Calculated and observed mineral assemblages from the Eclogite Zone, Tauern Window, Austria

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In the Eclogite Zone of the Tauern Window metamorphic peak conditions reached ~ 20–25 kbar, 600–630°C. Values near the upper range were derived from kyanite eclogites with the peak assemblage garnet+ omphacite+ kyanite+ phengite according to various thermobarometric calibrations (e.g. Hoschek 2006).
Evolution of mineral assemblages in selected rocks along their metamorphic PT path was modelled with pseudosections in the simplified NCFMASH system. For comparison softwares THERMOCALC (#1), THERIAK-DOMINO (#2) and PERPLEX (#3) were used coupled with thermodynamic data base A (Holland & Powell, 1998, updated) or data base B (Berman, 1988, updated) plus various solid solution models.
Generally results with software #1 and data base A are in reasonable agreement with observed assemblages, particularly about peak PT conditions. In case of software #2, database B and incorporated solid solution models only a partly similar assemblage pattern as with #1 is generated, a.o. due to more restricted amphibole solution models. In case of software #3 with database A also only a partly similar pattern is obtained. This is due to an outdated clinopyroxene model and more simplified amphibole models compared with #1.
In addition to pseudosections with fixed bulk compositions the effect of fractional crystallization of garnet was modelled. Stepwise subtraction of garnet composition from the initial garnet free starting bulk composition was calculated along selected PT paths. The latter approach leads to better accordance of calculated and observed mineral assemblages and compositions, e.g. in sample 2447. In 2188 talc is observed but only calculated with compositions modified by fractional garnet crystallization. However discrepancies remain, for instance in sample 2536 with paragonite observed but not calculated.
Pelitic-psammitic metasediments of the Eclogite Zone share a common tectonometamorphic history with metabasites. The pseudosection approach was extended to micaschists and quartzites and modelled in the simplified KNCFMASH system.
Preliminary results were obtained with software #2 and both databases A, B plus recent solid solution models incorporated in #2 (Keller et al. 2005).
Mica schist 2452 displays the main matrix assemblage garnet+ kyanite+ phengite+ quartz. Chloritoid is present as inclusions in the core but absent in rim region of ~1 cm sized garnet. Additionally small amounts of chloritoid are observed in the matrix with Mg- richer composition compared with inclusions. This implies a prograde PT path overstepping

chloritoid stability but reentering this region during retrograde metamorphism. Peak conditions at 600-630°C, 15–21 kbar are consistent with software #2, dataset B. Garnet+ kyanite+ chloritoid+ phengite+ paragonite+ clinozoisite quarzite 2009 is consistent with lower PT conditions at ~ 555°C, 16 kbar. Secondary corrosion of garnet and kyanite by chloritoid suggests H2O availability at the retrograde stage. A similar replacement of garnet by chloritoid is observed in sample 2005 with the assemblage garnet+ kyanite+ chloritoid+ phengite+ margarite+ chlorite+ clinozoisite. Compared with 2009 a final equilibration at lower PT conditions is indicated due to presence of margarite and chlorite.
Experimental studies with such rocks and with simplified bulk compositions are needed to get a better insight in the validity of the different pseudosection methods.

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