

Metamorphic evolution and geochronology of Variscan remnants in the Eastern Alps: the crystalline “Schollen” in the Greywacke Zone

Karner-Rühl, Kevin; Hauzenberger, Christoph Anton; Skrzypek, Etienne; Fritz, Harald

Institute for Earth Sciences, University of Graz, A-8010 Graz, Austria.

The Eastern Greywacke Zone is composed of three Alpine nappes. From bottom to top these are the Veitsch nappe (Early Carboniferous to Permian molasse), the Silbersberg nappe with the crystalline “schollen” such as the Kaintaleck Metamorphic Complex and Permian phyllites as cover, and the Noric nappe (mainly Ordovician to Devonian shelf sediments and Permian cover). All units experienced early Alpine lower greenschist facies metamorphism. Ductile shear zones which developed during the Alpine nappe stack building are responsible for the emplacement of the Kaintaleck Complex as lens-shaped bodies of 10–100 m thickness that stretch roughly West to East close to the base of the Noric nappe within the Eastern Greywacke Zone. The westernmost outcrop is located near Kalwang in Upper Styria, the easternmost exposure near Gloggnitz in Lower Austria. Lithologically, the Kaintaleck Complex is represented by a mafic suite, composed of amphibolite, garnet-amphibolite, greenschist and serpentinite, and a felsic suite that consists mostly of mica-schist (some of them garnet-bearing) and gneiss. The felsic units may derive from a former continent, whereas the mafic units represent most likely a former ocean. This work tries to determine the P-T-t path of the Kaintaleck Complex by applying U-Th/Pb dating and application of geothermobarometric/petrological techniques. Based on whole rock geochemistry, amphibolites and garnet-amphibolites from the localities of Prieselbauer and Frauenberg in the area of Bruck/Mur and Kapfenberg, as well as amphibolites from Unteraich and Oberdorf represent tholeiitic basalts with either a T-MORB or E-MORB affinity. Samples from the localities of Stübminggraben and Utschgraben have a N-MORB affinity. However, greenschists from the locality of Kalwang show a calc-alkaline differentiation trend and their trace element and rare-earth element composition indicate a continental arc affinity. The garnet-amphibolites show distinct plagioclase-epidote-rich symplectitic coronas, which are indicative of pressure relief from possibly eclogite-facies metamorphic conditions. First P-T estimations from geothermobarometric calculations yield about 515 °C and 10,2 kbar for the felsic suite, and 600 °C and minimum pressures of 12 kbar for the mafic suite. EPMA monazite dating of two garnet-mica-schists from the locality of Prieselbauer revealed a Variscan age of metamorphism with a mean age of 350.7 ± 4.1 Ma. The monazite grains in these samples are partly replaced by an apatite-allanite-corona, indicative of Alpine lower grade metamorphic overprint.