METAMORPHIC EVOLUTION OF RASPAS COMPLEX (ECUADOR) AND ITS RELATION WITH A J-K BELT OF MÉLANGES IN NW SOUTH AMERICAN PLATE.

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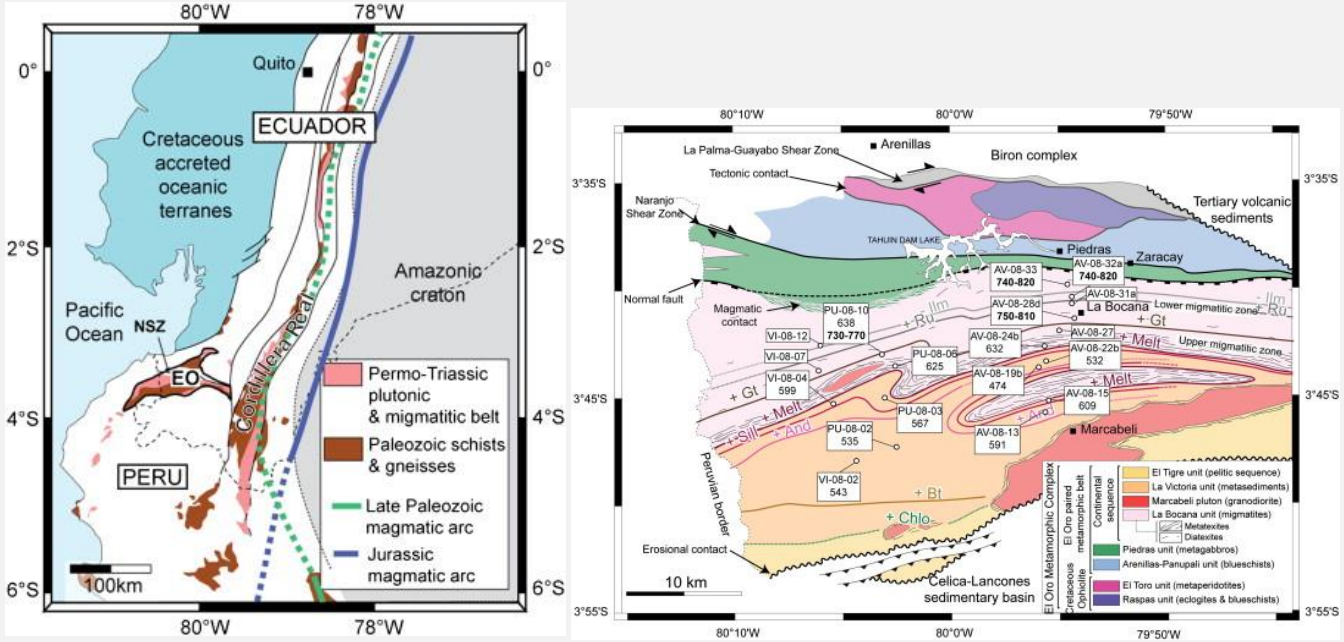


Fig. 1. Ecuador's general geology and Raspas Complex location.
Source: Riel et al. (2013)

Raspas Complex is located within the "El Oro" metamorphic province, south-western Ecuador.

Fig. 2. Access to Raspas Creek, Ecuador
Source: The authors

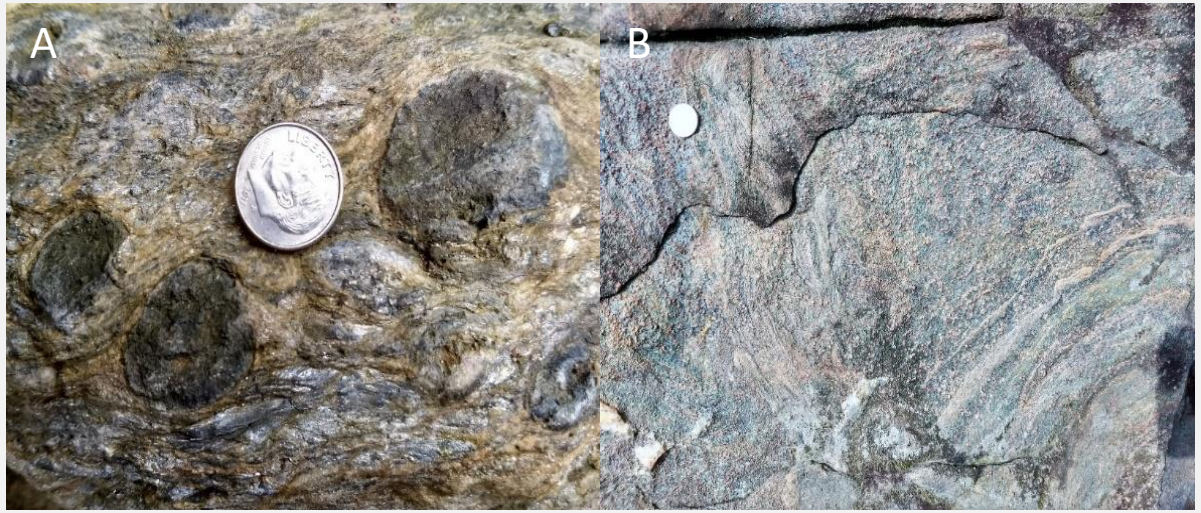


Fig. 3. A) Garnet porphyroblasts replaced by chloritoid within a metapelitic matrix.
B) Banded and folded blueschists and eclogites.
Source: The authors

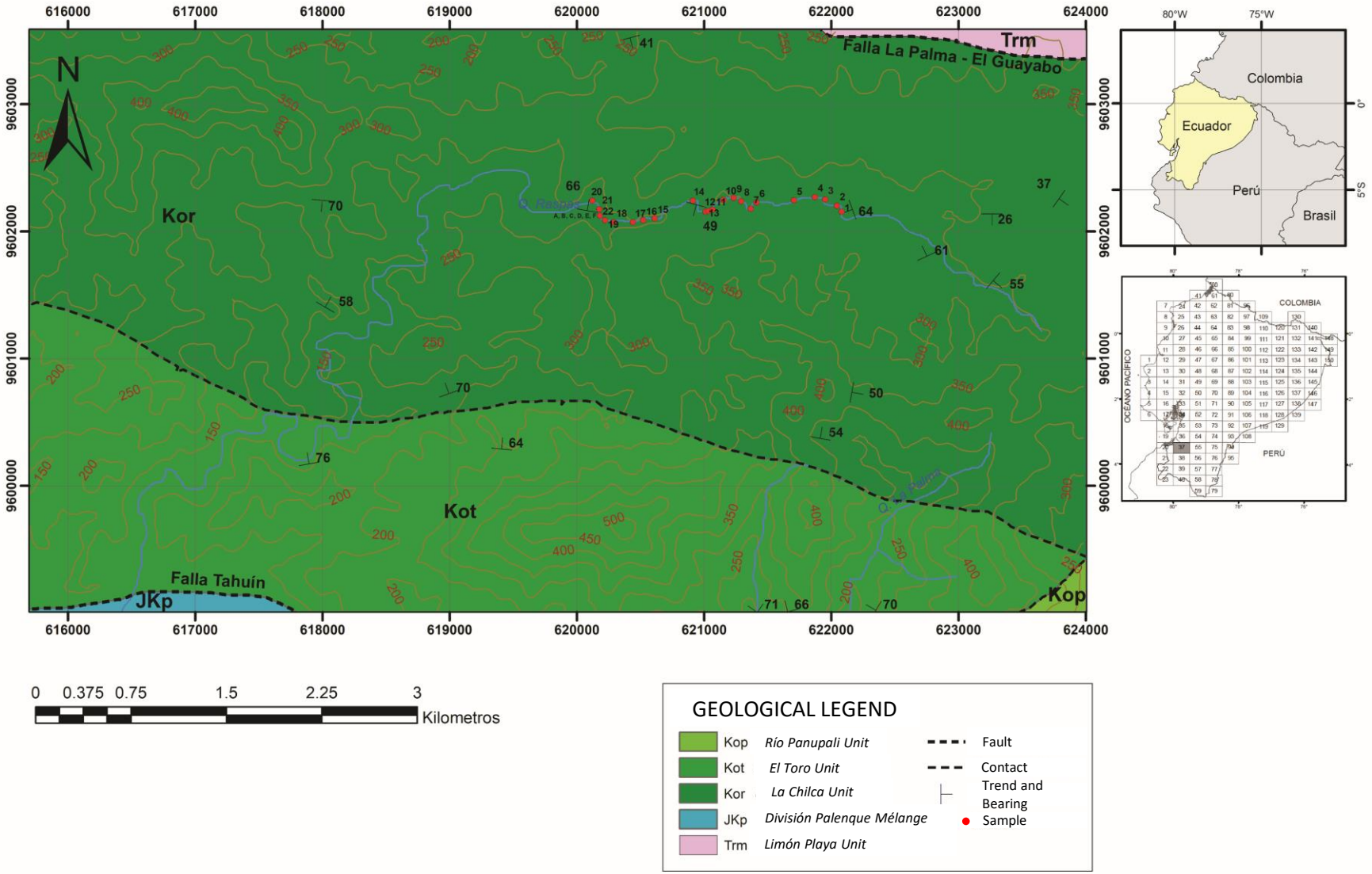


Fig. 4. Raspas Complex lithologies and sample extraction points. *Source: The authors.*

HAND SAMPLES

Group	Mineral Assemblage	Sample ID
Metapelites	Pl-Qz-Wm-Ctd-Zo **Acc**: Py **Alt**: Chl	Ecu 8 Ecu 9 Ecu 12
Eclogites	Grt-Omp-Qz-Zo- **Acc**:Ttn-Rt-Zr-Ktp **Alt:** Chl	Ecu 2 Ecu 6 Ecu 21 Ecu 22B
Retrograde Eclogites	Grt-Gln/Act-Zo-Omp-Ktp **Acc**:Ttn-Qz-Zr-Pl **Alt:**Chl	Ecu: 1,3,4,5,7,11,16,17, 18,19,22A, 22C,22D,22E, 22F
Amphibolic schists	Act/Trem-Ktp-Zo-Wm-Zo-Qz **Acc**: Grt(relict) **Alt**: Chl	Ecu 10 Ecu 13 Ecu 14 Ecu 15
Serpentinite	Srp-Chl-Idding. **Acc:** Ol (relict) **Alt** Iddingsite	Ecu 20

Table 1. Rock groups conforming Raspas Complex and their main mineral assemblages
Source: The authors.

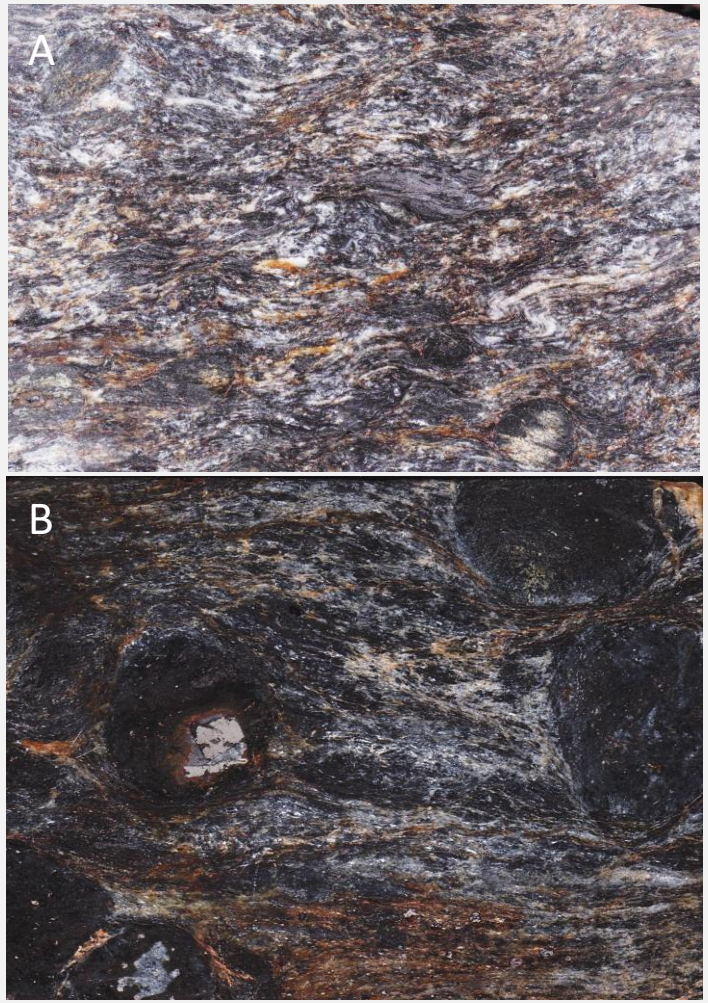


Fig. 5. Hand sample pictures, sample ECU 8 (**A)** and sample ECU 9 (**B**). *Source: The authors.*

HAND SAMPLES

Group	Mineral Assemblage	Sample ID
Metapelites	Pl-Qz-Wm-Cld-Zo **Acc**: Py **Alt**: Chl	Ecu 8 Ecu 9 Ecu 12
Eclogites	Grt-Omp-Qz-Zo- **Acc**:Ttn-Rt-Zr-Ktp **Alt:** Chl	Ecu 2 Ecu 6 Ecu 21 Ecu 22B
Retrograde Eclogites	Grt-Gln/Act-Zo-Omp-Ktp **Acc**:Ttn-Qz-Zr-Pl **Alt:**Chl	Ecu: 1,3,4,5,7,11,16,17, 18,19,22A, 22C,22D,22E, 22F
Amphibolic schists	Act/Trem-Ktp-Zo-Wm-Zo-Qz **Acc**: Grt(relict) **Alt**: Chl	Ecu 10 Ecu 13 Ecu 14 Ecu 15
Serpentinite	Srp-Chl-Idding. **Acc:** Ol (relict) **Alt** Iddingsite	Ecu 20

Table 1. Rock groups conforming Raspas Complex and their main mineral assemblages *Source: The authors.*

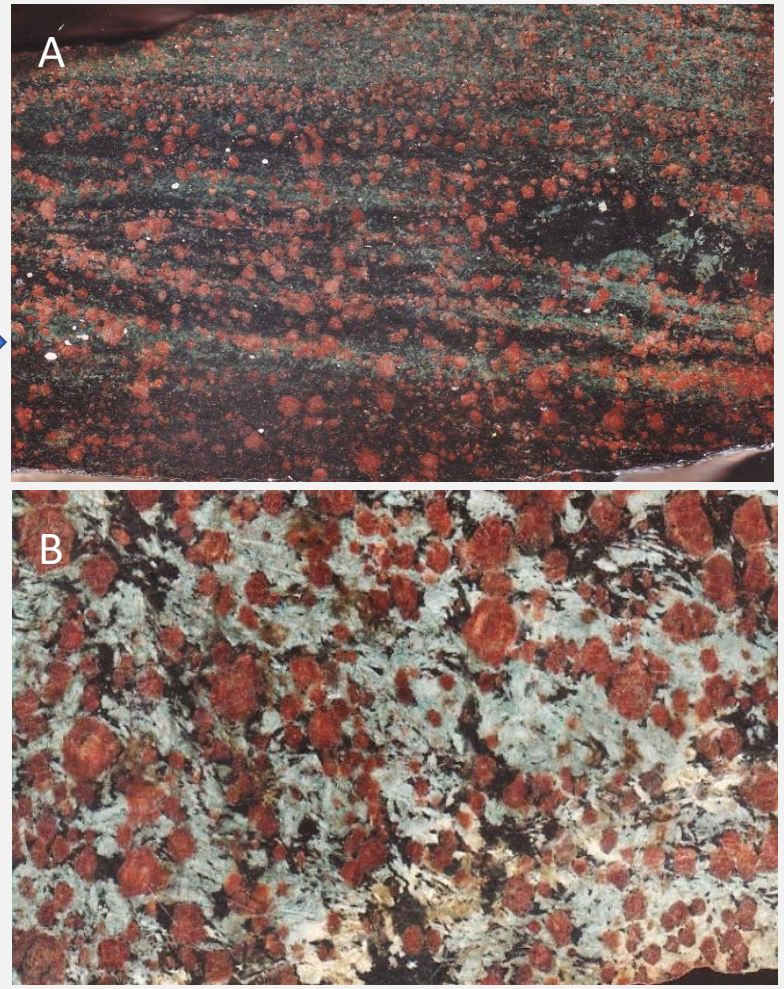


Fig. 6. Hand sample pictures, sample ECU 21 (**A)** and sample ECU 22B (**B**). *Source: The authors.*

HAND SAMPLES

Group	Mineral Assemblage	Sample ID
Metapelites	Pl-Qz-Wm-Cld-Zo **Acc**: Py **Alt**: Chl	Ecu 8 Ecu 9 Ecu 12
Eclogites	Grt-Omp-Qz-Zo- **Acc**:Ttn-Rt-Zr-Ktp **Alt:** Chl	Ecu 2 Ecu 6 Ecu 21 Ecu 22B
Retrograde Eclogites	Grt-Gln/Act-Zo-Omp-Ktp **Acc**:Ttn-Qz-Zr-Pl **Alt:**Chl	Ecu: 1,3,4,5,7,11,16,17, 18,19,22A, 22C,22D,22E, 22F
Amphibolic schists	Act/Trem-Ktp-Zo-Wm-Zo-Qz **Acc**: Grt(relict) **Alt**: Chl	Ecu 10 Ecu 13 Ecu 14 Ecu 15
Serpentinite	Srp-Chl-Idding. **Acc:** Ol (relict) **Alt** Iddingsite	Ecu 20

Table 1. Rock groups conforming Raspas Complex and their main mineral assemblages *Source: The authors.*

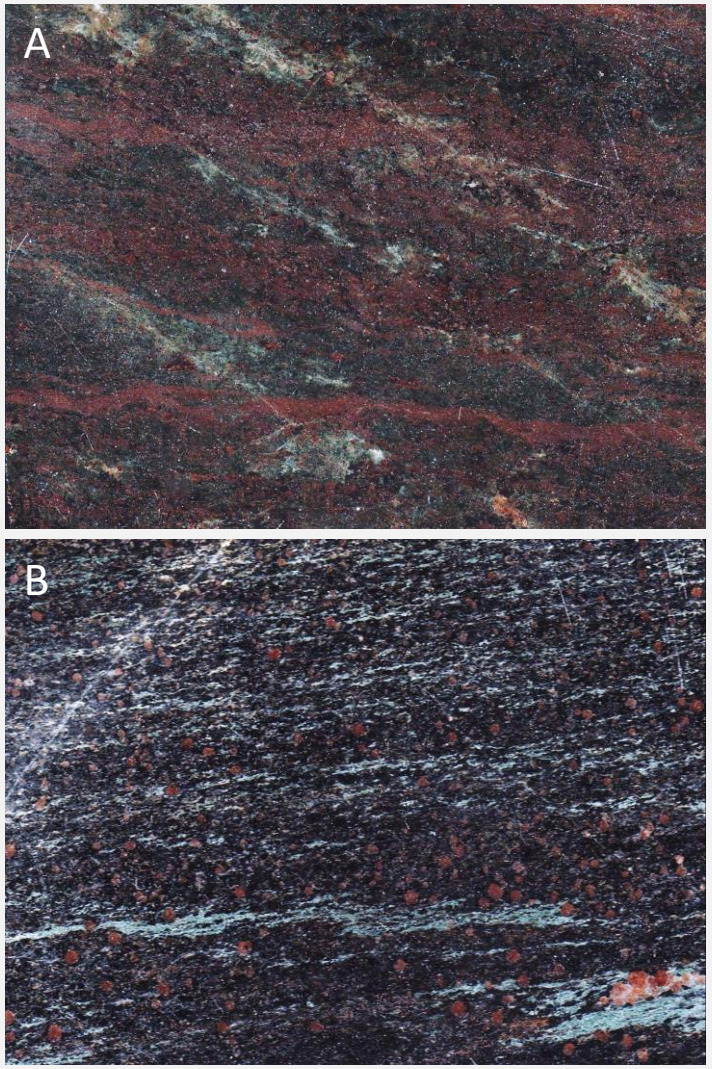


Fig. 7. Hand sample pictures, sample ECU 16 (**A)** and sample ECU 18 (**B**). *Source: The authors.*

HAND SAMPLES

Group	Mineral Assemblage	Sample ID
Metapelites	Pl-Qz-Wm-Cld-Zo **Acc**: Py **Alt**: Chl	Ecu 8 Ecu 9 Ecu 12
Eclogites	Grt-Omp-Qz-Zo- **Acc**:Ttn-Rt-Zr-Ktp **Alt:** Chl	Ecu 2 Ecu 6 Ecu 21 Ecu 22B
Retrograde Eclogites	Grt-Gln/Act-Zo-Omp-Ktp **Acc**:Ttn-Qz-Zr-Pl **Alt:**Chl	Ecu: 1,3,4,5,7,11,16,17, 18,19,22A, 22C,22D,22E, 22F
Amphibolic schists	Act/Trem-Ktp-Zo-Wm-Zo-Qz **Acc**: Grt(relict) **Alt**: Chl	Ecu 10 Ecu 13 Ecu 14 Ecu 15
Serpentinite	Srp-Chl-Idding. **Acc:** Ol (relict) **Alt** Iddingsite	Ecu 20

Table 1. Rock groups conforming Raspas Complex and their main mineral assemblages *Source: The authors.*

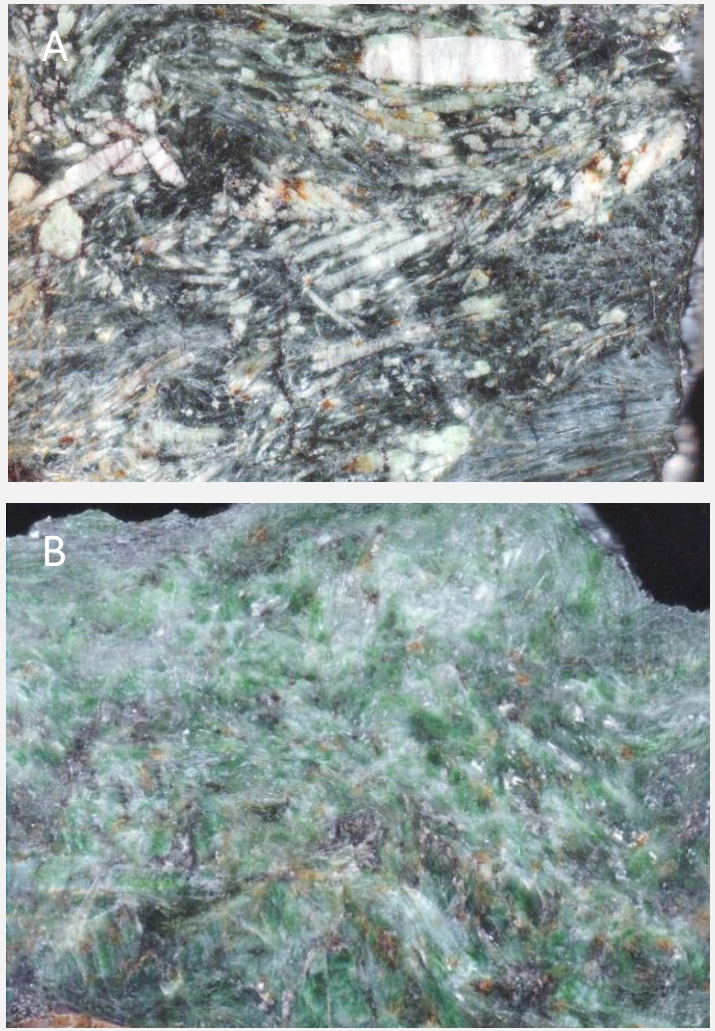


Fig. 8. Hand sample pictures, sample ECU 13 (**A)** and sample ECU 14 (**B**). *Source: The authors.*

Group	Mineral Assemblage	Sample ID
Metapelites	Pl-Qz-Wm-Cld-Zo **Acc**: Py **Alt**: Chl	Ecu 8 Ecu 9 Ecu 12
Eclogites	Grt-Omp-Qz-Zo- **Acc**:Ttn-Rt-Zr-Ktp **Alt:** Chl	Ecu 2 Ecu 6 Ecu 21 Ecu 22B
Retrograde Eclogites	Grt-Gln/Act-Zo-Omp-Ktp **Acc**:Ttn-Qz-Zr-Pl **Alt:**Chl	Ecu: 1,3,4,5,7,11,16,17, 18,19,22A, 22C,22D,22E, 22F
Amphibolic schists	Act/Trem-Ktp-Zo-Wm-Zo-Qz **Acc**: Grt(relict) **Alt**: Chl	Ecu 10 Ecu 13 Ecu 14 Ecu 15
Serpentinite	Srp-Chl-Idding. **Acc:** Ol (relict) **Alt** Iddingsite	Ecu 20

Table 1. Rock groups conforming Raspas Complex and their main mineral assemblages
Source: The authors.

Fig. 9. Hand sample picture, sample ECU 20
Source: The authors.

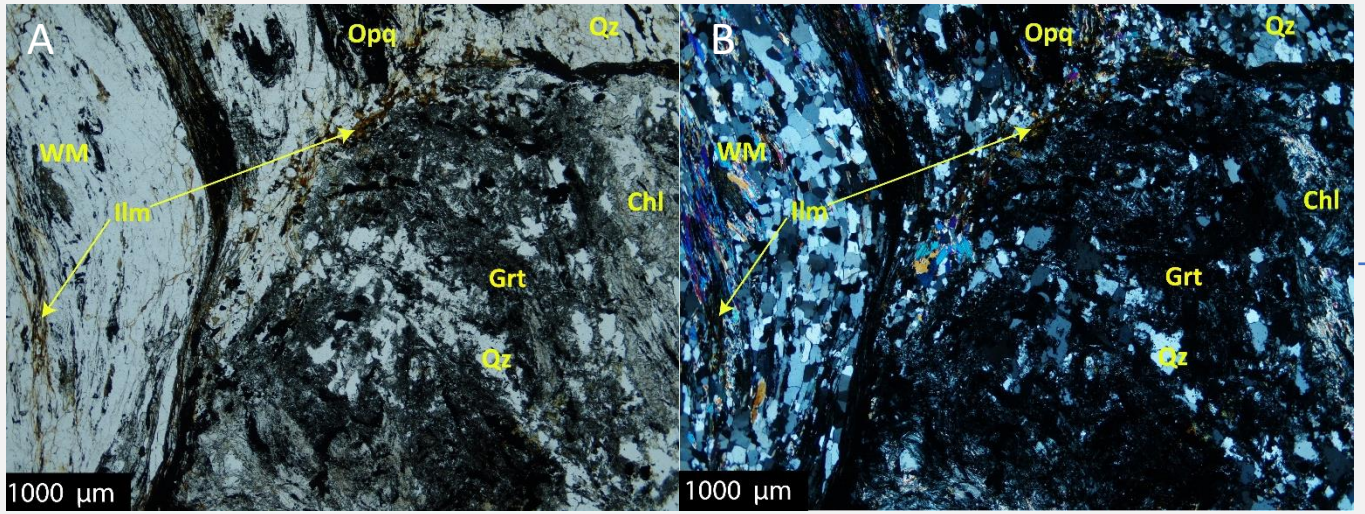


Fig. 10. Thin section pictures, sample ECU 9. PPL (**A**), XPL (**B**).
Source: The authors.

1. Metapelites

Pl : 0 – 20 %
Qz : 45 – 62 %
Zo : 0 – 18 %
Cld : 0 – 10 %

2. Eclogites

Qz : 5 – 50 %
Amp : 5 – 18 %
Grt : 20 – 52 %
Zo : 0 – 10 %
Cpx : 15 – 35 %

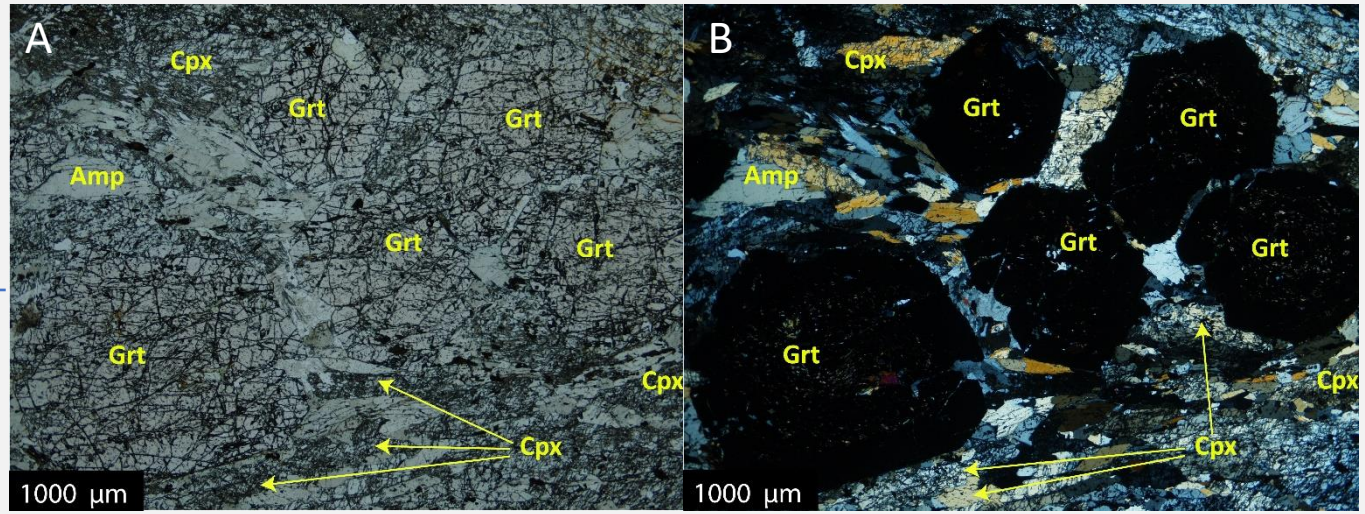


Fig. 11. Thin section pictures, sample ECU 22B. PPL (**A**), XPL (**B**).
Source: The authors.

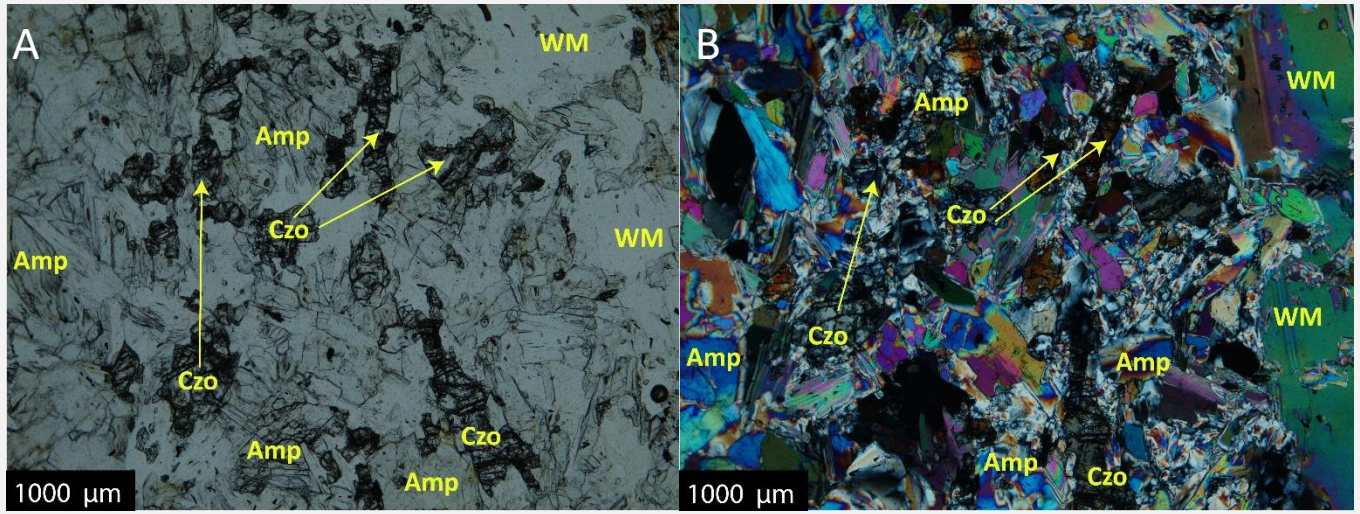


Fig. 12. Thin section pictures, sample ECU 15. PPL (**A**), XPL (**B**). *Source: The authors.*

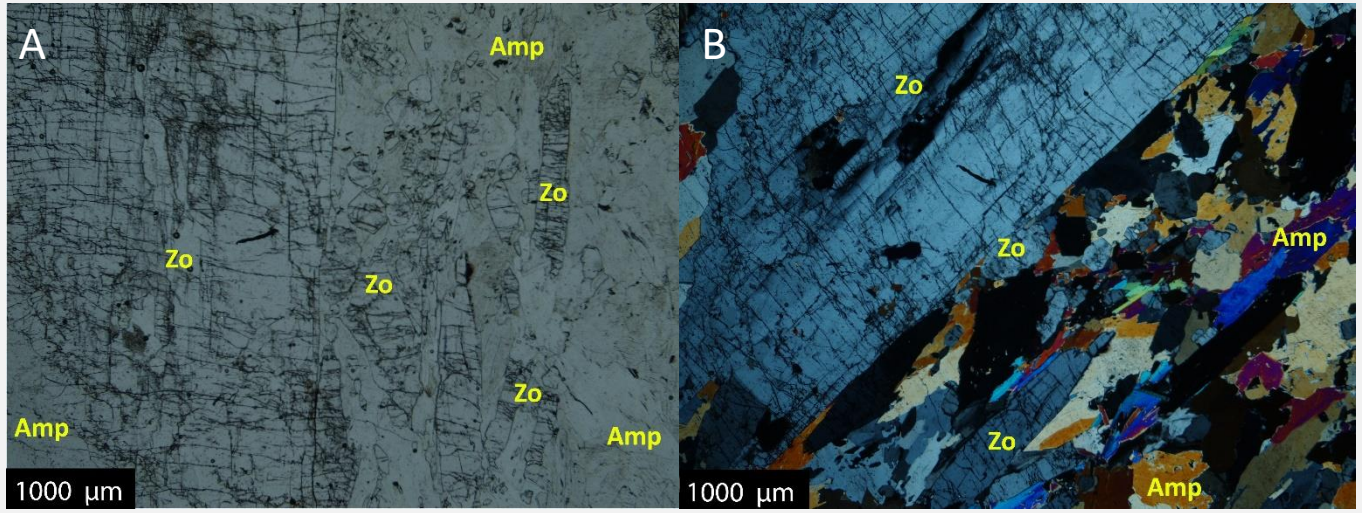


Fig. 13. Thin section pictures, sample ECU 10. PPL (**A**), XPL (**B**). *Source: The authors.*

3. Amphibolic Schists

Amp : 60 – 80 %
WM : 2 – 10 %
Czo/Zo : 10 - 20

Pseudomorphs after lawsonite (?)

4. Retrograde Eclogites

Grt : 10 – 55 %
Amp : 15 – 65 %
WM : 0 – 35 %
Zo/Czo : 0 – 15 %
Cpx : 0 – 18 %

Cpx replacement by amphibol suggests retrograde metamorphism.

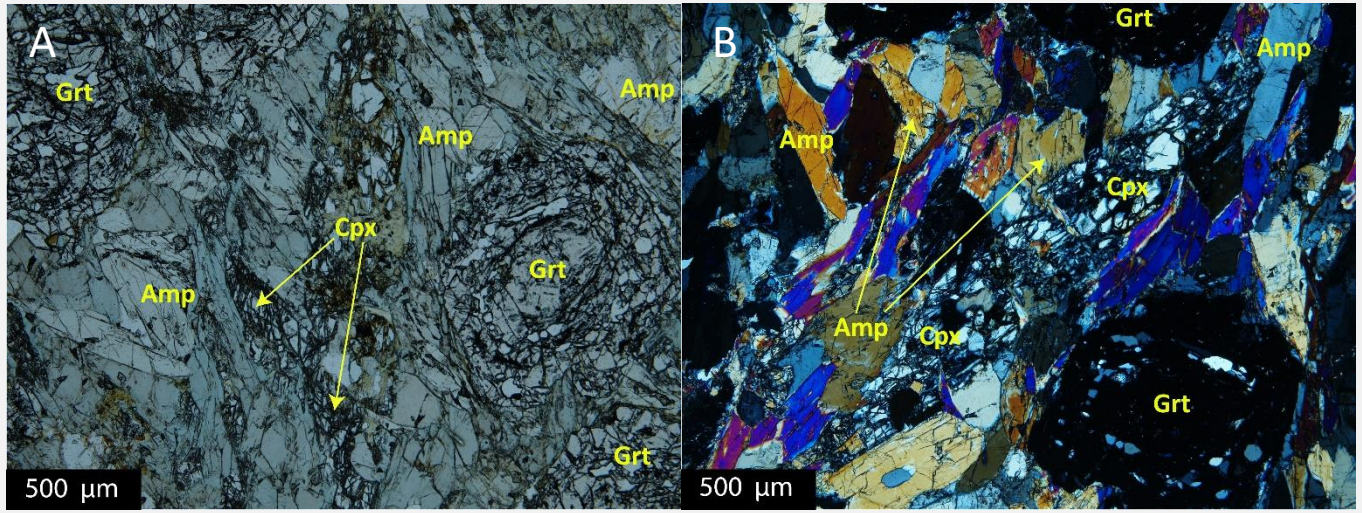


Fig. 14. Thin section pictures, sample ECU 7. PPL (**A**), XPL (**B**). *Source: The authors.*

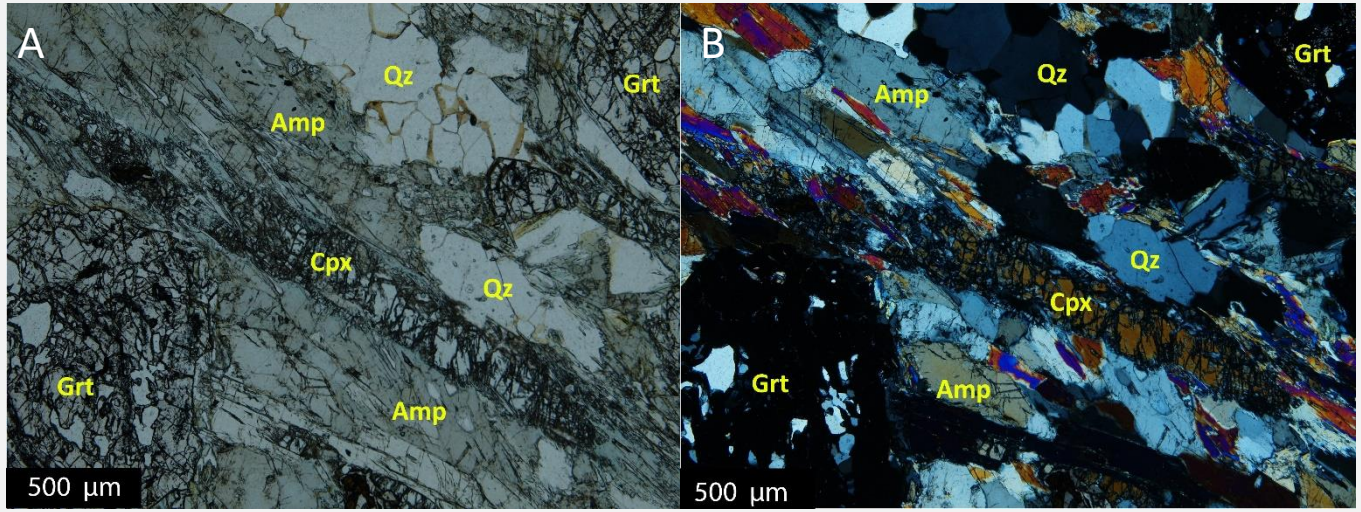


Fig. 15. Thin section pictures, sample ECU 7. PPL (**A**), XPL (**B**). *Source: The authors.*

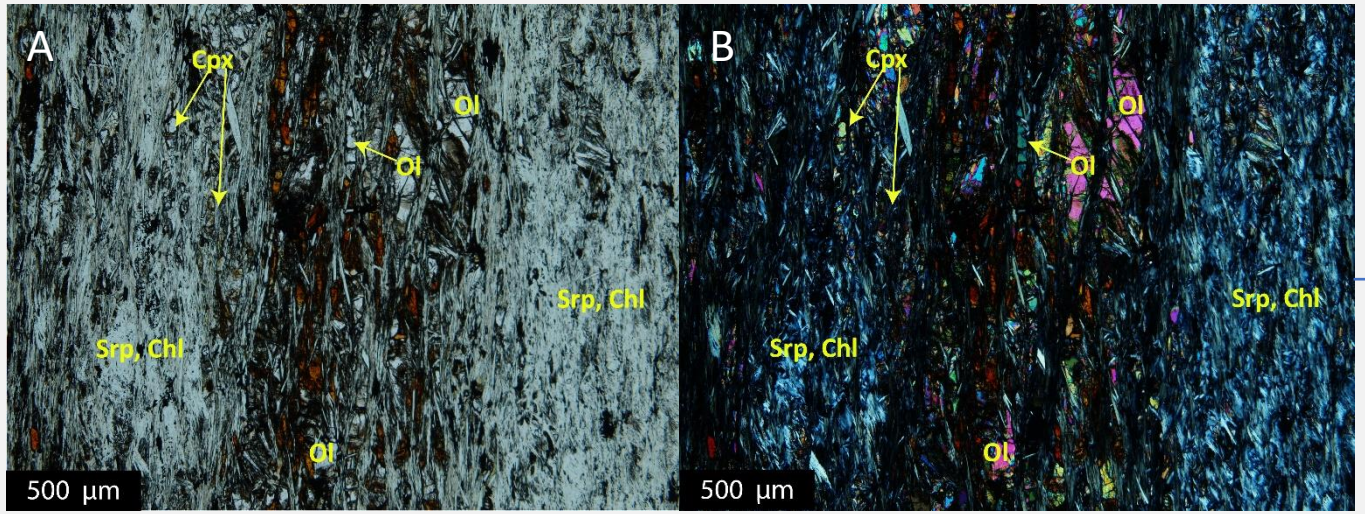


Fig. 16. Thin section pictures, sample ECU 20. PPL (**A**), XPL (**B**). *Source: The authors.*

5. Serpentinite

Srp : 65 %
Chl : 35 %
(Ol relict)

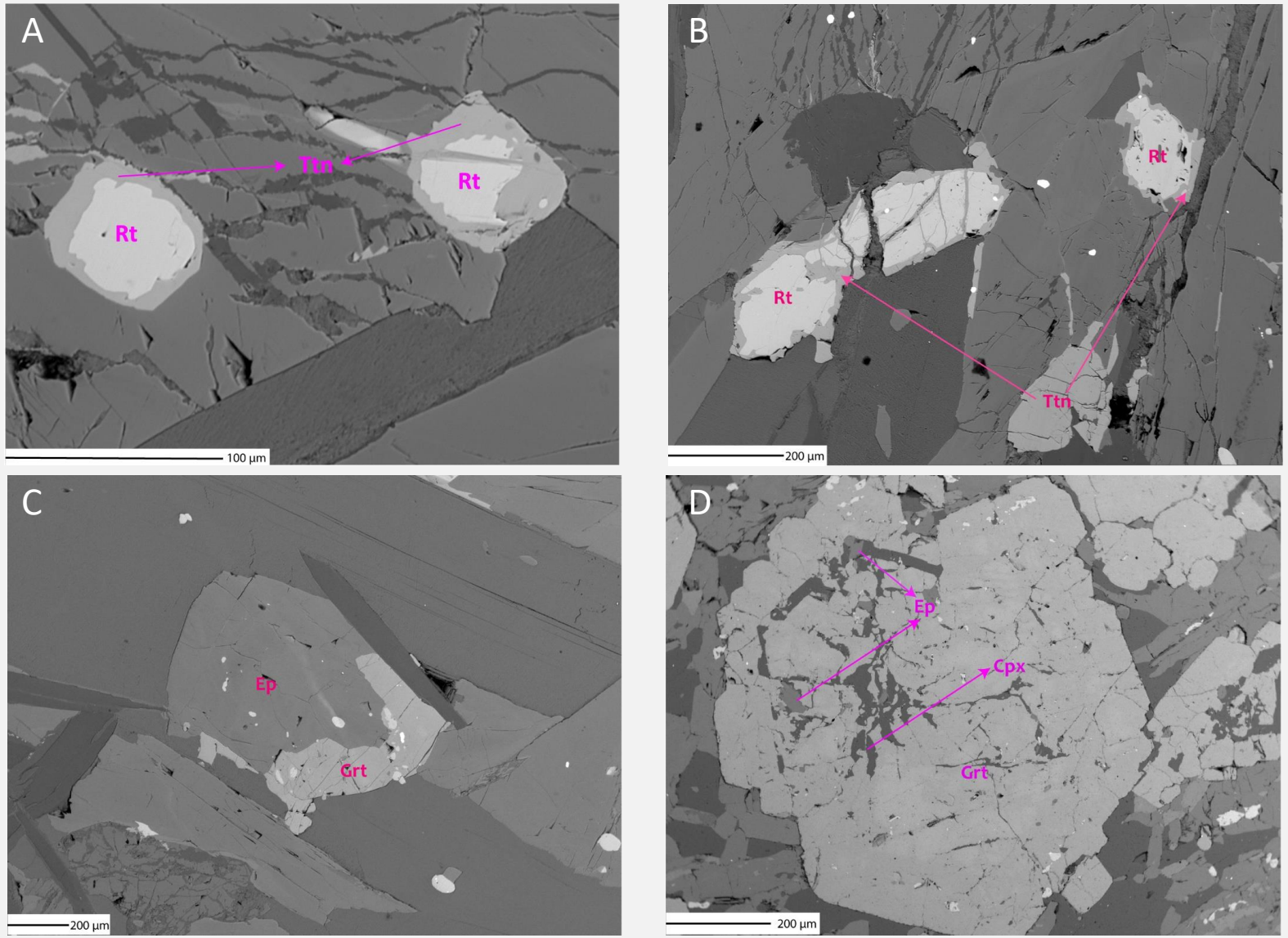
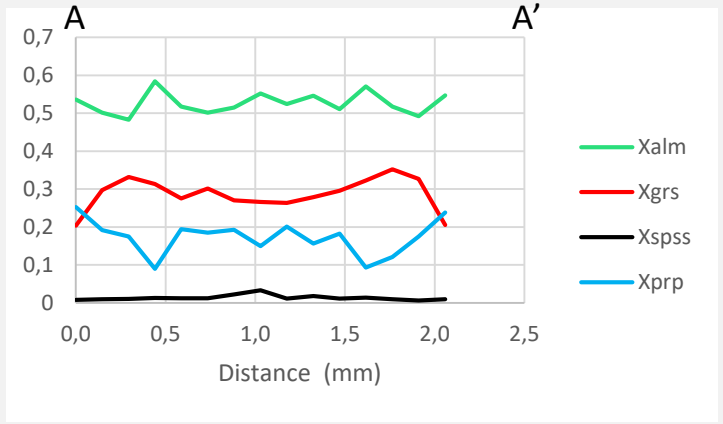
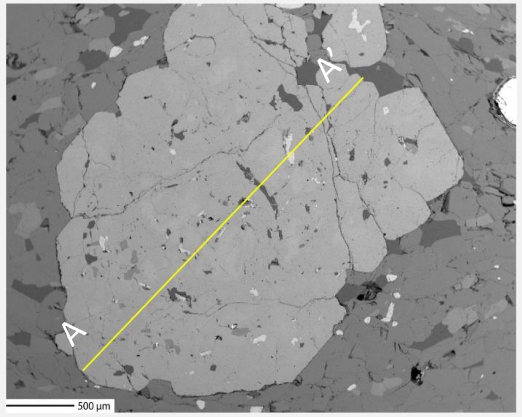
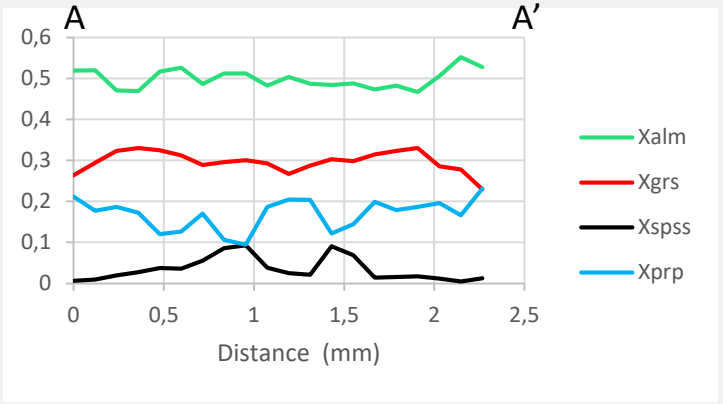
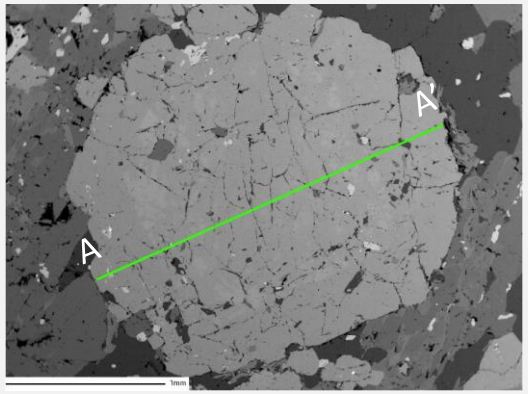


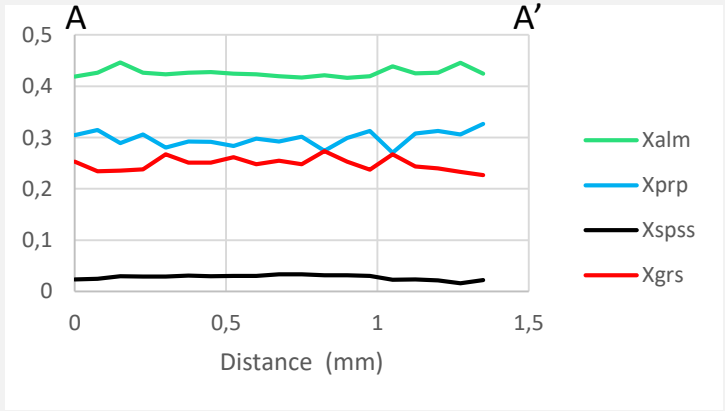
Fig. 17. X ray pictures, retrograde metamorphism textures. Sample ECU 1 (**A, B and C**). Sample ECU 21 (**D**).
Source: The authors.

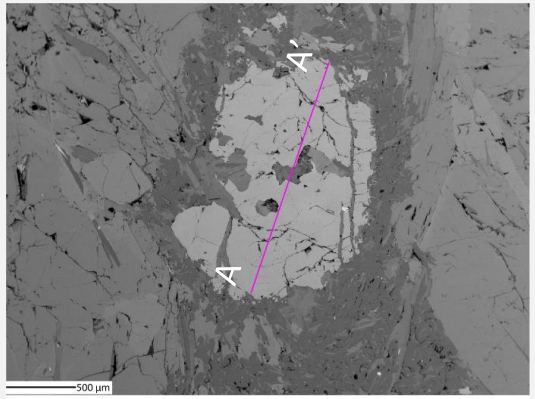












- Cores depleted in Fe and Ca but rich in Mn and Mg.
- Normal zonation patterns.
- At least two growth pulses

Fig. 18. Garnet compositional profiles, samples ECU 21 (Top), ECU 6 (Center) and ECU 10 (Bottom). *Source: The authors.*

ECU 6

ECU 21

ECU 10

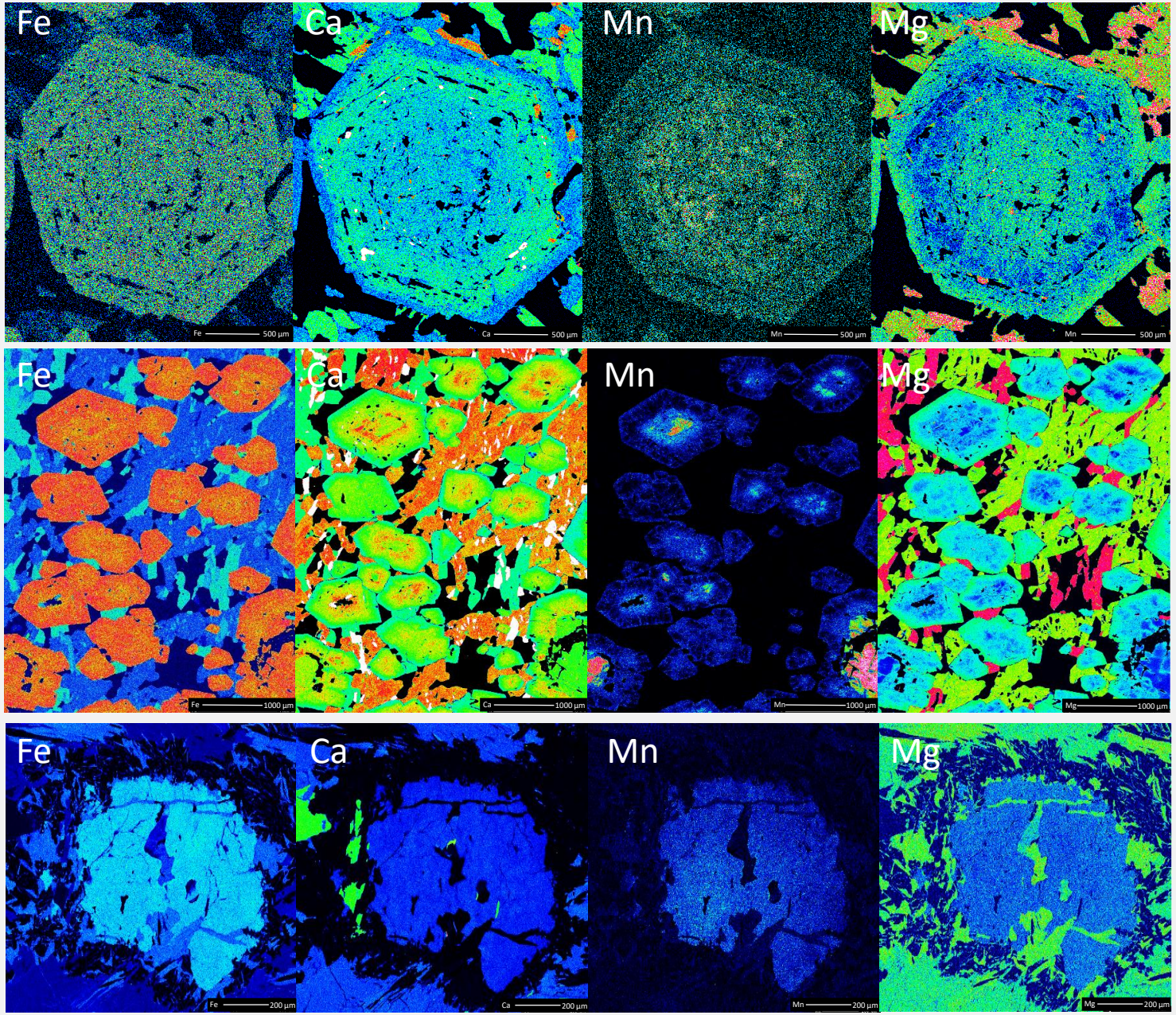


Fig. 19. Garnet compositional maps. *Souce: The Authors*

Pyroxene:

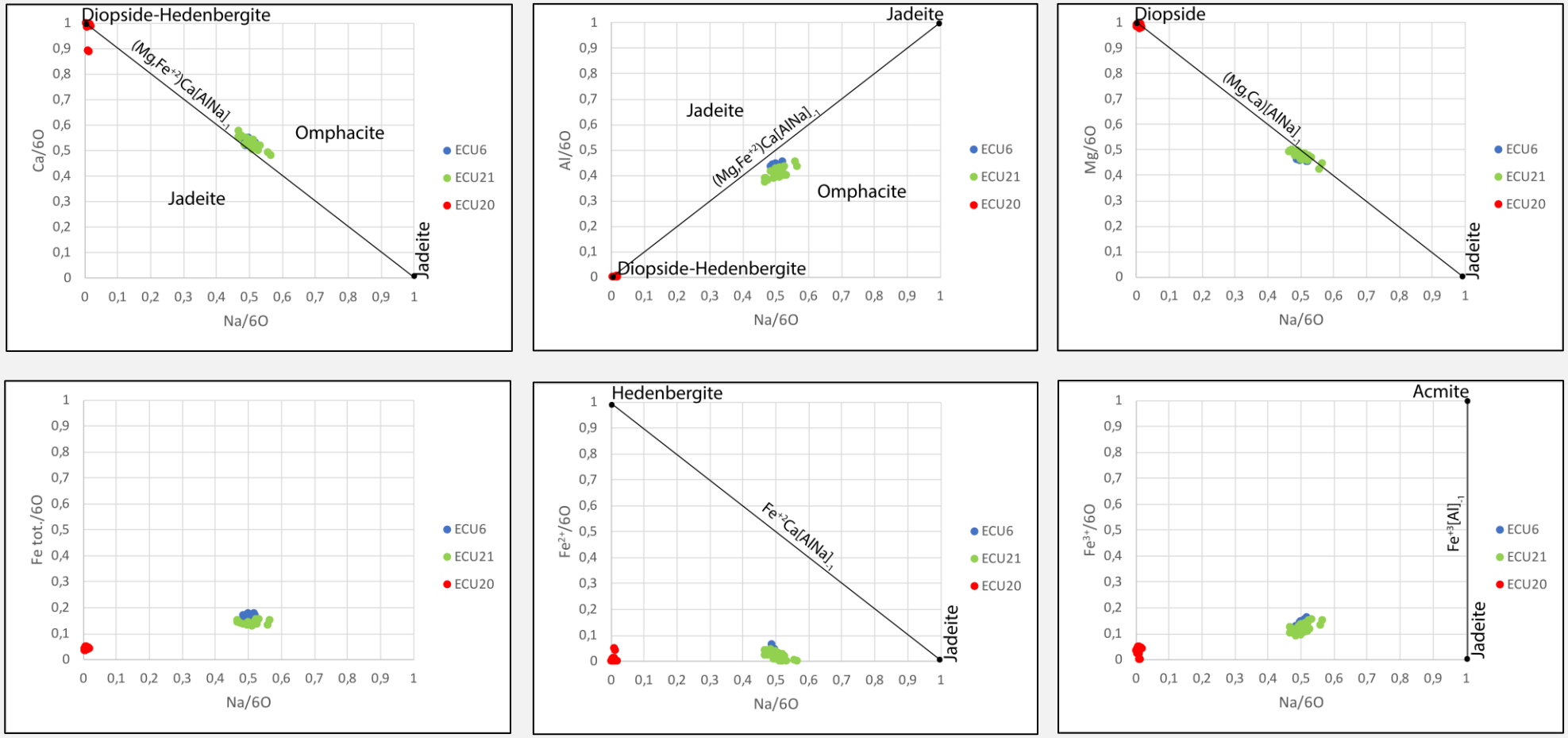


Fig. 20. Pyroxene classification diagrams. *Modified from García - Casco et al. (2009)*

MINERAL CHEMISTRY

Amphibole:

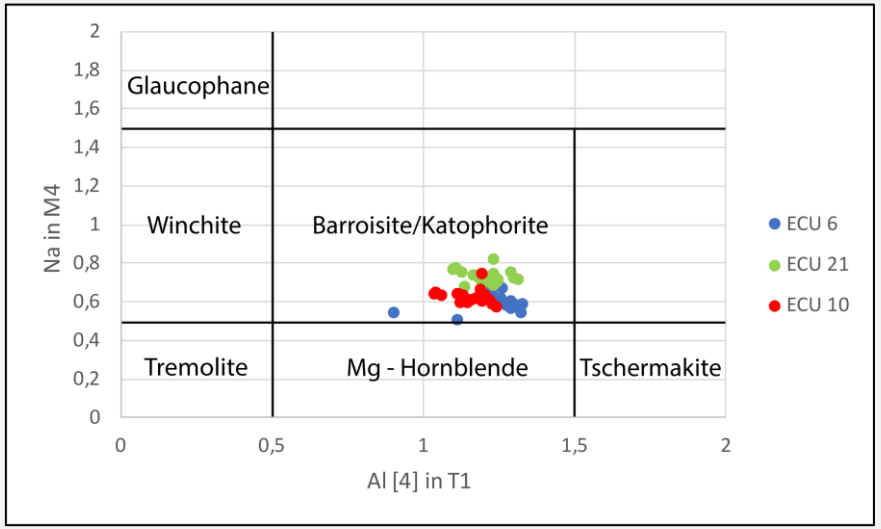


Fig. 21. Amphibole classification diagram. *After Leake et al. (1997)*

Plagioclase:

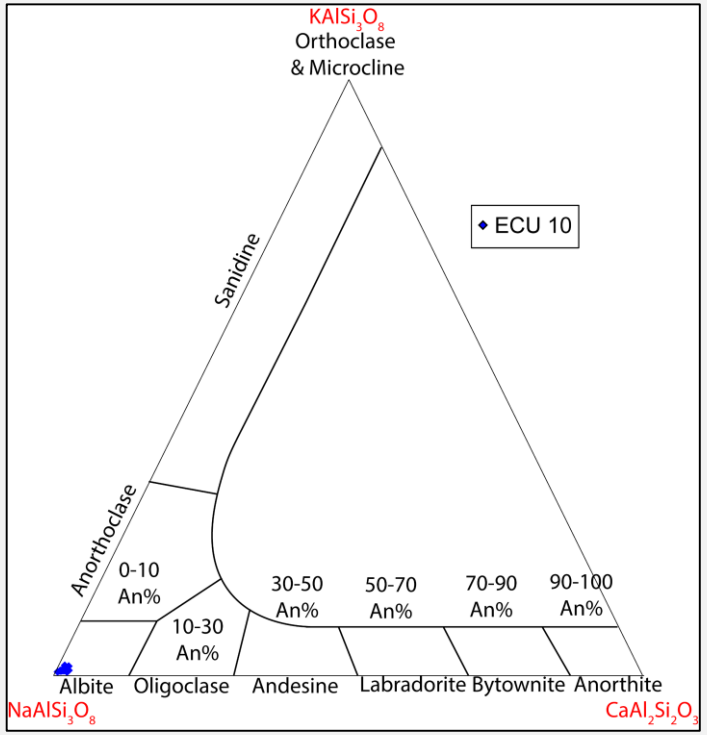


Fig. 22. Plagioclase classification diagram.

MINERAL CHEMISTRY

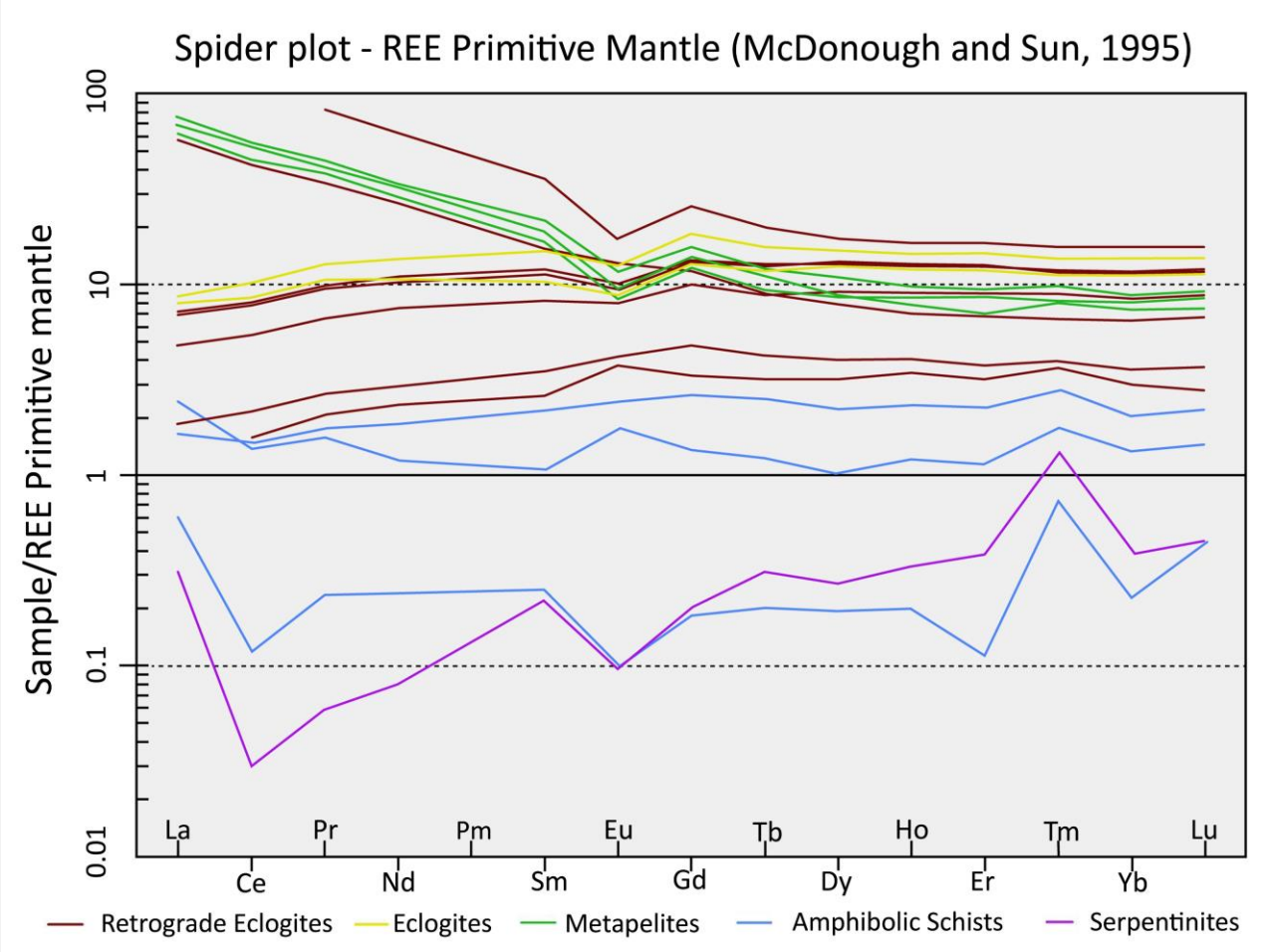


Fig. 23. Primitive mantle normalized spider Diagram *Source: The authors.*

- Metapelites are the most differentiated set of rocks.
- Enrichments in eclogites due to different types of alteration alongside the subduction zone.
- Ce anomalies as product of fluid alteration.

- Enrichments in eclogites due to different types of alteration alongside the subduction zone.
- Protolith NMORB type.

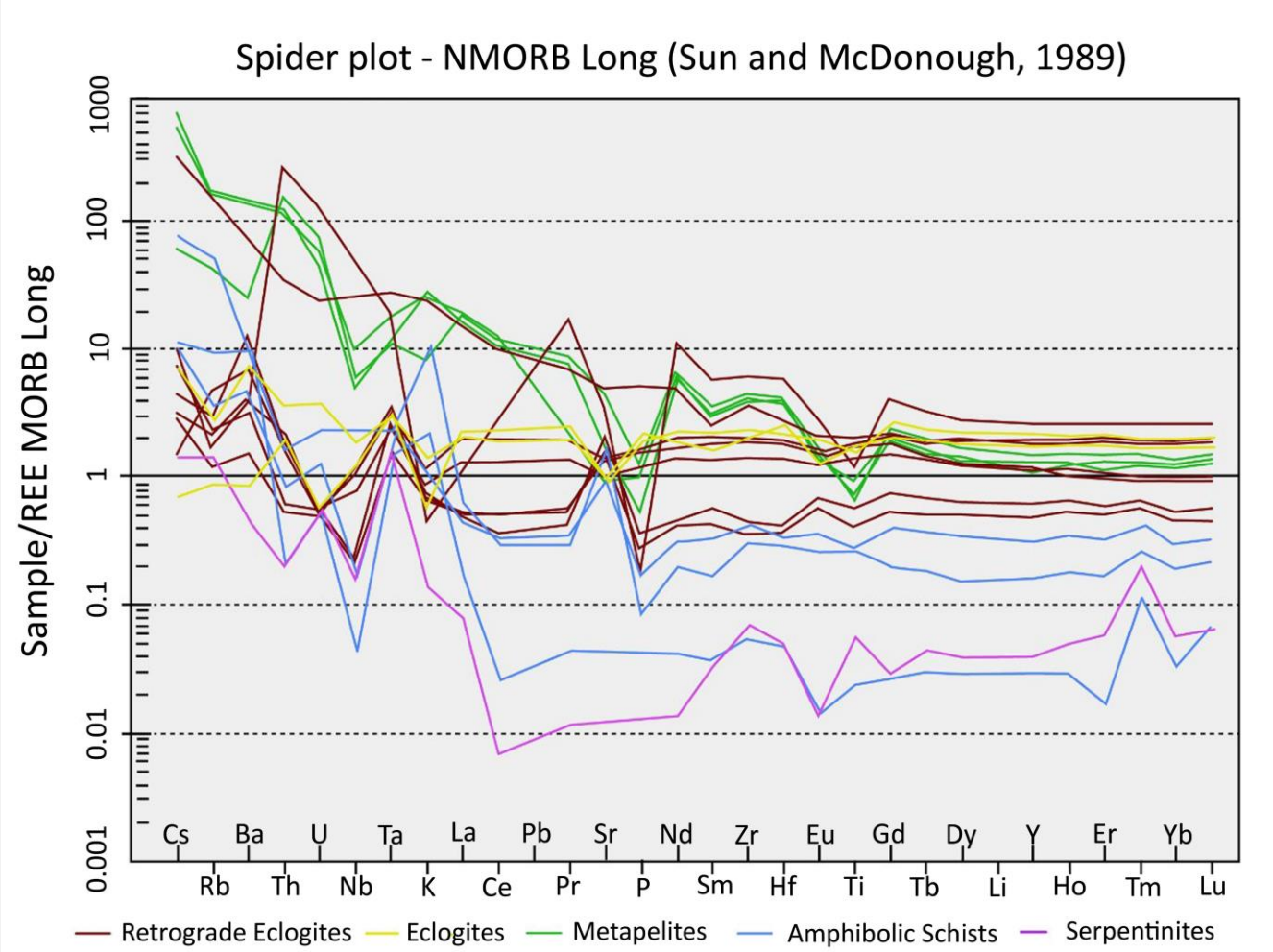


Fig. 24. N-MORB normalized spider Diagram *Source: The authors.*

ECU 6:

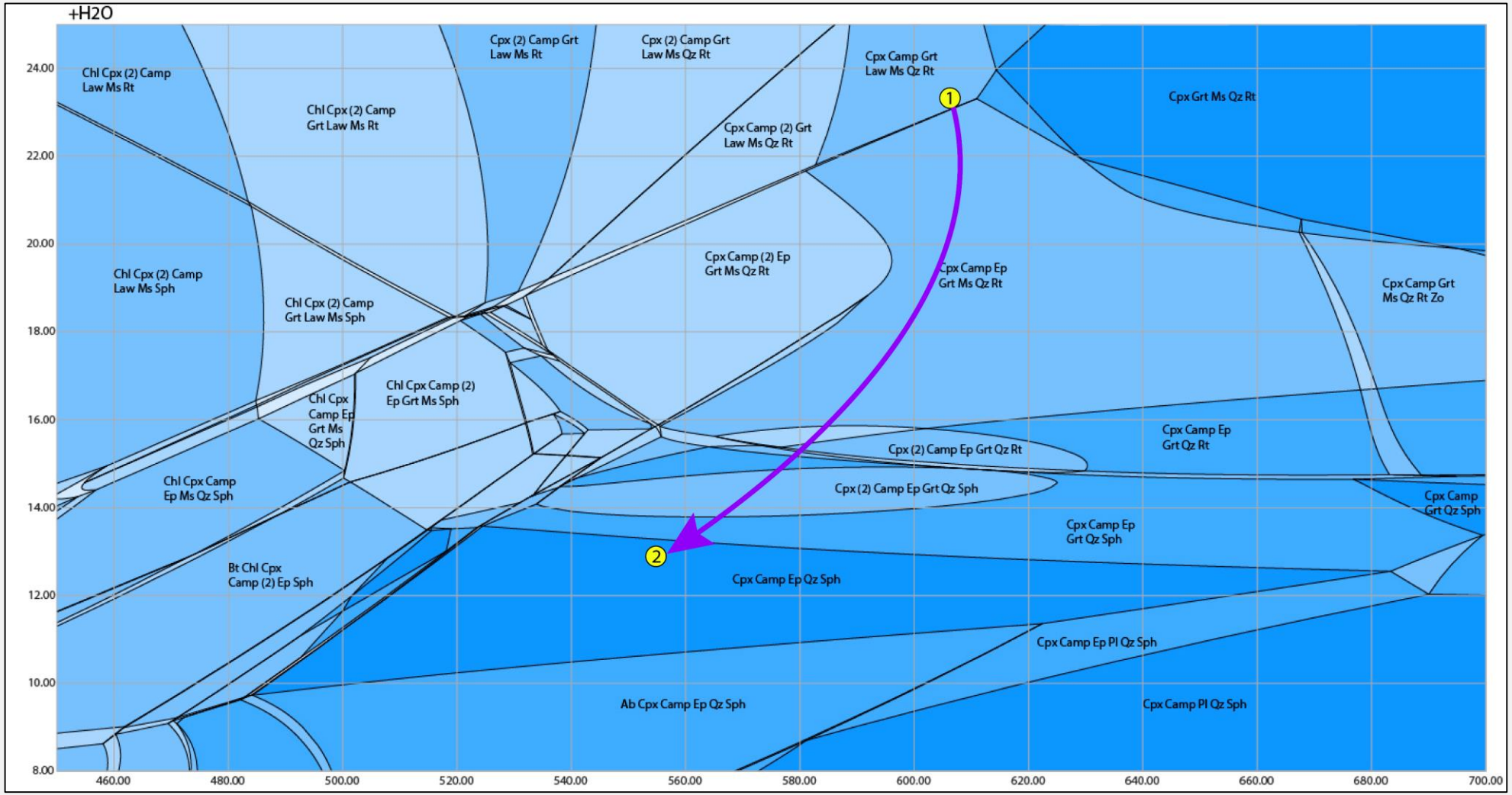


Fig. 25. Pseudosection and P-T path, sample ECU 6. *Source: The authors.*

P – T PATHS

ECU 10:

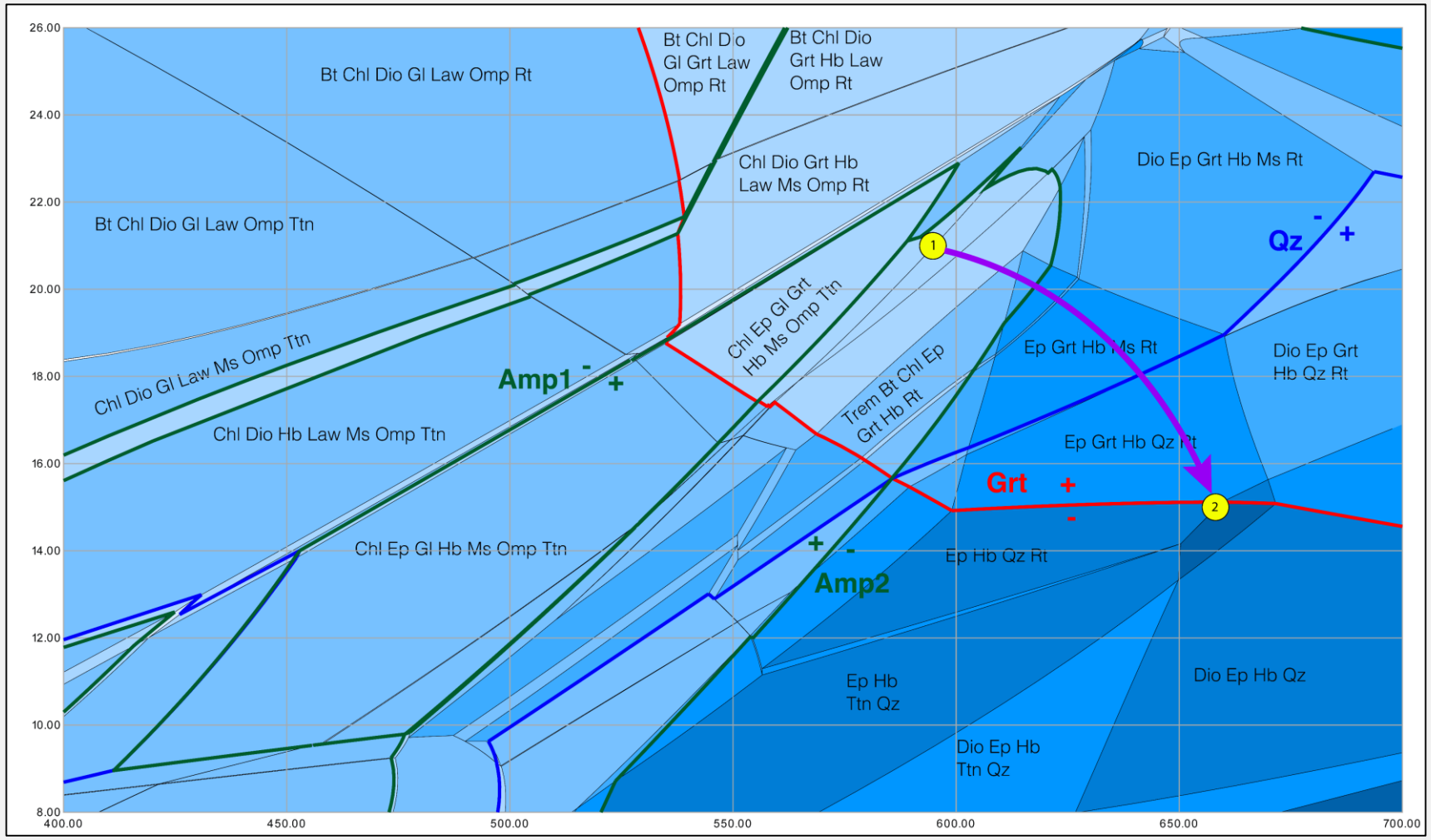
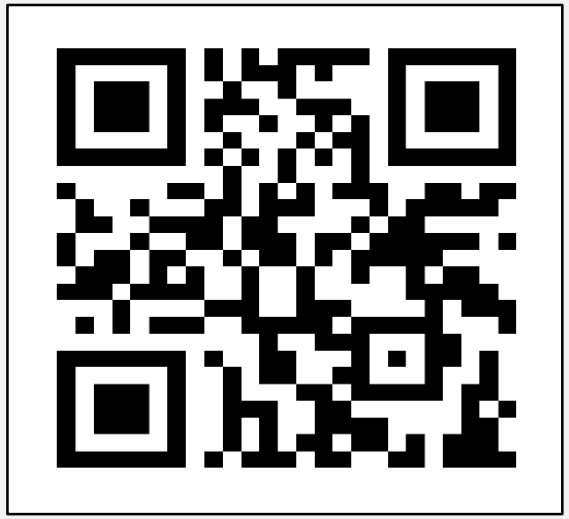


Fig. 26. Pseudosection and P-T path, sample ECU 10. *Source: The authors.*

P – T PATHS

- Peak of metamorphism corresponds to ≈ 21 ± 2 Kbar and 602 ± 20 °C. The retrograde metamorphic event was mainly driven by decompression, according to petrographic and X-ray observed evidence.
- Differences between calculated P and T values could be the result of different exhumation rates and velocities. This could explain the reason why not all the rocks have evidence of the pre-existence of Lawsonite.
- The retrograde P and T conditions reached by these rocks were not considerable enough in order to reverse zonation patterns inside garnet crystals.
- The P-T calculation results and the lithologies found in the Arquía Complex of Colombia *(Ríos-Reyes, Castellanos-Alarcón and García-Ramírez, 2016)* could indicate a direct relationship with the results obtained from the Raspas Complex, so these two complexes are found as parts of the same belt that was exhumed and formed in the NW subduction channel of South America.

SCAN FOR REFERENCES



CONCLUDING REMARKS