



Da Ramsay and Huber, 1987

Le pieghe

- Aspetti regionali e descrizione delle loro geometrie (nomenclatura e classificazione)



Esempio di culminazioni e depressioni



Makran - Iran

Esempio di “chiusura” periclinale





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Data di acquisizione delle immagini: 14 Set 2006

28°36'49.35" N 51°43'13.76" E 1158 m elev.

8.15 km Alt

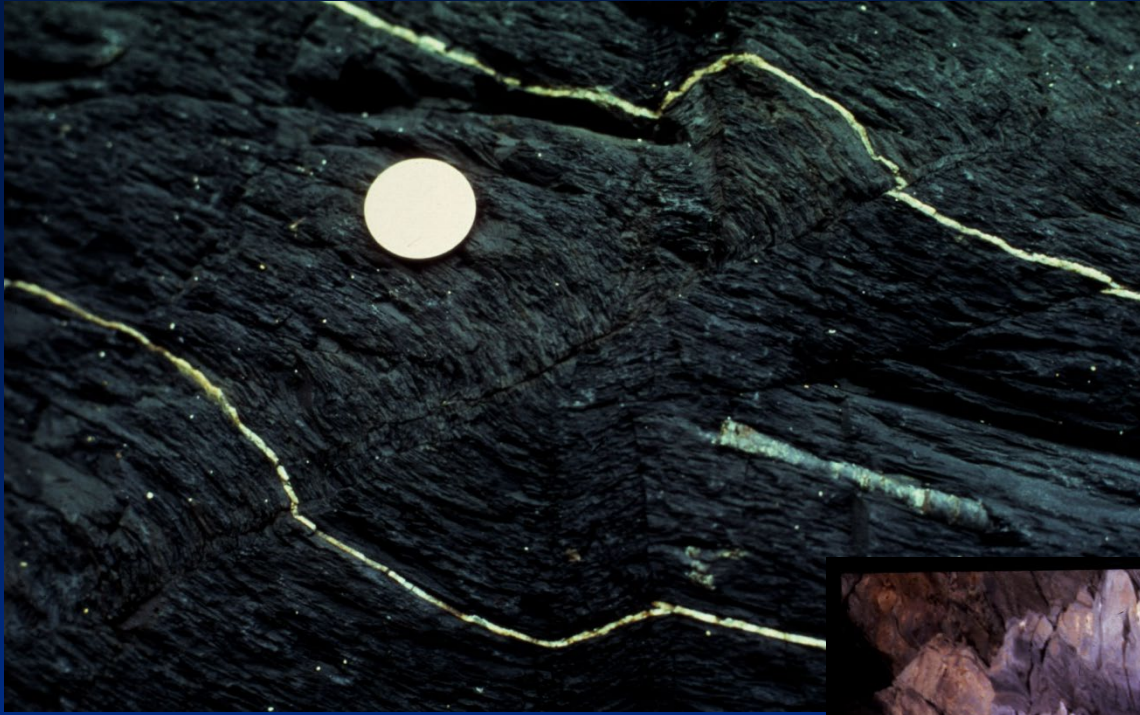
Immagini e fotografie tratte da:

- Boccaletti M & Tortorici L., 1987. *Appunti di Geologia Strutturale*. Patron Editore.
- Champati, A.K., et al., 2017. Hook-shaped type-3 superposed fold in granulite, Badarama complex, Rengali province, India. *International Journal of Earth Sciences*, 106, 2473–2474. <https://doi.org/10.1007/s00531-017-1486-5>
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- van der Pluijm B., Marshak S., 2004. *Earth Structure: An Introduction to Structural Geology and Tectonics, Second Edition*. WW Norton & Company.

GA Pini



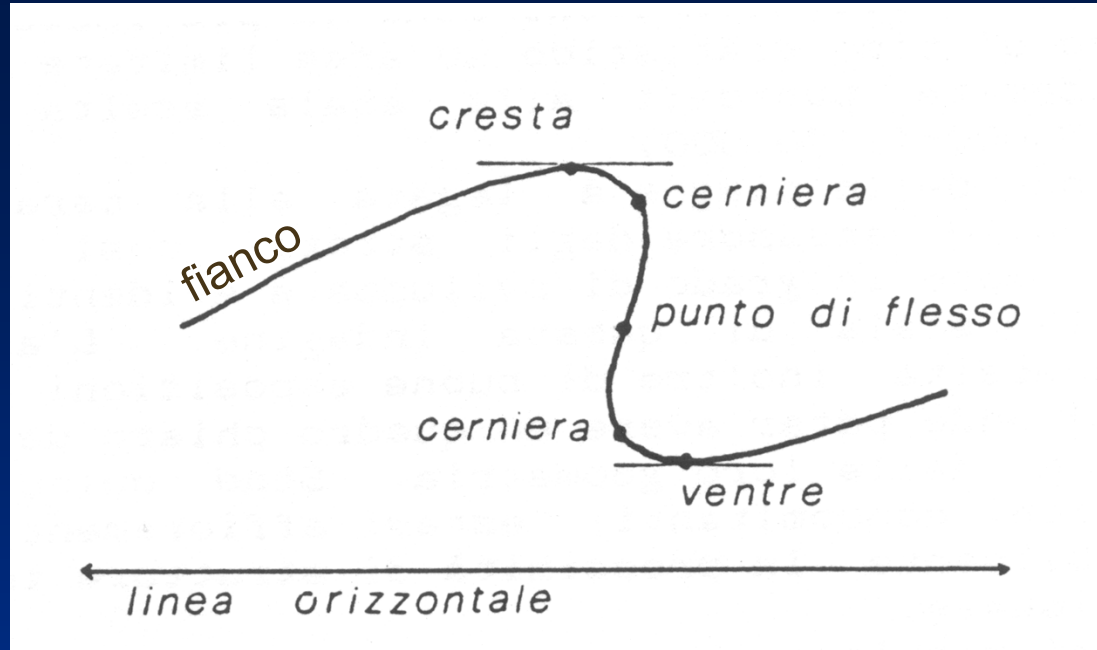
GA Pini



Da Ramsay and Huber, 1987

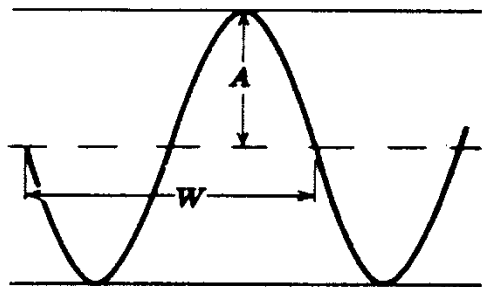
Da Ramsay and Huber, 1987



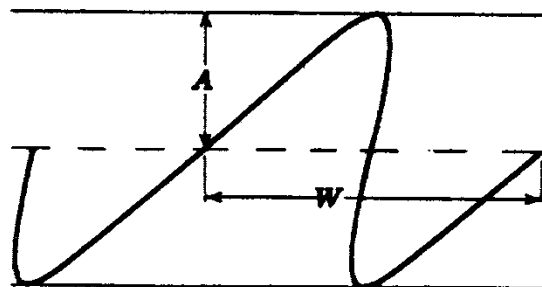


Da Boccaletti & Tortorici, 1987

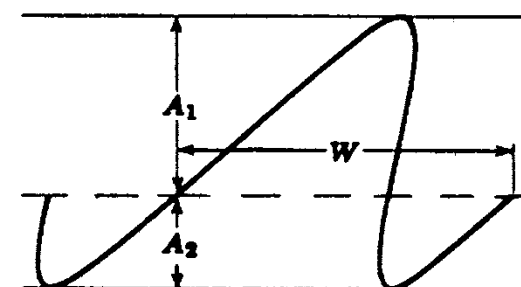
W =lunghezza d'onda; A =ampiezza



a
Piega simmetrica



b
Piega asimmetrica



c

Da Boccaletti & Tortorici, 1987

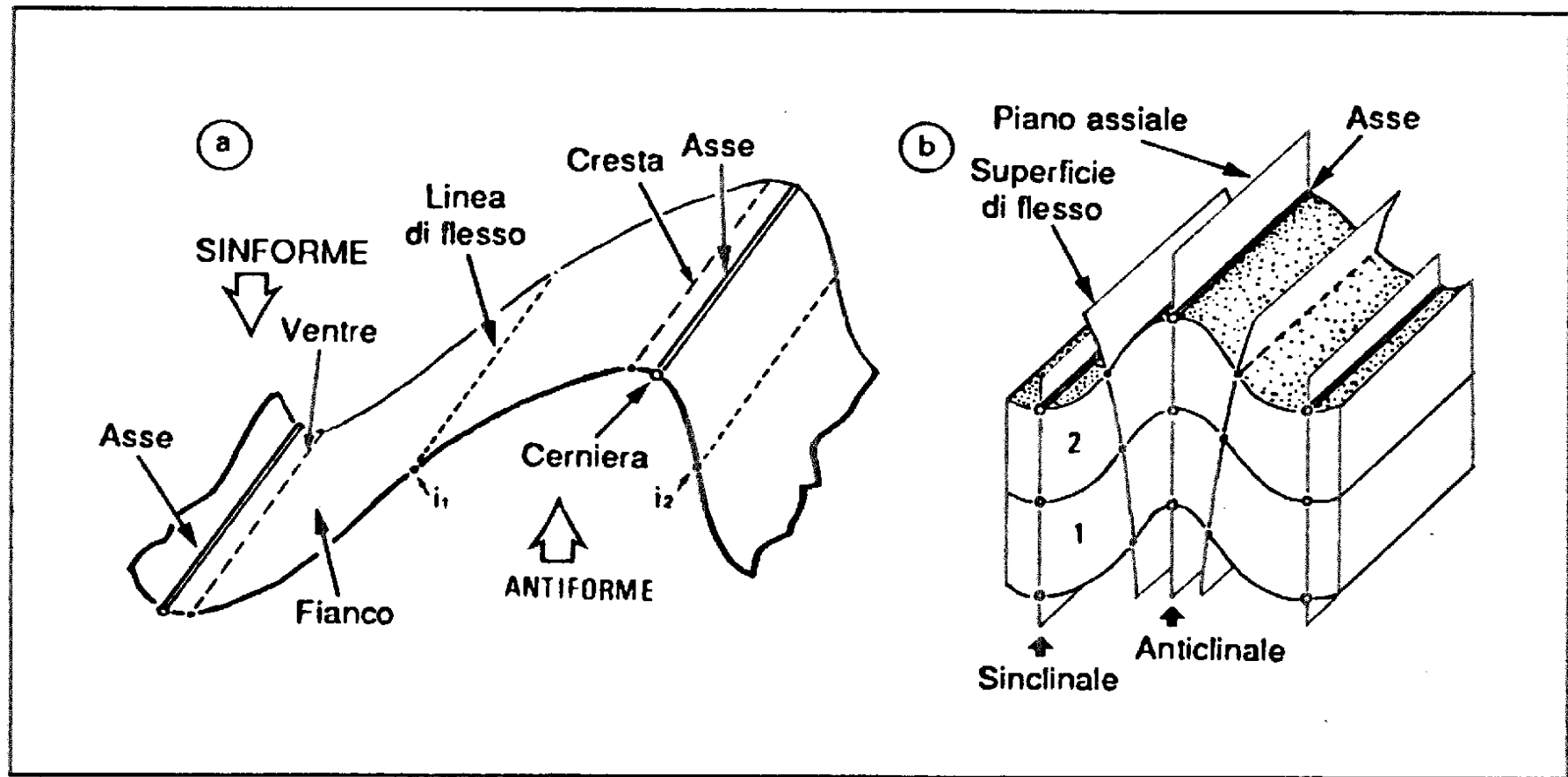
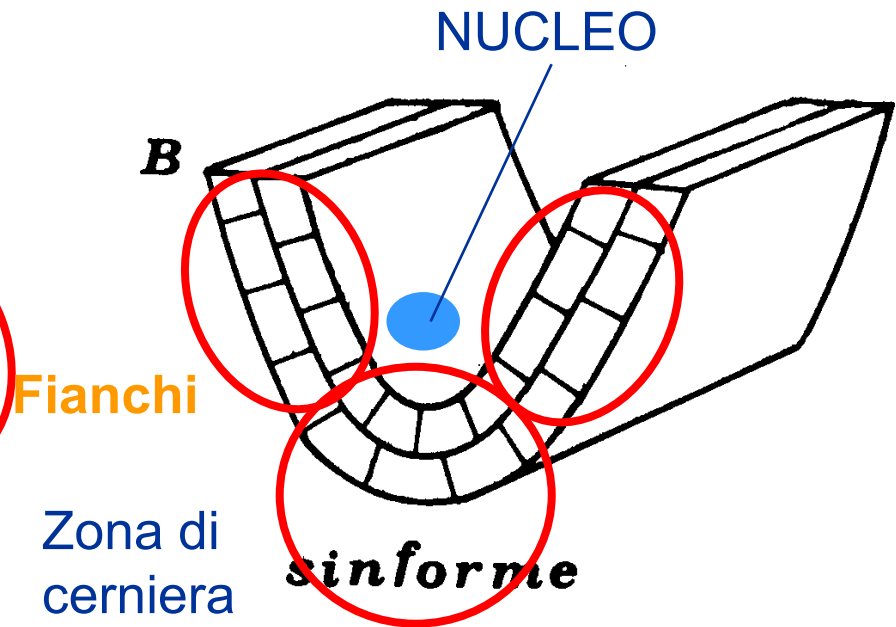
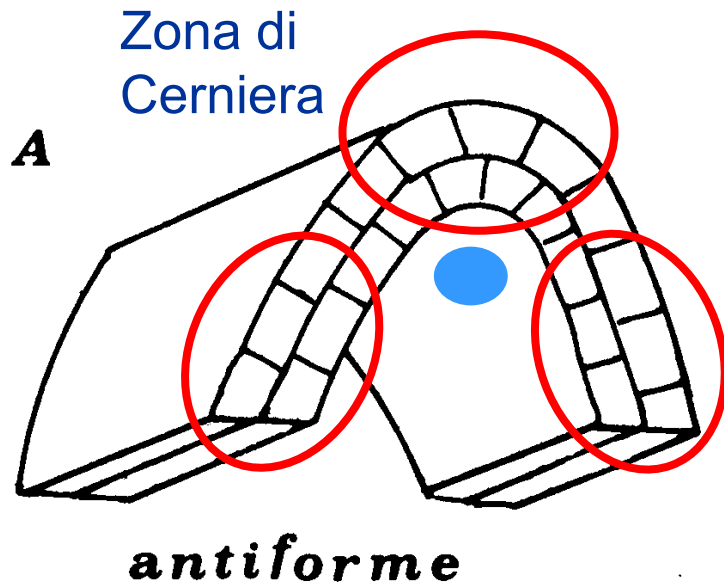
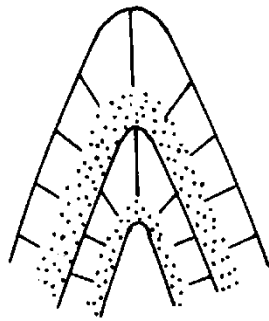


Figura 8.1. Principali termini utilizzati per la descrizione delle pieghe.

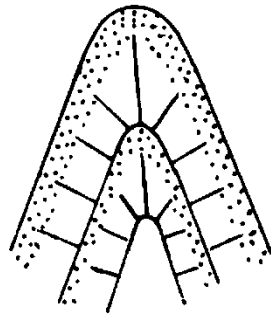




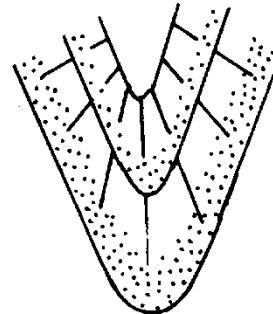
Anticlinale=rocce più antiche al nucleo
Sinclinale=rocce più recenti al nucleo



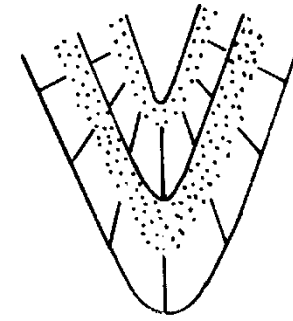
a



b



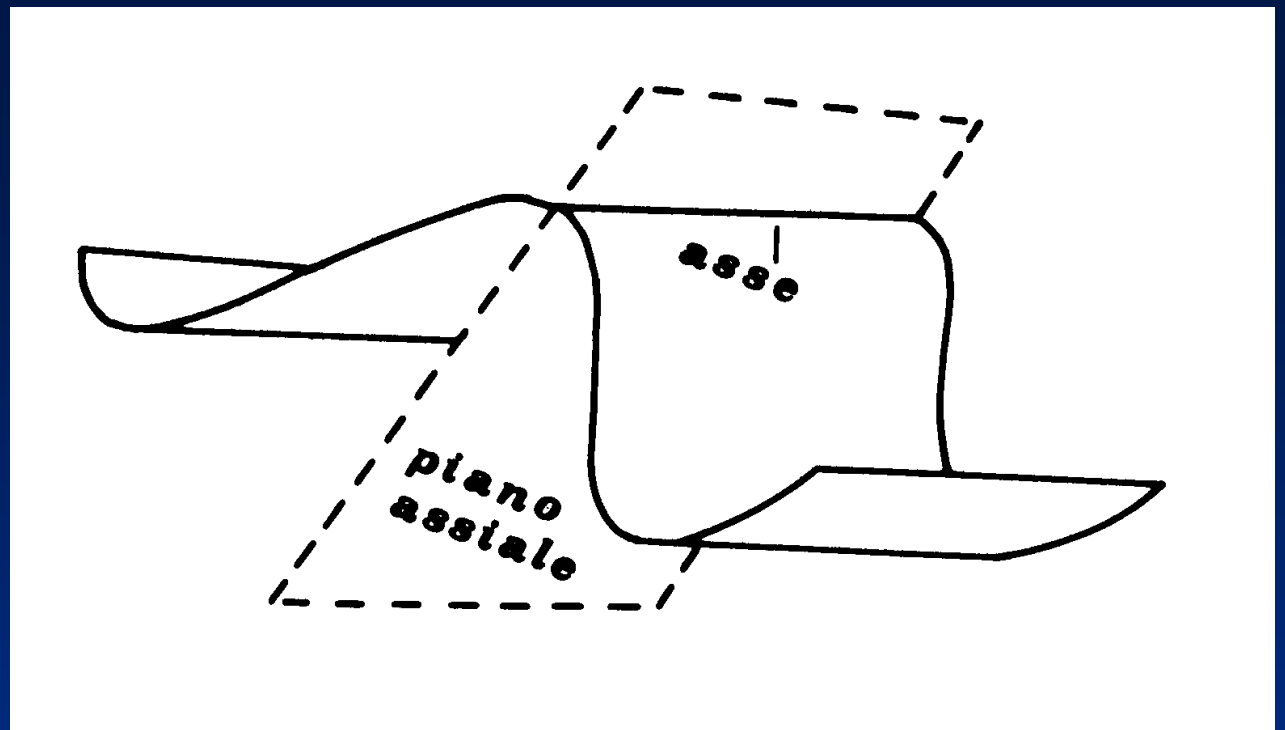
c



d

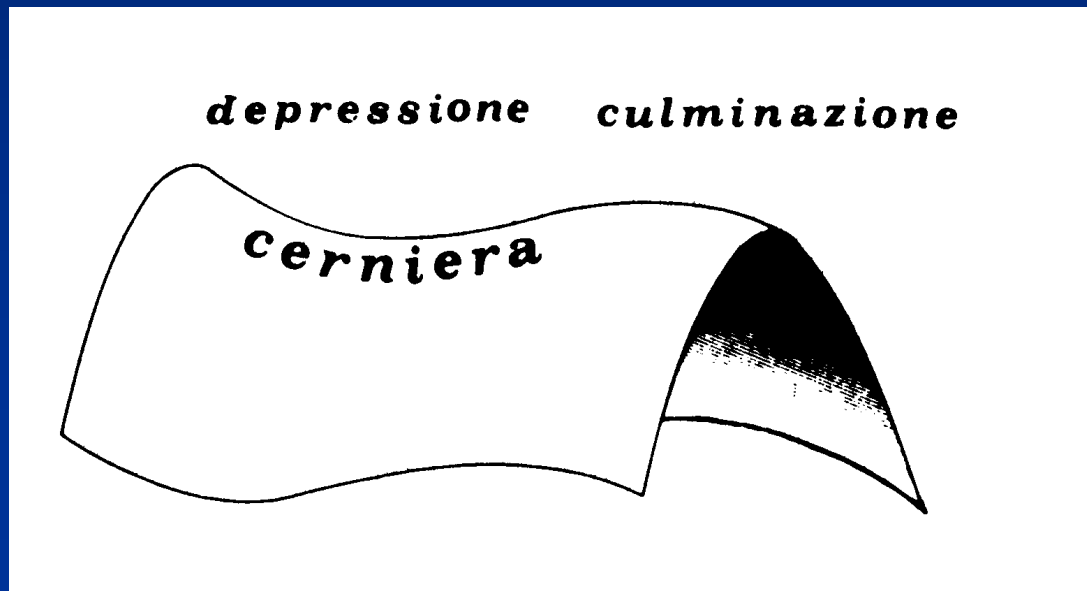
Fig. 50 - Esempi di antiforme anticlinale (a), antiforme sinclinale (b), sinforme sinclinale (c) e sinforme anticlinale (d).

Da Boccaletti & Tortorici, 1987



Da Boccaletti & Tortorici, 1987

Da Boccaletti & Tortorici, 1987





Khormocj

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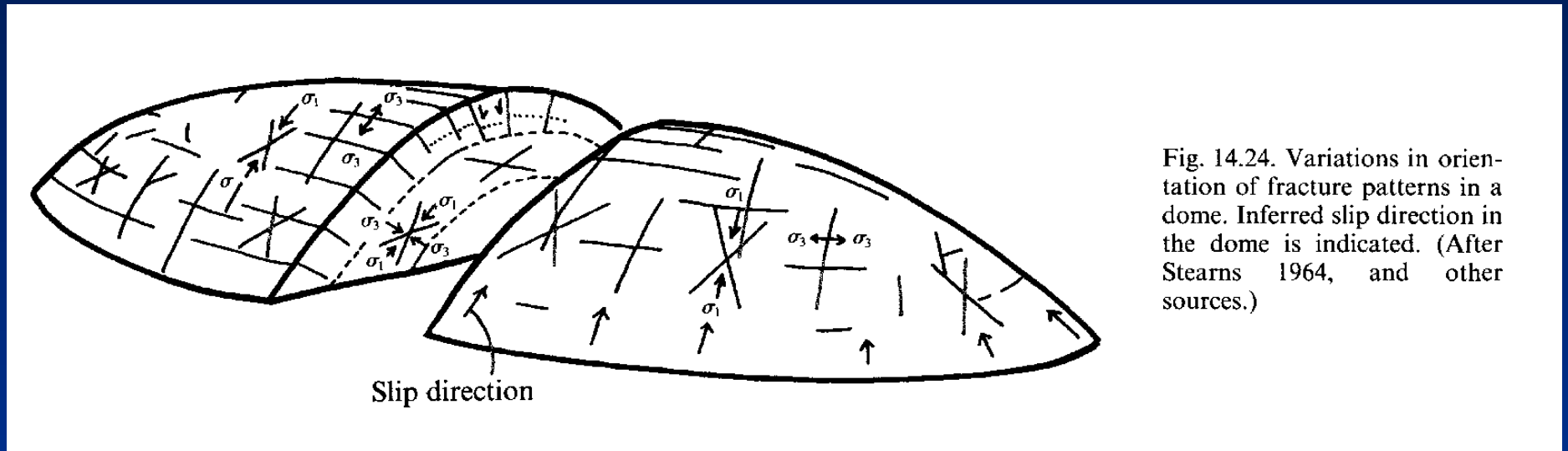
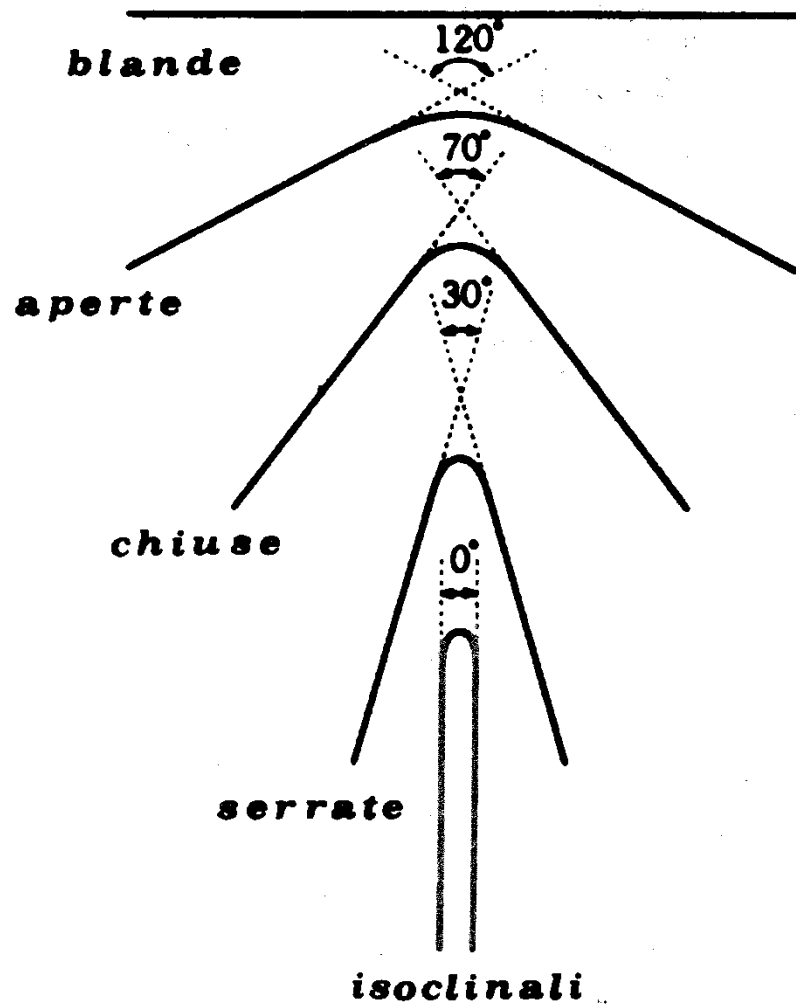


Fig. 14.24. Variations in orientation of fracture patterns in a dome. Inferred slip direction in the dome is indicated. (After Stearns 1964, and other sources.)

Da Price and Cosgrove, 1990



pieghe blande	120°-180°
pieghe aperte	70°-120°
pieghe chiuse	30°- 70°
pieghe serrate	10°- 30°
pieghe isoclinali	0°- 10°



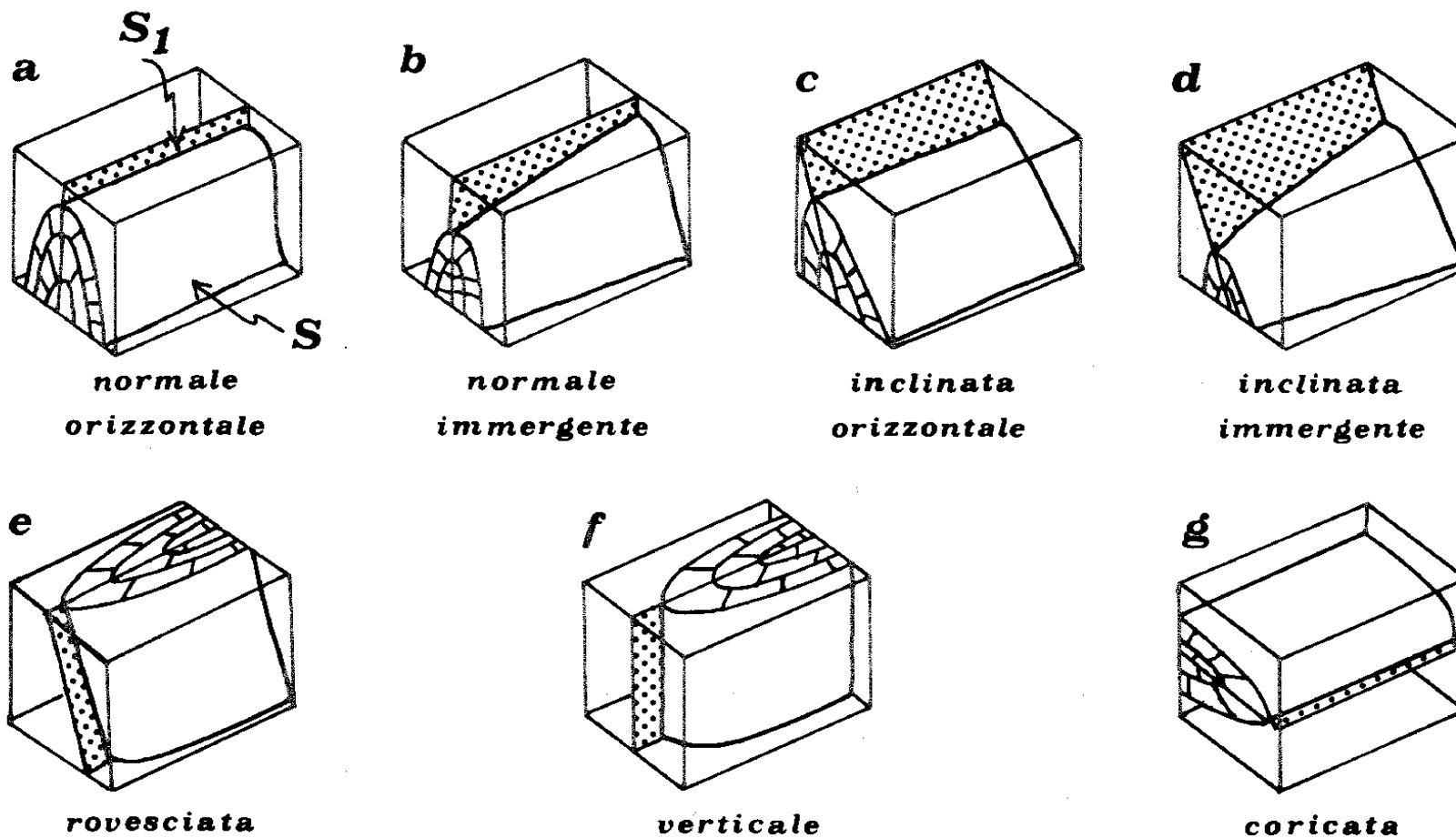


Fig. 79 - Diagrammi tridimensionali di pieghe secondo la classificazione del diagramma di fig. 78.

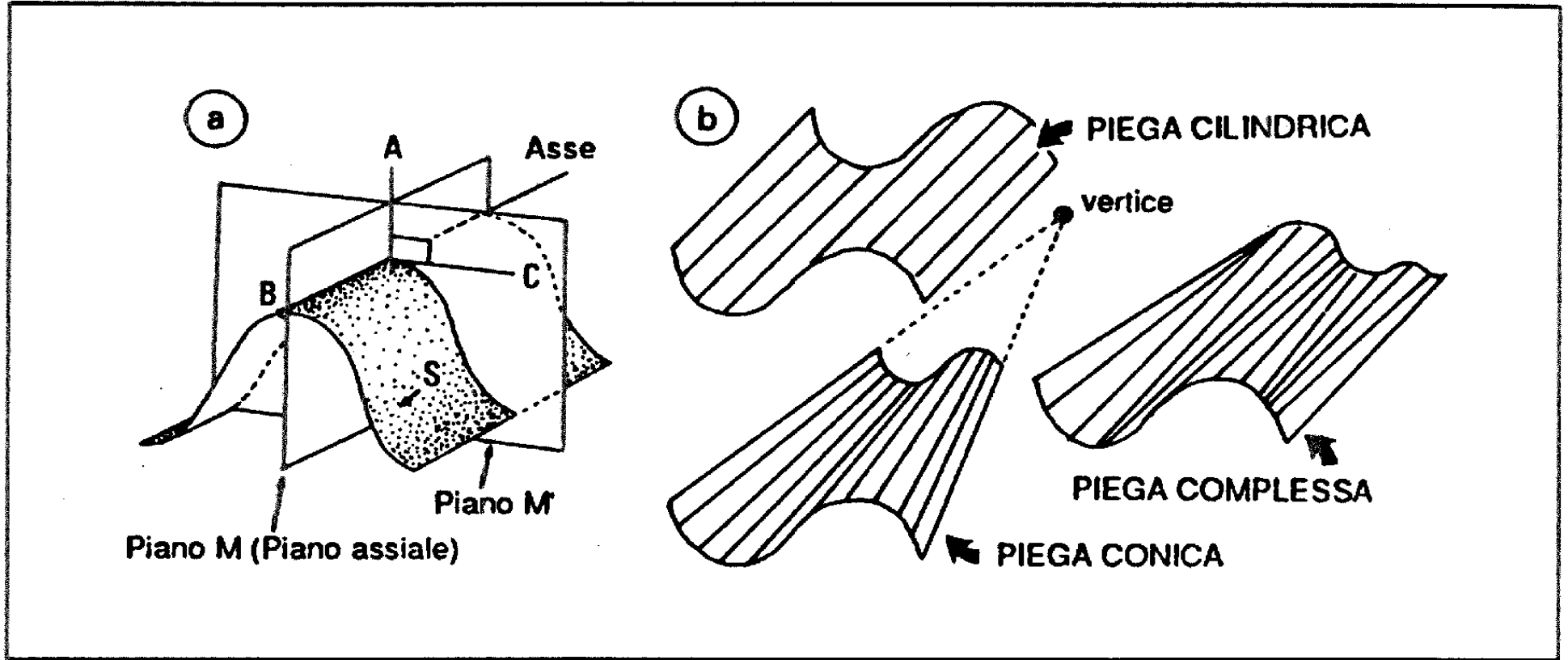


Figura 8.5. a) Piani di simmetria (M e M') ed assi geometrici (A, B, C) di una piega; b) superficie piegata descritta secondo le sue generatrici (piega cilindrica, conica e complessa).



C.C. Lucente

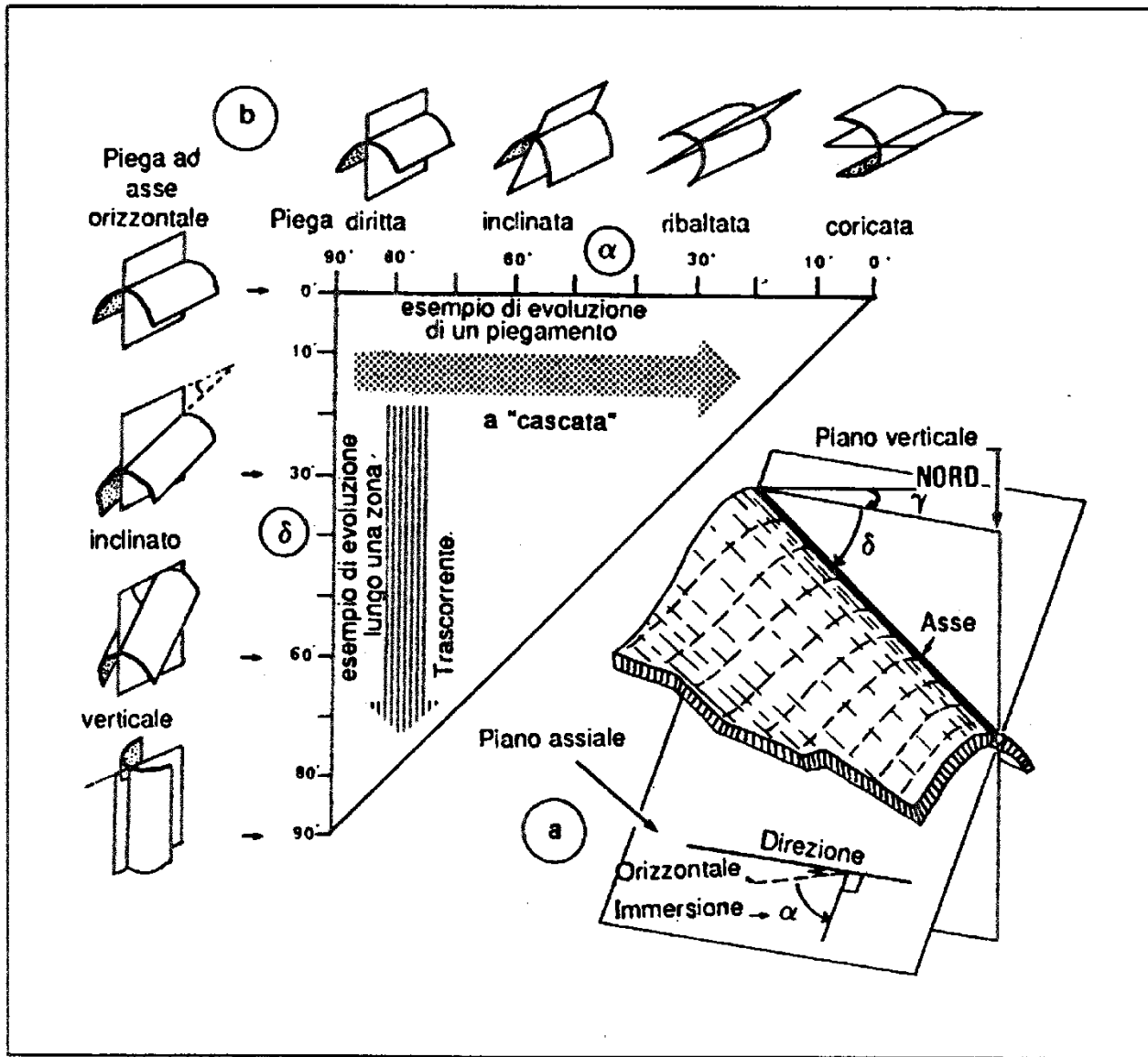


Figura 8.4. Diagramma di Fleuty (1964, Proc. Geol. Ass. Lond., 75, 461-492) che rappresenta le pieghe in funzione dell'immersione (δ) dell'asse e dell'inclinazione (α) del piano assiale.

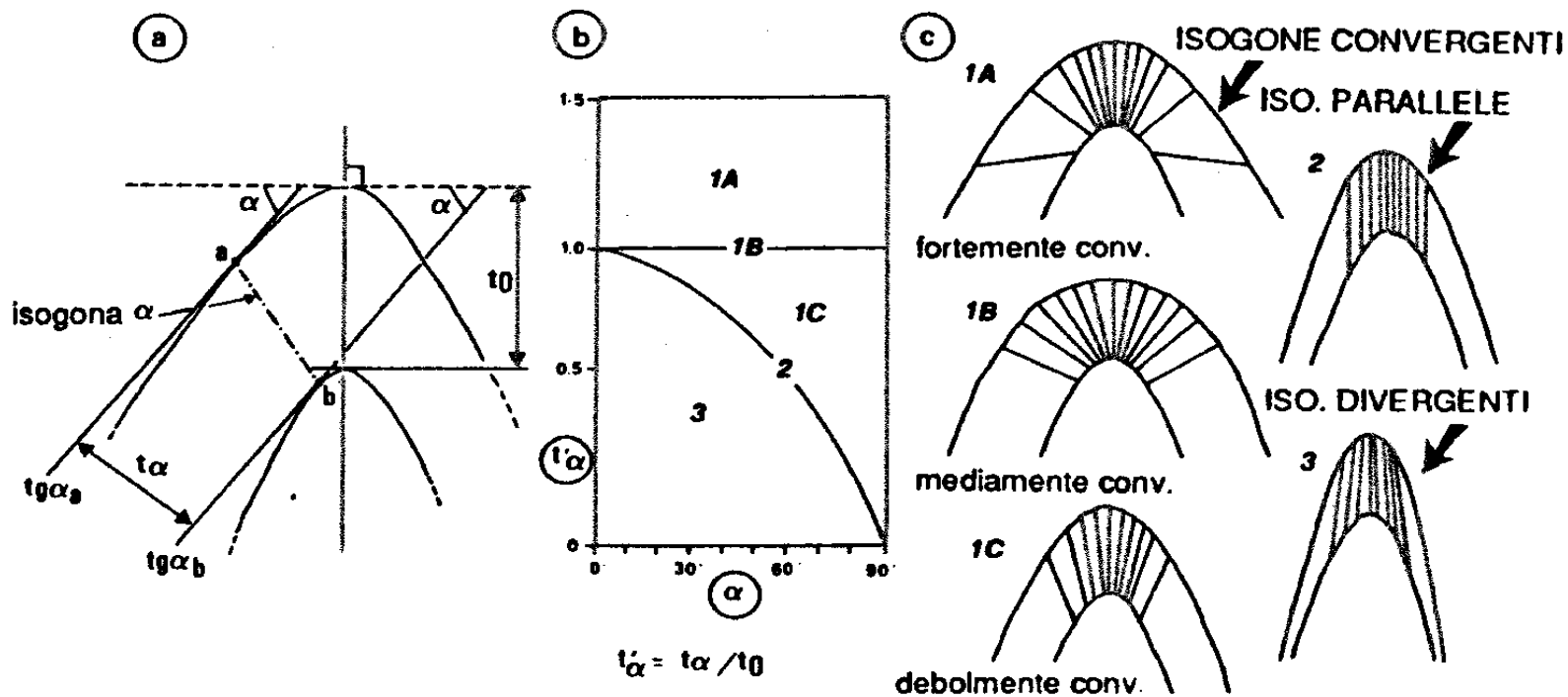
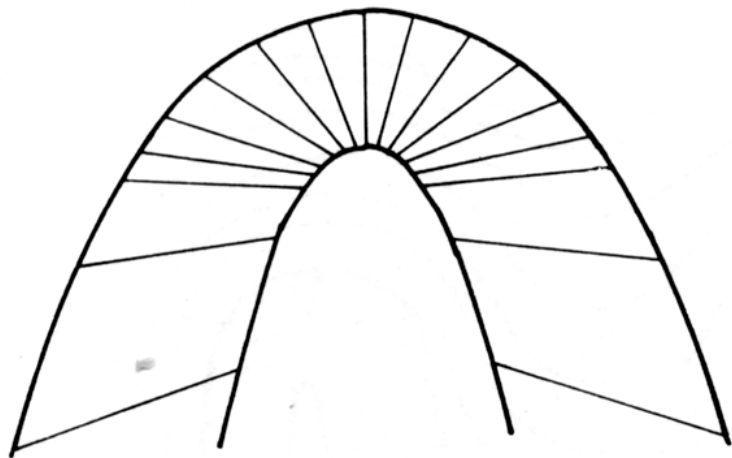
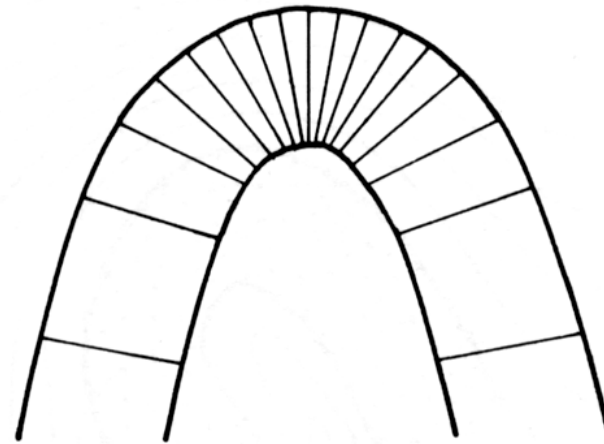


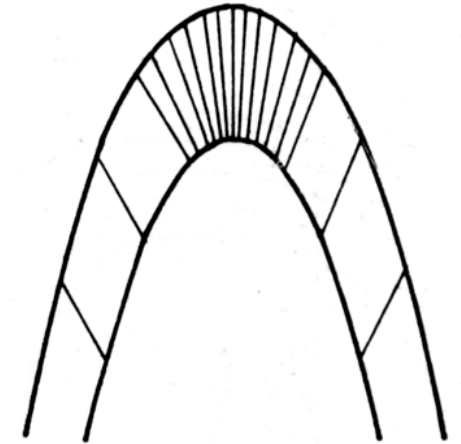
Figura 8.6. Classificazione delle pieghe secondo Ramsay (1967, McGraw Hill, 568 p.): a) determinazione dei valori di t_0 e t_α e costruzione dell'isogona a lungo una sezione della piega; b) diagramma di t'_α in funzione di i_α che definisce le diverse classi delle pieghe; c) geometria delle isogone delle pieghe di differenti classi.



1A



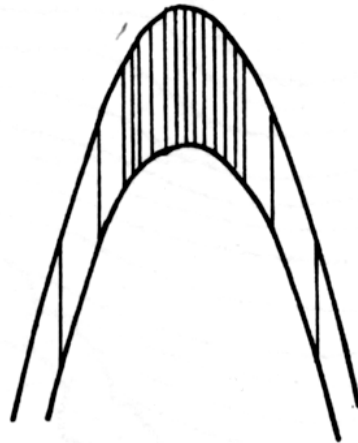
1B, Parallel



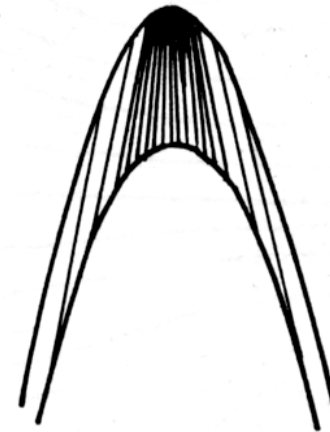
1C

Class 2

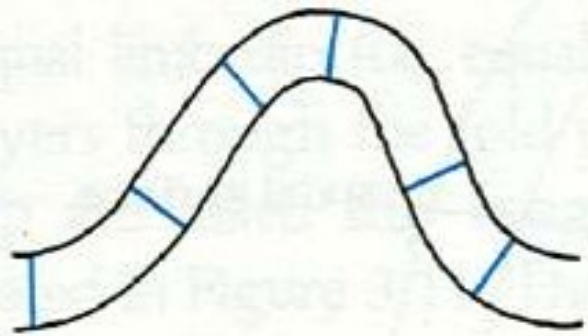
Class 3, divergent isogons



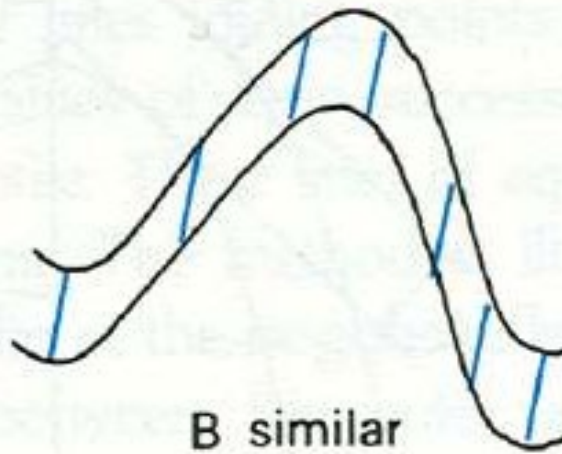
2, Similar



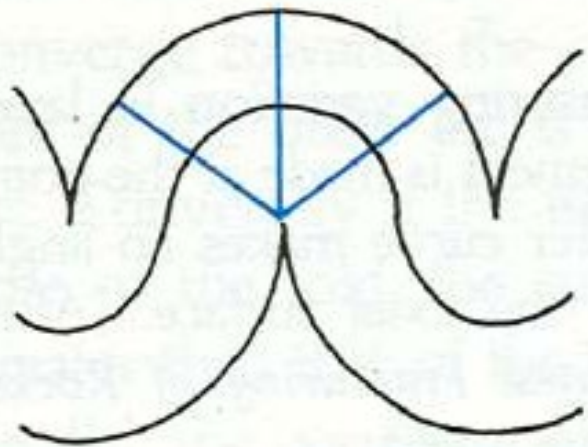
3



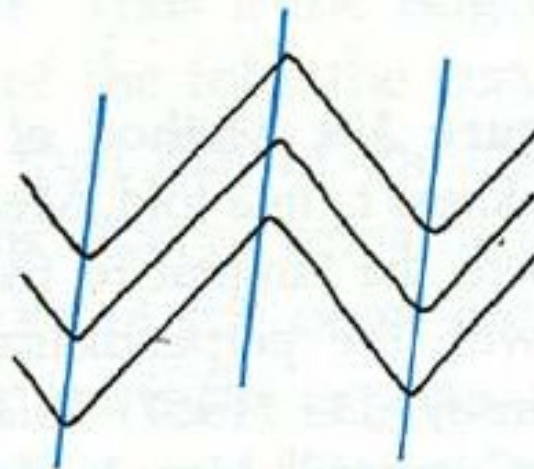
A parallel



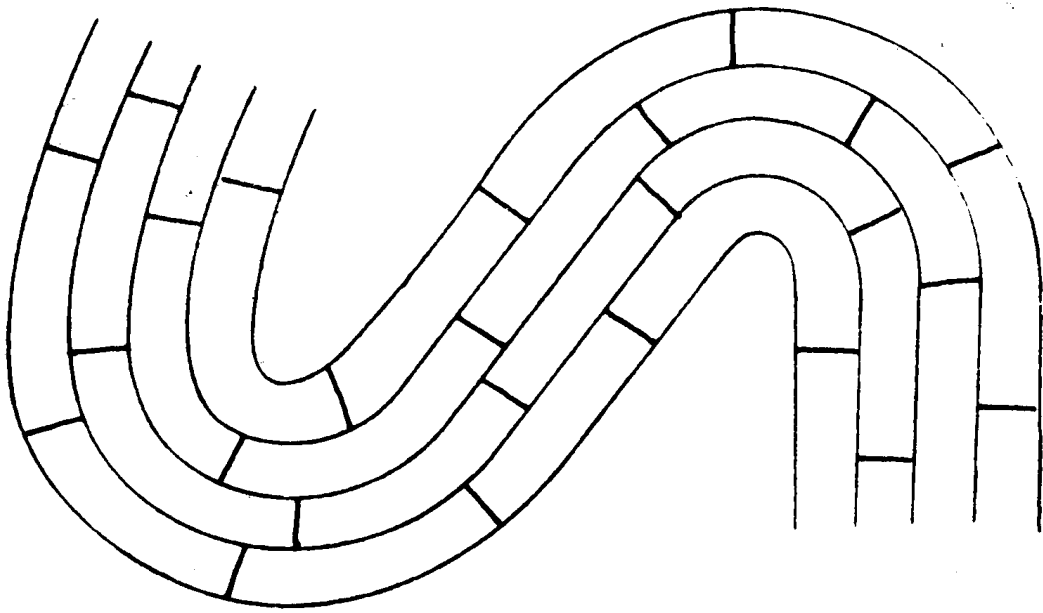
B similar



C concentric



D chevron



Pieghe parallele

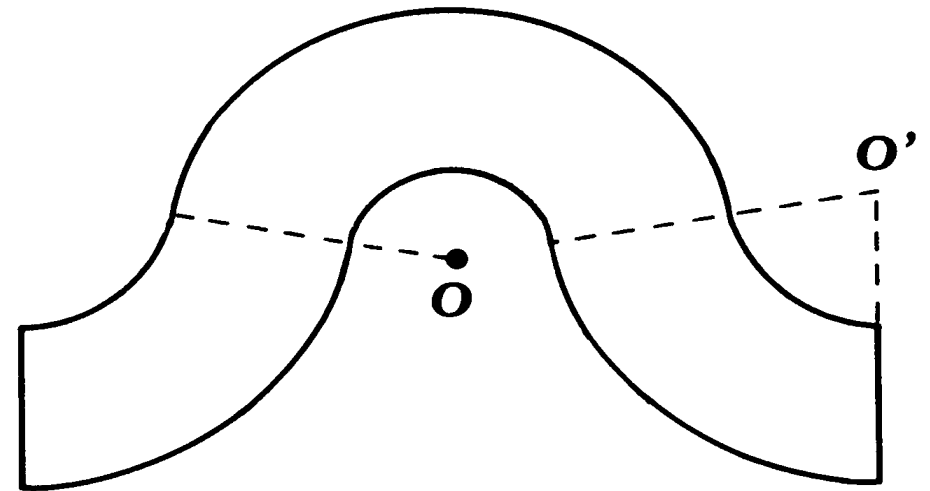
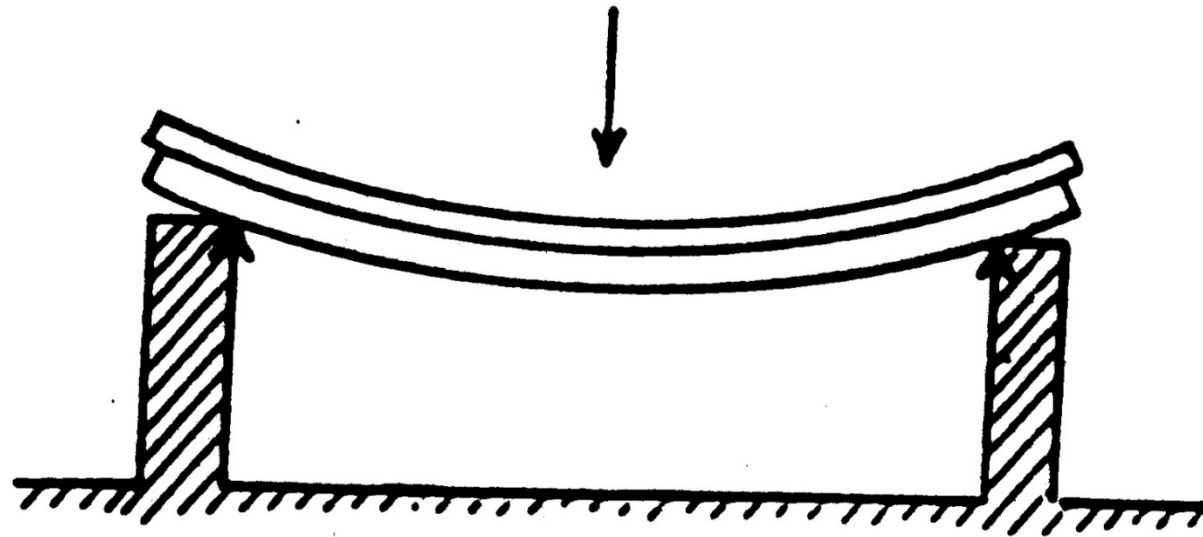
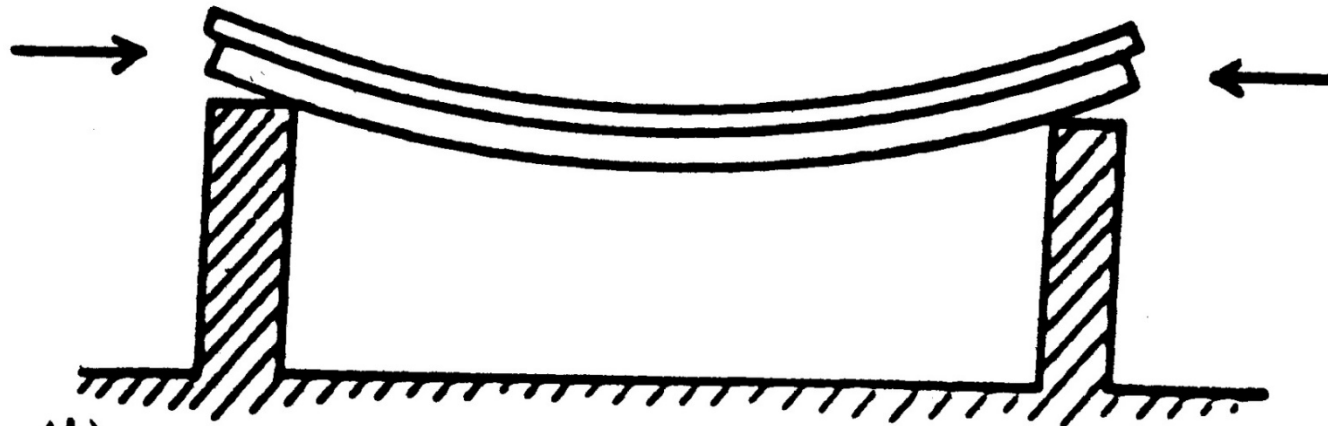


Fig. 66 - Esempio di piega concentrica. I punti O e O' rappresentano i centri origine dei relativi archi di circonferenza.



(a)

Bending

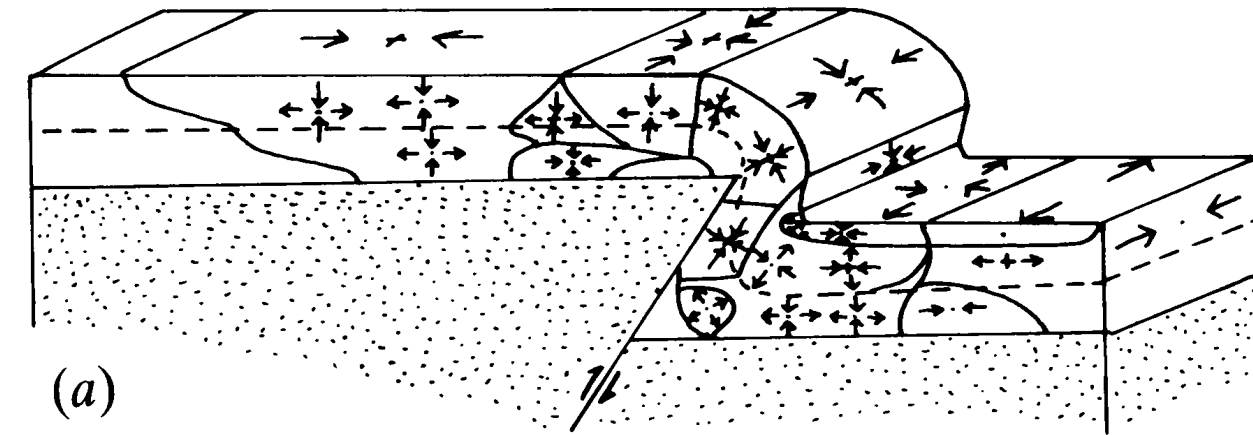


(b)

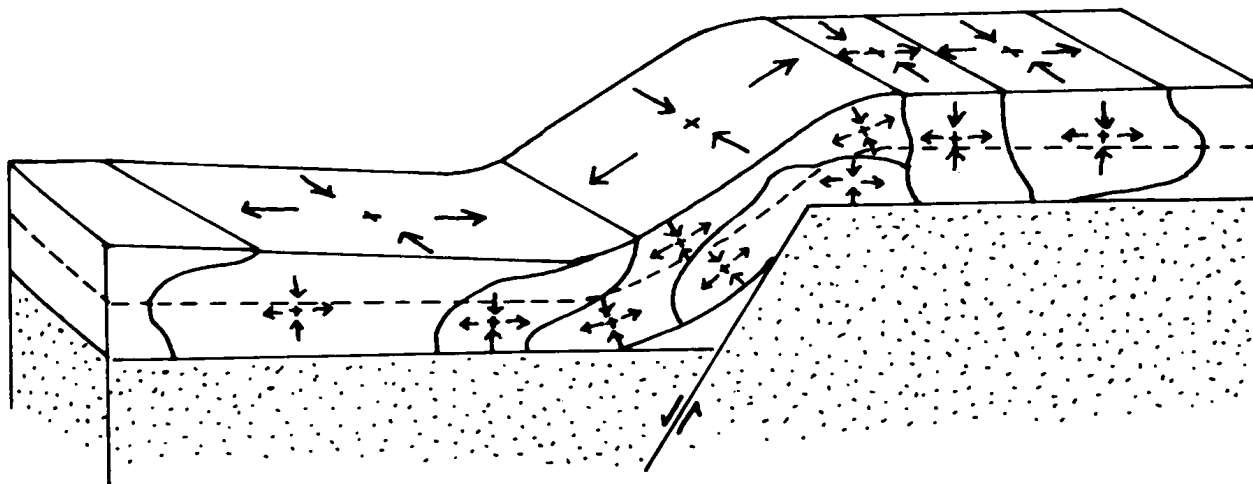
Buckling

Pieghe per flessione passiva

Bending



(a)



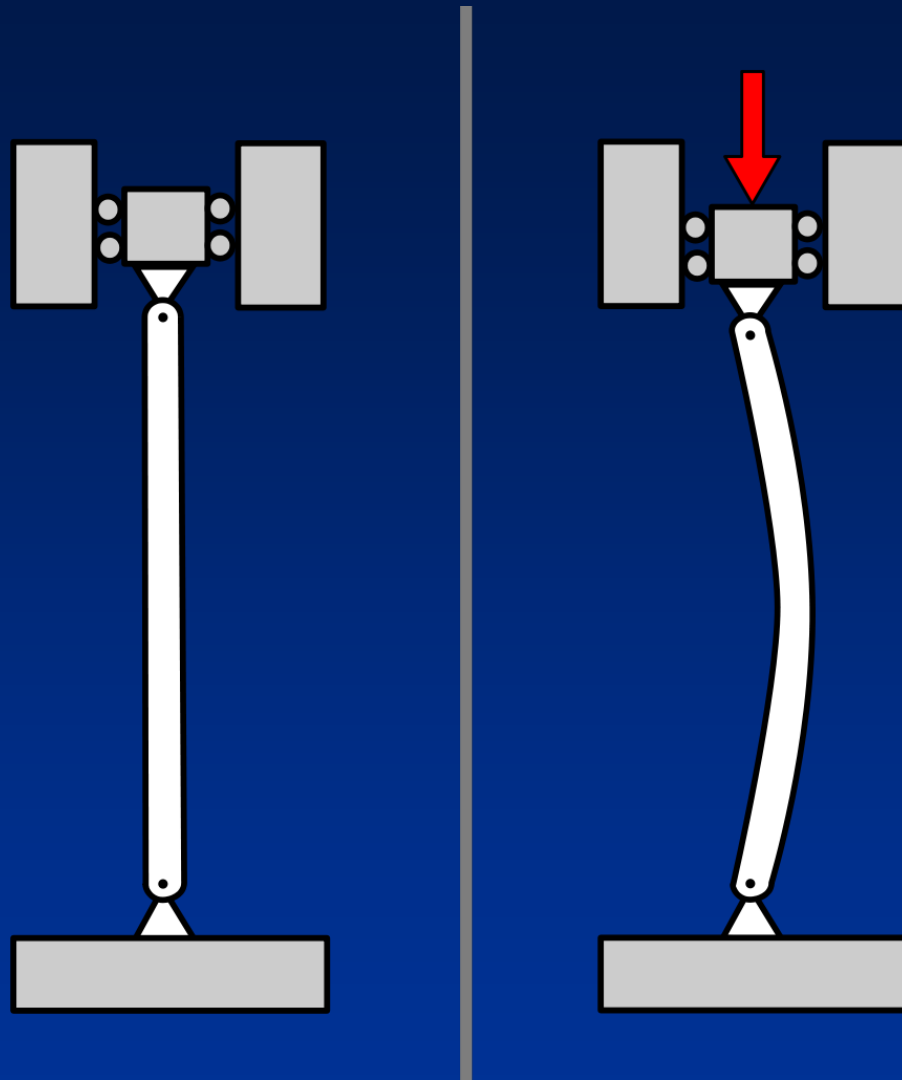
(b)

Fig. 10.20. Experiments showing the effects of (a) reverse and (b) normal faulting in a rigid basement on a layered, ductile cover. (After Ameen 1988.)

Buckling

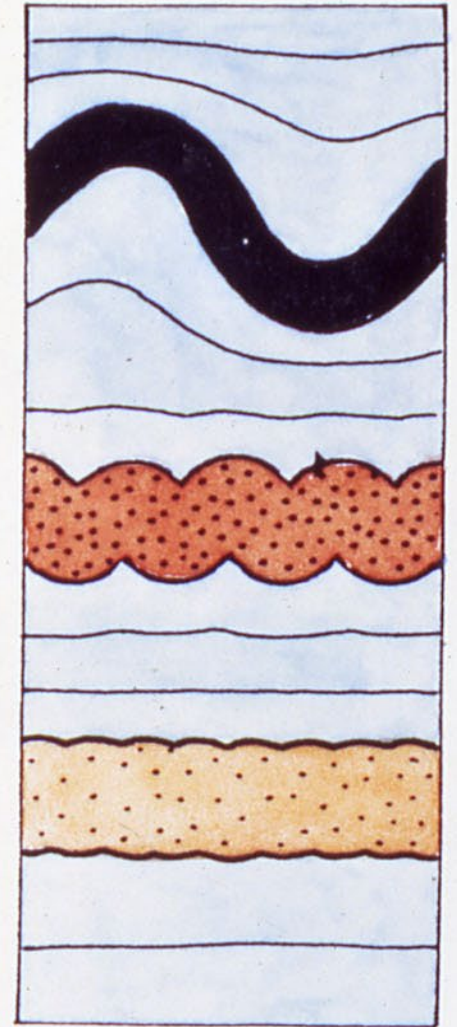
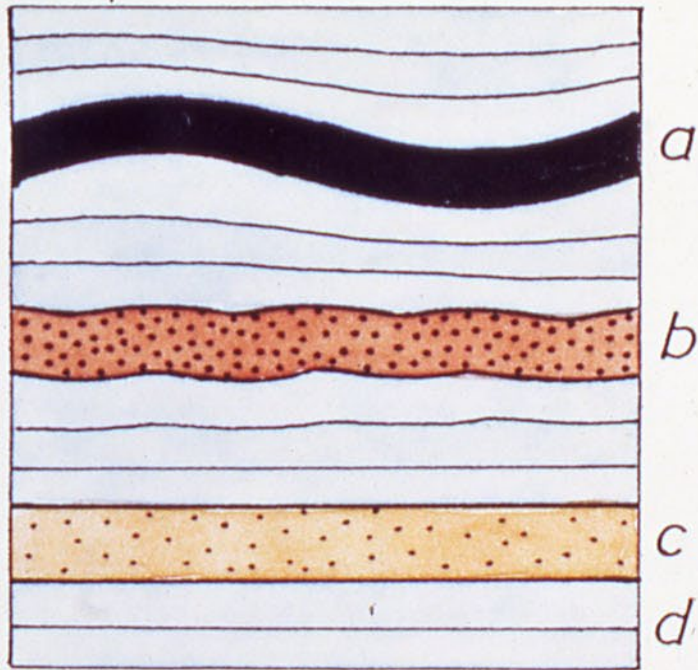


High heat resulted in thermal expansion of these rails, buckling this section of railway. Da U.S. Department of Transportation. Public domain, last modified 2019. <https://toolkit.climate.gov/image/1001>



By Buckled_column.png: Original uploader was Spindustrious at en.wikipediaderivative work: Mircalla22 (talk) - Buckled_column.png, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=7648435>

A.

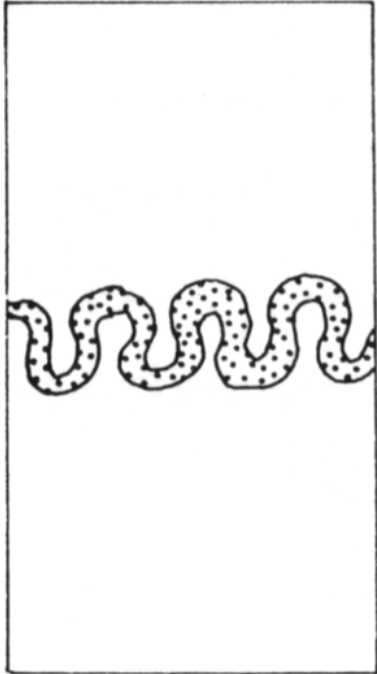




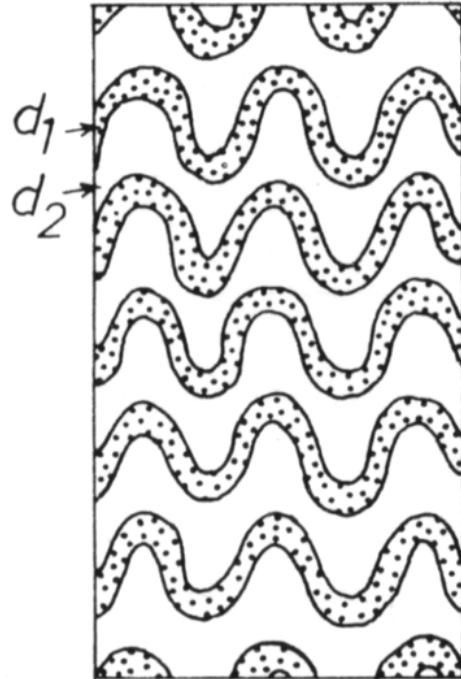
Da Ramsay & Huber, 1987

Pieghe ptigmatiche o a elastico

A. $n = \infty$



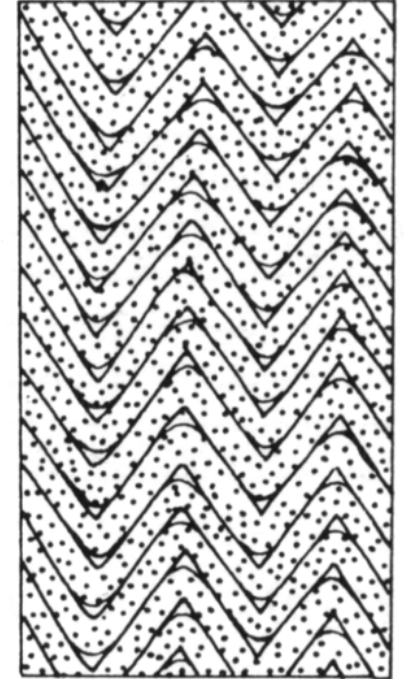
B. $n = 4$



C. $n = 1$



D. $n = 0.2$



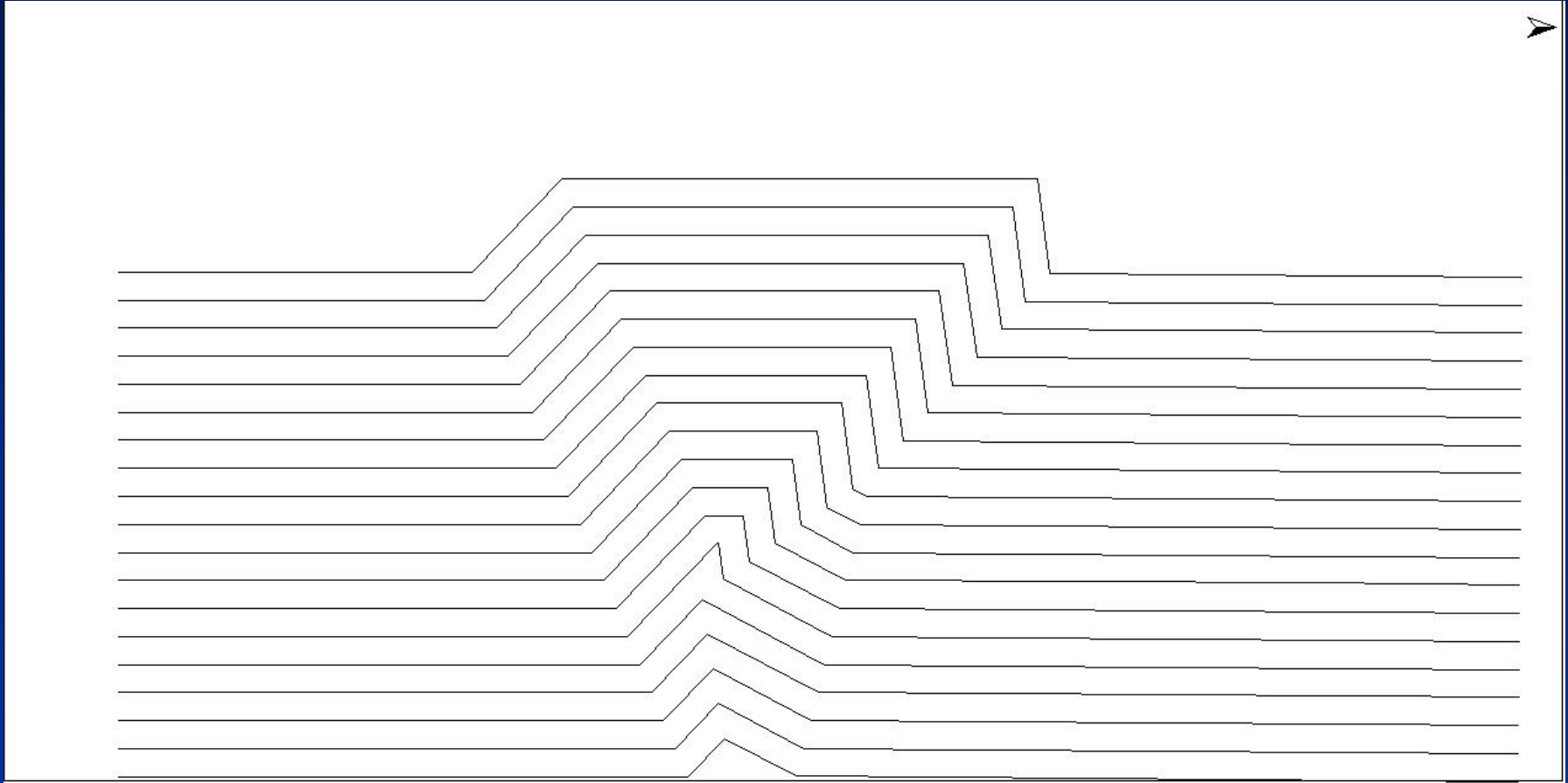
Da Ramsay & Huber, 1987

$$n = d_2 / d_1$$

Rapporto tra gli spessori dei livelli incompetenti e competenti

Pieghe chevron e “a scatola” (box fold)





Semplice modello in forwarding da Move (software licenses by courtesy of Petroleum Expert)

Fault-related or thrust-related folds

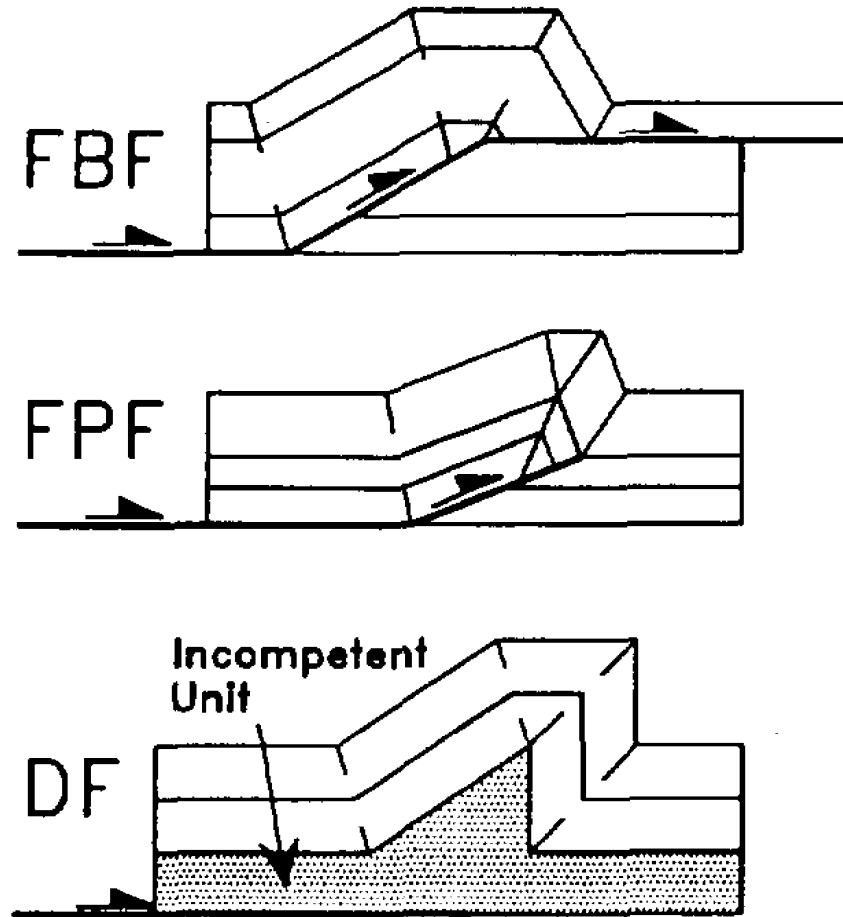


Fig. 1. Three major types of thrust-related folds in fold-and-thrust belts: fault-bend fold (FBF), fault-propagation fold (FPF), and detachment fold (DF).

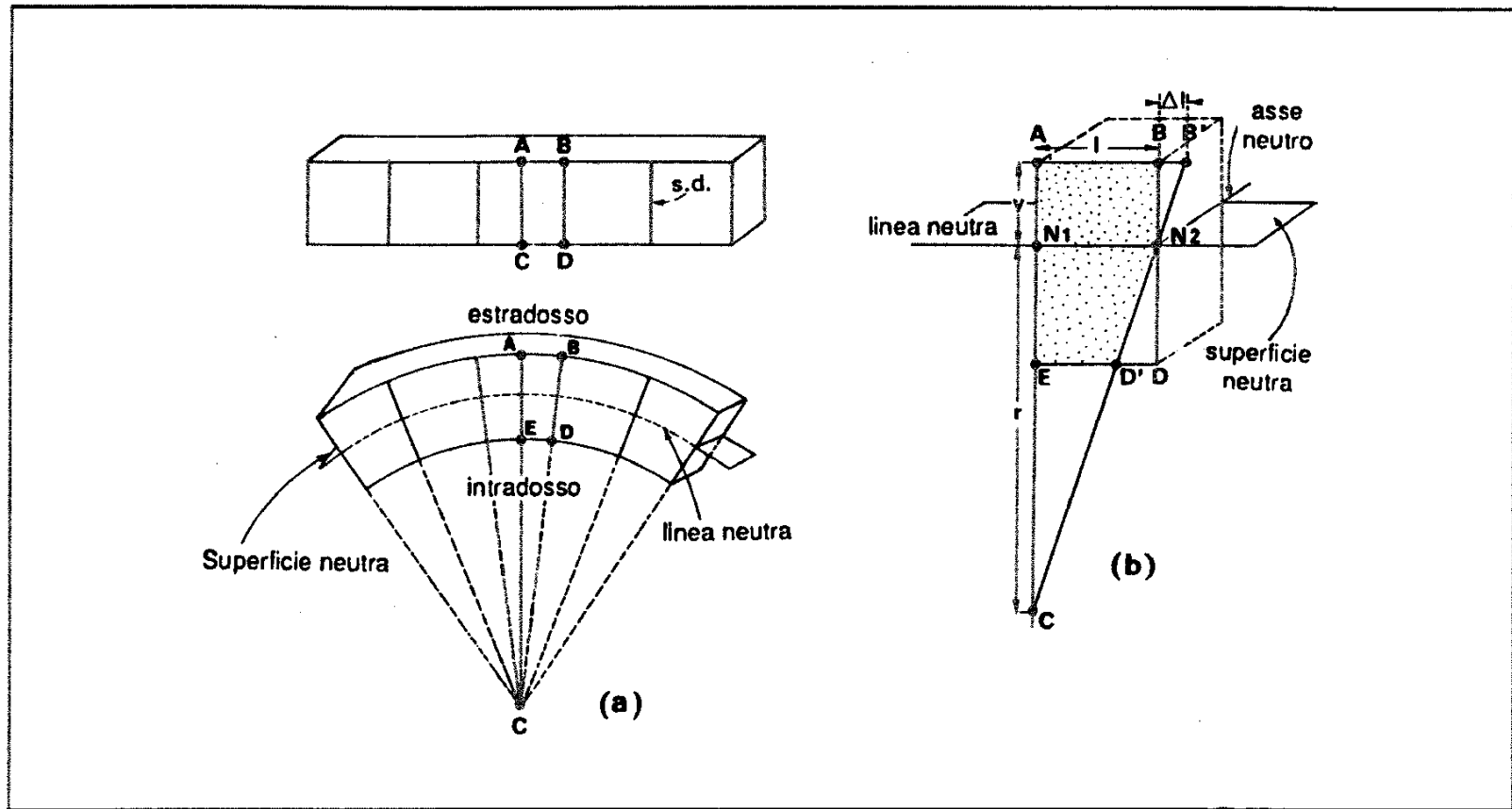


Figura 8.11. Sforzi in una trave in flessione pura (trave in appoggio libero).

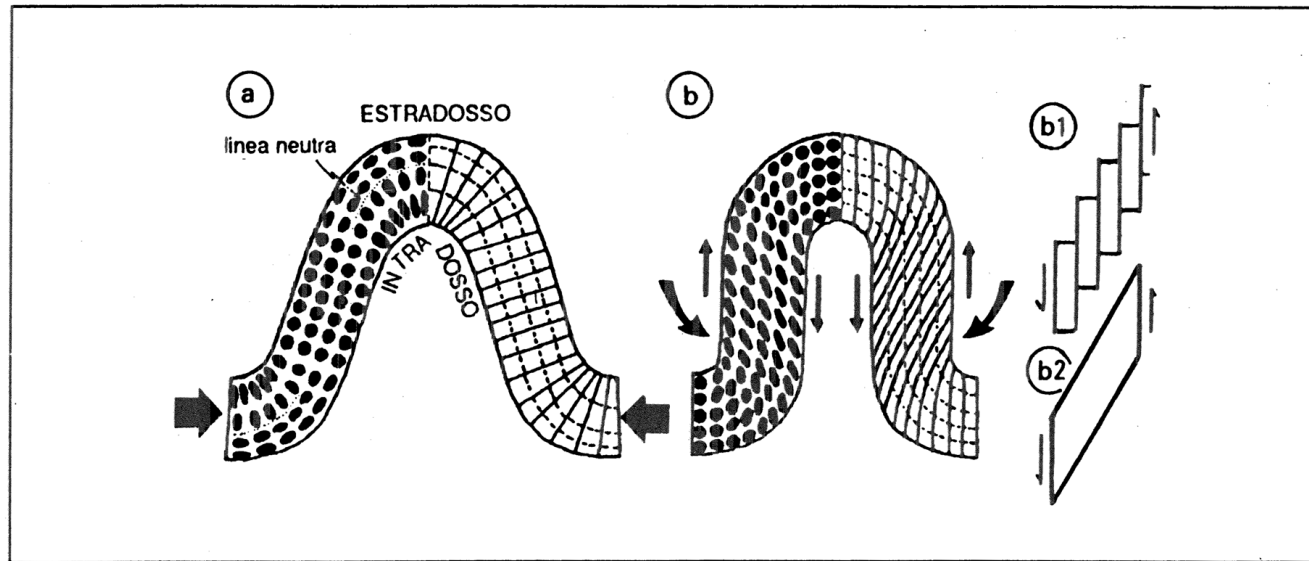


Figura 8.13. Piega monostrato a deformazione di cerniera (a) e dei fianchi (b) con taglio discontinuo (b₁) o continuo (b₂).

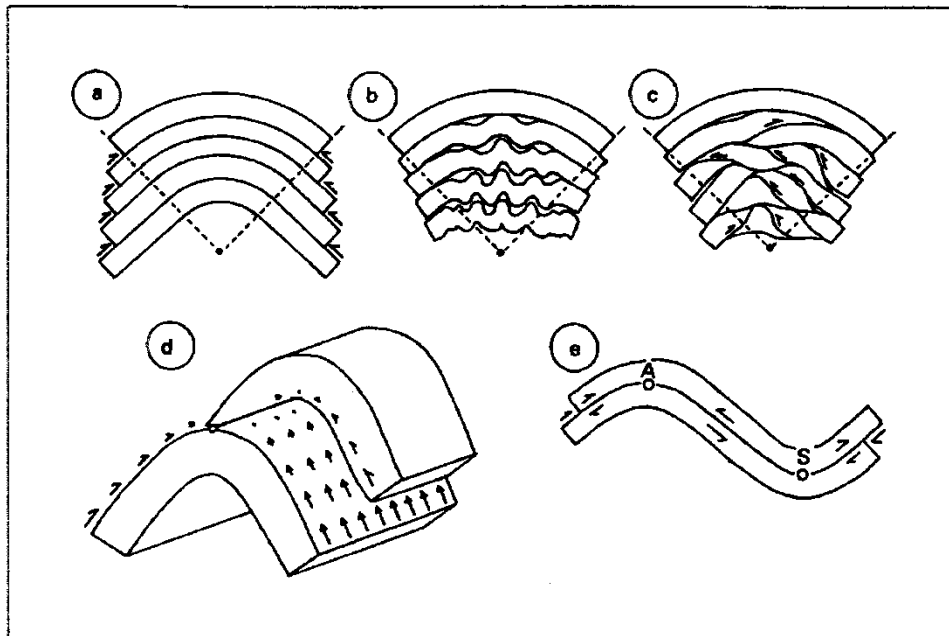


Figura 8.17. Piegamento isopaco di un pacco di strati: a) modello ideale ed accomodamento della deformazione per micropiegamenti b) o per tagli embriciati c), d) ed e) mostrano lo scorrimento banco su banco.

Da Mercier & Vergely, 1995

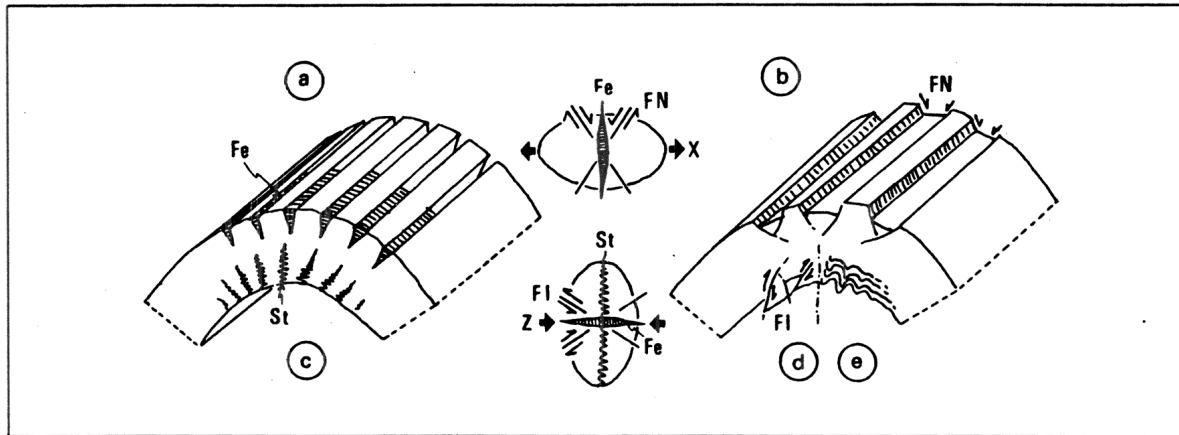


Figura 8.15. Strutture associate alle pieghe a deformazione in cerniera; a) squarci da trazione (Fe), b) faglie normali (FN), c) stiloliti (St), d) faglie inverse (FI) ed e) micropiegamenti; al centro modalità di associazione di diverse strutture.

Da Mercier & Vergely, 1996

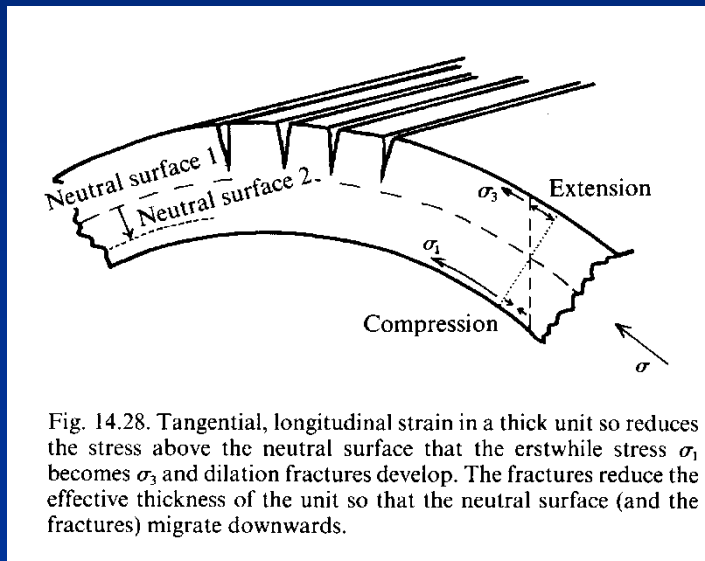
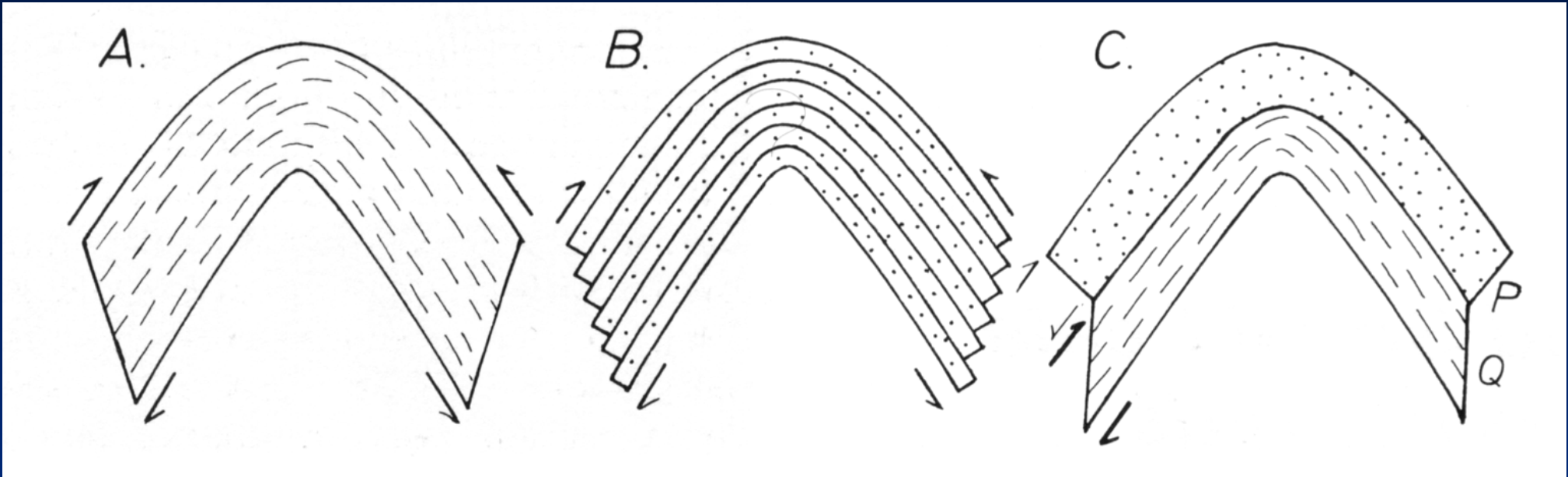


Fig. 14.28. Tangential, longitudinal strain in a thick unit so reduces the stress above the neutral surface that the erstwhile stress σ_1 becomes σ_3 and dilation fractures develop. The fractures reduce the effective thickness of the unit so that the neutral surface (and the fractures) migrate downwards.

Da Price and Cosgrove, 1990



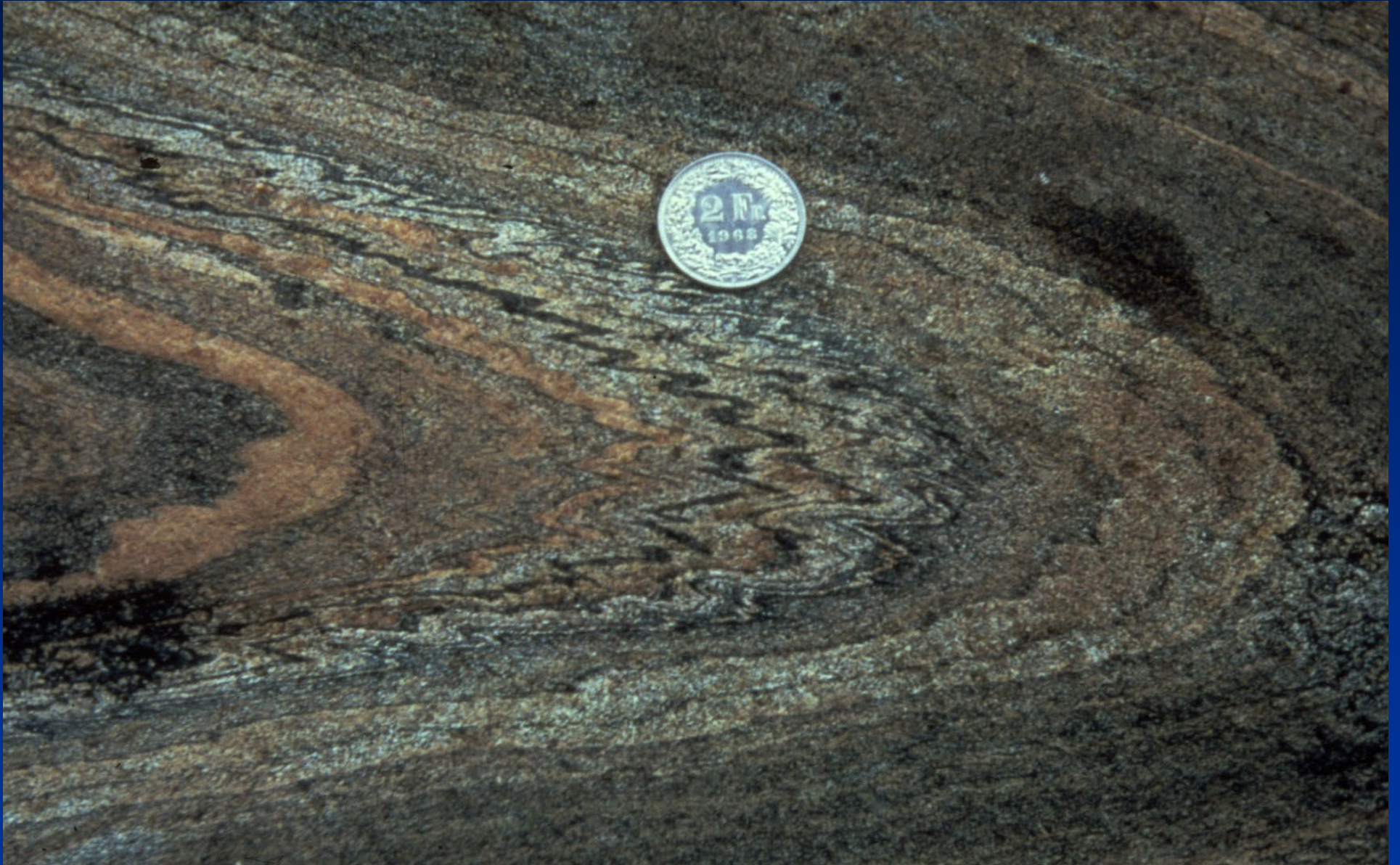
Da Ramsay & Huber, 1987

Flexural flow

Flexural slip

Misto

Pieghe parassite



Da Ramsay & Huber, 1987

Pieghe di secondo ordine Pieghe parassite

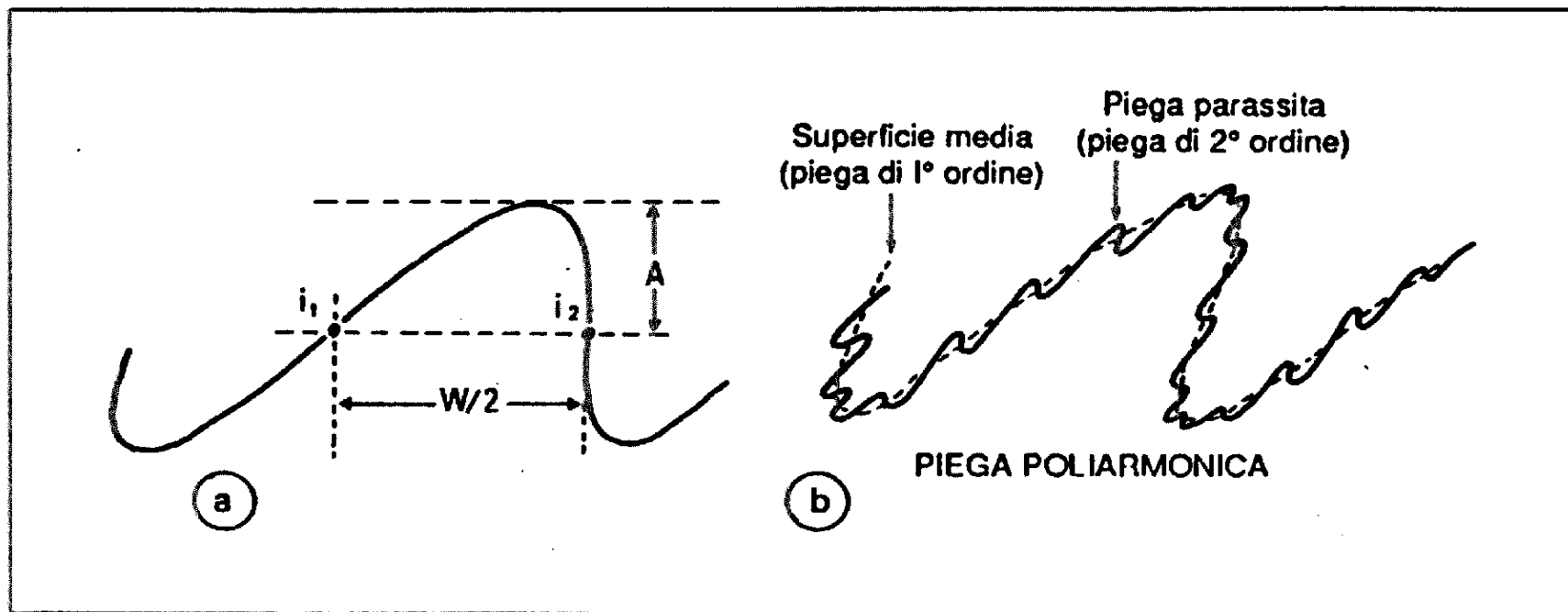
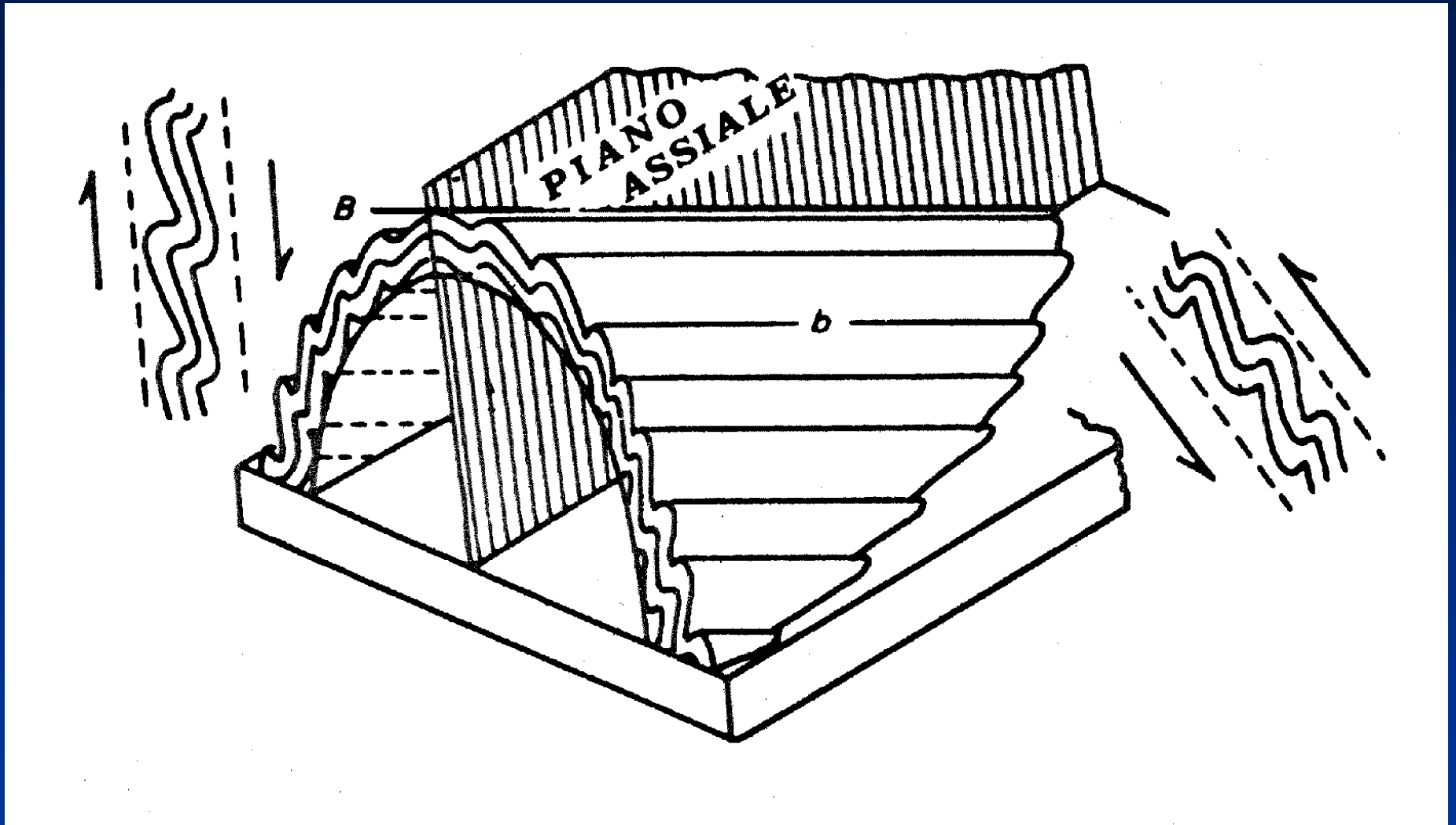
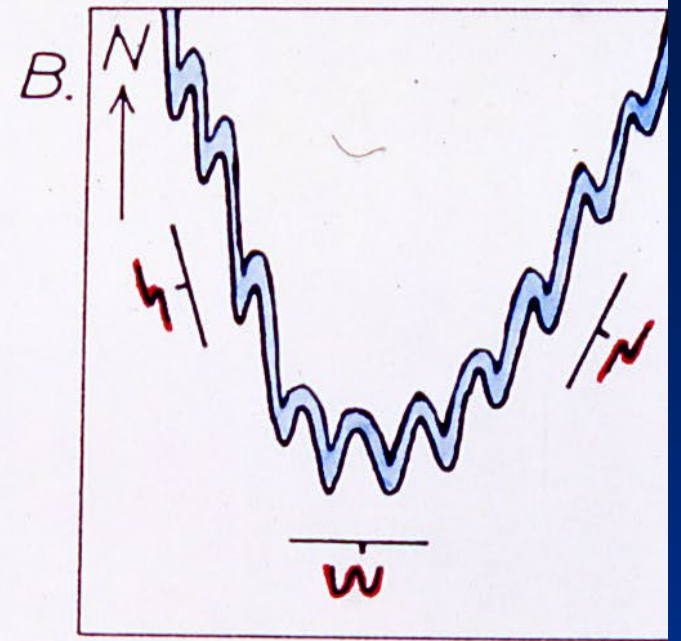
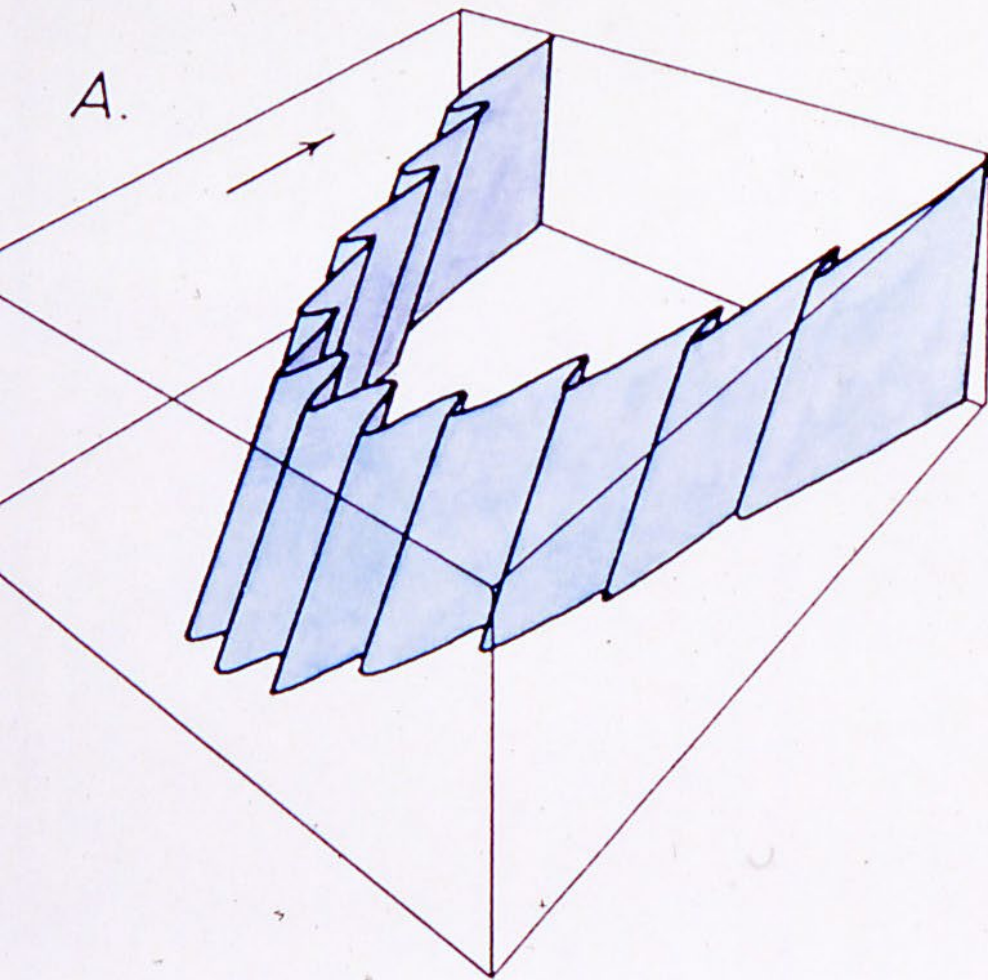


Figura 8.2. a) Ampiezza (A) e semi-lunghezza d'onda ($W/2$) di una piega; b) superficie media e pieghe parassite di una piega poliarmonica.

Da Mercier & Vergely, 1996

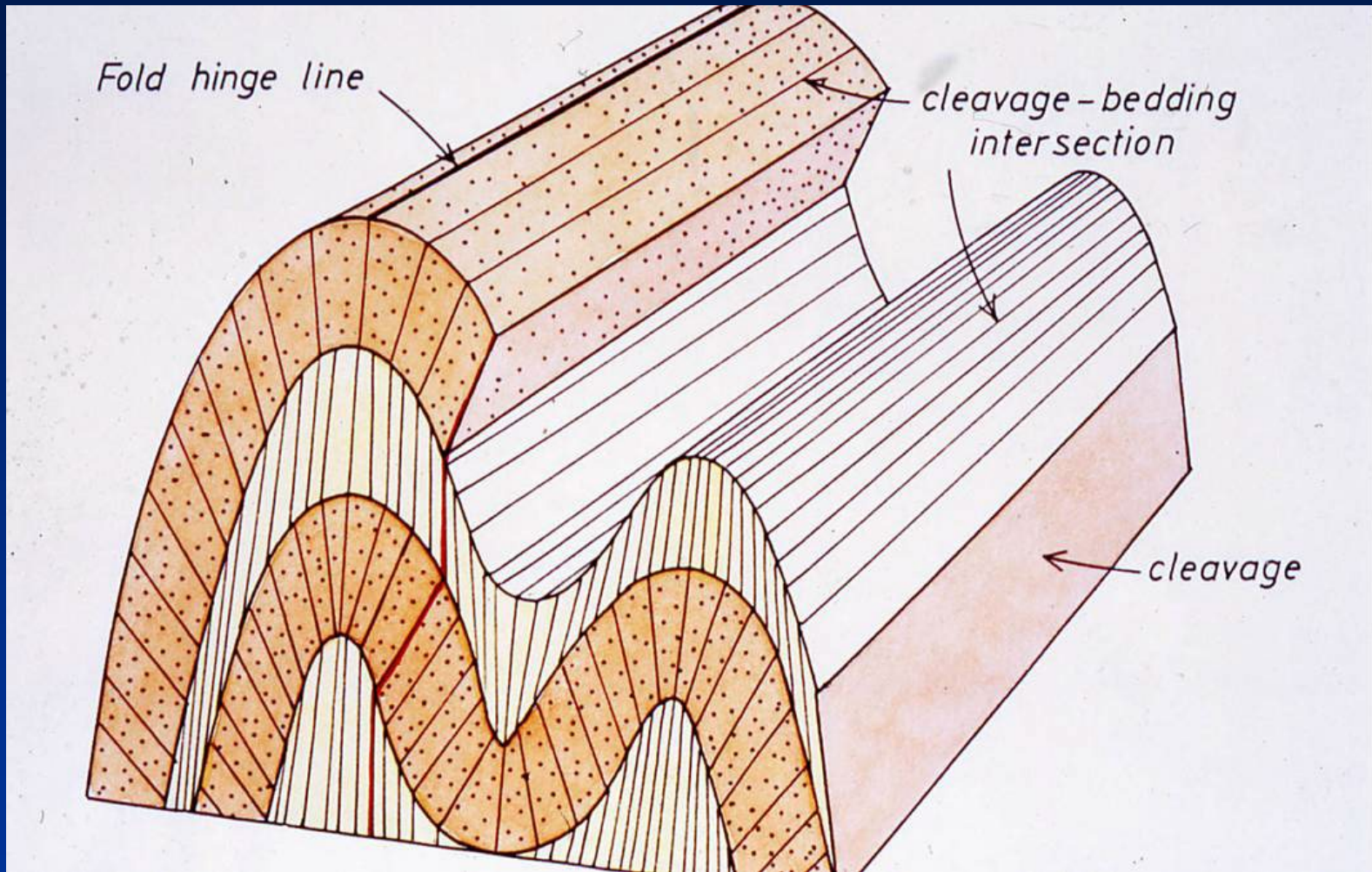


Da Boccaletti & Tortorici, 1987



Da Ramsay & Huber, 1987

Pieghe parassite

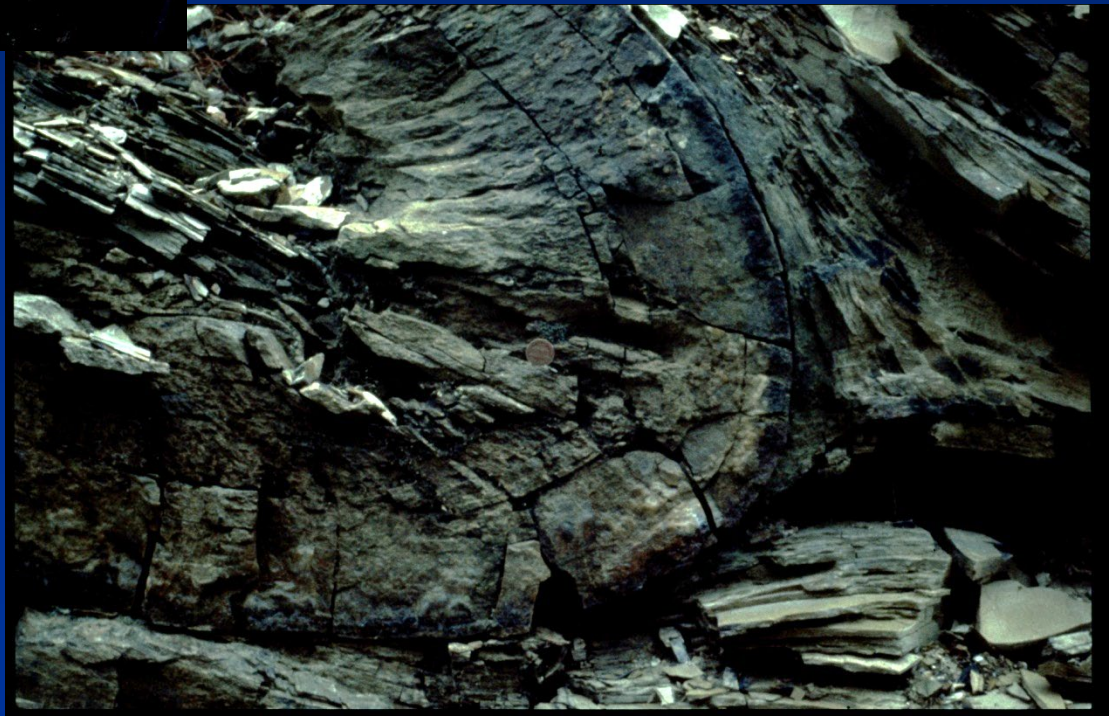


Da Ramsay & Huber, 1987



Da Ramsay & Huber, 1987

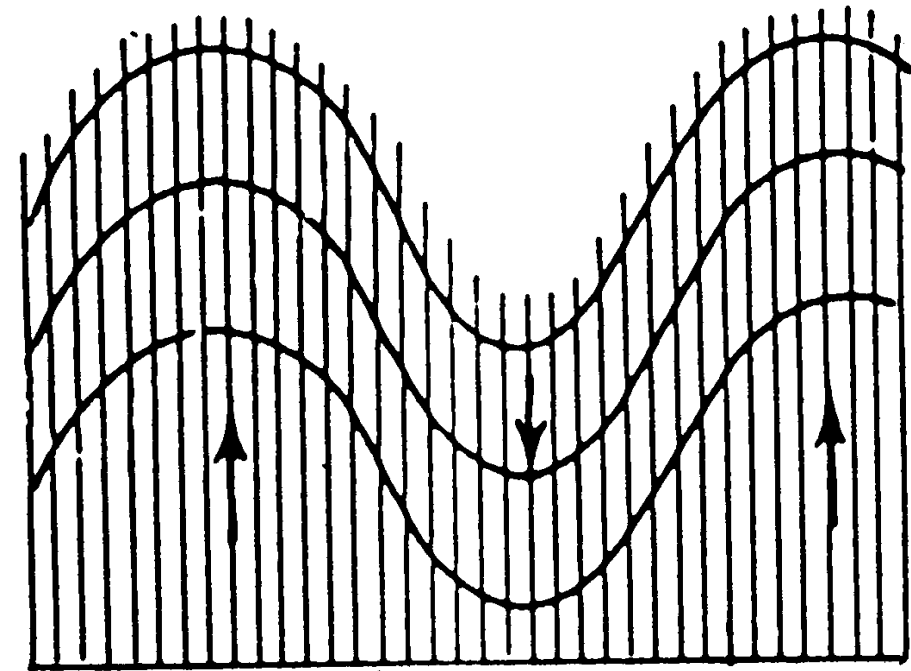
Da Ramsay & Huber, 1987



Foliazione di piano assiale: tipica dei regimi duttili e delle pieghe simili



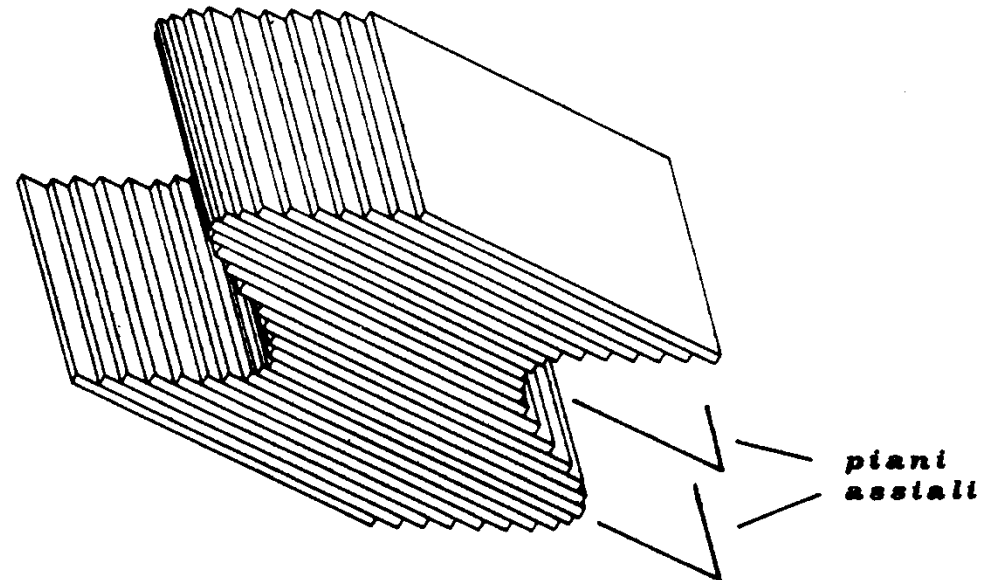
Da Ramsay & Huber, 1987



Pieghe simili

Fig. 68 - Esempio di pieghe simili
(da HILLS, 1963).

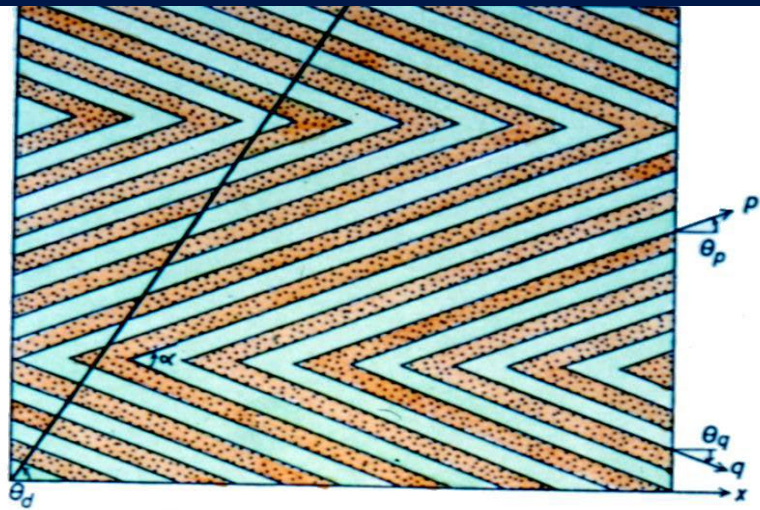
Da Boccaletti & Tortorici, 1987



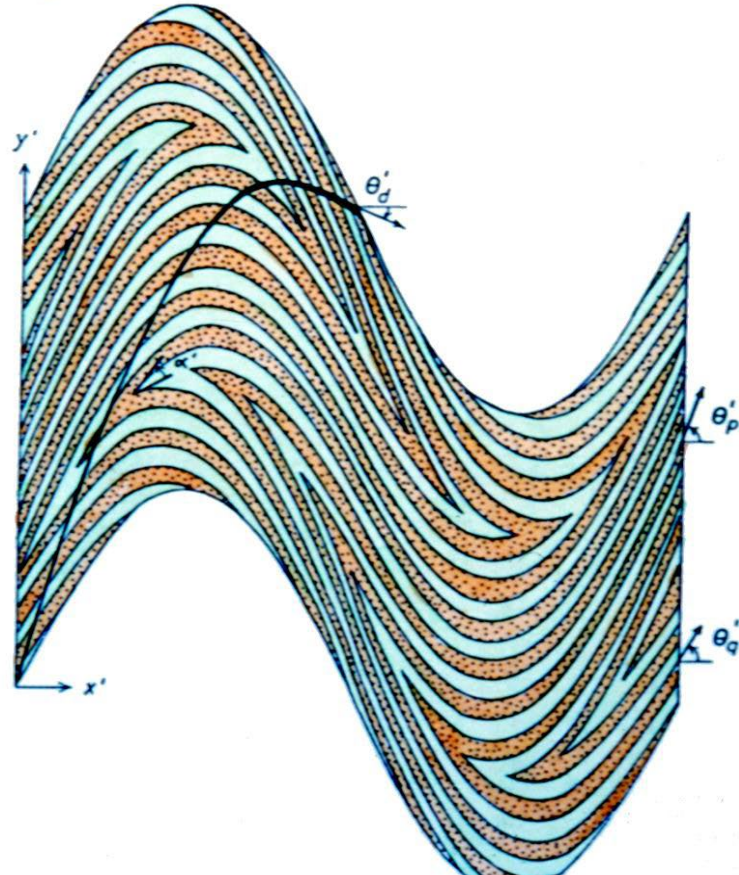
Pieghe ripiegate “strutture di interferenza”



Da Ramsay & Huber, 1987



B.



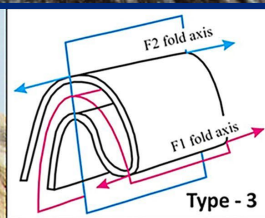
Da Ramsay & Huber, 1987



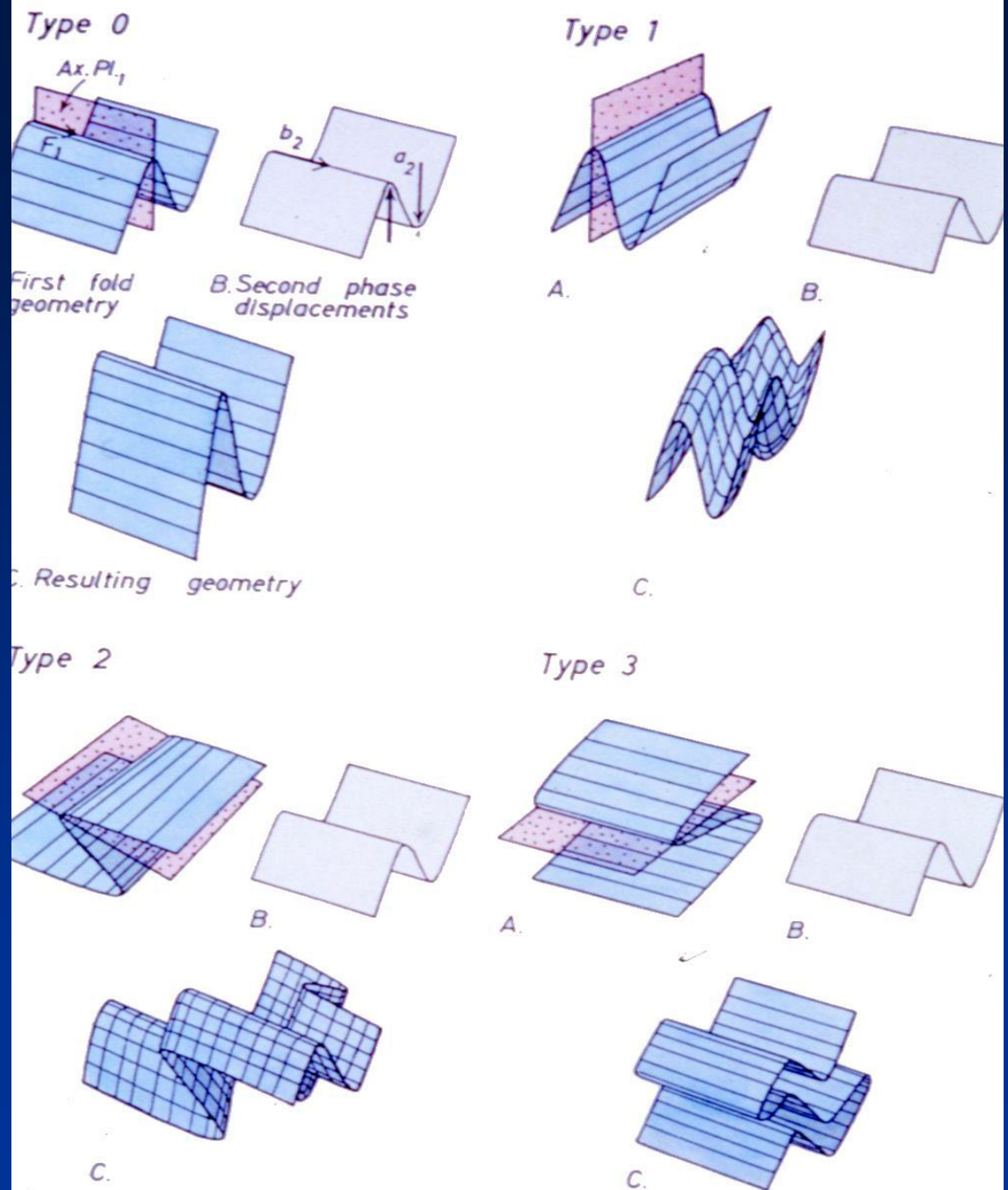
Da Fossen, 2010

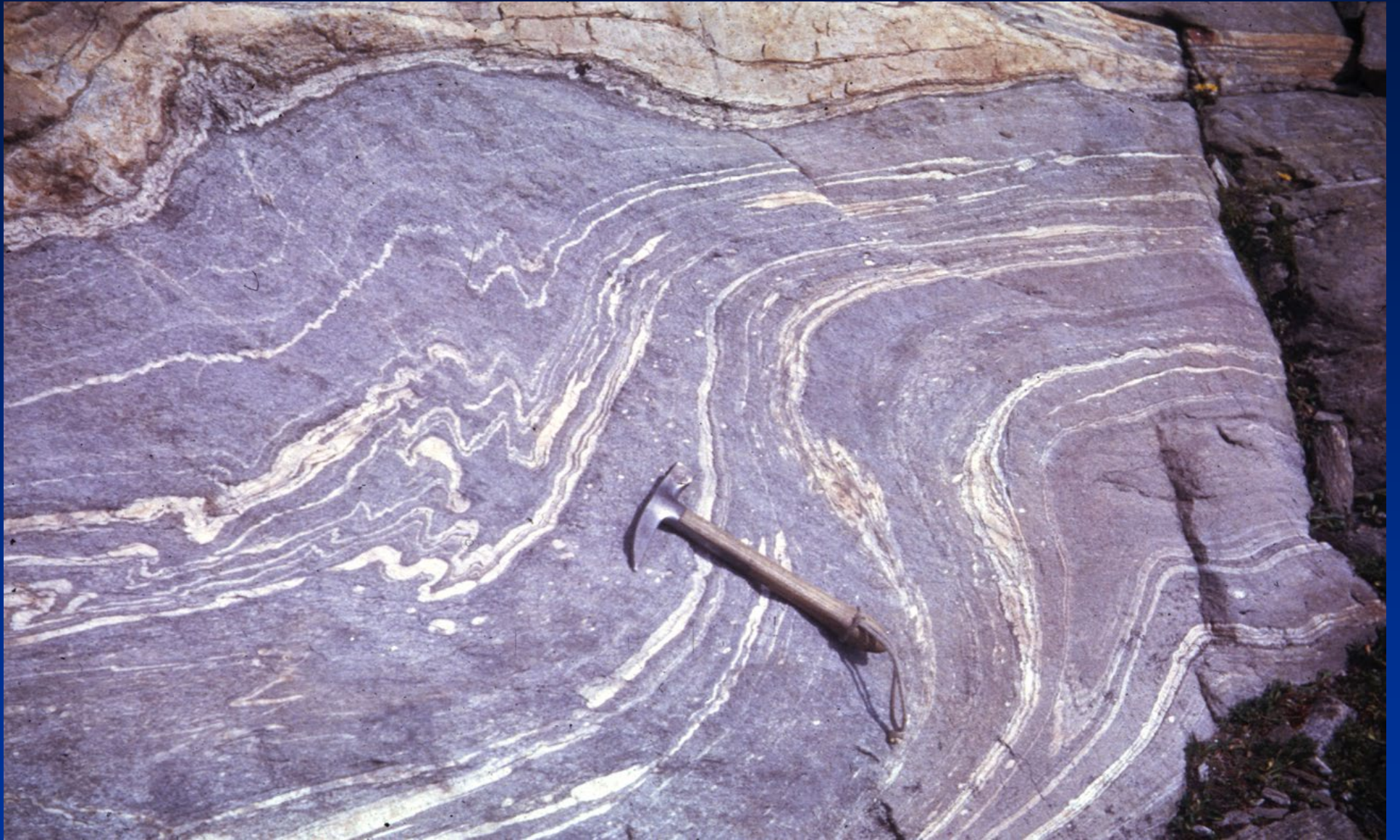


Champati et al., 2017



Pieghe ripiegate “strutture di interferenza”





Da Ramsay & Huber, 1987

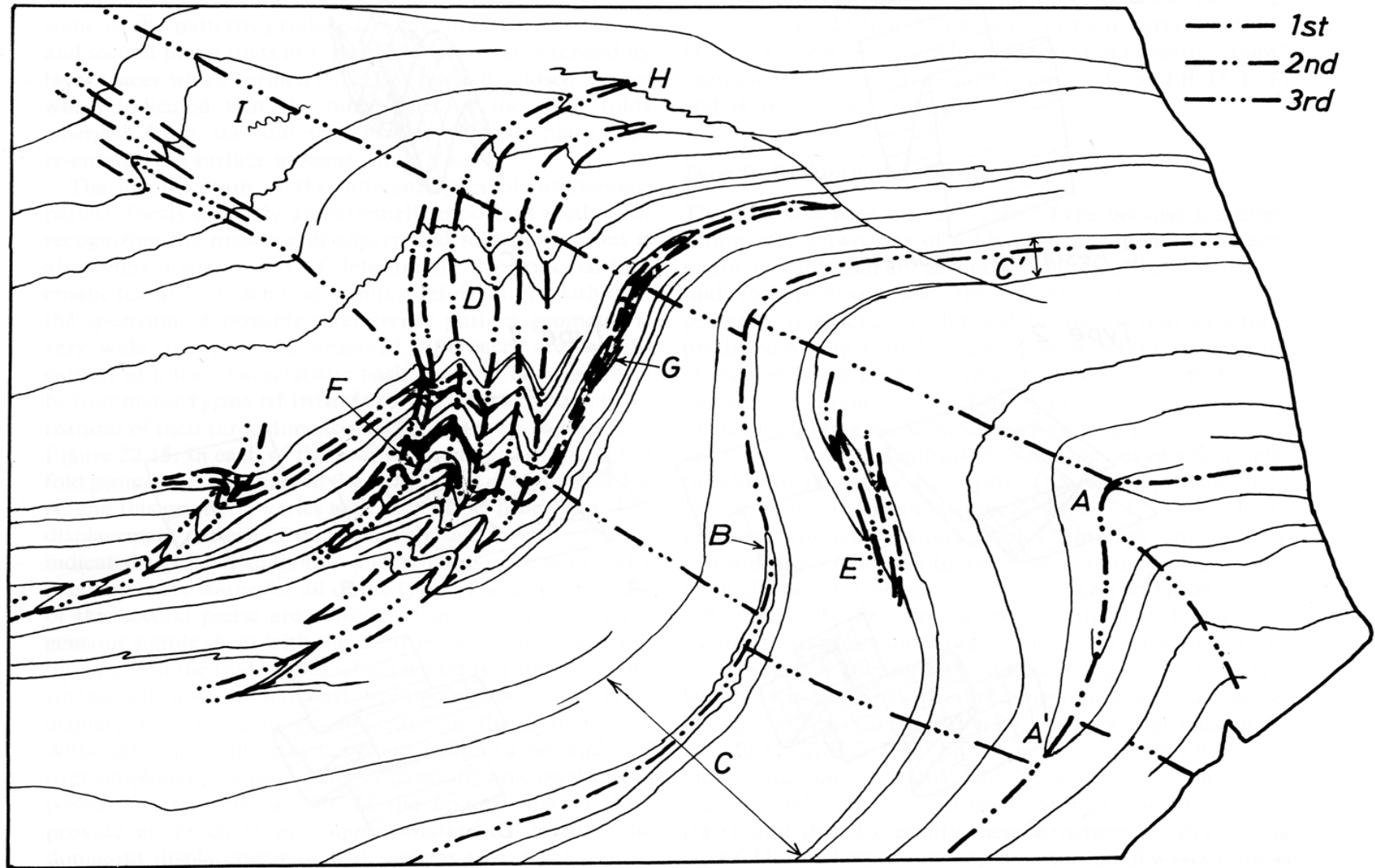


Figure 22.14. Answer 22.4 showing the positions of the axial traces of three sets of folds. For further details see discussion in text.