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IS THERE A HIGH-PRESSURE LOW-TEMPERATURE METAMORPHISM IN THE AUSTROALPINE BASEMENT NORTH OF THE TAUERN WINDOW, EASTERN ALPS?

Andreas Piber & Peter Tropper

This investigation is part of the ongoing project on the tectonometamorphic evolution of the Austroalpine nappes in the northern Zillertal area, Eastern Alps. The two units studied are the Kellerjochgneiss and the Innsbruck quartzphyllite. The former unit is of debated origin, since it has been attributed over the last years to either the lower- or the middle Austroalpine. The latter unit is part of the lower Austroalpine.

The Kellerjochgneis contains the mineral assamblage muscovite + biotite + albite + chlorite + quartz ± stilpnomelane. In addition, a pegmatite sample in the Kellerjochgneiss contains the assamblage garnet$_1$ (Alm_{68} $Spess_{27}$ Pyr_3 Gro_2) + garnet$_2$ ($Gros_{52}$ Alm_{33} $Spess_{15}$) + biotite + stilpnomelane + muscovite + chlorite + albite + quartz. Due to the discontinuous chemical zoning of the garnets this probably represents a remnant of an earlier metamorphic (possibly Permian or Variscan) event. Backscatter images reveal that the muscovites in some of the Kellerjochgneis samples are chemically zoned with newly grown outer rims of ca. 5 mm in diameter. They exhibit a zonation with increasing paragonite- and celadonite component from the core the rim.

Thermobarometry in the samples of the Kellerjochgneiss was performed by calculating invariant points with multi-equilibrium methods such as THERMOCALC v. 2.7 with the data base of HOLLAND & POWELL (1998) and TWQ v. 1.02 with the data base of BERMAN (1988) and MASSONNE (1997). In addition the empirically calibrated muscovite + chlorite + stilpnomelane + quartz thermobarometer by CURRIE & VAN STAAL (1999) was also applied. For the quartzphyllite samples only the program THERMOCALC v. 2.7. was used.

The calculations with THERMOCALC v. 2.7. with the assamblage muscovite + biotite + chlorite + albite + quartz ± clinozoisite, constrain an invariant point in the KNaMASH-system, which yields pressures ranging from 9.0 to 11.1 kbar and temperatures ranging from 360 to 390°C. This invariant point also involves H_2O, which is unconstrained yet. Calculations with varying $a(H_2O)$ from 1.0 to 0.1, only result in a slight shift in pressure of ca. 1 kbar. The calculations with the program TWQ 1.02 with the data base of BERMAN (1988) using the same mineral assemblage but without the celadonite component, which is not included in the data base BERMAN (1988) yields an additional invariant point. Additional invariant points were also calculated with the data base of MASSONNE (1997) which also includes Fe-stilpnomelane and phengite. Overall, these calculations yield pressures ranging from 8.3 to 9.5 kbar and temperatures ranging from 380 to 430°C. The results achieved with the empirical thermobarometer of CURRIE & VAN STAAL (1999) are in good agreement and yield pressures ranging from 5.8 to 7.5 kbar and temperatures ranging from 310 to 400°C.These high pressures are still consistent with the absence of jadeite at temperatures between 350–400°C (HOLLAND 1980).

In the Innsbruck quartzphyllite, due to the absence of biotite, it was only possible to calculate a reaction among muscovite, chlorite and albite. The calculations with THERMOCALC v 2.7 yield the reaction: 6Paragonite + 5Celadonite = 5Muscovite + 6Albite + Clinochlore + 2Quartz

+ $2H_2O$, which was used to estimate the pressures. The obtained pressures vary from 2.5 to 6.4 kbar between 300 - 400 °C.

These data indicate a possible HP-LT metamorphic overprint in the Kellerjochgneiss which is probably the result of early Eo-Alpine metamorphism.

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Authors' address:
Andreas Piber, Peter Tropper, Institute of Mineralogy and Petrography, University of Innsbruck, Innrain 52, A-6020 Innsbruck