# Early retrogression of eclogite in HP and UHP domains, Western Gneiss Region, Norway

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Norway grants

National Science Centre Poland

## Introduction

The Western Gneiss Region (WGR) in W Norway is the lowermost tectono-stratigraphic unit in the nappe pile of the Scandinavian Caledonides. Exposed high-grade gneiss hosts ultrahigh pressure (UHP) metamorphic eclogite in domains that alternate without evidence for being separated from one another by tectonic shear or ductile flow [1, 2]. We studied nine eclogites from two UHP domains and the interjacent HP area in the Storfjord–Moldefjord region for mineral chemistry and microstructures to constrain differences and similarities in their metamorphic evolution. This study aims on the reason for the apparent metamorphic bimodality that is the source for contrasting models of tectonic UHP rock exhumation in subduction zones [3, 4, 5].

## UHP rocks in the WGR

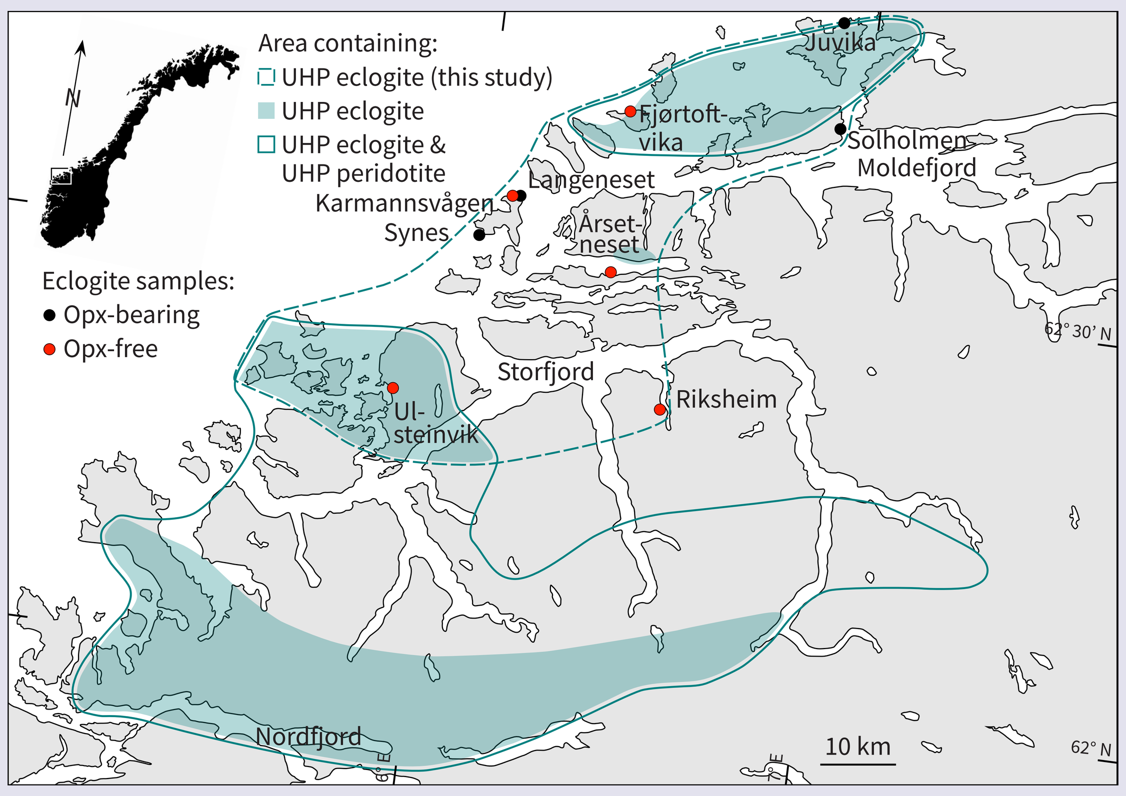


**Fig. 1:** Simplified map of the WGR that shows sample locations and known areas of UHP metamorphism from eclogite [1, 6] and peridotite [7].

Mafic rocks (eclogite) define three large UHP domains (or areas) that spread along the coast (shaded in Fig. 1). Ultramafic rocks (garnet-pyroxenite enclosed in orogenic garnet-peridotite) define UHP exposure that partially overlaps that of eclogite and partially fills the space in between (solid outline in Fig. 1). When taken together, evidence for UHP metamorphism is concentrated in two areas that are separated by a gap between the Storfjord and the Moldefjord. The sampling area (dashed outline in Fig. 1) covers this gap.

## Oriented inclusion petrography

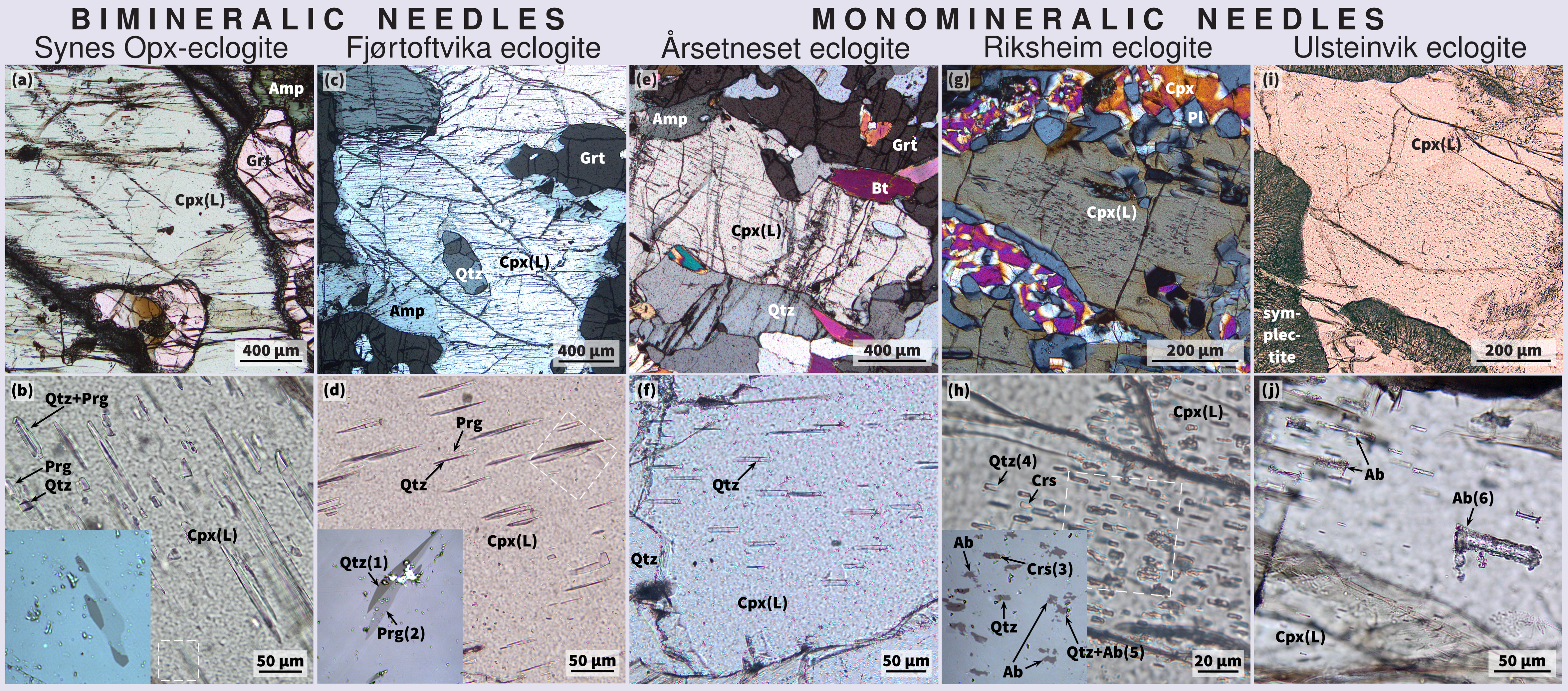


**Fig. 2:** Oriented inclusions in clinopyroxene (PPL; except c, e, g nearly XPL). (a–d) Bimineralic needles. (e–f) Monomineralic needles show a transformation by the reaction Qtz + Jd = Ab. Dashed frames display positions of inset photos (reflected light). Label numbers refer to Raman spectra shown in Fig. 3.

## Phase identification

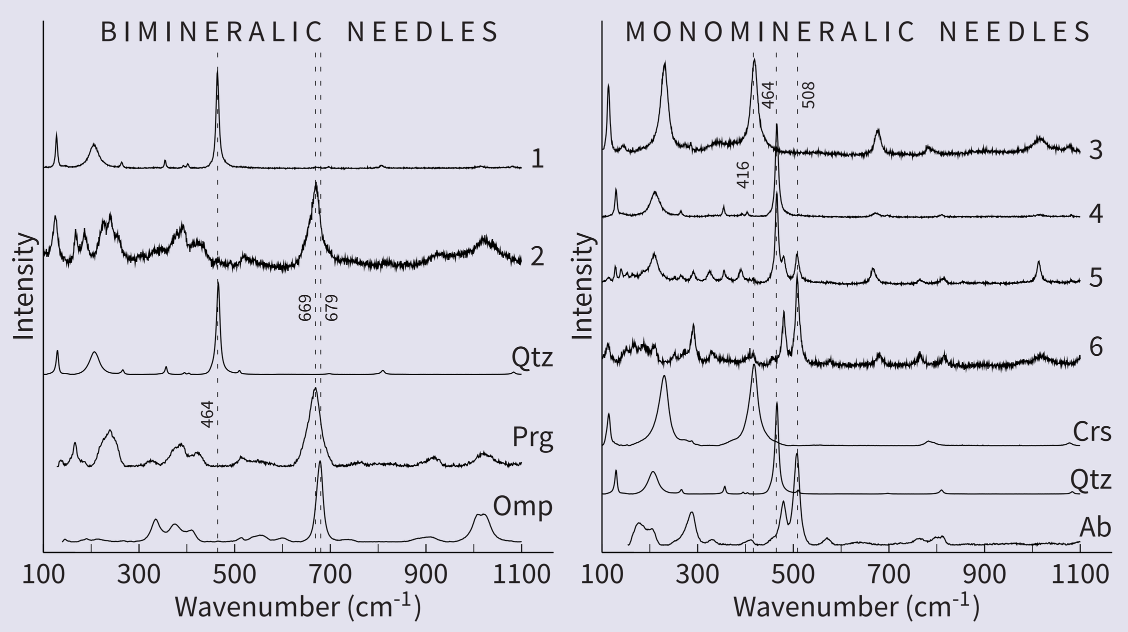


**Fig. 3:** Raman data of inclusions (numbered, Fig. 2) and reference material.

## Clinopyroxene chemistry

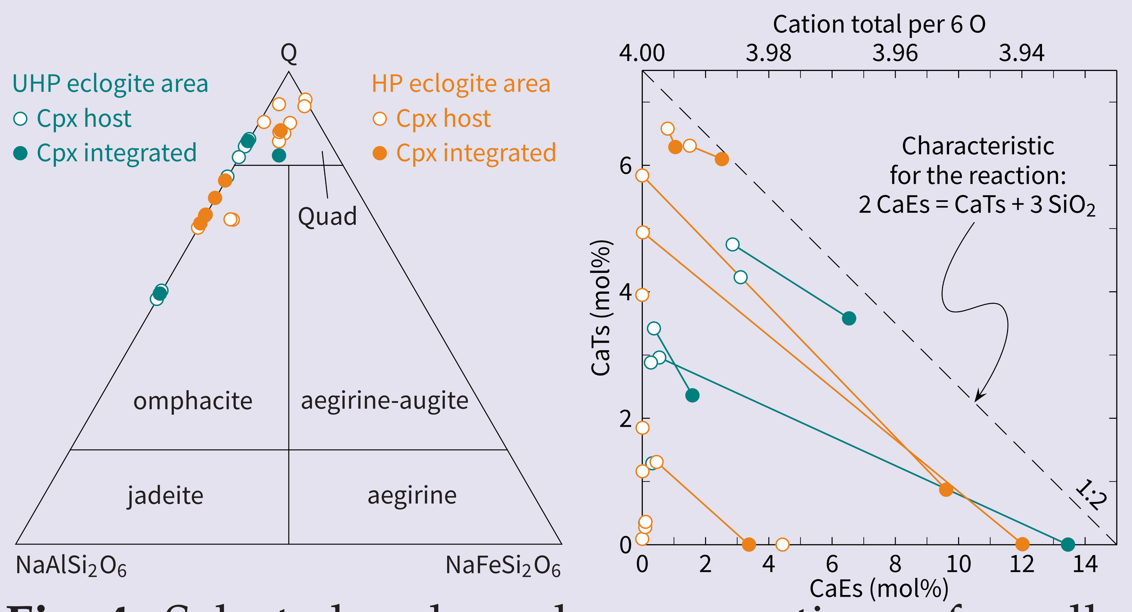


**Fig. 4:** Selected endmember proportions of needle bearing and integrated clinopyroxene. Solid lines connect compositions of individual grains.

## Thermobarometry

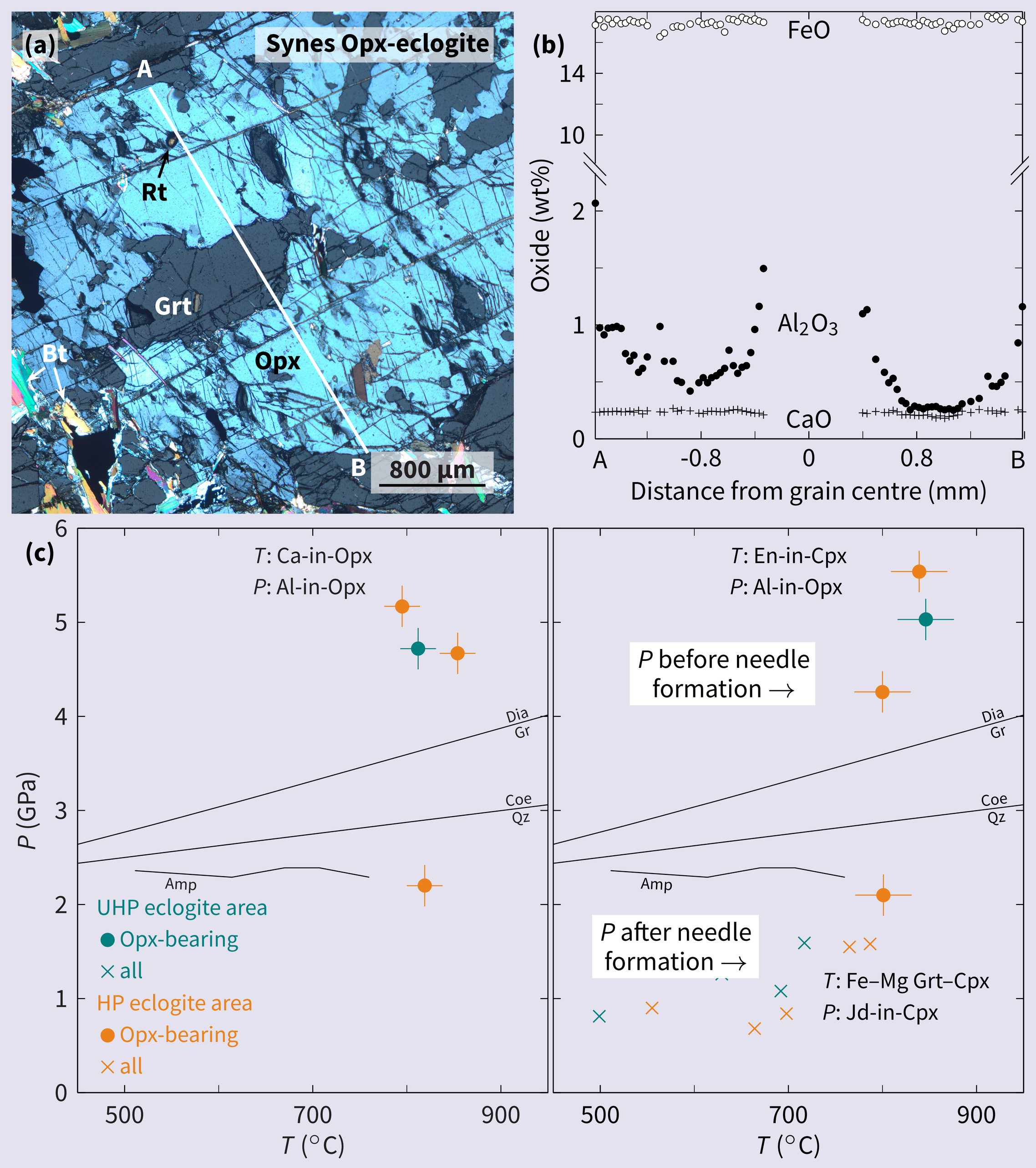


**Fig. 5:** Thermobarometry based on mineral chemistry. (a) Orthopyroxene with inclusions of irregularly shaped garnet (nearly XPL). (b) Element oxide concentrations along the profile shown in (a). (c) *PT* diagram with metamorphic estimates using three combinations of classical thermobarometers [8, 9, 10, 11].

## Funding

The research leading to these results has received funding from the Norway Grants 2014–2021 operated by National Science Centre under Project Contract No 2020/37/K/ST10/02784 granted to D.S.

## Conclusions

Eclogites exposed within and interjacent to two UHP areas in the WGR share:

(1) similar metamorphic *P&T* before and after eclogite facies decompression,
(2) oriented mineral inclusions in Cpx that formed after Ca-Eskola during decompression,
(3) variable degrees of retrogression irrespective of area boundaries (cf. Qtz needles → Ab).

Variable efficiency of retrogression formed an ostensible UHP eclogite distribution pattern.

## References

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