

## The polymetamorphic evolution of the Austroalpine nappes north of the Tauern Window (Patscherkofel Crystalline Complex, Kellerjochgneiss)

Andreas Piber, Peter Tropper & Peter J. Mirwald

Faculty of Geo- and Atmospheric Sciences, Institute of Mineralogy and Petrography, University of Innsbruck, Innrain 52, A-6020 Innsbruck, Austria

The Kellerjochgneiss and the Patscherkofel Crystalline Complex (PCC) are part of the Austroalpine basement nappes north of the Tauern Window. The Kellerjochgneiss contain the mineral assemblage muscovite + plagioclase + chlorite + quartz  $\pm$  biotite  $\pm$  clinozoisite. It tectonically overlies the Innsbruck Quartzphyllite. The Patscherkofel Crystalline is mainly composed of mica schists with the mineral assemblage ab + plag + ms + bt + chl + qtz  $\pm$  ctd  $\pm$  ga<sub>1</sub>  $\pm$  ga<sub>2</sub>  $\pm$  ilm  $\pm$  czoi  $\pm$  stau  $\pm$  marg. Ga<sub>1</sub> + sta represent Pre-Alpine relics, all other minerals are part of the Eo-Alpine mineral assemblage.

Multiequilibrium calculations of samples of the Kellerjochgneiss based on the programs TWQ v.1.02 and THERMOCALC v.3.01 yield pressures in the systems KNFMASH and KFMASH yield pressures ranging from 3.2 to 6.8 kbar at temperatures in a range of 285 to 345 °C. Average pressure of best fitted intersections performed with TWQ v.1.02 (Berman, 1988, 1992 written comm.) lie at pressures of  $5.7 \pm 0.4$  kbar at temperatures of  $297 \pm 10$  °C. Best *P-T* constraints performed with THERMOCALC v.3.01 and the data base of Holland and Powell (1998) yield average pressures in a range of  $5.0 \pm 1.0$  kbar at temperatures of  $311 \pm 29$  °C. Furthermore calculations performed with the program stilp.mod2 (Currie and Van Staal, 1999) on the base of reactions between stilpnomelane + muscovite + chlorite + quartz yield average pressures in a range of 4.5 to 6.2 kbar at temperatures of 296 to 393 °C.

Application of the garnet – biotite thermometer and the garnet – plagioclase – muscovite – quartz barometer, yields temperatures between 510 °C and 570 °C at pressures ranging from 9.5 to 12.2 kbar for most of the samples from the Patscherkofel Crystalline Complex (PCC). Thermobarometric calculations with multi-equilibrium programs such as TWQ v.1.02 and THERMOCALC v.3.02 in the H<sub>2</sub>O present system KCNFMASH and the two H<sub>2</sub>O absent systems KCNFMAS and KCFMAS yield pressures in a range of 7.3–11.5 kbar and temperatures of 454–585 °C for the same samples. Based on calculations with the hbl-plag thermometer by Holland and Blundy (1994) Variscan temperature estimates were performed. These temperatures are in a range of 563 to 650 °C at presumed pressures of 5 kbar.

Microstructural evidence and the low temperature nature of the Eo-Alpine metamorphic overprint probably indicate that the *P-T* data from the Kellerjochgneiss represent the

Eo-Alpine metamorphic overprint. In contrast the PCC exhibits definitely higher metamorphic conditions, but due to similar structural development of the Innsbruck Quartzphyllite and the PCC and based on geochronological evidence the thermobarometric data are thought to represent Eo-Alpine metamorphic conditions. The *P-T* data and the mineral paragenesis from the PCC are in good correlation to southern parts of the Ötztal-Stubai Crystalline Complex.

Berman, R. G. (1988): *J. Petrol.* 29, 445-522.

Currie, K. L. & van Staal, C. R. (1999): *J. Metam. Geol.* 17, 613-620.

Holland, T. J. B., Blundy, J. D. (1994): *Contrib. Mineral. Petrol.* 116, 433-447.

Holland, T. J. B., Powell, R. (1998): *J. Metam. Geol.* 8, 89-124.