The sulphatic Haselgebirge evaporite mélange revisited: evidence from the Moosegg quarry within central Northern Calcareous Alps

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For reconstruction of Alpine tectonics, the Permian-Lower Triassic Haselgebirge Formation plays a key role in (1) origin of Haselgebirge bearing nappes, (2) the potentially primary or tectonic inclusion of magmatic and metamorphic rocks revealing tectonic processes not preserved in other units, and (3) debated mode of emplacement, namely gravity-driven or tectonic. With these aims in mind, we studied the sulphatic Haselgebirge exposed to the east of Golling, particularly the gypsum quarry Moosegg and its surroundings in the central Northern Calcareous Alps. Overlying there the Lower Cretaceous Rossfeld Formation, the Haselgebirge Formation forms a tectonic klippe preserved in a synform, which is cut along its northern edge by an ENE-trending high-angle normal fault juxtaposing Haselgebirge to Upper Jurassic Oberalm Formation. A high variety of both sulphatic fabrics are preserved within the Moosegg quarry and dominant gypsum/anhydrite bodies are tectonically mixed with subordinate lenses of dark dolomite, dark-grey and red shales, pelagic limestones, and marls. In gypsum breccia, a wide variety of abundant plutonic and volcanic rocks and rare metamorphic rocks are preserved within decimeter- to meter-sized tectonic clasts and boudins. At the base of the Haselgebirge Fm., strongly foliated fine-grained anhydrite mylonite is preserved with WNW-trending stretching lineation constituting together a L-S fabric indicating emplacement of the Haselgebirge evaporite mélange within ductile conditions. In other places at the base of the Haselgebirge, anhydrite is transformed into foliated gypsum leaving behind a still well preserved L-S fabric. The main Haselgebirge body comprises foliated, massive and brecciated anhydrite and gypsum. Gypsum breccias with foliated gypsum clasts are quite common, and some of these breccia lenses are again foliated and clasts are stretched implying several stages of ductile deformation. Because of peculiar fabrics, we interpret formation of gypsum and anhydrite breccia by fluid overpressure, possibly in part related to dehydration reactions of gypsum to anhydrite. According to fluid inclusion studies, the Haselgebirge sulphates experienced a relatively high temperature (>240 °C; SPÖTL et al. 1998, WIESHEU 1997).

Magmatic and metamorphic rock boudins within the evaporite mélange have been studied in great detail. We found various types of rare ultramafic rocks (serpentinite, pyroxenite), widespread biotite-bearing diorite and some gabbro, various types of altered volcanic rocks with well preserved feldspar, as well as rare schists. The diorite samples commonly bear kaersutitic amphiboles (see BERNROIDER et al. this volume). The $^{40}Ar/^{39}Ar$ biotite from six diorite samples with variable composition and fabrics range from 246 to 254 Ma (e.g., 253.7±1.7 Ma) indicating a Permian age of cooling after magmatic crystallization. The chemical composition of diorite and gabbro indicate an alkaline trend. We interpret the plutonic and volcanic rocks to represent a rift-related magmatic suite. These, together with a high variety of Permian to Jurassic sedimentary rocks, were incorporated during nappe emplacement. We also studied rare metamorphic rocks, particularly metagabbroic blueschists. The scattered $^{40}Ar/^{39}Ar$ white mica age of one sample is at 340-350 Ma and proofs the Variscan age blueschist metamorphism. This age is in the range of detrital white mica ages found in the underlying Rossfeld Fm. (EYNATTEN et al. 1996) indicating a close source-sink relationship.

According to our new data, the Haselgebirge bearing nappe was transported over Lower Cretaceous Rossfeld Formation, which includes many clasts derived from the Haselgebirge Fm. and its exotic blocks deposited in front of the incoming nappe. Such mylonitic high-temperature shear zones were mapped in several other areas from the southern margin (e.g., Rettenstein and Werfen Imbricate zone) to close to the northern margin of the Northern Calcareous Alps (Berchtesgaden - Dürrnberg, see NEUBAUER et al. this volume).

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Seismostratigraphische Untersuchungen im Bekes Becken, Rumänien

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Das Bekes Becken mit einer Fläche von rund 3900 km² (TELEKI et al. 1994) ist ein Teilbecken des Pannonischen Beckensystems an der Grenze von Ungarn und Rumänien. Der Hauptteil des Bekes Beckens mit über 6500 m mächtigen neogenen syn- und postrift Sedimenten liegt in Ostungarn. Sämtliche bis dato veröffentlichten seismischen und damit seismostratigraphischen Daten stammen aus dem ungarischen Beckenteil. In dieser Studie werden seismische Daten mit seismostratigraphischer Interpretation aus dem östlichen Beckenrand des Bekes Beckens, der in Rumänien liegt, gezeigt.