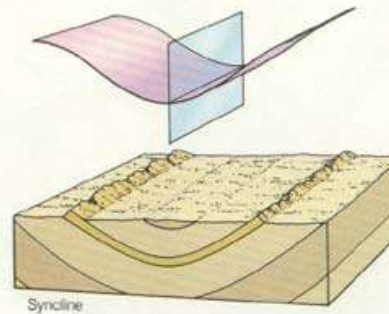
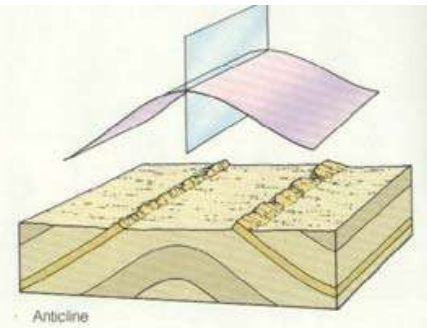
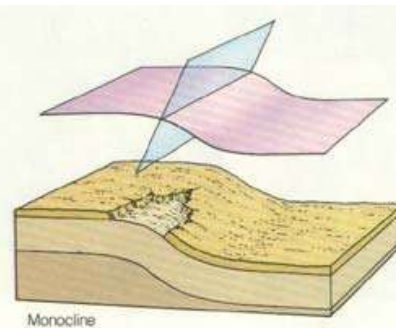
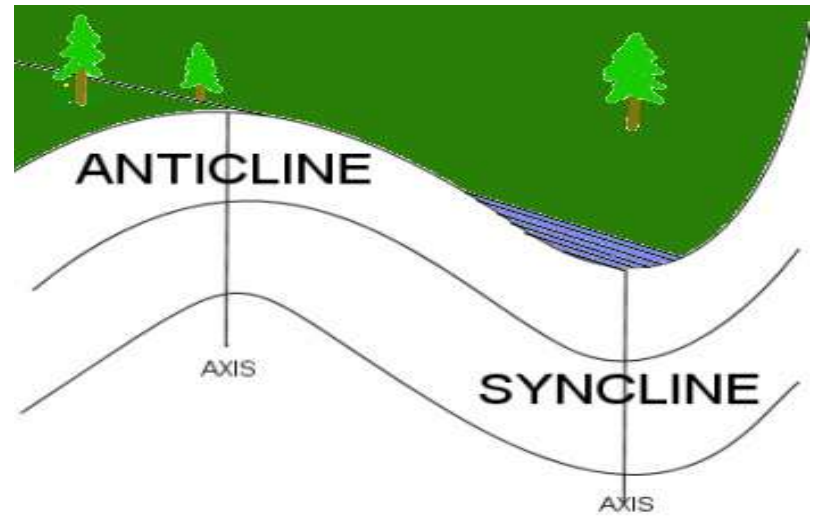
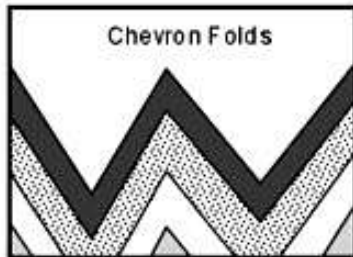
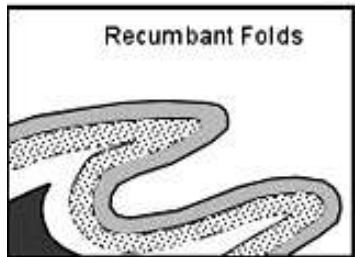
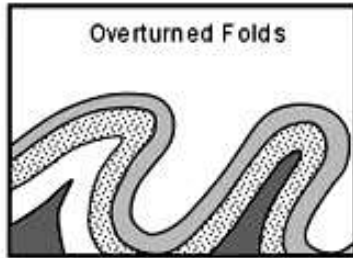
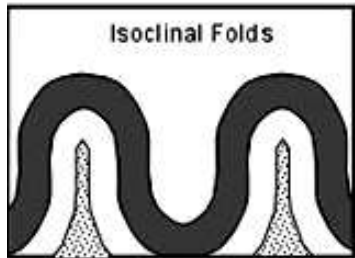
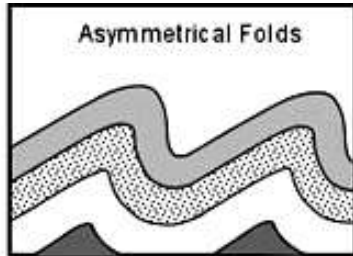
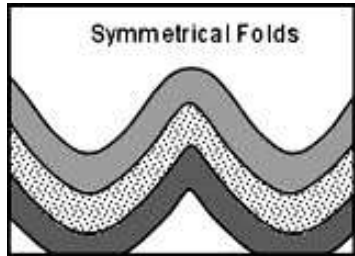
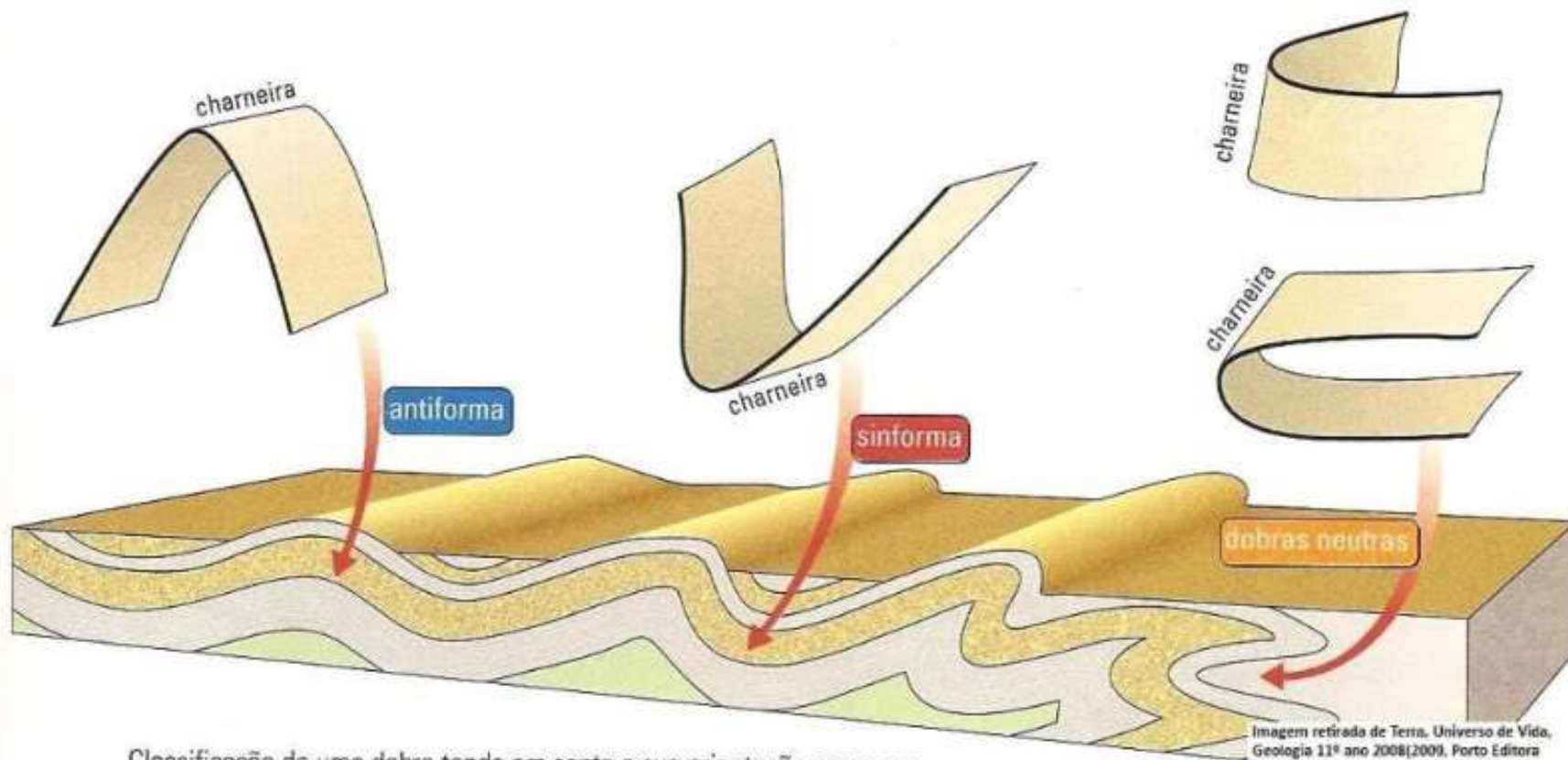


Fig. 19.19 Classificação de dobras com base na estratigrafia das camadas: sinclinal e anticlinal. Seqüência estratigráfica das camadas: 1 mais antiga, 2 intermediária, 3 mais nova. Em a, seqüência normal, em b, seqüência invertida.





Classificação de uma dobra tendo em conta a sua orientação no espaço.

Anticlinais e sinclinais

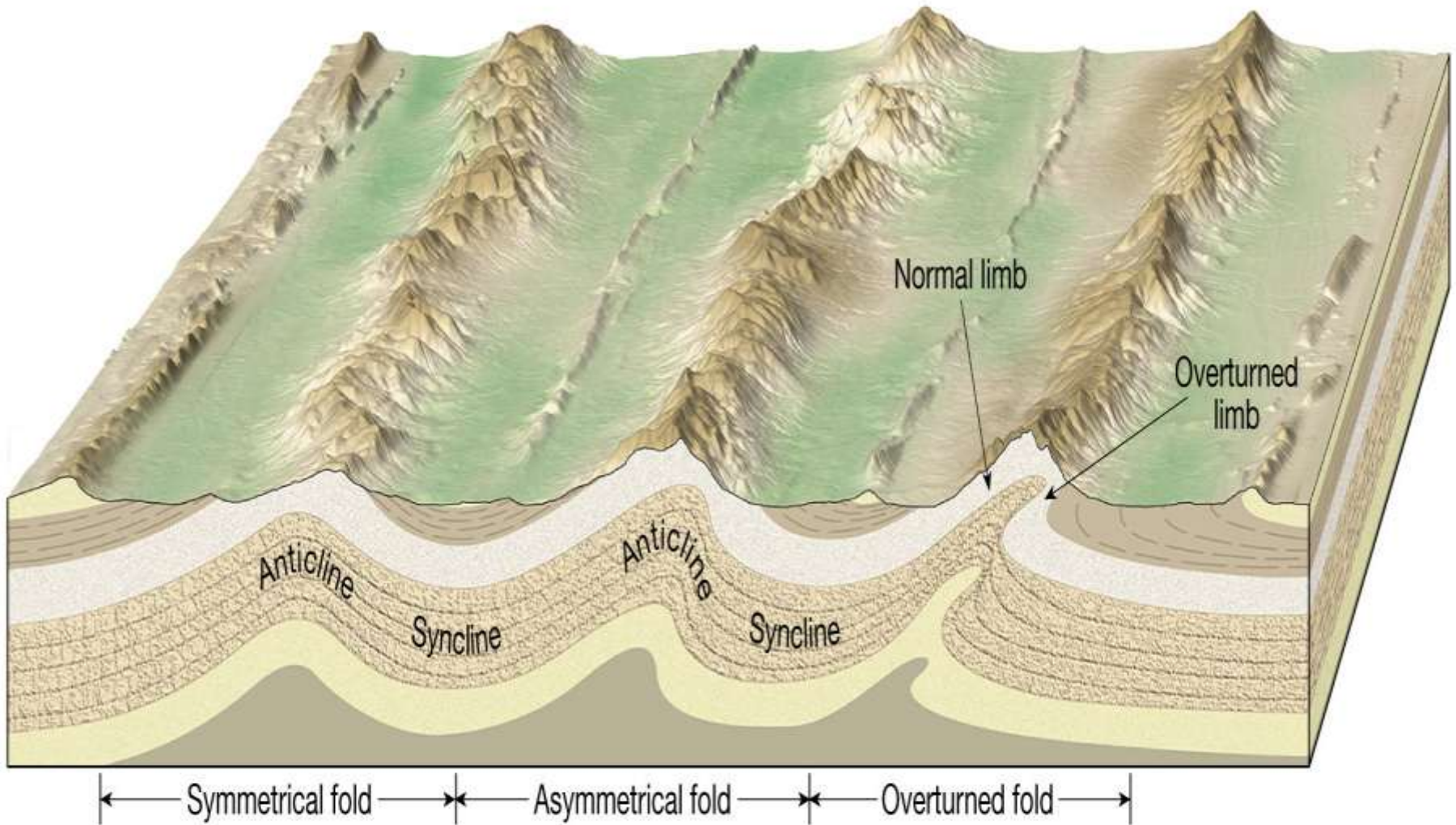






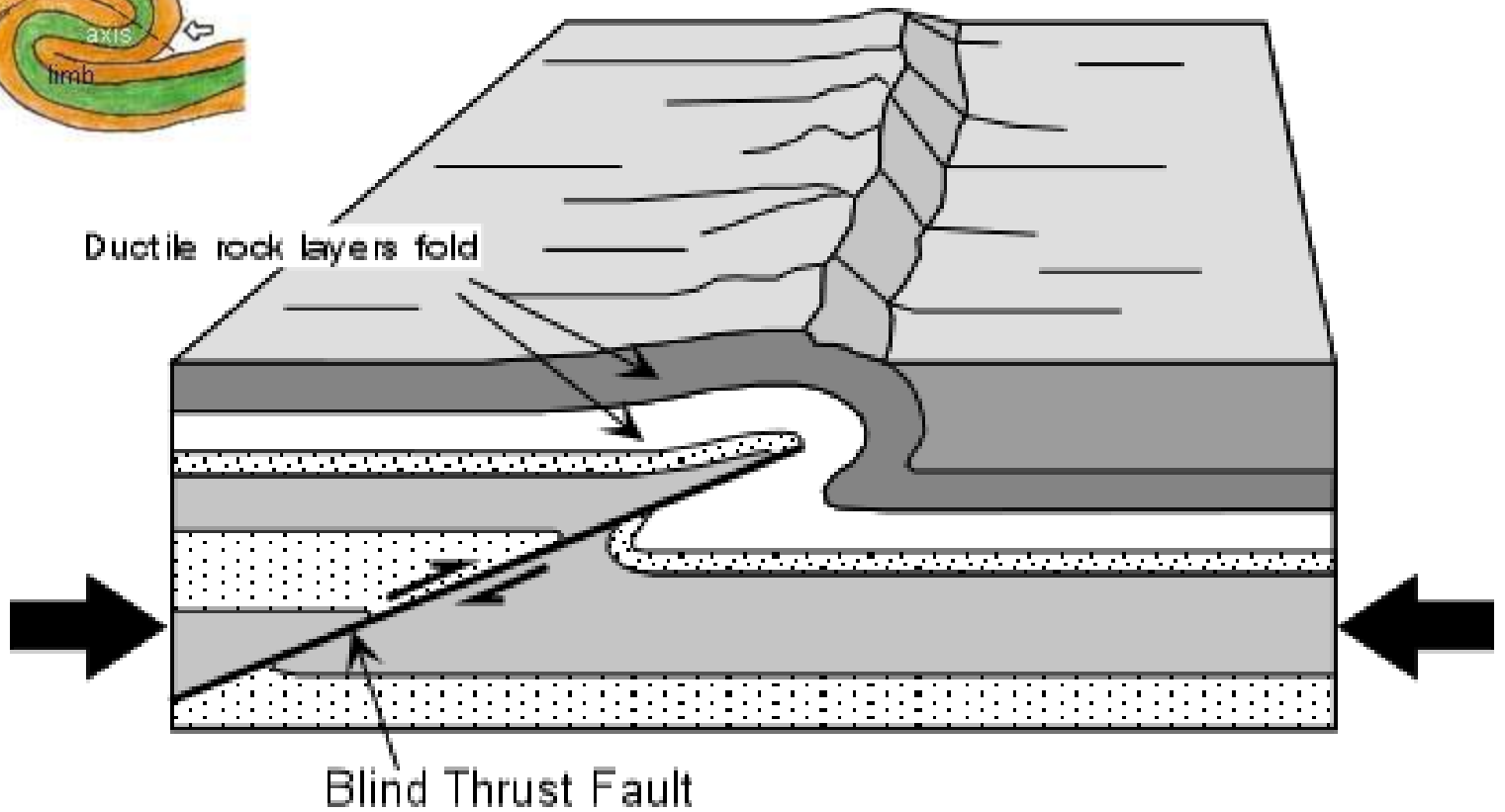
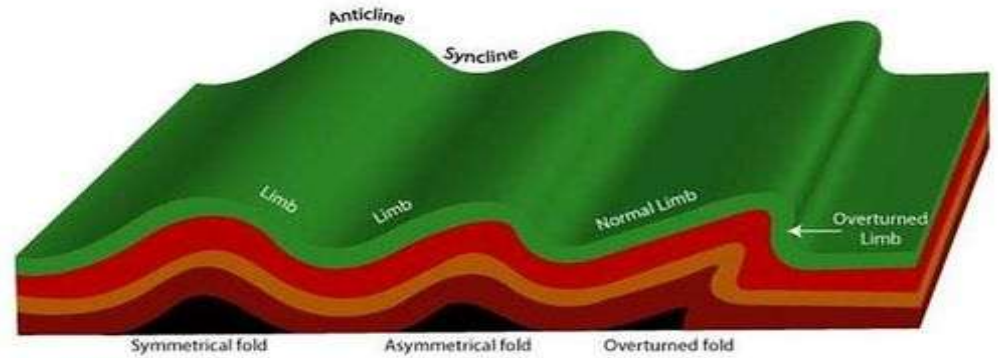
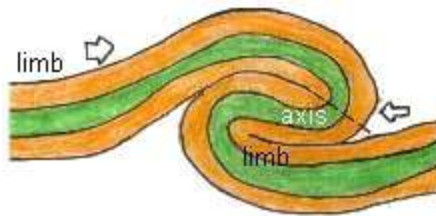
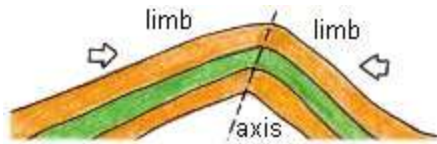
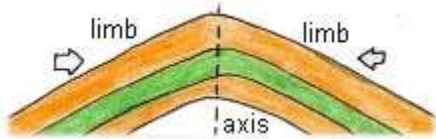








Figure 15.5 Deformed sedimentary strata exposed in a road cut near Palmdale, California. In addition to the obvious folding, light-colored beds are offset along a fault located about one-third of the way in from the right-hand edge of the photograph. (Photo by E. J. Tarbuck)

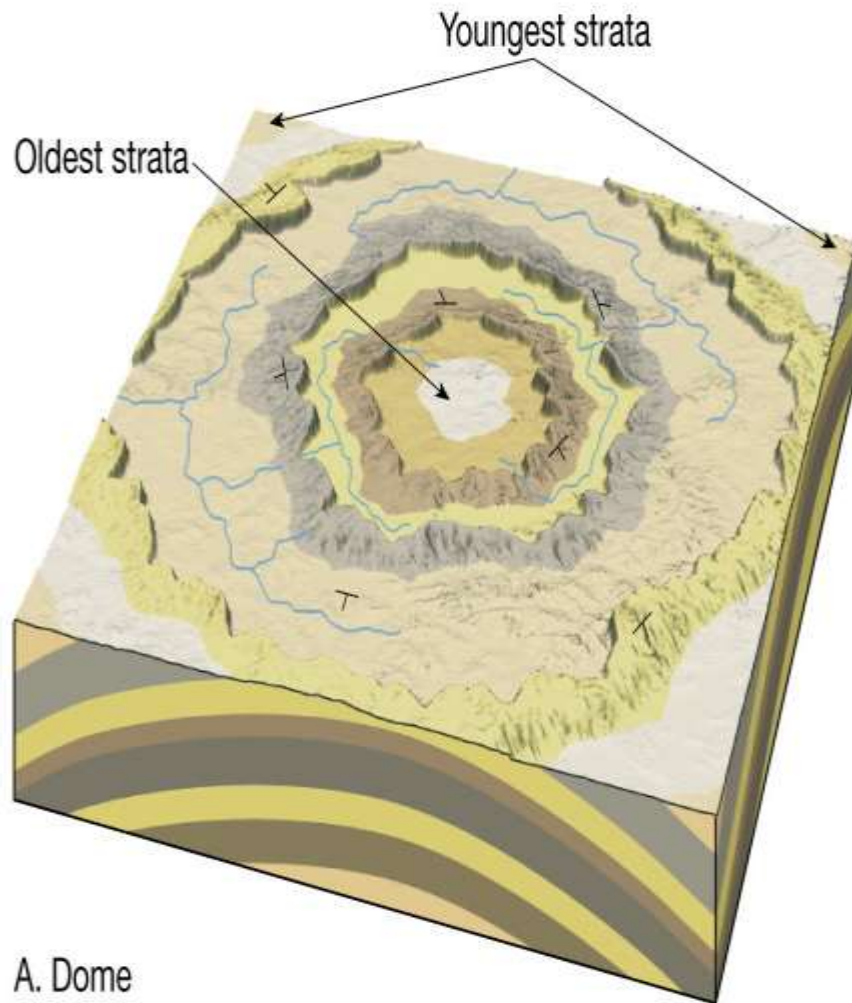




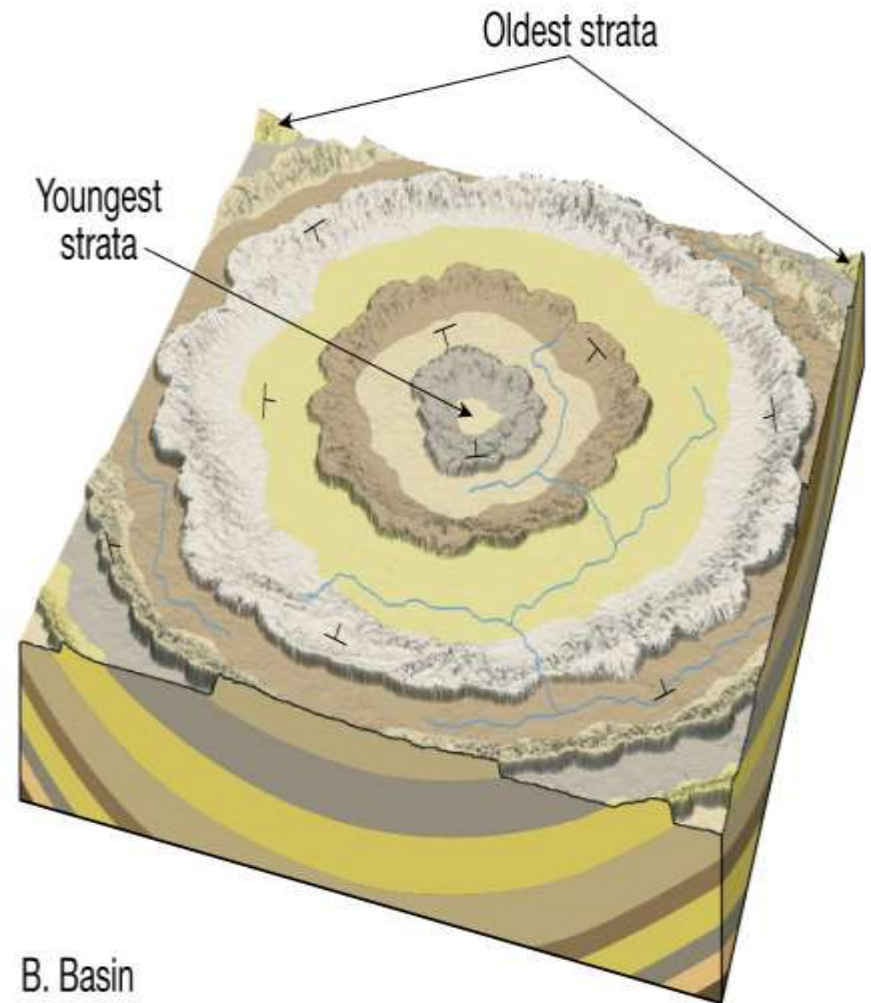
B. Bunter Sandstone, Merseyside, U.K. B. Bending of strata by ductile deformation; limestones in Crete.



Padrões circulares são típicos em áreas de
dobras tipo domos e bacias



A. Dome



B. Basin

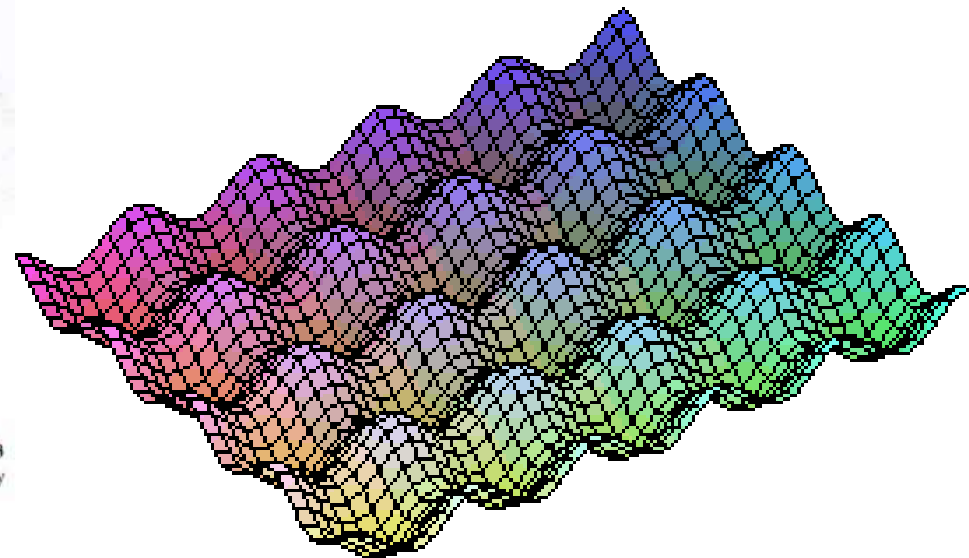
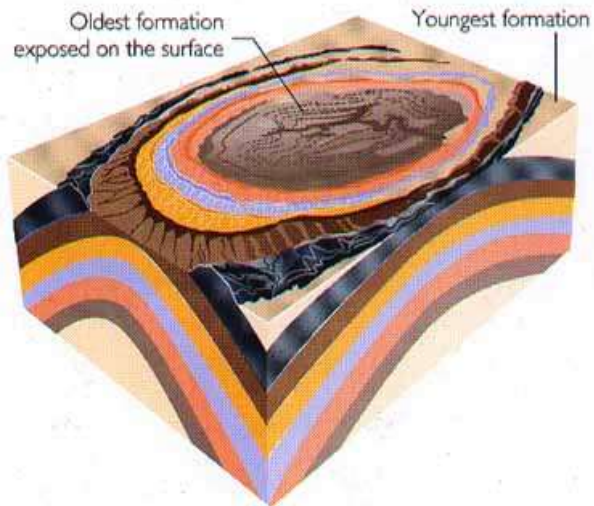
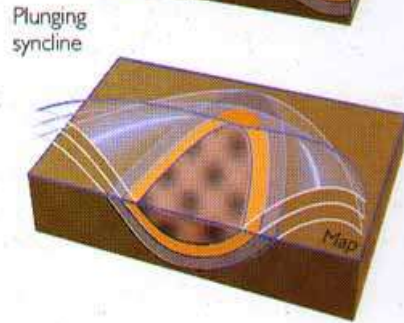
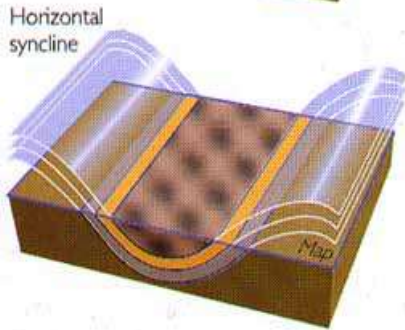
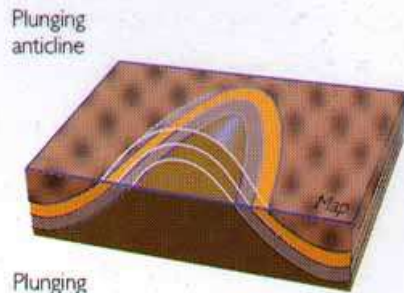
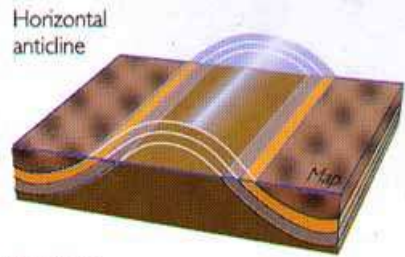
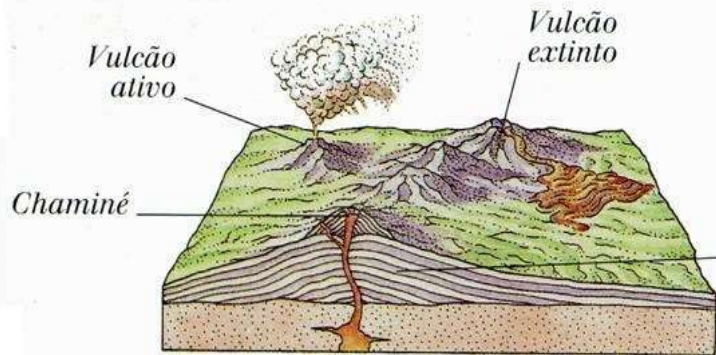


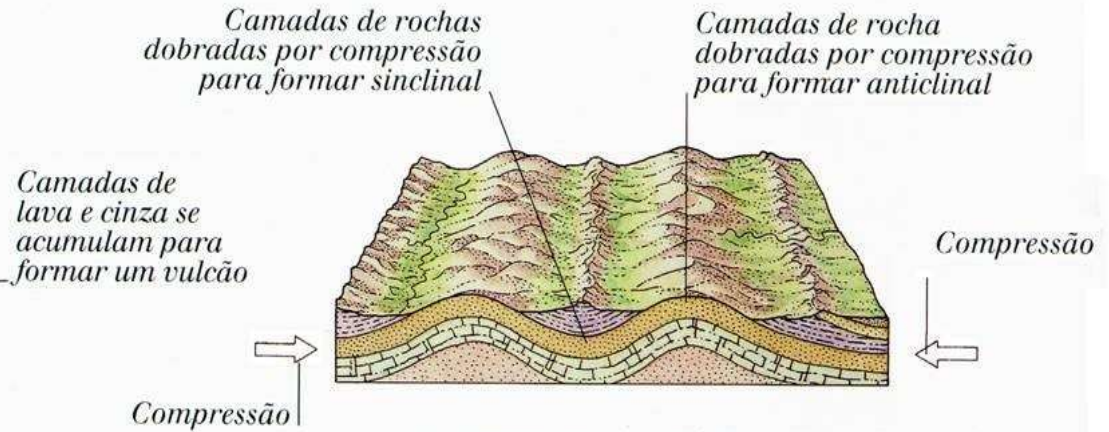
Figure 10.14, 10.16
Press and Siever: *Understanding Earth*

Cadeias de montanhas formadas por falhas e dobras

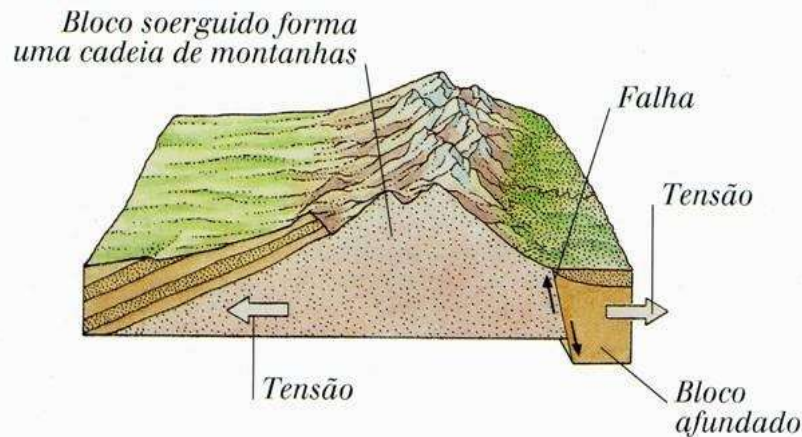
EXEMPLOS DE MONTANHAS



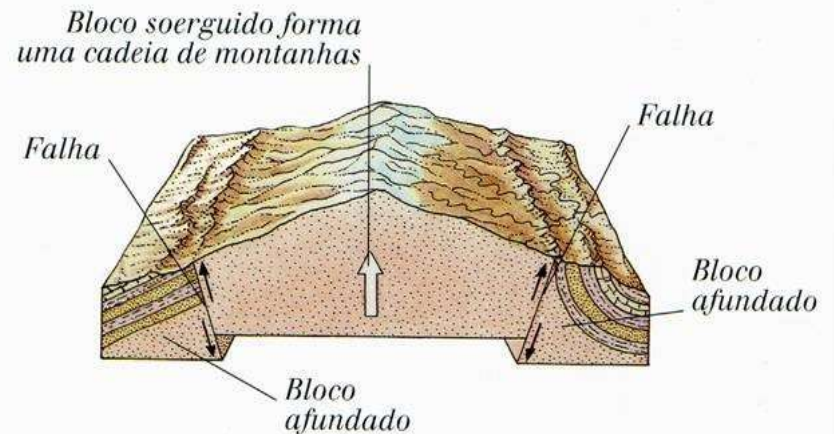
MONTANHA VULCÂNICA



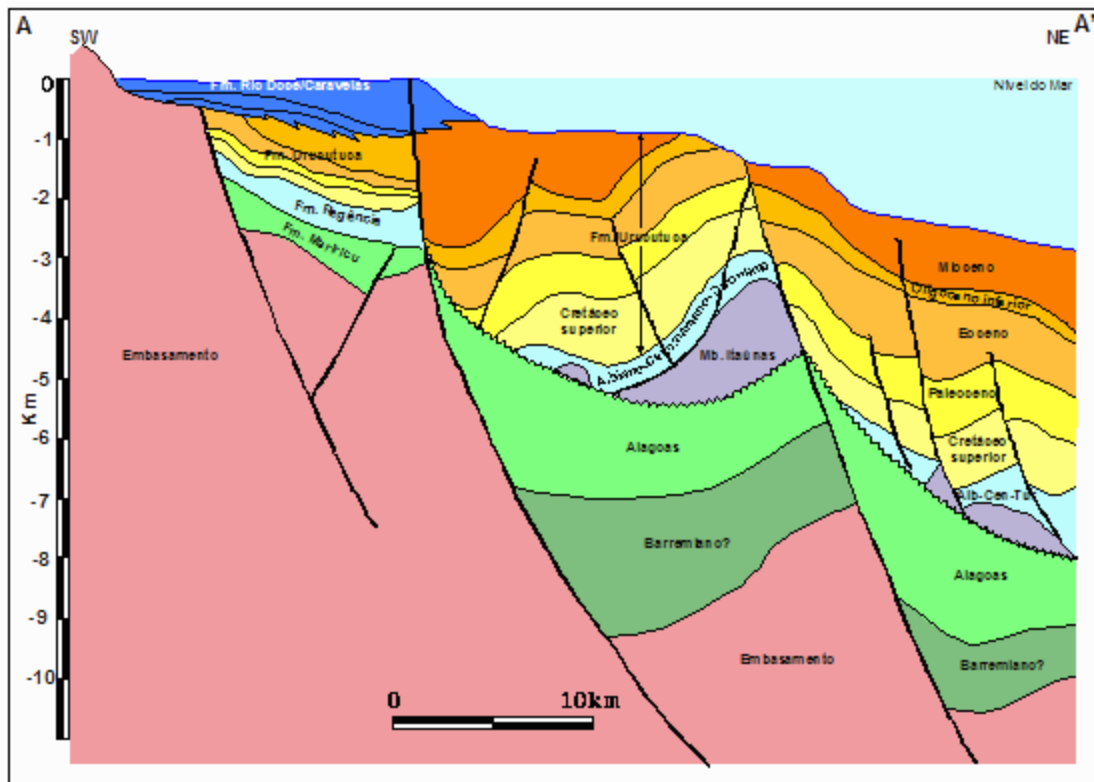
MONTANHA POR DOBRAMENTO



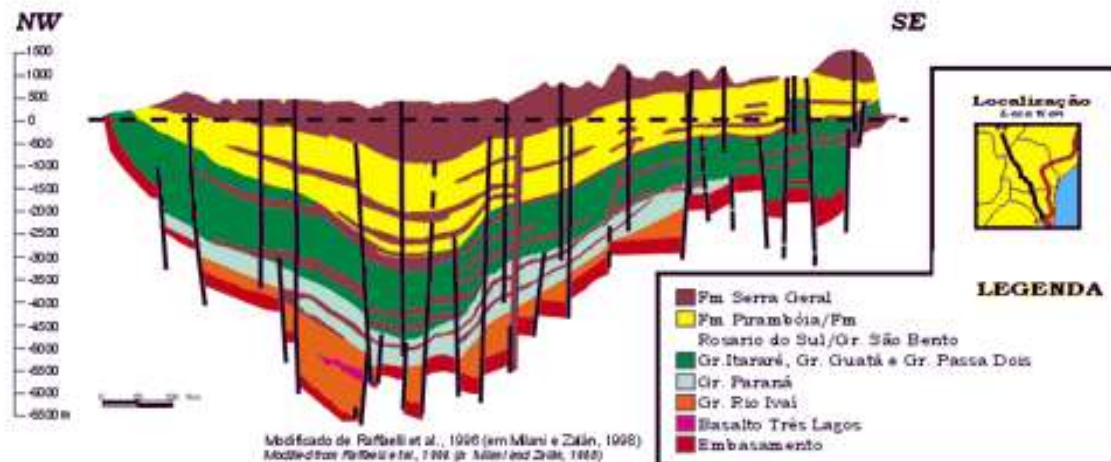
MONTANHA DE BLOCO

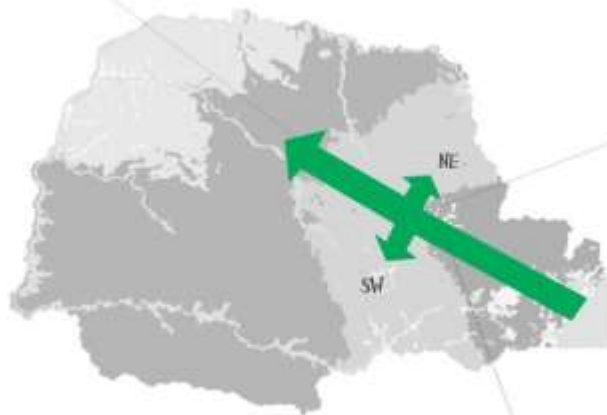
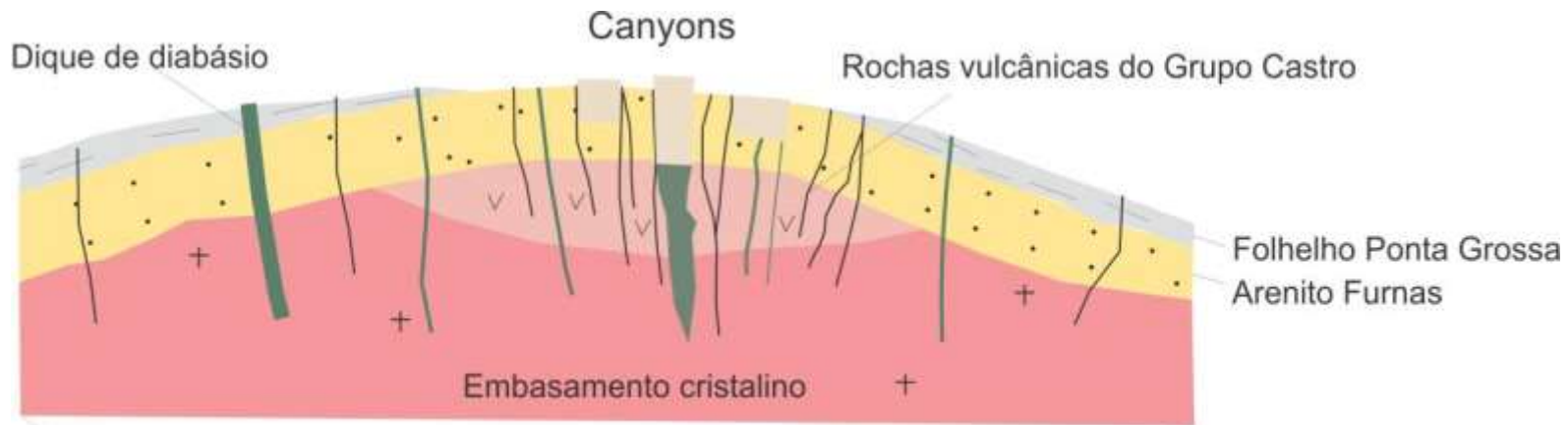


MONTANHA DE BLOCO SOERGUIDO

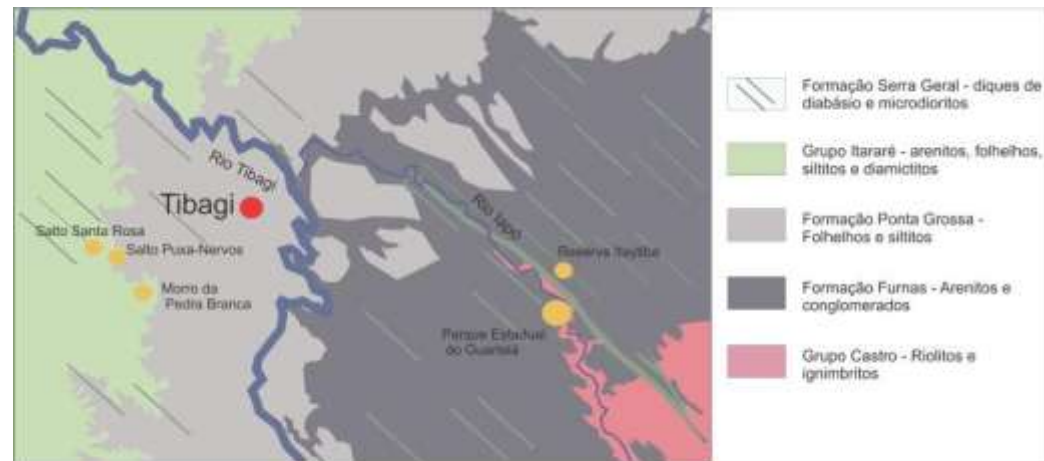


Seção geológica esquemática da bacia do Jequitinhonha (MG) e da Bacia Sedimentar do Paraná





Arco de Ponta Grossa



Mapa geológico da região de Tibagi, com indicação das principais formações litológicas. Percebe-se que o comportamento dos rios está condicionado às estruturas e rochas e que, neste caso, tendem a apresentar direção NW-SE, assim como os canyons e diques de diabásio.