

## **The easternmost part of the Silvretta-Seckau Nappe System (Austroalpine Unit, Styria/Austria) and its relation to the Central Western Carpathian Unit**

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This contribution reports new geochronological data from the Troiseck-Floning, forming the northeastern most extension of the Silvretta-Seckau Nappe System. The data include zircon crystallization ages determined by Laser Ablation ICP-MS as well as Rb-Sr biotite ages reflecting cooling below c. 300°C.

The Troiseck-Floning Nappe consists of a basement formed by the Troiseck Complex and a Permo-Triassic cover sequence. Paragneiss is the dominant lithology but there are several intercalations of micaschist, amphibolite, and different types of orthogneiss including pegmatite gneiss. The basement rocks experienced a Variscan (Late Devonian) tectonothermal overprint at amphibolite facies conditions. The cover sequence includes Permian clastic sediments and metavolcanic rocks, Early Triassic quartzite (Semmering Quartzite) and rauhwacke as well as Middle Triassic calcitic marble and dolomite. The Troiseck-Floning Nappe formed during the Eoalpine (Cretaceous) tectonothermal event. Eoalpine deformation at lower greenschist facies conditions is penetrative in the cover sequence, while in the basement the Variscan structures are mostly well preserved.

Detrital zircon grains from a paragneiss yielded ages in the range of 530-590 Ma, indicating a Late Neoproterozoic to earliest Cambrian source and a Cambrian to Early Devonian deposition age of the paragneiss protolith. The amphibolite bodies derived from basalt with a calc-alkaline to island arc tholeiitic signature.

Leucocratic orthogneiss with K-feldspar porphyroclasts up to 1 cm in size and a calc-alkaline granitic composition plots in the field of volcanic arc granite. According to the youngest zircon grains, it crystallized during the Variscan event in the Late Devonian. Inherited zircon cores yield mostly Cambrian to Middle Ordovician ages. Two pegmatite gneisses with a calc-alkaline composition are early Mississippian in age. Their zircon grains are characterized by high U contents (147-2400 ppm) and high U/Th ratios (60-820).

Mylonitic orthogneiss with a pronounced stretching lineation appears as layers with an irregular shape in the southern, tectonically lower part of the nappe. It is leucocratic, very fine grained and contains scattered feldspar porphyroclasts with a round shape and a diameter of about 1 mm. Its chemical composition is granitic/rhyolitic with an alkali-calcic signature. In classification diagrams it plots in the field of syn-collision granite. Zircon ages indicate a Permian age of about 270 Ma. Inherited grains yield Pennsylvanian ages reflecting a late Variscan event in the source rocks, whereas some Neoproterozoic to Ordovician grains are absorbed from the surrounding paragneiss.

Similar rocks appear on top of the Troiseck-Floning Nappe and in the neighbouring Roskogel Nappe of the Lower Austroalpine Unit. They are identified as Permian rhyolitic metavolcanics and they share a similar chemical composition and a crystallization age of about 270 Ma. Neoproterozoic to Ordovician grains dominates their detrital zircon spectra, but there is also an age group of about 2 Ga.

Associated with the rhyolitic rocks intermediate metavolcanics (referred in the literature as “biotite-uralite schists”) occur. They developed from calc-alkaline basaltic andesite and their zircon age is the same as for the rhyolitic rocks. Further, they contain a few grains with Late Variscan Pennsylvanian ages.

New Rb-Sr biotite ages in combination with literature data indicate a cooling trend within the Troiseck-Floning Nappe. A single age from the western part is 88 Ma, about 80 Ma were measured in the central part and new data from the eastern part are 75 Ma. A similar trend is documented by Oligocene and Miocene apatite fission track data from the literature.

In summary, the basement rocks of the Troiseck Complex developed from clastic metasediments and basic volcanic rocks deposited in Cambrian to Early Devonian times. During the Late Devonian, they were affected by an early phase of the Variscan collisional event, causing deformation at amphibolite facies conditions and intrusion of calc-alkaline granites. Geochemical signatures suggest a volcanic arc setting. During the early Mississippian pegmatite dikes intruded, maybe during decompression and exhumation. At least in Permian time the Troiseck Complex was at the surface, because clastic sediments and volcanic rocks were deposited on top. Permian volcanic and subvolcanic rocks include rhyolite and basaltic andesite. Even if the rhyolite is characterized by a syn-collisional signature, an extensional environment can be assumed based on regional considerations. In Triassic times carbonate platform sediments were deposited. During the Eo-Alpine collision the unit was part of the tectonic lower plate and subducted to shallow crustal levels, indicated by a lower greenschist facies metamorphic overprint. The Troiseck-Floning Nappe was formed and exhumed since about 85 Ma. Rb-Sr as well as apatite fission track data indicate a tilting with more pronounced exhumation and erosion in the eastern part during Miocene lateral extrusion of the Eastern Alps.

The western continuation of the Troiseck-Floning Nappe, represented by the Seckau Nappe shows an analog geodynamic history. A similar type of pre-Alpine basement is present in the Tatric and Veporic units of the Central Western Carpathians. However, their Alpine tectonic evolution is different.