

A Cambrian continental arc and its Early Proterozoic hinterland in Eastern Alps: the Wechsel Gneiss Complex

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As known since a long time, the Austroalpine nappe complex of Eastern Alps and Western Carpathians contains two major basement units, which collided during the Variscan orogeny (Neubauer & Frisch, 1993). These include (1) a nearly unmetamorphic Gondwana-derived fossil-rich unit, which represents an Ordovician back-arc unit and a Devonian passive margin; and (2) an amphibolite-grade metamorphic unit, which was fully affected by Variscan amphibolite-grade metamorphism including Devonian, early Variscan high-pressure metamorphism, and which is considered representing, in major portions, a poorly dated magmatic arc system with intermediary and acidic orthogneisses. Among these, the Lower Austroalpine Wechsel Gneiss unit of the Wechsel window shows Devonian pressure-dominated metamorphism in upper greenschist (Müller et al., 1999).

The basement within the Wechsel window comprises three units from base to top: (1) the Monotonous Wechsel Gneiss unit, (2) the Variegated Wechsel Gneiss unit, and (3) the Wechsel Phyllite unit. In the field, albite porphyroblasts represent the most pronounced feature of both Monotonous and Variegated Wechsel Gneiss units (Neubauer & Frisch, 1993).

The Variegated Wechsel Gneiss Unit contains magmatic rocks (hornblende-gneiss, greenschist, acidic orthogneiss) with U-Pb zircon ages between 508 and 523 Ma. In paragneisses and quartzite, the detritus is dominated by several age groups that include euhedral zircons of ca. 490–500 Ma, 550 Ma and detrital components of ca. 1.9–3.2 Ga, with a pronounced maximum of ca. 2.1 Ga. In one samples only, the detritus is dominated by Devonian–Carboniferous ages (380–300 Ma).

The Wechsel Phyllite unit includes feldspar-rich tuffs, which gives latest Neoproterozoic ages (e.g., 556.5 ± 2.3 Ma and 556.5 ± 9.7 Ma), whereas other samples bear a significant detrital component with dominant age populations of 450–550 Ma and 2.5–2.9 Ma

Consequently, the new age data gives evidence for two stages of continental arc-like magmatism at 500–520 Ma and 550–570 Ma. We speculate on relationships of the continental arc-type magmatism and coeval oceanic lithosphere (Speik complex) of Proto-Tethyan affinity, which is also preserved in the Austroalpine nappe complex (Neubauer & Frisch, 1993 and references therein). The abundant, nearly uniform 2.1 Ga-age signatures calls for Lower Proterozoic continental crust in the nearly source showing the close relationship to northern Gondwana prominent in West Africa and Amazonia (Stephan et al., 2018).

References

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