Pre-Alpine basement units in the southernmost Austroalpine domain: Significance for Alpine-Carpathian tectonics and paleogeography

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Among all distinct Austroalpine tectonic basement units of Eastern Alps and Western Carpathians, the Nötsch-Veitsch-Ochtina (NVO) unit is particularly interesting because of two reasons: (1) it comprises elsewhere unknown Lower Carboniferous clastic shallow water formations overlain by Upper Carboniferous terrestrial conglomerates and sandstones, interpreted to represent molasse deposits to the early Late Carboniferous Variscan orogeny; and (2) the Veitsch (Eastern Alps) and Ochtina (Western Carpathians) nappes are the lowermost units overlain by a pre-Variscan amphibolite-grade metamorphic basement unit as well as a Lower Paleozoic phyllitic basement, all representing tectonic units in the footwall of the Late Jurassic/Early Cretaceous oceanic Meliata suture. The Nötsch area is located between the Periadriatic and another major regional strike-slip fault (the Drau Range South margin fault) in the southernmost part of the Austroalpine domain, and comprises, from base to top, similar three tectonic units as the NVO unit in the north: (1) the non-metamorphic Carboniferous Nötsch Group, (2) the retrogressed amphibolite facies metamorphic Nötsch basement, and (3) the rare fossil-bearing Silurian-Devonian greenschist facies metamorphic Gailtal basement.

In the Gailtal basement, the U-Pb zircon age of 441.6±6.7 Ma obtained from the Dellach augengneiss points to a Silurian magmatic protolith, metamorphosed during the Carboniferous (Ar-Ar sericite ages of 321±1 Ma to 345±1 Ma) and overprinted by a second thermal event with a maximum age of 265±3 Ma. In the Nötsch basement, U-Pb zircon ages of 480.3±9.4 Ma and 442.5±1.7 Ma from mylonitic orthogneisses indicate similar intrusion ages. Ar-Ar white mica ages range from 408±2 Ma to maximum 430±2 Ma constraining a cooling after the pre-Variscan metamorphism. Both, biotite and K-feldspar plateau ages vary from 344±2 Ma to 337±2 Ma and are overprinted by a younger event between 213±1 Ma and 198±1 Ma, interpreted as a result from an advanced stage of an Alpine rifting. White mica from orthogneiss boulders of the Pölland Fm. from the Nötsch Group show plateau ages ranging from 343±4 Ma to 380±2 Ma, affected by a post-depositional very low-grade metamorphic overprint.

New data demonstrate, beside its significance for the Variscan history, that the tectonic succession of the Nötsch area at the southernmost part of the Austroalpine unit has a strong similarity to the nappe stack (including the NVO unit) of the northern Austroalpine sectors (Greywacke zone and Ochtina area). Therefore, we consider these three units of the Nötsch area as a remnant of the root zone of the basement and cover nappes in the footwall of the Meliata suture. The structural relationships point to a more than 150–200 km large-scale nappe transport of the Meliata suture remnants in the Eastern Alps as well as the involvement of large, hitherto undetected Cenozoic strike-slip faults into the Austroalpine structure.