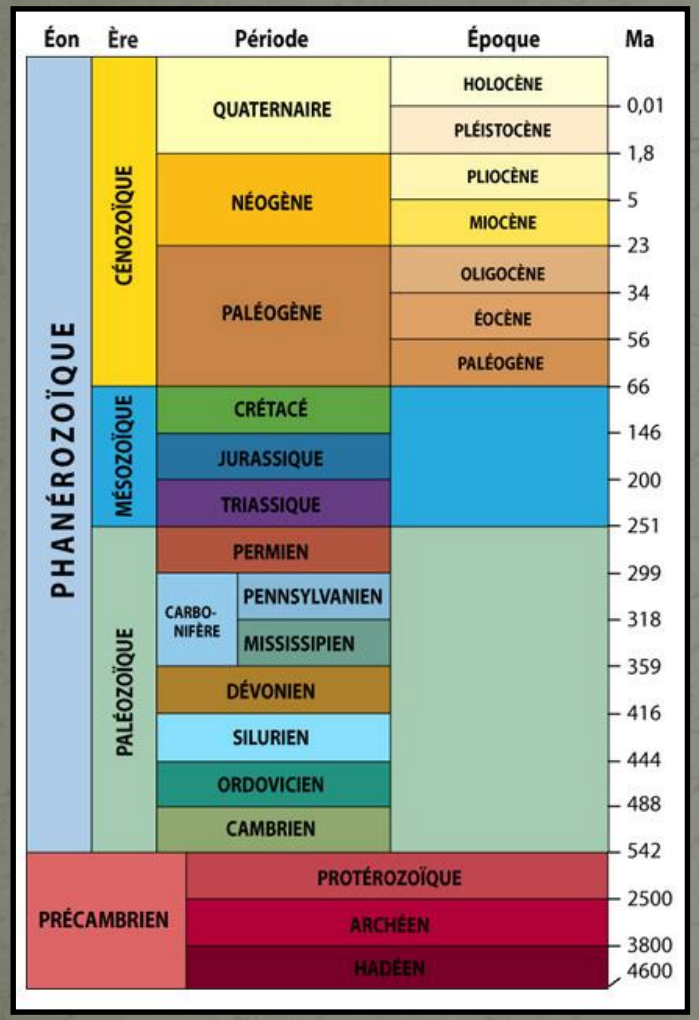
Université de Liège
Faculté des Sciences
Département de Géologie
Laboratoire de Minéralogie

La tonalite de la Helle, une roche magmatique dans les Fagnes

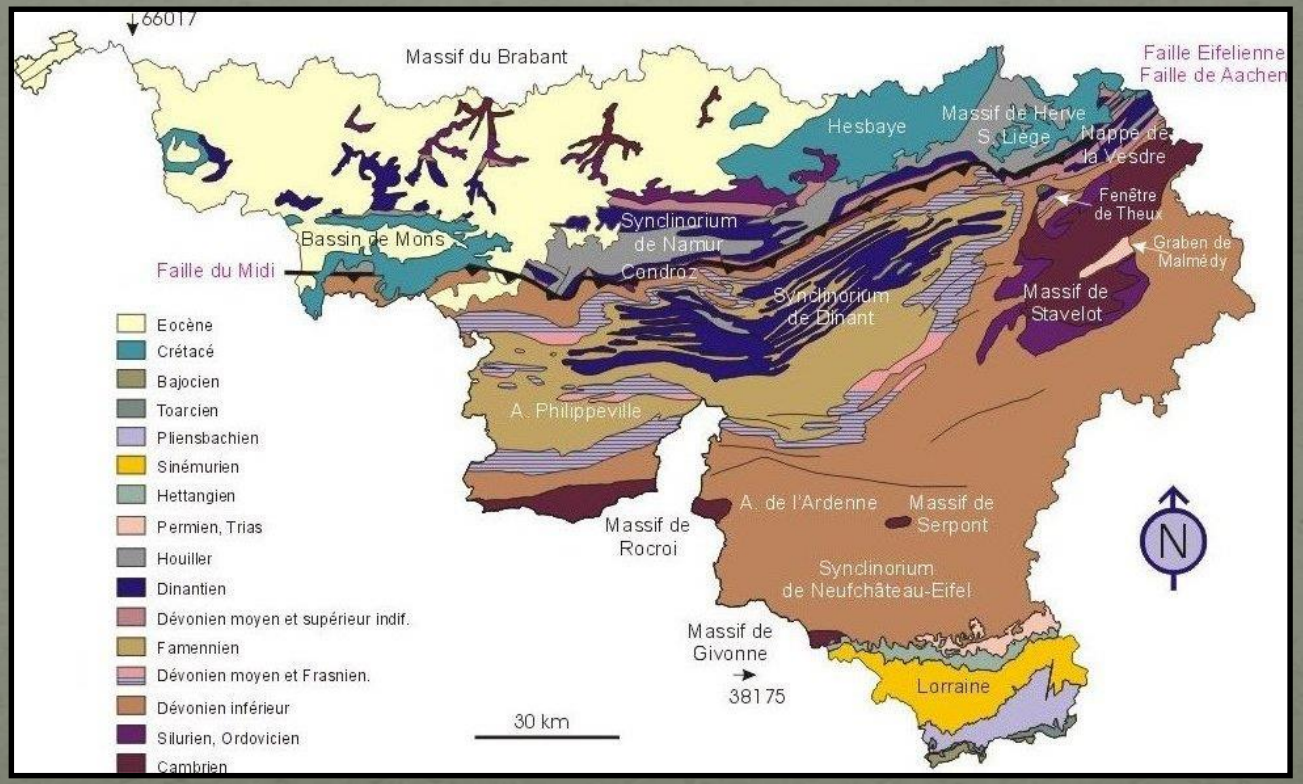
Mont Rigi, le 23 novembre 2024
Prof. Frédéric Hatert

Géologie de la Wallonie

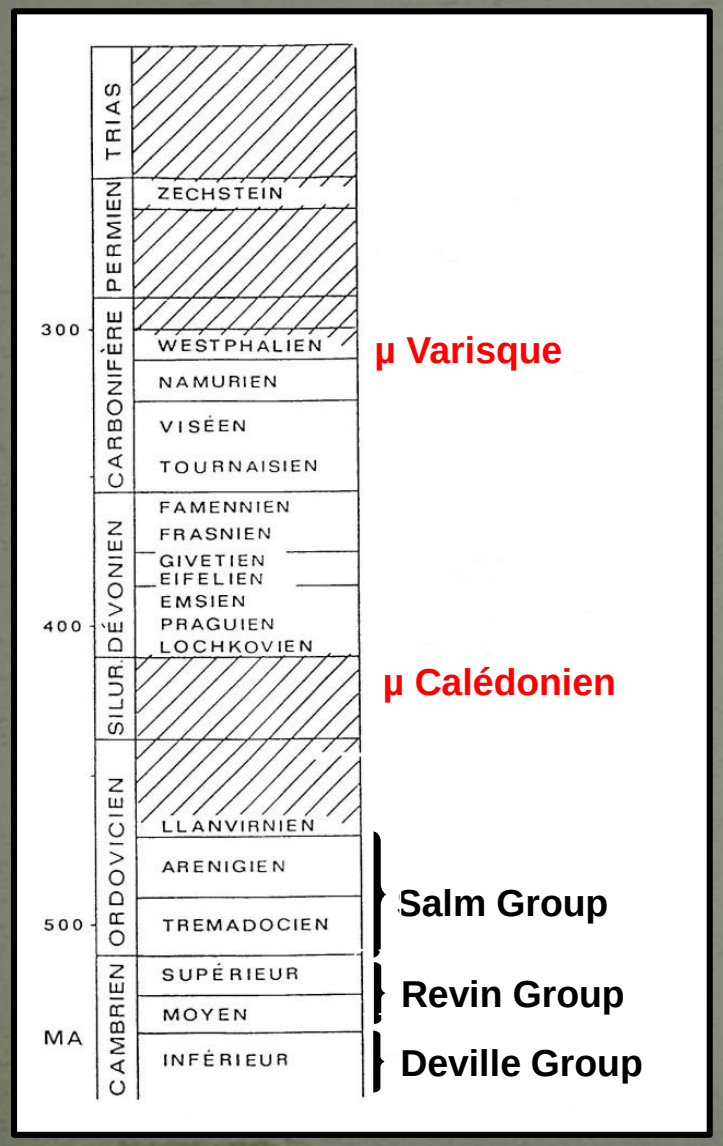


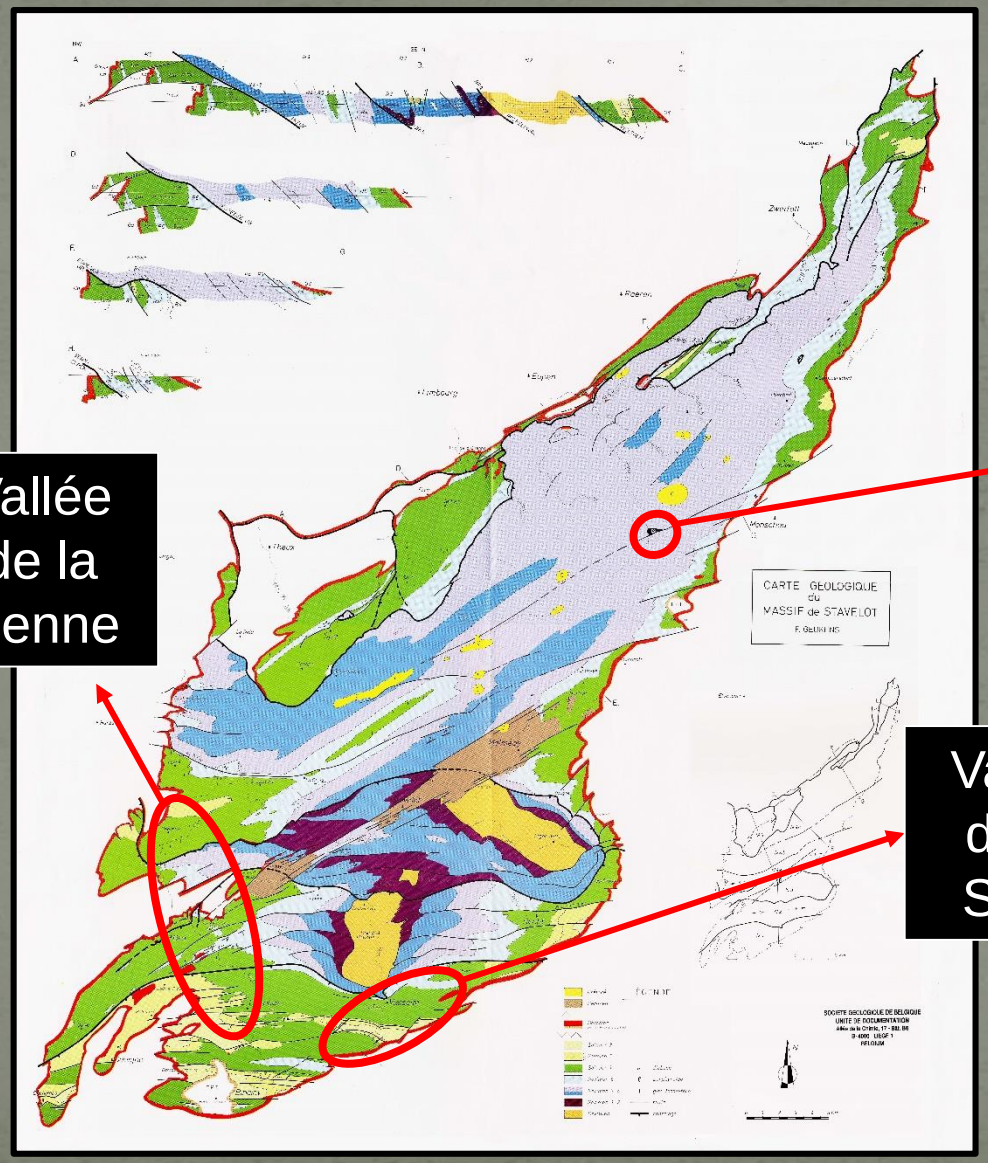
Massifs cambro-ordoviciens

Stavelot, Rocroi, Serpont, Givonne



Le Massif de Stavelot





Métamorphisme calédonien

- Conditions déterminées par Ferket *et al*. (1998)
- Inclusions fluides dans les veines de quartz

- Age: ~ 430 My
- T = 200-350°C
- Effacé par le métamorphisme varisque

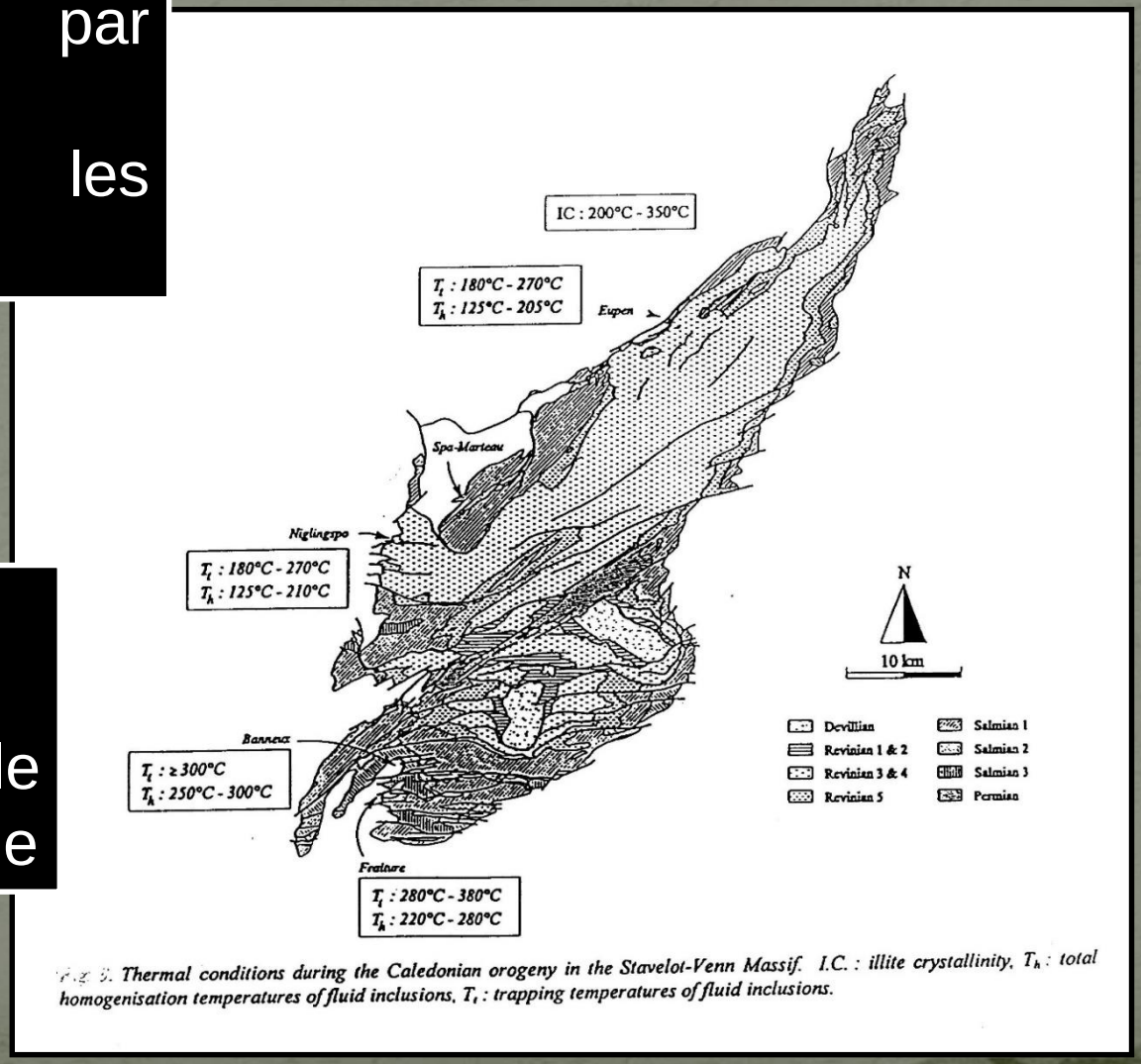
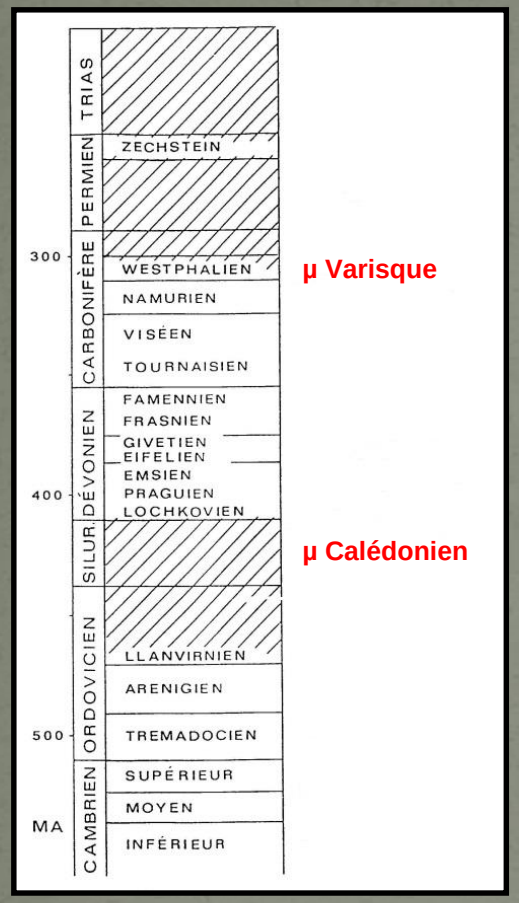


Fig. 3. Thermal conditions during the Caledonian orogeny in the Stavelot-Venn Massif. I.C. : illite crystallinity, T_h : total homogenisation temperatures of fluid inclusions, T_t : trapping temperatures of fluid inclusions.

Métamorphisme varisque



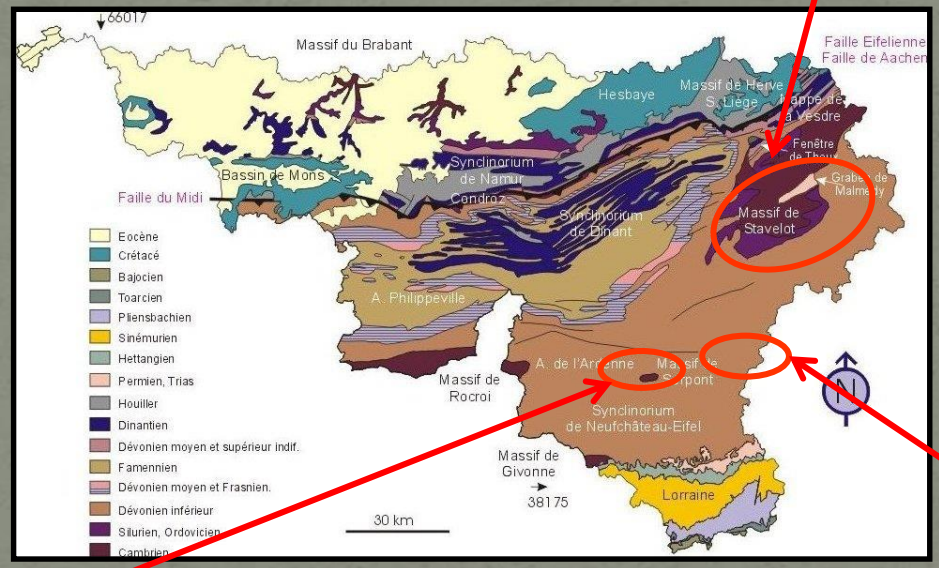
Vallée de la Salm

- Kramm *et al.* (1985)
- Rhodochrosite + quartz

Vallée de la Lienne

- Theye *et al.* (1996)
- Carpholite

Massif de Stavelot
360-420°C/2 kbar (Salm Valley)
300°C/1-2 kbar (Lienne Valley)

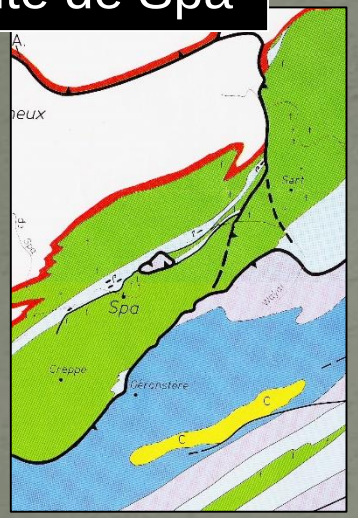


Zone de Libramont
500°C/3-4 kbar

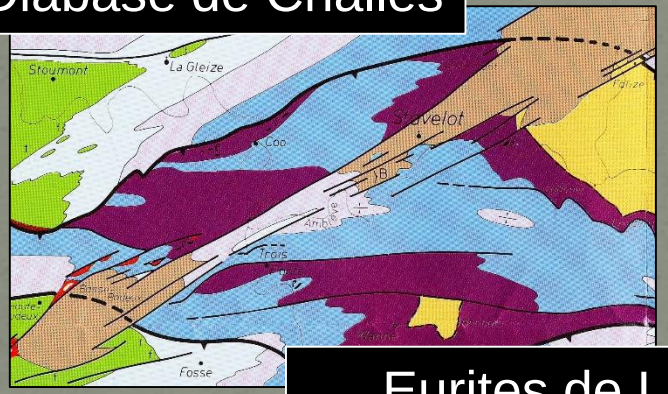
Zone de Bastogne
400°C/2 kbar

Roches magmatiques

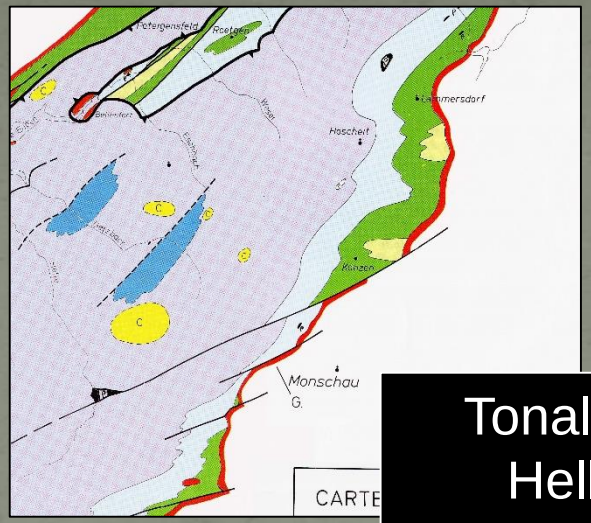
Eurite de Spa



Diabase de Challes

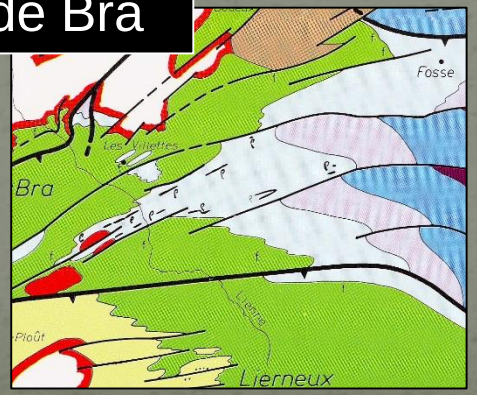


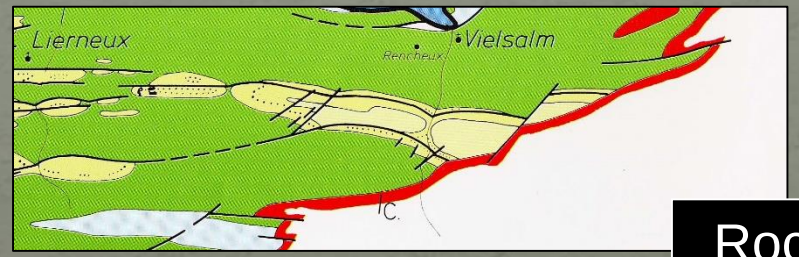
Eurites de La Gleize et Coo

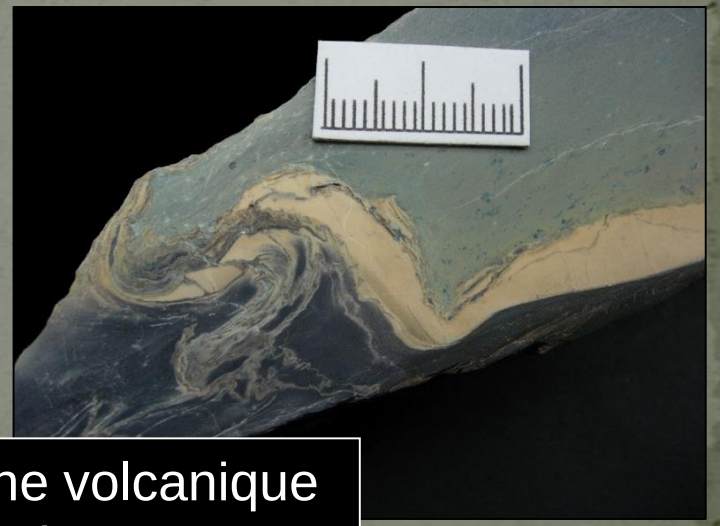


Tonalites de la Helle et de Lammersdorf

Eurites de Bra

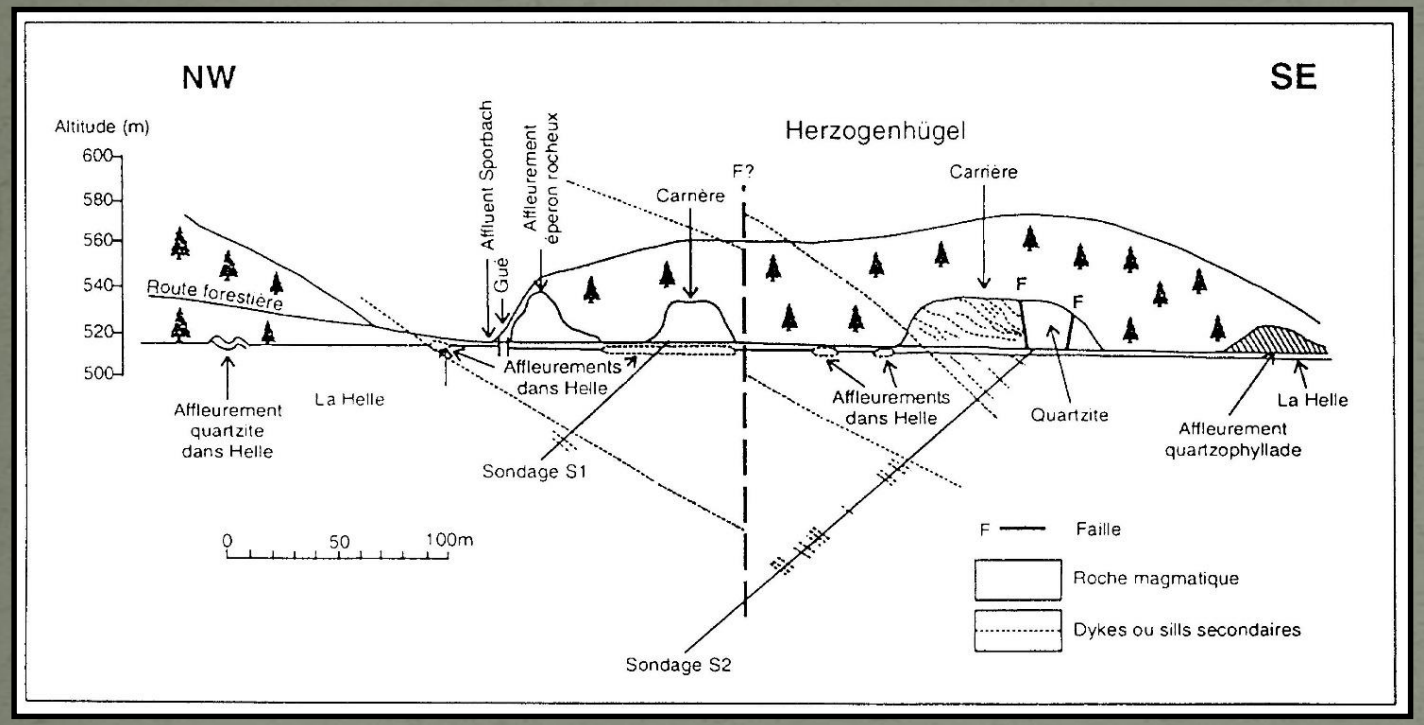


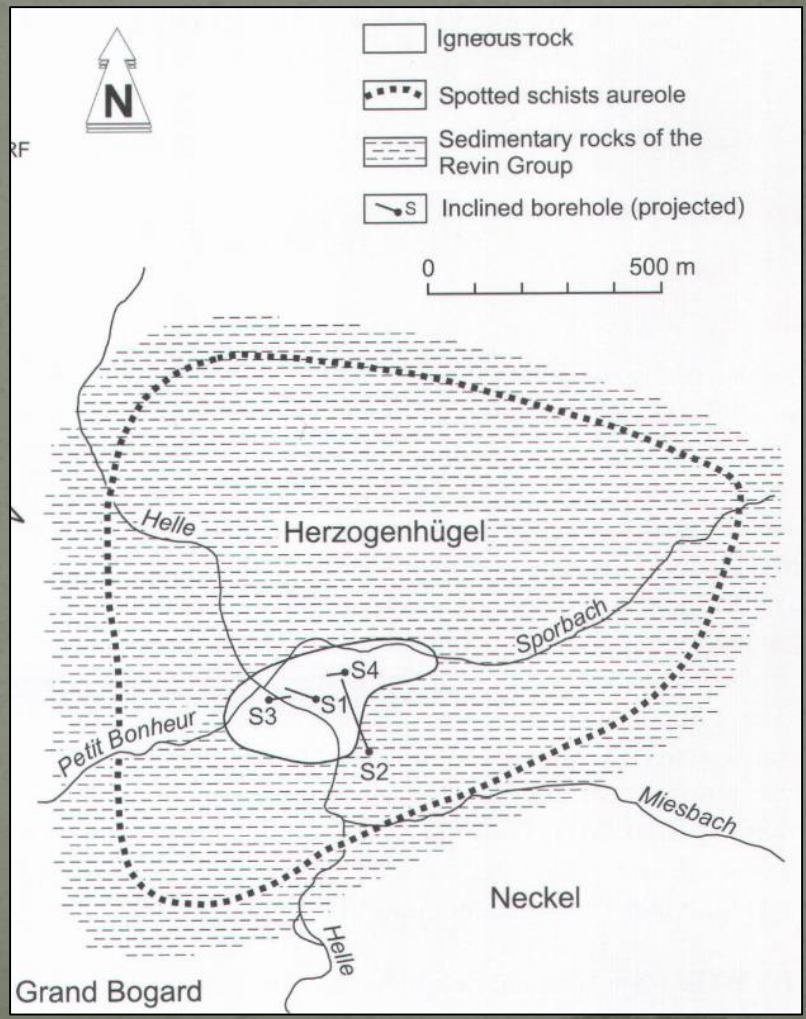




Roche volcanique de Sart

Herzogenhügel (Ternell)





Les affleurements de tonalite

La Helle

Affleurement de tonalite

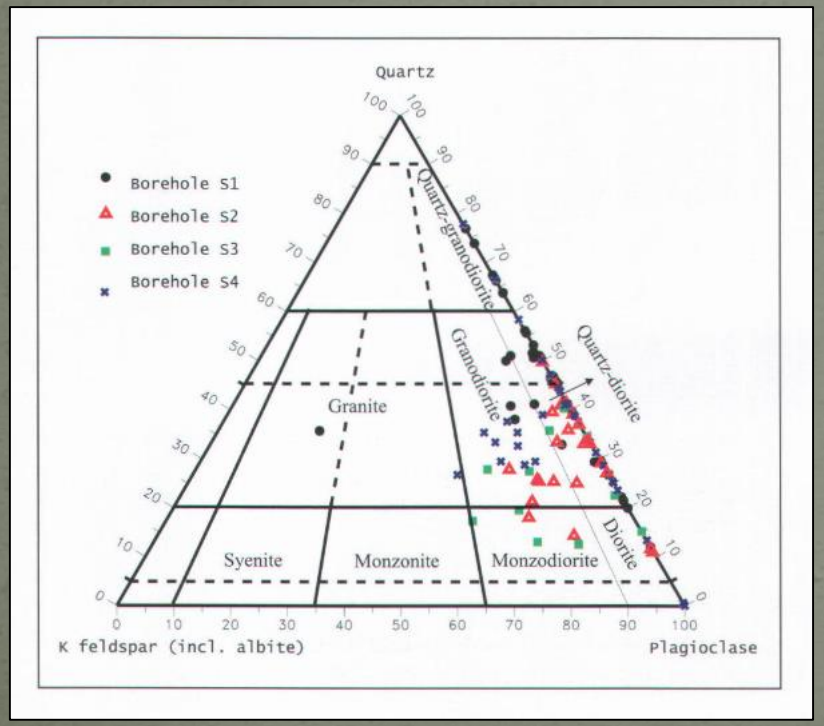
Quartzites reviniens

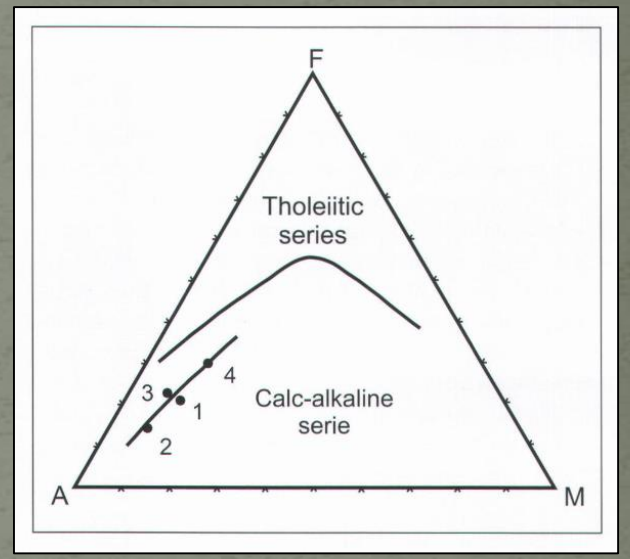
Nature de la roche

GEOLOGICA BELGICA (2003) 6/1-2: 43-47

THE HELLE IGNEOUS ROCK AND ASSOCIATE PORPHYRY COPPER MINERALIZATION (EASTERN BELGIUM): A SUMMARY OF THE PRESENT-DAY KNOWLEDGE

Léon DEJONGHE





- Granodiorite à diorite quartzique
- Magma appartenant à la série calco-alcaline
- Caractéristique des zones de subduction

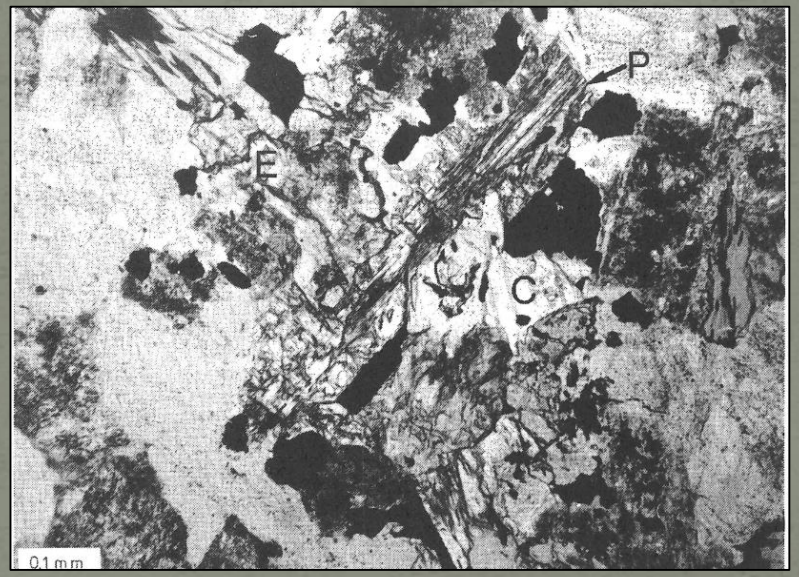
Conditions métamorphiques

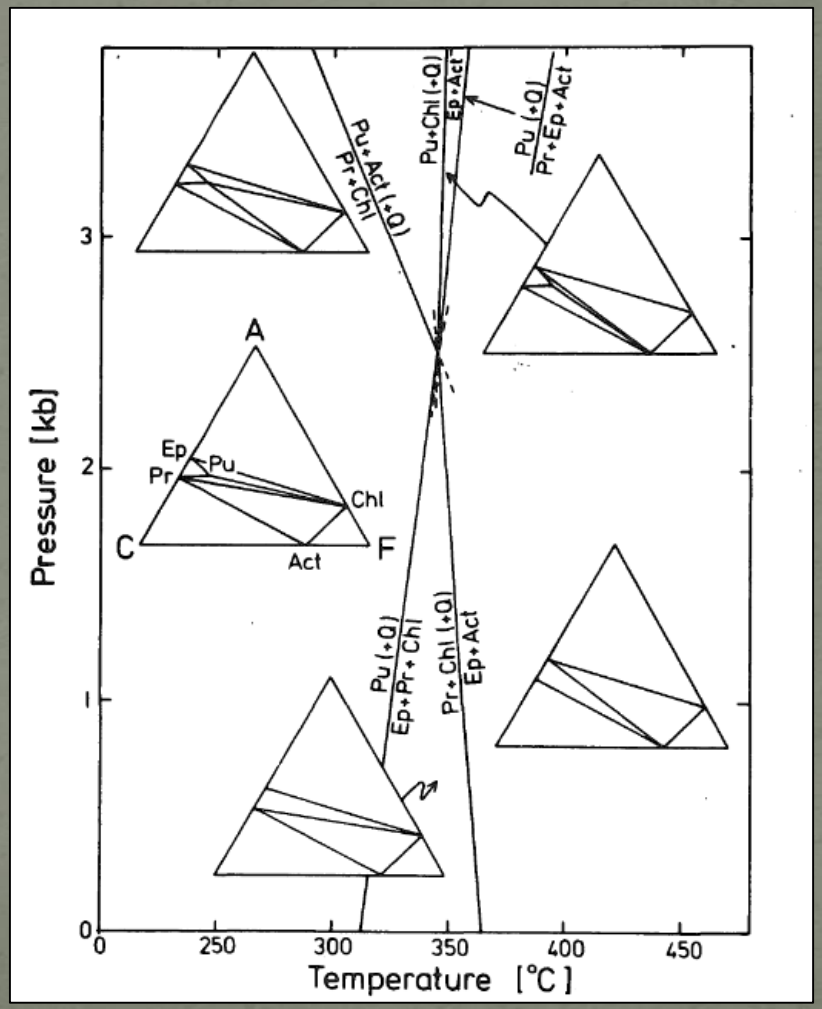
Annales de la Société Géologique de Belgique, T. 101 – 1978, pp. 227 – 241 mai 1979

PREHNITE/CHLORITE AND ACTINOLITE/EPIDOTE BEARING MINERAL ASSEMBLAGES IN THE METAMORPHIC IGNEOUS ROCKS OF LA HELLE AND CHALLES, VENN–STAVELOT–MASSIF, BELGIUM[1]

by

W. SCHREYER & K. ABRAHAM[2]



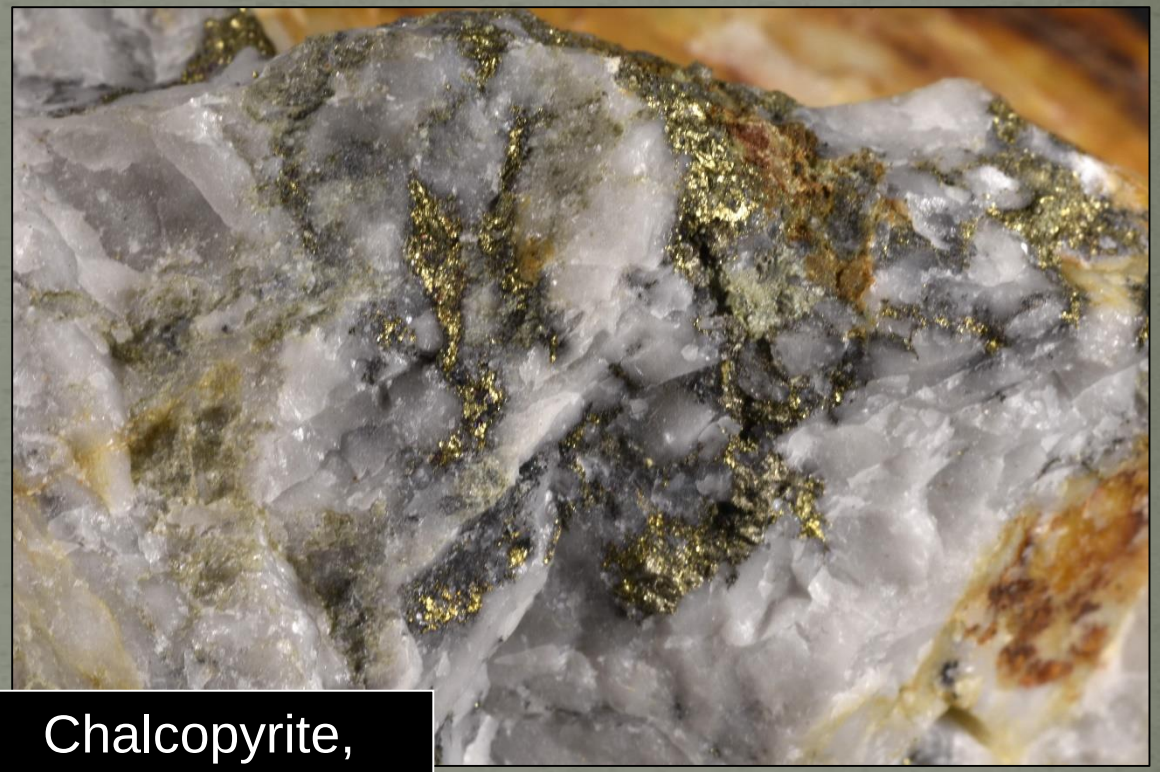


- Estimation des conditions métamorphiques
- T = 320 à 360°C – P < 2,5 kbar

Minéralisation en sulfures primaires

Pyrrhotite, $Fe_{1-x}S$

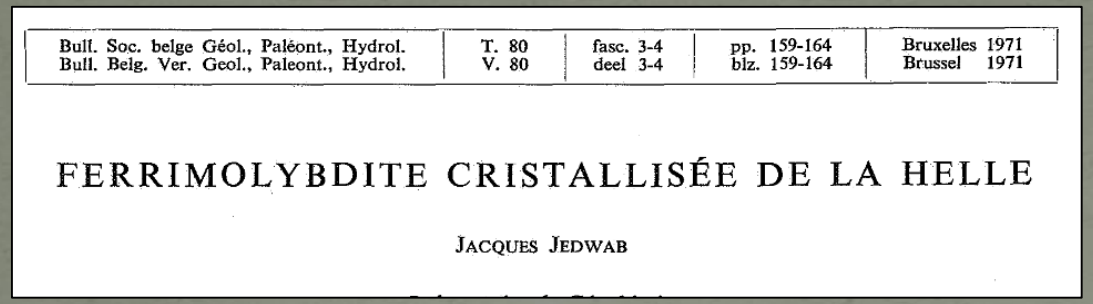
@ A. Bouvy



Chalcopyrite, $CuFeS_2$

@ A. Bouvy

Molybdénite et ferrimolybdite



Bull. Soc. belge Géol., Paléont., Hydrol.	T. 80	fasc. 3-4	pp. 159-164	Bruxelles 1971
Bull. Belg. Ver. Geol., Paleont., Hydrol.	V. 80	deel 3-4	blz. 159-164	Brussel 1971

FERRIMOLYBDITE CRISTALLISÉE DE LA HELLE

JACQUES JEDWAB

Ferrimolybdite, $Fe^{3+}_2(MoO_4)_3.8H_2O$

@ A. Bouvy

Molybdénite, MoS_2

Gisement de type « Porphyry copper »

Séquences génétiques

La minéralisation des tonalites de la Helle et de Lammersdorf et leurs relations avec les autres minéralisations,

par L. VAN WAMBEKE.

1956

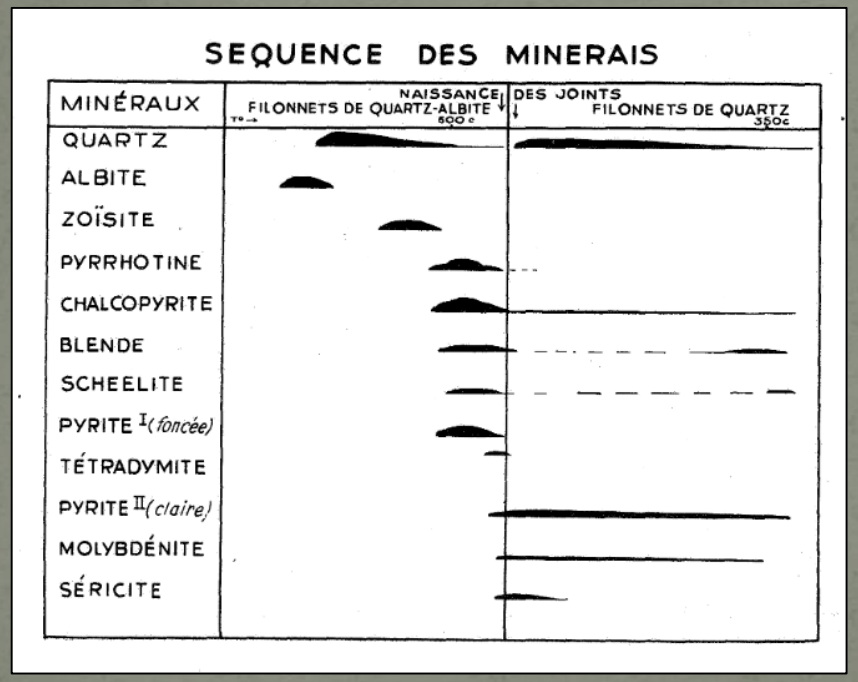
Annales de la Société Géologique de Belgique, T. 103 – 1980, pp. 15-23 décembre 1980

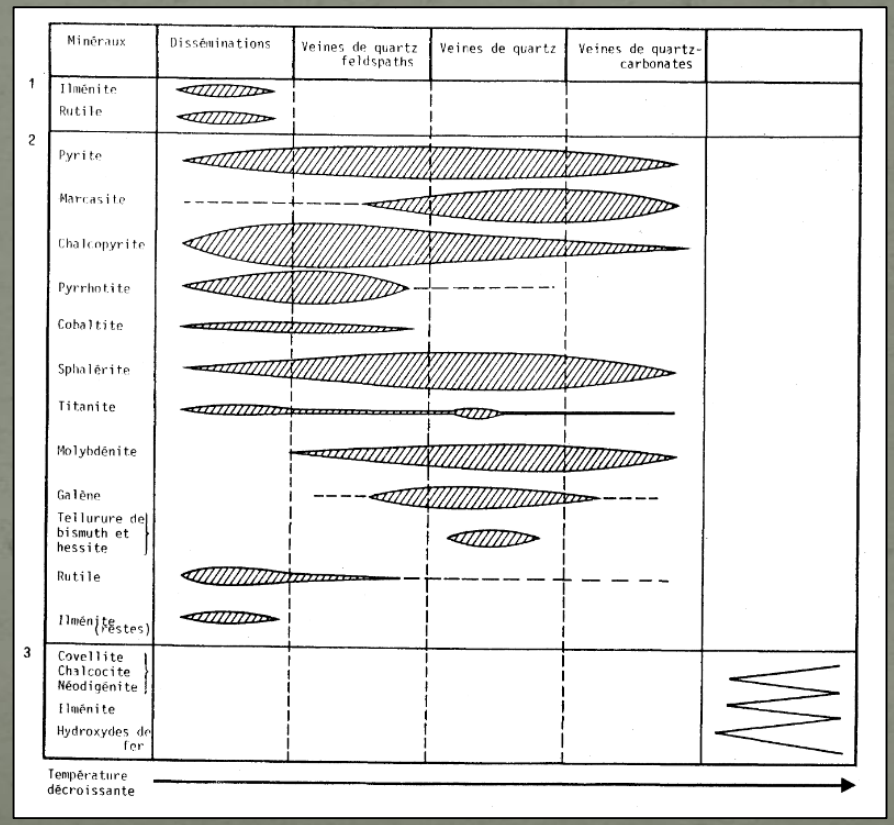
LES ASSOCIATIONS DES MINERAUX OPAQUES ET SEMI-OPAQUES DE LA ROCHE IGNEE DE LA HELLE [1]

par

WEIS, D.[2], DEJONGHE, L.[3] & HERBOSCH, A.[2]

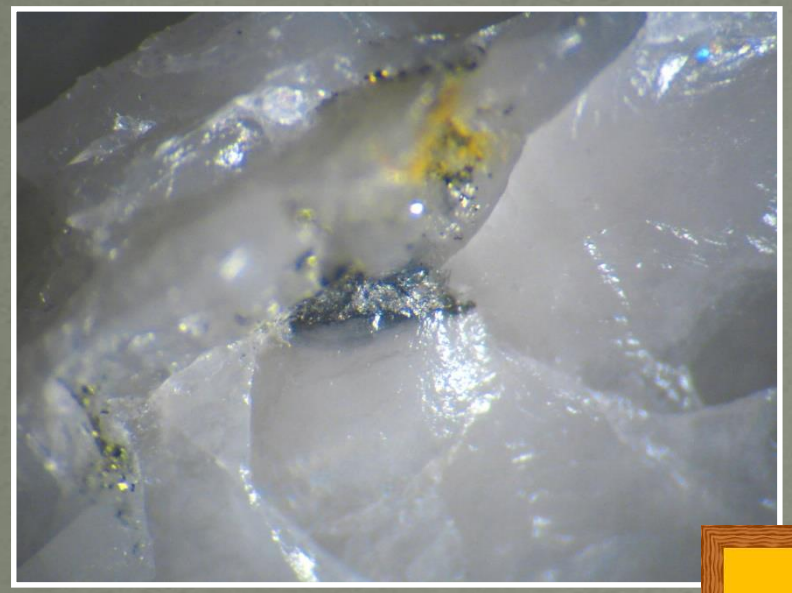
(1 planche, 2 figures et 1 tableau)



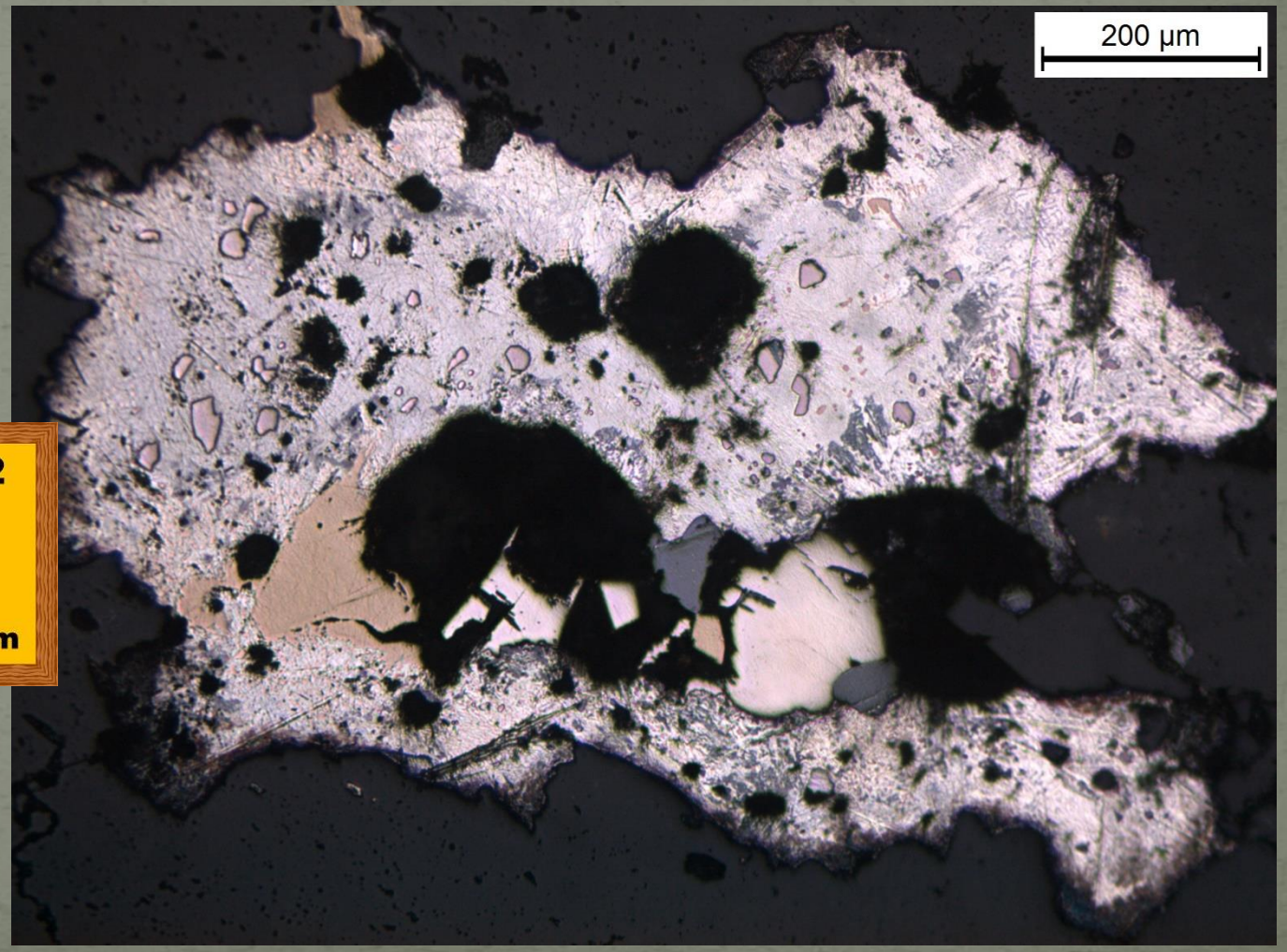


Tellurures, cobaltite, scheelite (?)

Inclusions de tellurures

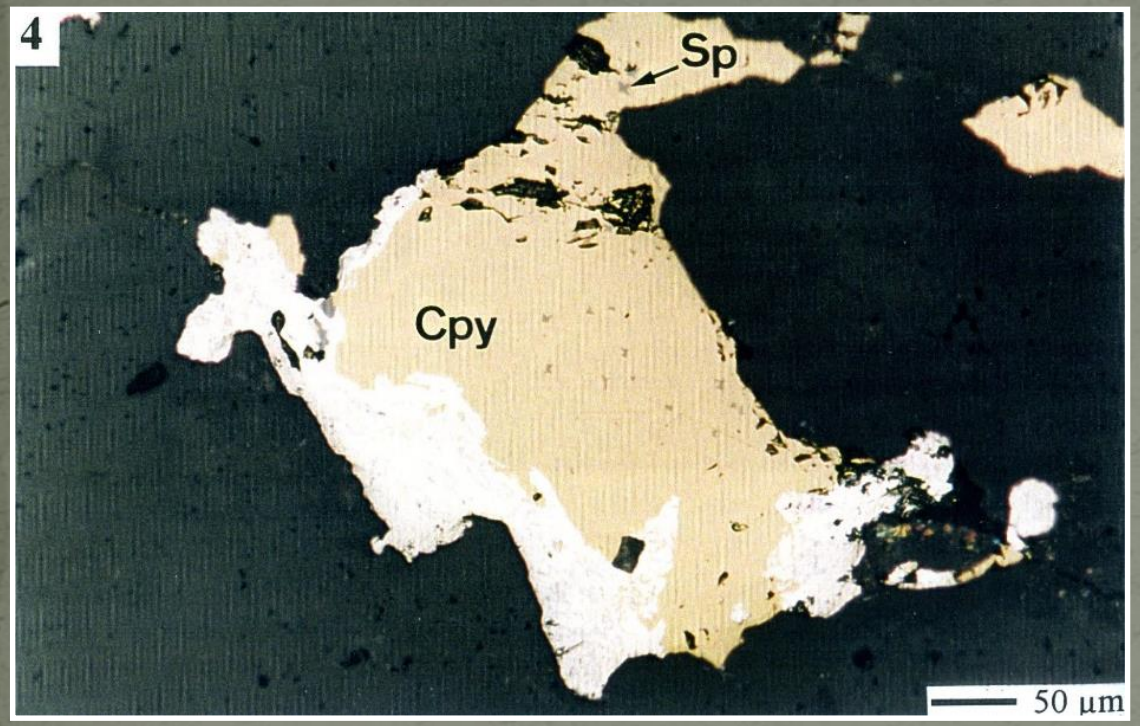


52
Te
Tellurium

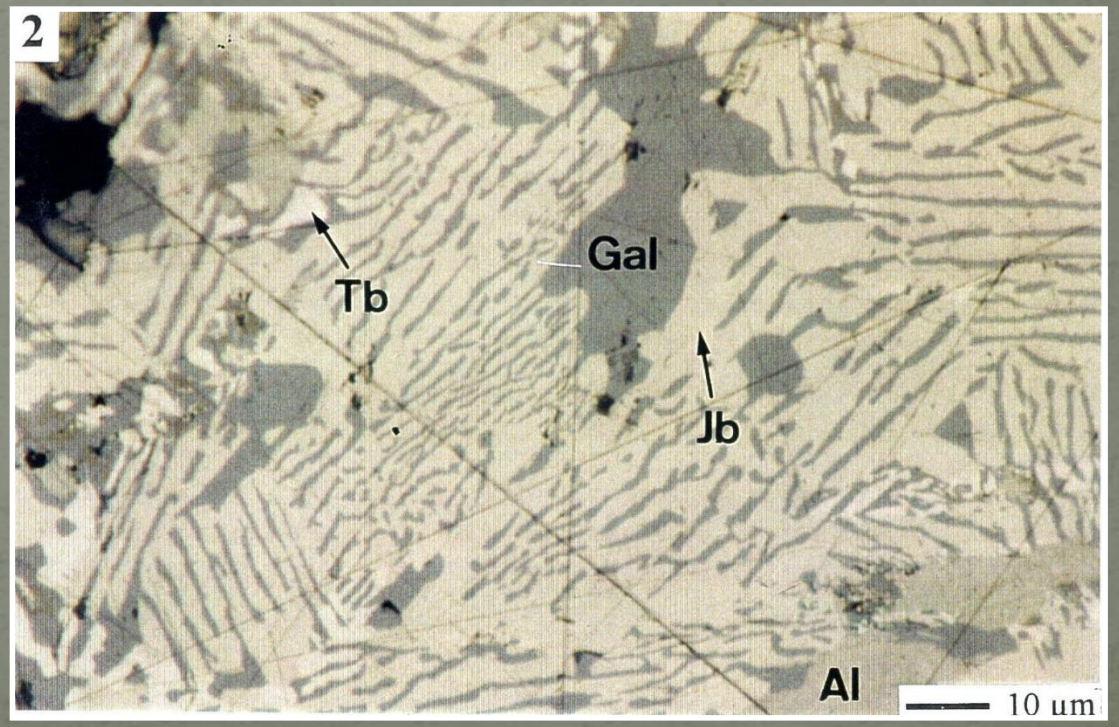


Chalcopyrite: $Cu_{1,00}Fe_{0,99}S_{2,01}$
Marcasite: $Fe_{1,00}S_{2,00}$
Pyrrhotite: $Fe_{0,86}S_{1,00}$

Inclusions de tellurures



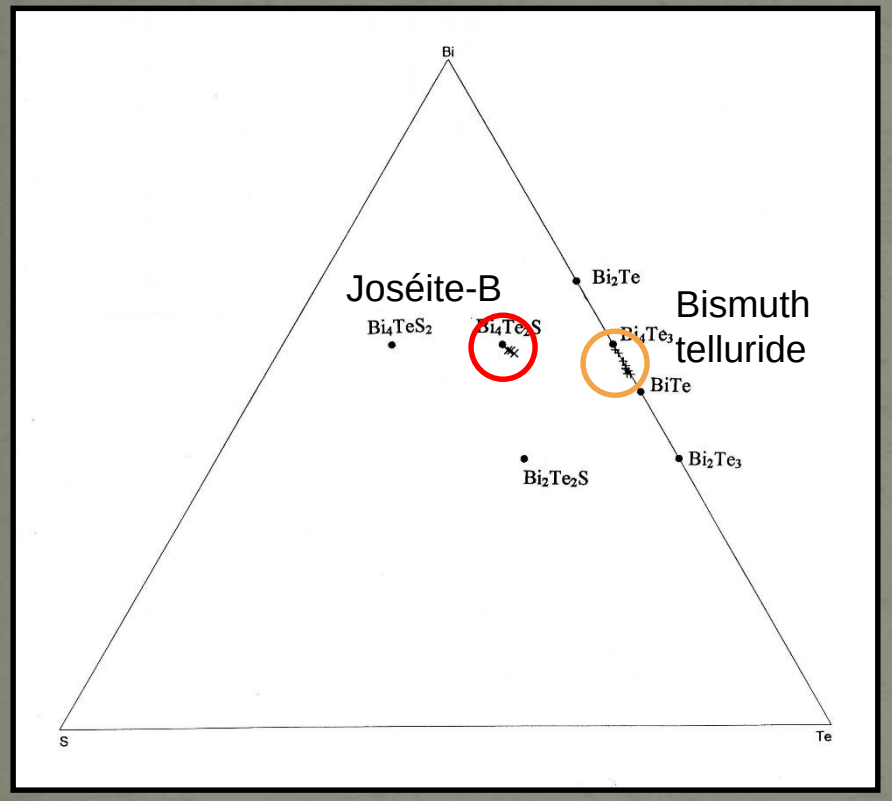
Sphalérite: $(Zn_{0,88}Fe_{0,11})S_{1,01}$
Galène: $(Pb_{0,96}Bi_{0,02}Ag_{0,02})S_{1,00}$



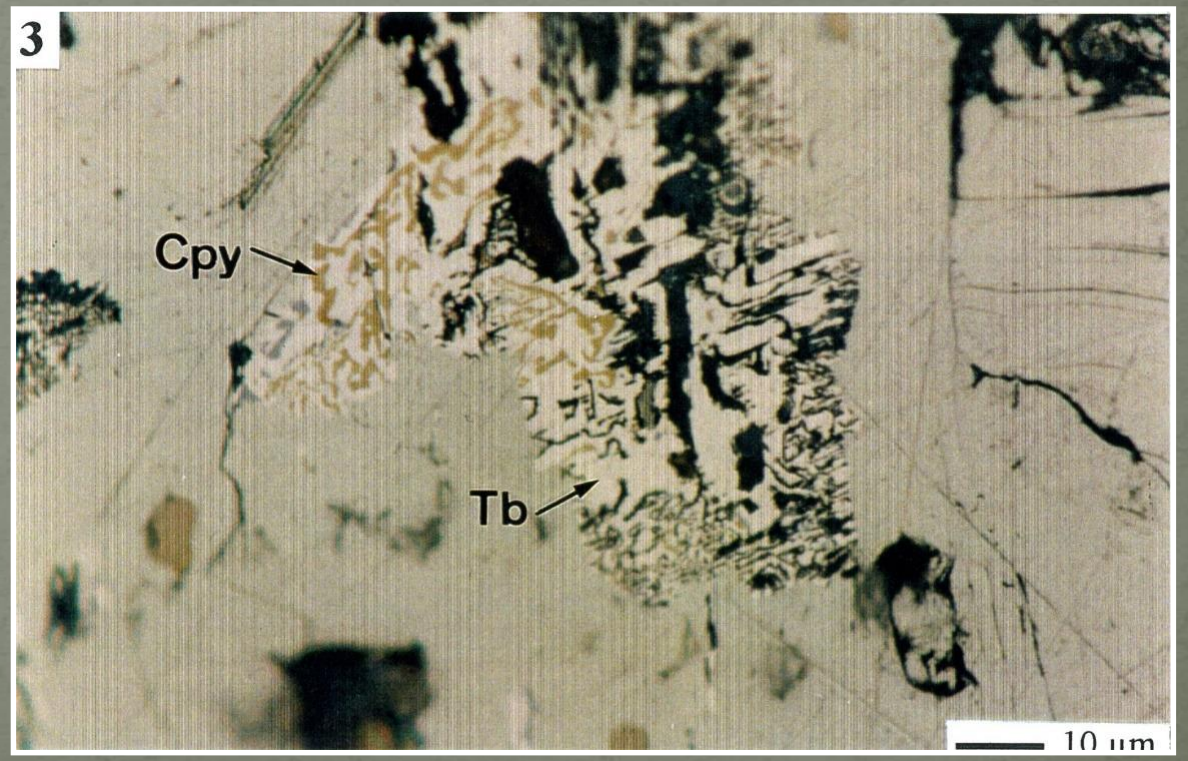
Joséite-B: $(Bi_{3,83}Pb_{0,09})Te_{2,08}(S_{0,93}Se_{0,06})$

Joséite-B Bi_4Te_2S

Inclusions de tellurures

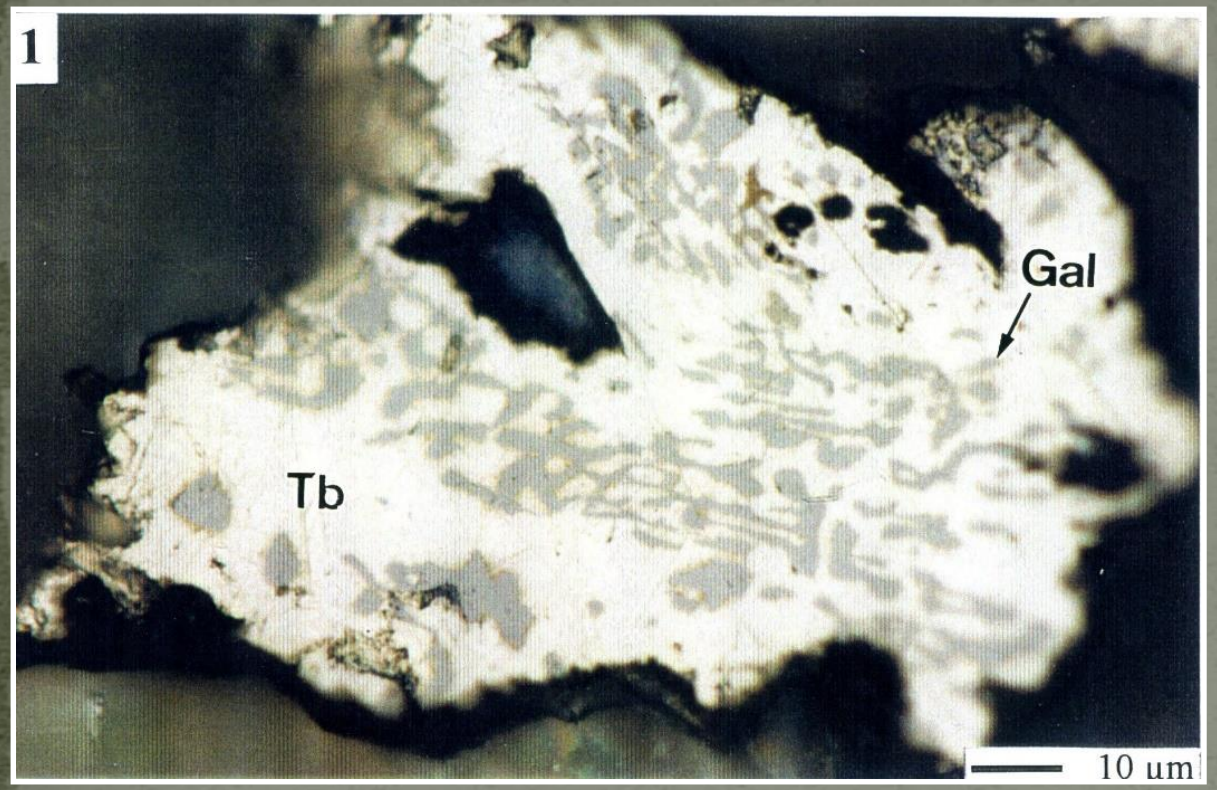


- Tellurure de bismuth, plus blanc que la joséite-B.
- Composition chimique entre celles de la tsumoïte (BiTe) et de la pilsénite (Bi_4Te_3)



Nouvelle espèce minérale?

Inclusions de tellurures

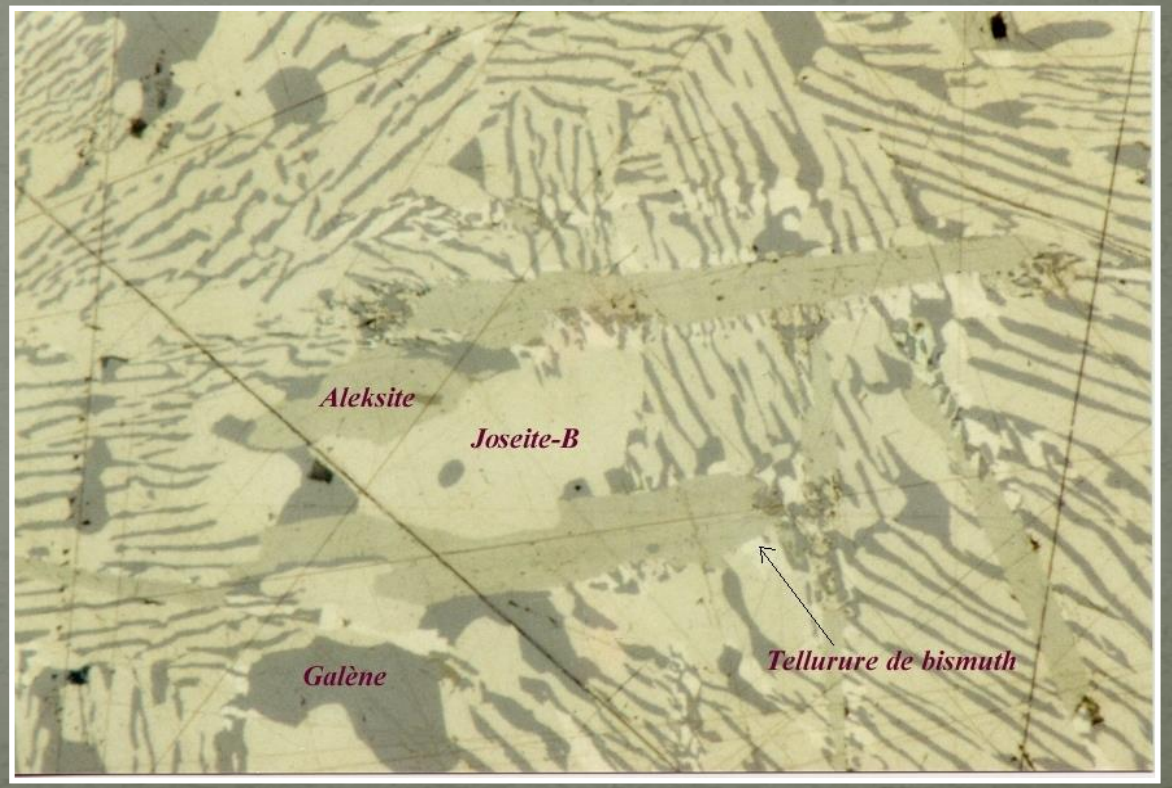


Benjaminite
$Ag_3Bi_7S_{12}$

Benjaminite:
$(Ag_{1,80}Pb_{1,20})(Bi_{5,56}Pb_{0,82}Cu_{0,58})(S_{11,39}Te_{0,33})$

Aleksite: $(Pb_{0,76}Bi_{0,28})Bi_{2,00}Te_{1,99}S_{1,90}$
Hessite: $Ag_{1,99}Te_{1,01}$

Aleksite
$PbBi_2Te_2S_2$



Conclusions

- La tonalite de la Helle est une roche magmatique intrudée dans les quartzites reviniens durant le Silurien.
- Elle peut être classée comme granodiorite à diorite quartzite.
- Durant le métamorphisme varisque, elle a été affectée par des températures et pressions atteignant 320-360°C et 2,5 kbar.
- Chalcopyrite et molybdénite permettent de la ranger parmi les gisements de type « porphyry copper ».
- Les minéraux de tellure rares et variés observés dans les veines de quartz confirment la nature remarquable de ce gisement.