

Tectono-sedimentary evolution of deep water rifted margins: the example of the distal SE Alpine Tethys margin (Central Alps, SE Switzerland).

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Since the beginning of the 20th century, Alpine geologists did significant contributions in understanding the tectonic and sedimentary processes leading to “Atlantic-type” oceans. Major contributions were the discovery and description of fault bounded rift basins, ophiolites, and, more recently the discovery of low-angle detachment faults and exhumed subcontinental mantle. Thanks to the weak Alpine overprint and its position in the hanging wall of the Alpine subduction, remnants of the fossil Jurassic Adriatic rifted margin are spectacularly exposed in the Austroalpine units in SE Switzerland. The study of these remnants give new constraints on the tectono-sedimentary evolution of a distal magma-poor rifted margin.

The Austroalpine in Grisons consists of 4 paleogeographic domains, which are exposed in a top-to-the-west nappe-stack. These are from top to bottom: (1) the proximal rifted margin with classical fault bounded basins (e.g. Ortler nappe); (2) the transition zone between the proximal and distal margin, also referred to as the necking-zone (e.g. Bernina nappe); (3) the distal rifted margin preserving top-basement detachment fault overlain by extensional allochthons (e.g. Err nappe); and (4) the zone of exhumed subcontinental mantle (e.g. Platta nappe).

This study focus on the Err nappe and especially on the Samedan Zone, which preserves a detachment system showing pre-Alpine relationships to pre-, syn- and post rift sedimentary sequences. The structures can be reconstructed over 11km in E-W and 2 to 4km in N-S direction perpendicular to the transport direction. Within the basin 4 formations can be distinguished, each one corresponding to an evolutionary step of the “supra-detachment basin”.

- (1) The Bardella formation consists of massive breccias derived from the Triassic to lower Jurassic carbonate platform. It formed along small high-angle faults and records the localization of debris-flows processes into small fault-bounded basins within the hanging wall of an evolving detachment system.
- (2) The Saluver A formation consists of basement breccias and is directly related to the detachment dynamics. It records the first exhumation of the footwall and leads to lateral siliciclastic debris-flows derived from the footwall of the detachment system.
- (3) The Saluver B and C formations correspond to the onset of an axial sand-dominated turbiditic system and the stopping of local tectonic activity.
- (4) Post-rift sediments are deposited in an under-filled basin due to the global margin starvation and onlap onto the necking zone (Bernina).

In conclusion, the syn-rift sequences observed in the Zone of Samedan seem to record all steps of an evolving detachment system. These elements supply a new framework to understand late rifting processes and can help to re-interpret the complex tectono-sedimentary architecture of the most distal parts of present-day magma-poor rifted margins.