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Abstract

On the peak metamorphic conditions of the Yuli belt, eastern Taiwan: new constraints using garnet isopleths

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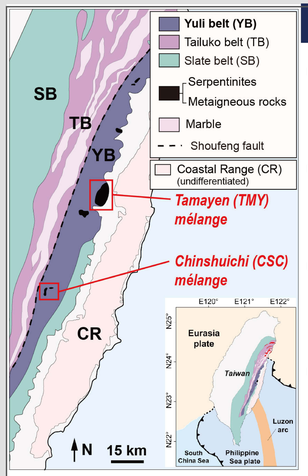

Fig. 1. Simplified geological map of the Yuli belt.

1. Introduction

- The **Yuli metamorphic belt** is one of **the youngest high-pressure (HP) terranes** in the world.
- A few **metamélange units** of garnet pelitic matrix contain HP blocks and antigorite serpentinites.
- **Peak pressure-temperature (P-T) conditions** of these HP blocks and the matrix of the metamélanges are still unclear.
- We apply **phase equilibrium modeling with garnet isopleths** to constrain the peak P-T conditions.

2. Garnet compositions in the Yuli belt

- **Two types of garnet compositional natures**

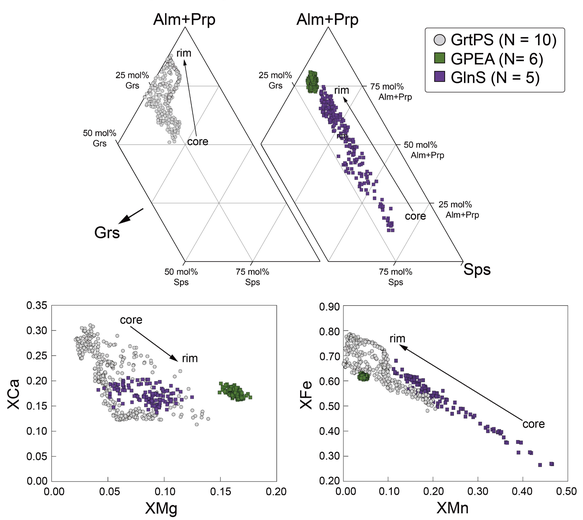

Fig. 2. Summary of garnet compositions from the Yuli belt. Data from Tsai et al. (2013), Keyser et al. (2016), and our unpublished work.

3. Garnet pelitic schist (GrtPS)

- Peak assemblage: **Grt-Ph-Pg-Rt-Qz**
- Prograde garnet zoning
- Max. Si in phengite up to ~3.34 pfu (11O)
- Discovery of oscillatory zoning in garnet from the Yuli belt

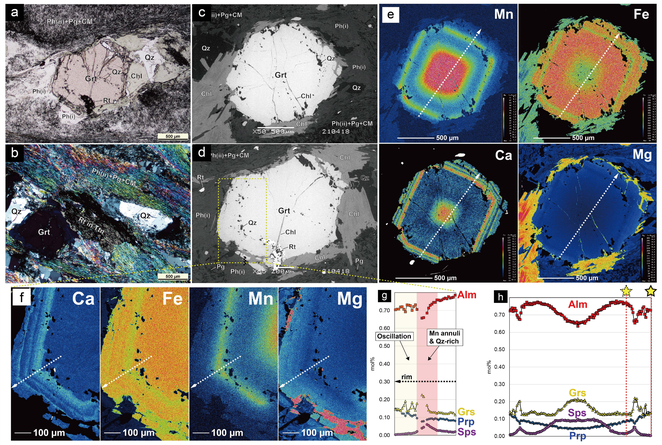

Fig. 3. Photomicrographs (a-b), BSE images (c-d) and garnet compositional maps (e-f) and profiles (g-h) of the studied GrtS.

4. Garnet-paragonite-epidote amphibolite (GPEA)

- Peak assemblage: **Grt-Pg-Ep-Amp(Prg)-Rt-Qz**
- Nearly homogeneous garnet
- Gln and Ph replacing Prg and Pg in some samples

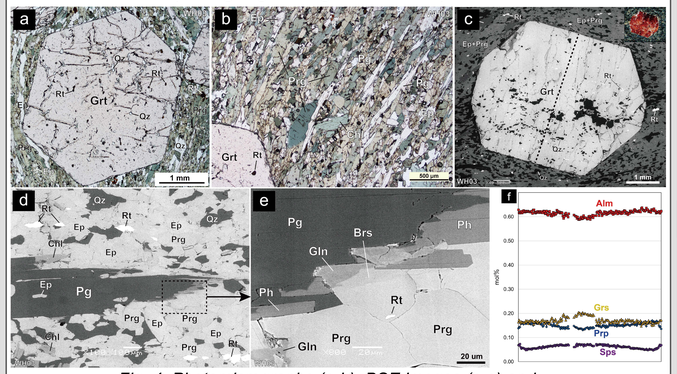

Fig. 4. Photomicrographs (a-b), BSE images (c-e) and garnet compositional profile (f) of GPEA.

5. Glaucophane schists (GlnS)

- Investigated sample: Type II GlnS in Tsai et al. (2013)
- Peak mineral assemblage: **Grt-Amp(Brs)-Ph-Ilm-Mag**
- Gln as both inclusions in and overgrowth on Brs

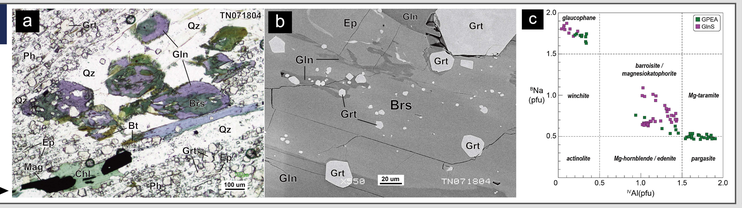

Fig. 5. Photomicrograph (a), BSE image (b) of GlnS, and plot of amphibole compositions (c).

6. Phase equilibrium modeling & Grt isopleths

- **Perple_X** (ver. 7.0.7, Connolly, 2005) with the dataset and solution models from Holland and Powell (2011), White et al. (2014) and Green et al. (2016).

P-T pseudosection: GrtPS

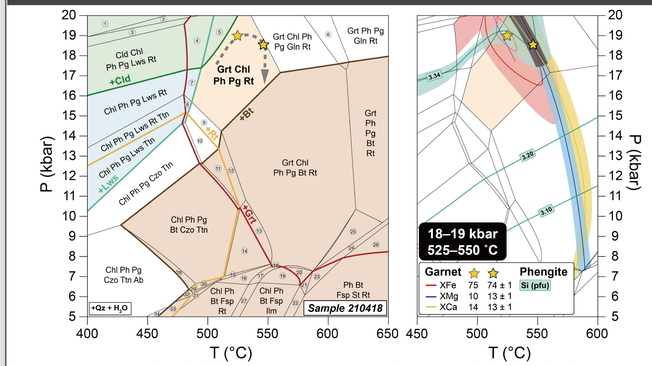

Fig. 6. P-T pseudosection modeling result from the GrtS.

P-T pseudosection: GPEA

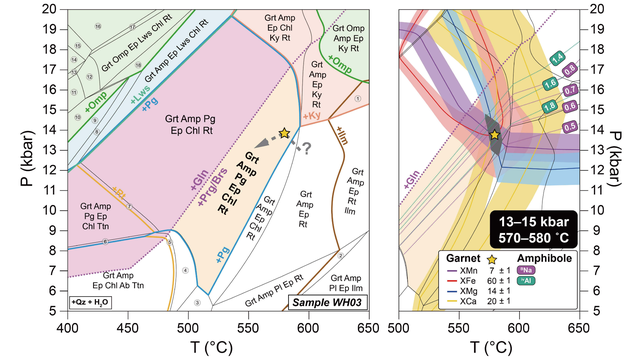

Fig. 7. P-T pseudosection modeling result from the GPEA.

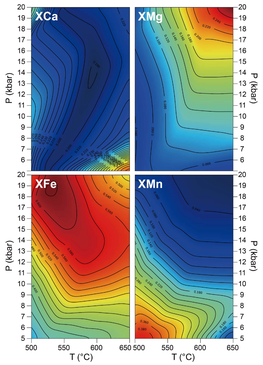

Fig. 8. Garnet isopleths of the GPEA.

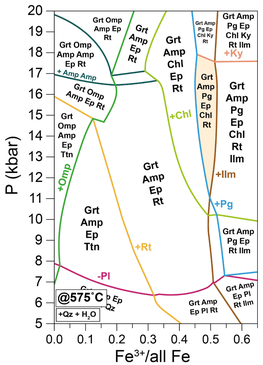

Fig. 9. P-Fe³⁺ pseudosection.

P-T pseudosection: GlnS

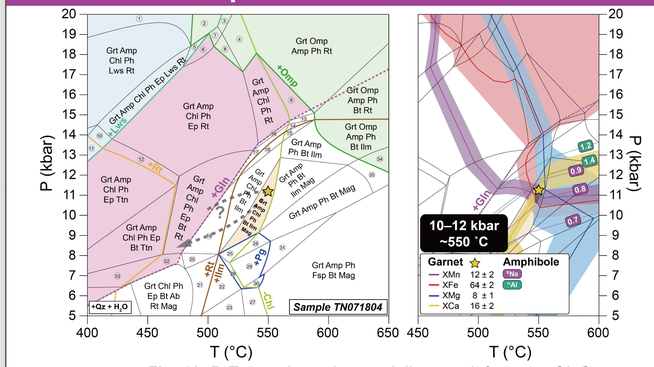

Fig. 10. P-T pseudosection modeling result from the GlnS.

7. P-T summary

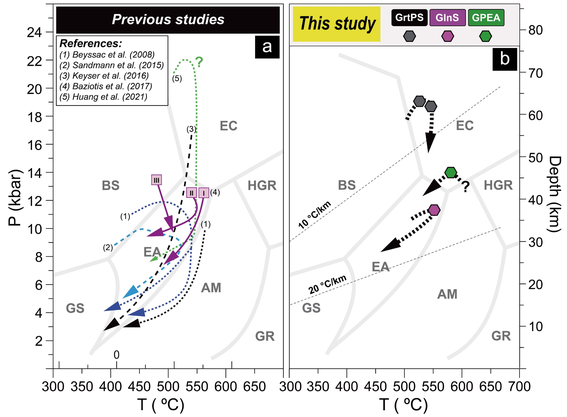

Fig. 11. P-T estimates from previous studies (a) and this work (b).

8. Conclusions

- The peak P-T conditions were constrained by the intersecting garnet isopleths: **18-19 kbar and ~525-550˚C** for the GrtPS, **13-15 kbar and 570-580˚C** for the GPEA, and **10-12 kbar and ~550˚C** for the GlnS, respectively.
- The GPEA might have experienced a counter-clockwise P-T path.
- The diverse peak P-T conditions of the three rock types imply a "**tectonic mixing**" nature of the rock association along the subduction interface.

Acknowledgement

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References