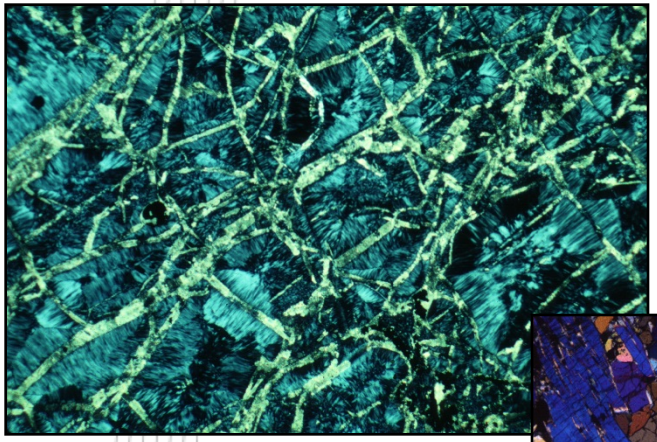

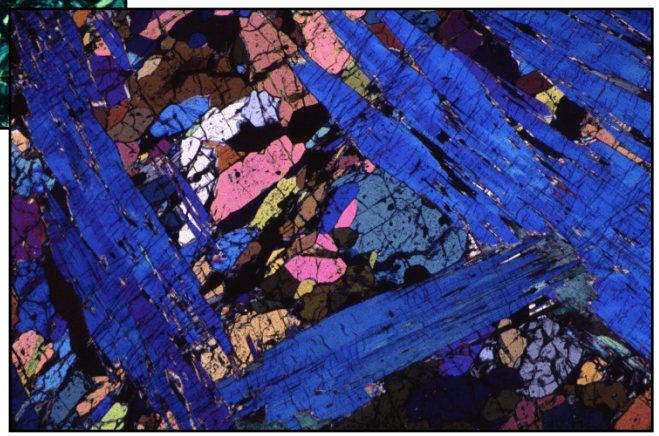

- Low grade metamorphism, hydration
- Prograde metamorphism, mixed volatile equilibria
- Modification of sulfides

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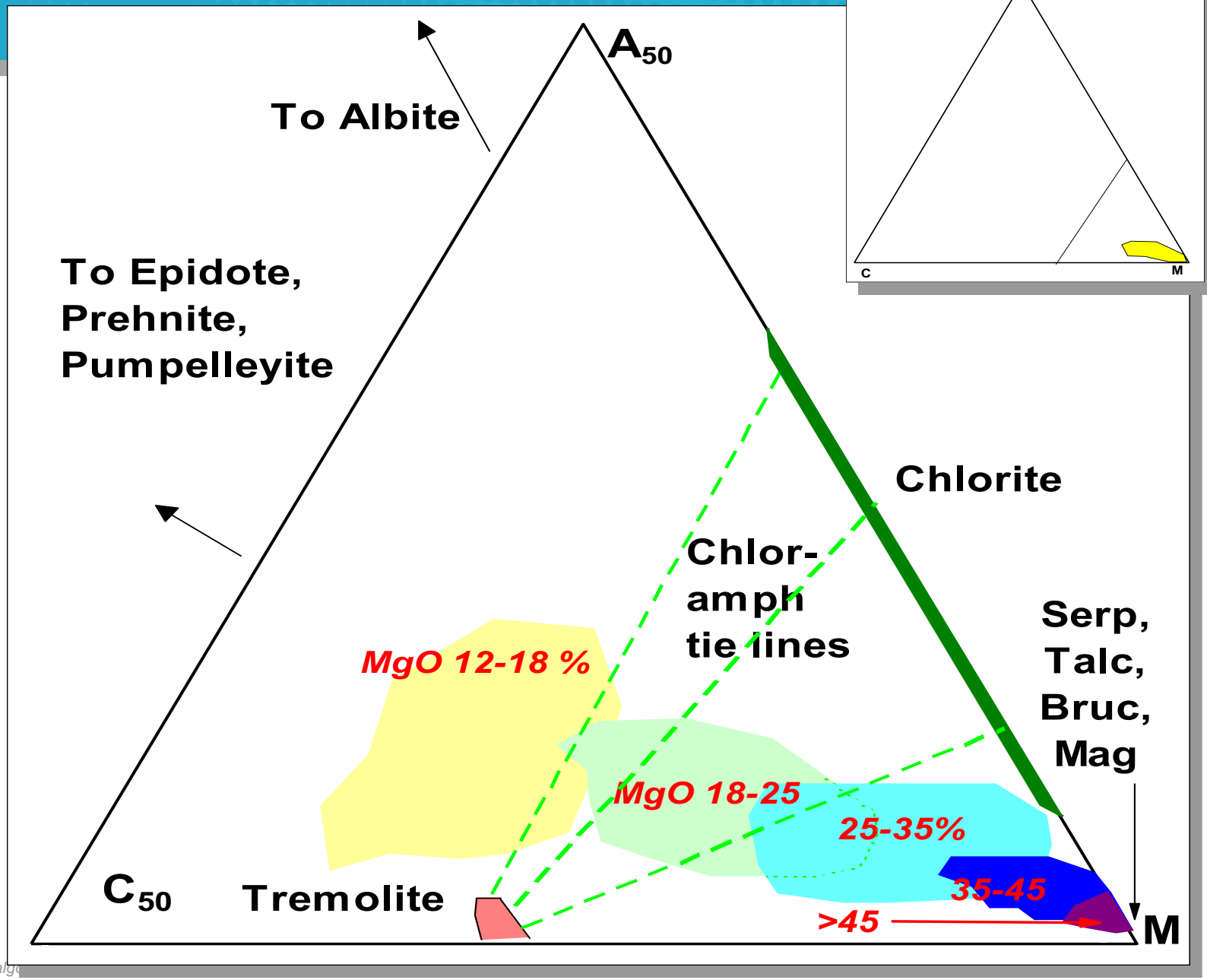
Alteration and metamorphism of Komatiites

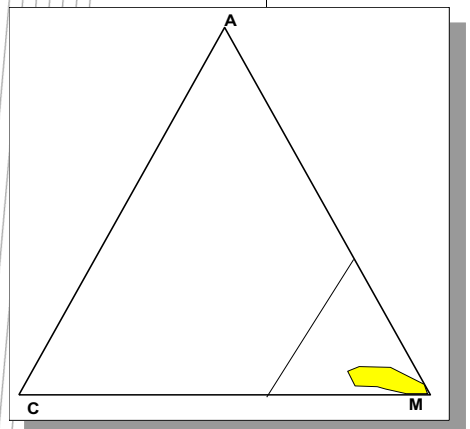
CSIRO Nickel Exploration Short Course
Kalgoorlie August 29-30 2007

CSIRO

Phase relations at **greenschist** facies, and compositional range of komatiites in Al_2O_3-CaO-[MgO+FeO] system



Phase relations at **amphibolite** facies, and compositional range of komatiites in Al_2O_3-CaO-[MgO+FeO] system



To Anorthite

A_{50}

To Epidote

Chlorite

Chlor-amph tie lines

Oliv, Talc Anth Enst

Hornblende

MgO 12-18

MgO 18-25

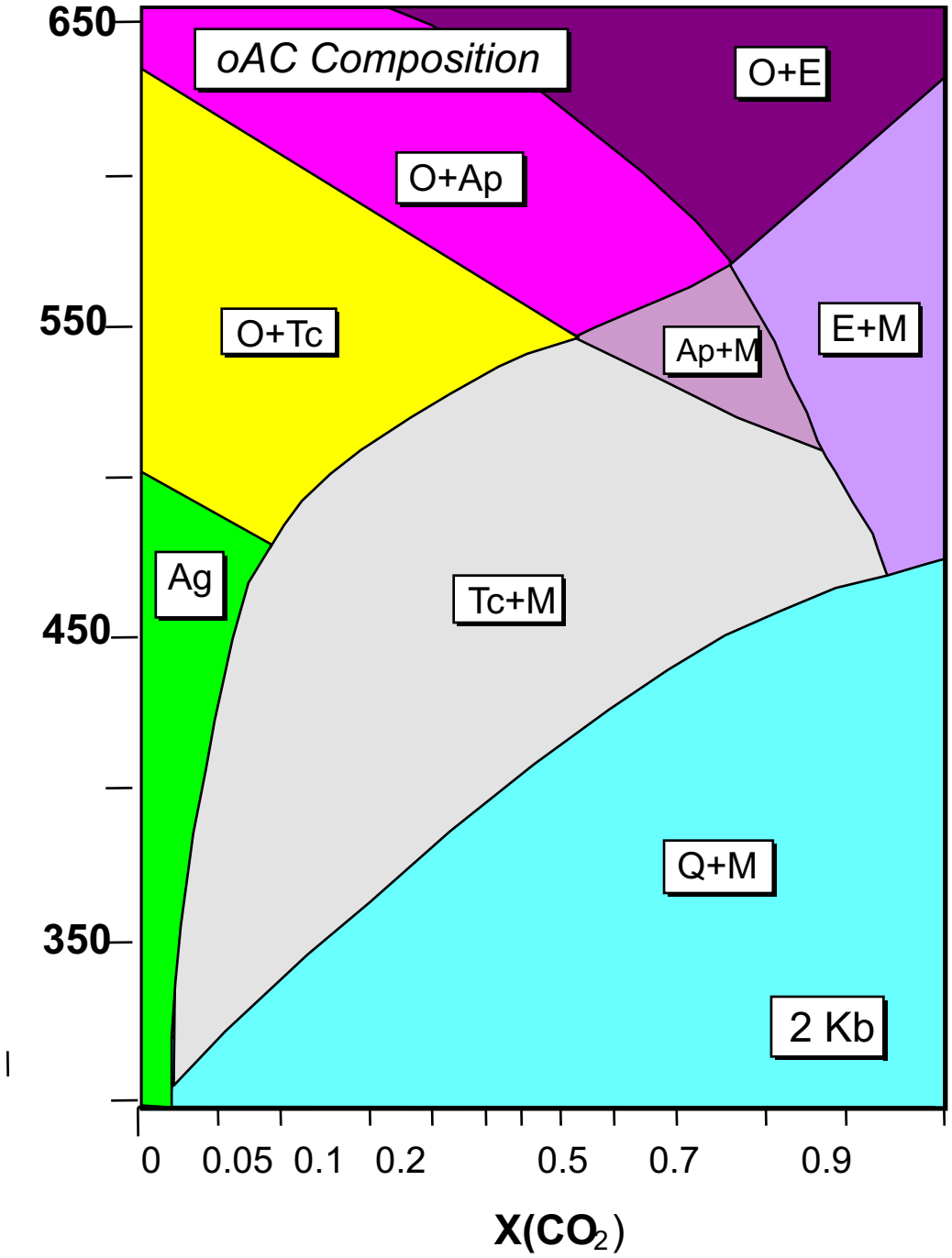
25-35

35-45

C_{50}

Tremolite

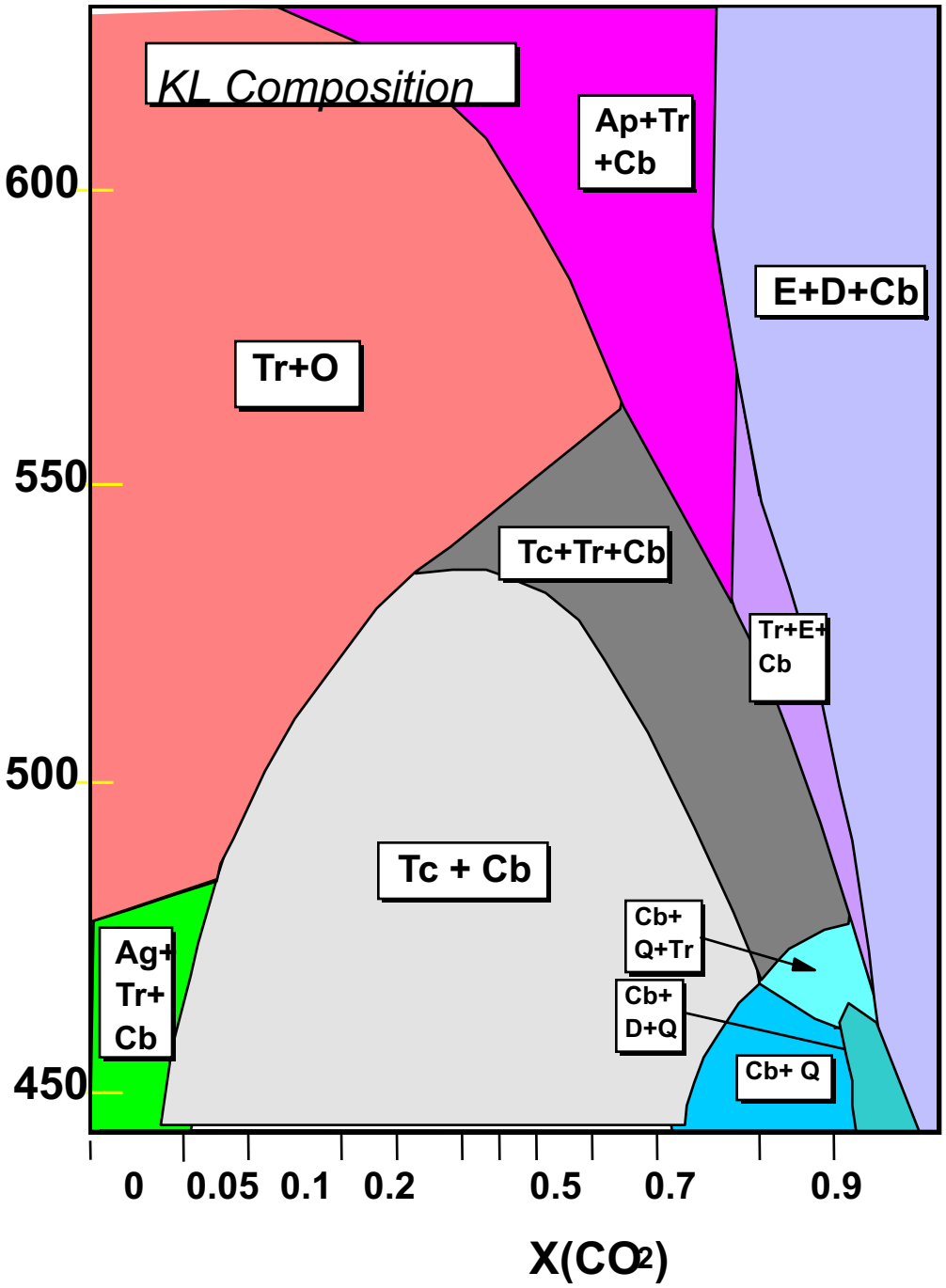
M



T-X(CO_2) section for model 50% MgO olivine mesocumulate

O=olivine, E=enstatite, Ap=anthophyllite, Tc=talc, Ag=antigorite, M=magnesite, Q=quartz.

All assemblages in equilibrium with chlorite

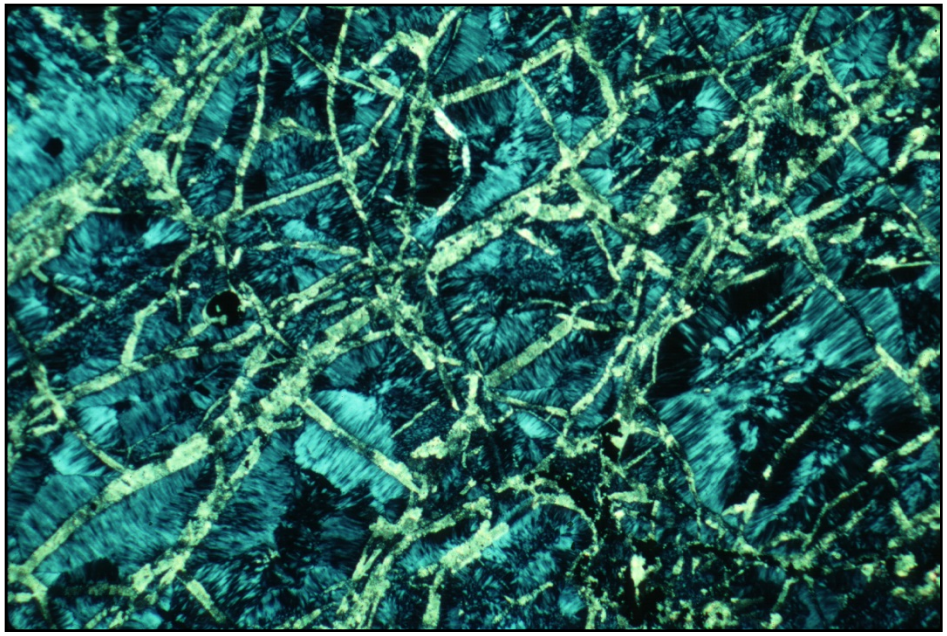


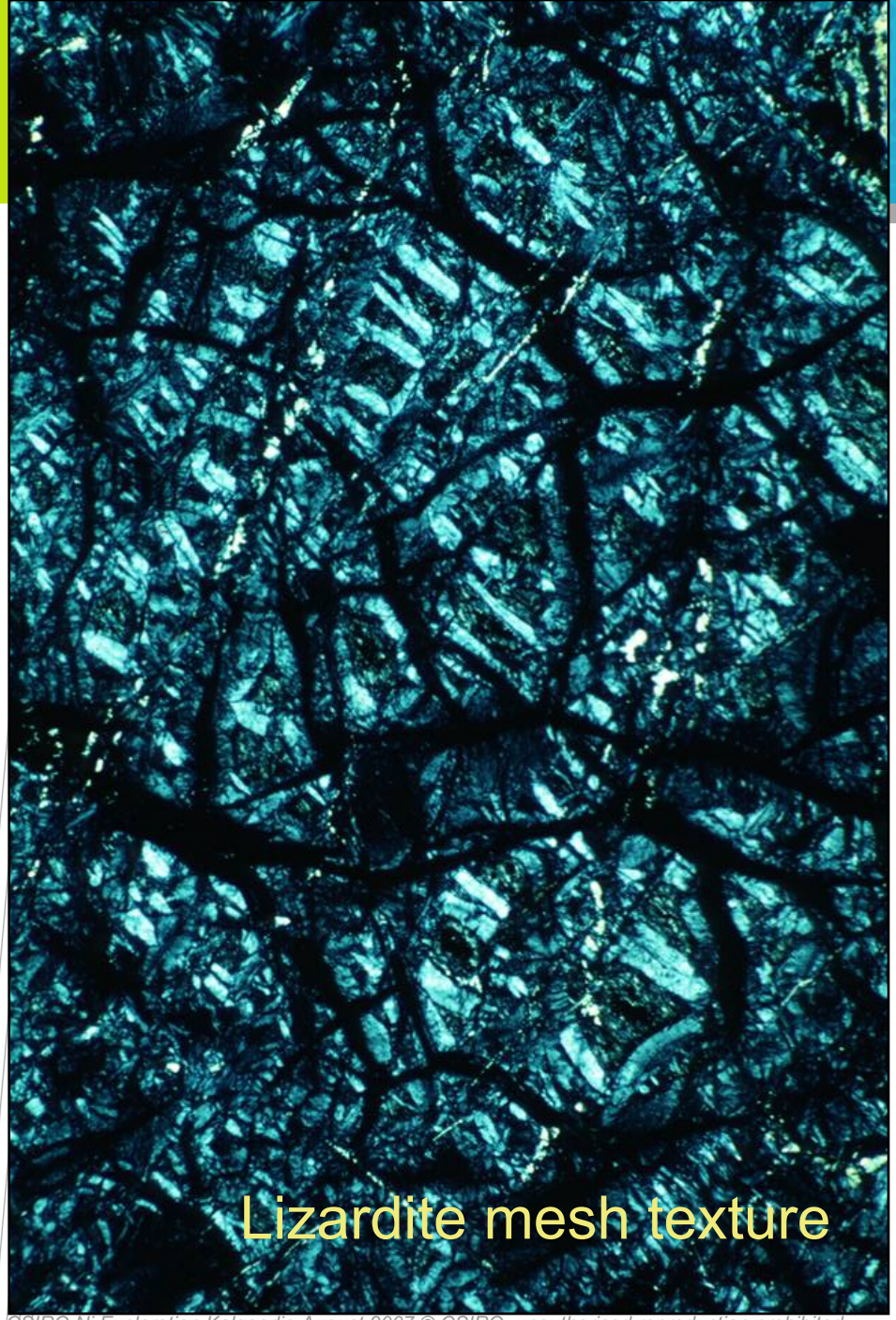
T-X(CO_2) section for model 28% MgO komatiite composition

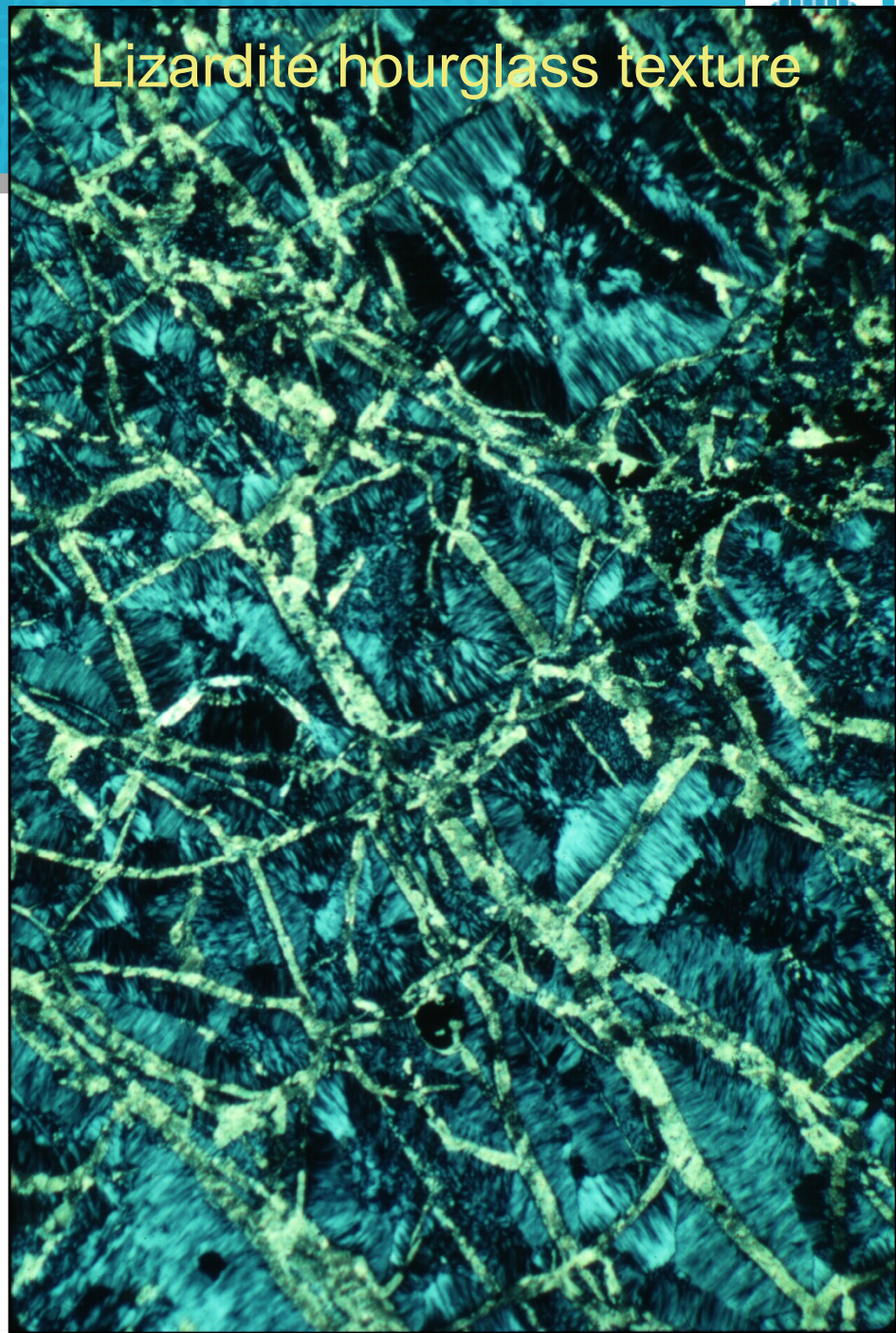
O=olivine, E=enstatite, Ap=anthophyllite, Tr=tremolite, Tc=talc, Ag=antigorite, B=brucite, M=magnesite, D=dolomite.

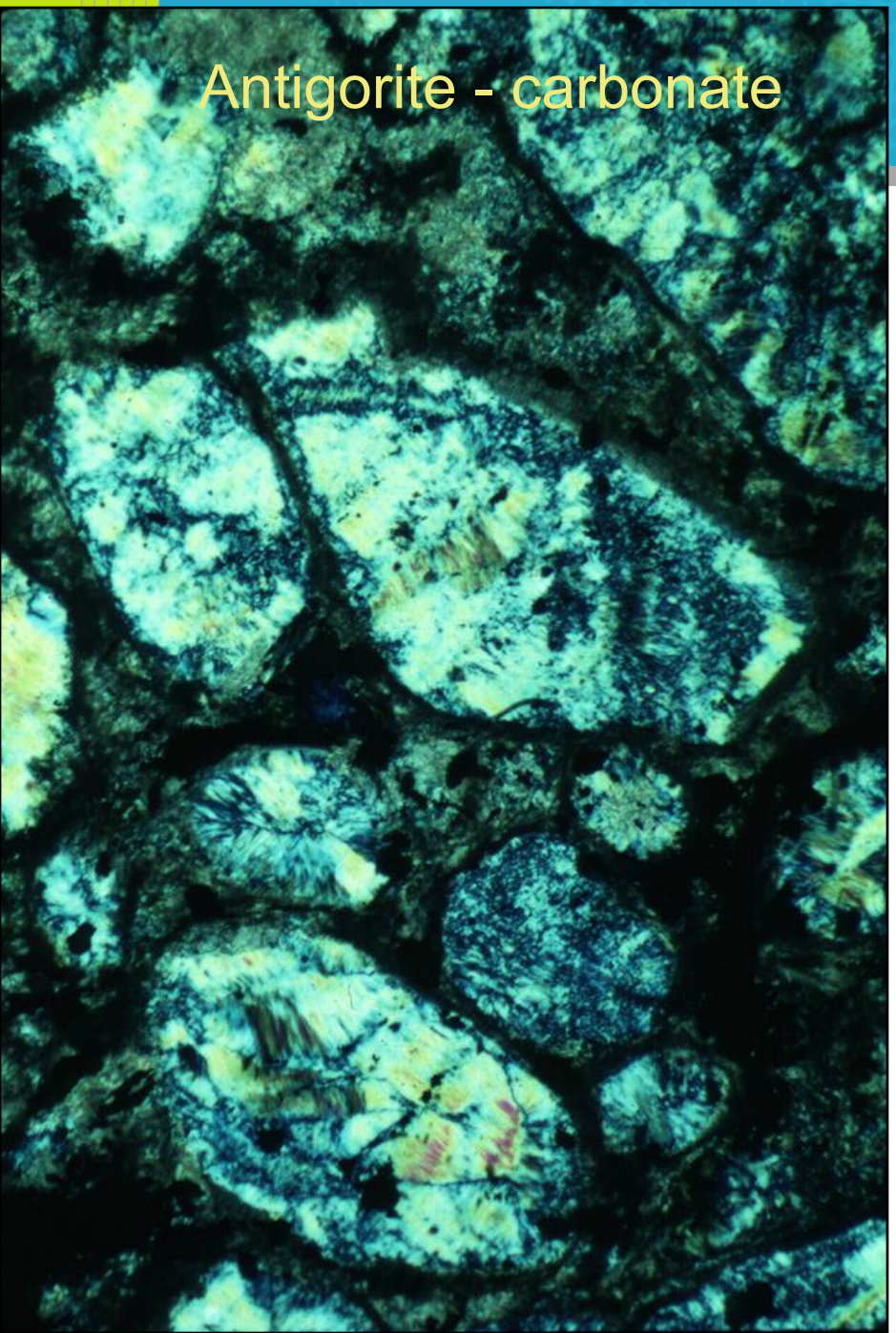
All assemblages in equilibrium with chlorite

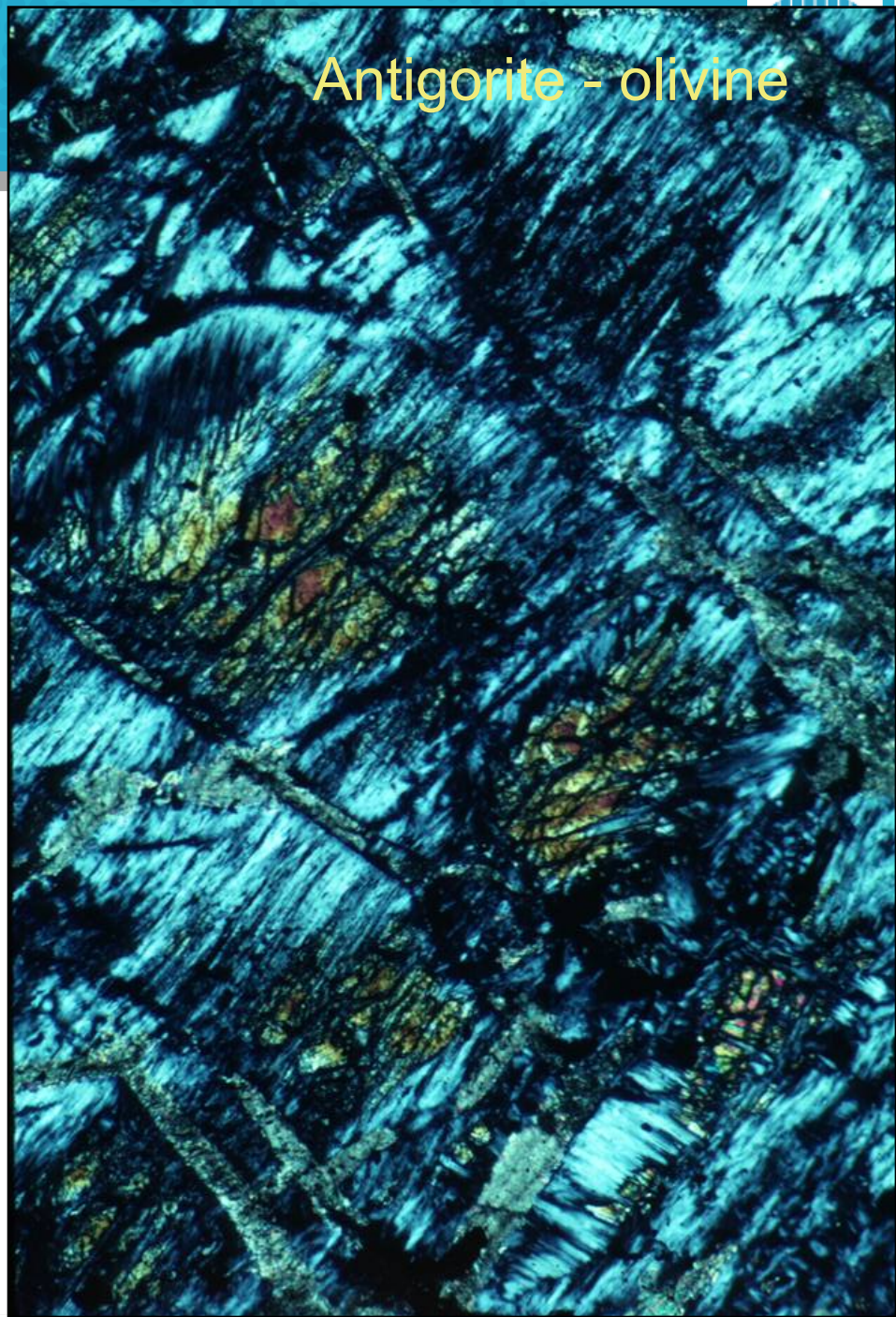
Low-grade metamorphism (alteration)



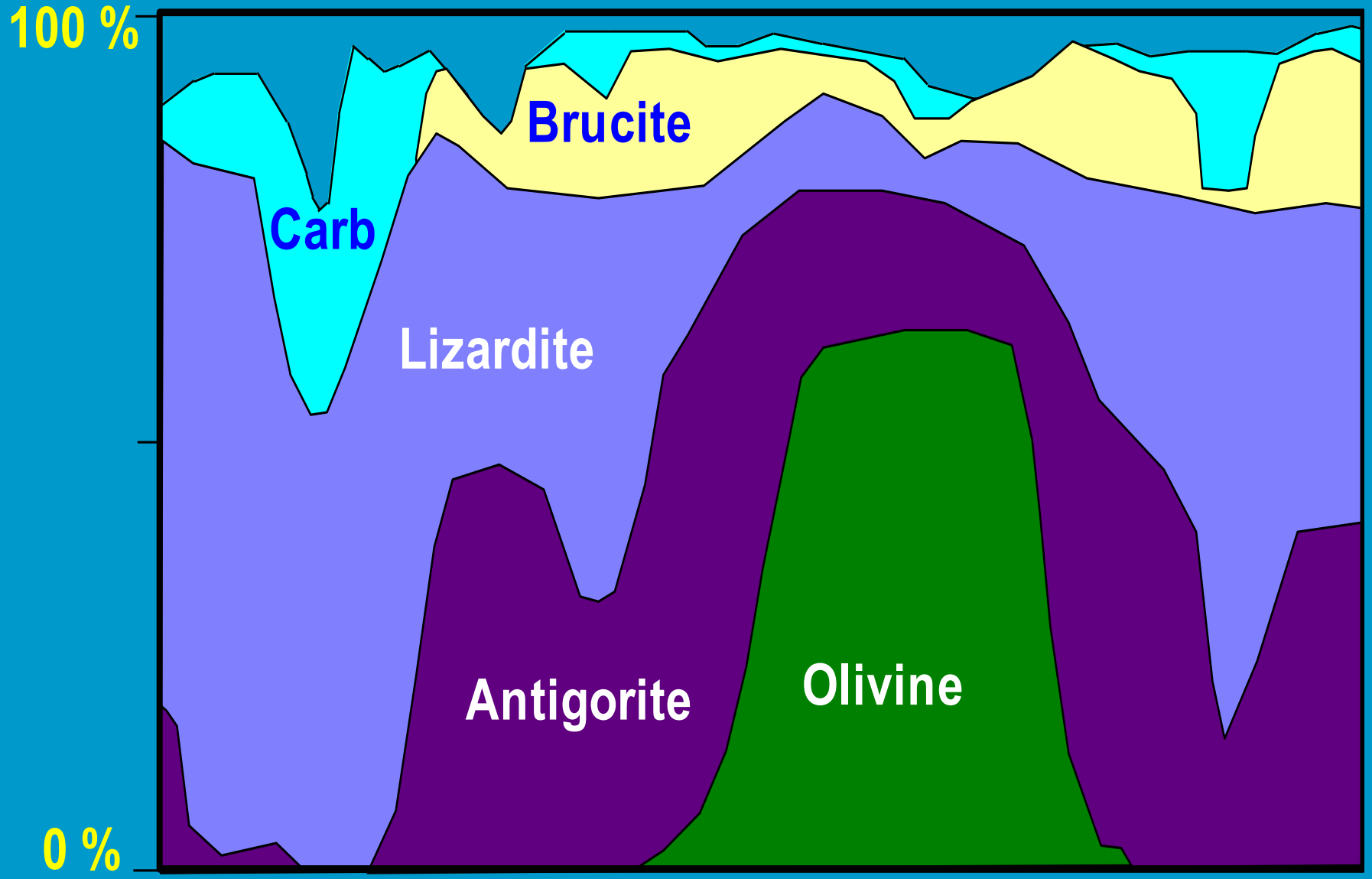


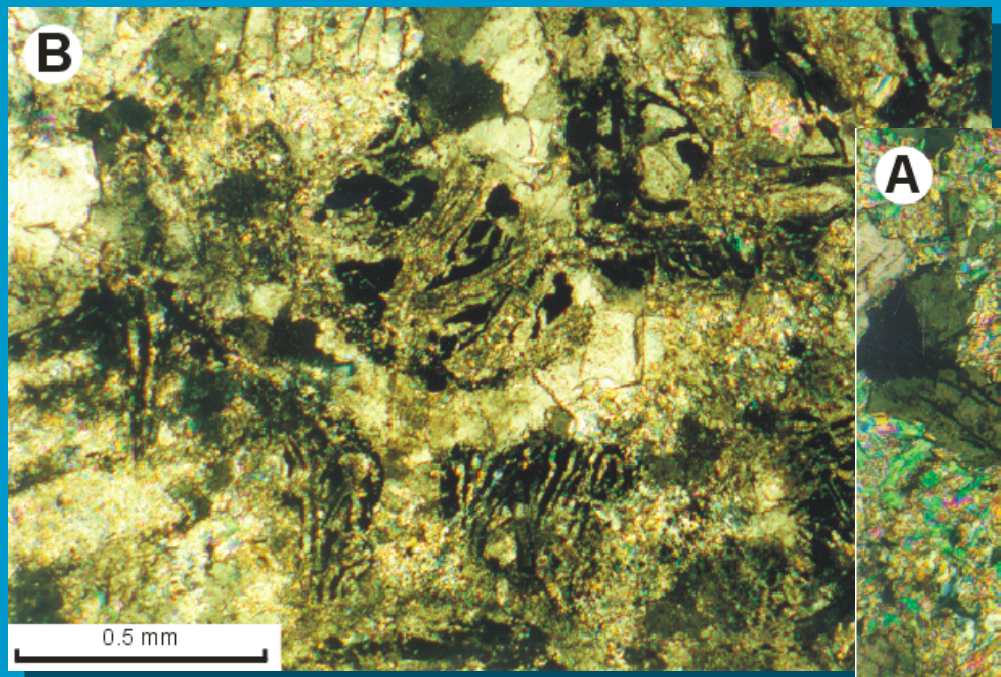


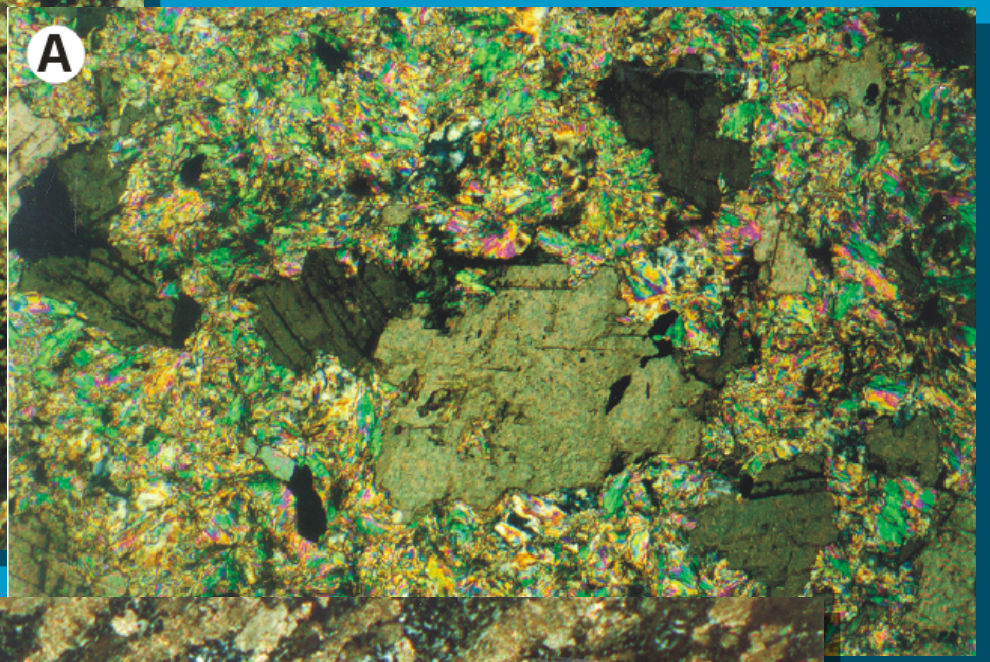

Antigorite - carbonate


Antigorite - olivine

Profile across Six Mile Dunite body

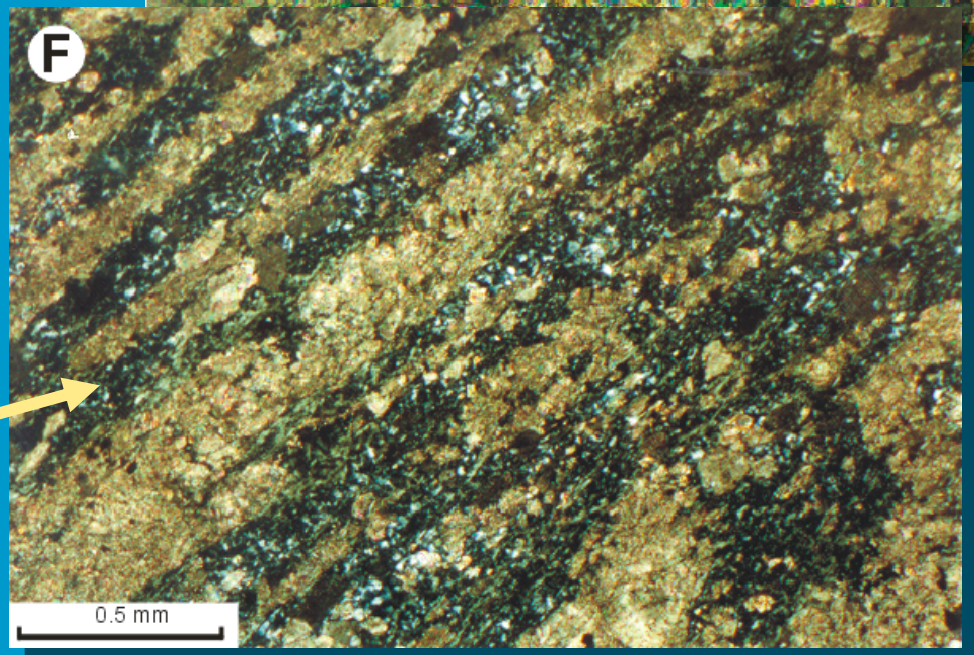






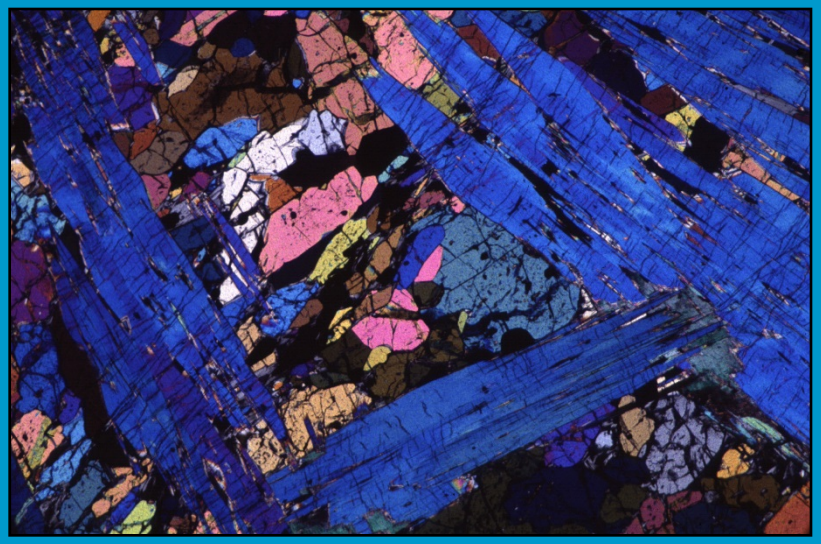
Talc-carbonate-(quartz) rocks

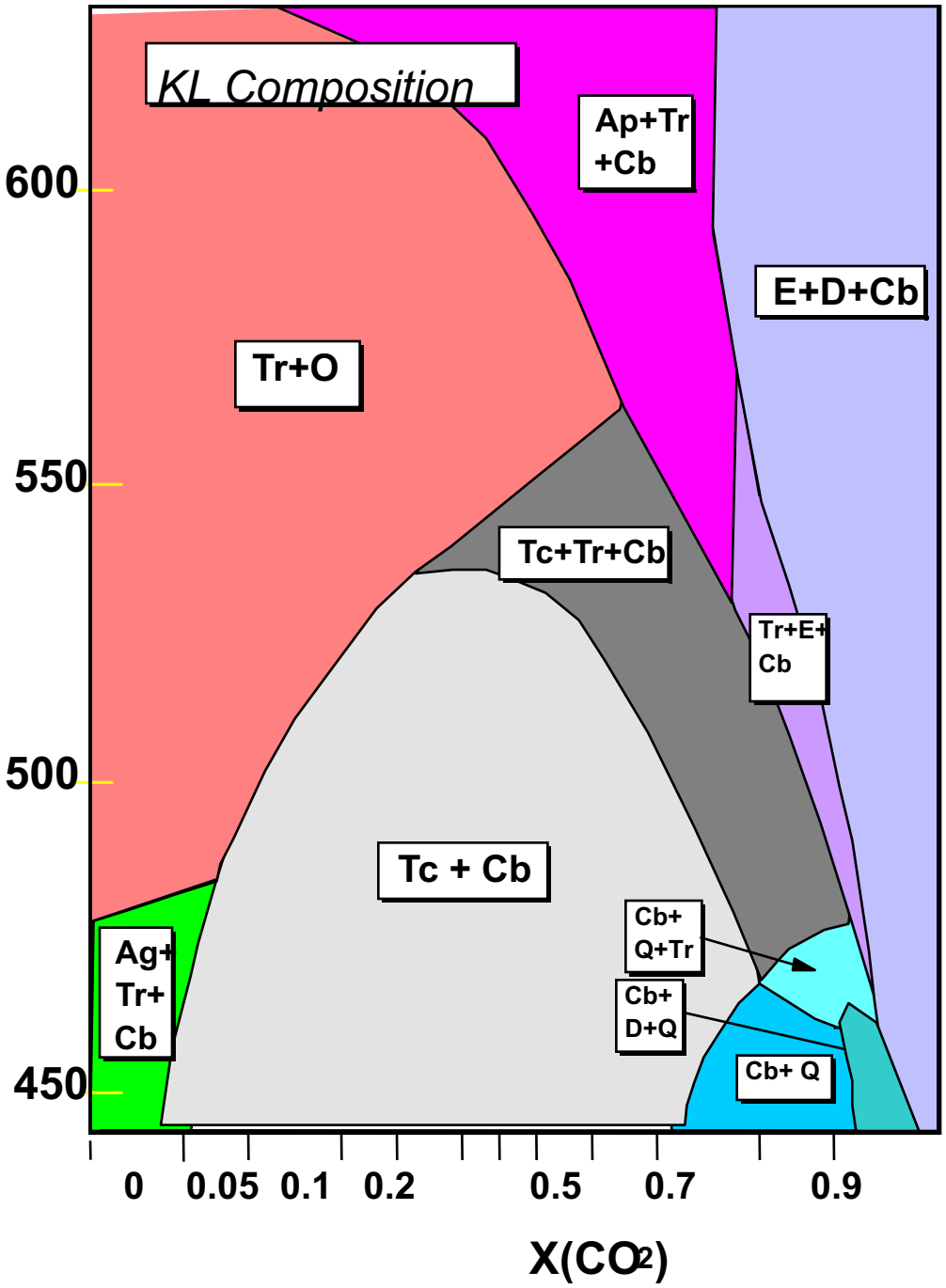
Qtz-carbonate-chlorite after spinifex rock



Alteration and metamorphism

- **Prograde metamorphism, mixed volatile equilibria**



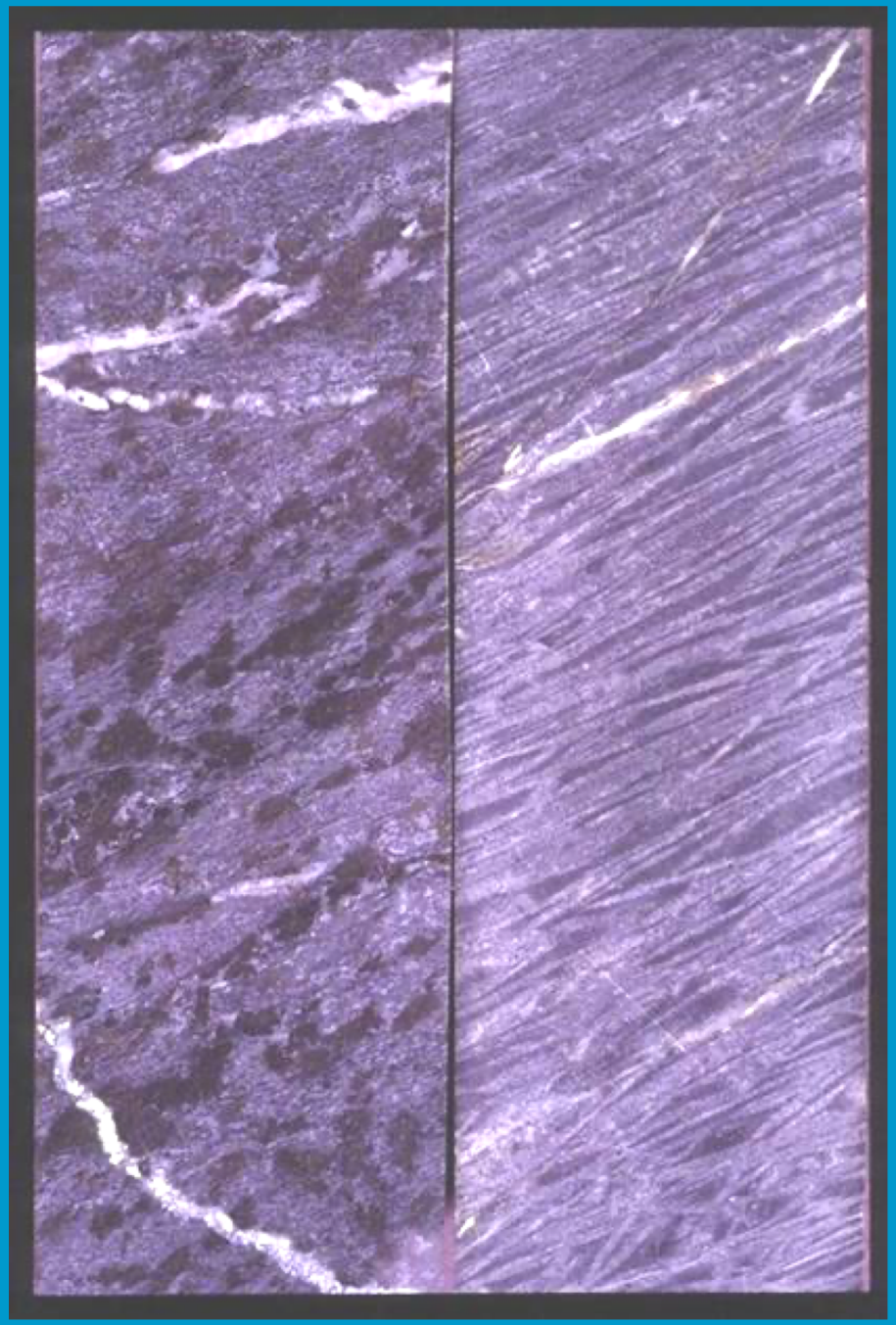


T-X(CO_2) section for model 28% MgO komatiite composition

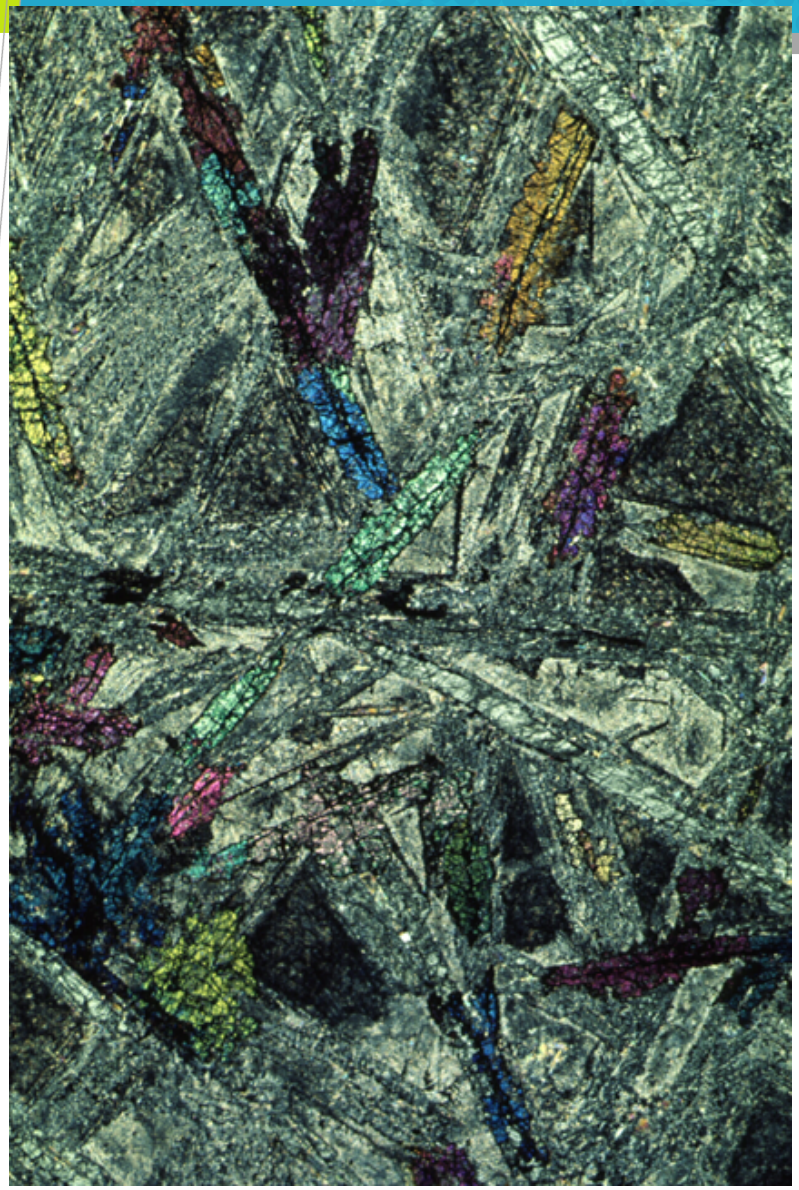
O=olivine, E=enstatite, Ap=anthophyllite, Tr=tremolite, Tc=talc, Ag=antigorite, B=brucite, M=magnesite, D=dolomite.

All assemblages in equilibrium with chlorite

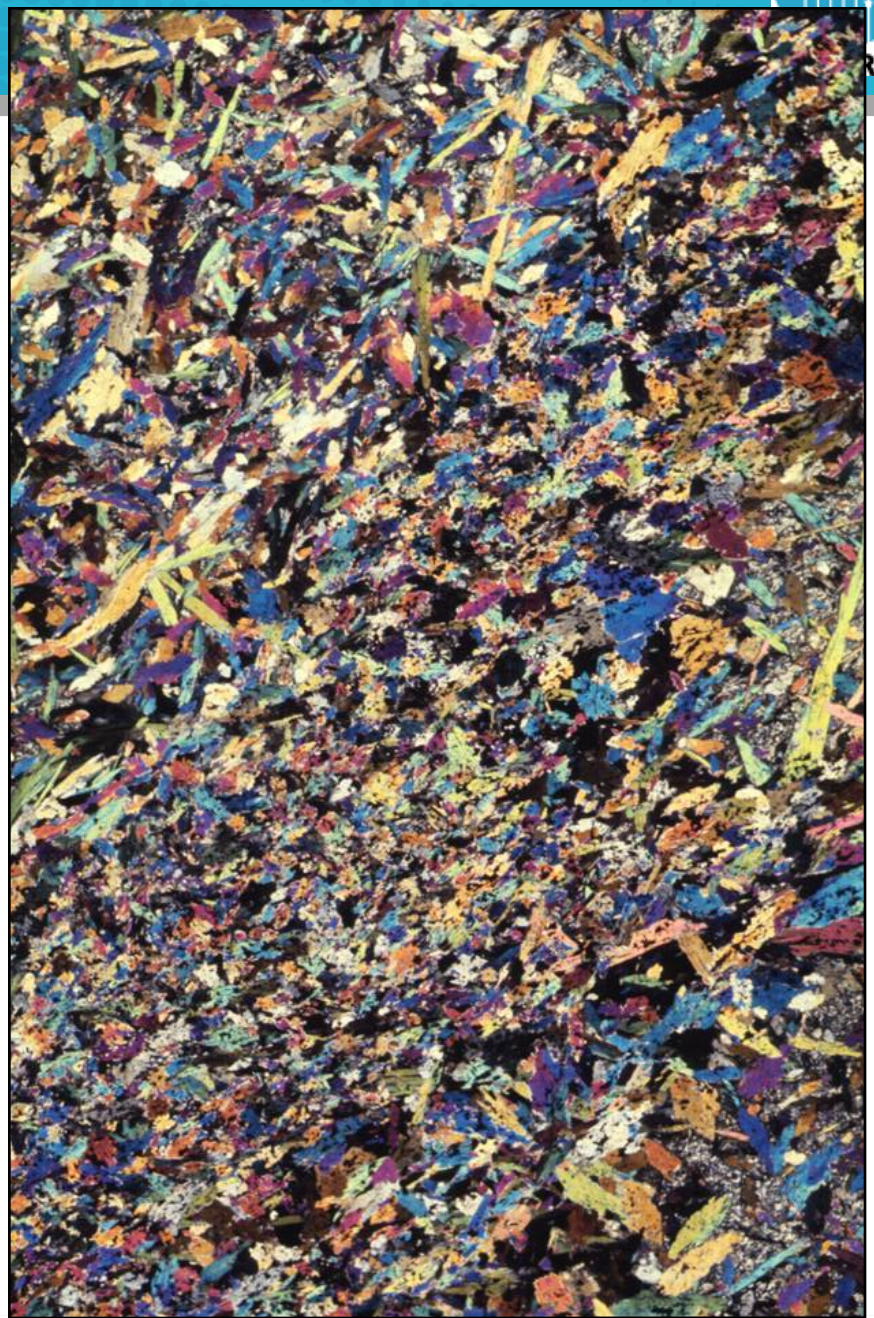
Metamorphic olivine –trem – chlor after spinifex rock

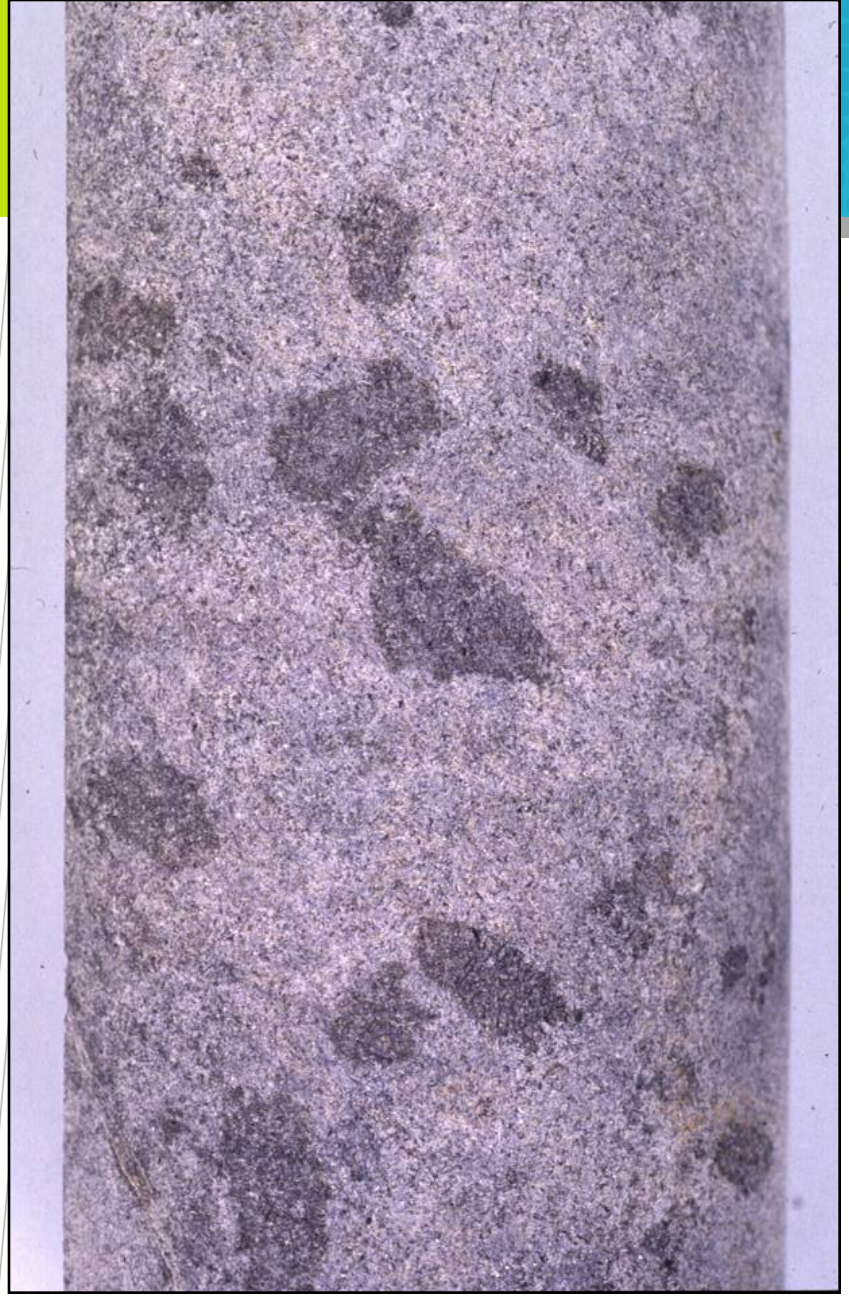


Metamorphic olivine – tremolite – chlorite after spinifex rock

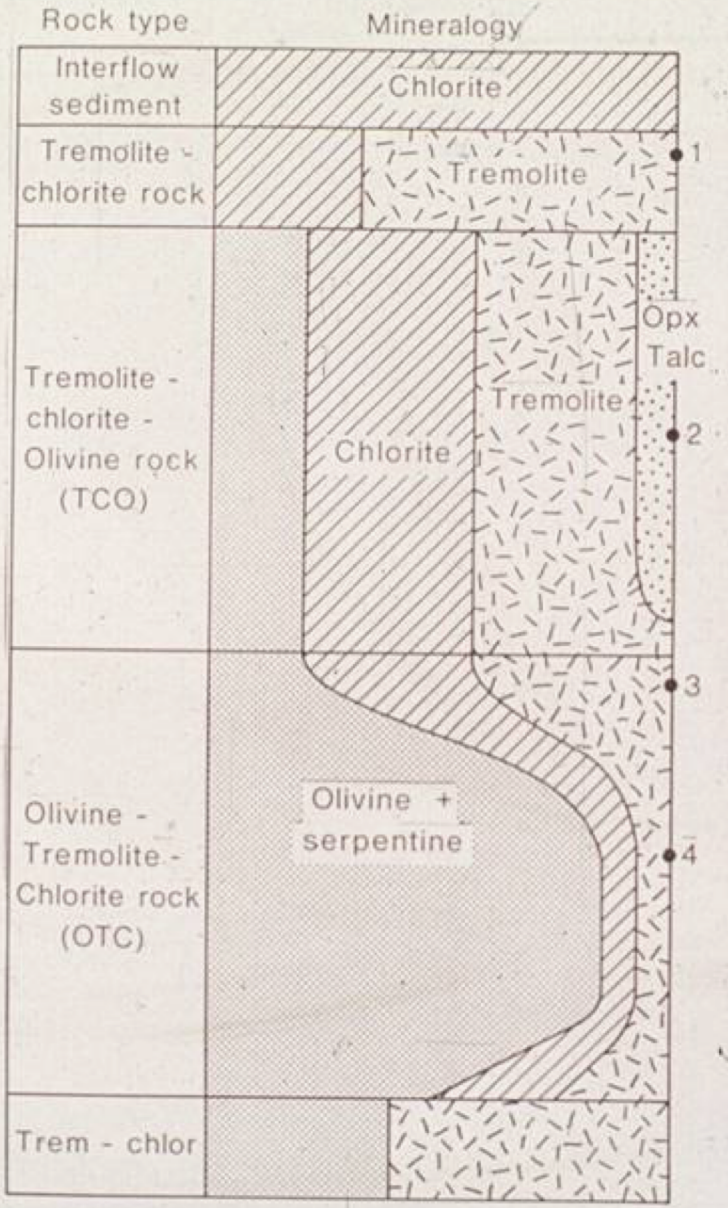


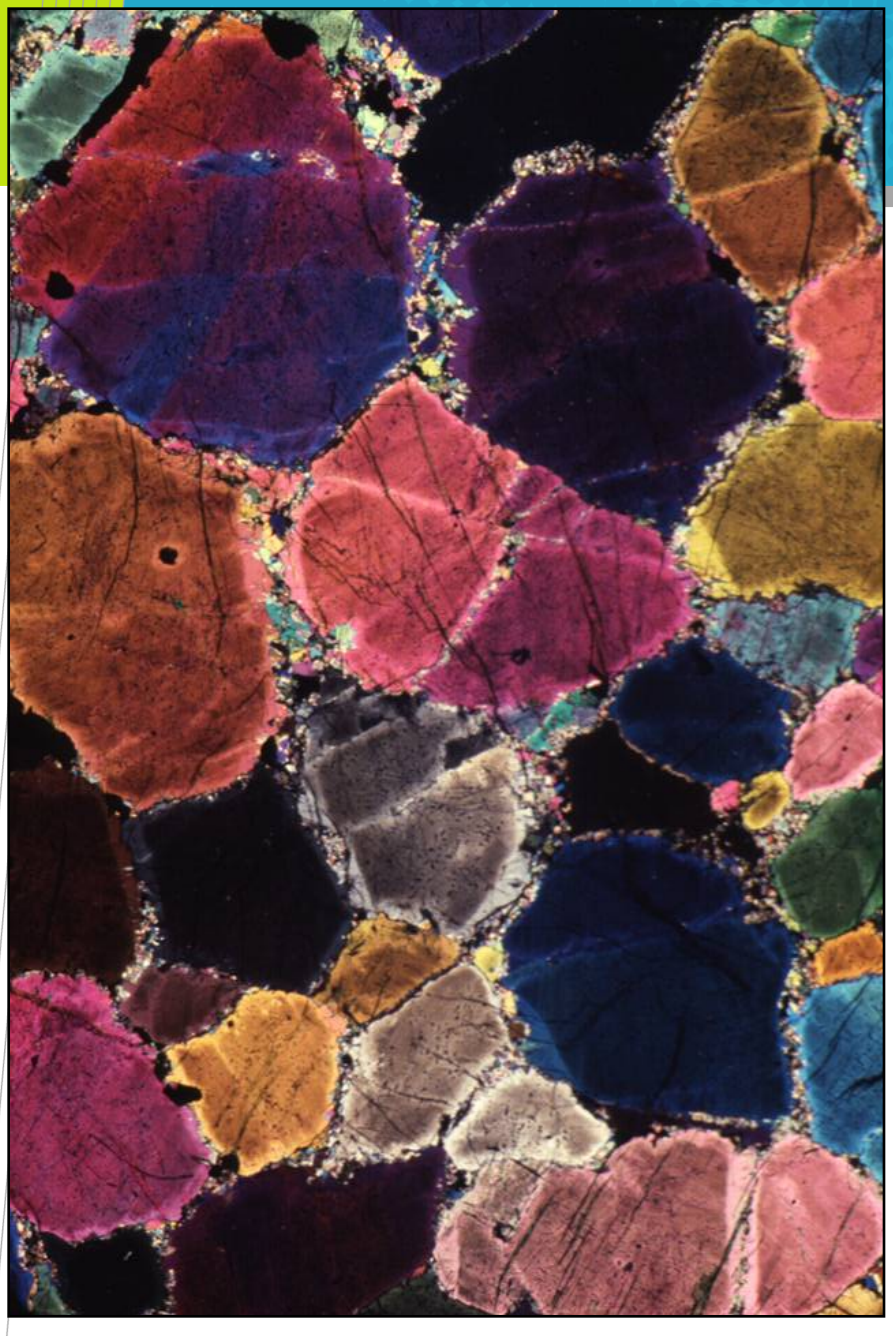
Tremolite-chlorite after spinifex rock - deformed

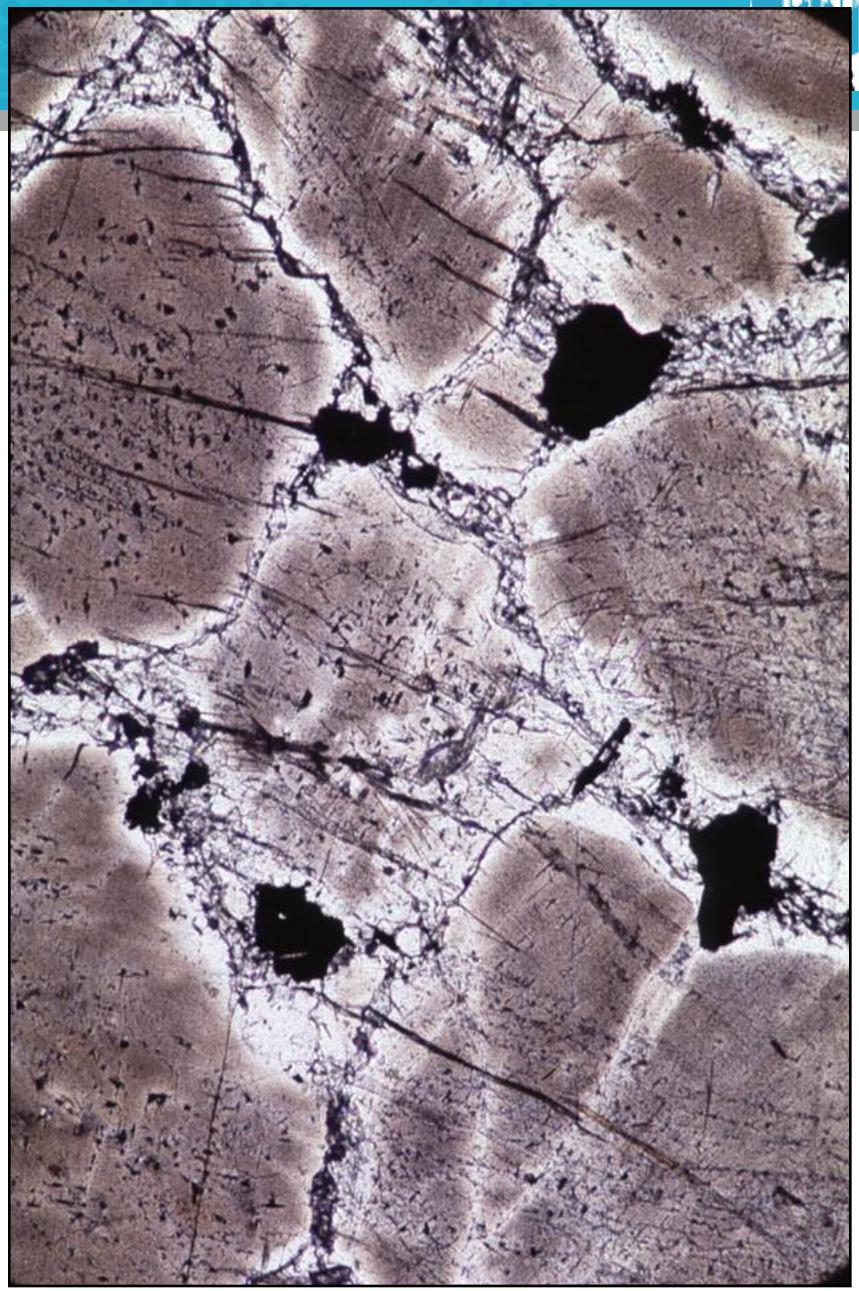




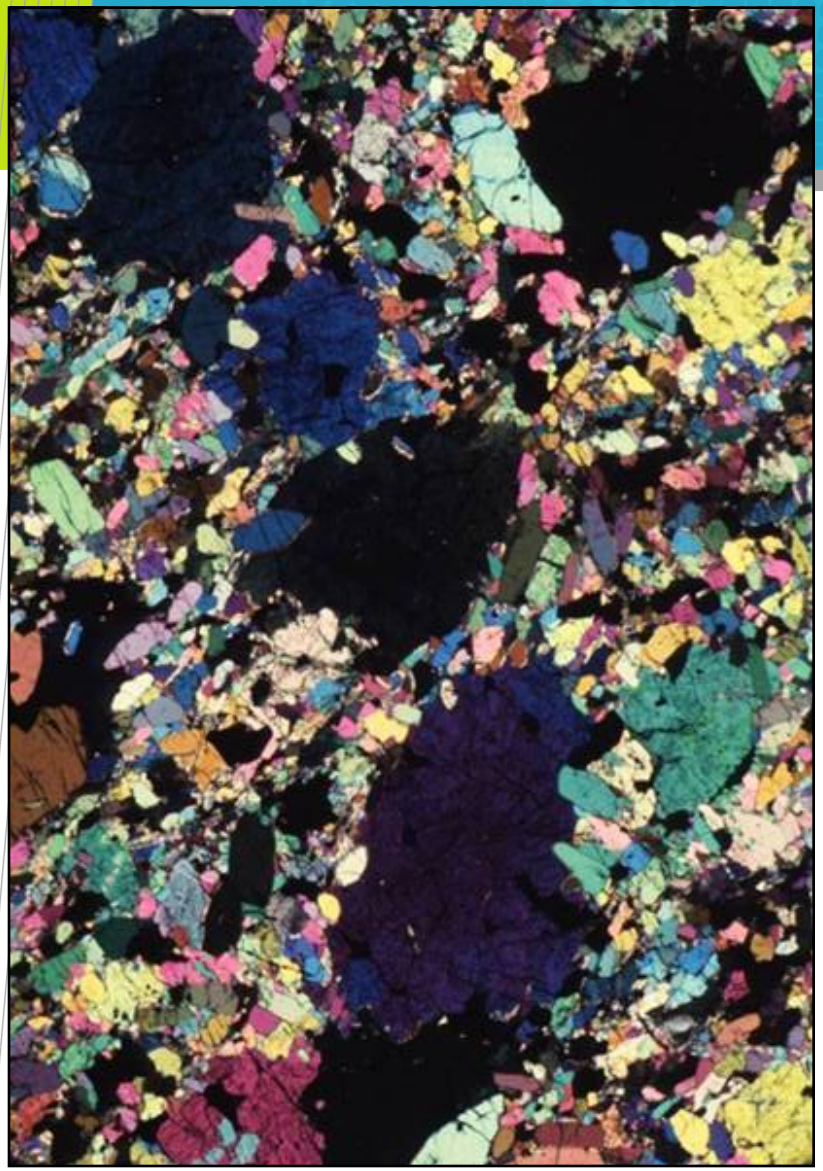
Metamorphic olivine –tremolite-chlorite after orthocumulate

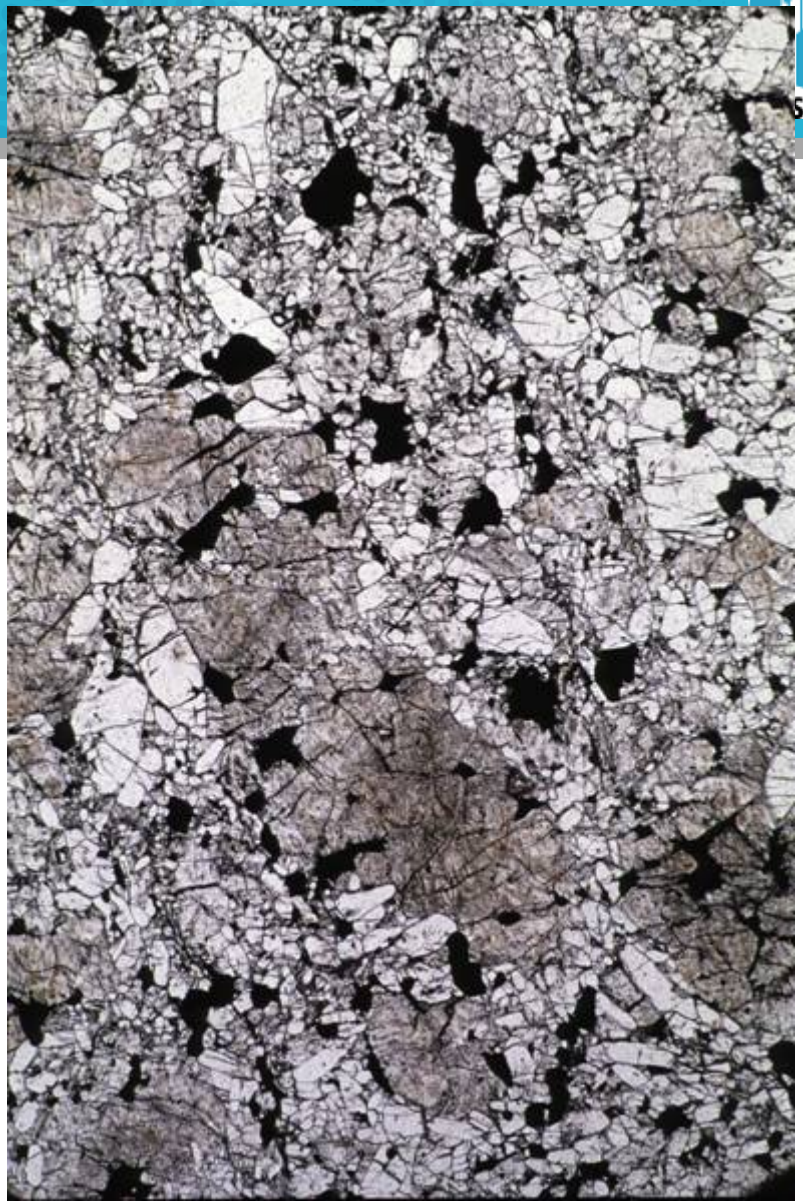






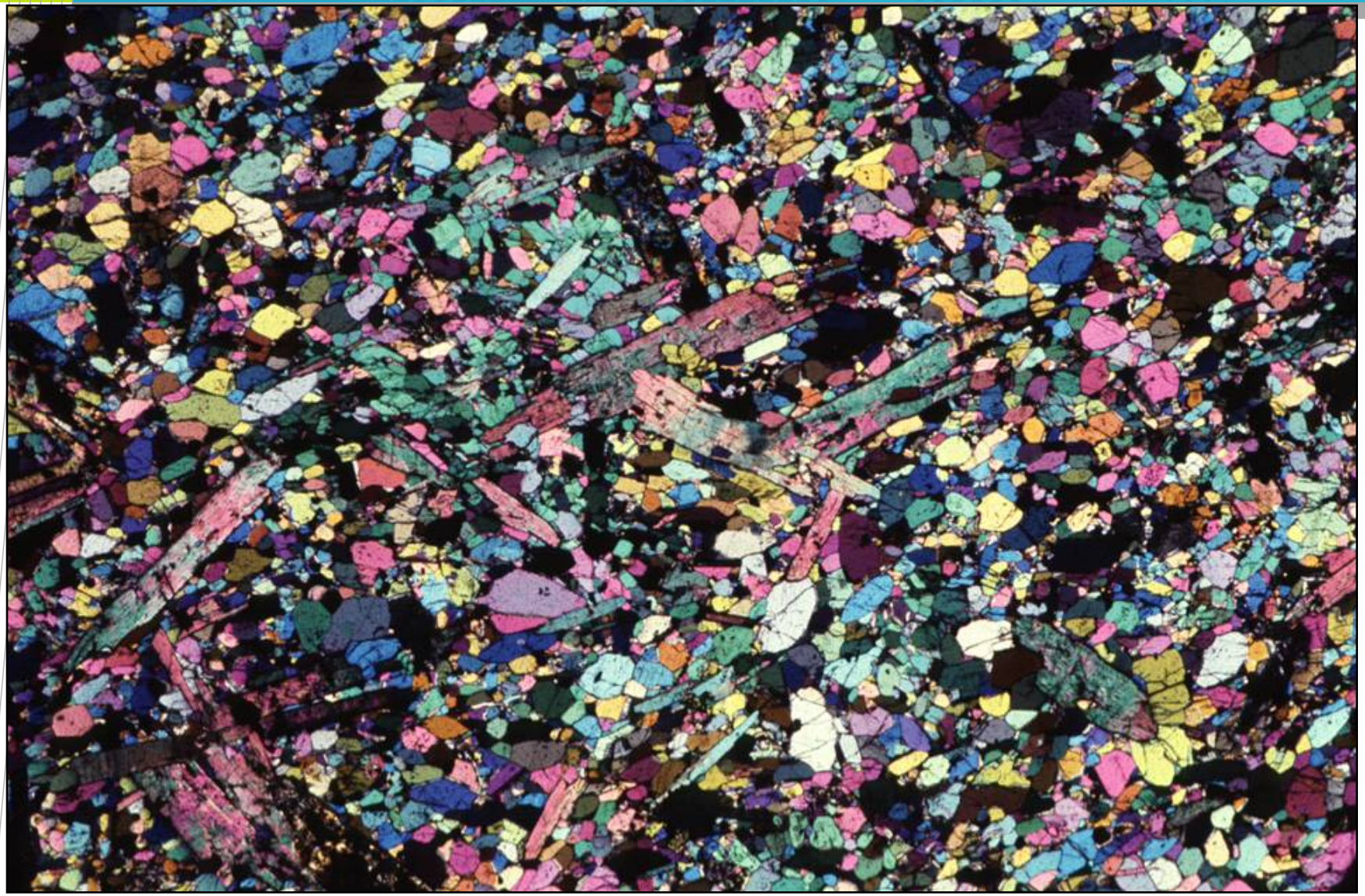
Dunite, igneous cores

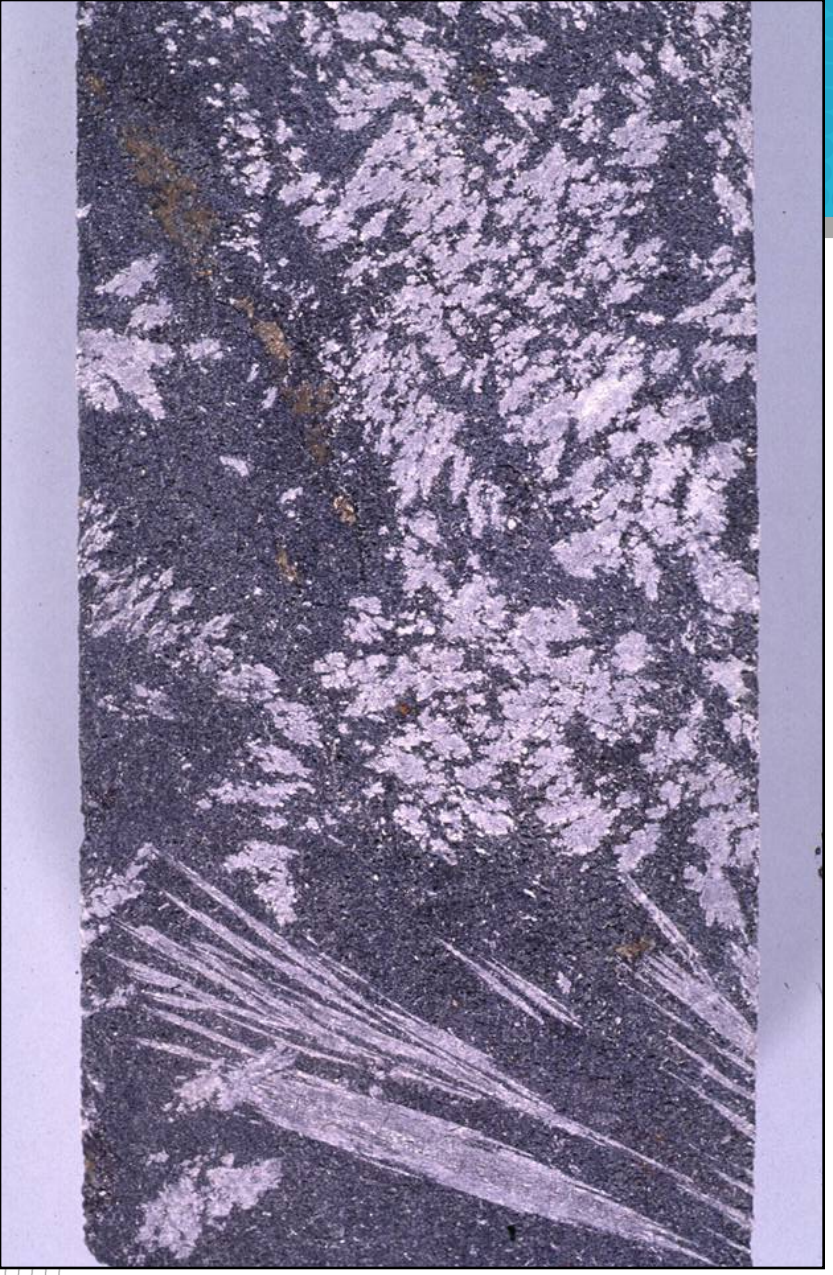


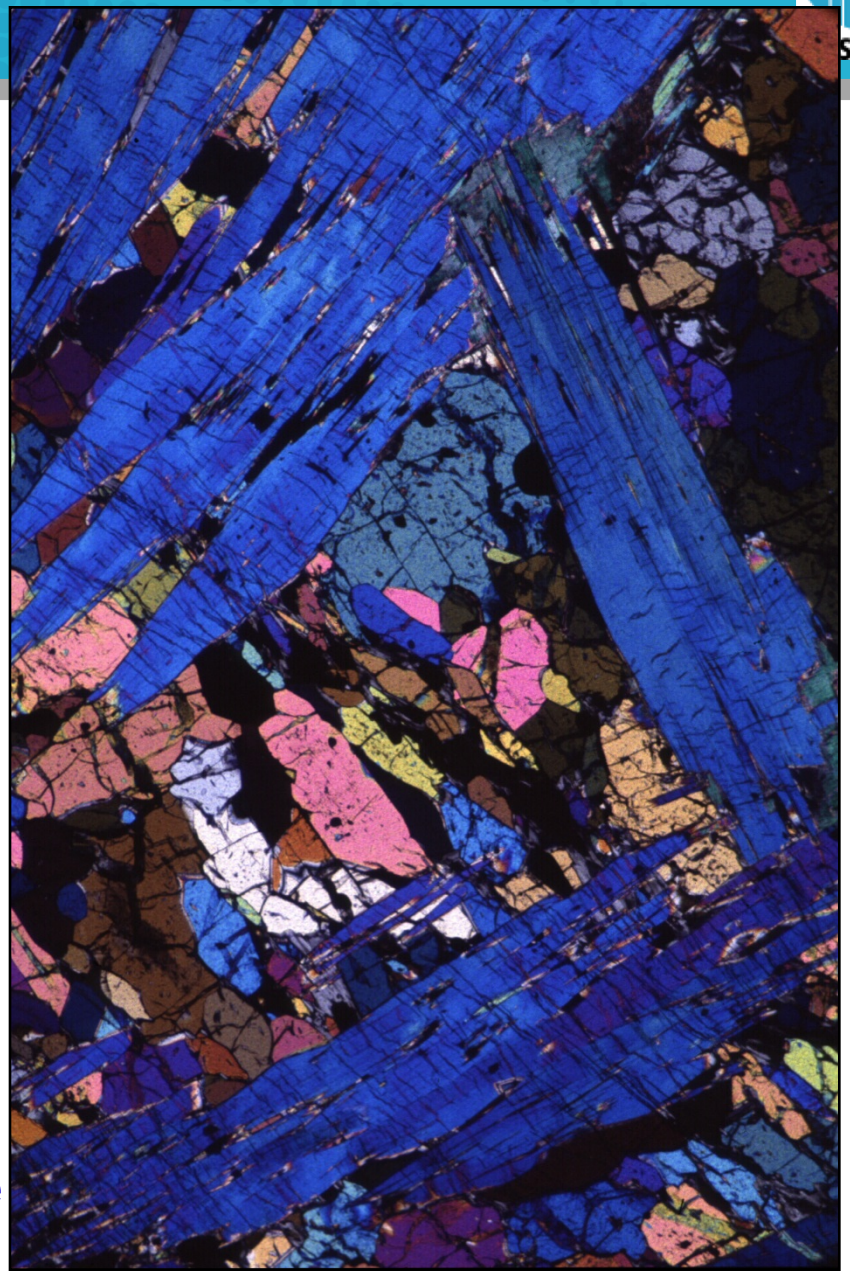


Dunite, igneous cores, dynamic recrystallisation

Metamorphic olivine – talc after adcumulate

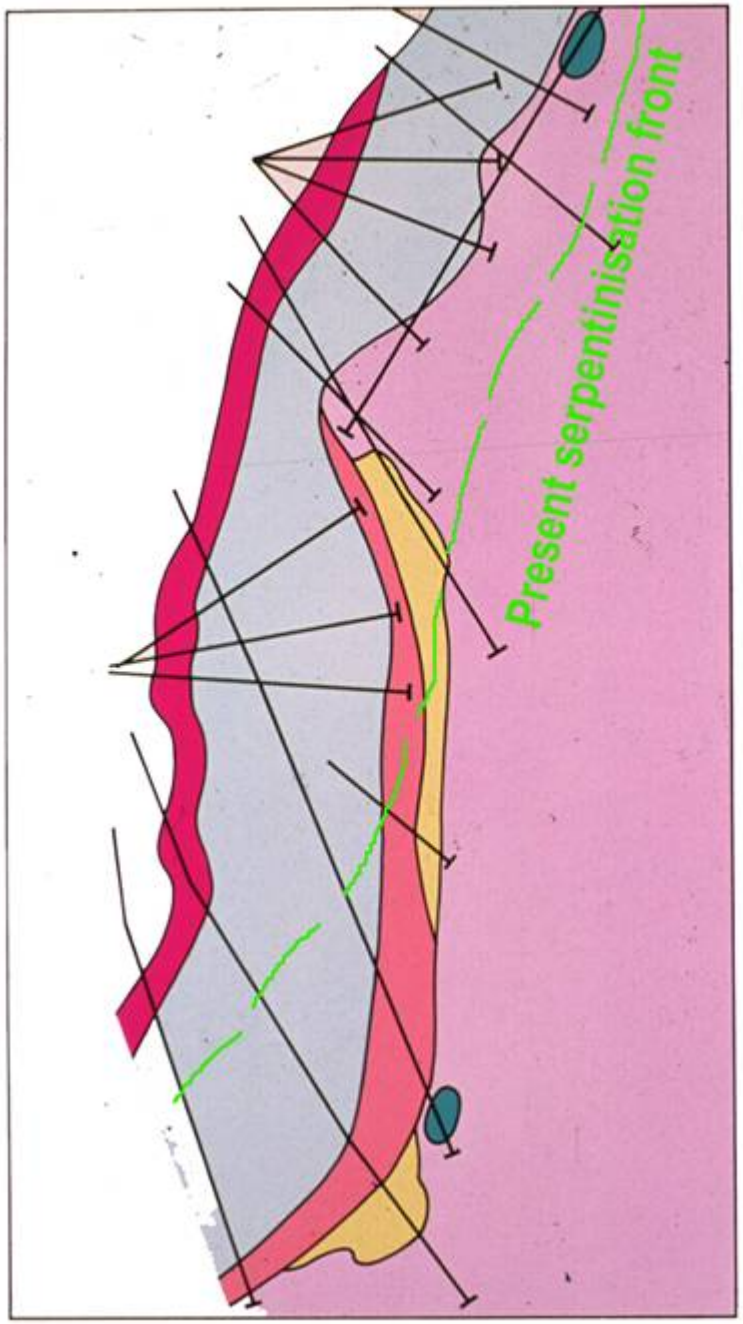






Metamorphic olivine – anthophyllite after adcumulate

Metamorphic olivine – tremolite – chlorite – enstatite after orthocumulate



Metamorphic Assemblages

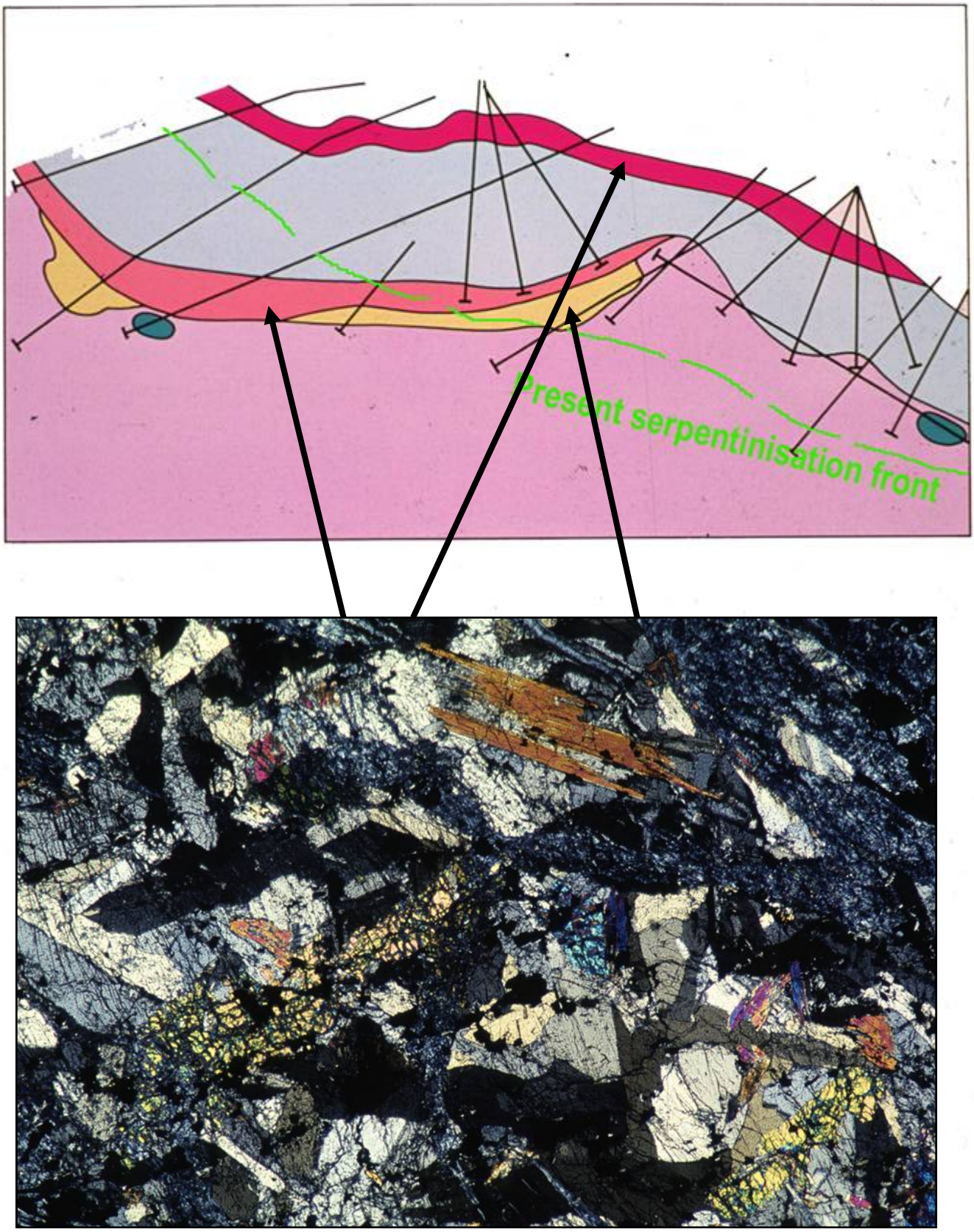
- Enstatite
- Anthophyllite
- Talc
- Antigorite

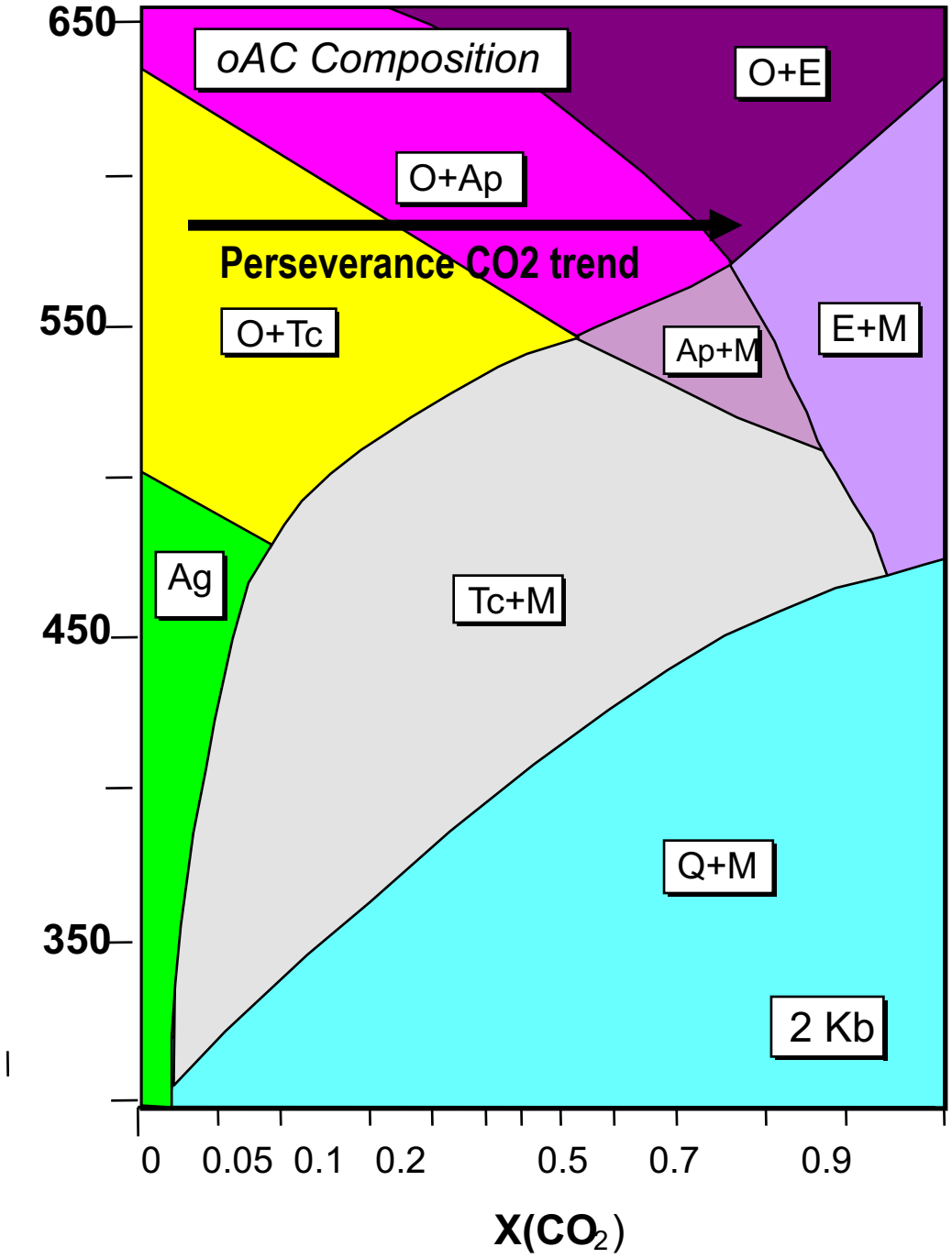
\+ olivine

- Olivine - sulfide
- Olivine adcumulate
- Drill hole

100 m

Perseverance

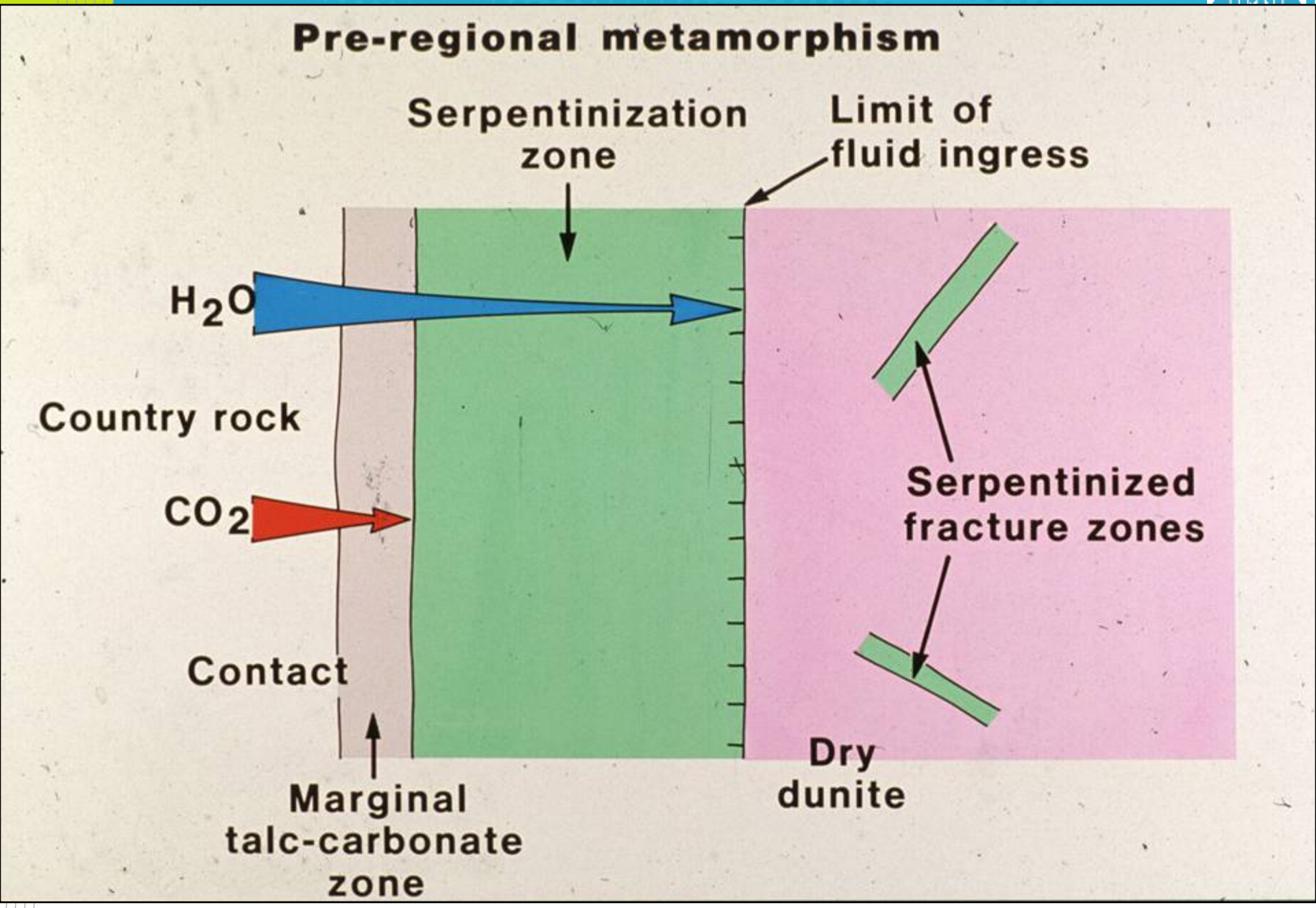

Present serpentinisation front



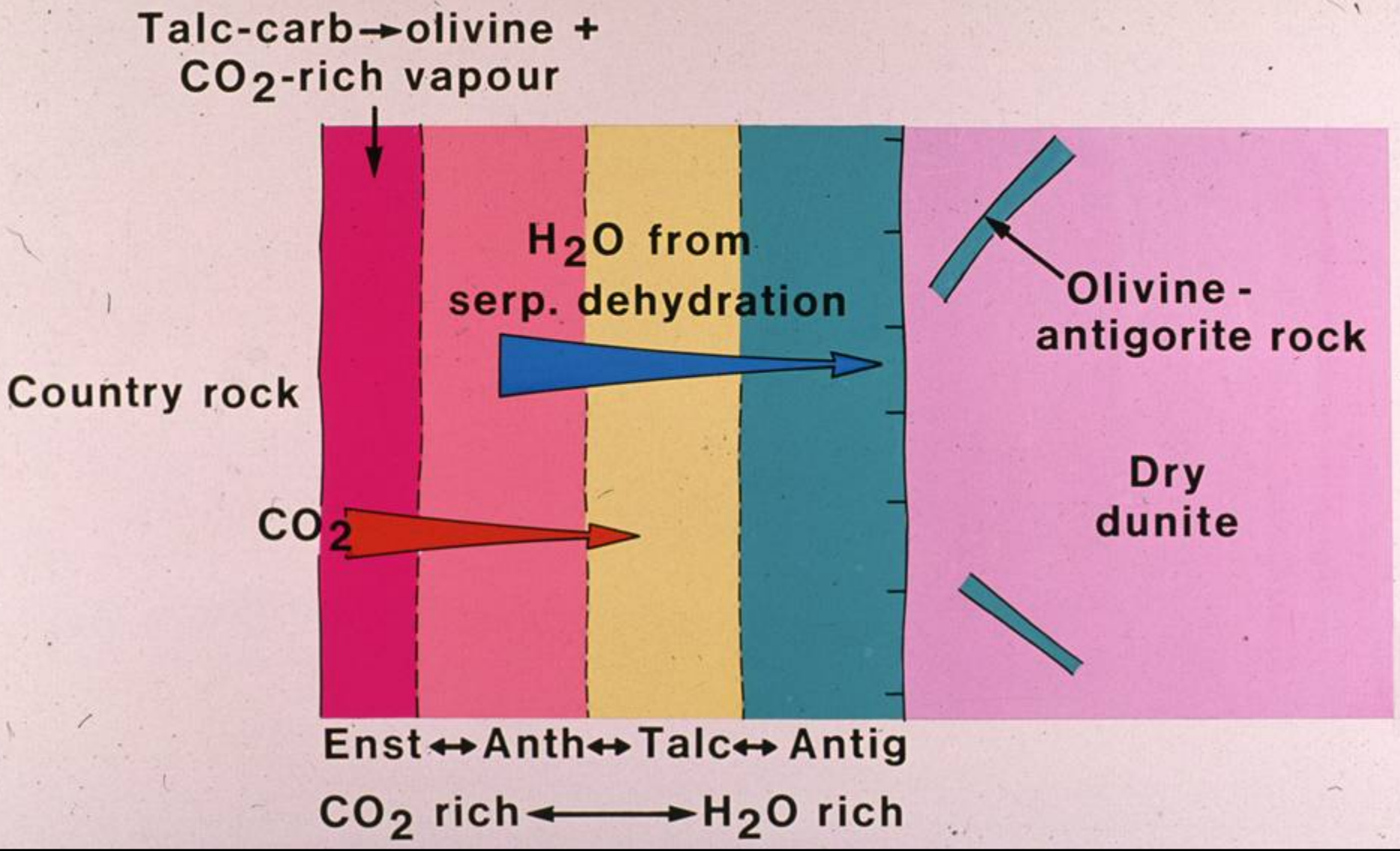
T-X(CO_2) section for model 50% MgO olivine mesocumulate

O=olivine, E=enstatite, Ap=anthophyllite, Tc=talc, Ag=antigorite, M=magnesite, Q=quartz.

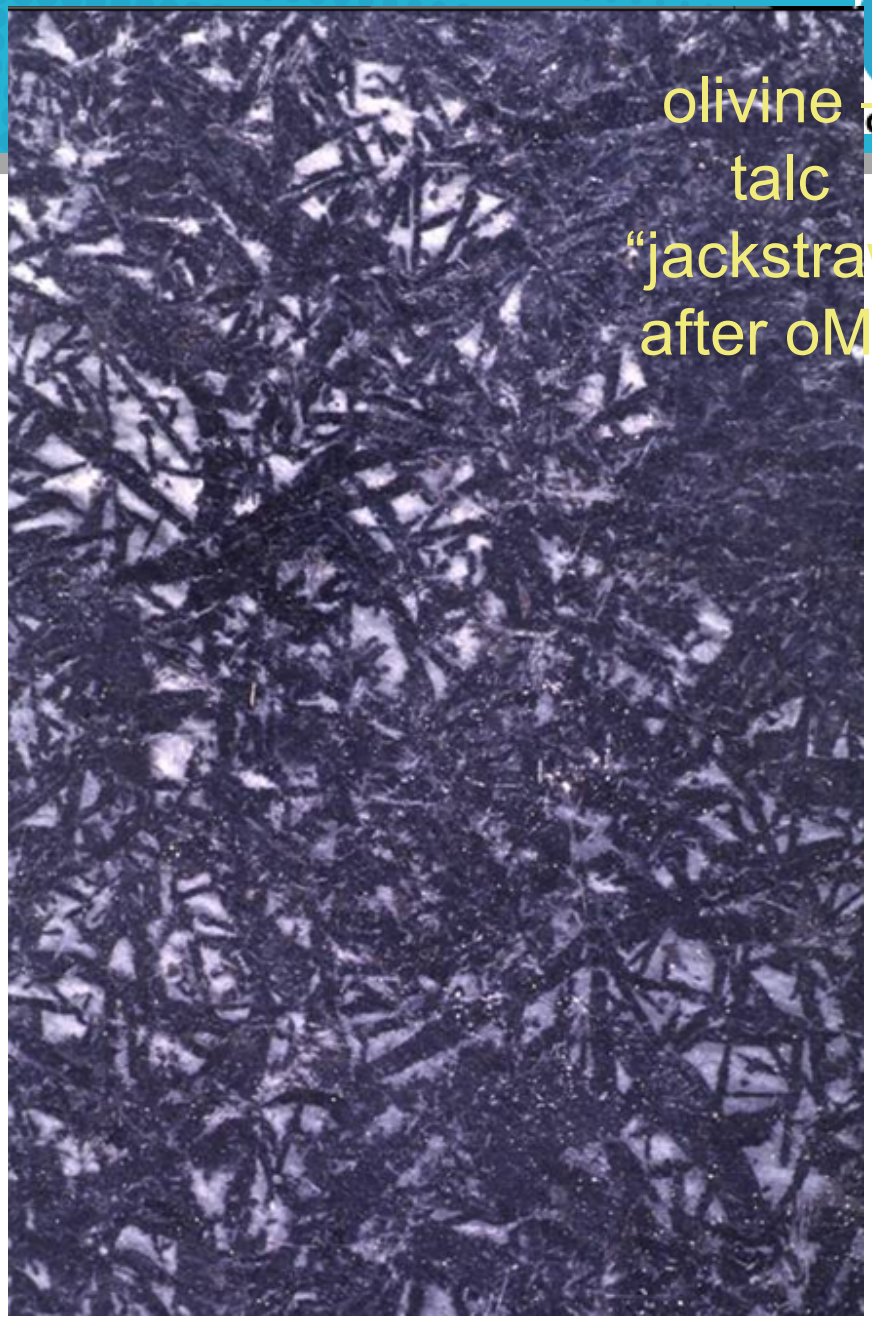
All assemblages in equilibrium with chlorite



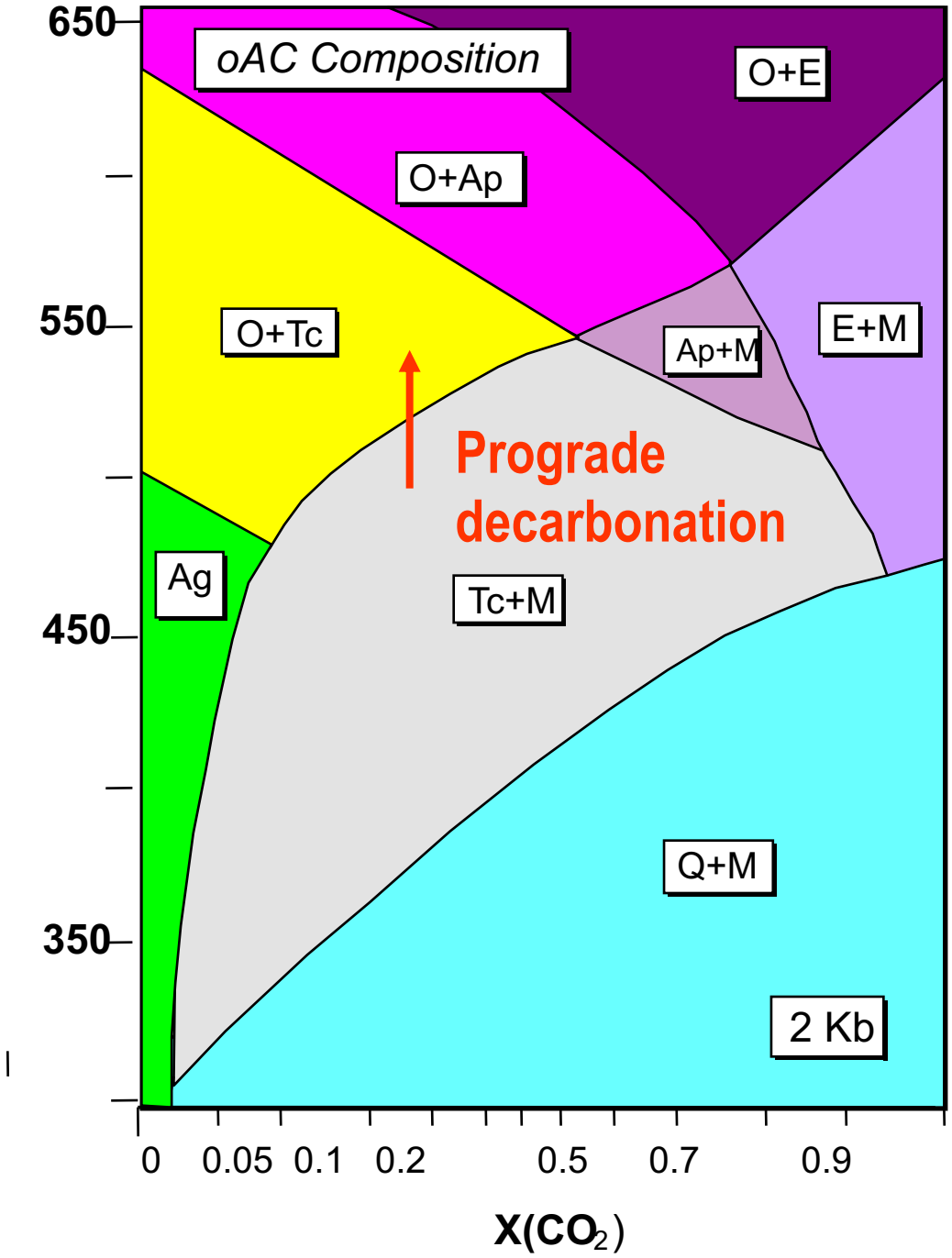
Regional prograde metamorphism



olivine – sulfide – carbonate
"jackstraw"



olivine – talc "jackstraw" after oMC



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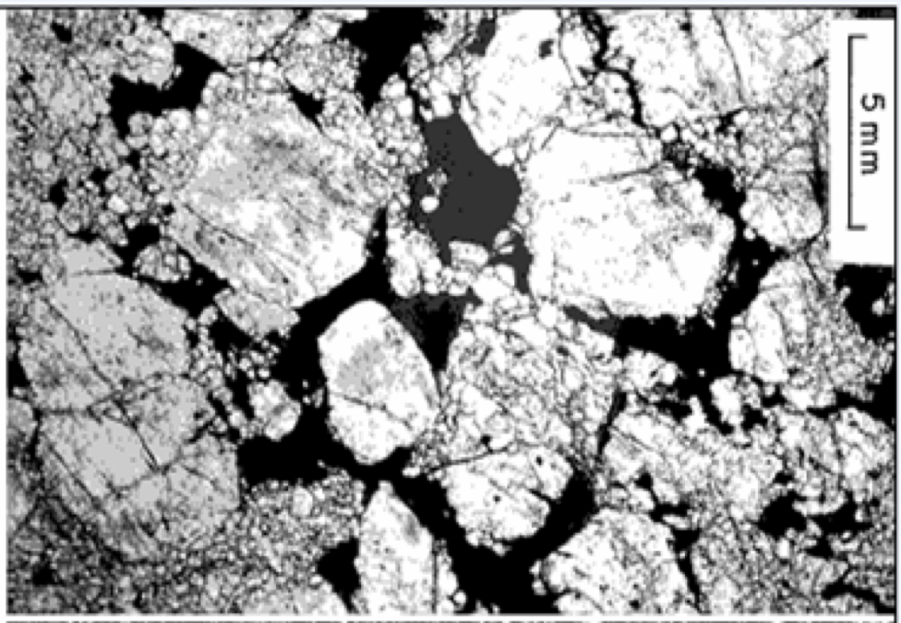
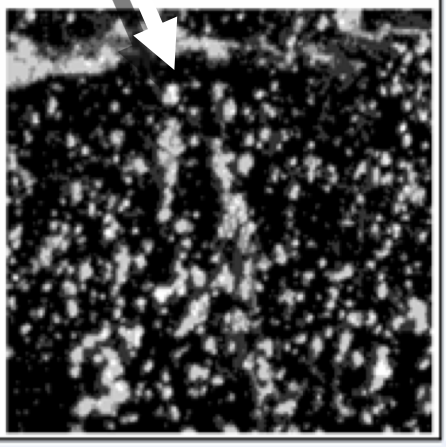
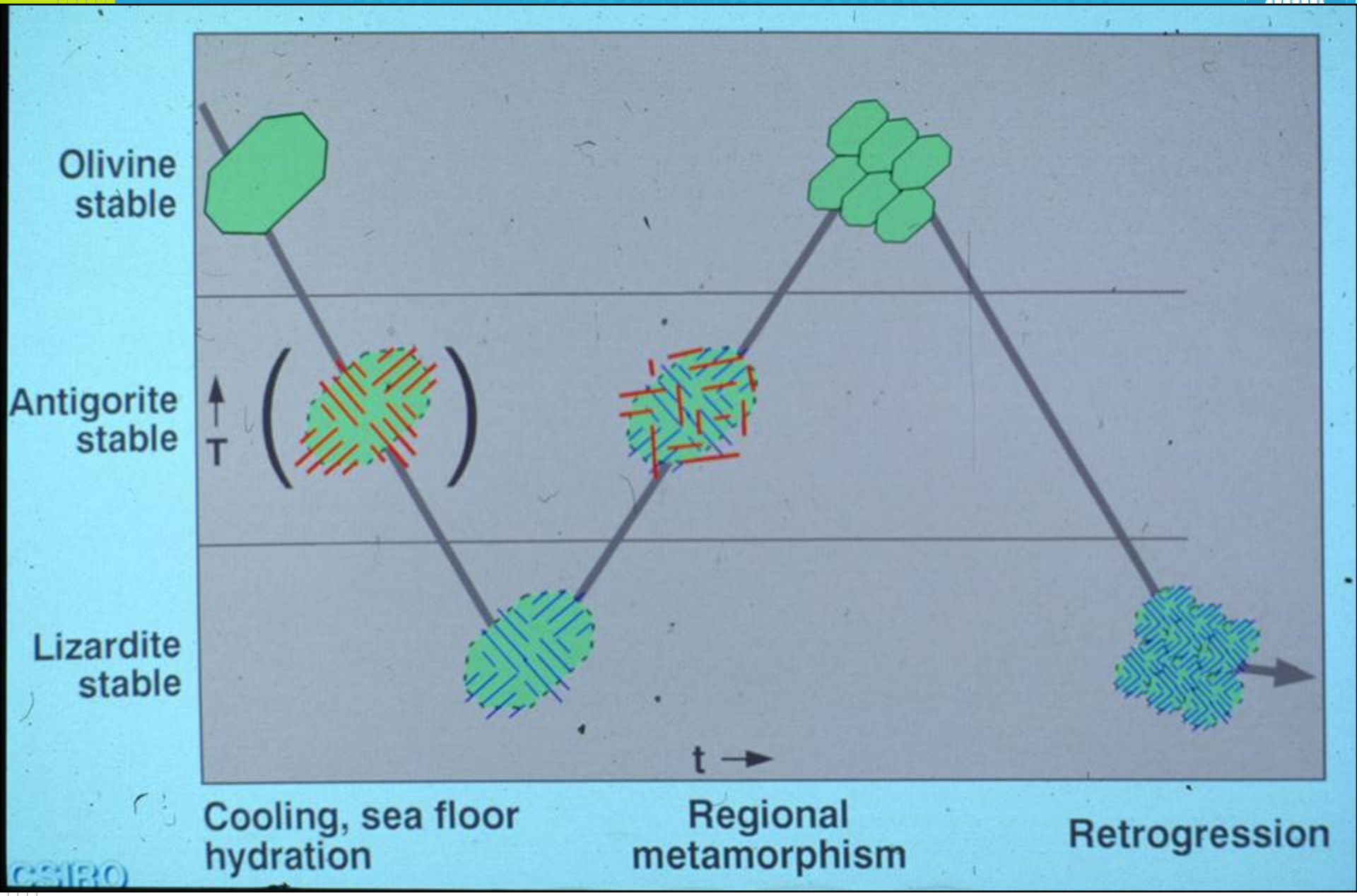
All assemblages in equilibrium with chlorite

Olivine-sulfide metamorphic textures






Olivine stable
Antigorite stable
Lizardite stable
T
t
Cooling, sea floor hydration
Regional metamorphism
Retrogression
CSIRO