Petrology of sub-cratonic pyroxenite and eclogite containing lamellae-bearing garnet, Western Gneiss Region, Norway

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Peridotite bodies in W Norway

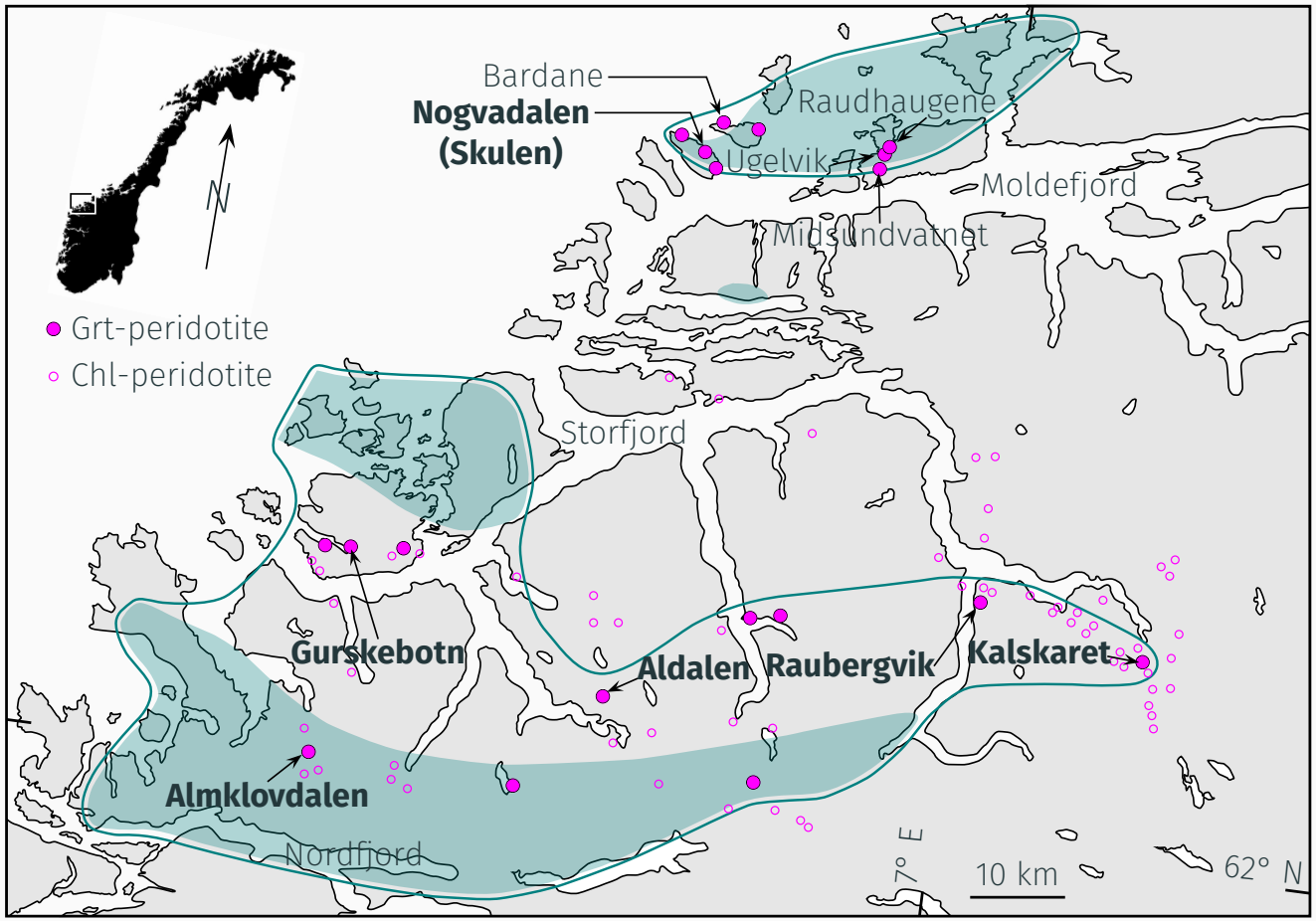
Grt-bearing bodies have layers of pyroxenite/eclogite

Some Grt contain exsolved lamellae

Q1) Lamellae types?

Q2) Spatial distribution?

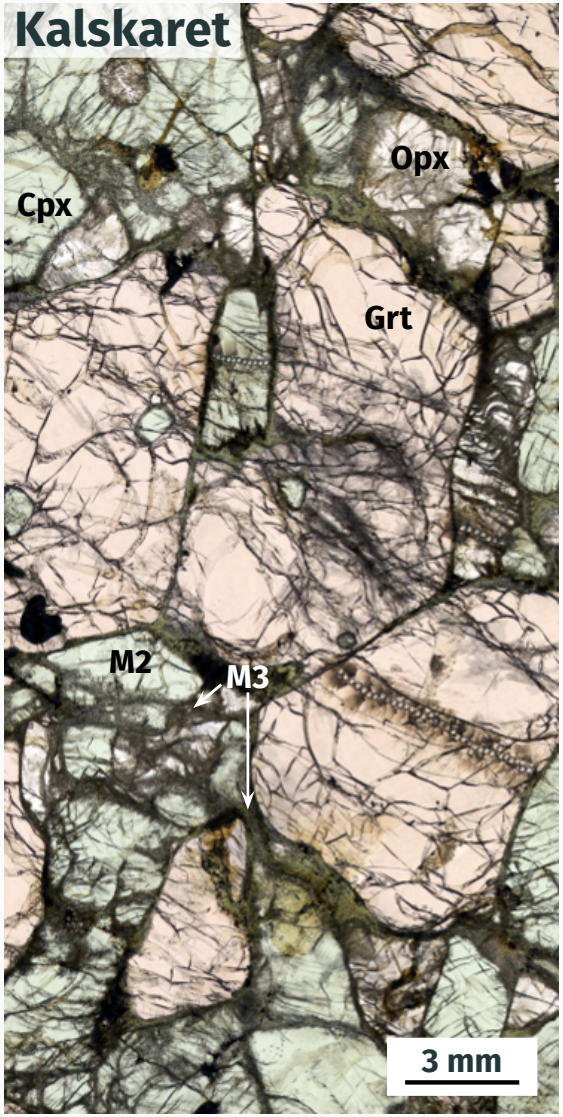
Q3) Significance to UHPM?



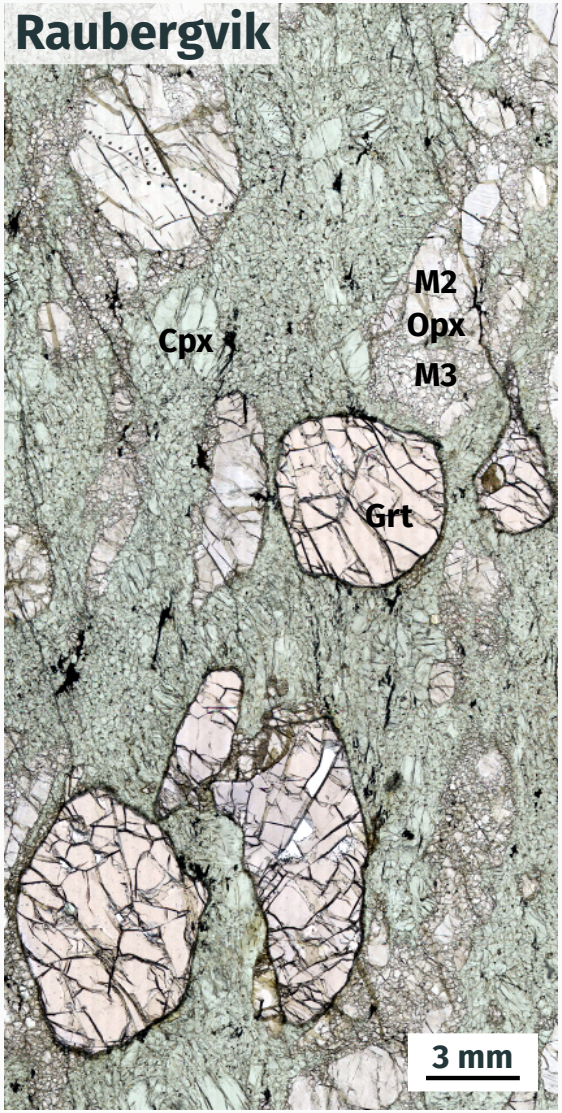
Distribution of WGR peridotite bodies (after Brueckner, 2018). Labelled bodies have garnet containing lamellar exsolutions. Sample locations are boldface.

Area with UHP eclogite (Spencer et al., 2013)
Area with UHP eclogite and UHP peridotite (this study)

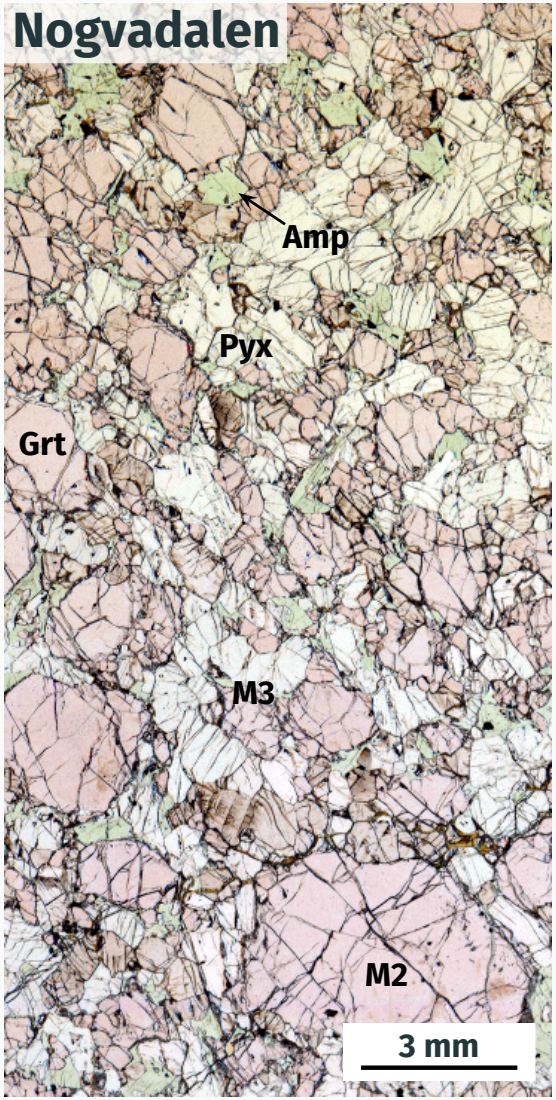
Degree of recrystallisation



minor
→ M2 granoblasts, ±M3

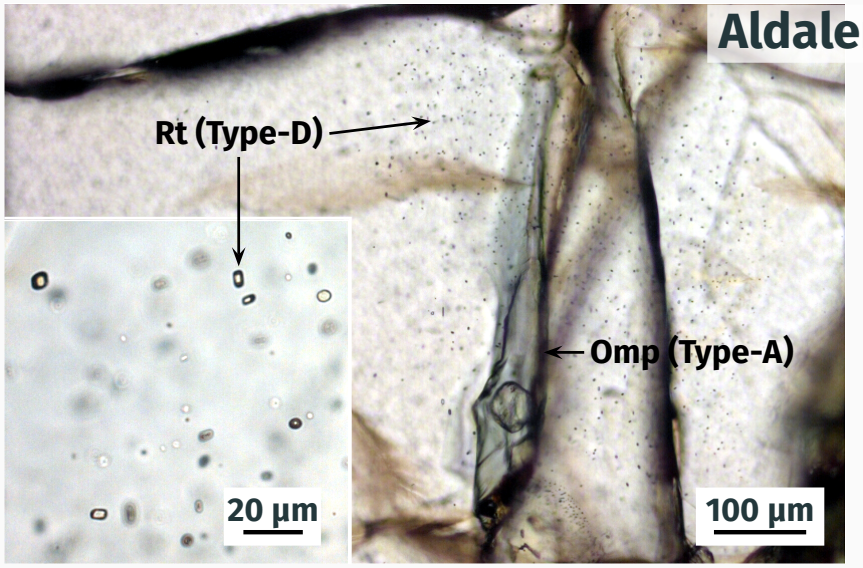


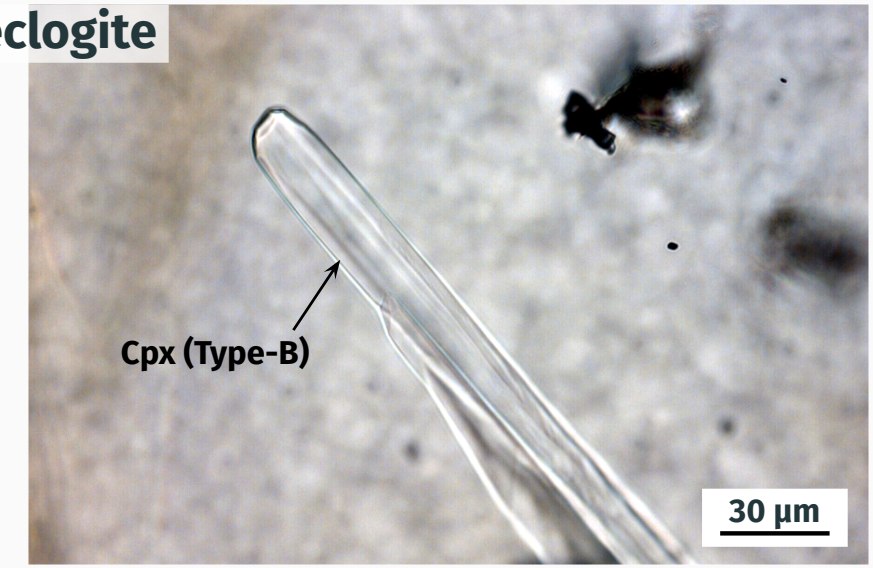
moderate
→ M2 porphyroclasts, M3

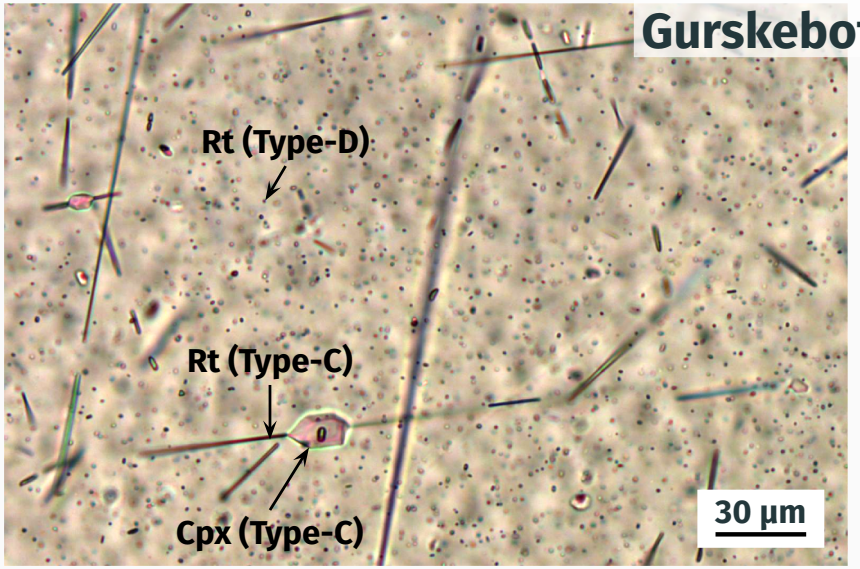


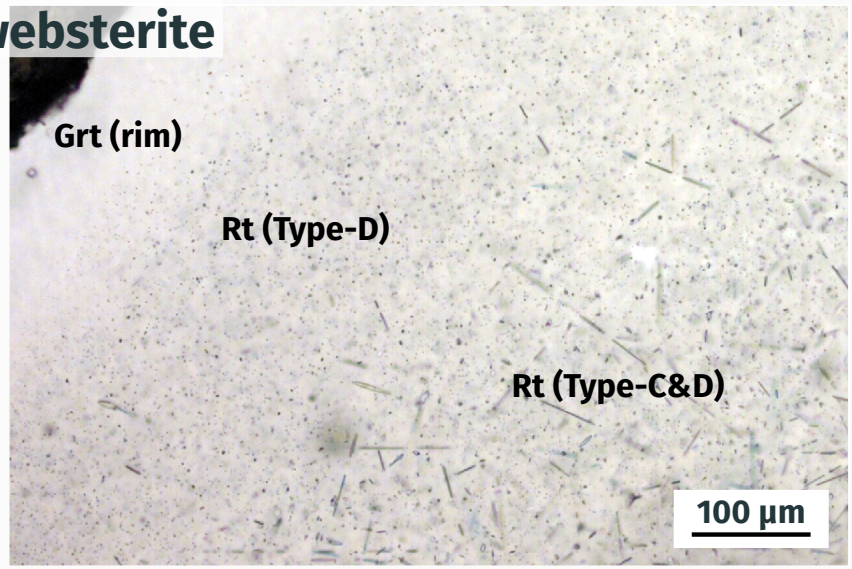
intense
→ M3, ±M2 porphyrocl.

Inclusions in M2 Grt: early types (A–D)

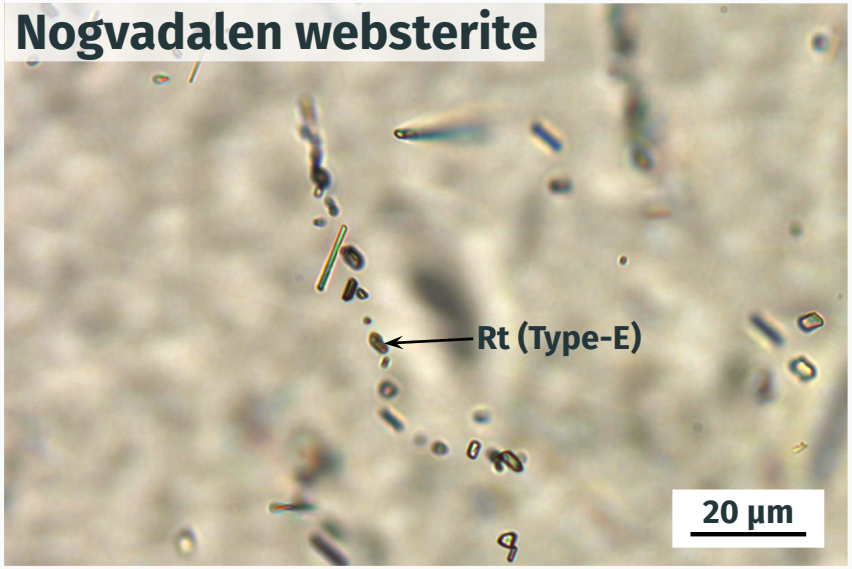


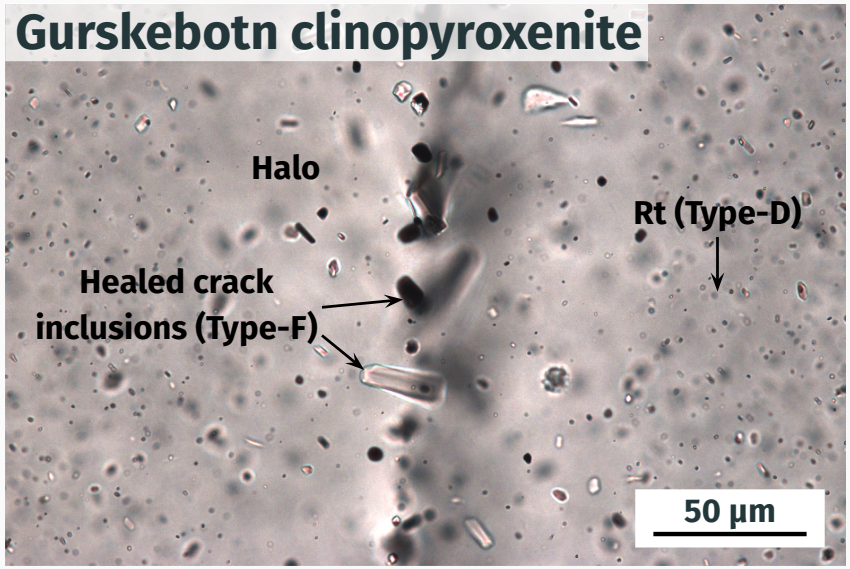






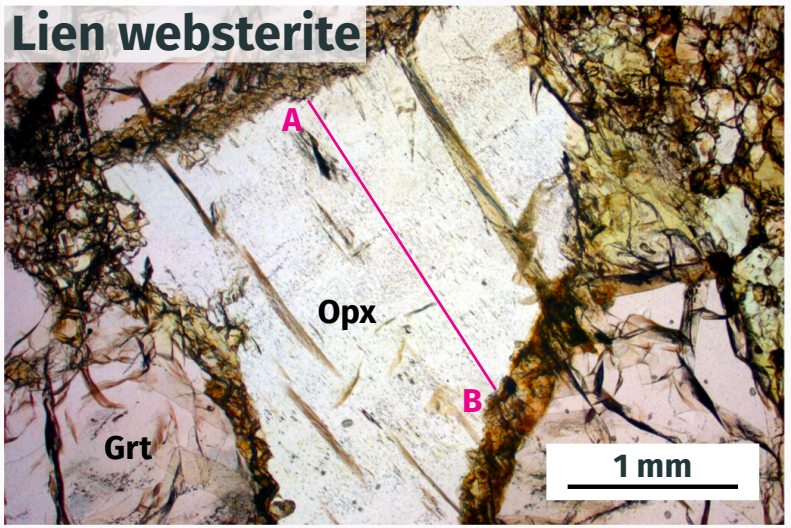
Inclusions in M2 Grt: late types (E–F) & overview

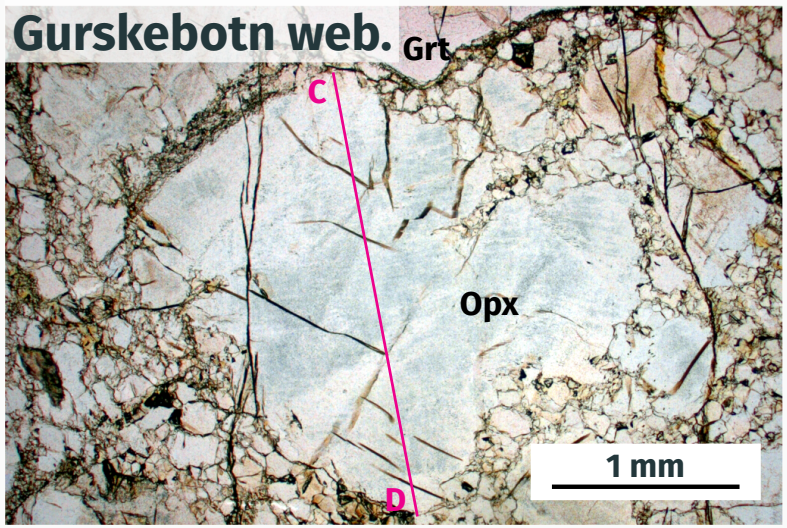


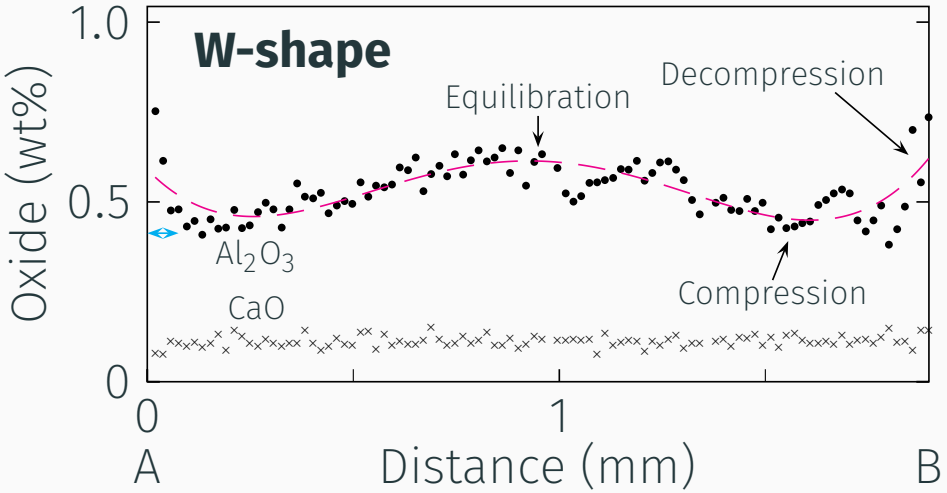


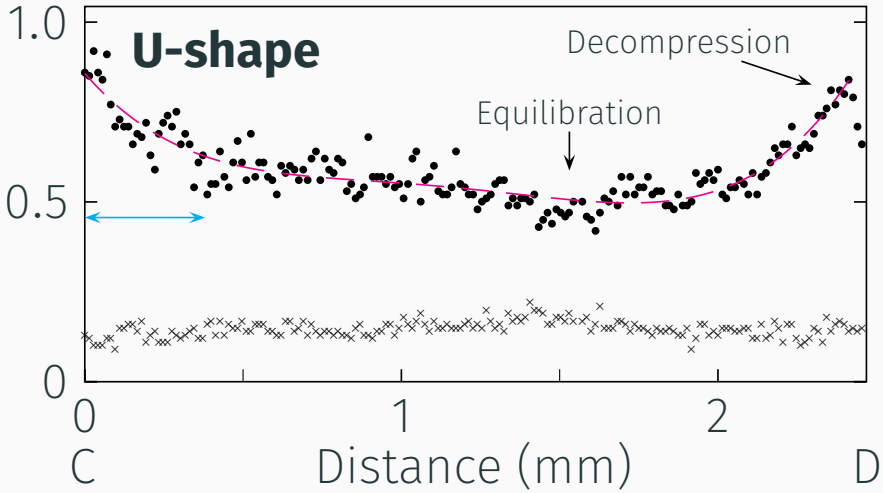
Type	Mineral group (thickness)	Distribution	Aldalen	Alm.: Lien	Alm.: Rødhaugen	Gurskebotn	Kalskaret	Nogvadalen	Raubergvik
A	Pyx (40–60 µm)	spatially uniform	●		●				
B	Pyx (5–20 µm)	spatially uniform	●		●			●	●
C	Ti-oxides ± Chr ± Pyx (1–5 µm)	spatially uniform	●	●	●	●	●	●	●
D	Ti-oxides (<1 µm)	spatially uniform		●	●	●	●	●	●
E	Ti-oxides (≤1 µm)	dislocations						●	
F	Silicates, carbonates, oxides, fluid inclusions (1–50 µm)	healed cracks	●		●	●	●	●	

Chemical zoning in M2 Opx





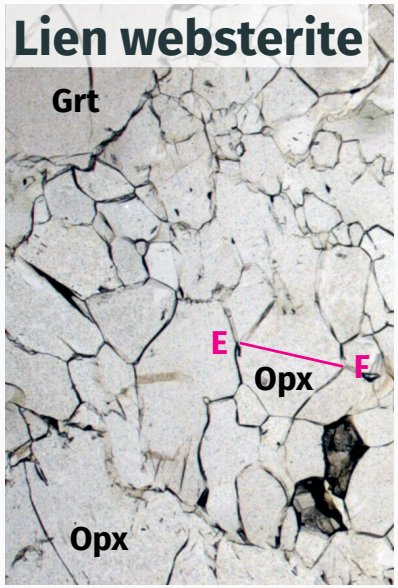


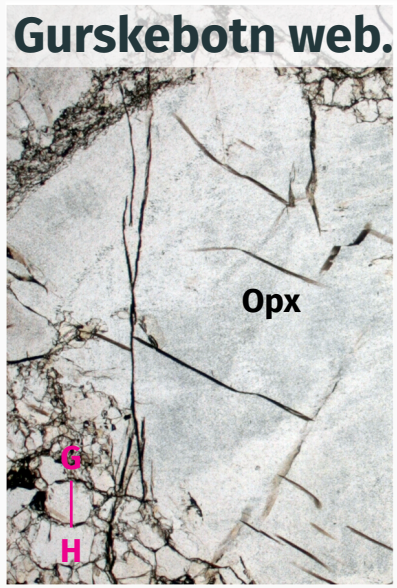


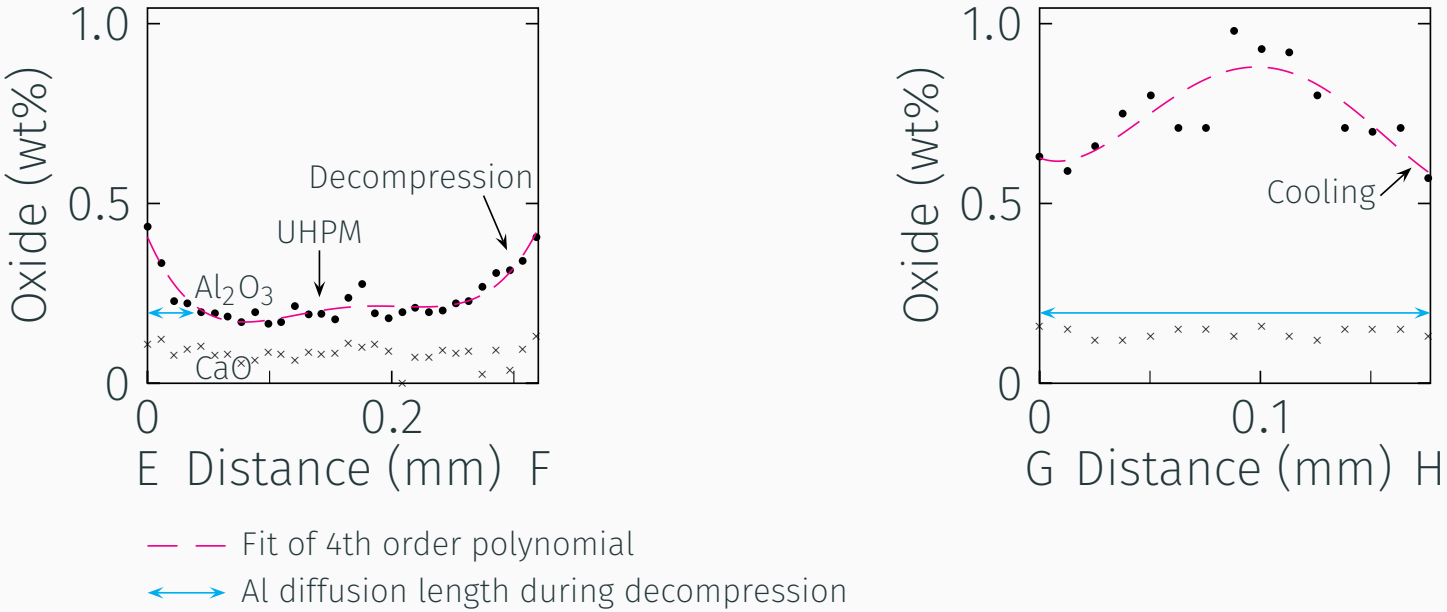
Fit of 4th order polynomial

Al diffusion length during decompression

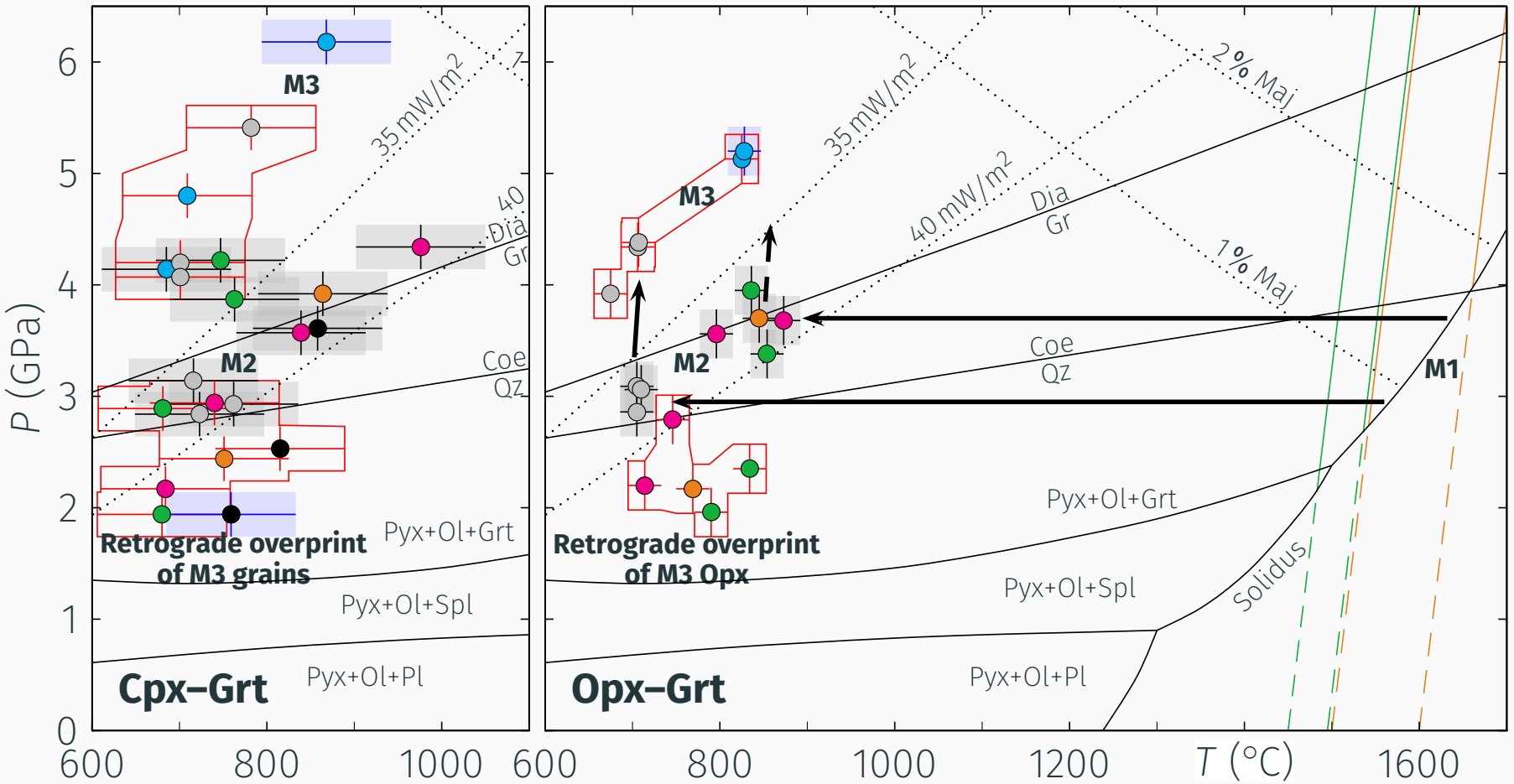
Chemical zoning in M3 Opx







P–T estimates



- Aldalen
- Almklovdalen (M2=W)
- Gurskebotn
- Kalskaret (M2=W)
- Nogvadalen
- Raubergvik

Thermobarometry:

Cpx–Grt: Beyer et al. (2015) – Nakamura (2009)

Opx–Grt: Brey & Köhler (1990)

- M2 Pyx – M2 Grt
- M3 Pyx – M2 Grt
- M3 Pyx – M3 Grt

Range of adiabats of ambient mantle 2.5–3.4 Ga ago:

- Ganne & Feng (2017)
- Herzberg et al. (2010)

CMAS phase diagram: Gasparik (2014)

Geotherms: Hasterok & Chapman (2011)

Conclusions

A1) Four generations of pyroxene and Ti-oxide inclusions in mantle garnet share features (systematics in orientation, spacing, distribution) typical for exsolution.

A2) Such inclusions occur widespread in at least 50 % of WGR garnet peridotite bodies.

A3) WGR gneiss-hosted mantle garnet peridotites were derived from the coesite stability field and then overprinted by tectonic UHPM – statistics suggest all of them.