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Permian and Triassic Meliata-related rift and drift processes in Eastern Alps: middle and lower crust and its potential correlation with sedimentary units

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The poorly studied middle and lower crust (MLC) of passive continental margins, a key plate tectonic element, is often preserved in thick-skinned tectonic wedges of mountain belts. We studied the Permian to early Norian Meliata Ocean-related rift-characteristics of MLC and detached upper crust (UC) of the Austroalpine nappes of Eastern Alps (and Western Carpathians) with the aim to assess rift models, composition and temporal and spatial distribution of magmatism. We also compare the development of UC sedimentary units with similar successions of the eastern Southalpine unit. There, rifting started already during Early Permian, and a major extensional event occurred during late Early Permian separating Lower and Upper Permian carbonate platforms. In Austroalpine units, rifting occurred later, and the response of LMC to rifting includes acidic and subordinate, mostly earlier mafic magmatism, high-temperature/low-pressure metamorphism (ca. 0.46 GPa, 540 °C), and pure and simple shear deformation in shallow parts of MLC. In UC, the poorly dated rift-onset unconformity formed in Early or Middle Permian and resulted in N-S to NE-SW striking halfgrabens filled with up to 1.5 km thick terrestrial clastics. First marine ingressions occurred during latest Permian, since Anisian carbonate deposition dominated (loss of the clastic hinterland). We recently detected a break-up angular unconformity in central Northern Calcareous Alps (NCA) on top of tilted Lower Anisian Gutenstein Limestone and wedge-shaped Middle Triassic carbonates covered by Norian Dachstein Reef Limestone indicating the break-off and spreading in the Meliata oceanic tract. In Permian evaporites, polyhalite veins and grains crystallized between 235 and 225 Ma and at ca. 210 Ma testifying intense fluid flow along normal faults similar as Anisian/Ladinian strata-bound iron and Pb-Zn-Ba-F mineralizations do. In the underlying basement, we detected similar Permian to Triassic ductile shear zones with Ar-Ar sericite ages of 239 and 267 Ma.
Age, type and distribution of LMC magmatism allow correlation with UC rift basin infill and therefore correlation of detached pieces within the Austroalpine thrust wedge. A continent-ward, ca. NW-ward directed progression of initiation of magmatism is constrained during the initial extension mode. The rifting is oblique, NE-Sw, to the present-day E-W strike of the orogen. This model also allows a new tectonic reconstruction of the Cretaceous-aged Austroalpine nappe stack.