

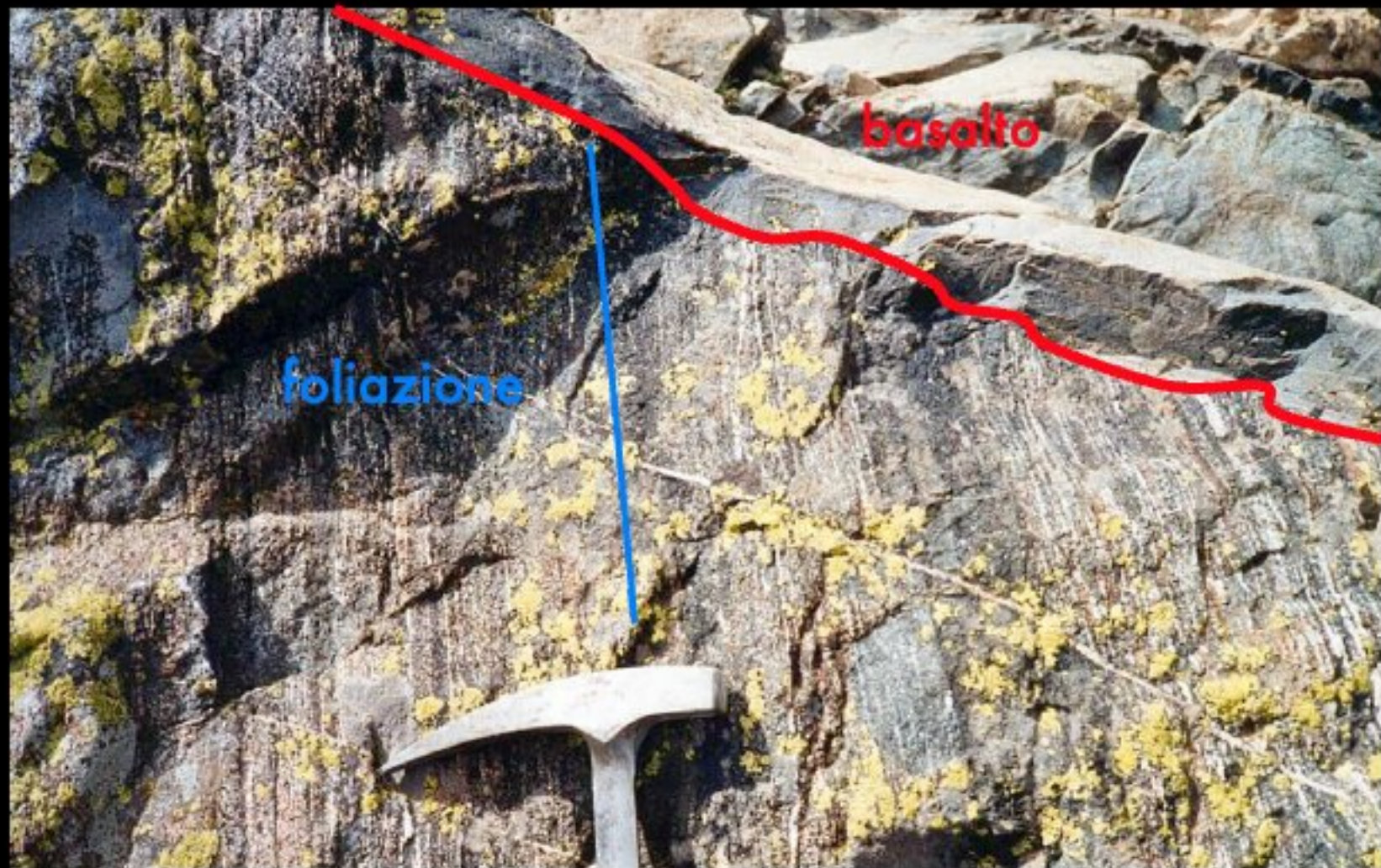


Maria Iole Spalla

“Le Alpi: un filo di Arianna della storia geologica del cuore d'Europa”

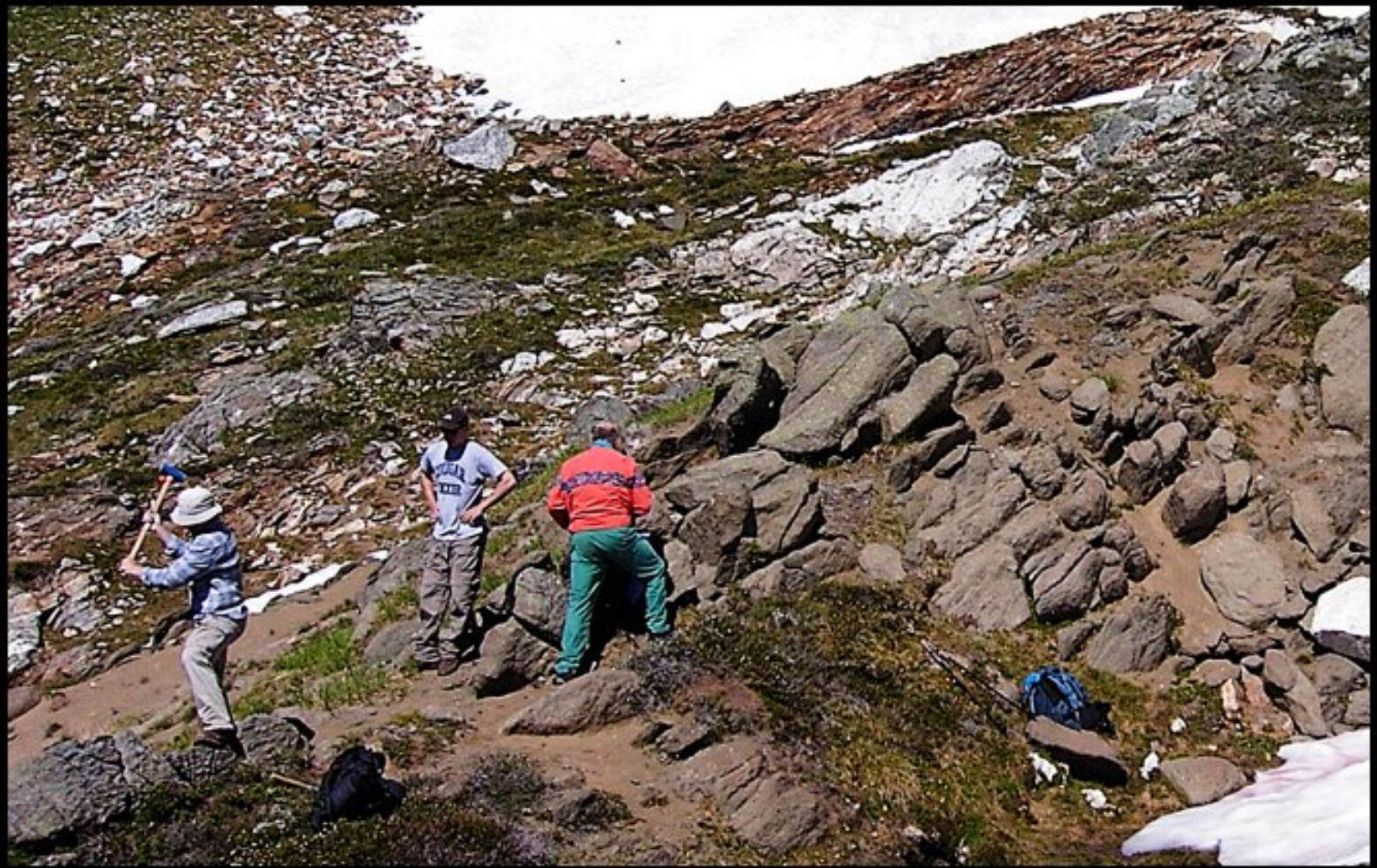
40^o
anniversario
1982-2022





basalto

foliazione



Dal campione di roccia al "cioccolato" e,
infine, alla sezione sottile

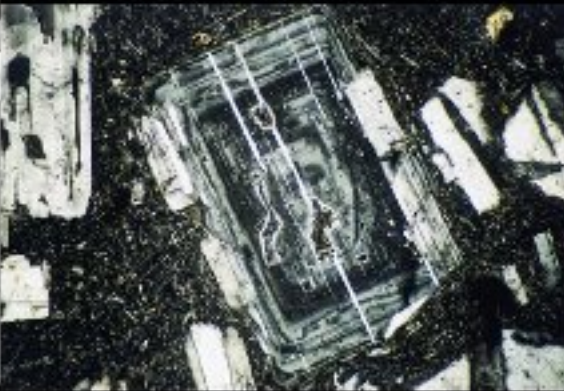
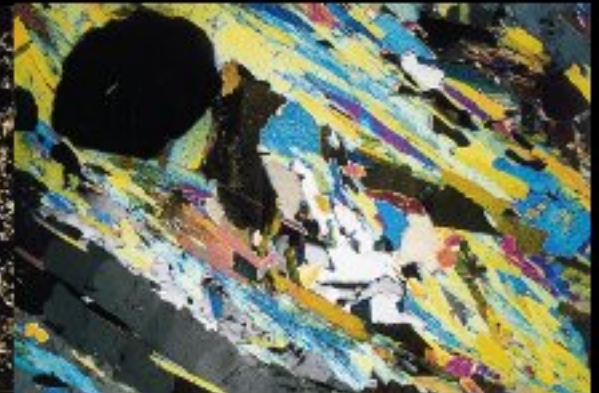
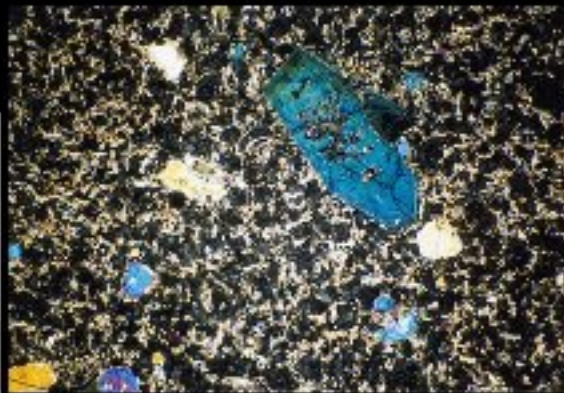
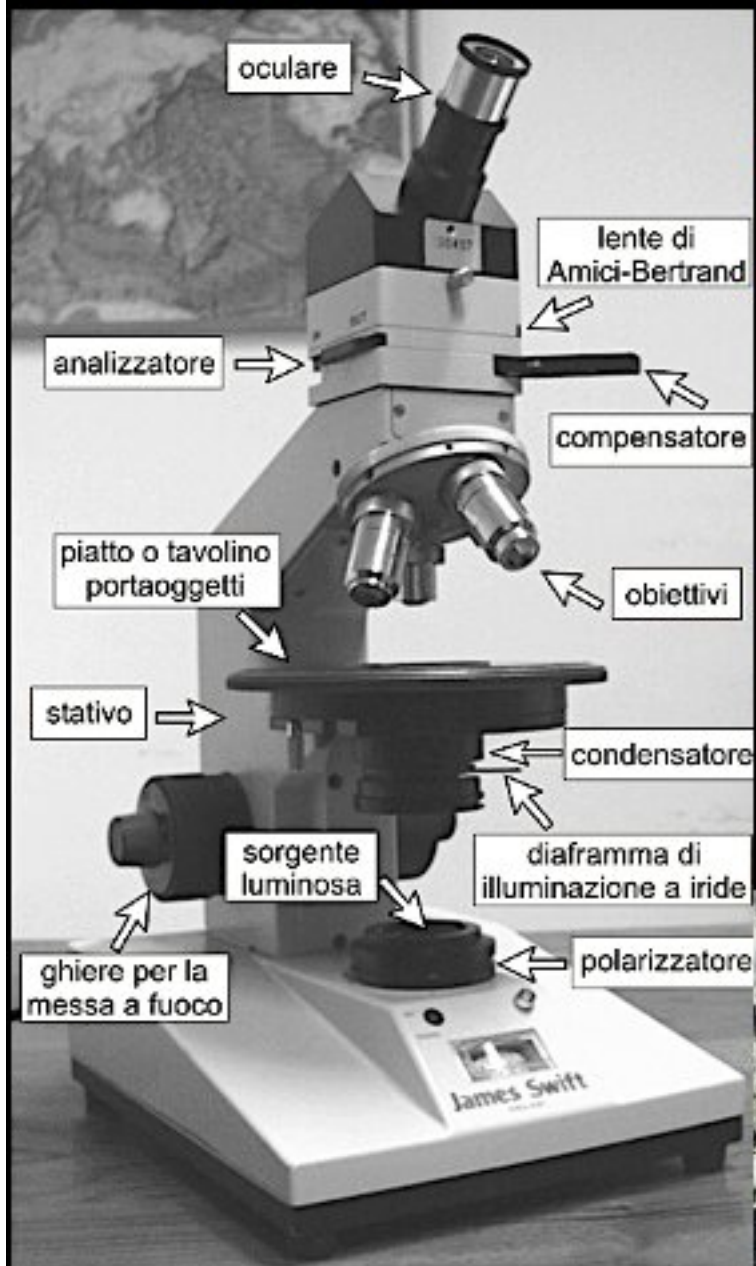


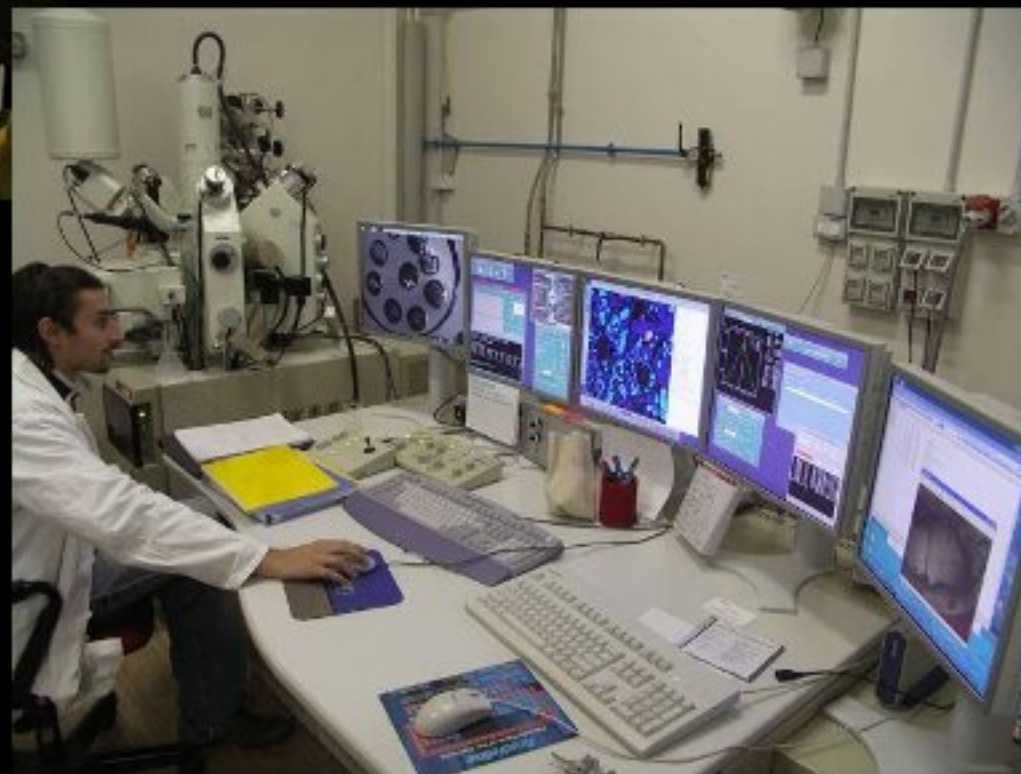
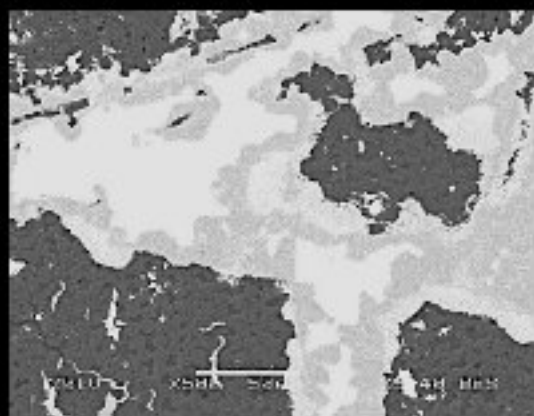
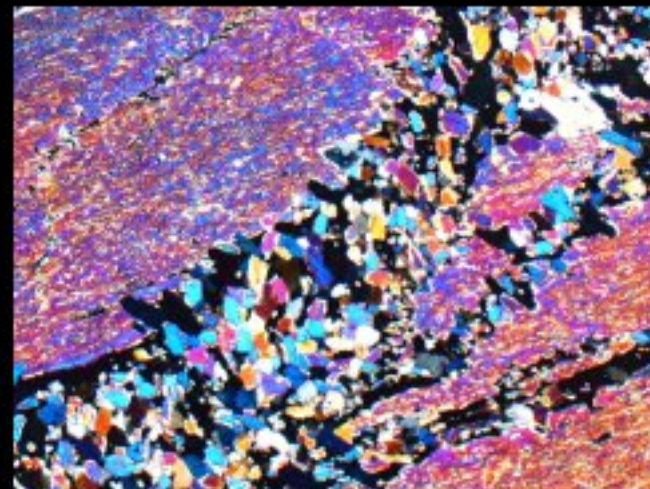
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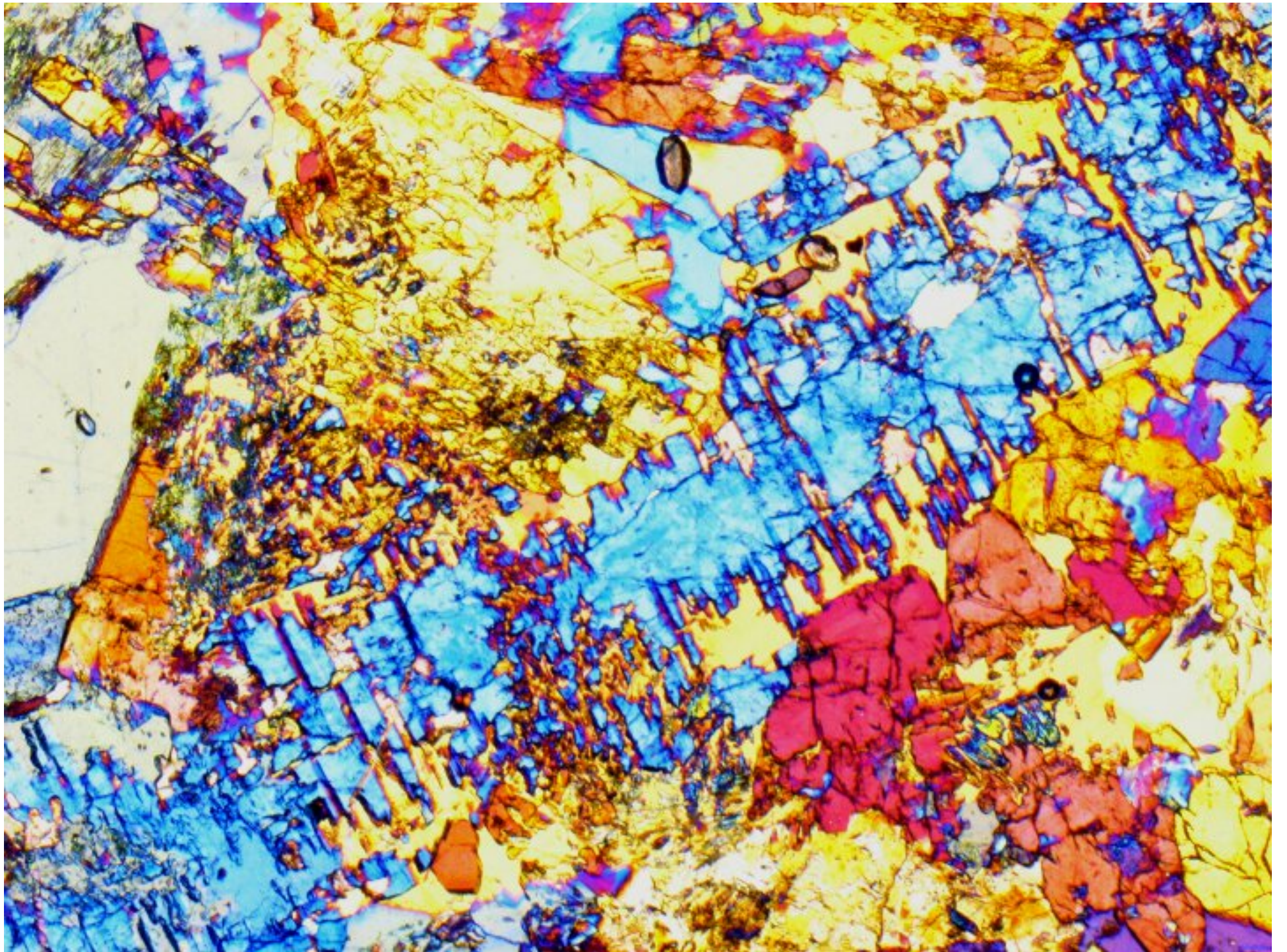
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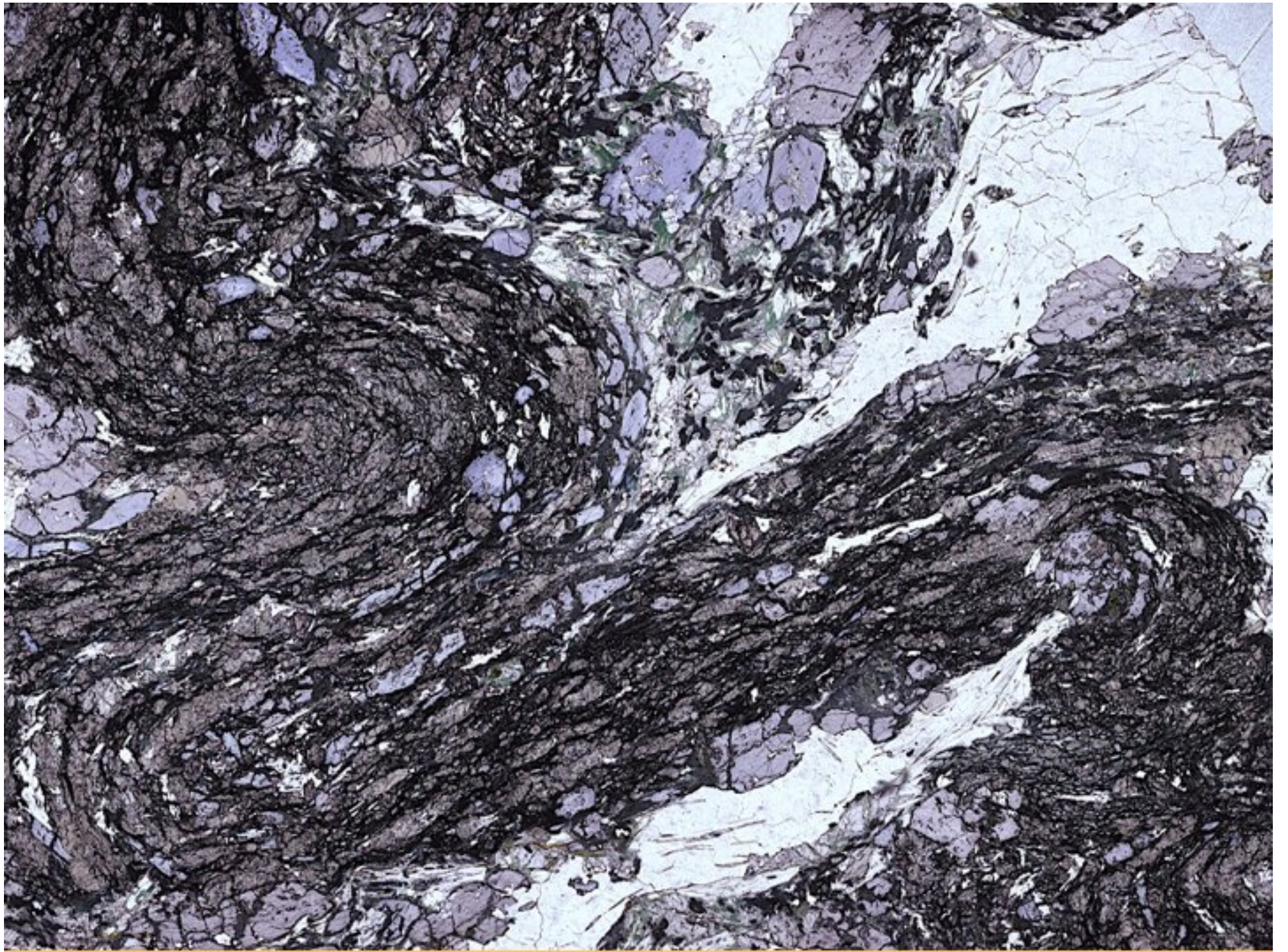
campione di
roccia

Il Microscopio













La Terra è un pianeta in movimento con trasferimento di materia e di calore dall'interno alla superficie e viceversa come è testimoniato da:

Attività sismica
Attività vulcanica

Topografia
Età della crosta

Magnetismo
Metamorfismo



SISMICITA'

La traccia più immediata della dinamica interna del globo è la sismicità.

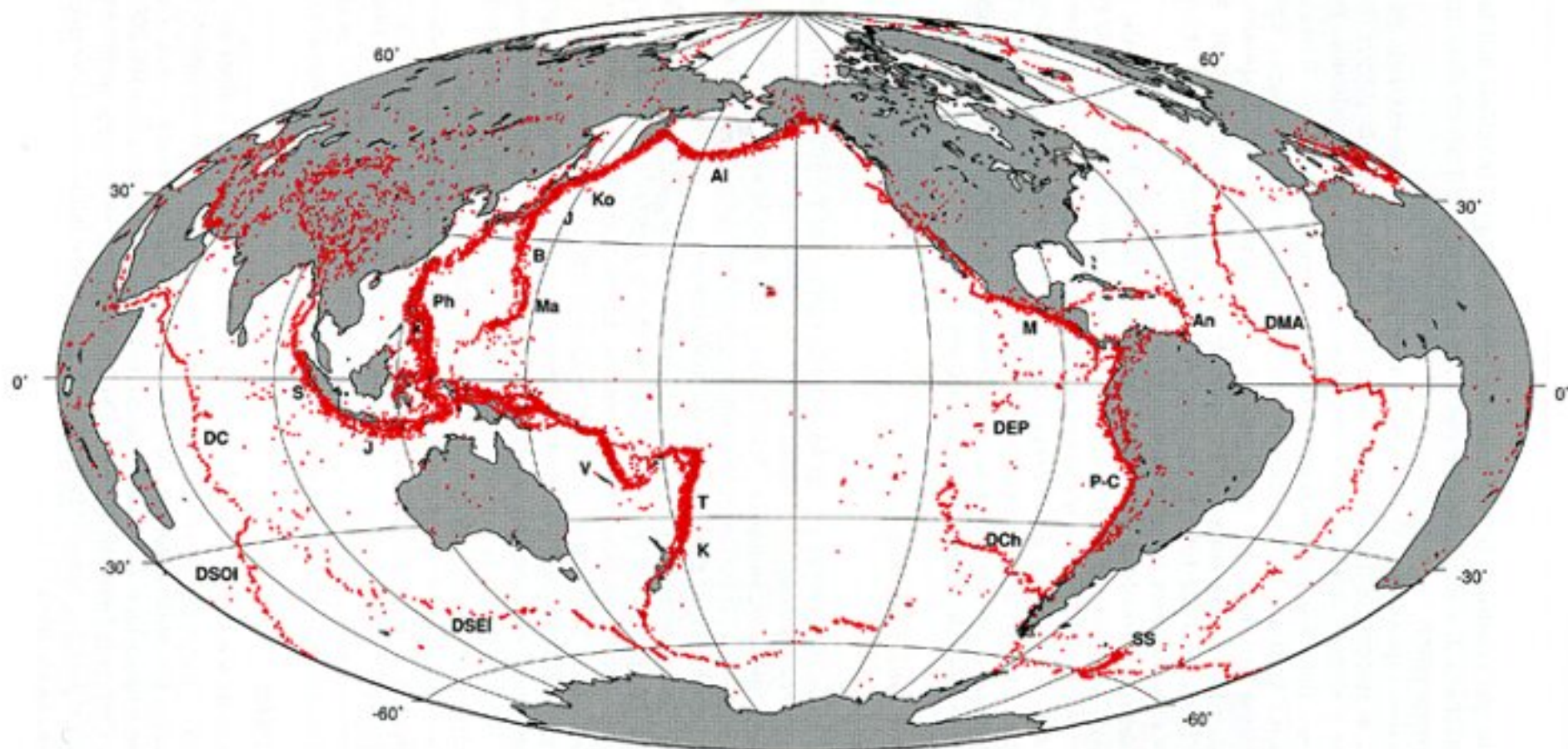
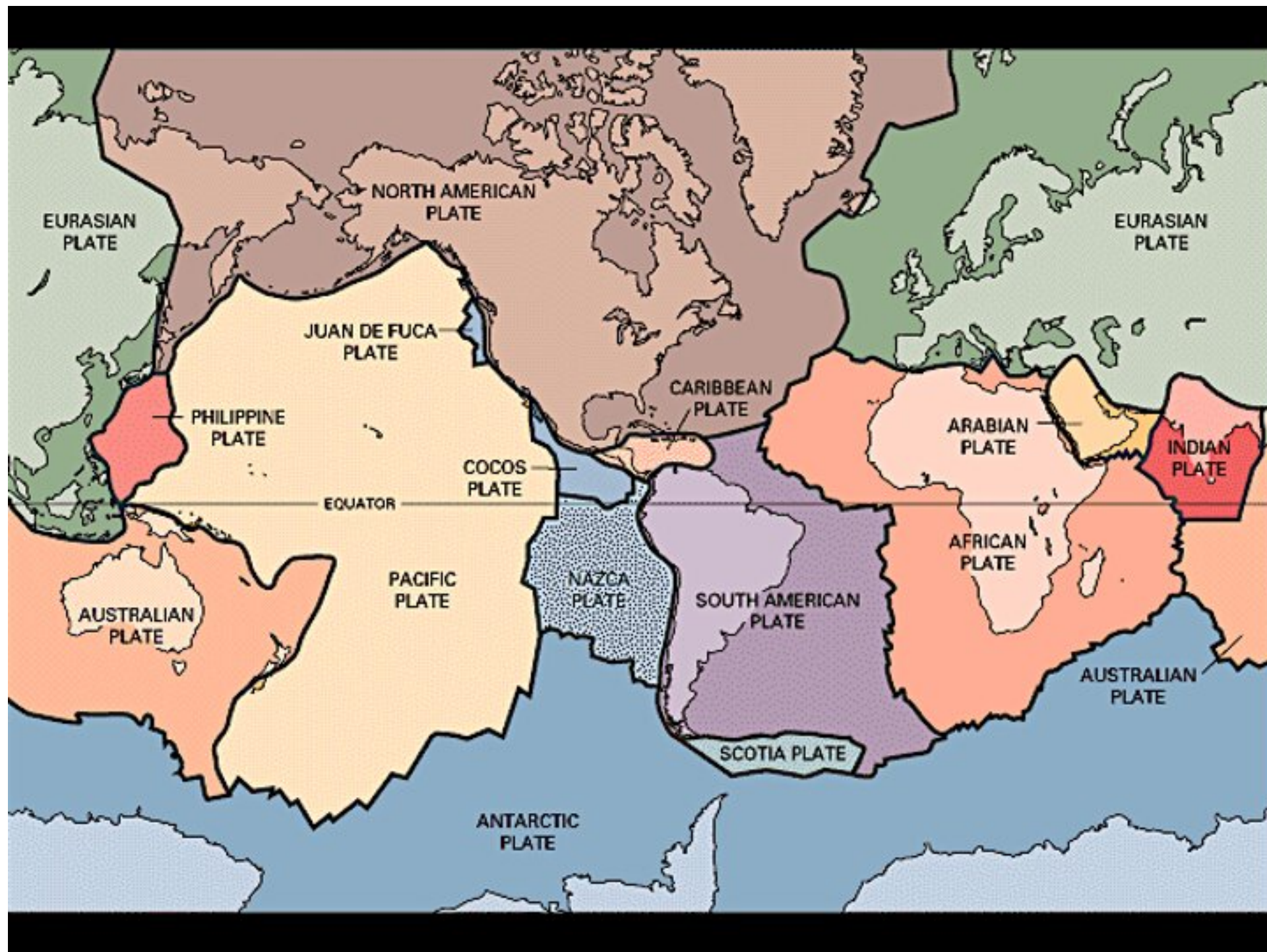


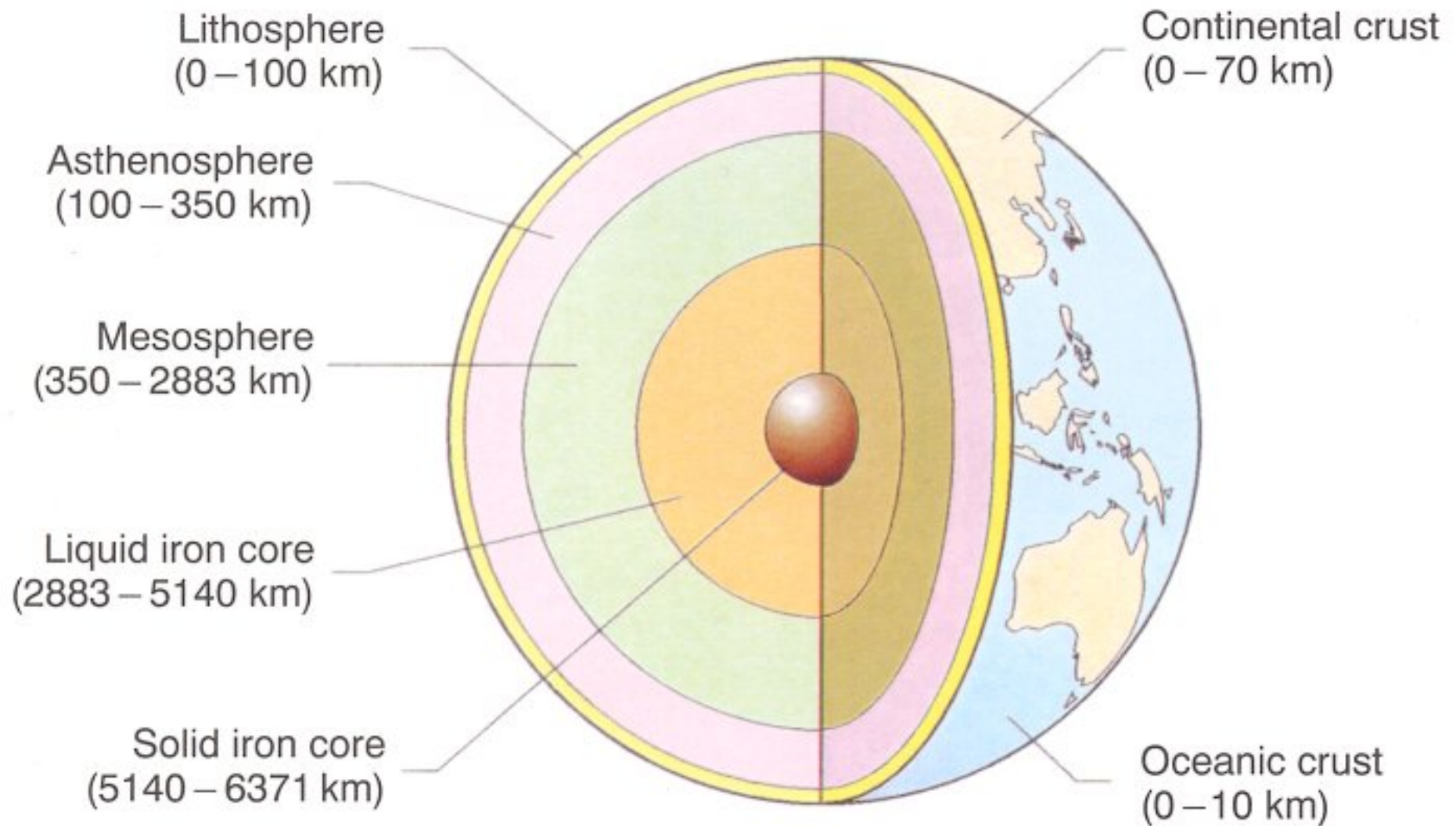
FIGURE 3.8 – Carte de la sismicité mondiale (compilation logiciel GMT, UMR Dynamique de la Lithosphère, Montpellier).

La répartition des séismes souligne les zones de déformation active dans les océans ou sur les continents. On a indiqué le nom des principales zones de subduction et des dorsales océaniques. Fosses de Kermadec (K), Tonga (T), Vanuatu (V), Philippines (Ph), Mariannes (Ma), Bonin (B), Japon (J), Kouriles (Ko), Aléoutiennes (Al), Mexique (M), Pérou-Chili (P-C), Java (J) Sumatra (S), Antilles, (An), Sandwichs du Sud (SS). Dorsale Médio-Atlantique (DMA), dorsale Est-Pacifique (DEP), dorsale Sud-Ouest Indienne (DSOI), dorsale Sud-Est Indienne (DSEI), dorsale de Carlsberg (DC), dorsale du Chili (DCh).

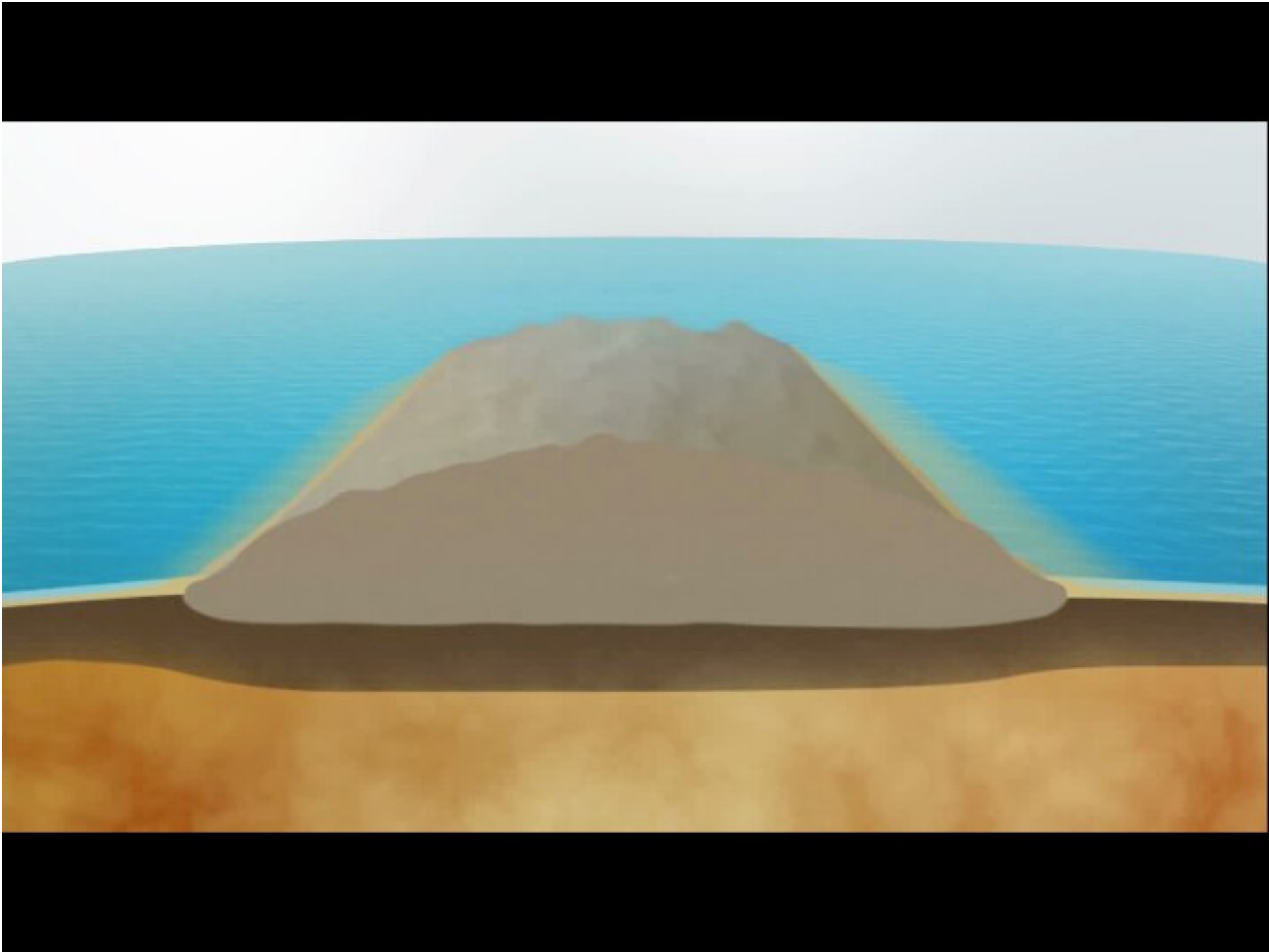


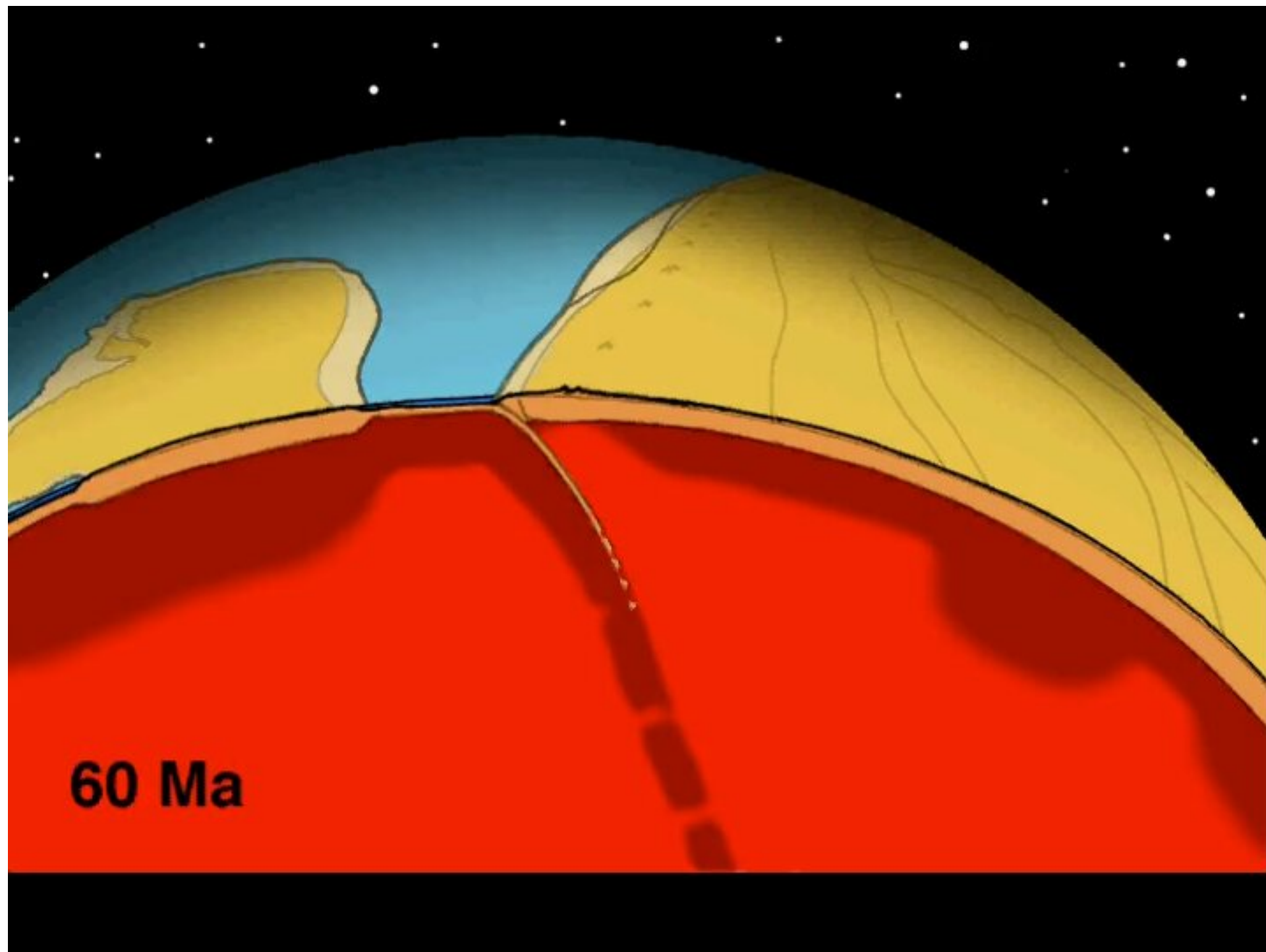


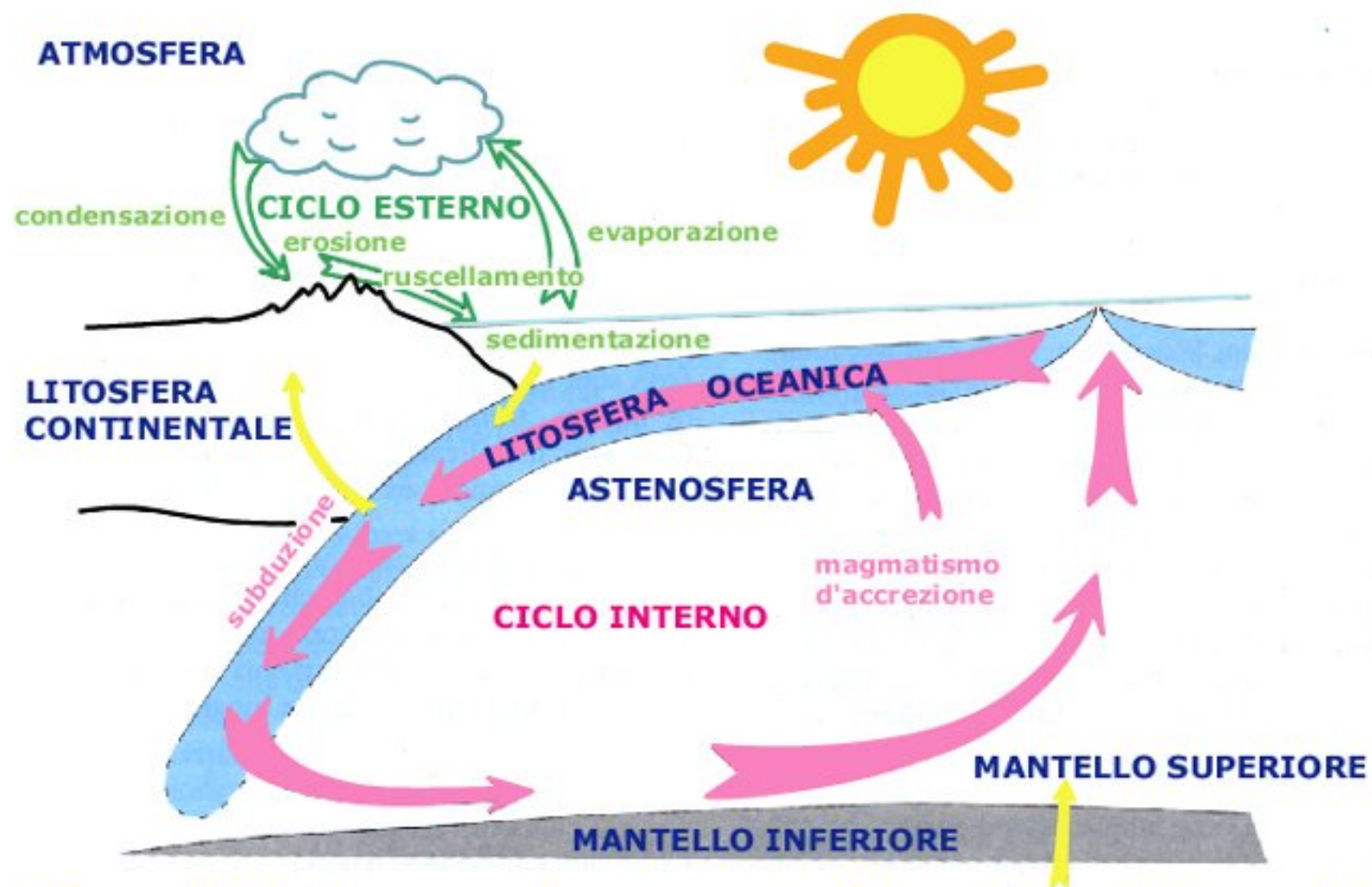




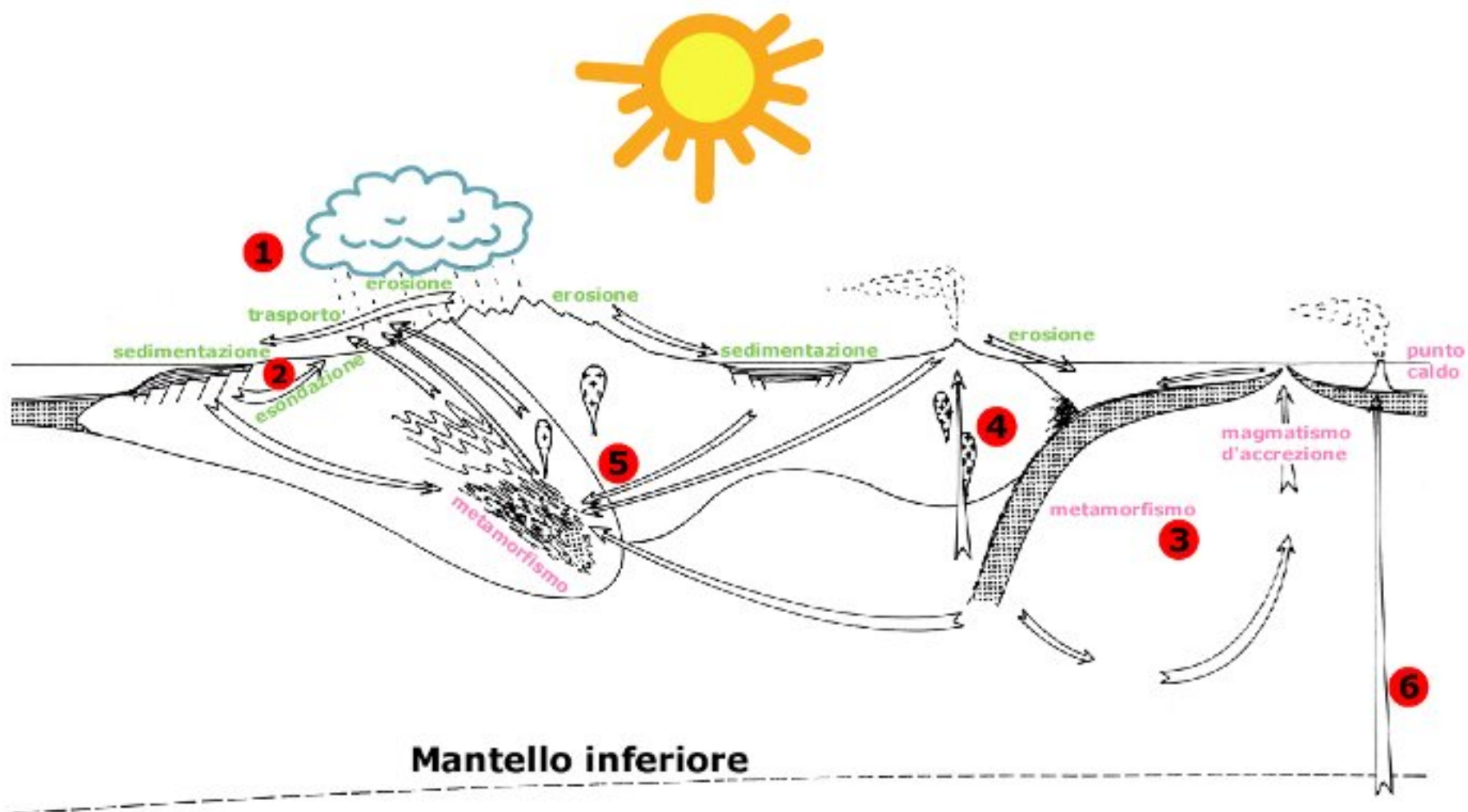




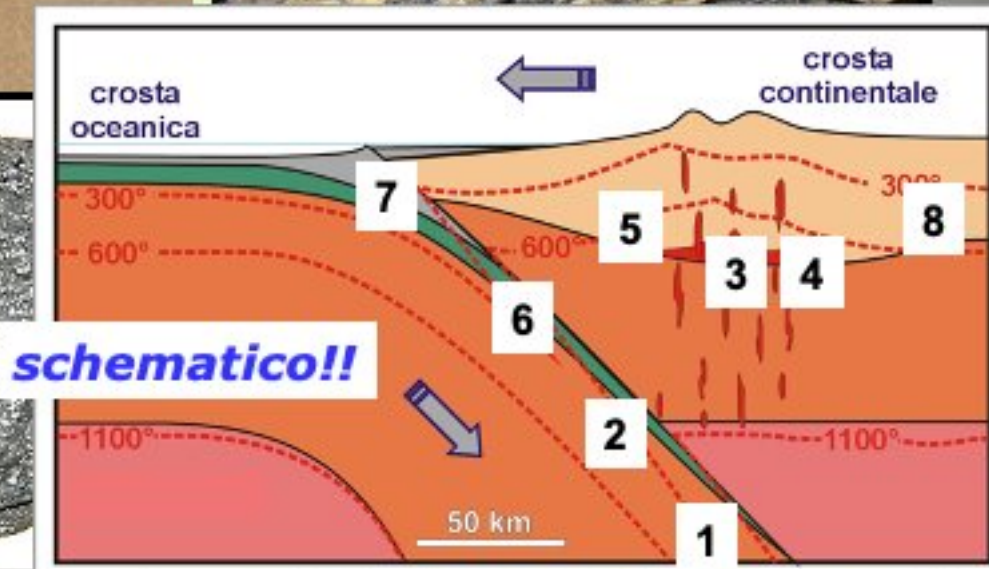
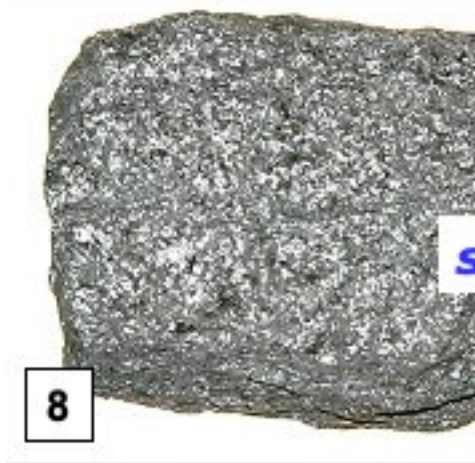
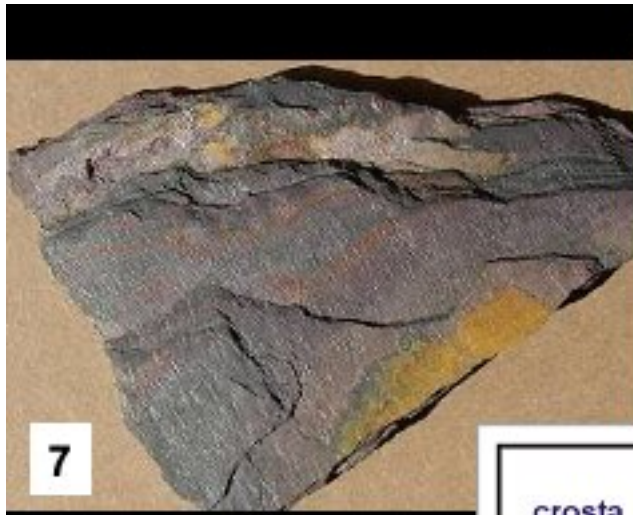




Le frecce gialle indicano come ci possa essere trasferimento di materia tra un ciclo e l'altro: ad esempio i sedimenti possono entrare nel ciclo interno se trascinati nelle zone di subduzione.

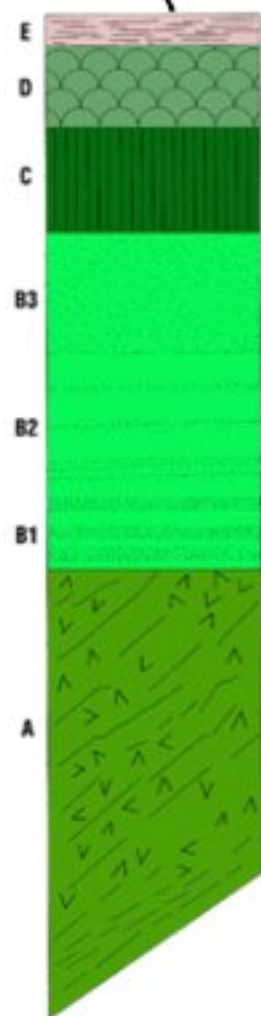


Le rocce e il loro coinvolgimento nei due cicli
interno ed esterno

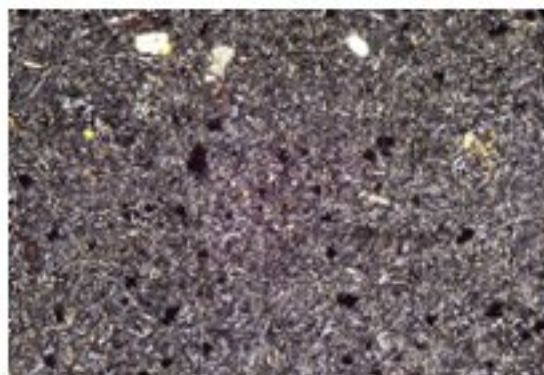




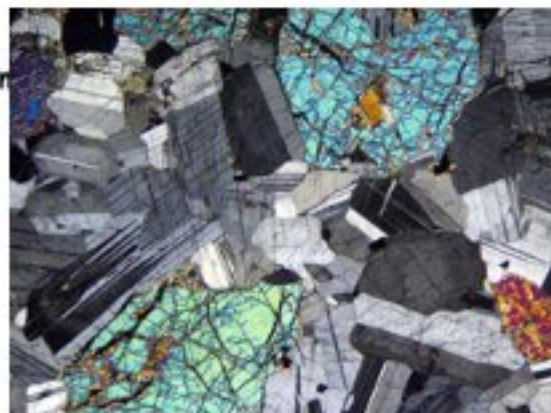
sedimenti



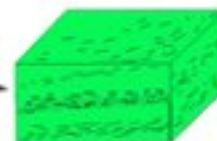
D) Basalti a cuscini



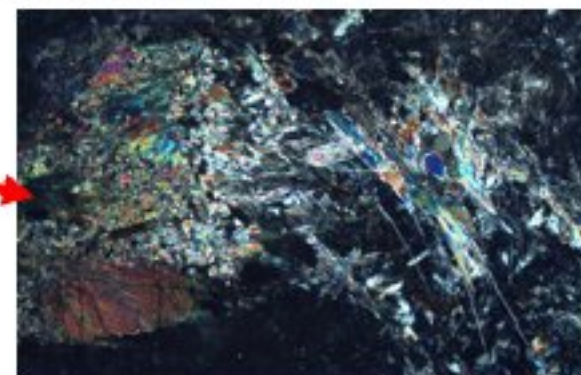
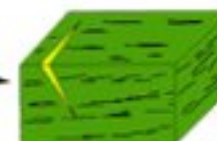
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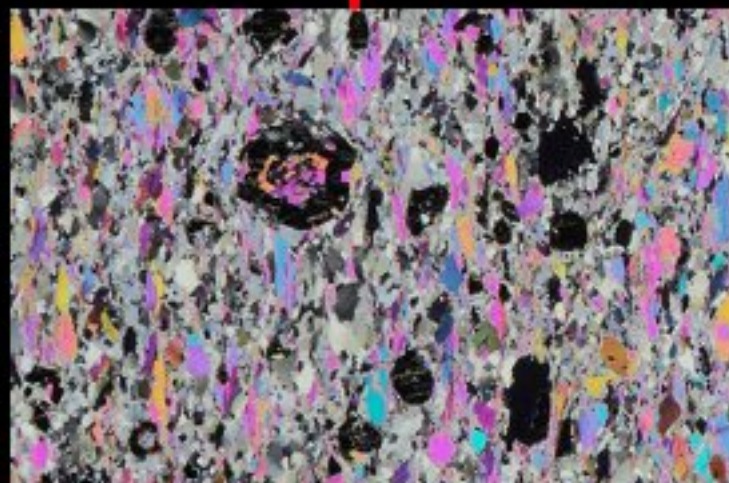
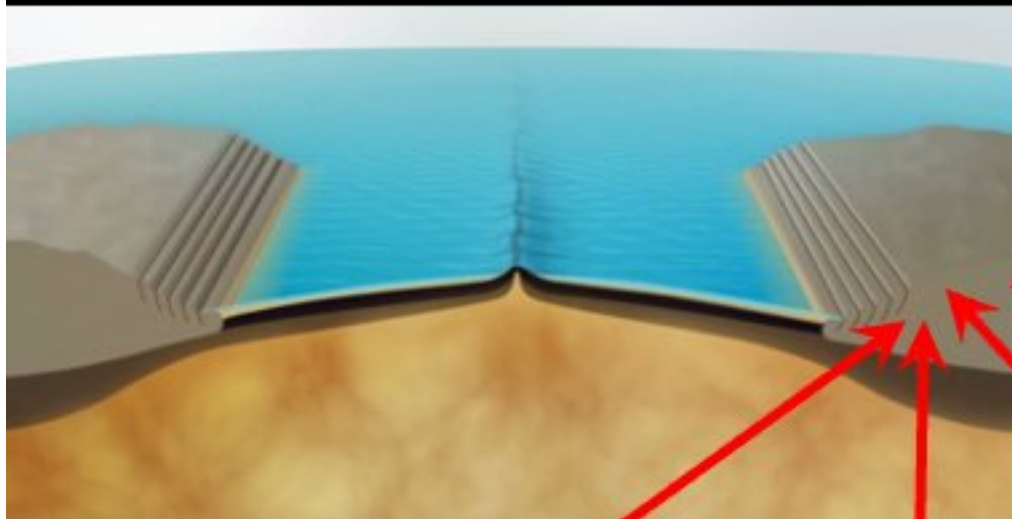


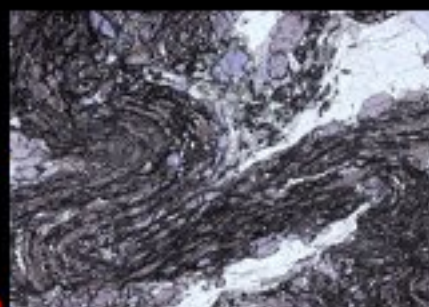
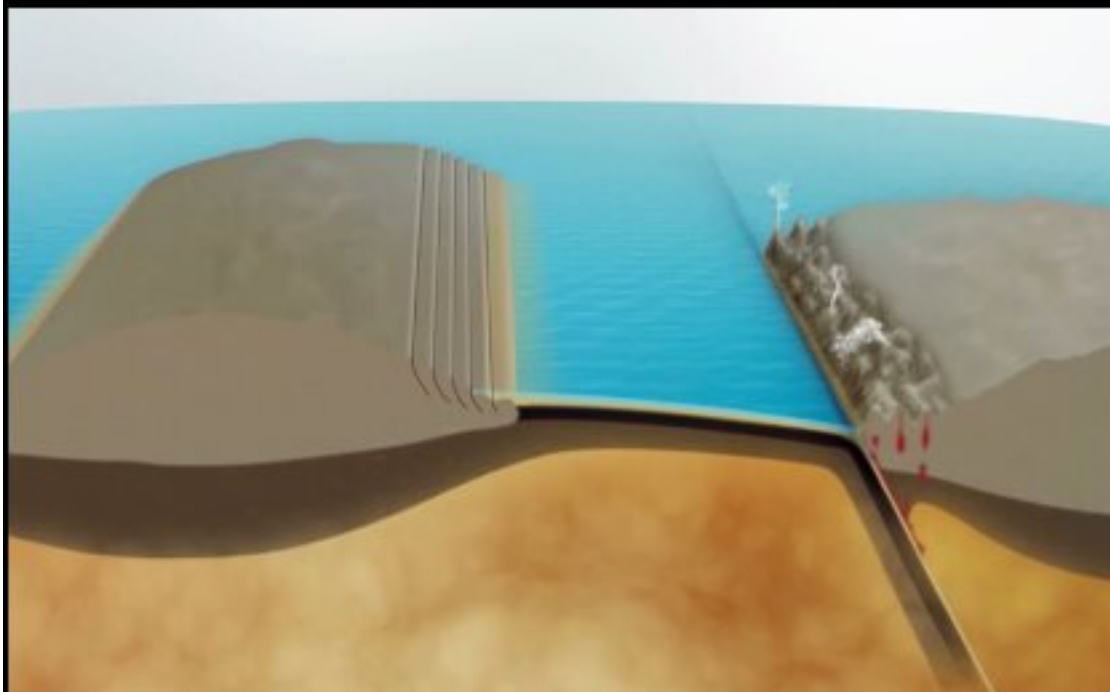
B) Gabbri cumulitici



A) Peridotiti tettonitiche

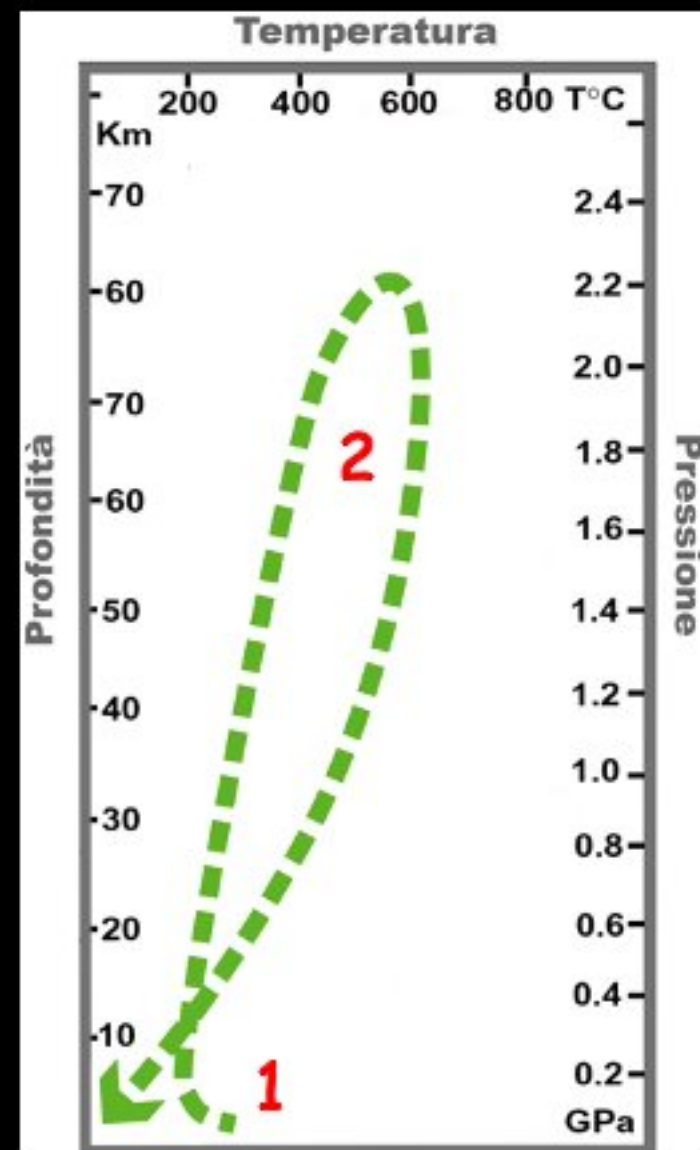
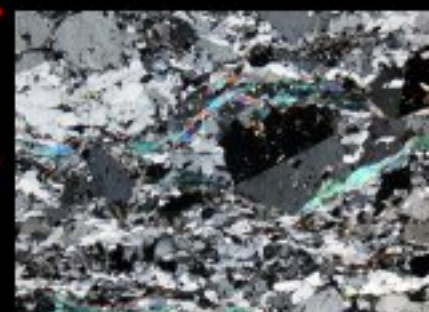


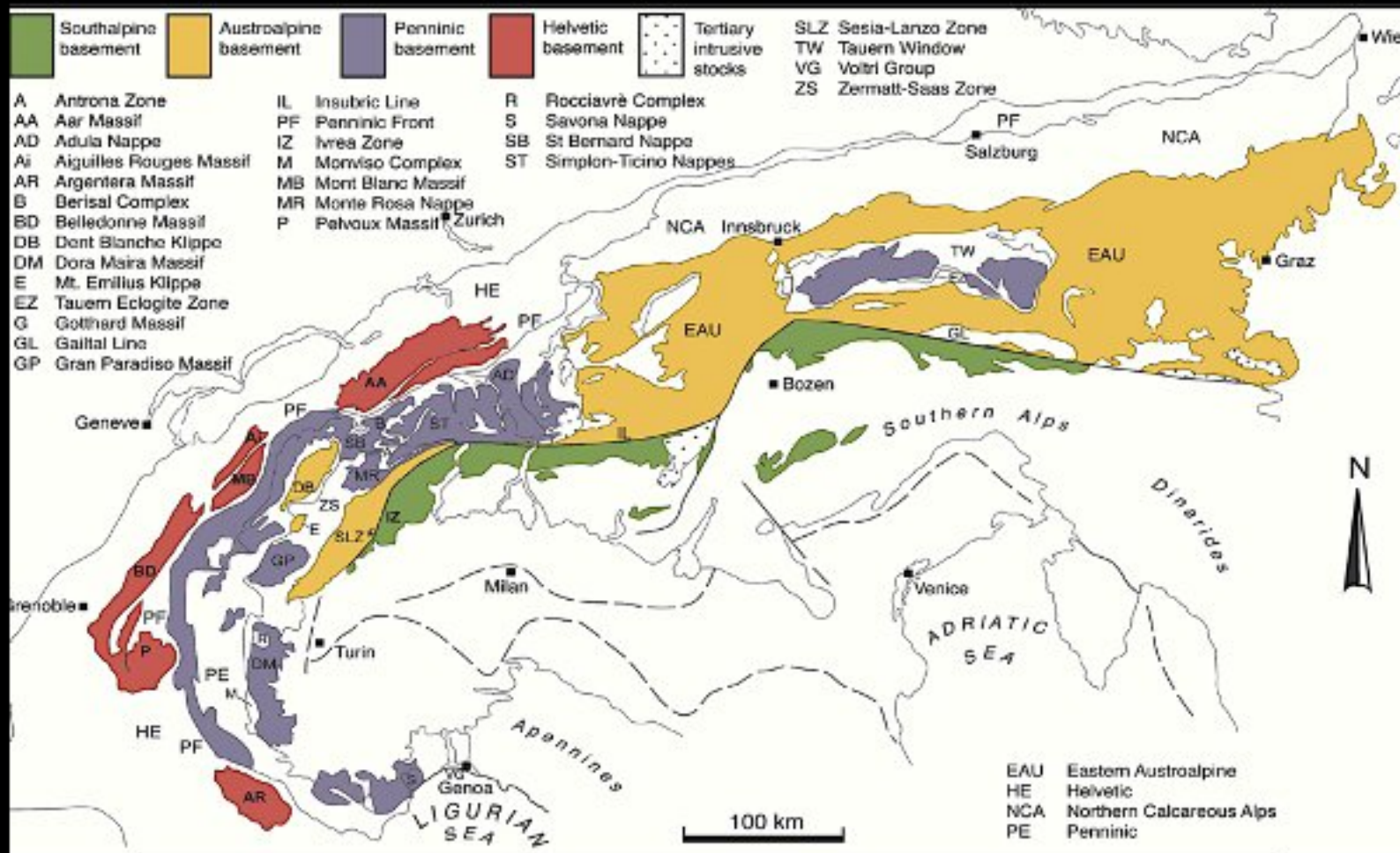




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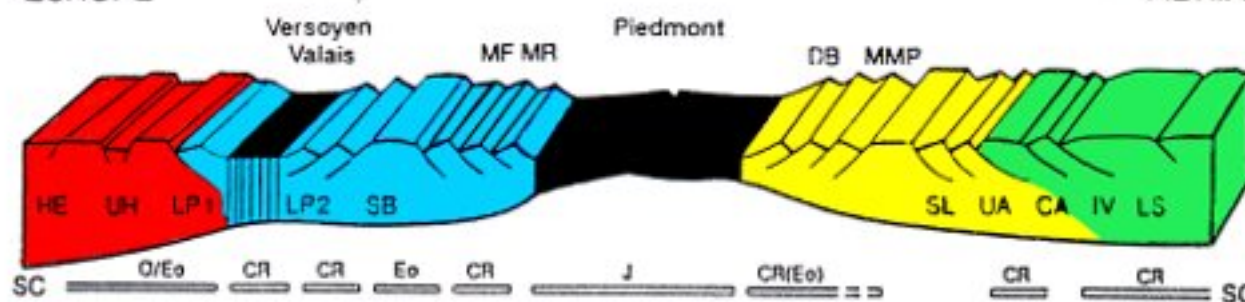
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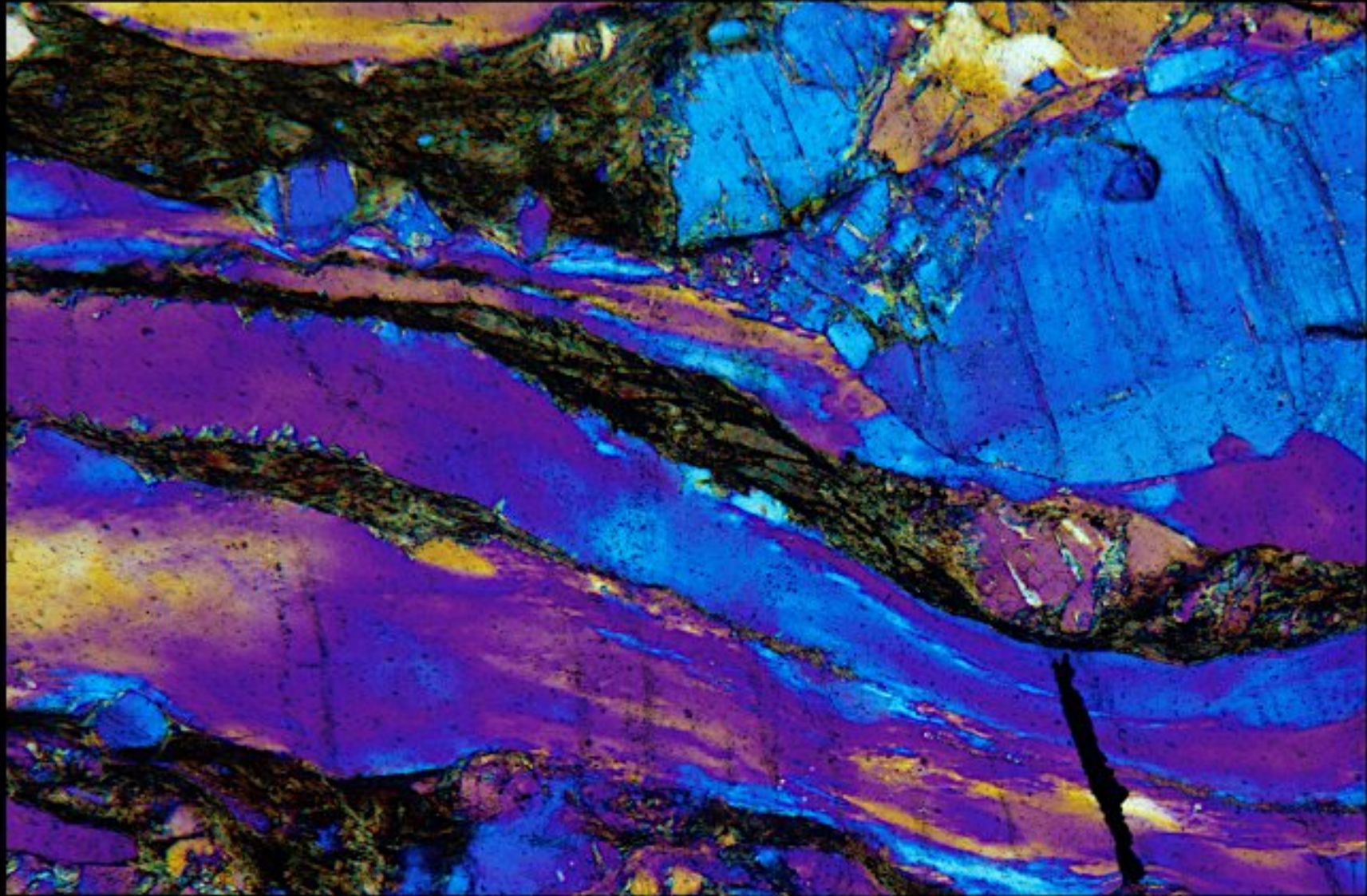
EUROPE

ADRIA

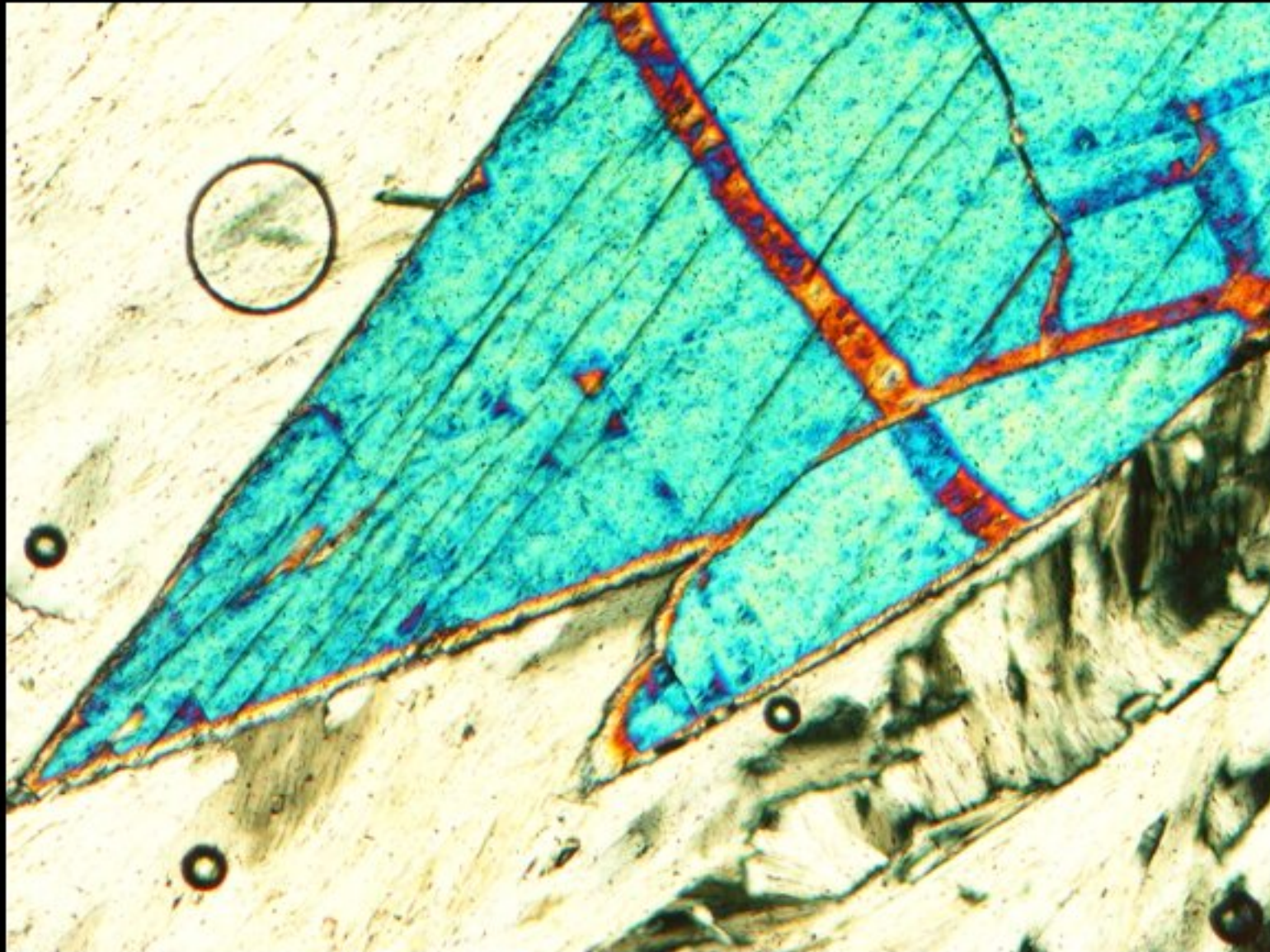


Tema "A. Desio"

Qualche storia...



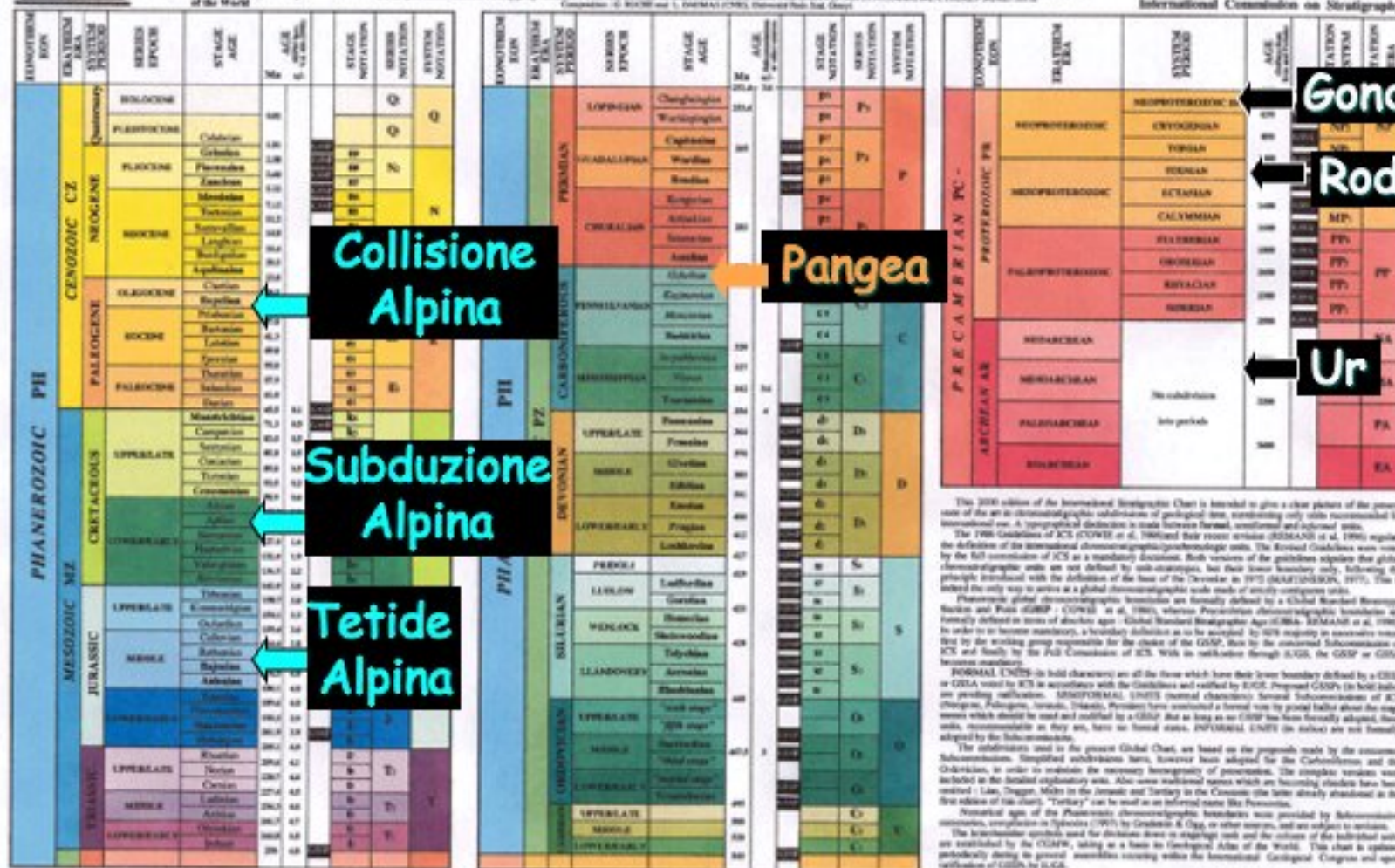
Le ofioliti metamorfiche delle Alpi Occidentali e
il margine continentale di Adria....





International Union of Geological Sciences

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Rodinia

Pangea

Collisione Alpina

Subduzione Alpina

**Tetide
Alpina**

Ur

This 2000 edition of the International Geographical Chart is intended to give a clear picture of the present state of the art in choroplethographic subdivisions of geological time, mentioning only units recommended by International use. A nomenclatorial distinction is made between formal, traditional and informal units.

The 1986 Guidelines of ICS (COTW) and of 1986/87 Guidelines for recent authors (BOSMAN *et al.*, 1986) regulate the definition of the international chromosomographic/cytogenetic units. The Revised Guidelines were used by the 5th commission of ICS as a mandatory document. Both versions of the guidelines stipulate that global chromosomographic units are not defined by sub-strategies, but their lower boundary only, following the principle introduced with the definition of the base of the Decade in 1975 (BOSMAN/BOSSON, 1975). This is indeed the only way to arrive at a global chromosomographic scale made of truly comparable units.

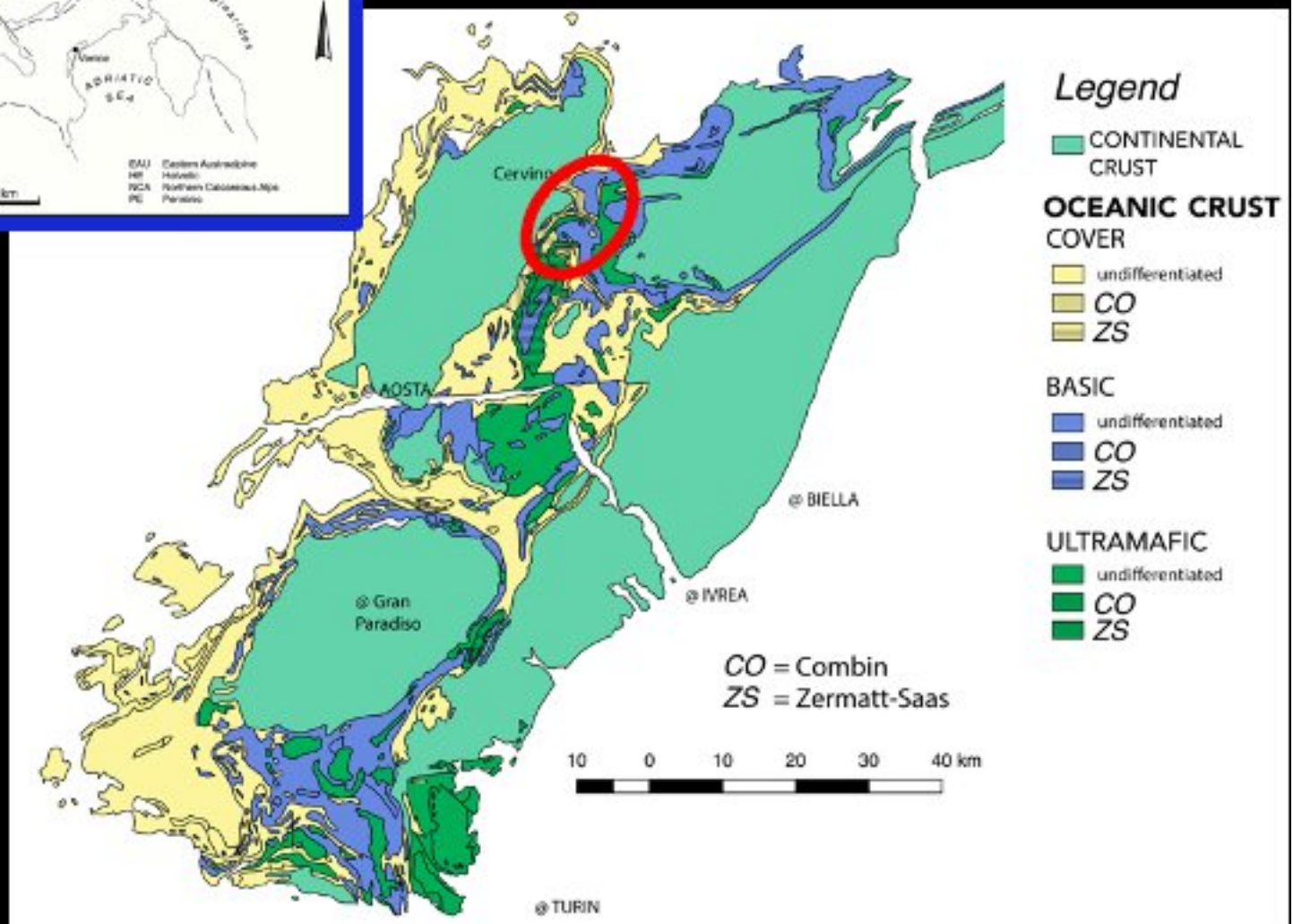
Pharmaceutical global electroencephalographic boundaries are formally defined by a United Nations Economic and Social Commission (UNESCP) in 1981 (e.g., 1980), whereas Prescription electroencephalographic boundaries are formally defined in terms of abnormality in a Global Standard Neurographic (GNSA) (MANNAN *et al.*, 1990). In order to be income mandatory, a boundary definition as to be accepted by UNESCP majority in successive vote, first by the Working group responsible for the choice of the GNSP, then by the concerned Subcommittees of ICS and finally by the Full Committee of ICS. With its authorization through UNESCP, the GNSP or GNSA become mandatory.

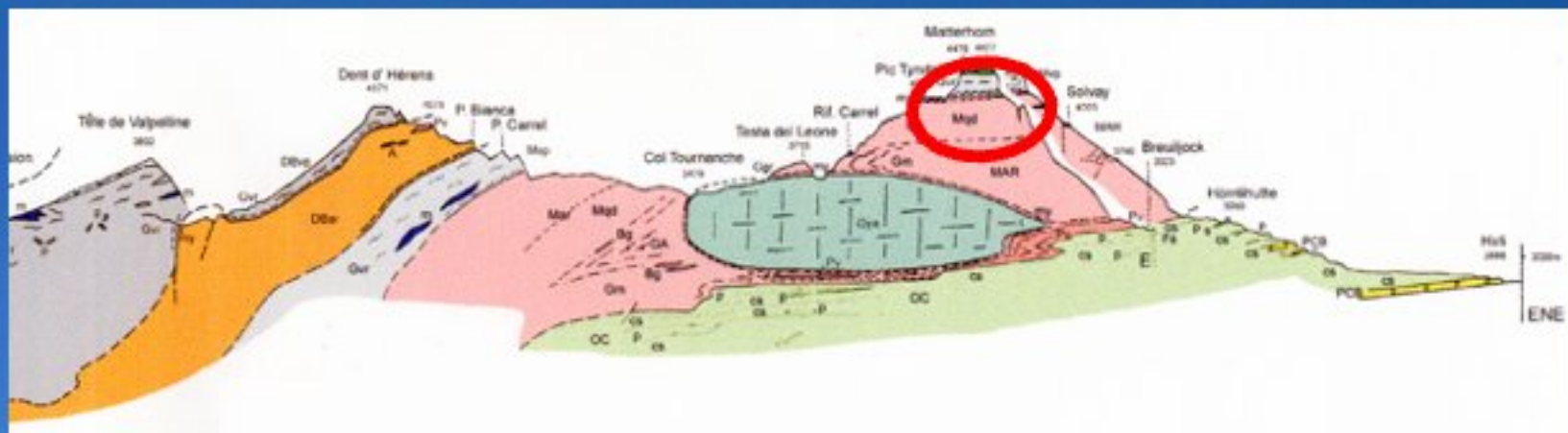
FORMAL UNITS (in bold characters) are all the those which have their lower boundary defined by a *CDSP* or *CDSP* word or *ICS* in accordance with the Guidelines and verified by *EUSE*. Proposed *CDSPs* (in bold italic) are pending publication. **UNFORMAL UNITS** (normal characters): Several Subcommunities of *ICS* (Pangean, Pangean, Iranian, Diaketic, Persian) have constituted a formal unit by general belief about the languages which should be used and verified by a *CDSP*. But as long as no *CDSP* has been formally adopted, these units, recommended as they are, have no formal status. **INFORMAL UNITS** (in italics) are not formally adopted by the Subcommunities.

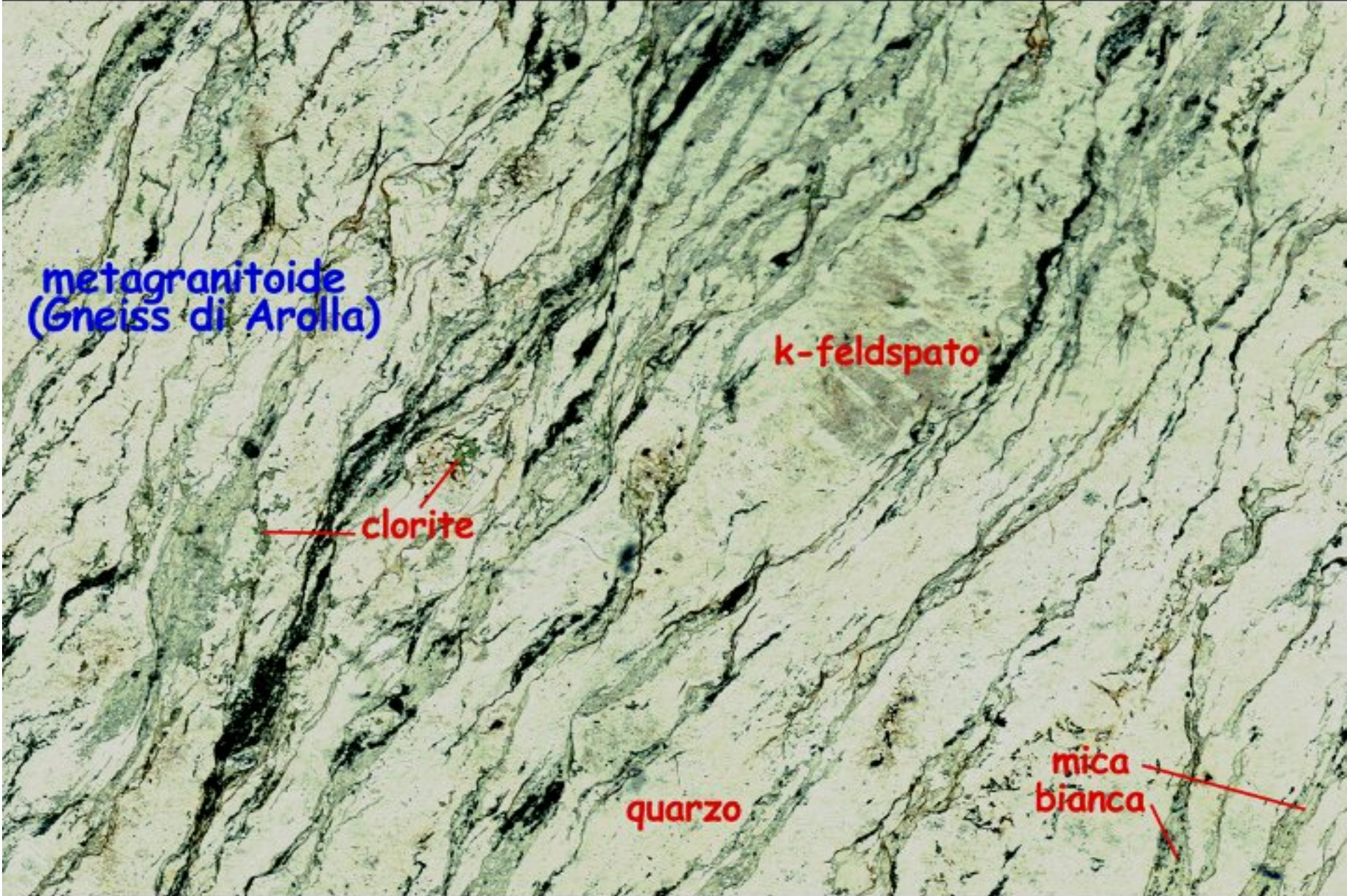
The abbreviations used in the present Global Chart, are based on the proposals made by the concerned Subcommissions. Simplified abbreviations have, however been adopted for the Carboniferous and the Ordovician, in order to maintain the necessary homogeneity of presentation. The complete systems were included in the detailed explanatory text. Also some traditional names which are becoming obsolete have been omitted: *Lian*, *Daguer*, *Miles* in the Jurassic and *Tartaria* in the Cretaceous (the latter already abandoned in the first edition of this report). "Tartaria" can be used as an informal name for the Boreal zone.

The *International Geographical Names* is published by the International Geographical Names Union (IGNU) and is the official journal of the International Geographical Names Union. It is published by the International Geographical Names Union (IGNU) and is the official journal of the International Geographical Names Union (IGNU).

Source of GDP is January 2001's website for description.







metagranitoide
(Gneiss di Arolla)

k-feldspato

clorite

quarzo

mica
bianca

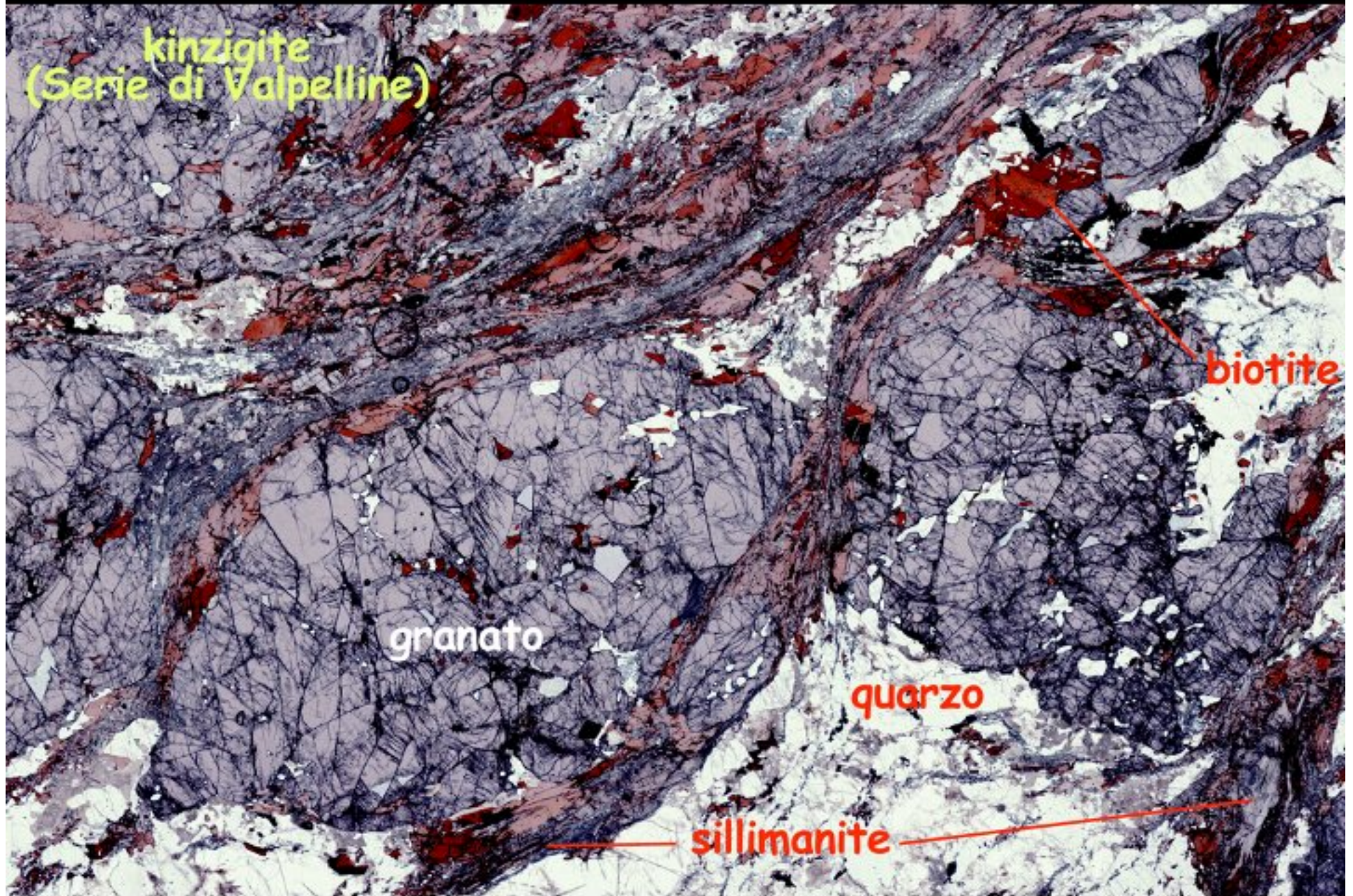
kinzigite
(Serie di Valpelline)

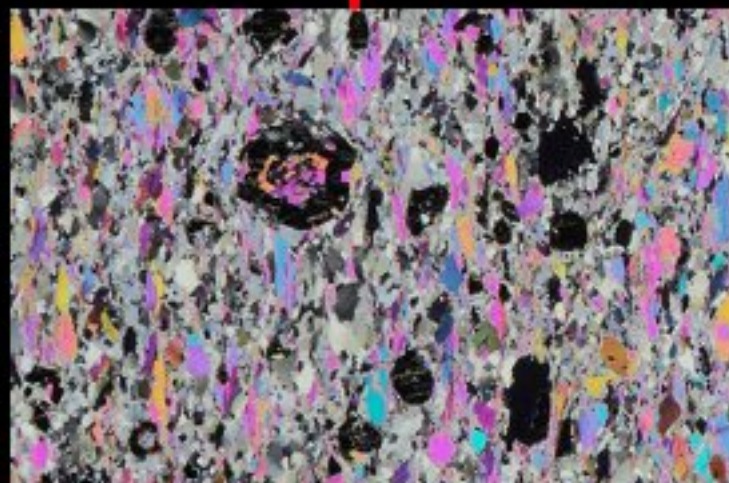
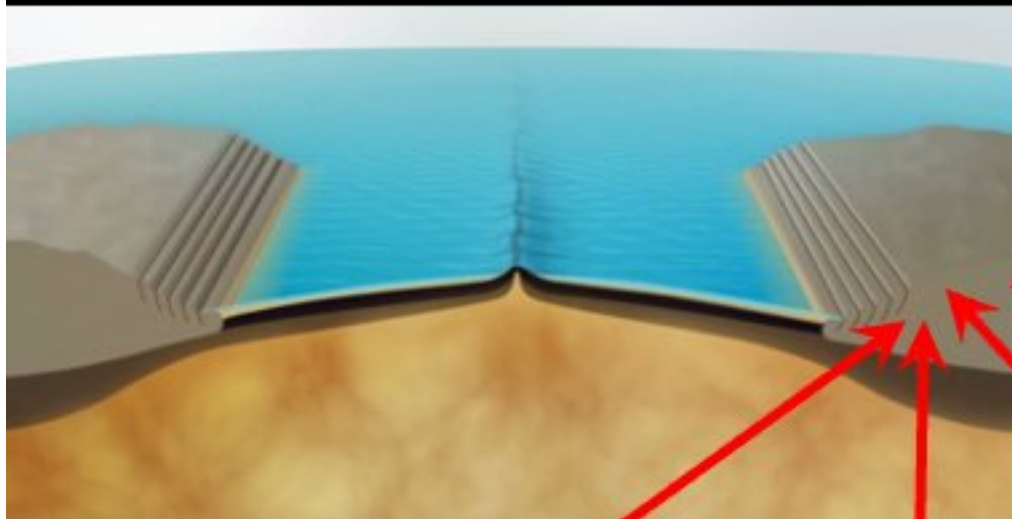
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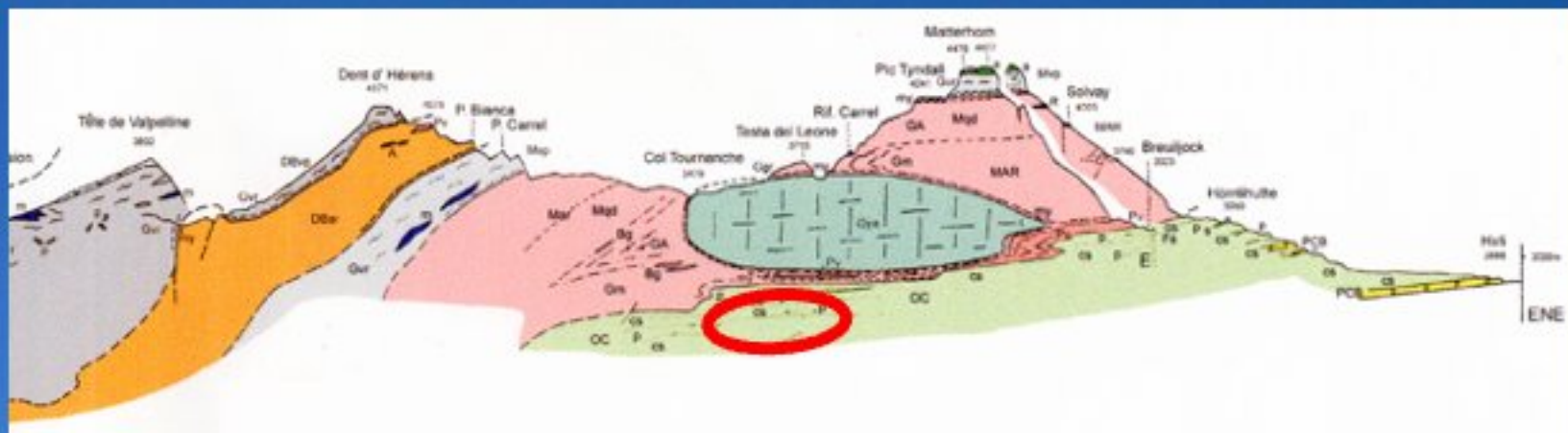
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quarzo

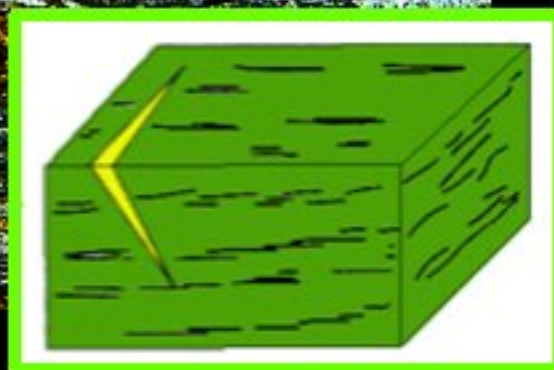
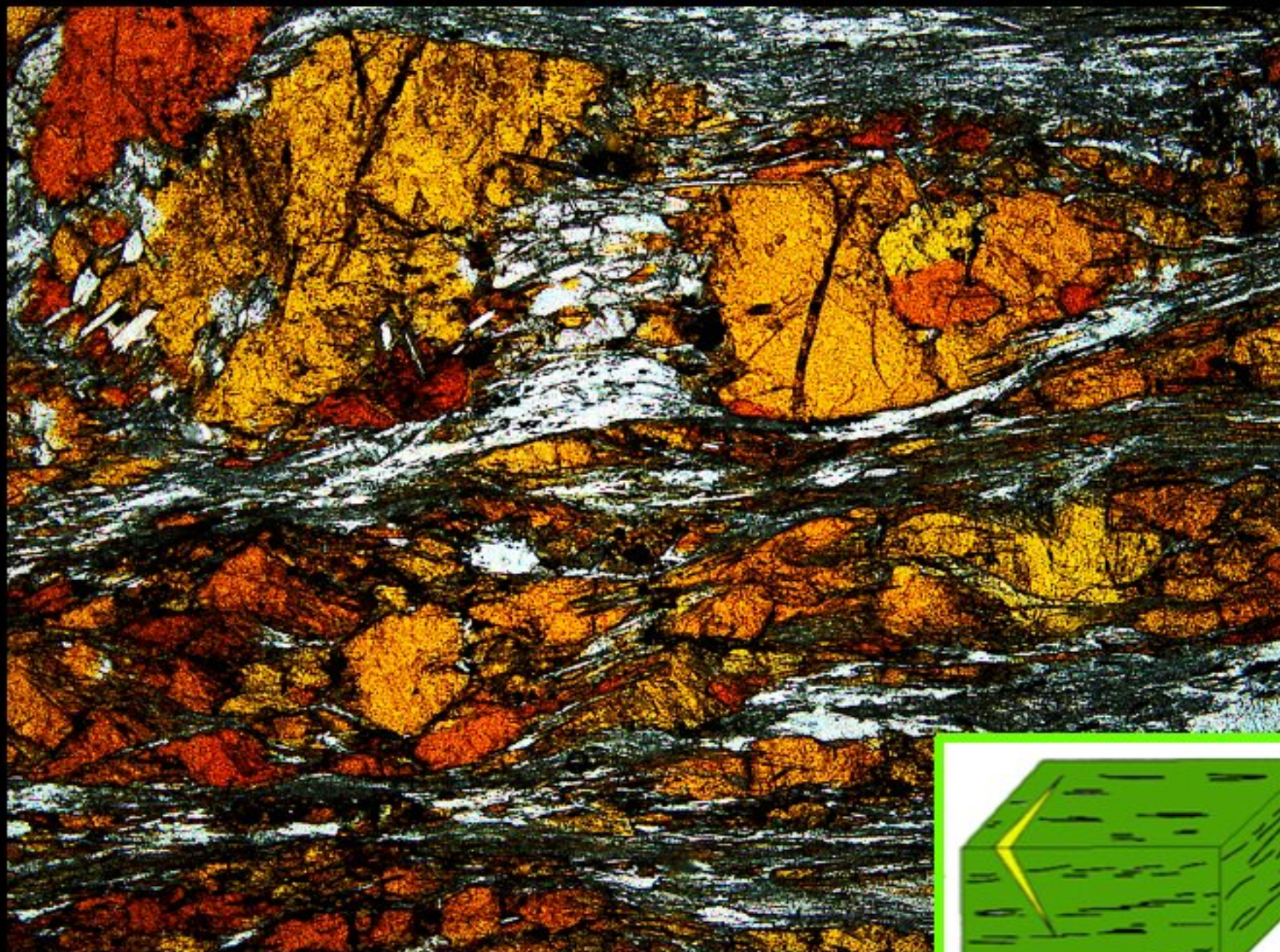
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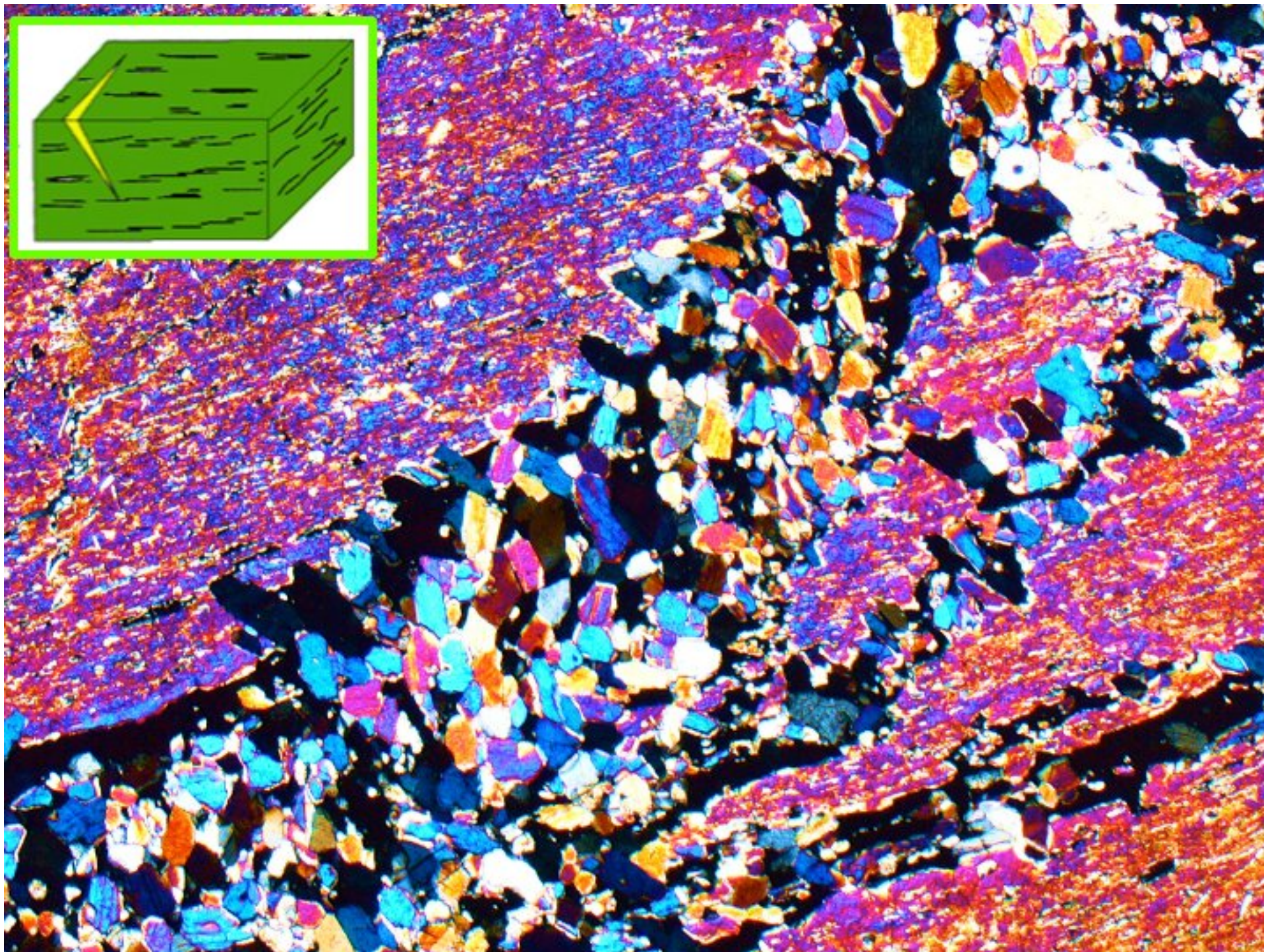




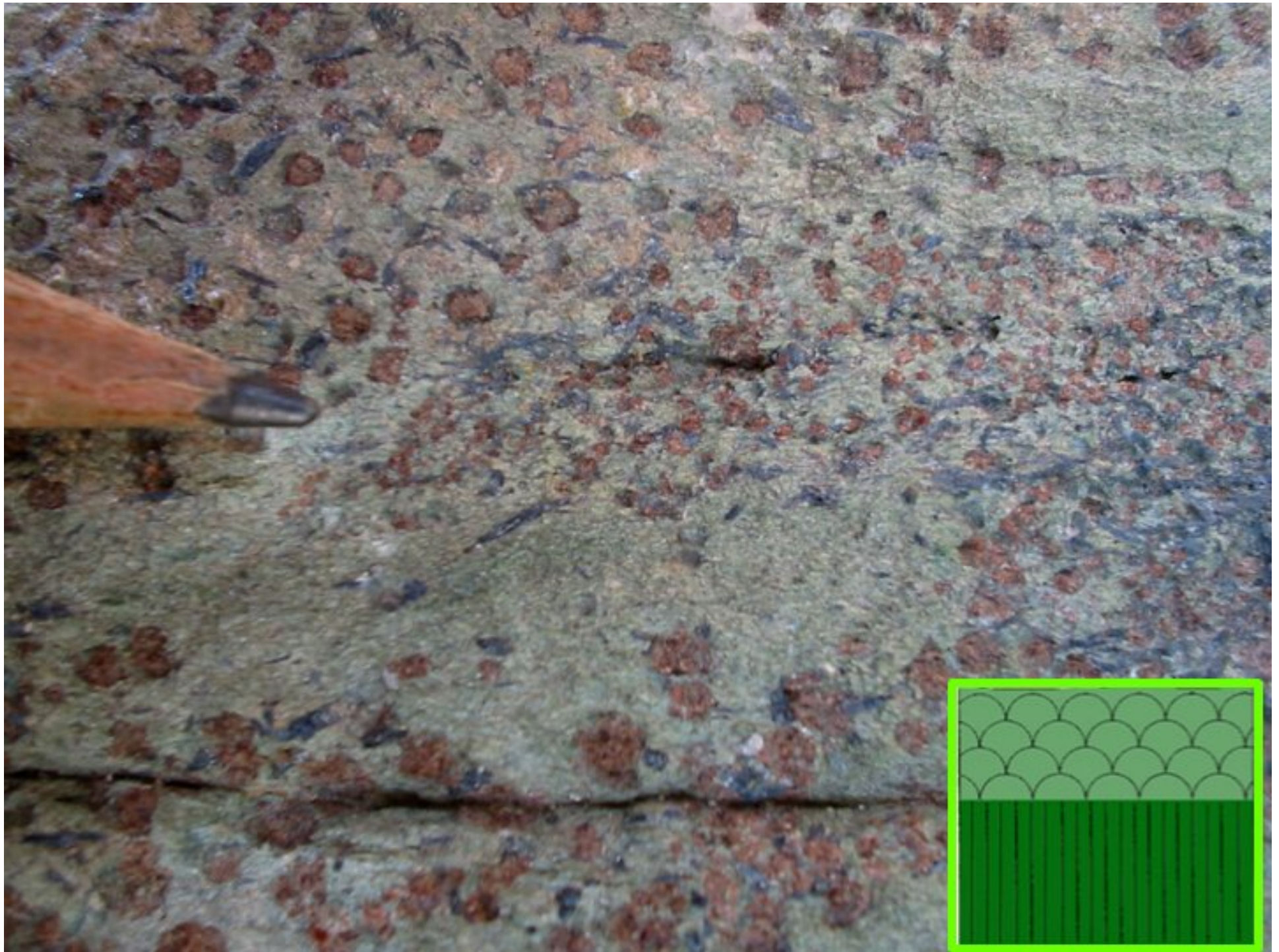




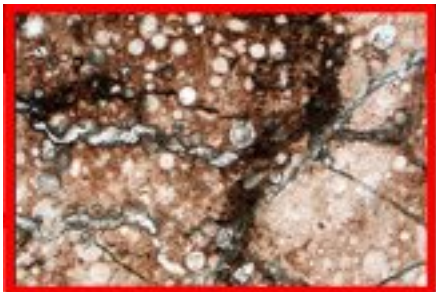












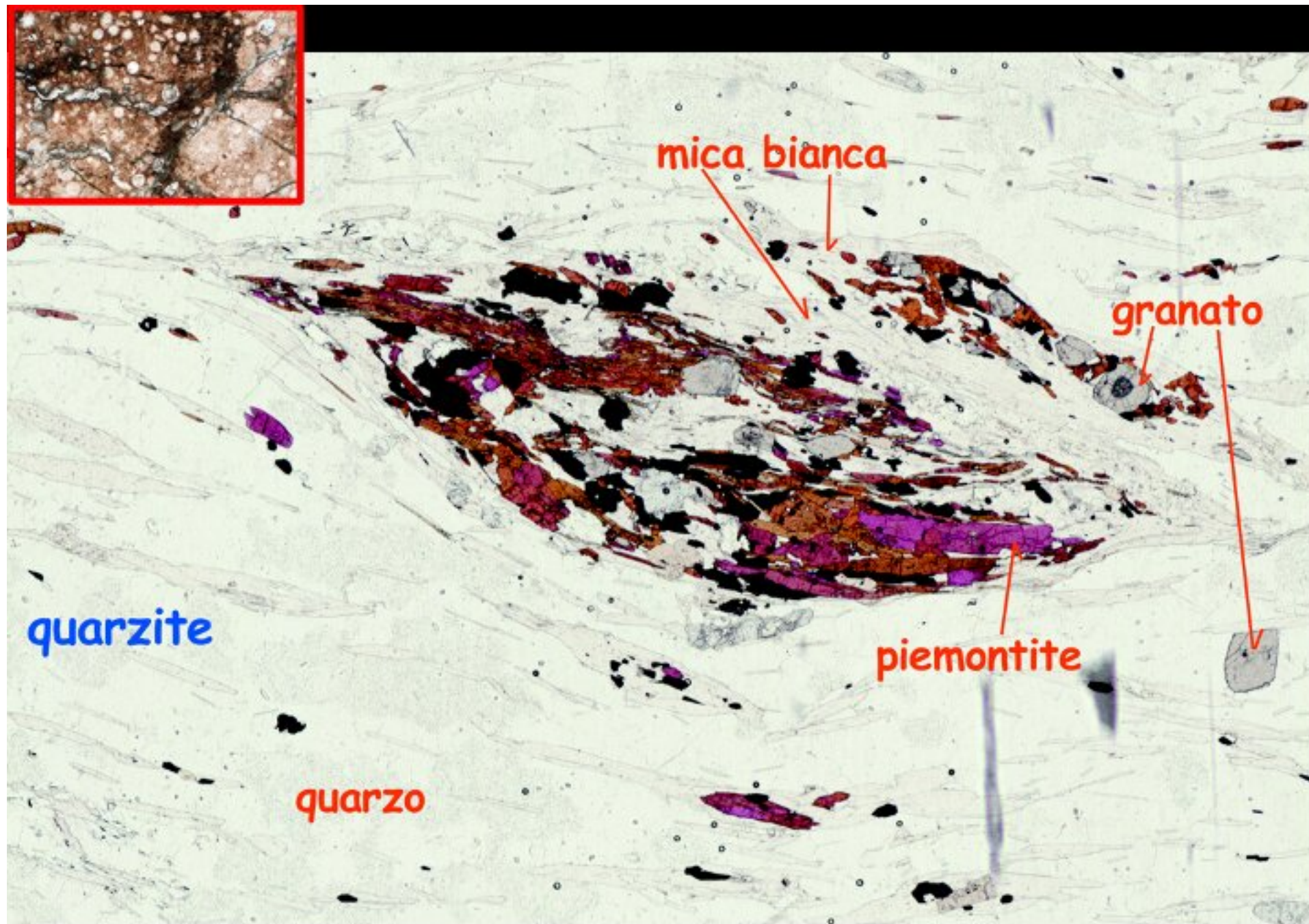
mica bianca

granato

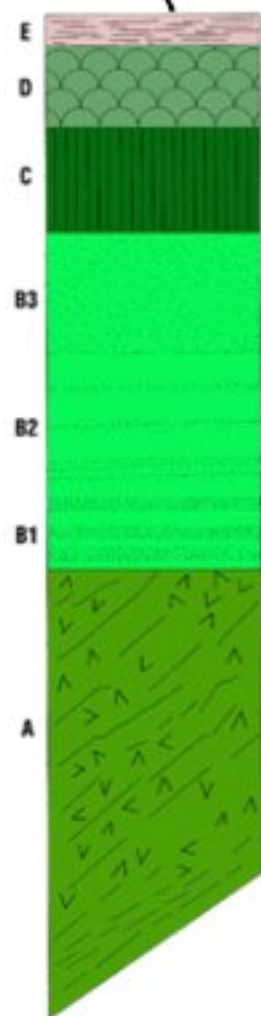
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piemontite

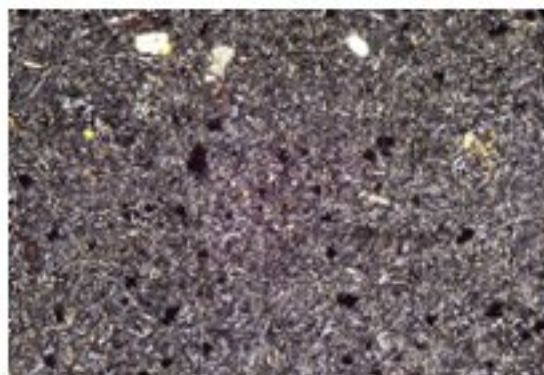
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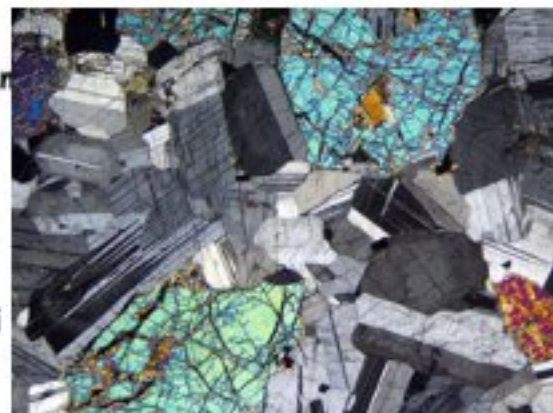
sedimenti



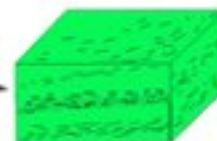
D) Basalti a cuscini



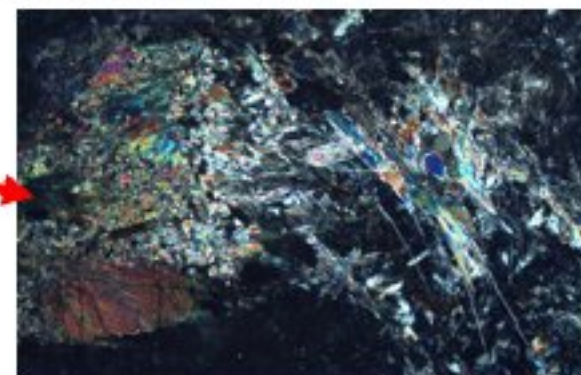
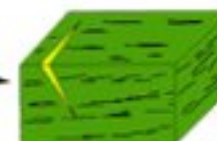
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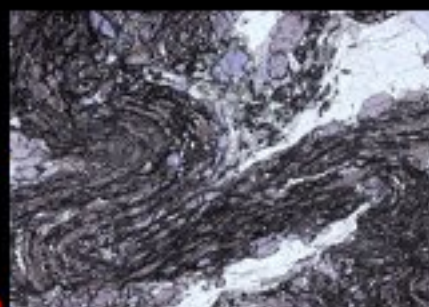
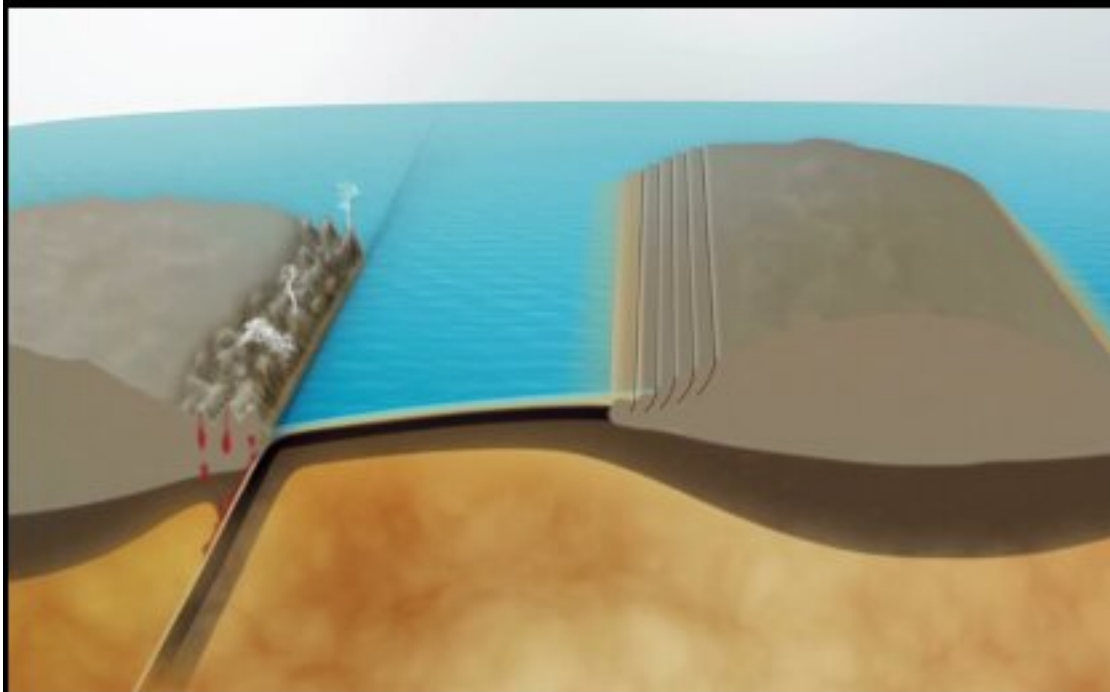


B) Gabbri cumulitici

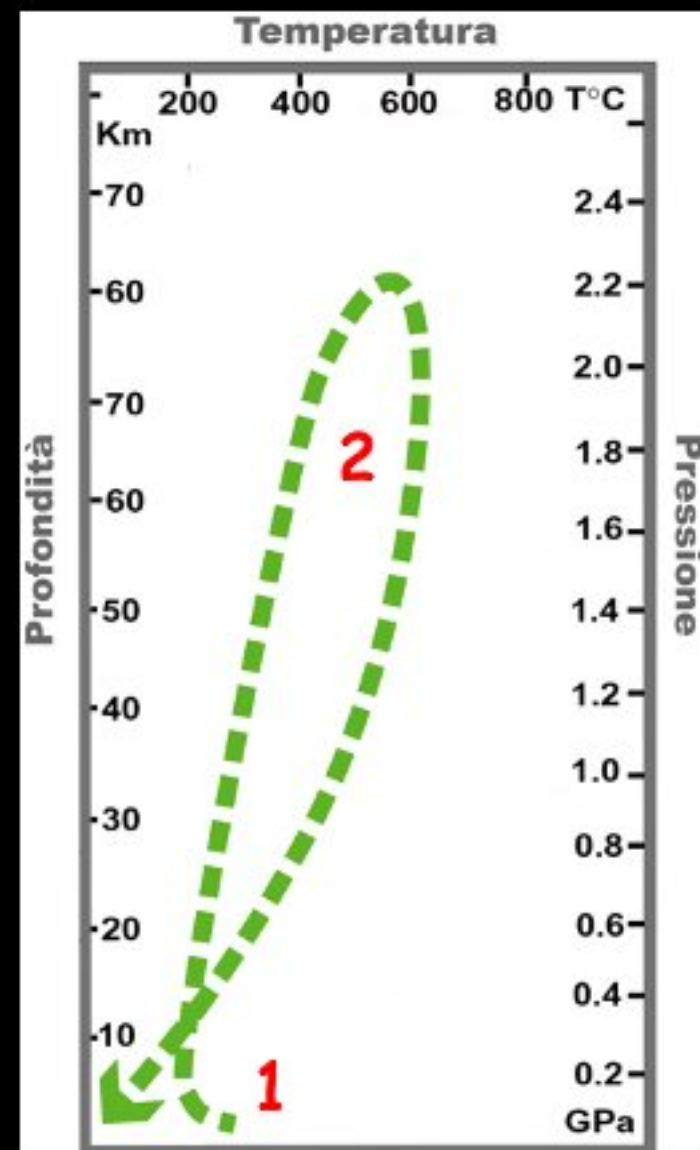
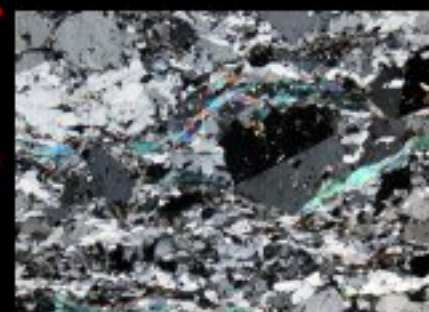


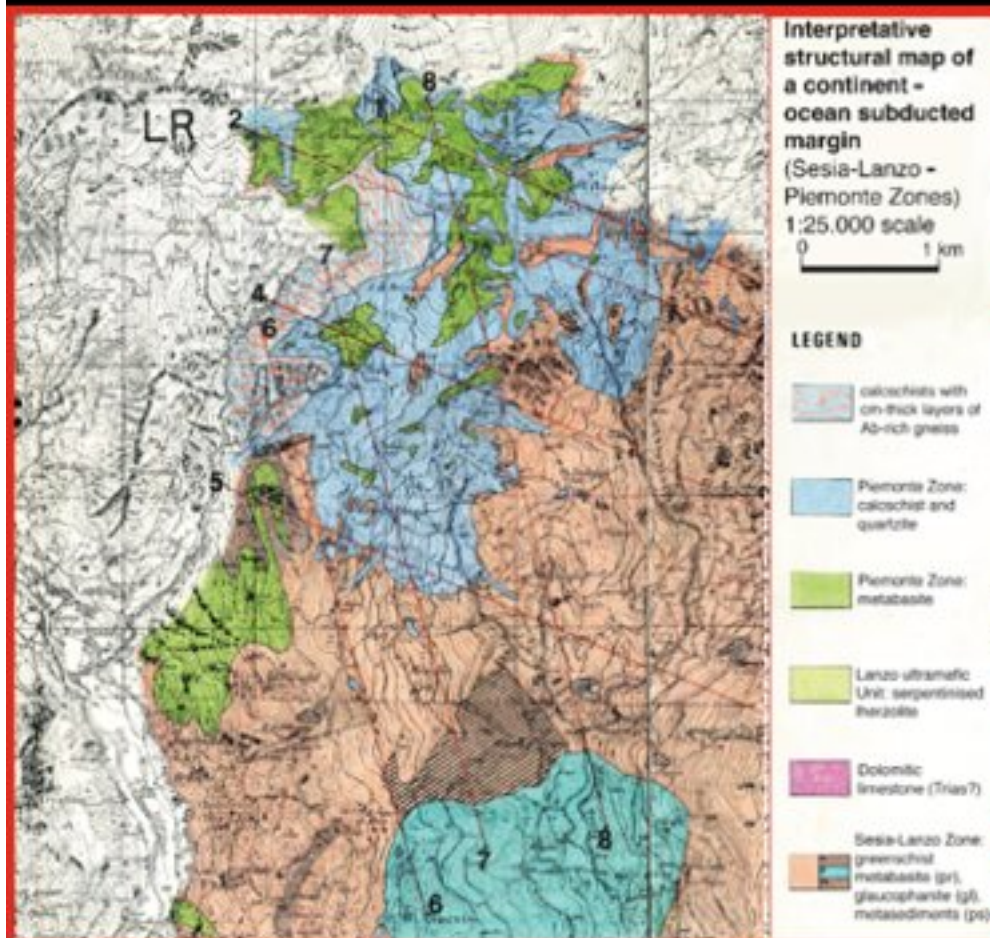
A) Peridotiti tettonitiche





1 2





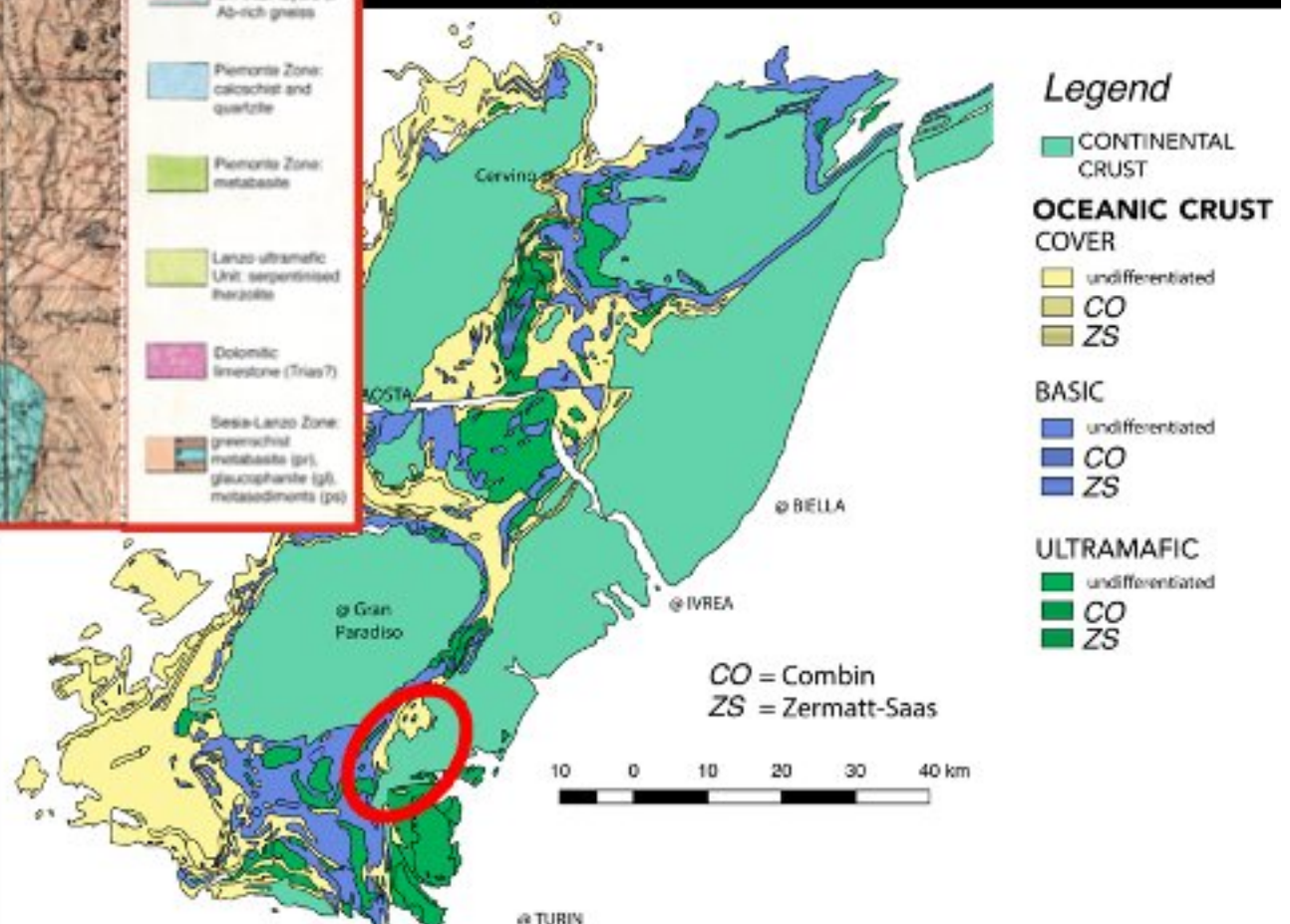
Zona Piemontese (Oceano):

metasedimenti carbonatici & terrigeni, quarziti, metabasiti, metagabbri, eclogiti, serpentiniti, oficalciti, rodingiti.

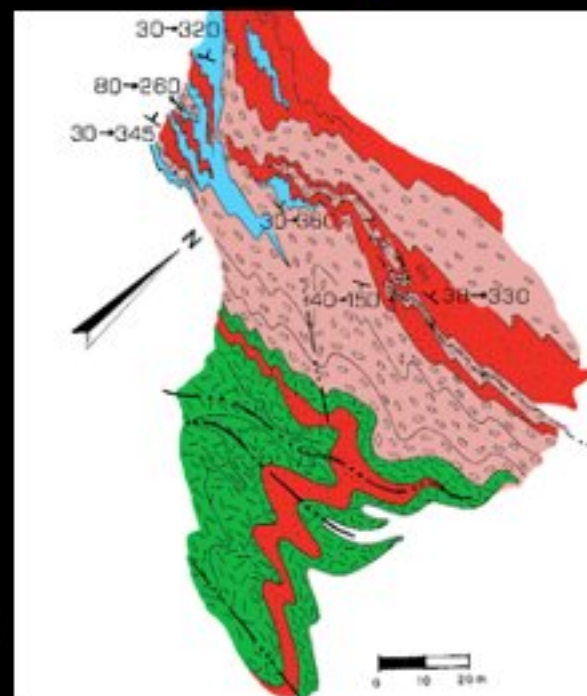
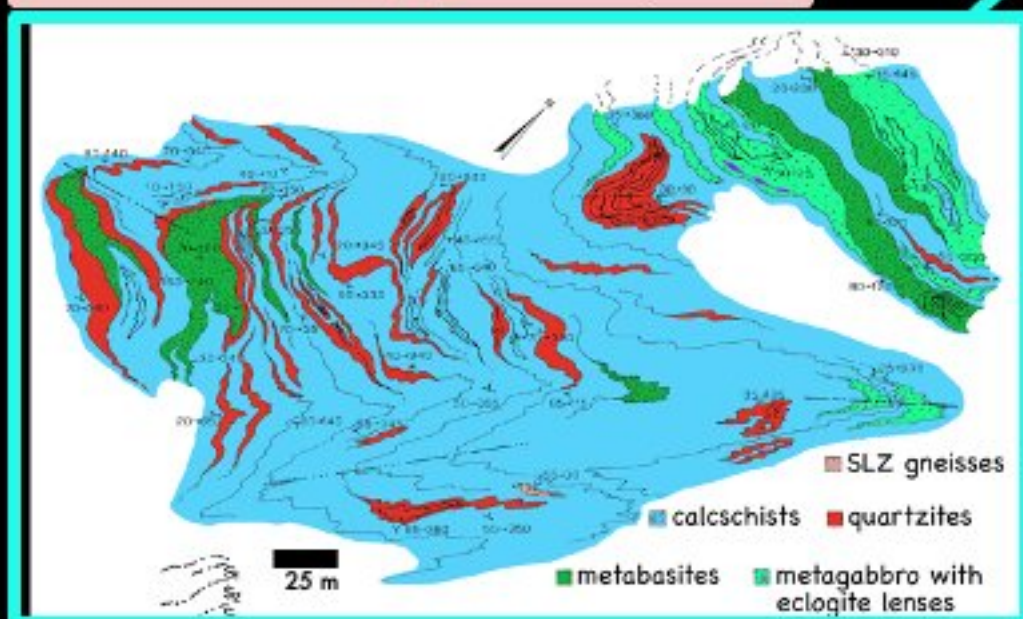
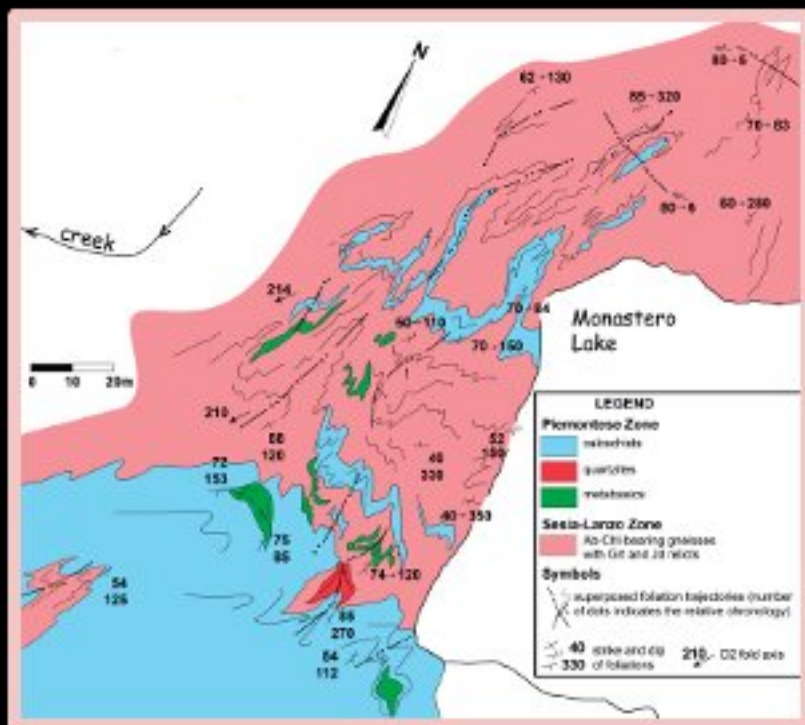
Zona Sesia Lanzo

(Adria):

metagranitoidi, metapeliti, metagabbri



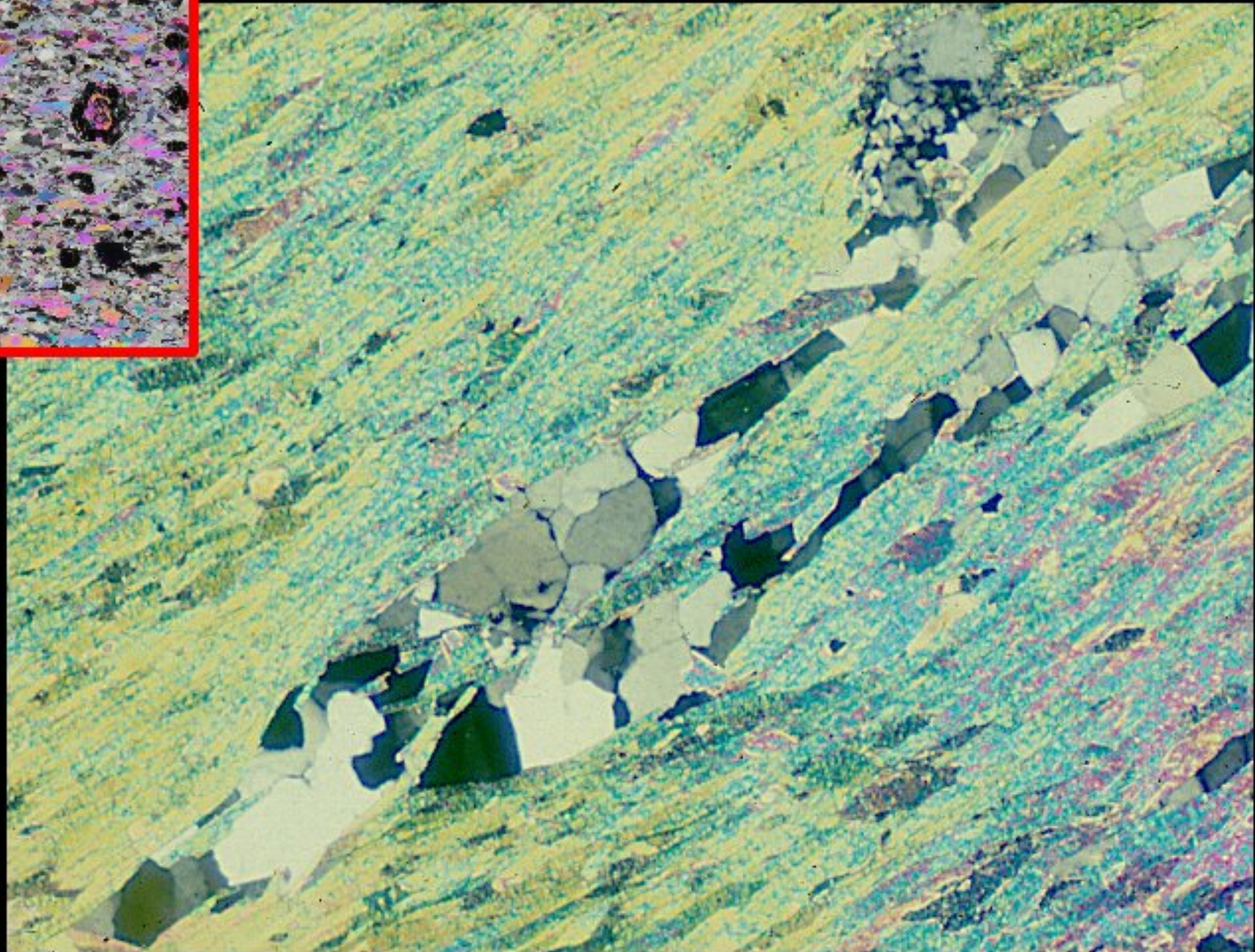


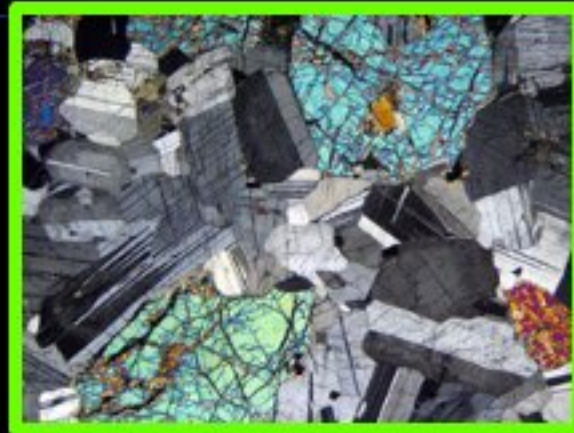


Gosso et al.
(2015)

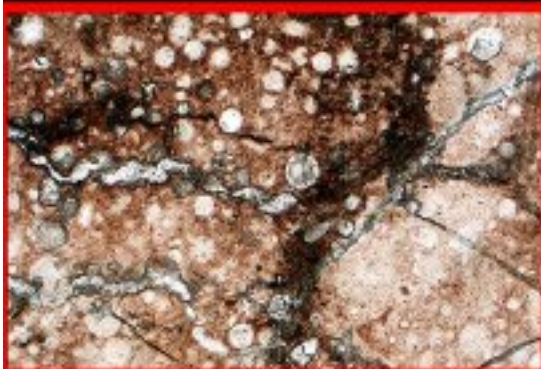


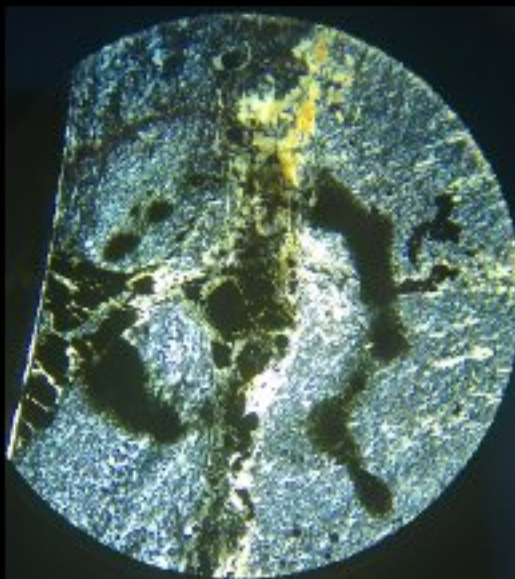
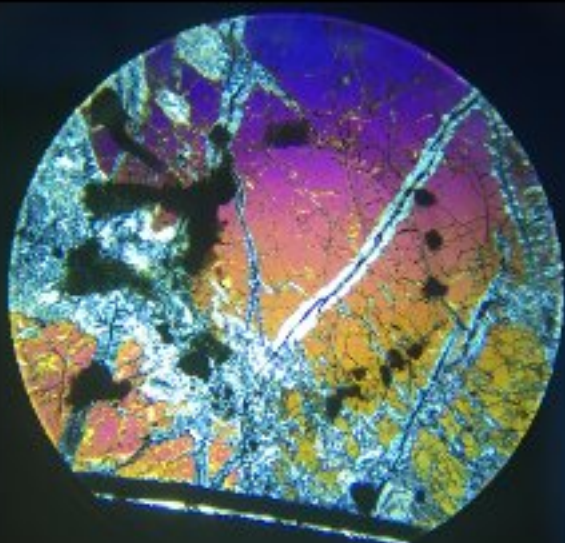
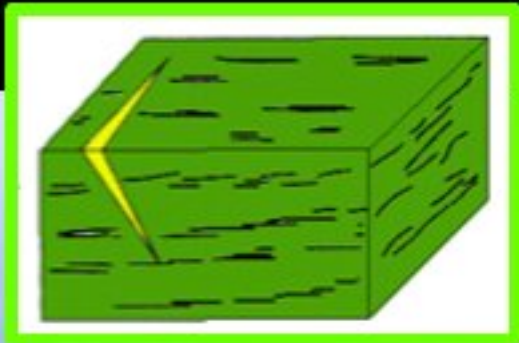


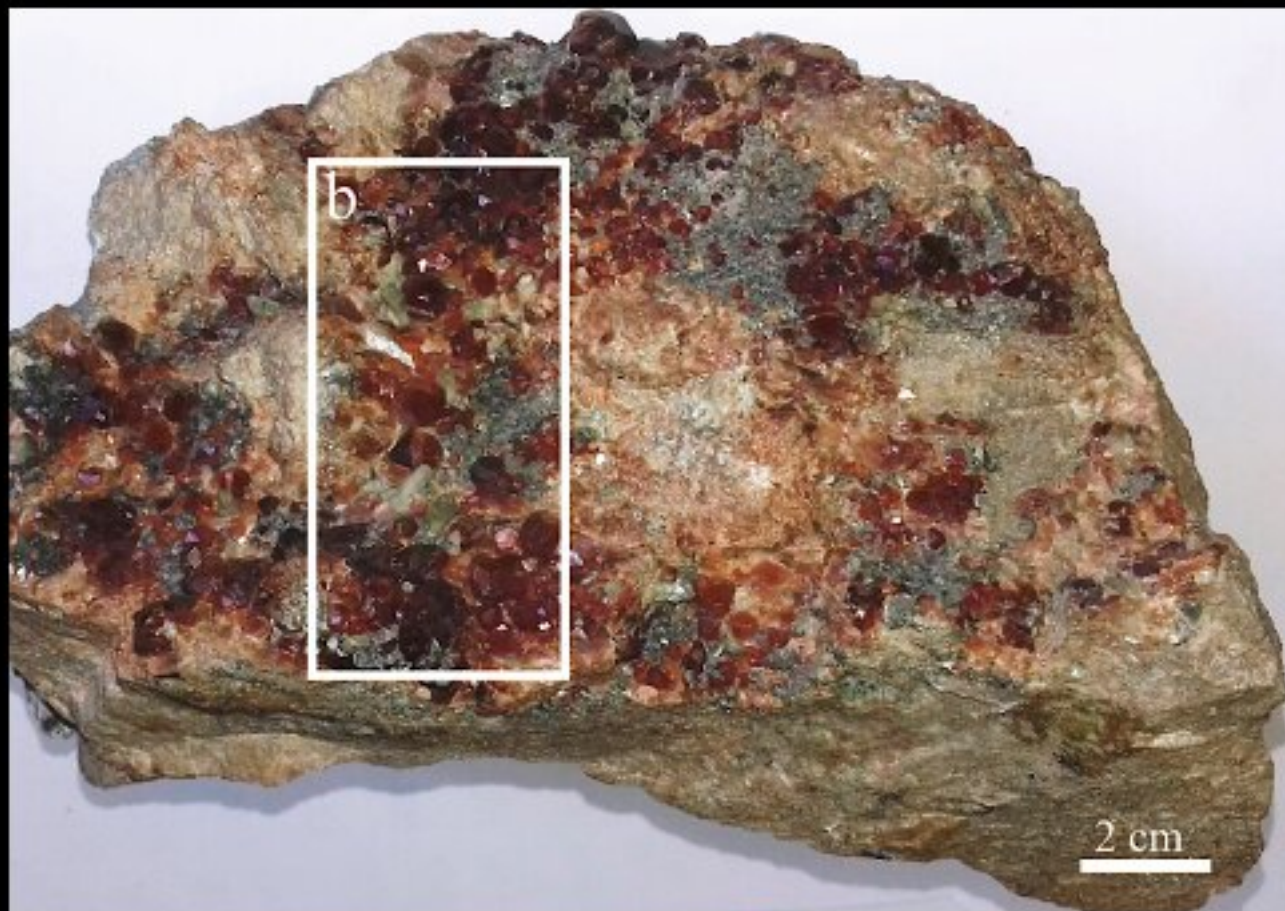


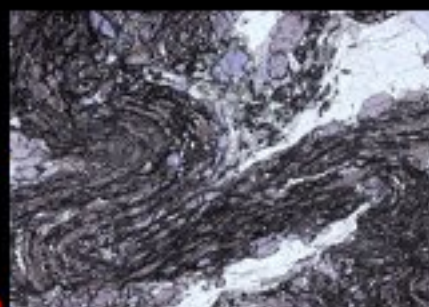
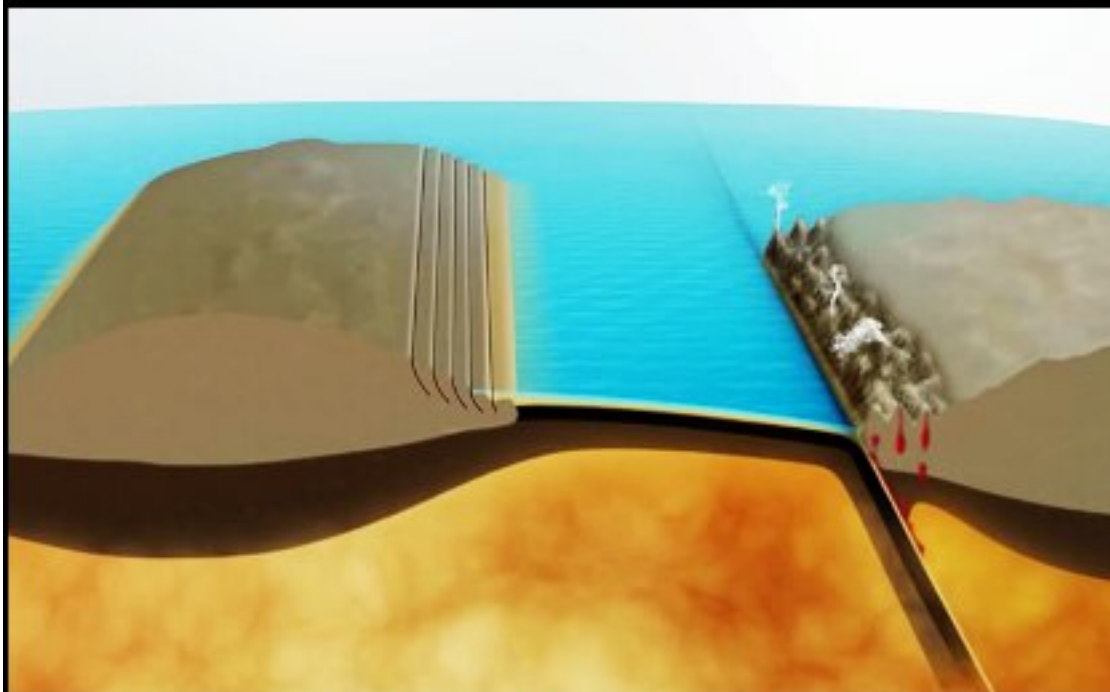




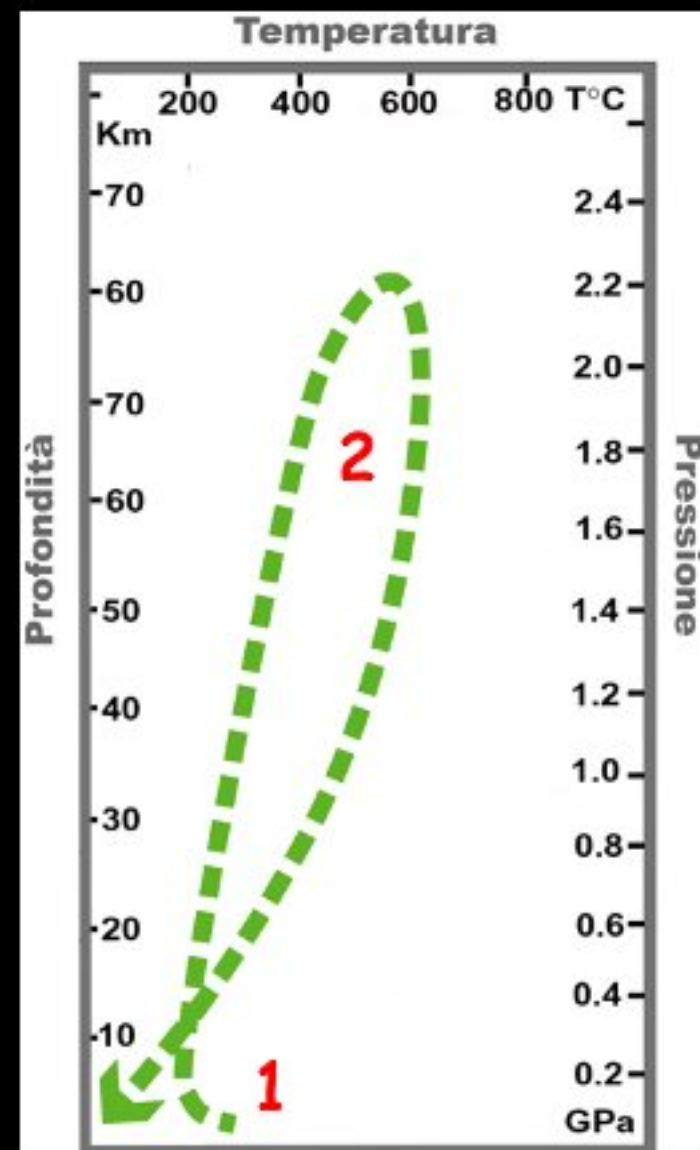
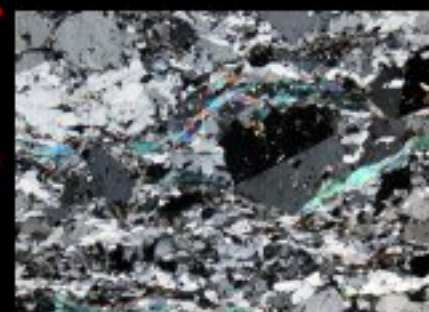


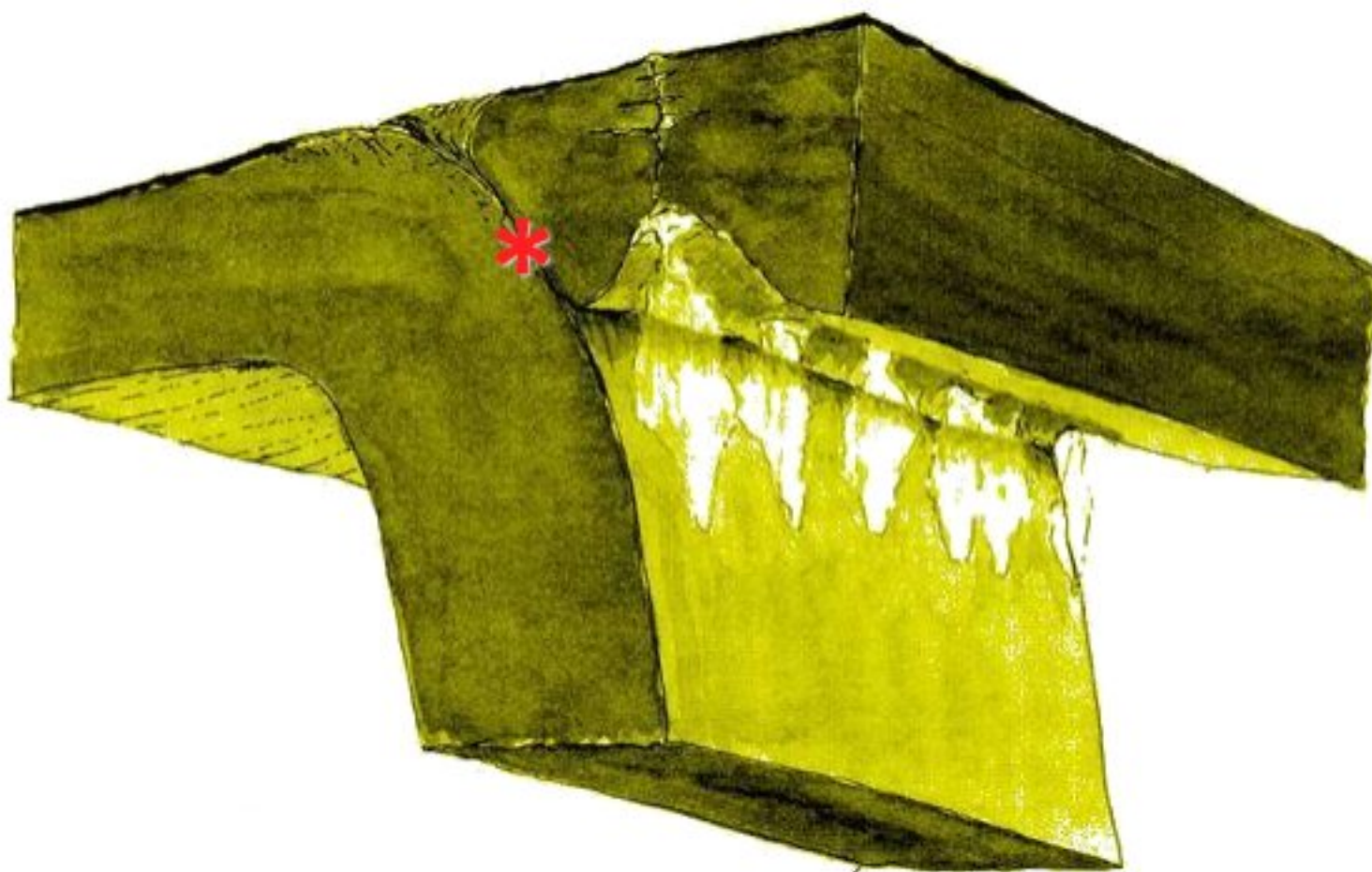






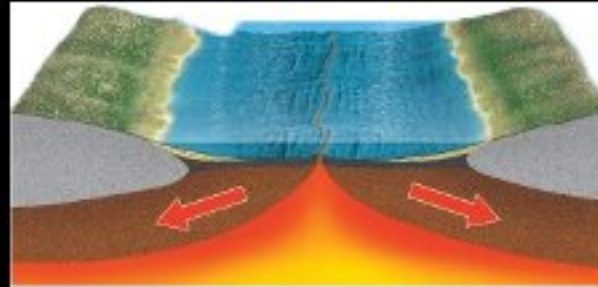
1 2



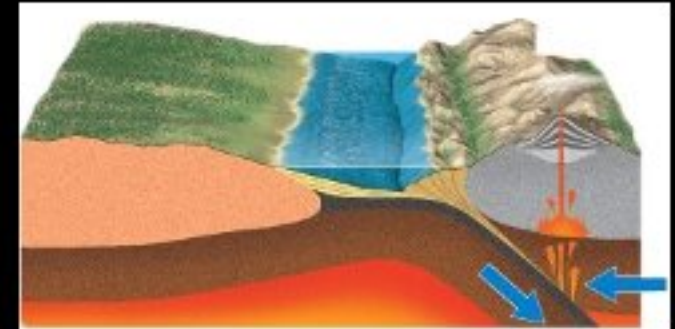


Metamorfismo di subduzione: durante la subduzione Alpina sono state raggiunte profondità maggiori di 70 km

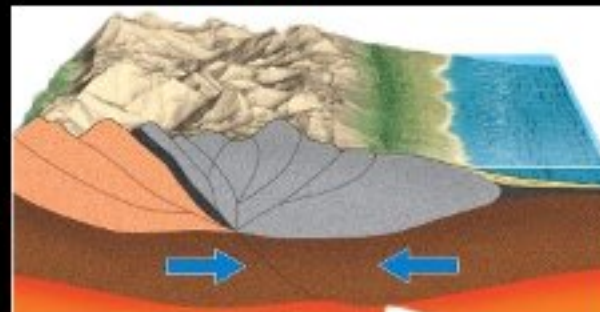
**Formazione della crosta
oceanica (da ~ 170 Ma)**



**Subduzione di crosta
oceanica e continentale
(110-40 Ma)**



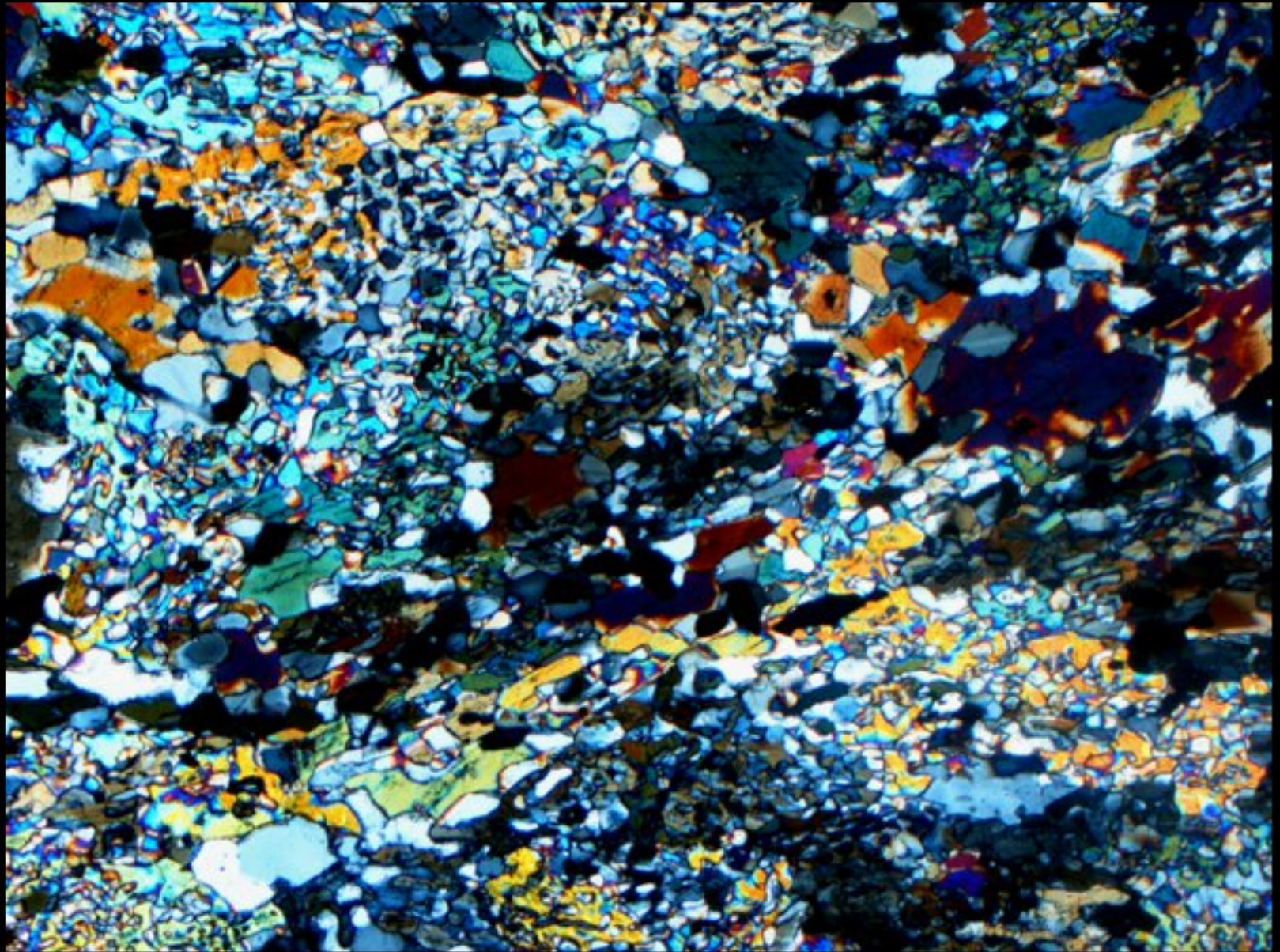
**Collisione continentale
(35 Ma)**



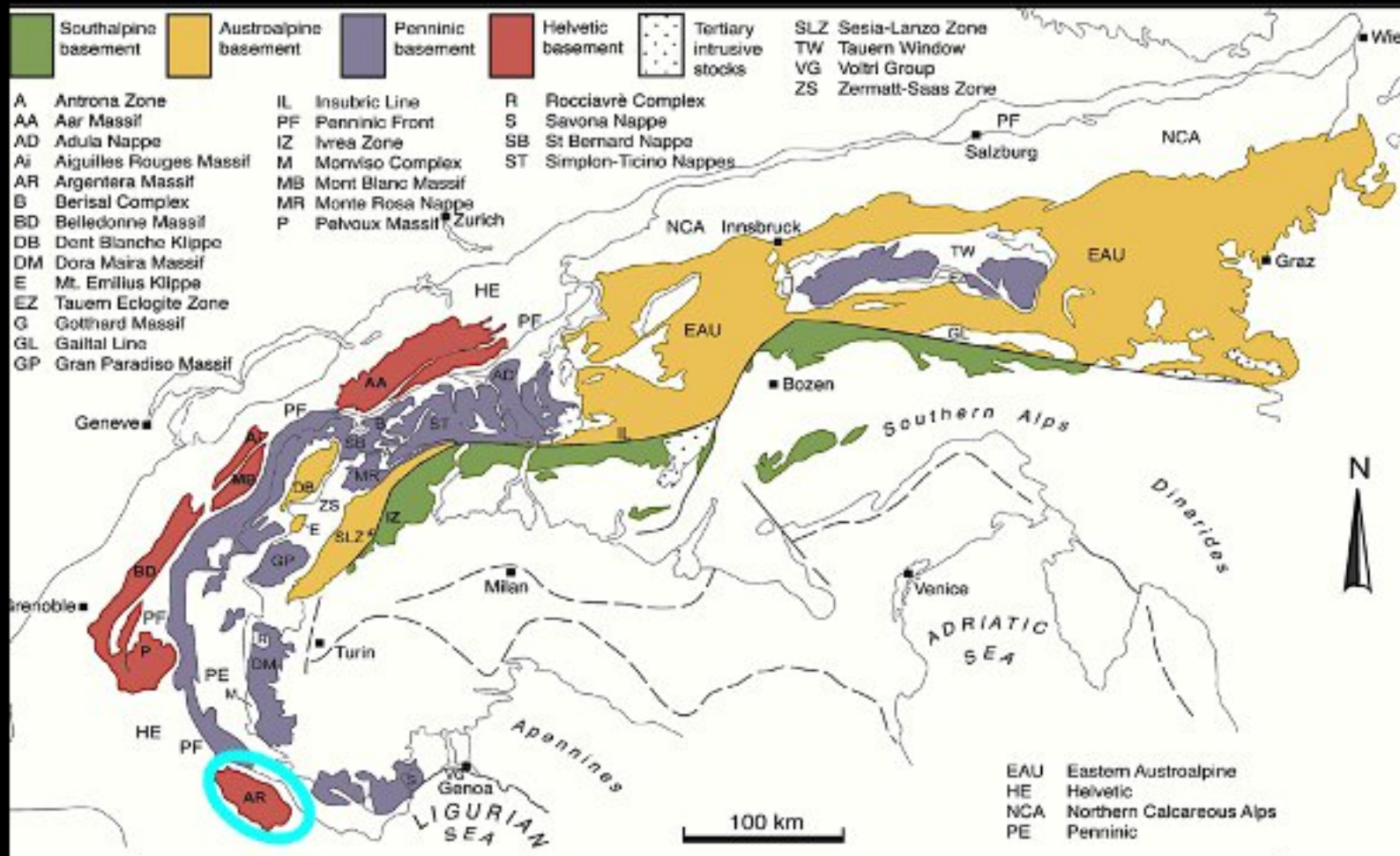
**Esumazione ed esposizione
nella zona assiale della
catena**



L' Argentera....

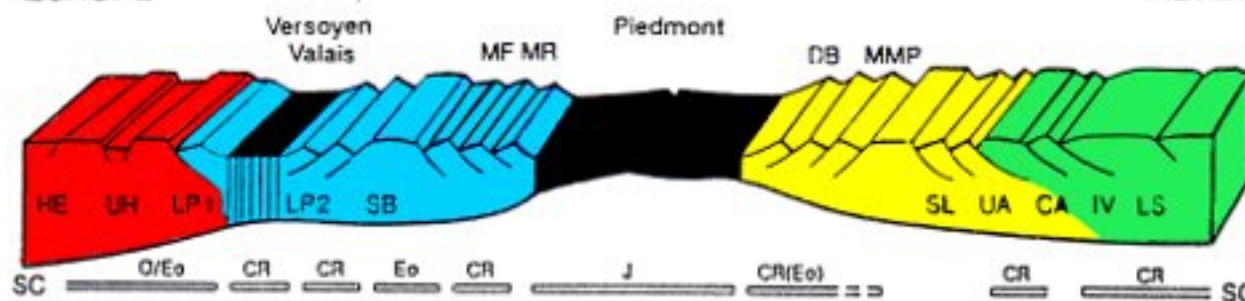


Notes: (1) χ^2 test is significant at 0.001 level. (2) χ^2 test is significant at 0.001 level.

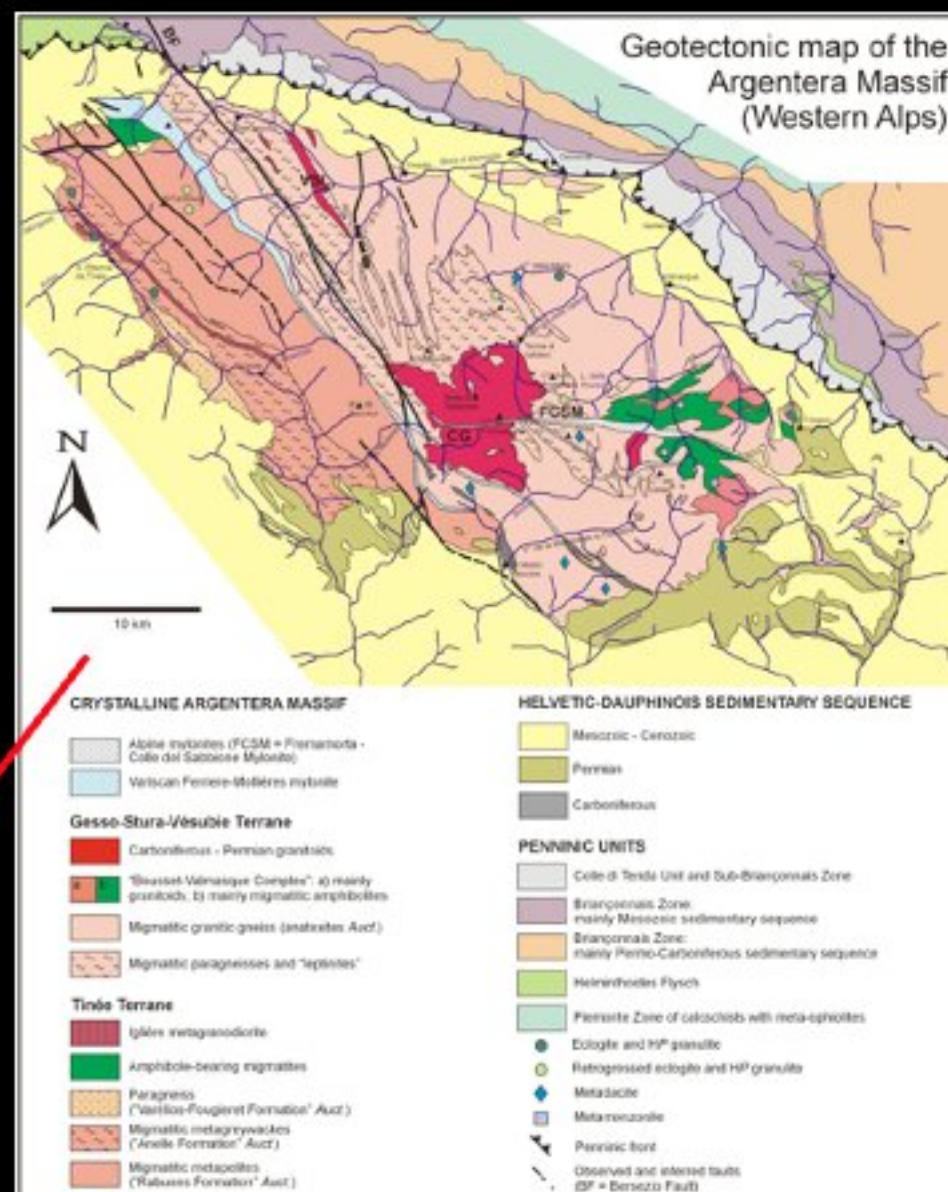
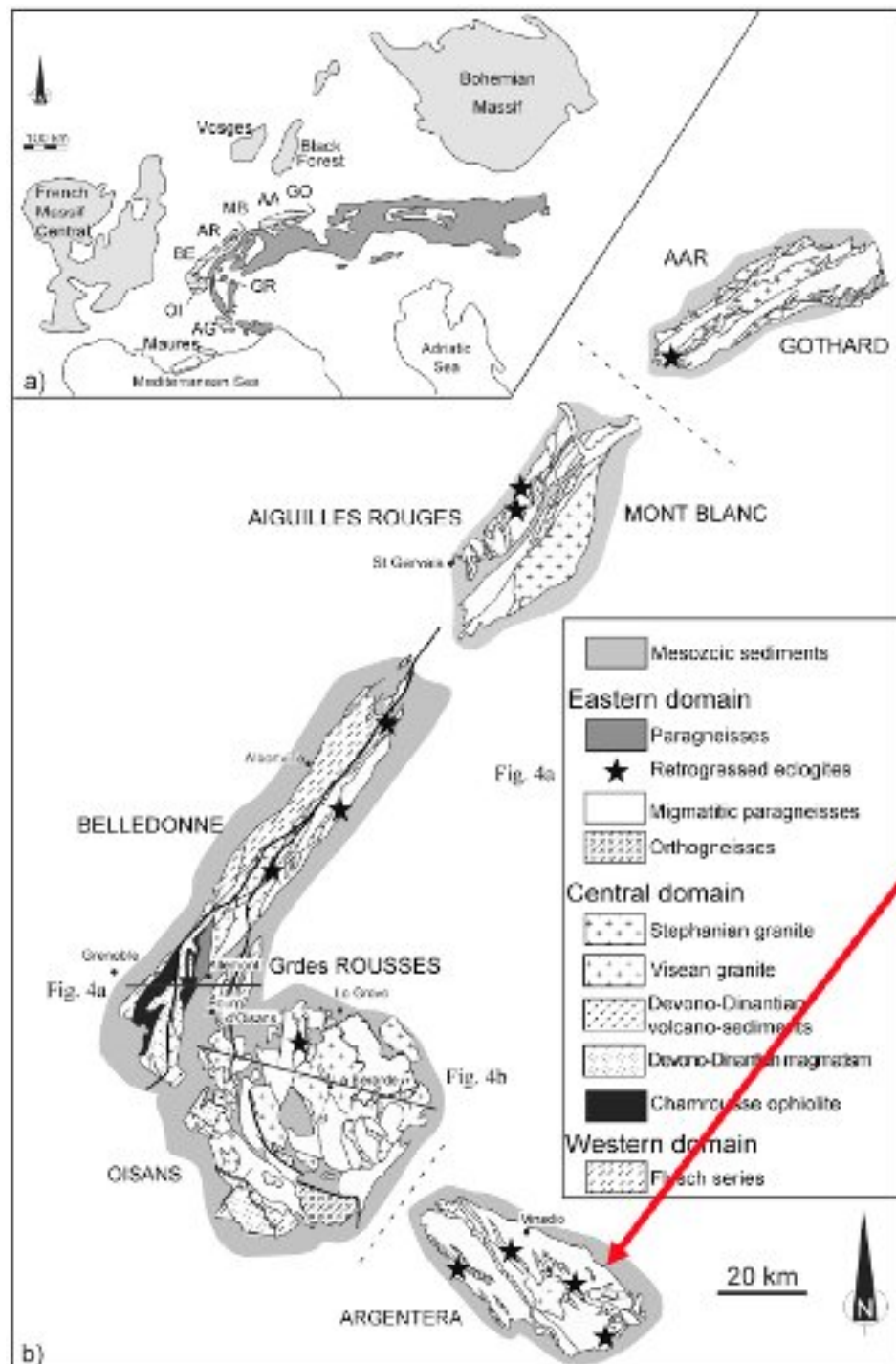


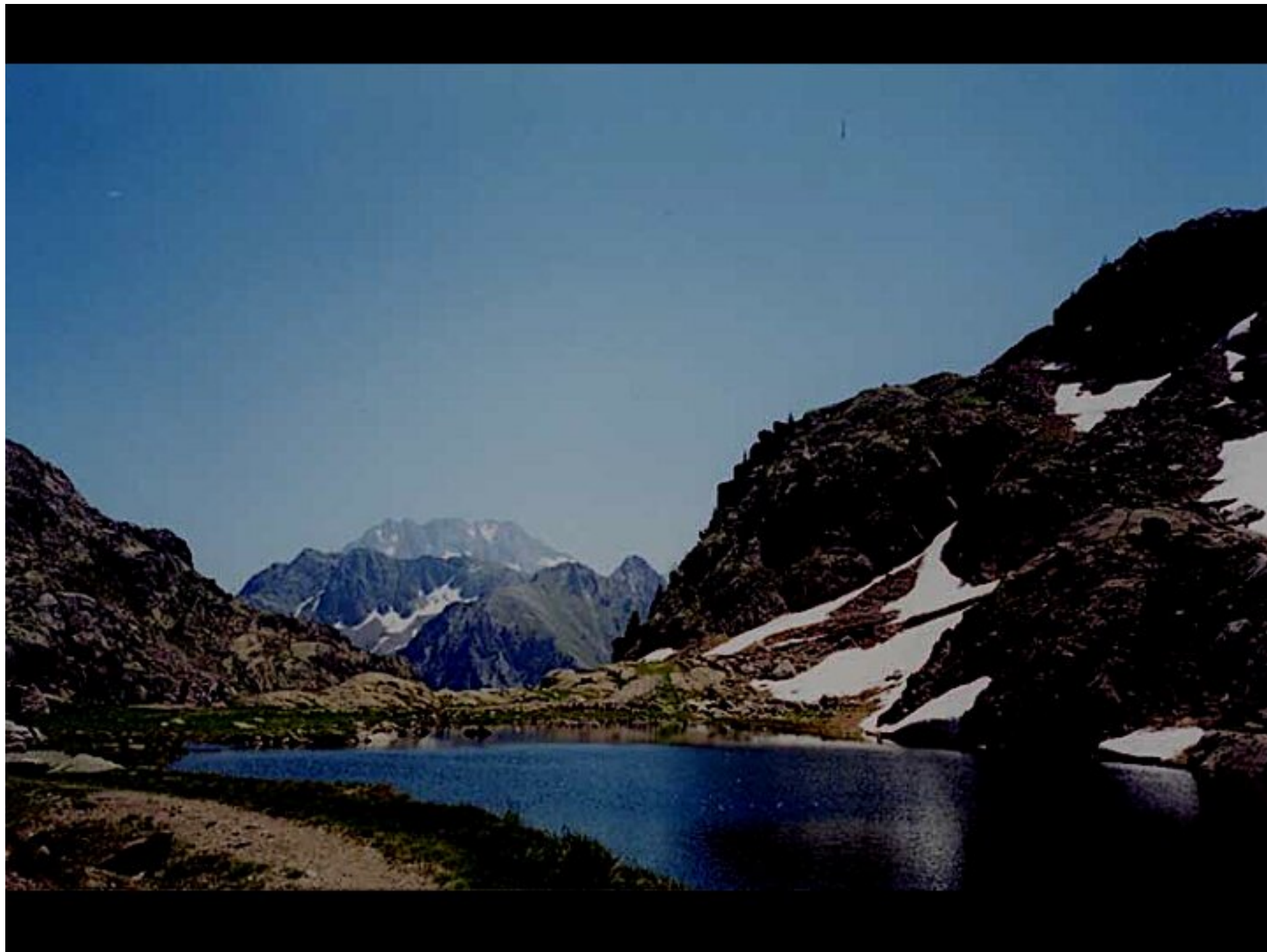
EUROPE

ADRIA



Tema "A. Desio"

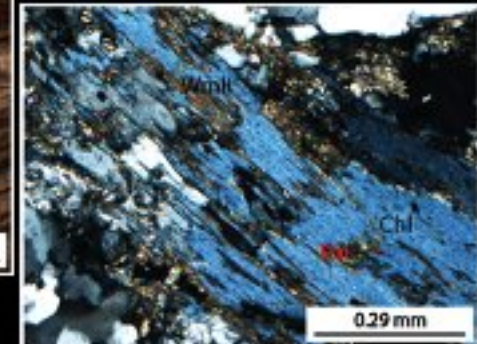
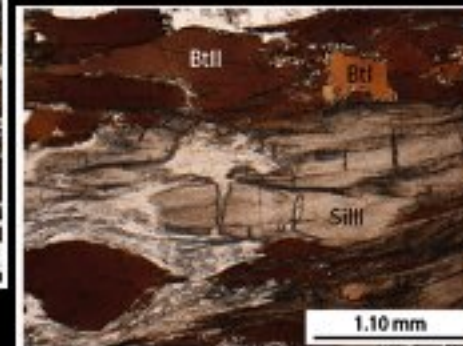
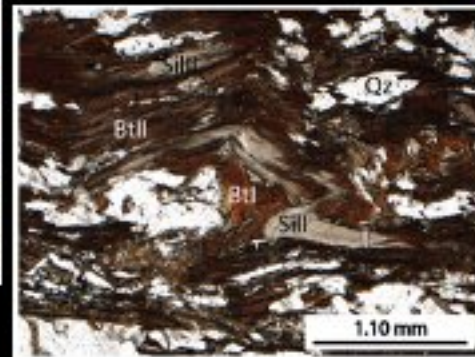
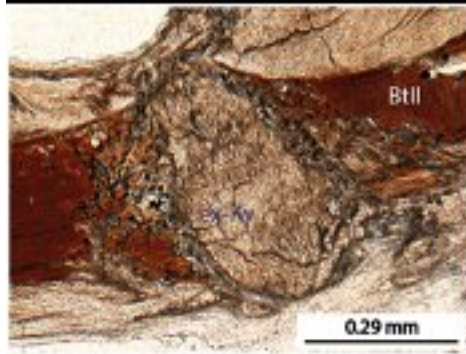




Migmatiti a Bt: Paragneiss e Ortogneiss migmatitici



Metatessiti a biotite: paragneiss e ortogneiss migmatitici (Lago delle Portette)



Boudin inclusi nelle migmatiti



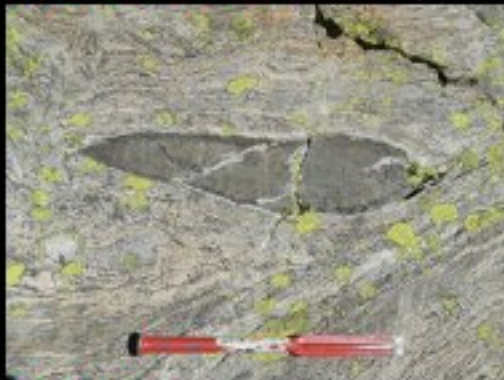
Marmi a silicati



Peridotiti serpentizzate



Talcoscisti a relitti di Amp, Phl, Spl



Anfiboliti



Gneiss ad Amp a grana fine



Eclogiti riequilibrata

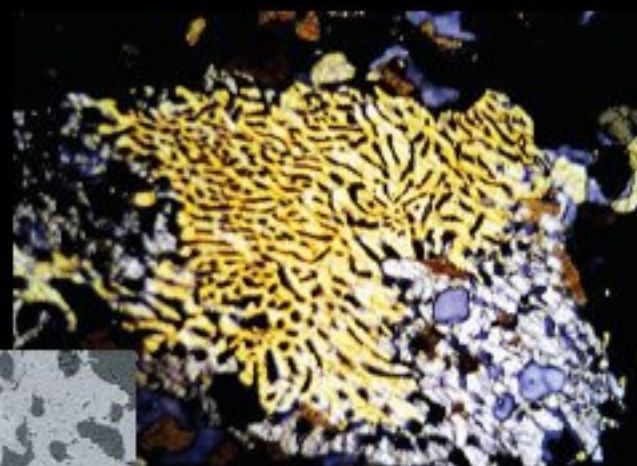
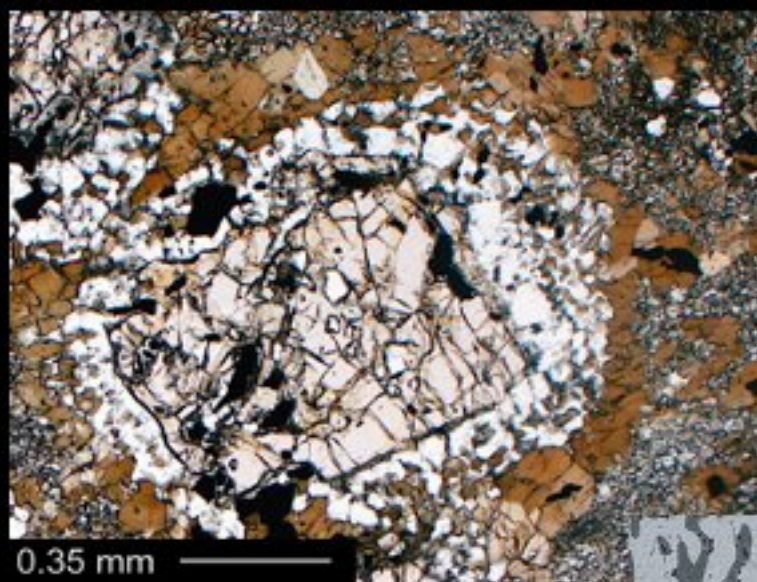
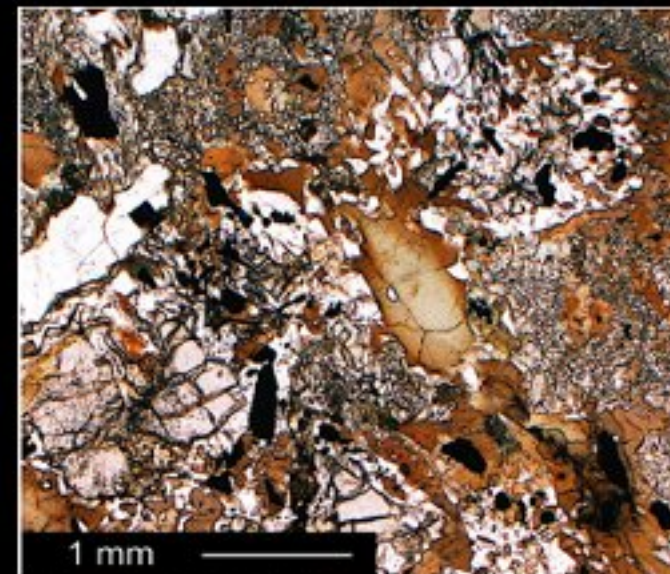
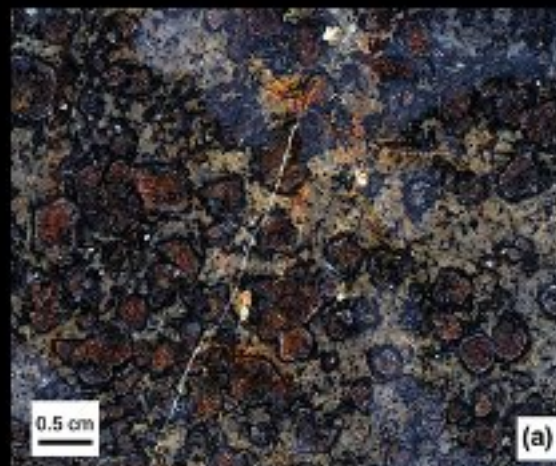


Biotititi

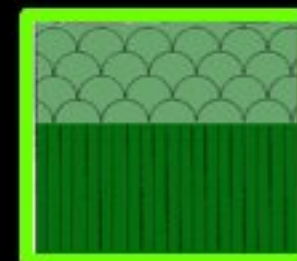
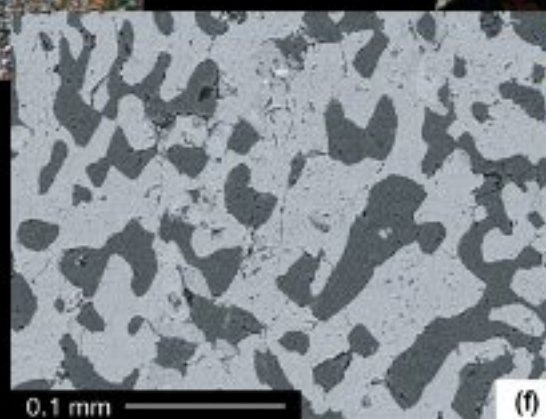


Rocce a silicati di calcio

**Boudin = banche dati
geologiche!!!**



Eclogiti riequilibrare



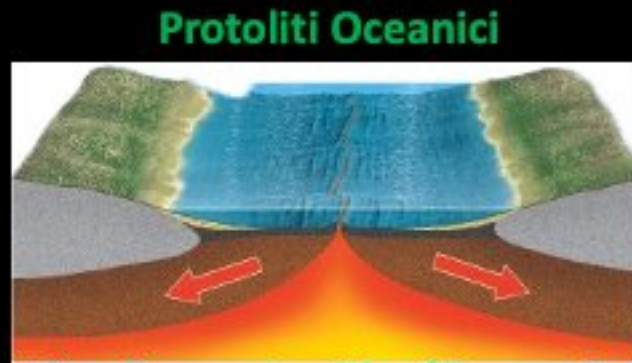


margine dell'intrusione

granito centrale
dell'Argentera

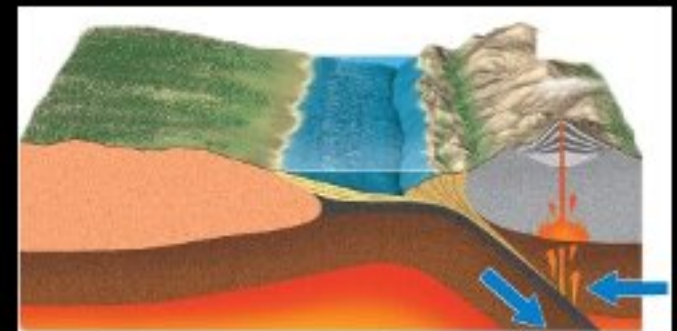
dettaglio della struttura al margine intrusivo del Granito Centrale dell'Argentera alla Testa di Tablasses W; unita' tettonica Elvetico-delfinese-**provenzale** al margine esterno delle Alpi

Rifting e
apertura della
Tetide Alpina



Margine divergente attivo (Oceano Reico?)

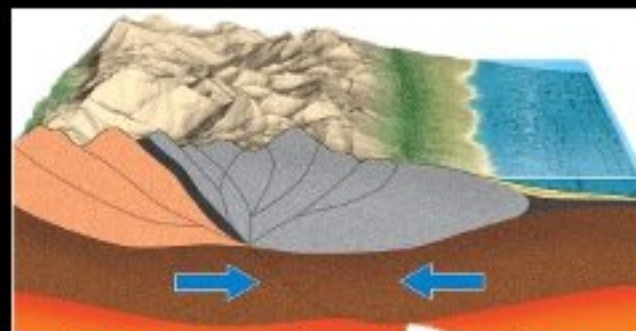
eclogiti



Subduzione 380-340 Ma ca.

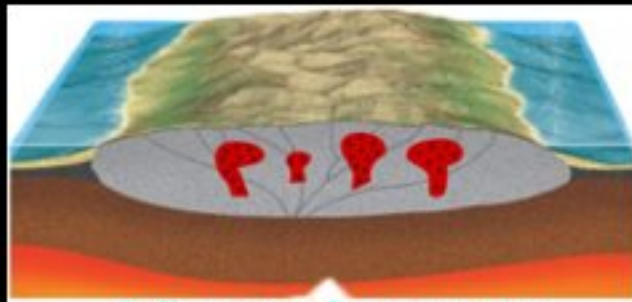
Ciclo Varisico

migmatiti



Collisione continentale matura

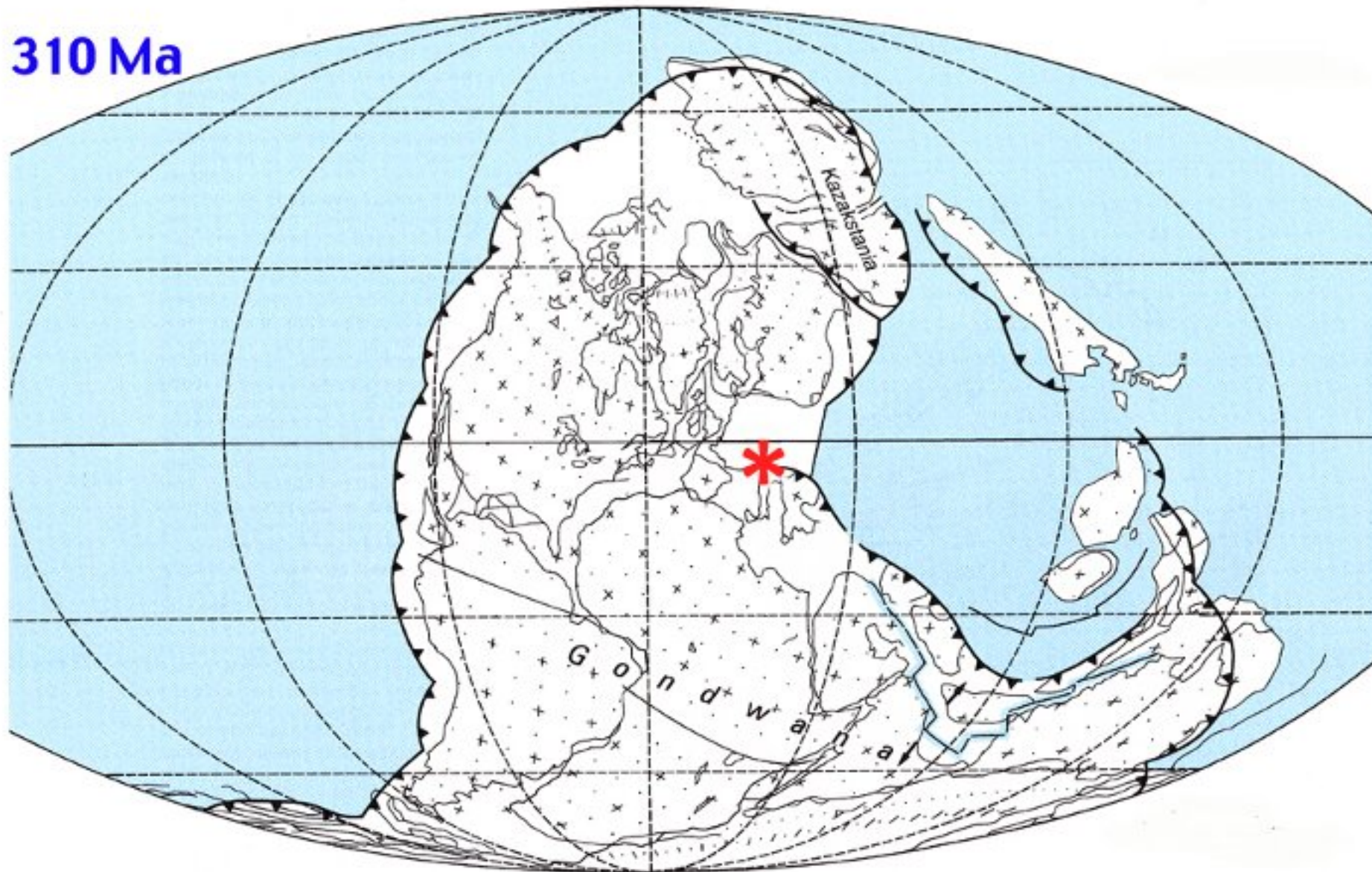
graniti 290 Ma



Collasso tardo-orogenico

PANGEA

310 Ma





Le bellissime rocce delle Alpi ci rivelano che
il continente Europeo contiene i segni di
apertura e chiusura di oceani antichi, ma....



se ci affacciamo verso sud dalle cime delle Alpi
Maritime... la nostra vista si apre su un nuovo
"oceano"