The Plankogel complex within the Austroalpine nappe complex of Eastern Alps: a Paleotethyan suture?

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The pre-Alpine Austroalpine amphibolite-grade metamorphic basement of Eastern Alps contains a number of ophiolitic sutures, which are poorly constrained in age. All of them have been considered to have formed not later than Variscan plate collision during the Carboniferous. Major portions of this basement are then overprinted by Permian rift processes, which also include low-pressure rift metamorphism. As a result, the location of a Paleotethyan suture has not been considered to extend into the Alps.

Here we report preliminary results of an extensive U-Pb zircon dating and geochemical analyses on the Plankogel complex in Eastern Alps (Saualpe and Koralpe), which was considered to represent part of the pre-Alpine basement. The Plankogel complex is composed of coarse-grained garnet-micaschist as a matrix and plagioclase-rich biotite schist, within which hectometer-sized lenses of marble, manganese-rich spessartine-quartzite, amphibolite and ultramafic rocks occur. The marble was the host of a manganese-rich iron mineralization mined until ca. four decades ago. The amphibolites have a N-MOR-basalt geochemical signature. The manganese-rich quartzites were explained as siliceous deep-sea sediments. No protolith age were known up to now.

Metasedimentary rocks like the garnet-biotite-micaschist show a large population of Pre-Permian, partly euhedral zircons implying an age of the sedimentary precursor rocks not older than Permian. The manganese quartzites show a large Permian to Early Triassic volcanic component (244±6 –282±8 Ma with ~340 Ma peak and minor >630 Ma peak ages of detrital zircons. The spessartine-rich garnet in quartzite is interpreted to result from deep-sea manganese-rich silica-rich sediments (probably chert). Two amphibolites show late Permian/Early Triassic protolith ages (249±7 Ma –266±4.2 Ma).

As a whole, our dating results are entirely unexpected and require a re-evaluation of the tectonic history of the Austroalpine units. Based on the dating results, we conclude that the Plankogel complex represents a Triassic ophiolite-bearing mélange with oceanic trench sediments and components from a deep-sea environment. The detritus is rich in Permian to Middle Triassic volcanic components. The volcanic components indicate the subduction of the Paleotethyan Ocean, and oceanic lithospheric elements were incorporated into the trench sediments.

In the Saualpe, the Plankogel complex is directly overlying the Eclogite-Gneiss unit, which indicates Cretaceous high-pressure metamorphism and subduction of continental crust during Cretaceous plate collision. The Plankogel complex is preserved in the hanging wall of it and incorporates Triassic trench sediments indicating another, older suture. Such scenarios with preservation of an earlier, displaced suture can be explained by displacement during Cretaceous plate collision according to scenarios proposed by numerical and analog modeling (Vogt et al., 2018).

References

Vogt K., Willingshofer E., Matenco L., Sokoutis D., Gerya T. &Cloetingh, S. (2018). The role of lateral strength contrasts in orogenesis: A 2D numerical study. Tectonophysics, 746, 549–561