



Assembling UHP-metamorphic units in the Alps and Rhodopes

Thorsten Nagel (1), Niko Froitzheim (1), Marian Janak (2), Silke Schmidt (3), Sascha Sandmann (1), Frederik Kirst (1), Daniel Herwartz (1), and Maria Kirchenbaur (1)

(1) Steinmann-Institut, Universität Bonn, Bonn, Germany, (2) Geological Institute, Slovak Academy of Sciences, Bratislava, Slovakia, (3) Institut für Geologie und Paläontologie, Uni Münster, Münster, Germany

HP- and UHP-metamorphic relicts in the Adula Nappe (Central Alps, Switzerland), in the Pohorje Complex (Eastern Alps, Slovenia), and in the Rhodope Terrane (Rhodopes, Greece) are preserved in mixed units assembled from dominantly continental material (orthogneisses, paragneisses, marbles, and mica schists) and a relatively small portion of mafic and ultramafic rocks which are often not derived from Mesozoic protoliths. Rocks recording peak-pressure conditions are eclogites, garnet peridotites and garnet-mica schists. In all three cases, peak pressure conditions were followed by regional amphibolite facies conditions. Such continental mélanges appear to be typical for UHP-metamorphic provinces and are often interpreted as having formed in a subduction channel. Models of exhumation from UHP-metamorphic conditions hinge on whether mélangé formation occurred before peak pressures were reached or during exhumation. Models of continuous return-flow in a weak subduction channel predict intense mixing during exhumation and thus a record of different PT-paths and metamorphic ages in HP-mélanges (e.g. Gerya and Stöckert, 2006). In contrast, models assuming exhumation events usually predict units with coherent PT-conditions and metamorphic ages (e.g. Chemenda et al. 1995, Froitzheim et al. 2003). We use structural, petrological and geochemical data to infer that the three discussed units were strongly deformed during exhumation from UHP-metamorphic conditions but probably remained coherent. Where known, post-peak-pressure strain and metamorphic gradients are continuous. In the Pohorje Complex, isotopic ages for HP conditions are consistent in various rocks. In the Adula Nappe, published ages and new Lu-Hf ages from eclogites and indicate a short lived alpine HP event affecting a Variscan continental basement. We propose that UHP-metamorphic mélanges are assembled dominantly from old continental crust before peak-pressure conditions are reached and that exhumation of rocks from such depth occurs in distinct events.