Strain partitioning in the Belledonne and Pelvoux massifs. Some clues to understand the Variscan tectono-thermal evolution

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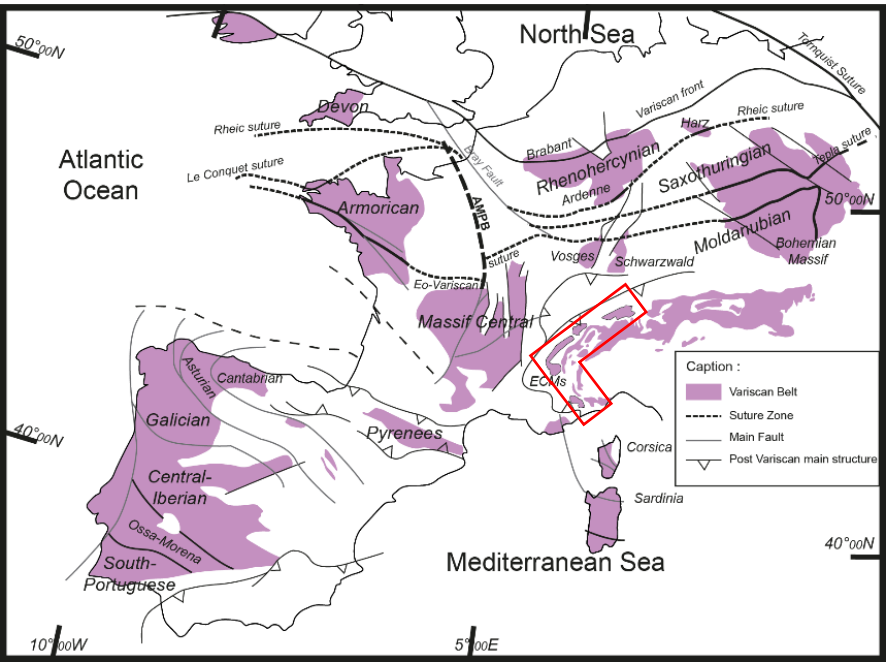
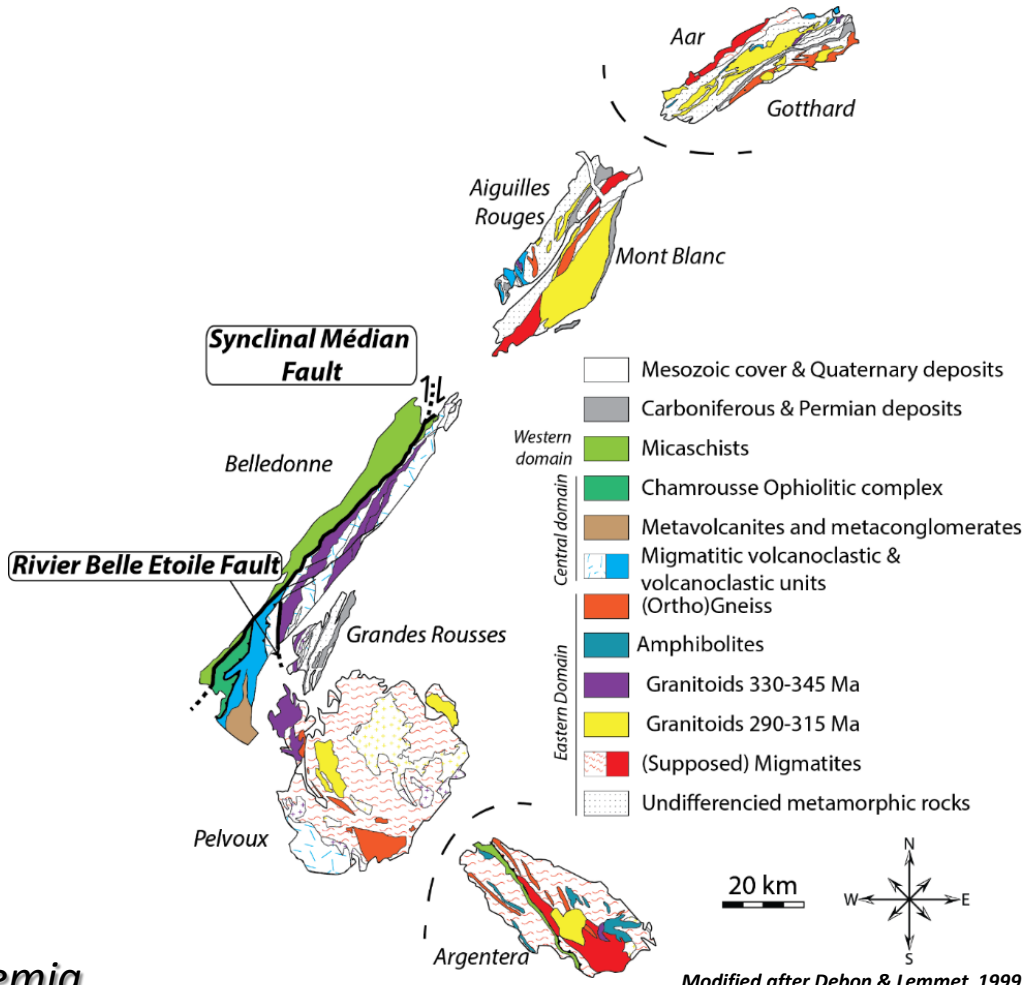
Introduction



Modified after Tabaud, 2012, Faure et al., 2015



Modified after Debon & Lemmet, 1999

Variscan belt → Extended from Iberia to Bohemia
External Crystaline Massifs → SE Variscan Branch
Western Alps → weakly involved in the Alpine deformation

Introduction

Flysch unit *Série Satinée*

Ophiolitic unit *Chamrousse unit*

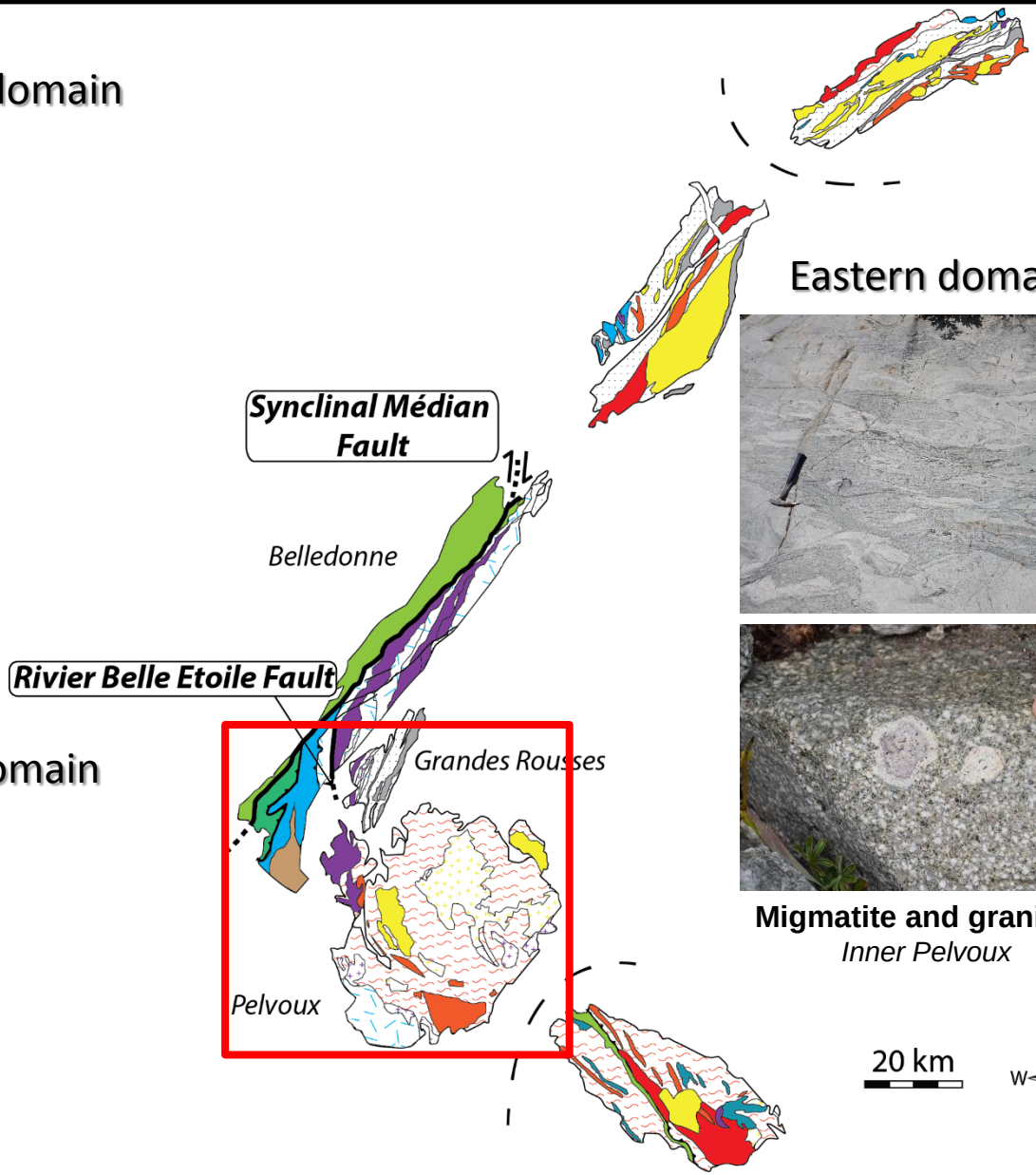
Volcano-sedimentary unit
Rioupéroux-Livet + Outer Pelvoux

Visean conglomeratic unit
Taillefer unit + Outer Pelvoux

Western domain

Central domain

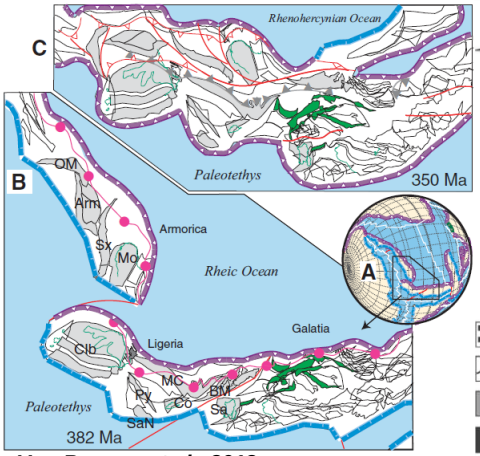
Eastern domain



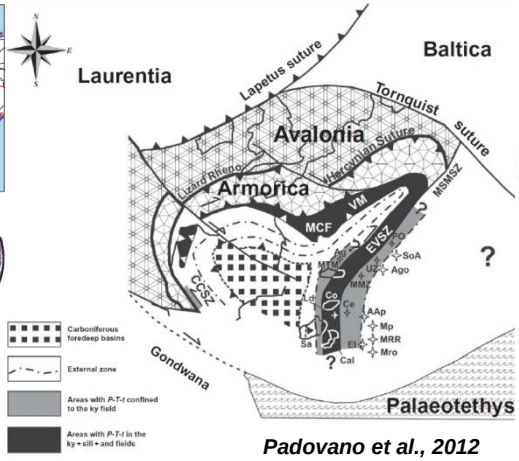
Migmatite and granitoid
Inner Pelvoux

3 main domains exposing upper to middle-lower crust

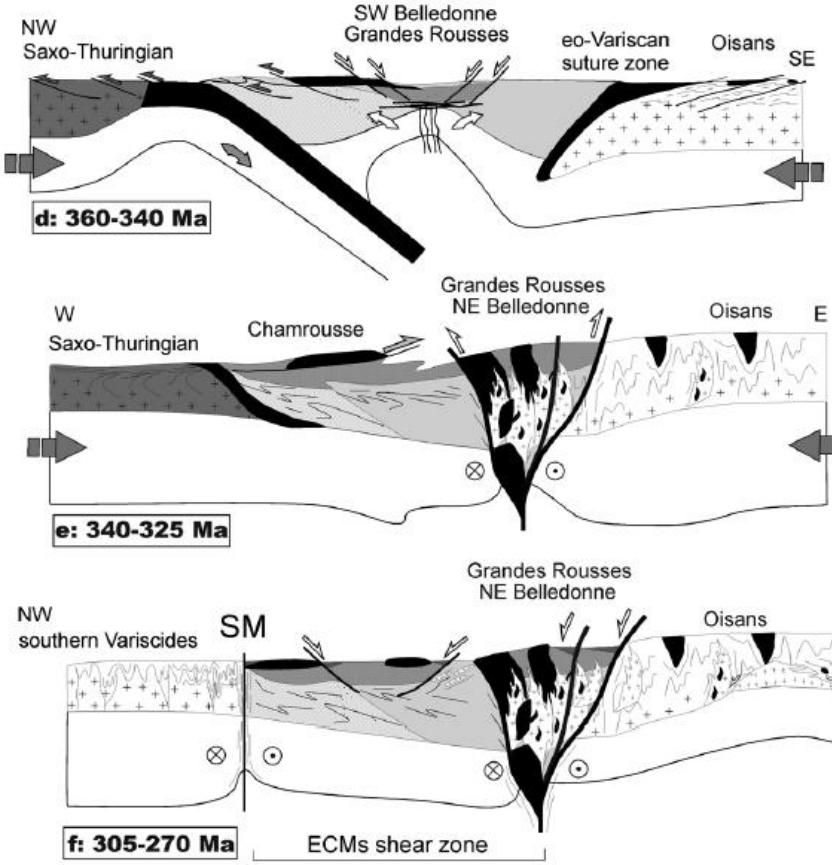
Introduction



Von Raumer et al., 2013



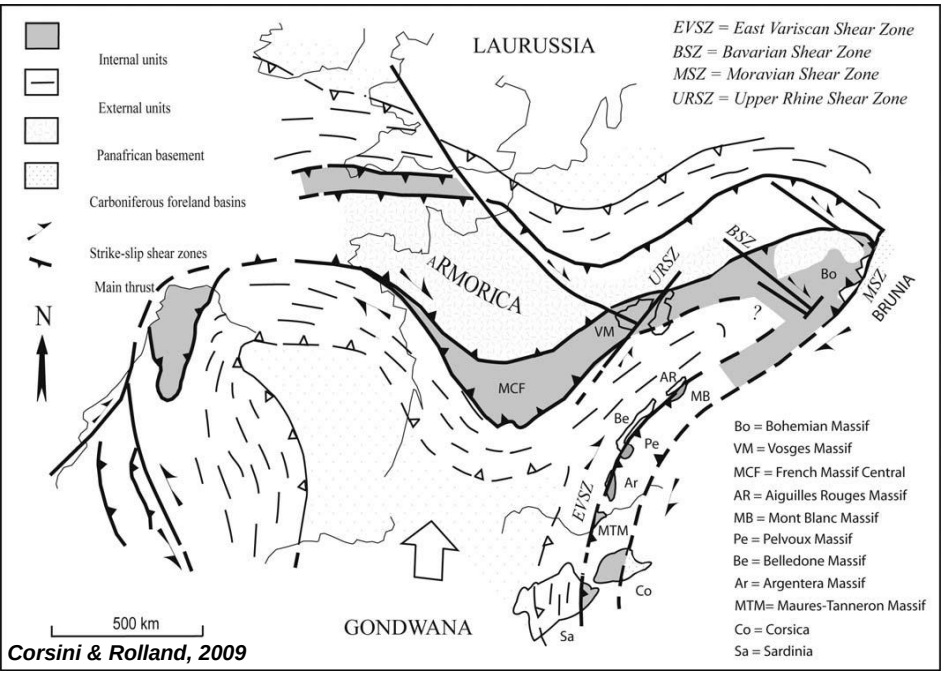
Padovano et al., 2012



Western domain

Central domain

Eastern domain



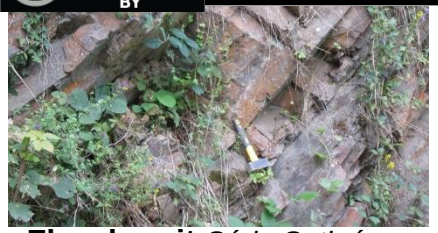
Corsini & Rolland, 2009

Tectonic juxtaposition of the 3 domains allong the EVSZ (330-300Ma)

Bring some clues to discuss the place of the ECMs in the variscan framework

The Belledonne Massif

Western domain



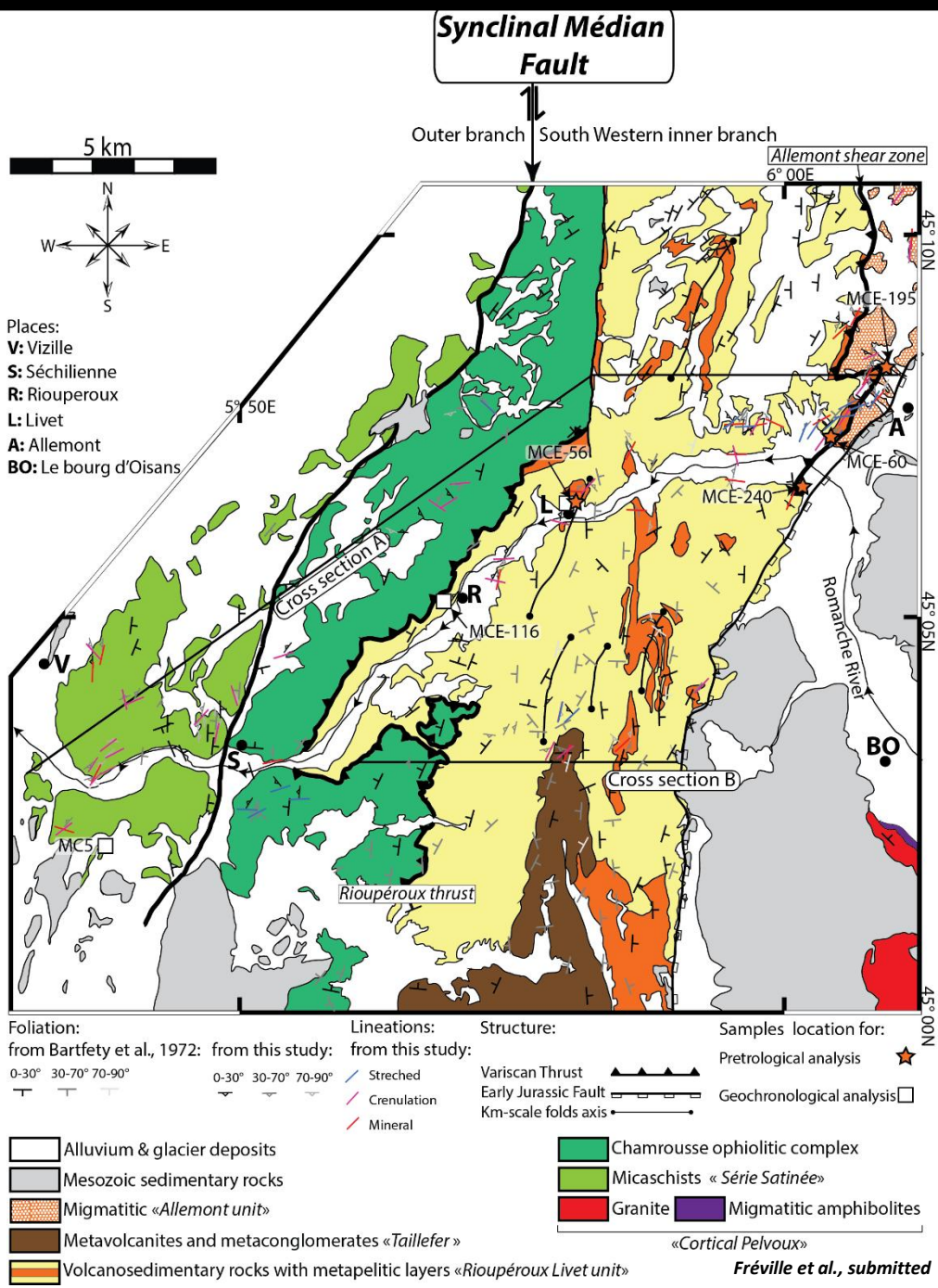
Flysch unit *Série Satinée*

Ophiolitic unit *Chamrousse unit*

Volcano-sedimentary unit
Rioupéroux-Livet + Outer Pelvoux

Visean conglomeratic unit
Taillefer unit + Outer Pelvoux

Central domain



Fréville et al., submitted

D1 event →Nappes stacking event

D1 Deformation

Pole of $S_{0\text{-}1}$ foliations
Lower hemisphere

Chamrousse ophiolitic complex — n =37

Rioupéroux Livet unit — n =202

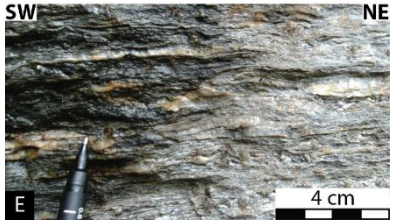
Taillefer unit — n =18

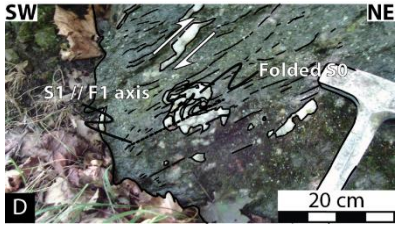
Pole of F_1 fold plane
F_1 Fold axis
Lower hemisphere

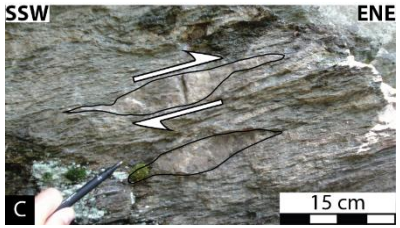
Sw Belledonne — n =29, n =21

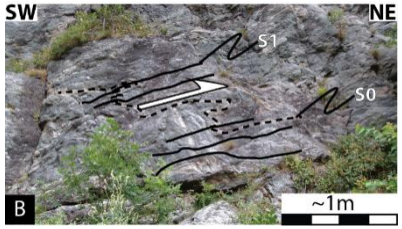
L_1 mineral lineation
Lower hemisphere

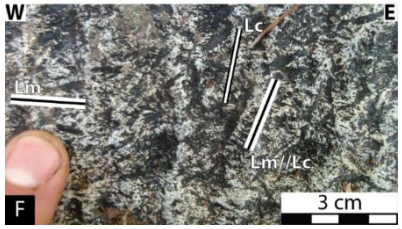
Rioupéroux Livet unit — n =44

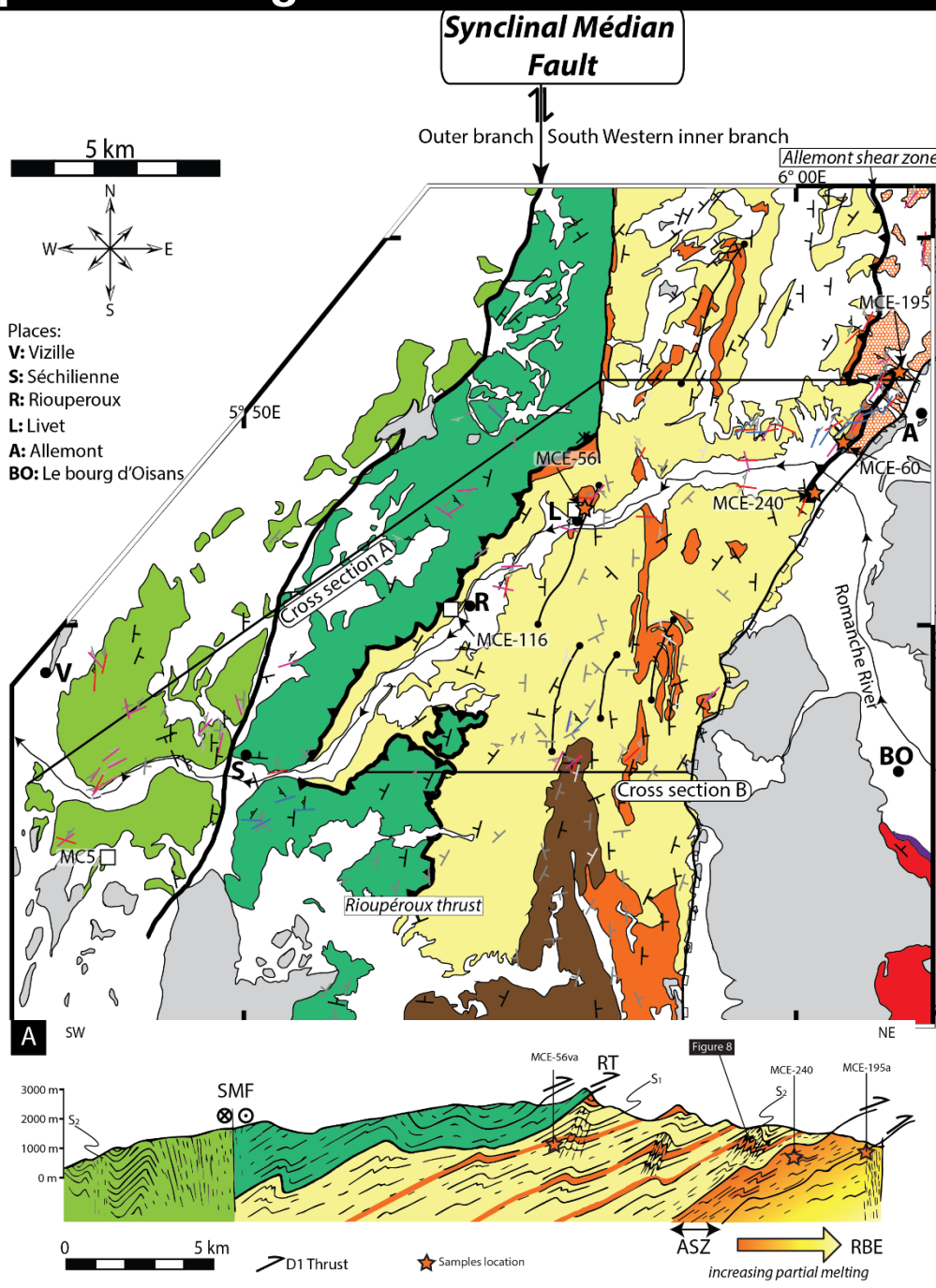












Fréville et al., submitted

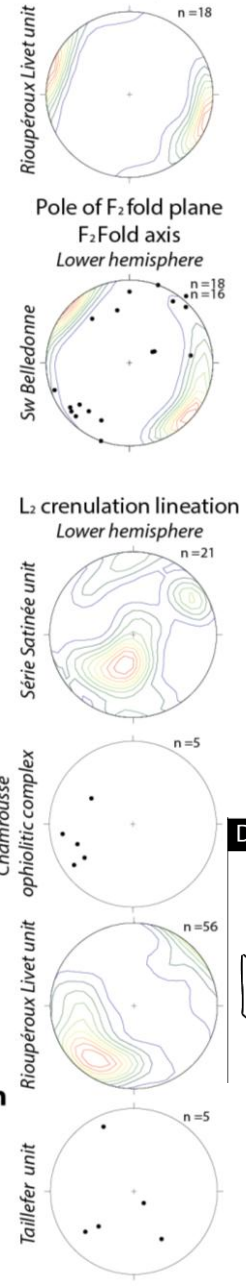
D2 event → NW-SE shortening event

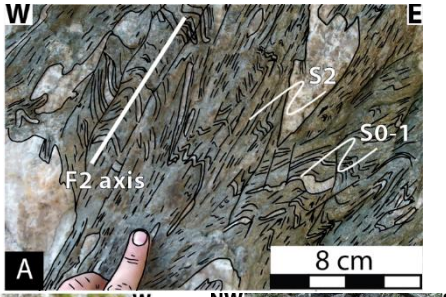
D2 Deformation

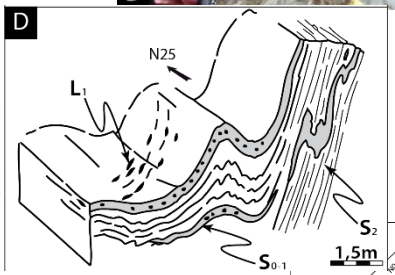
Pole of S_2 foliations
Lower hemisphere

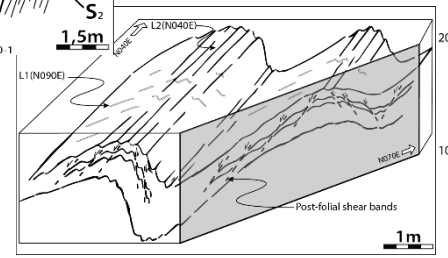
Pole of F_2 fold plane
F_2 Fold axis
Lower hemisphere

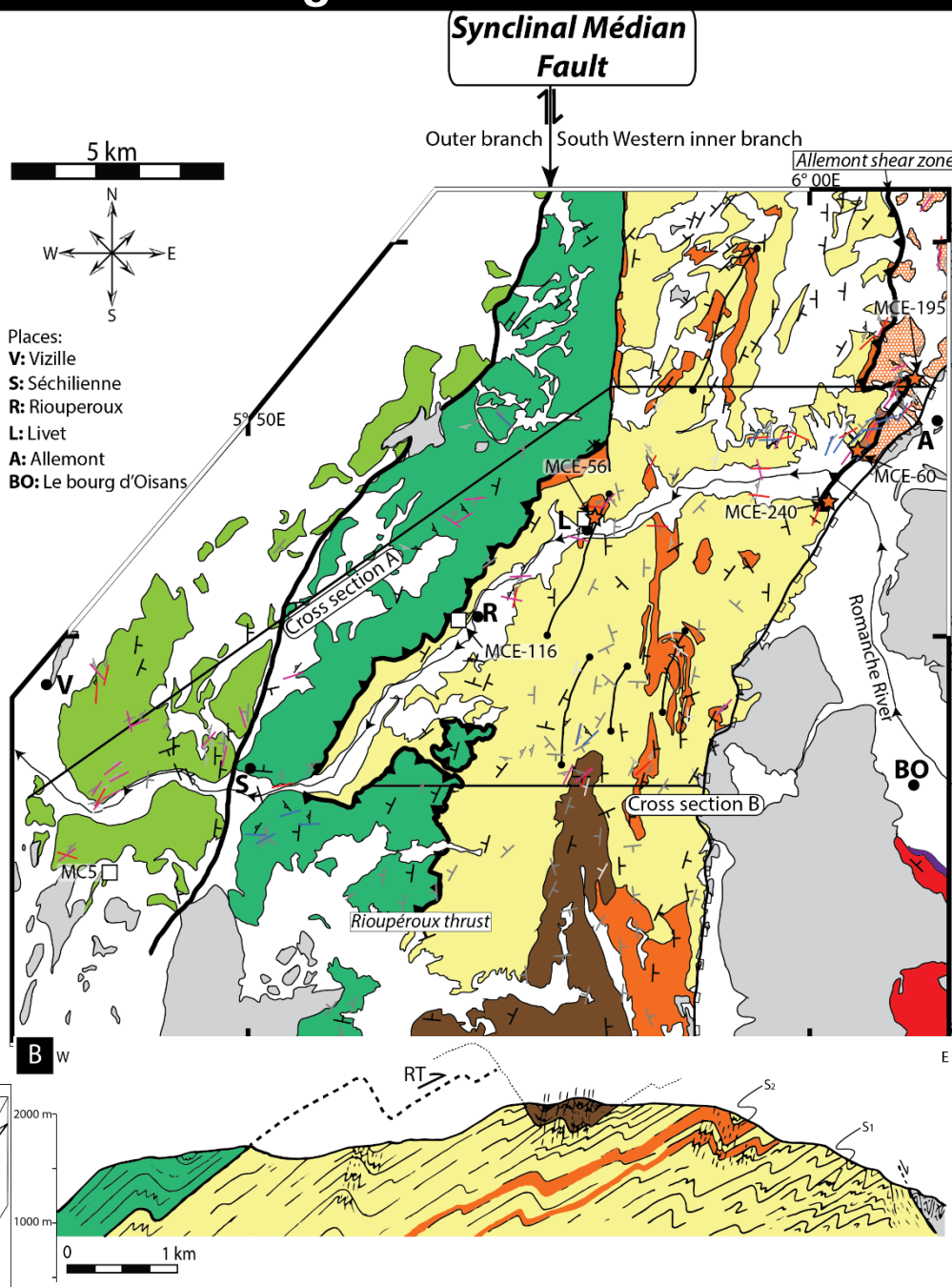
L_2 crenulation lineation
Lower hemisphere





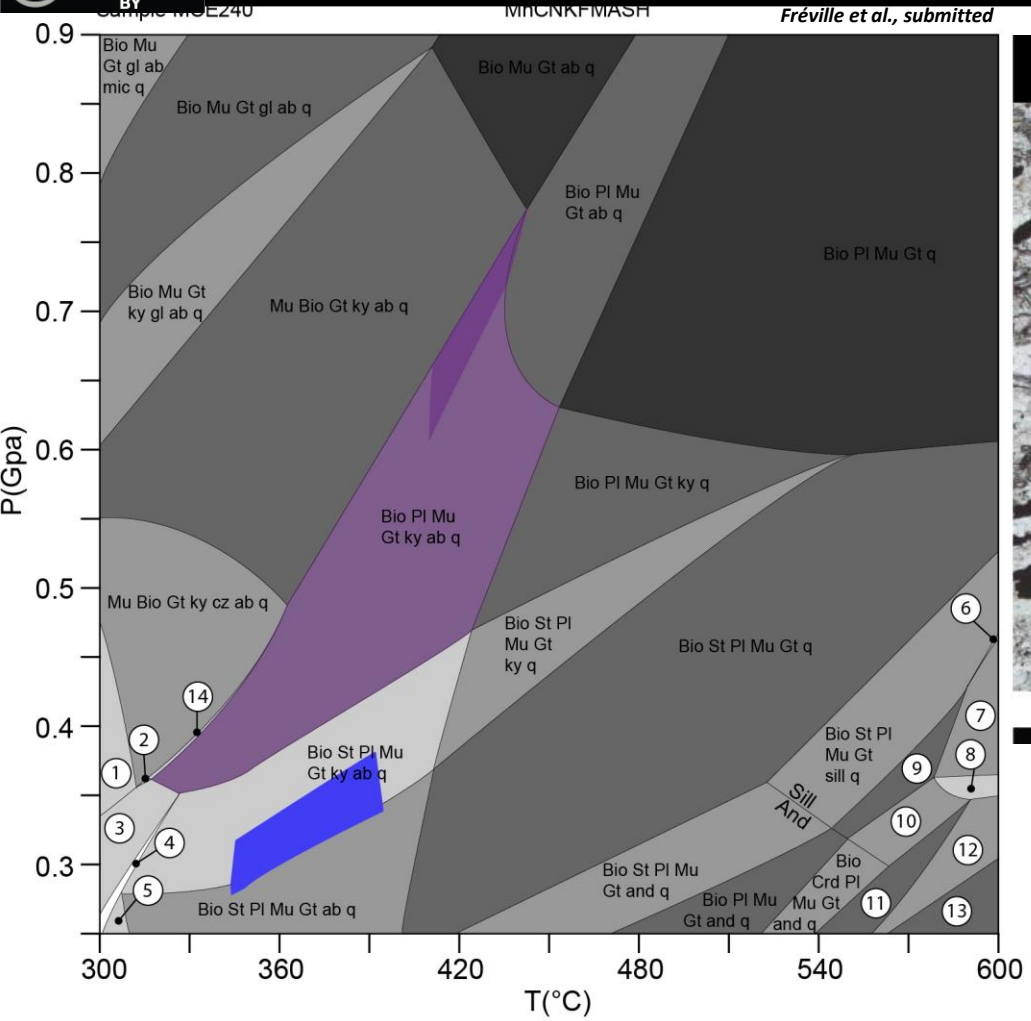


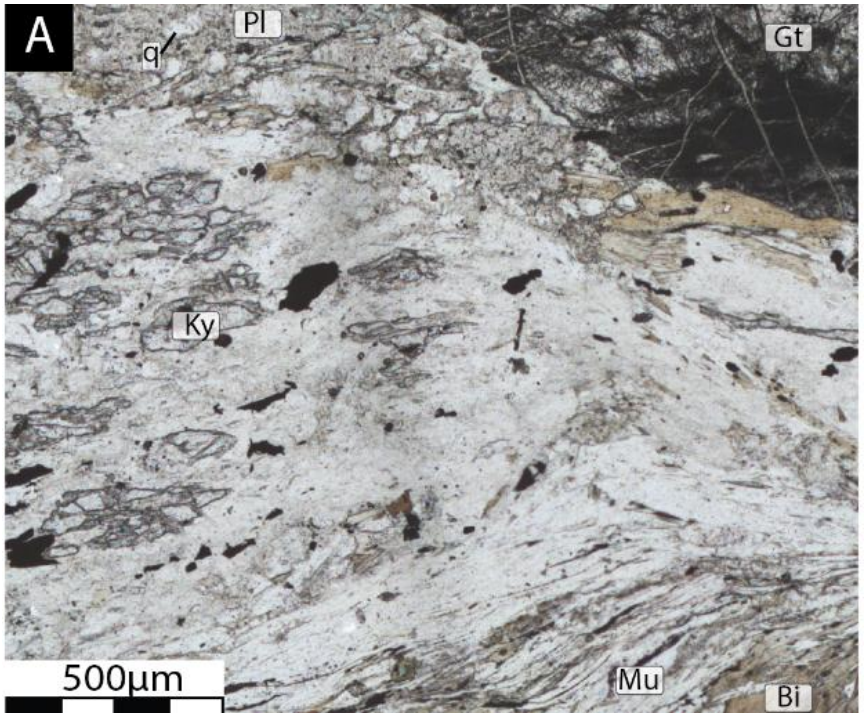




Fréville et al., submitted

Dx event → MP-LT metamorphism -Mx-





Ky-Ab bearing micaschist from the VSU unit

Bi-Pl-Mu-Gt-ky-ab-q
Mx metamorphism

Undocumented deformation event
(no structural evidence)

Peak

ca. 7±1kbar, 430±20°C

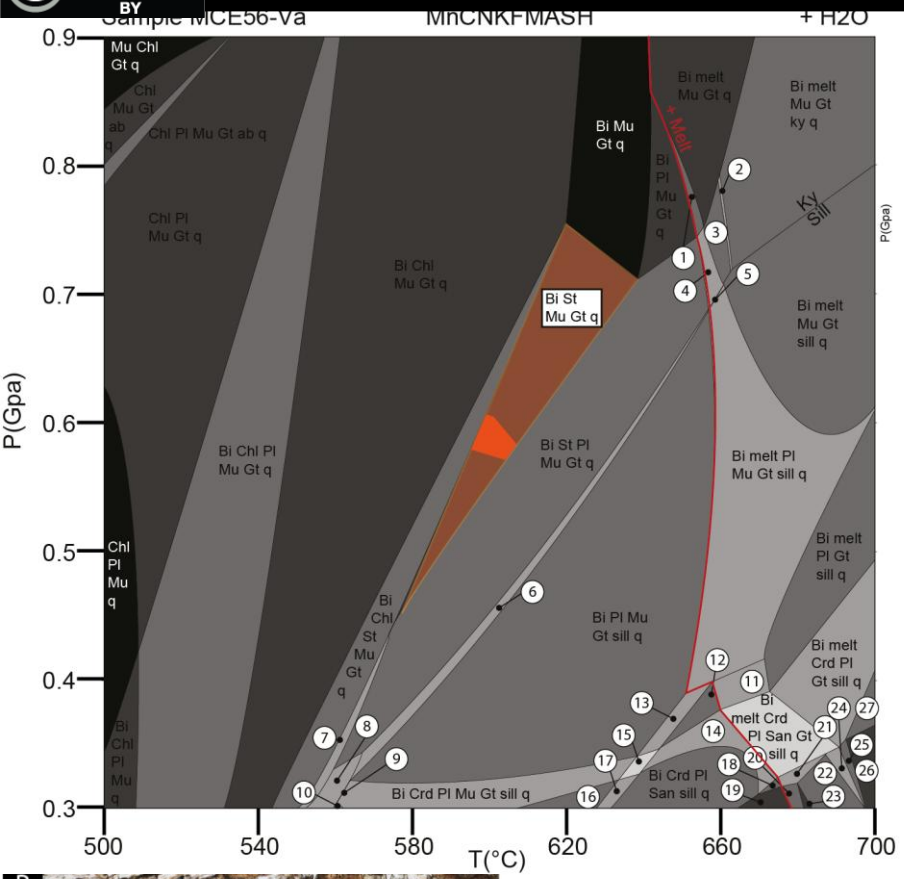
Prograde

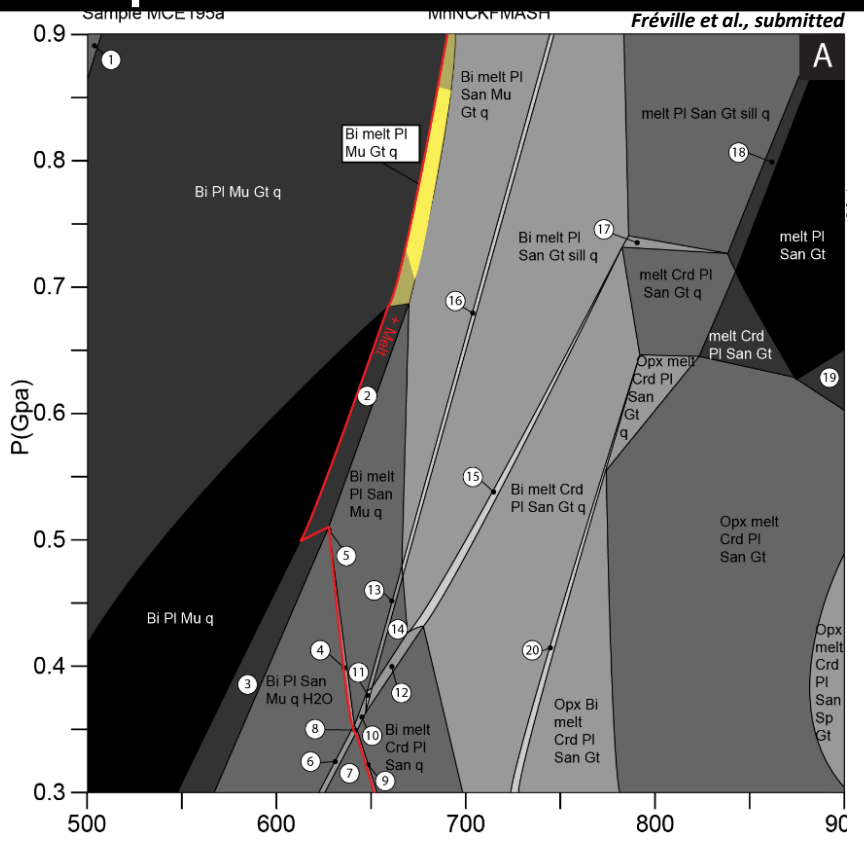
ca. 3.3±0.5kbar / 370±25°C

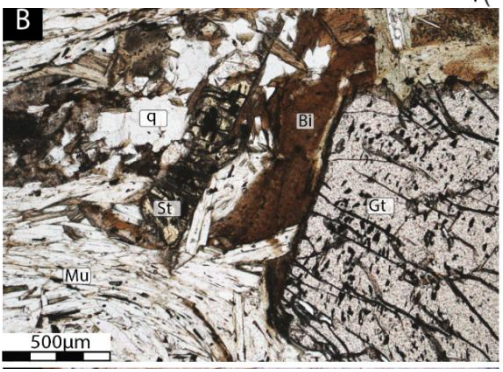
Cold metamorphic gradient (10°C/km)→ Obduction

MP-LT metamorphism coeval with an earlier event -Dx- obduction?

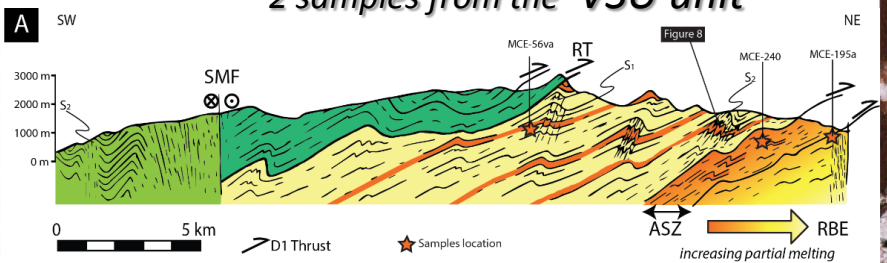
D1 event → MP-HT metamorphism -M1-

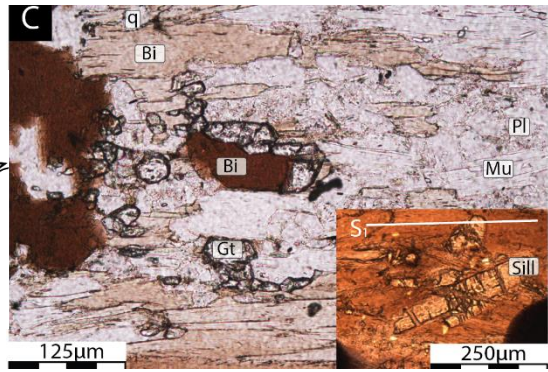






2 samples from the VSU unit



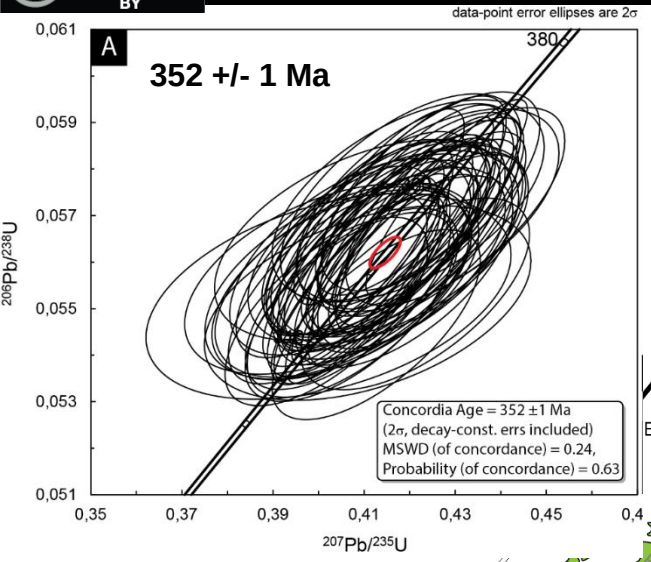


Bi-St-Mu-Gt-q
ca. 6±0.5kbar / 600±10°C

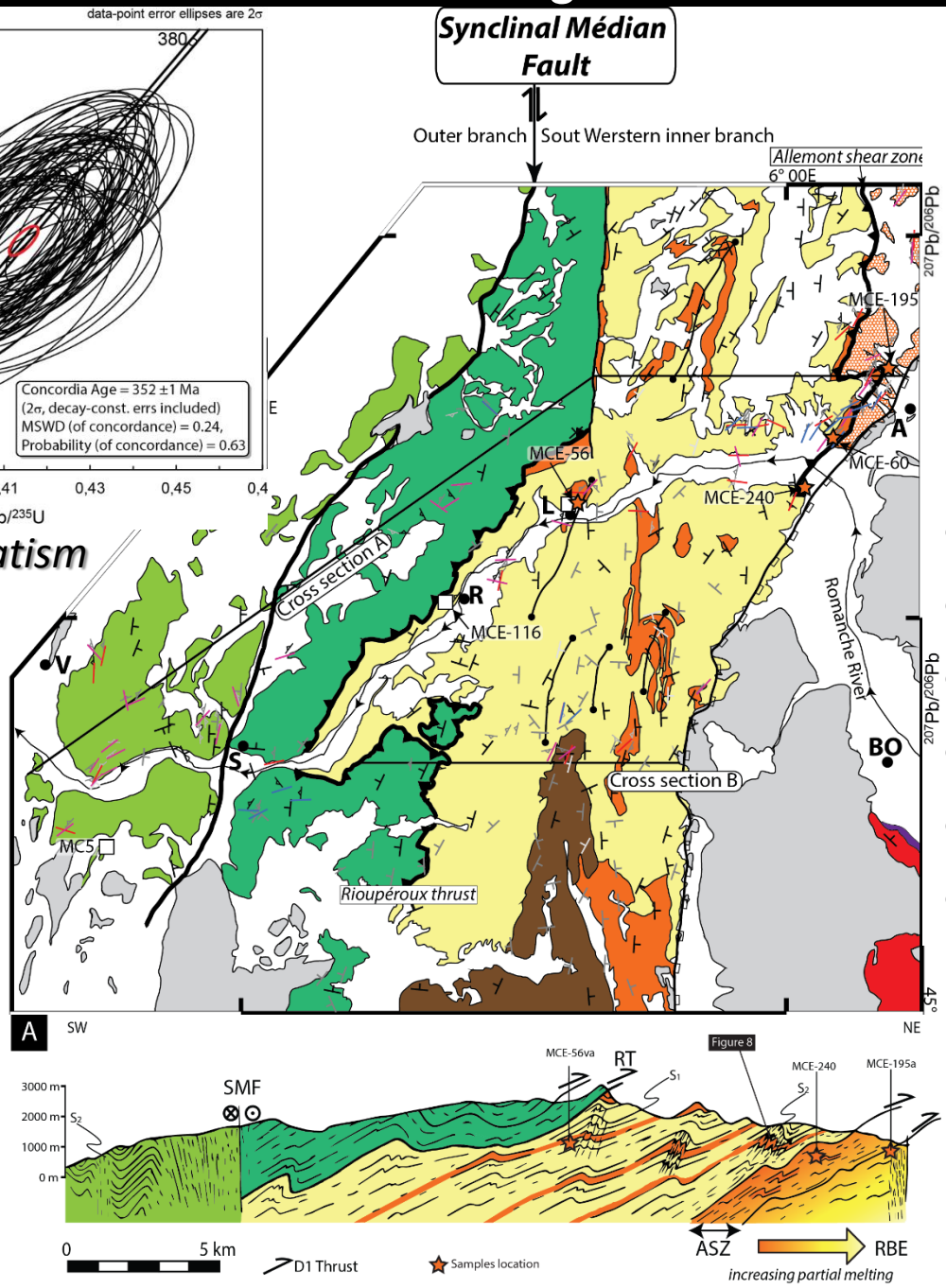
MP-HT metamorphism coeval with D1 event

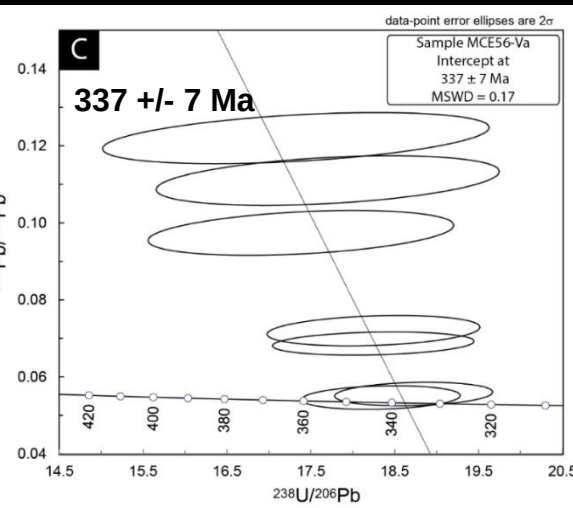
Bi-Pl-Mu-Gt-q +melt
ca. 8±0.7kbar / 680±11°C

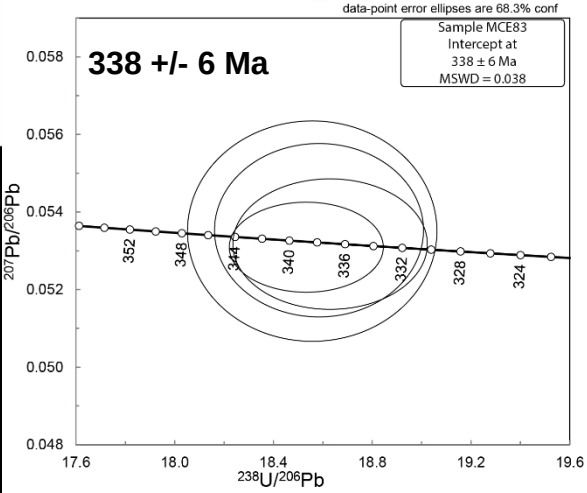
Geochronological contrains



Bi-modal magmatism



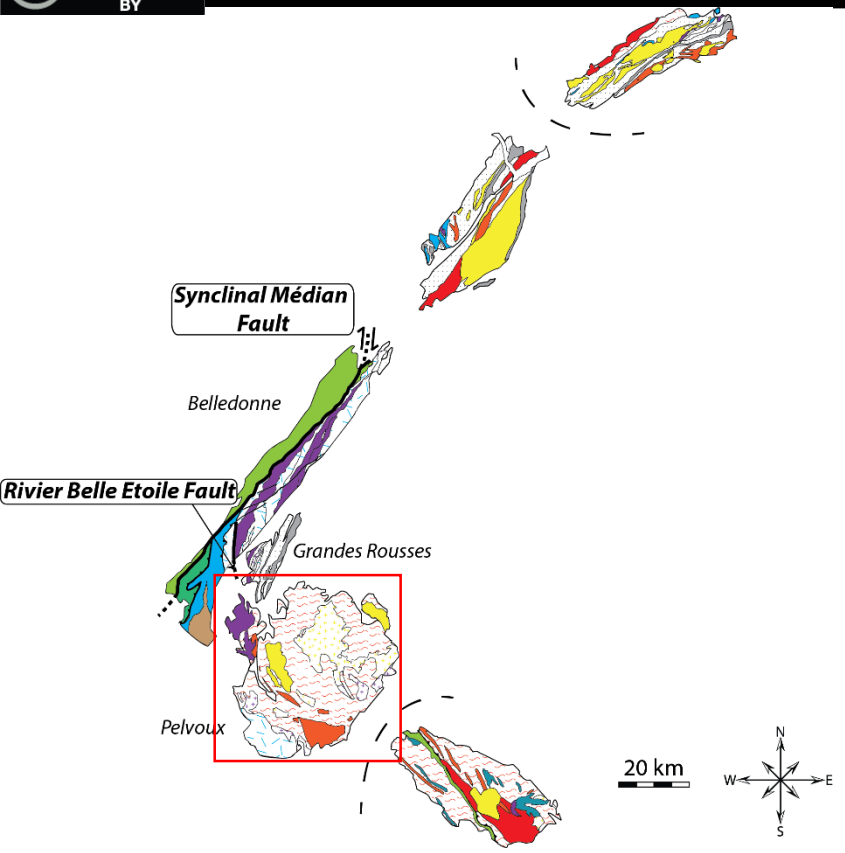


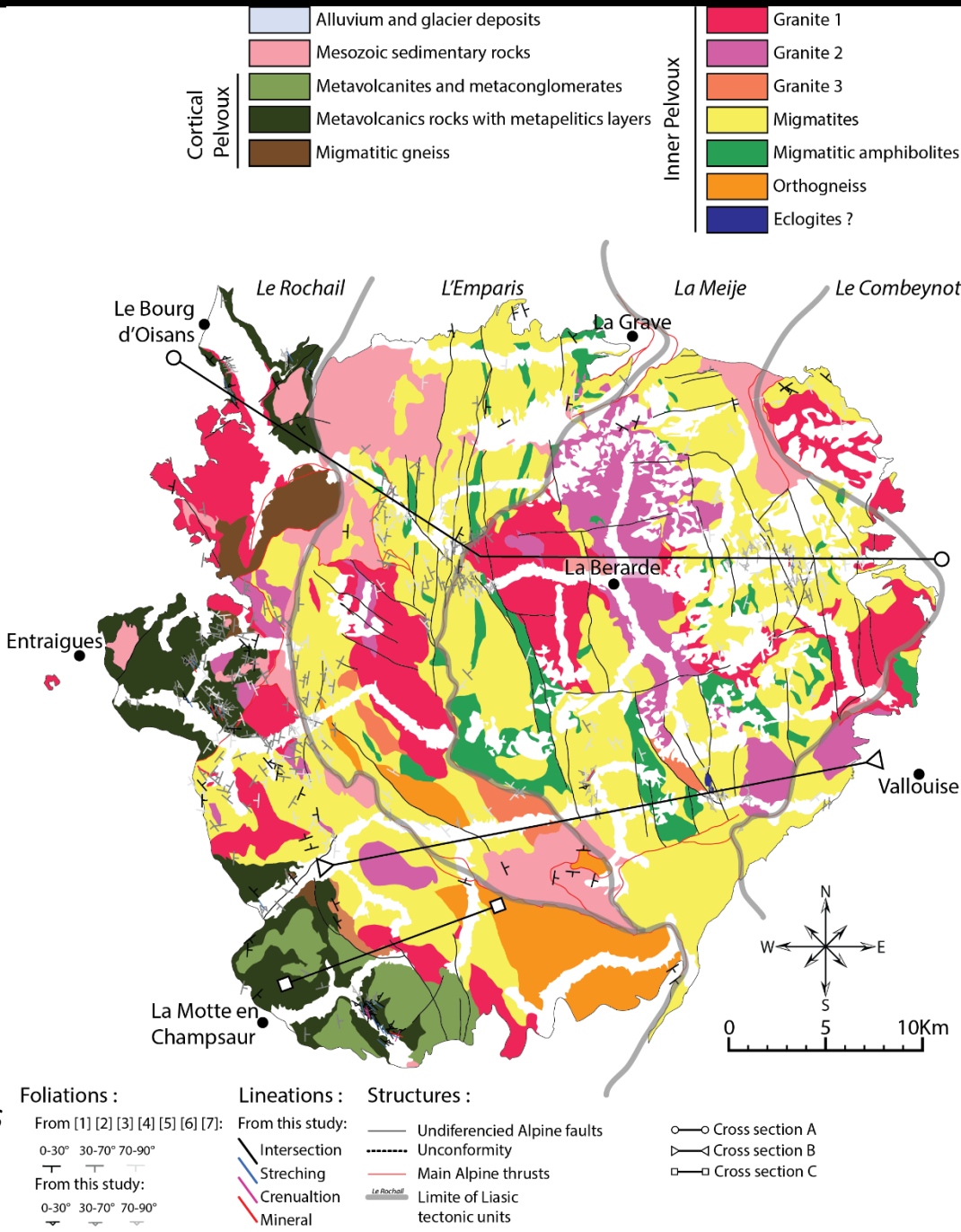


M1 metamorphism

Fréville et al., submitted

The Pelvoux Massif





The Pelvoux Massif :

2 Domains :

Central Domain: *Outer Pelvoux*

(VSU + Visean Deposit)

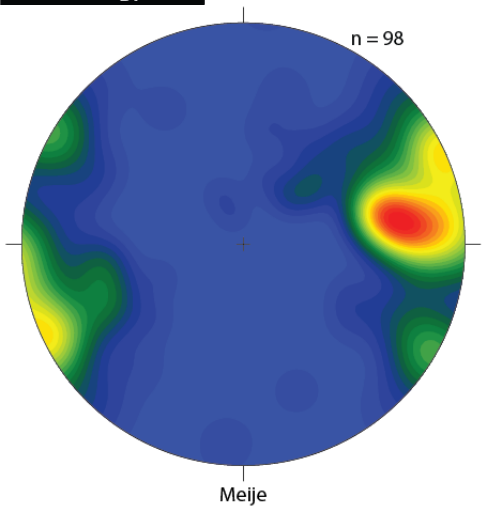
Eastern Domain: *Inner Pelvoux*

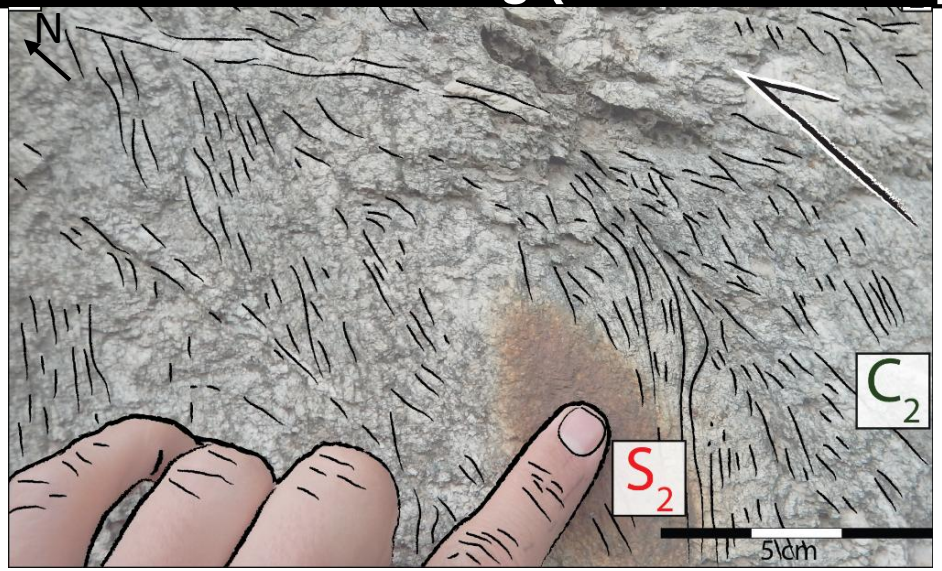
(Migmatites + Granitoids)

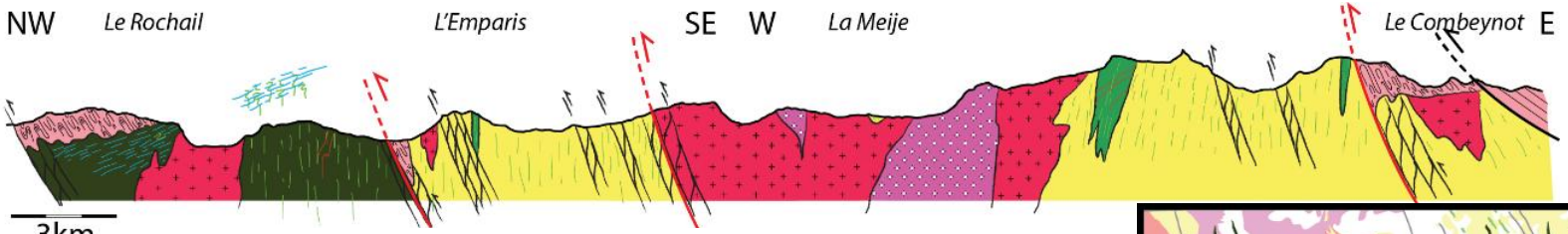
4 tilted Liassic blocs

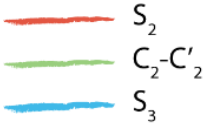
Exposure of different structural levels

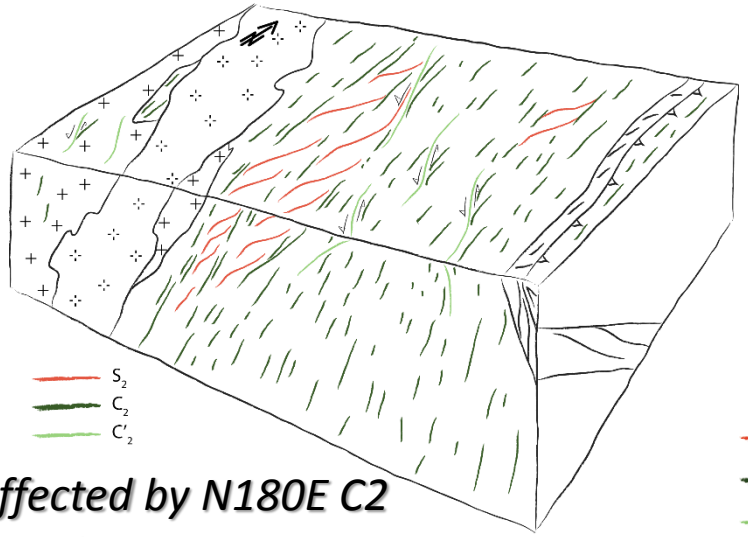
D2 event → NW-SE shortening (Sinistral transpression)

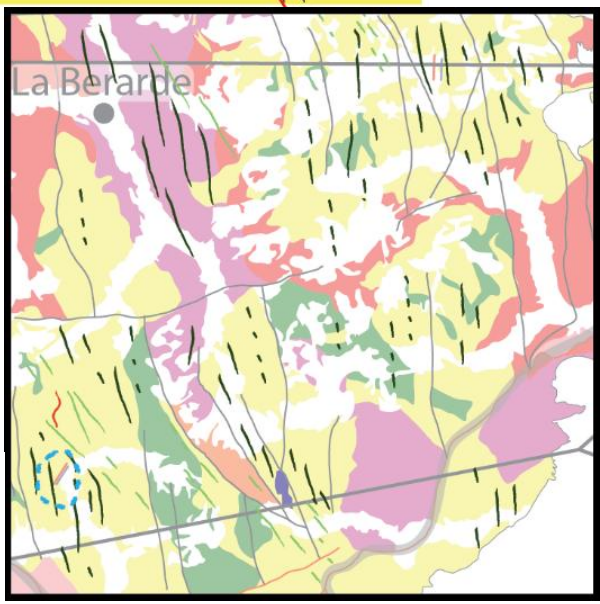


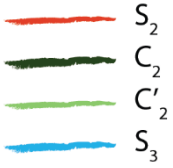






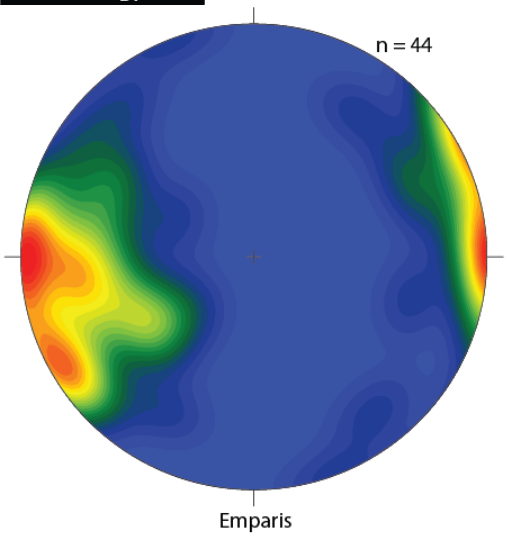


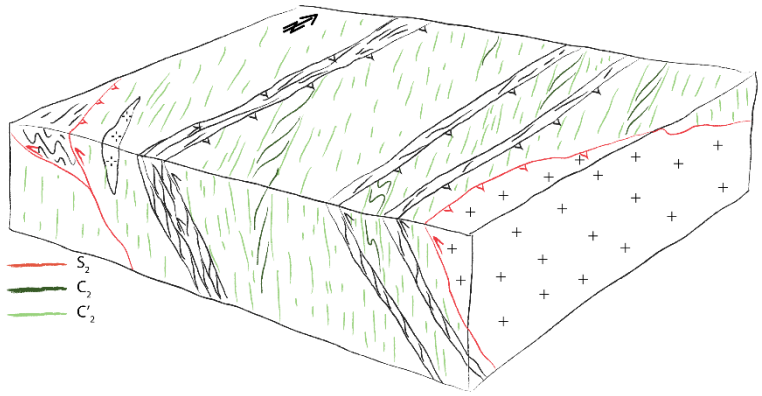


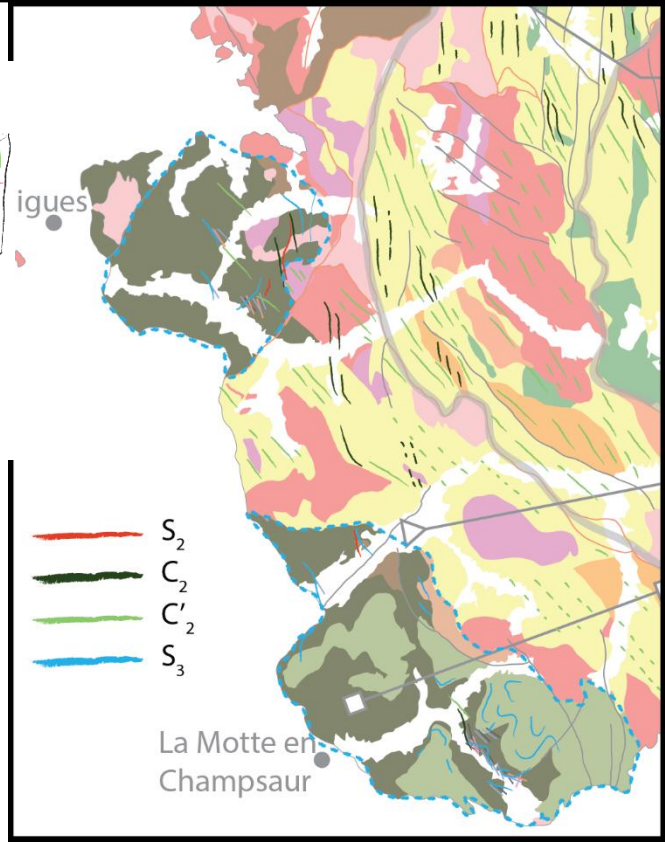


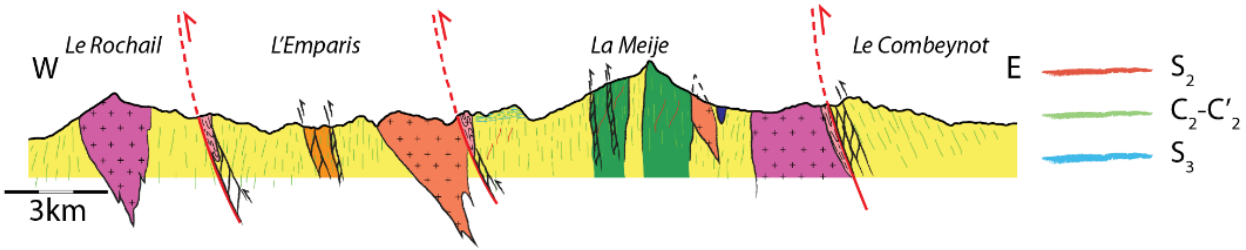
N030E S2 foliation affected by N180E C2 with a sinistral kinematic

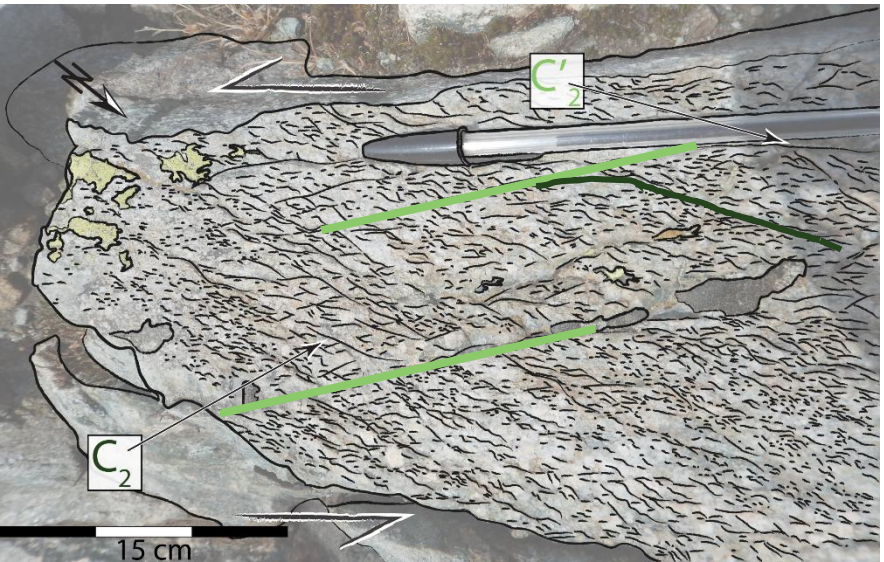
D2 event → NW-SE shortening (Sinistral transpression)





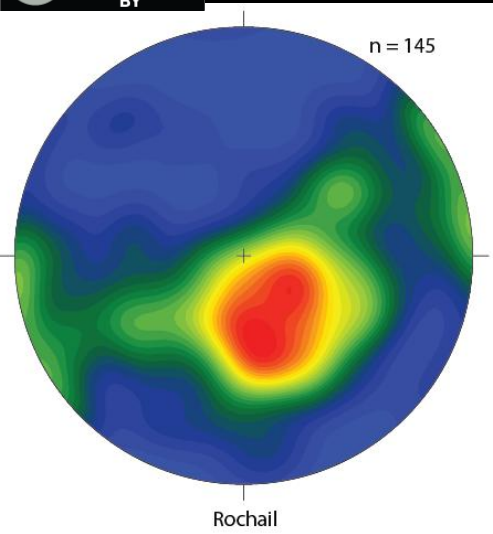


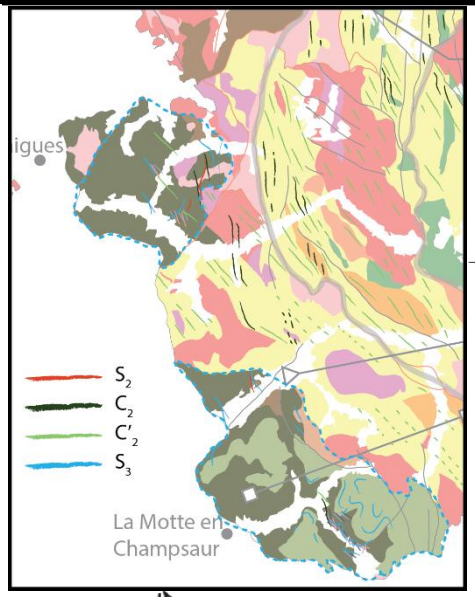


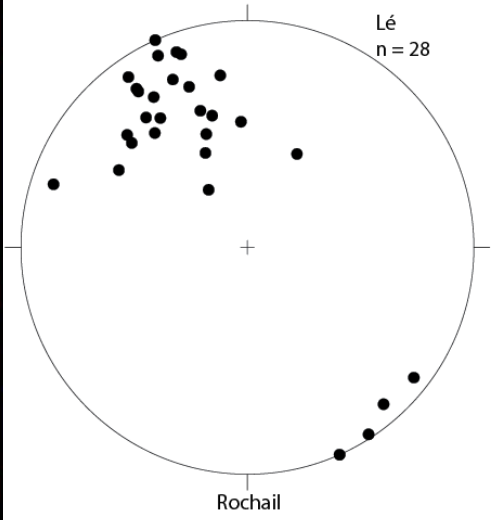


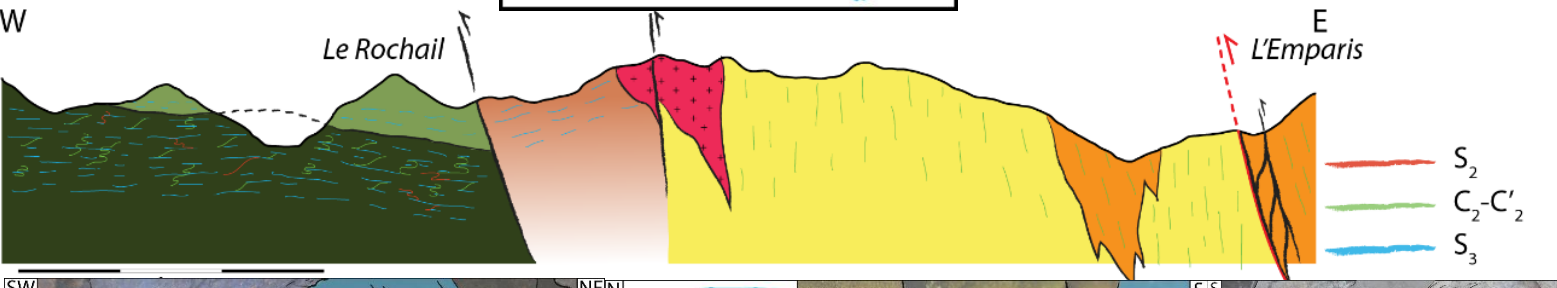
N180E C2 are affected by N150E C'2 with a sinistral kinematic

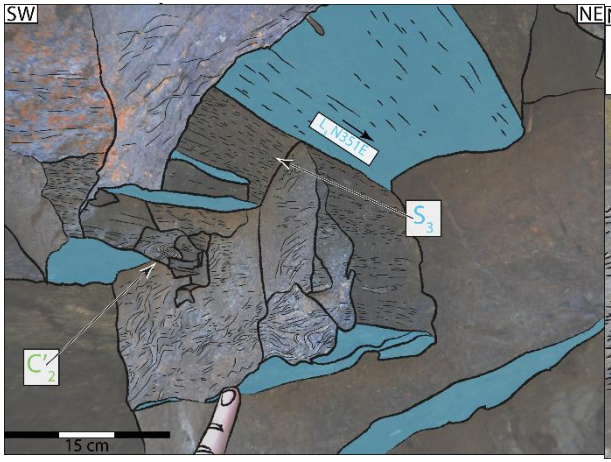
3 deformation → Localized thinnig along S3 transition zone

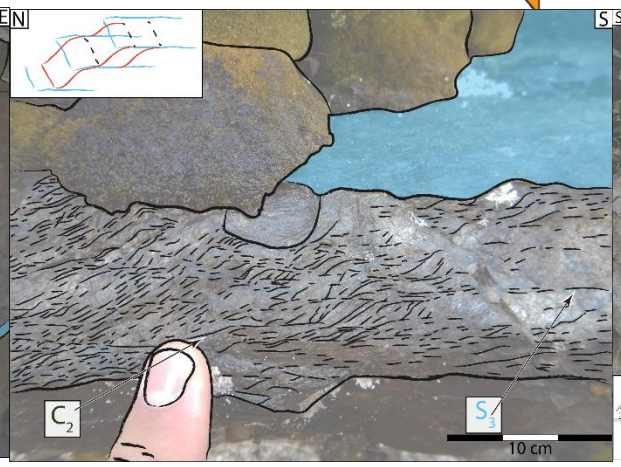


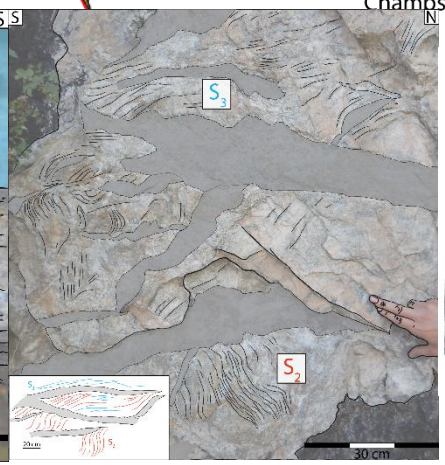


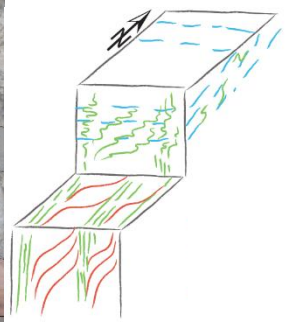












S2, C2, C'2 pattern is affected by the S3 flat laying foliation

Conclusion

Tectono-metamorphic evolution: 461 – 355 Ma → Mx LT-MP
Eastward obduction (Dx)

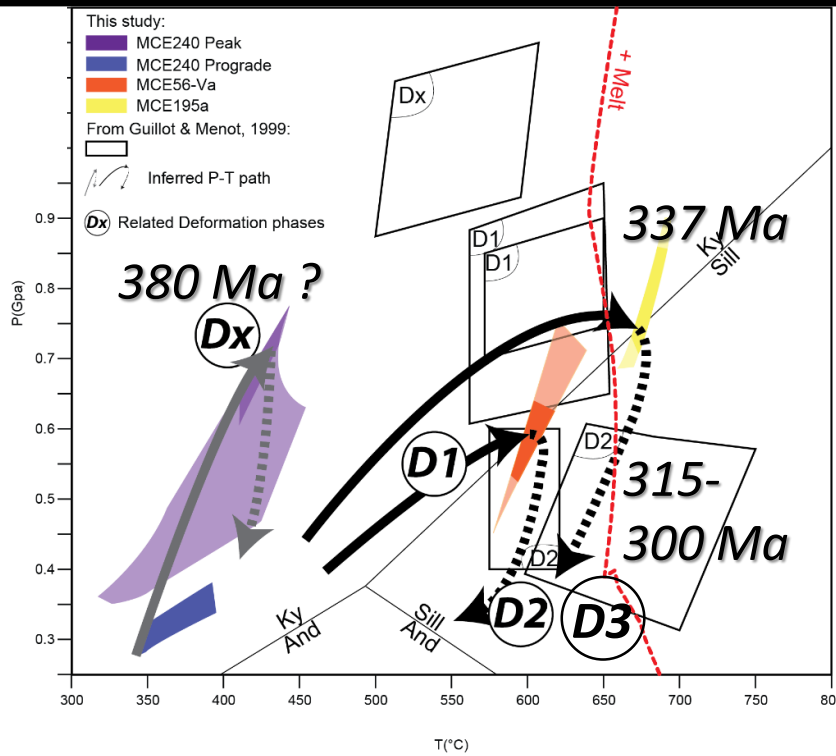
Bi-modal magmatism of the VSU : *c.* 352 Ma

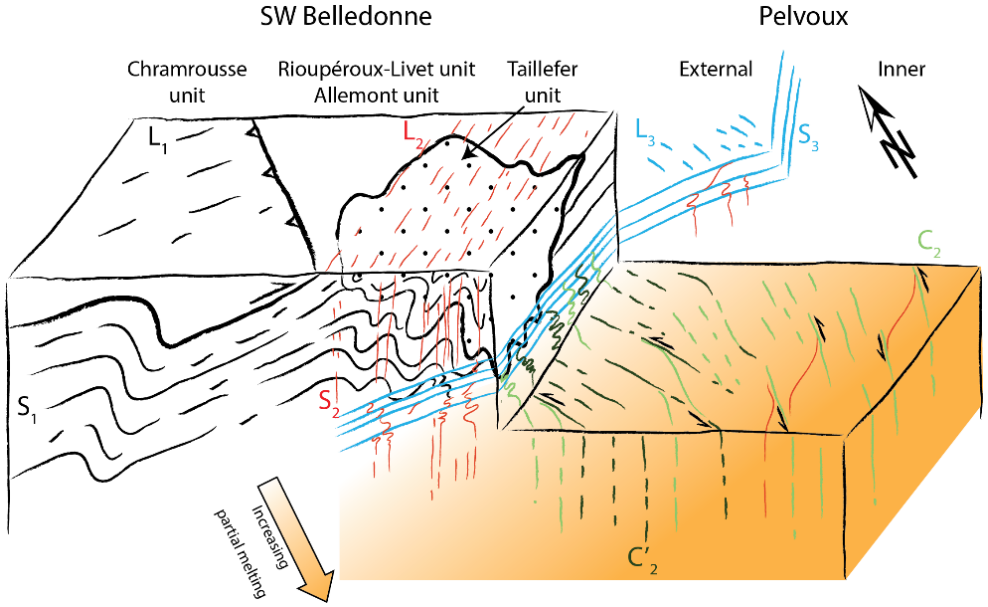
Eastward Nappe stacking (D1): *c.* 338 Ma → M1 HT-MP
S1, L1, F1

Unconformably deposit of the Visean unit : *c. 325 Ma*

Sinistral transpression (D2) : *c. 315-300 Ma* *(Granitoid, Debon & Lemmet 1999)*
Belledonne → F2, S2, L2
Pelvoux → S2, C2, C'2

S3 flat laying transition zone (D3): *c. 315-300 Ma*
Outer Pelvoux → S3, L3
Syn to post D2





- *Belledonne-Pelvoux area exposes two differents tectono-metamorphic expressions of the same history, due to their different structural position in the continental crust*

- *No evidence of late tectonic juxtaposition along a EVSZ*

Thanks for your attention