Our analyses clearly proof the independent tectonothermal evolution of the Upper Austro-Alpine basement complex, exposed in the KMC during the Late-Paleozoic. Whereas the Middle Austro-Alpine basement, exposed in the FTC, suffered Carboniferous metamorphism and pegmatite intrusion due to Variscan tectonothermal activity, the Upper Austro-Alpine basement of the KMC experienced intra-Devonian metamorphism and pegmatite intrusion.

TRANSITION FROM ECLOGITE- TO AMPHIBOLITE FACIES METAMORPHISM IN THE AUSTROALPINE ULTEN ZONE, SOUTHERN TYROL

HAUZENBERGER, Ch., HÖLLER, W. & HOINKES, G.

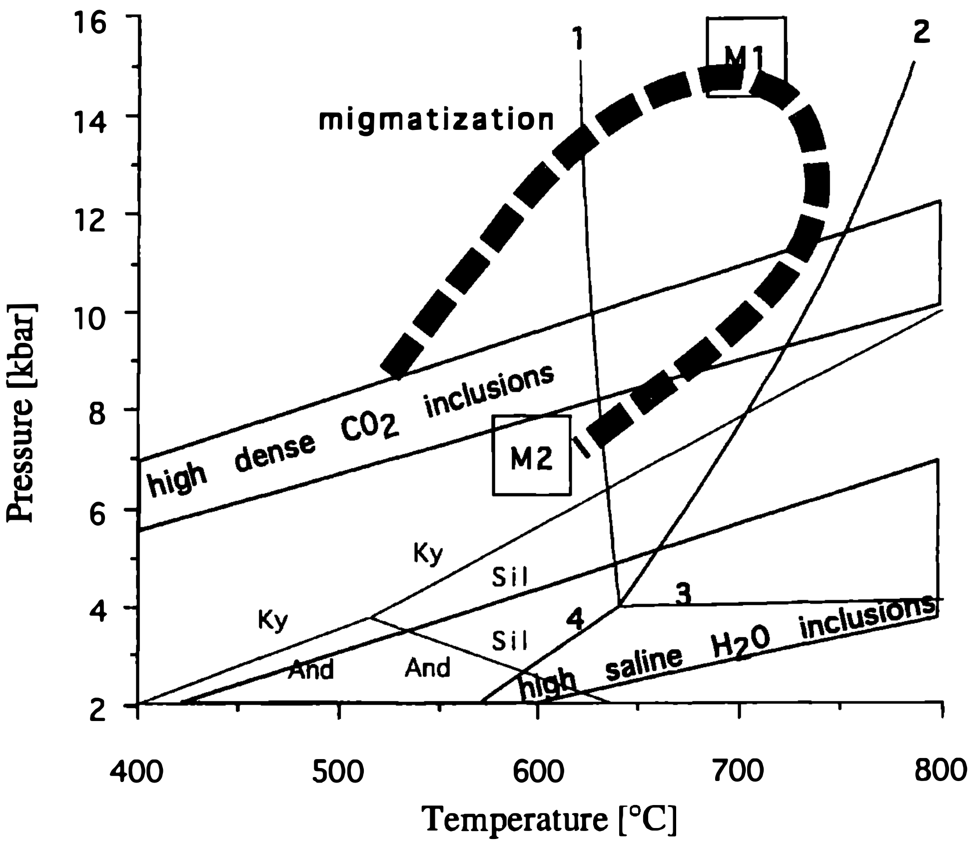
Institute of Mineralogy-Crystallography and Petrology, University of Graz, Austria

The crystalline basement, situated southwest of Meran (Italy) between the Peio line and the Insubric lineament, must be considered as distinct block within the Austroalpine basement units. Besides the occurrence of lense-shaped ultramafic bodies embedded in metapelites and metagranitoids, migmatites, "granulites" and metabasites (partly eclogites) indicate high grade metamorphic conditions. The granoblastic paragneisses consist of the primary mineral assemblage M1 (GRT-KY-BIO-MS-KFS-PL-QTZ-RT), indicative of eclogite facies conditions, which was replaced by retrograde amphibolite-facies reequilibration during uplift. In metacalcsilicates pseudomorphs of MRG and CZO after LWS are representative of the prograde path to the eclogite facies event M1. During the retrograde M2 MRG + CZO was replaced by AN + QTZ. Further reactions in paragneisses during decompression are:

1. GRT + MS = BIO + 2KY + QTZ
2. 2KFS + GRT + H_2O = 3QTZ + BIO + MS
3. GRT + 3RT = 3ILM + KY + QTZ

The M2 mineral assemblage of the paragneisses comprises GRT-KY-BIO-MS-PL-QTZ-ILM ± KFS ± ST. Using cation exchange thermometers (GRT-BIO, GRT-CPX), experimentally calibrated mineral reactions (Ghent-barometry, GRAIL), net transfer reactions (HODGES & CROWLY, 1985) and multiequilibrium methods (TWEEQ according to BERMAN, 1991) conditions for the high-grade metamorphic event M1 of about 700 °C and at least 15 kbar and for M2 about 7 - 8 kbar and 600 °C are estimated.

High-density fluids entrapped in kyanite are CO_2-rich and represent the fluid during M1, whereas secondary fluids entrapped during M2 along healed fractures in quartz have H_2O-rich compositions of high salinity. The migmatites occur in both lithologies, metagranitoids and metapelites. Melting started on the prograde path of metamorphism under fluid present conditions. First melts appeared in orthogneisses due to the simplified reaction KFS + PL + QTZ + H_2O = L. The very rare occurrence of KFS in metapelites shifts the melting reaction to higher temperatures.



Reactions:
1 Mu + Bio + Ksp + Qtz + V = L
2 Mu + Qtz = Bio + Ksp + Als + L
3 Mu + L = Bio + Ksp + Als + V
4 Mu + Qtz = Bio + Ksp + Als + V

Fig. 1: P-T-path of the Variscian metamorphism, melting reactions in KFMASH and isochores for the fluid inclusions.

The lack of the restite phase KY in scarce melanosomes indicates that the MS-breakdown reaction MS + QTZ = KFS + KY + L was not responsible for melt formation. The relatively small areas of migmatites in the Nonsberg region indicate only small amounts of a H_2O-CO_2-fluid. It is thought that H_2O was used up by melt reactions leading to a remaining CO_2-rich fluid composition which still can be found in KY. Subsequent uplift leads to crystallization of melts and the release of a H_2O rich fluid, allowing a thorough chemical equilibration of mineral assemblages and entrapment of this aqueous fluid during the M2 stage (Fig. 1).

$^{207/206}Pb$ evaporation dating of single zircons of orthogneiss-migmatites shows two distinct age groups of about 470 m.y. and 365 m.y.. The Caledonian ages are suggested to date the magmatic intrusion and crystallization. The Variscan zircon ages as well as the garnet Sm-Nd age of 345 ± 1 m.y. and the white mica Rb-Sr ages of about 300 m.y. determine the Variscan metamorphic overprint.

Mineral abbreviations after KRETZ (1983)

Acknowledgements:
M. Thöni and U. Klötzli performed the geochronological data. Their help and the financial support by FWF-project S4708-GEO is gratefully acknowledged.

BERMAN, R. G. (1991): Thermobarometry using multi equilibrium calculations: A new technique with petrological application. - Can. Min. 29, 833 - 855.

HODGES, K.V., CROWLEY, P.D. (1985): Error estimation and empirical geothermometry for pelitic systems. - Am. Min., 70, 702 - 709.

KRETZ, R. (1983): Symbols for rock-forming minerals. - Am. Min., 68, 277 - 279.

PHYSICAL PROPERTIES OF ALTERATED SECTIONS IN SOUTH BOHEMIAN GRANITES

HEINZ, H. & SEIBERL, W.

Geological Survey of Austria, Department of Geophysics, Vienna

Interpreting the magnetic anomalies in the Central Southern Bohemian Plutonic Massif the main problem is to classify their sources, genetic conditions and alterations. It is obvious that magnetic structures are clustered close to the marginal parts of the granitic bodies. Very frequently they coincide with highly altered and mineralized sections (e.g. Hirschenschlag, Nebelstein, Liebenau). Generally, all of these phenomena are due to a quite complicated multiface sequence of intrusive processes with a late Hercynian crustal level of the area: intrusive bodies younger than the three well-known standard types of granites especially biotite rich granites (known solely from drilling evidence) are involved into the alteration events.

The magnetic anomalies are due to secondary magnetites which have been proved by very frequent inclusions of rock forming mineral phases within accumulated magnetite grains. However, large areas of homogenous-looking granites (e.g. Karlstift type) are characterized by random distributions of magnetites. The Karlstift granite intrusively cuts the Weinsberg mass near the village of Liebenau; the contact zones are emphasized by magnetic anomalies with (relatively) high ampli-