Geophysical Research Abstracts
Vol. 15, EGU2013-12115, 2013
EGU General Assembly 2013

High T/P metamorphism at 1.45 Ga: P-T evolution and SIMS U-Pb zircon ages of paragneisses from southernmost Sweden

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We present the first quantitative P-T estimates on paragneisses from Romeleåsen, in the southernmost Fennoscandian Shield, and demonstrate a clockwise P-T evolution with a metamorphic peak at c. 750°C and 4-5 kbar. SIMS U-Pb zircon ages date this metamorphism at 1.45 Ga. The rocks are locally associated with granitic injections and intrusions, coeval with the 1.45 Ga metamorphism. The studied rocks are locally affected by Sveconorwegian discrete deformation at low grade conditions, typical for the easternmost marginal part of the Sveconorwegian orogen. The 1.45 Ga high-temperature and low-intermediate pressure conditions, and the coeval magmatic association, are in striking contrast to the high-pressure character of the 1.0 Ga metamorphism of the Sveconorwegian orogeny.

Petrography, bulk and mineral geochemistry and pseudosection modelling show that the rocks underwent prograde staurolite-sillimanite grade metamorphism peaking at upper amphibolite to granulite conditions, with the formation of Crd + Sill + Grt + K-fsp + Ilm + Melt ± Spl ± Bt. The rocks followed a clockwise P-T path with heating during decompression and partial melting. Later stages involved the formation of sillimanite + biotite at the expense of garnet and cordierite. Local low-temperature and fluid-assisted retrogression caused the formation of chlorite and muscovite at the expense of cordierite and garnet, and pseudomorphism of ilmenite by rutile-rich fine-grained intergrowths.

Both granites and paragneisses contain complex zircon grains with inherited 1.7 Ga igneous cores and high-U, low-Th secondary zircon, mainly reworked rims c. 1.45 Ga old.

The P-T evolution demonstrates burial and exhumation in a high T/P environment, with coeval granitic magmatism. These conditions are in accordance with an accretionary orogenic setting.