Evolution of the northern Lower Austroalpine – Tatric margin: from Jurassic rifting to Cretaceous stacking

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The Lower Austroalpine units in the Eastern Alps and Western Carpathians record a rifted passive margin setting during the Early–Middle Jurassic, post-rift subsidence in the Late Jurassic to Early Cretaceous times and active margin contraction during the Late Cretaceous. It is inferred that these three evolutionary periods are closely related with opening, spreading and subduction of the neighbouring South Penninic – Vahic oceanic realm, respectively. We present a few examples of this particular passive/active margin from the Eastern Alps (Tauern Window) and Western Carpathians (Malé Karpaty and Považský Inovec Mts) to illustrate the sedimentary and tectonic development of ancient plate margins incorporated into collisional orogenic belts.

The northern rim (Nordrahmenzone) of the Tauern Window involves the Upper Penninic nappes overridden by the Lower Austroalpine basement/cover sheets and is composed of thick, strongly deformed and metamorphosed "Bündnerschiefer" sedimentary complexes composed of green, grey to black, mostly calcareous phyllitic schists intercalated by limestones and bodies of sandstones, carbonate breccias with dolomite olistoliths, gabbros and serpentinites. The zone represents detached sedimentary complexes of a former Jurassic to Lower Cretaceous distal (with respect to the continent), passive, totally inverted margin, which were partly mixed with oceanic material within an Upper Cretaceous accretionary wedge associated to subduction of the (South) Penninic Ocean.

In contrast, the Borinka Unit in the Malé Karpaty Mts shows only a slight inversion related to overthrusting of the Bratislava nappe, which was derived from more internal Austroalpine (Tatric) zones. The Borinka Unit is composed of strongly asymmetric infill of a Jurassic halfgraben characterized by thick aprons of coarse grained terrigenous breccias and represents a proximal passive margin setting. The halfgraben was likely bounded by the break-away fault that separated the Infra-Tatric rifted margin from the rest of the Tatric domain characterized by a less distinct rifting.

The third example comes from the Belice Unit of the Považský Inovec Mts that documents a margin that was nearly completely destroyed and overridden by the upper plate Tatric basement-cover thrust sheet (Inovec nappe). However, the Upper Cretaceous syn-orogenic, coarse-grained mass-wasting deposits contain olistoliths of the earlier passive margin sequences, including Jurassic syn-rift sediments.

Summing up, different, but correlative depositional and tectonic settings are demonstrated along-strike the ancient Austroalpine-Penninic plate margin: 1) slightly inverted, proximal passive margin halfgraben (Borinka Unit) overridden by a comparatively thin basement sheet (Tatric Bratislava nappe), probably located in the very rear of the later accretionary wedge; 2) imbricated middle parts of the accretionary complex (Belice Unit), where thin, slope-derived passive margin sequences were damaged and recycled into syn-orogenic olistostromes scraped off the subducting Vahic plate; 3) the Upper Penninic units of the Tauern Window include thick distal passive margin complexes that were deeply buried within the lower parts of the accretionary wedge and only exhumed by the subsequent Tertiary collision.

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