Permotriassic tectonic evolution of Eastern Alps: What does it mean?

Franz Neubauer & Johann Genser
Dep. of Geography and Geology, University of Salzburg, Hellbrunnerstraße 34, A-5020 Salzburg, (Austria) (Franz.Neubauer@sbg.ac.at; Johann.Genser@sbg.ac.at)

Based on new data from sedimentary basins (see below), magmatism and metamorphism, the Permian and Triassic tectonic evolution of Austroalpine (AA) and eastern Southalpine units (SA) have been studied in order to reveal the tectonic evolution and a new model is developed. The Permian development is largely dominated by a rift succession post-dating Upper Carboniferous (Variscan) molasse deposition. Permian sedimentary deposits comprise a wide range of terrestrial and marine (Southalpine domain) facies and thickness and can be interpreted as result of the infilling of rift basins and non-deposition on rift shoulders. The associated bimodal magmatism may indicate rifting, too. A relatively high geothermal gradient indicates decompression und exhumation of the basement, and extensional ductile shear zones were formed. However, the rift evolution was likely interrupted by a short-living Mid Permian compressional phase, and this phase is interpreted as large-scale shortening associated with Siberia-Laurussia collision. The early Middle Triassic is interpreted as transition from rift to drift stage, the later associated with opening of the Meliata oceanic tract. Abundant Middle Triassic magmatism has been identified not only in Southern and southern Eastern Alps as well as in Dinarides and Carpathians. On a large scale, this magmatism shows both affinites to both rift and hot spot alkalic varieties. Another early Middle Triassic expression is extensional faulting forming a Mid-Triassic horst-graben topography.

The new data include detailed work on variably thick Permian to Lower Triassic siliciclastic successions and their petrographic composition of conglomerate, breccias and sandstones of central southern sectors of the Northern Calcareous Alps (NCA), the Stangalm area and Lower Austroalpine "Quartzphyllite" units. These units have been studied in order to reveal their geodynamic setting. These data are combined with successions exhibit a spatially variable sequence of new-defined formations, which are separated along strike by new detected low-angle normal faults (e.g. the Halm fault of NCA). A halfgraben-type siliciclastic infilling includes a ca. 1.5 – 2 km thick sequence starting with the Filzmoos Conglomerate containing coarse polymict breccia and quartz conglomerate, thick Alpine Verrucano, and the Gerzkopf Fm. representing a thick quartz arenite at the top. These are overlain by the shallow marine Werfen Formation. Only in light-coloured sandstones intercalated within purple siltstones, some trace fossils have been found. The Alpine Verrucano Formation also contains a layer of pure green sericite slates interpreted to represent a completely transposed acidic tuff. The entire sequence is interpreted to represent the transition from desert climate to shallow marine barriere sandstones during prograding extension within a syn-rift geodynamic setting. Overlying siliciclastic sediments are interpreted to monitor changes between terrestrial and marine environments until a full marine environment was established in upper parts of Lower Triassic in a post-rift tectonic setting. The thick graben infill is juxtaposed to relatively thin successions deposited on horst structures. These lack coarse clastic formations and are dominated by fine-grained sandstones.

The new data show that main portions of the siliciclastic base of above mentioned units can be interpreted as a rift succession monitoring syndepositional extension and thick rift basin infills occur both at the base of central NCA and Lower Austroalpine Radstadt and Semmering Mountains.