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Dating crustal anatexis in UHT granulites with Lu-Hf

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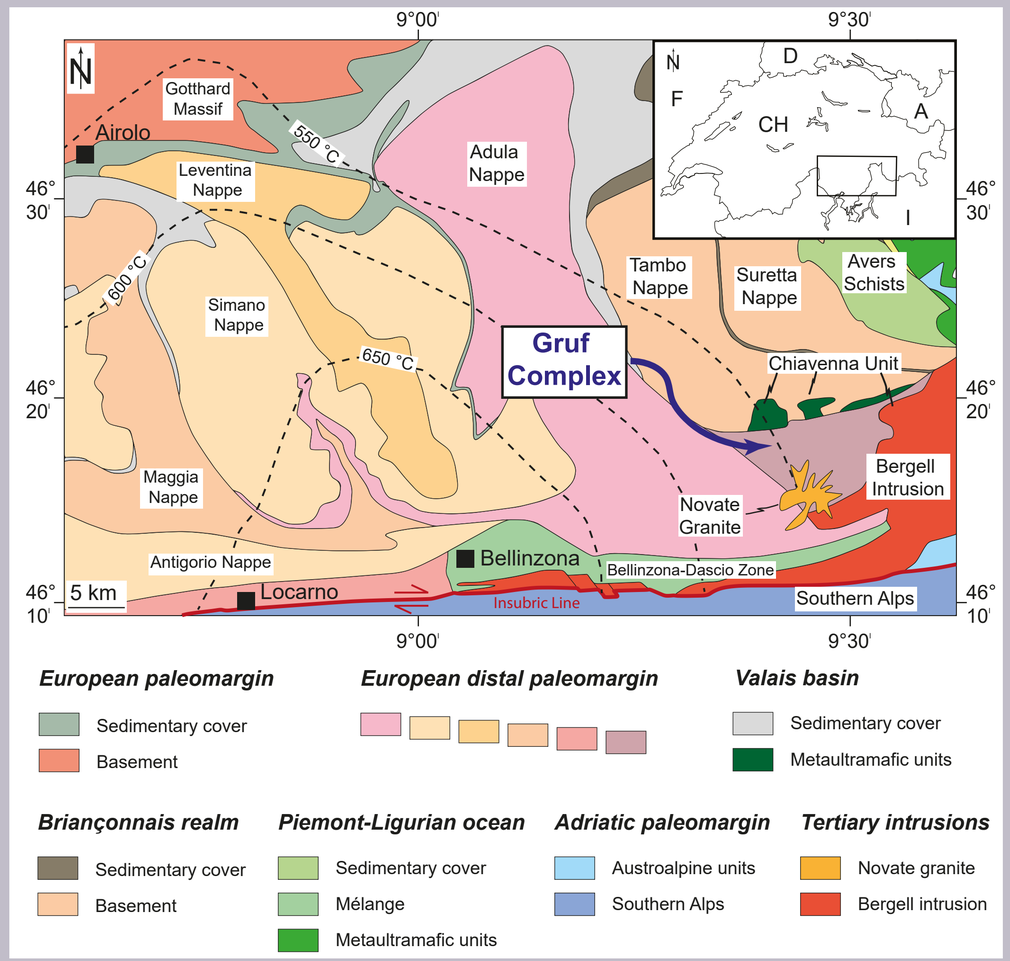

Fig.1: Tectonic map of the Central Alps and location of the Gruf Complex (modified after Trommsdorff & Nievergelt, 1983).

The Gruf Complex is a ~12 x 10 km migmatitic body located in the Central Alps (see Fig.1), in which residual granulites are observed. These granulites recorded ultra-high temperature (UHT) conditions, i.e. T > 900 °C at P ~8-10 kbar and are the result of crustal anatexis.

GOAL: determine the age of anatexis.

We combine Lu-Hf garnet dating with petrological and geochemical analyses to infer the age of the anatectic event that produced the residual UHT granulites.

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UHT GRANULITES & MELT

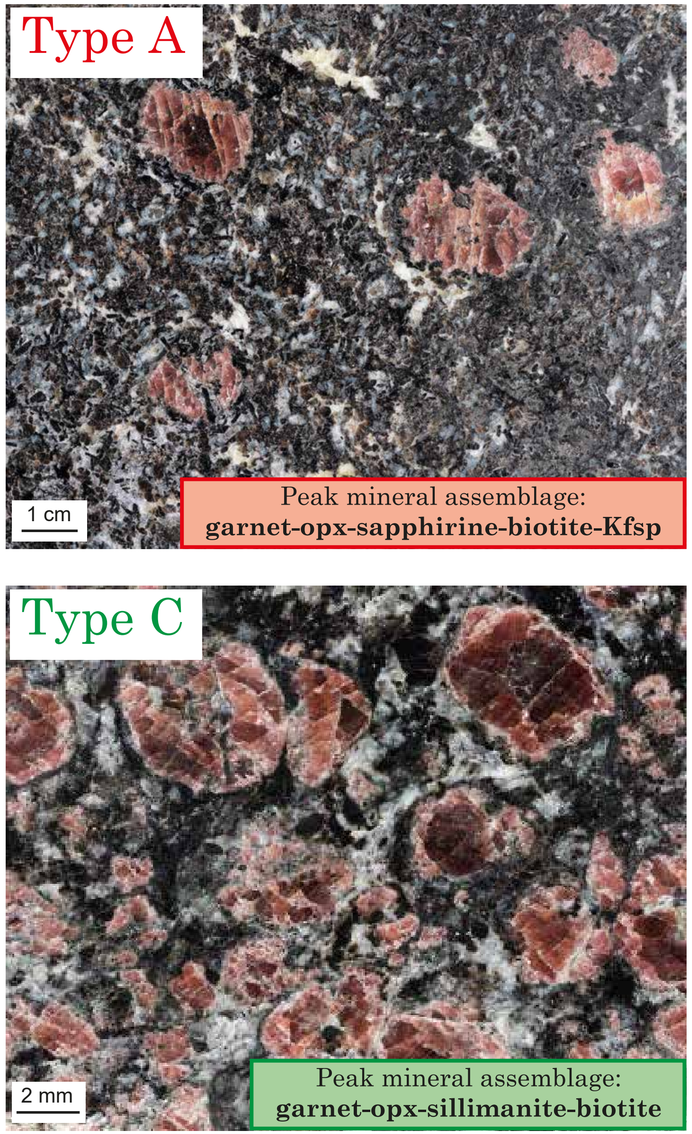

Fig.2: UHT granulites from the Gruf Complex.

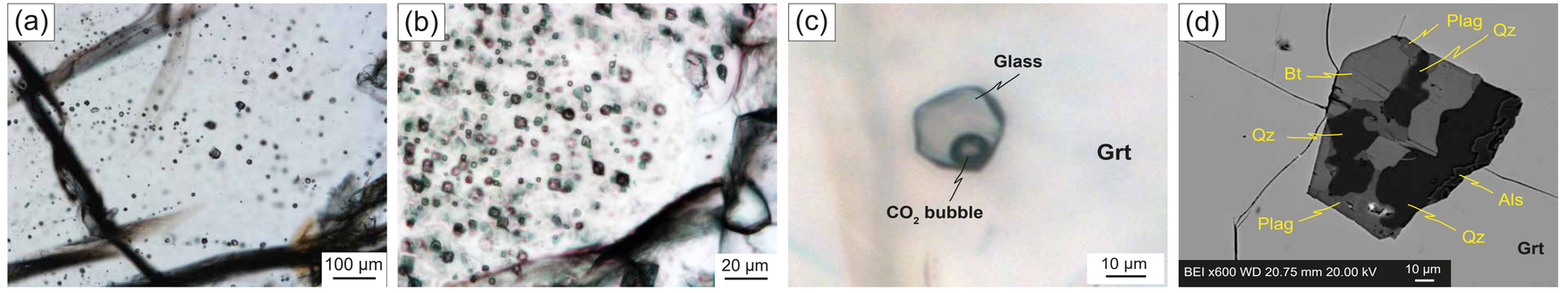

Fig.3: Clusters of melt inclusions (MI) in garnets (a-b). MI may be glassy or polycrystalline (c-d).

- Two types of granulites have garnet cores that contain primary clusters of melt inclusions (MI).
- MI are glassy or polycrystalline (**nanogranitoids**).
- Glassy MI and experimentally re-melted nanogranitoids display peraluminous **rhyolitic** compositions typical of anatectic melts.

➡ **incongruent melting** of crustal protolith

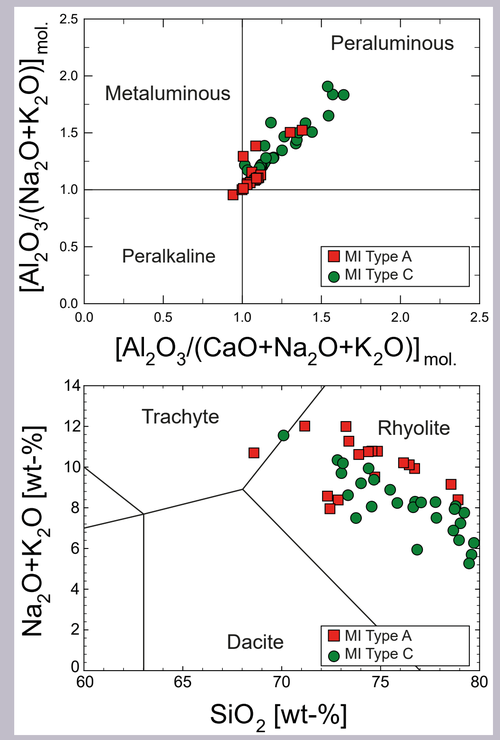

Fig.4: Chemical composition of MI.

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GARNET CHEMISTRY & AGE

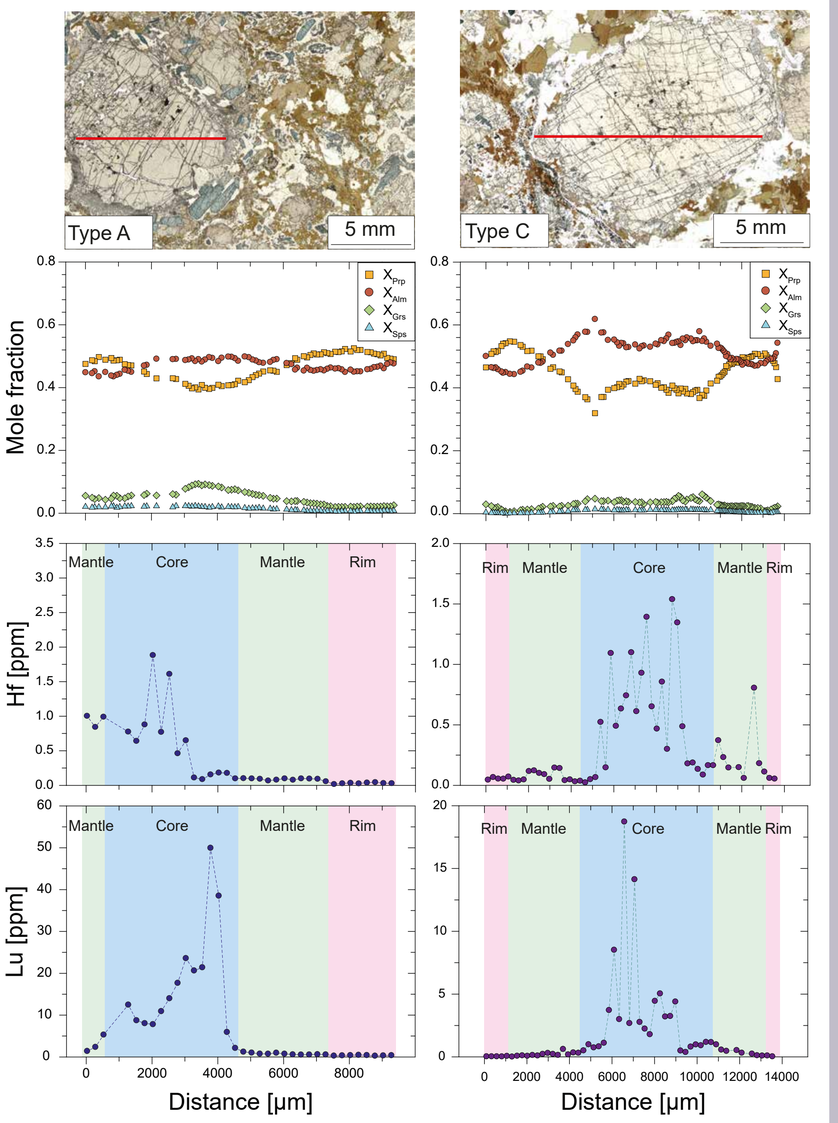

Fig.5: Garnet zoning in Type A and Type C granulites.

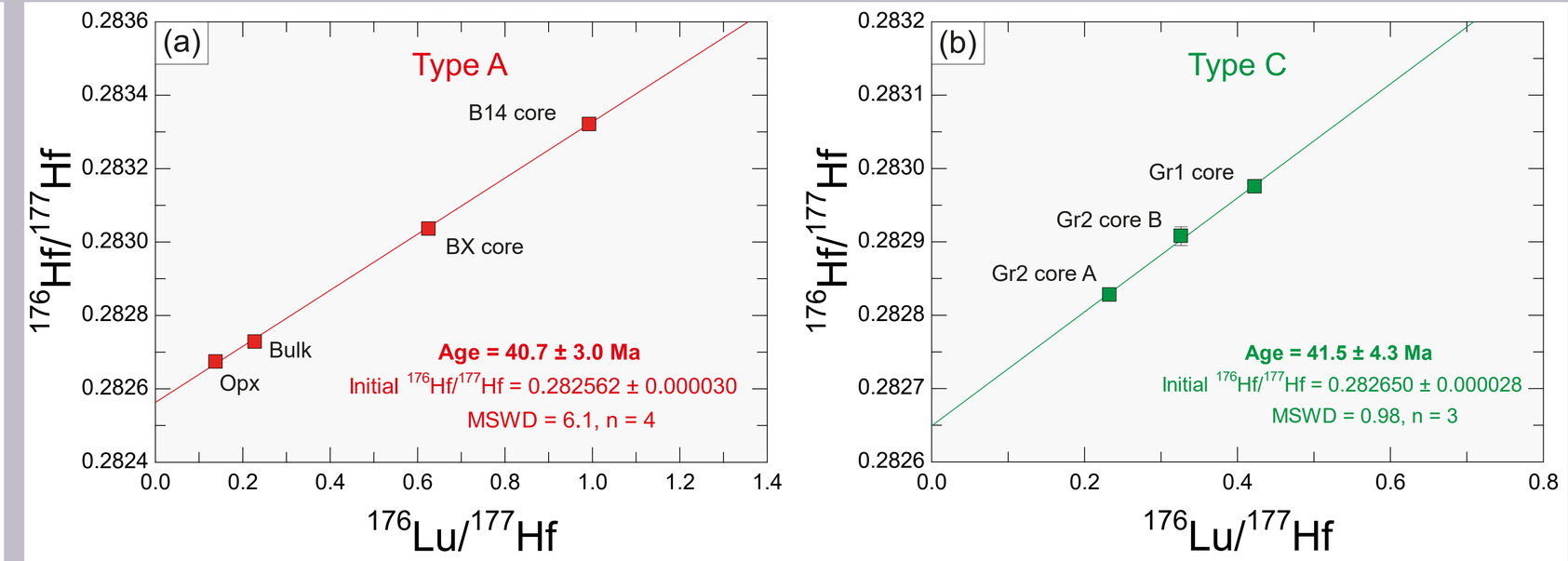

Fig.6: Lu-Hf dating of the UHT granulites.

- Garnets are almost pure almandine-pyrope solid solutions.
- Garnet cores are enriched in Lu and Hf compared to rims.
- Lu-Hf isochrons for both types of granulites suggest that garnets formed at ca. **41 ± 4 Ma**.

CONCLUSIONS

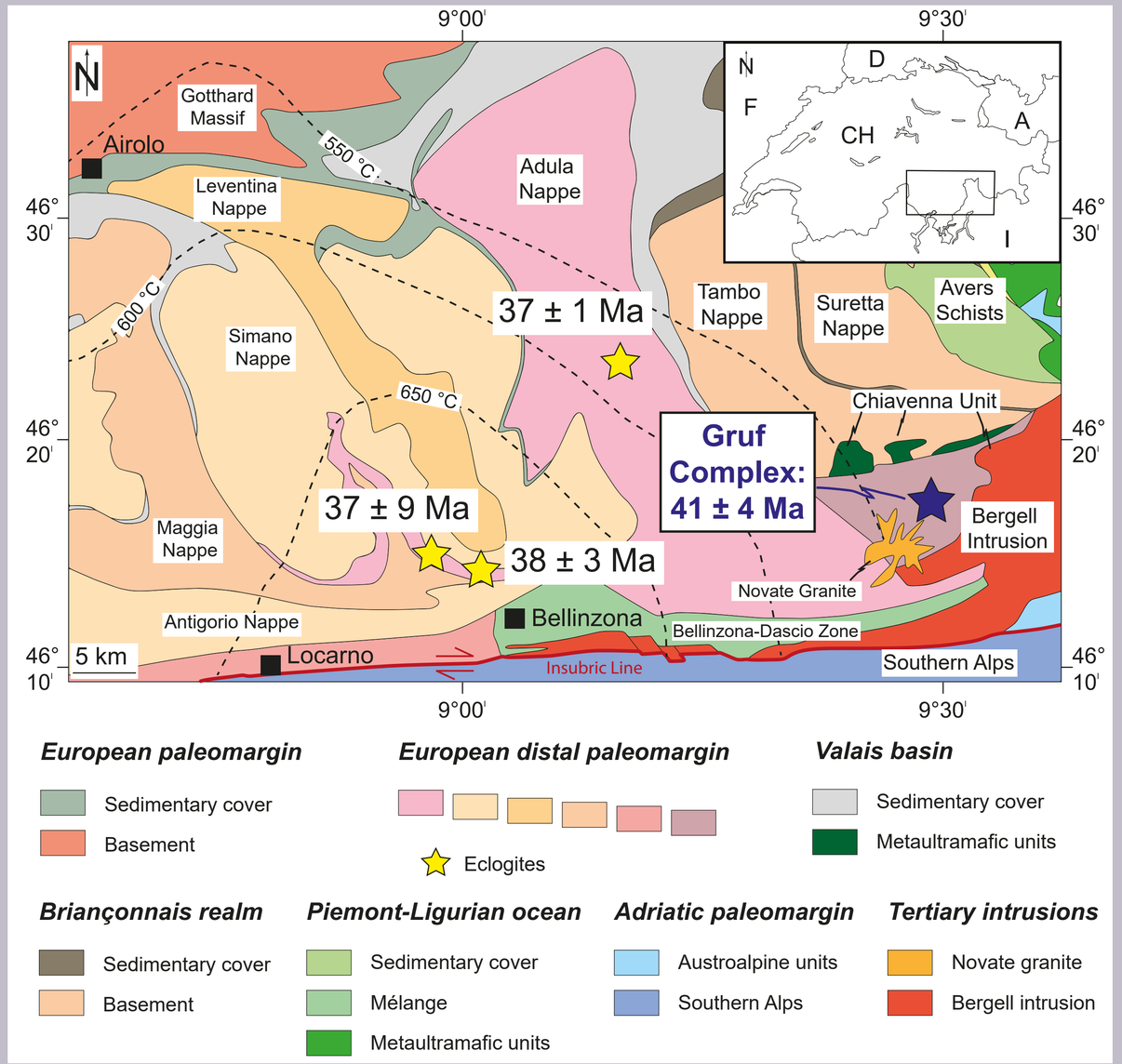

Fig.7: Garnet Lu-Hf ages in the Central Alps.

- MI indicate that garnets grew in the presence of melt and are therefore peritectic.
- The partial melting event that formed the residual granulites occurred ca. 41 ± 4 Ma.
- Lu-Hf ages for the UHT granulites are similar to those found in the eclogites of the adjacent Adula Nappe (see Fig. 7).
- Consequently, crustal anatexis in the Gruf Complex is related to the Alpine collision.