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THE VARSCAN METAMORPHIV EVOLUTIONOF THENORTHERN ÖTZTAL COMPLEX DEDUCED FROM ECLOGITES AND AMPHIBOLITES (TYROL, EASTERN ALPS)

von

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Within the polymetamorphic Austroalpine Ötztal Complex (ÖC), Variscan eclogites have been described mainly from the central part (MILLER & THÖNI, 1995) but also from the northern (EICHHORN, 1991) and western part (FÜGENSCHUH, 1994) of the ÖC. P-T data are very sparse and exist only from the eclogites from the central ÖC. The eclogites from the northern part of the ÖC occur as small lenses within amphibolites with the mineral assemblage: hornblende ± cummingtonite ± barroisite + plagioclase + epidote + garnet + quartz. The metamorphic peak assemblage of the eclogites is garnet + omphacite ± taramite ± katophorite ± hastingsite + clinozoisite + rutile + quartz. During the retrograde evolution of these rocks, the formation of abundant symplectites, composed of albite-rich plagioclase + tschermakite + diopside-rich clinopyroxene, occurred. Mineral chemical data indicate that clinopyroxenes occurs texturally and chemically in three generations with increasing diopside component, whereas clinopyroxenes with the highest jadeite component (40-45 mol.% Jd) are part of the peak assemblage and clinopyroxenes from the symplectites show the lowest jadeite component (<20 mol.% Jd).

Thermobarometry of the northern ÖC eclogites was performed by simultaneous calculation of all possible reactions within the peak metamorphic assemblage garnet + omphacite + clinozoisite + barroisite + quartz with the program THERMOCALC v. 3.1. (HOLLAND, 2001, written comm.) and the data set of HOLLAND & POWELL (1998). The approach we used is the average P-T calculation by POWELL & HOLLAND (1988, 1994). Calculations assuming $a_{(H2O)}$ = 1, yields P-T conditions of 620-700°C and 1.7-2.3 GPa. Calculations of garnet-clinopyroxene temperatures with the calibration of KROGH-RAVNA (2000), yields a wide range of temperatures of 370-670°C, depending on the calculation of Fe^{3+} and thus was not considered reliable. Application of the Zr in rutile thermometer by ZACK et al. (2004) yielded temperatures of 500-600°C for matrix rutiles. The P-T conditions of symplectite formation were calculated to be 550-620°C and 1.0-1.3 GPa. This is in very good agreement with data from barroisite-bearing high-P amphibolites, which yielded P-T conditions of 630-670°C and 1.1-1.3 GPa.

The adjacent amphibolites record information not only about the last stage of the Variscan P-T evolution, namely an amphibolite-facies overprint of 500-650°C and 0.6-0.8 GPa, but barroisite-bearing amphibolites also provide informations about an intermediate P-T stage of 630-670°C and 1.1-1.3 GPa, which corresponds well with the P-T conditions of symplectite formation in the eclogites. Equilibria involving cummingtonite lead to a large scatter in P-T estimates, most likely due to uncertainties in the a-X relations of cummingtonite-grunerite solid solutions.

Overall, these data indicate that the northern Ötztal Complex underwent a nearly isothermal decompression at 600-650°C from ca. 1.7-2.3 GPa to 1.1 and 0.6 GPa during the Variscan metamorphic event in the ÖC.

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