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Deformation and metamorphism of blueschists within the Phyllite-Quartzite Unit of the External Hellenides, Greece: a comparative study on fluid inclusions

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The Phyllite-Quartzite Unit, exposed in the southernmost part of the Mani peninsula, occurs between the medium-grade metamorphosed Plattenkalk Unit and the low-grade metamorphosed Tripolitsa Unit. The unit contains blueschists arranged as boudins which are surrounded by chloritoid-bearing micaschists. HP/LT metamorphism resulted from subduction of the Adriatic plate beneath the Eurasian plate during Eocene time. Structural mapping indicates three phases of folding. Stage F1 is rarely preserved and results from uniaxial stretching by holding steep SW-plunging fold axes. Superposition of folding events F2 and F3 form a large km-scale fold interference pattern with tight S- to SE and shallow W-E plunging fold axes, respectively.

On microscale, blueschists contain glaucophane+chloritoid+phengite+quartz. The surrounding rocks consist of chloritoid+phengite+paragonite+chlorite+quartz. Mineral chemical analysis of chloritoid indicates a prograde growth. Chloritoide porphyroblasts reflect an earlier foliation S1 (D1) and show locally pseudomorphic transformations to phengite and chlorite that are accompanied with SSW-directed shearing (D2). D2 is responsible for the penetrative foliation S2.

Constraints for the post-peak P-T evolution of the Phyllite-Quartzite Unit have been performed by fluid inclusion studies on late-stage boudin necks close to the blueschists. Necks consist of coarse grained quartz aggregates. Fluid inclusions (FIs) show a frequent occurrence of aqueous saline inclusions predominantly with halite daughter crystals. FIs occur up to 3-phase (S,L,V) and indicate the chemical system H_2O-NaCl-$CaCl_2$. The system is established by eutectic temperatures Te and Raman spectroscopy. Te shows always very low temperatures in the range of -72°C which is interpreted as metastable phase behaviour or crystallization stage. Last ice melting of about -49°C occurs earlier than hydrohalite melting (~-35°C) which coincides well with respective Raman spectra. This indicates a fluid composition around 47 mass% H_2O, 36 mass% NaCl and 17 mass% $CaCl_2$. Densities lie between 1.24 and 1.17 g/cm3. Assuming proposed maximum peak temperatures from blueschists from this area of about 550°C, conditions for extension of boudin necks can be established due to fluid density isochore calculations between 7 and 9 kbar. This fluid inclusion study will now be compared with fluid inclusions in concordant quartz veins which act as host rocks of the blueschist boudin structures.