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Tectonic models for the Austroalpine structure in Eastern Alps: nomenclature matters

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Current structural models of the Austroalpine nappe complex (ANC) need significant revision, and a new one will be proposed. The ANC is a mostly continental basement-cover nappe complex, which is separated from the Southalpine unit by the Periadriatic fault. Both are part of the Adriatic microplate representing a similar Triassic-Jurassic passive margin. In a high structural level within the Northern Calcareous Alps (NCA), the ANC also includes remnants of the Ladinian-Jurassic (oceanic) suture-like Meliata basin representing the slope-basin facies to the Middle-Upper Triassic shallow water successions. Many models were proposed for the ANC based on a few principles including (1) the presence of Permotriassic cover between pre-Alpine basement units, (2) the assignment to distinct Middle-Upper Triassic paleogeographic domains explaining the transition of shallow water to pelagic sediments, (3) the degree of Cretaceous metamorphism associated with top-NW and subordinate top-N ductile shear, particularly the presence of early Late Cretaceous-aged eclogites (UHP/HP unit) in Central Alps testifying intracontinental subduction, and (4) the need of putting all structural and lithostratigraphic units into a GIS for getting an internally consistent map. Among others, major challenges to present models include: (1) the non-correlation of the uppermost nappes (Noric-Tirolic, Graz Paleozoic, Gurktal nappes & Drauzug) by eliminating the former Middle Austroalpine unit, (2) the disputed relationships between the basal incomplete NCA cover nappes with metamorphosed basement-cover nappes with decapitated sections in Central Alps, (3) the different application of lithostratigraphic vs. structural nomenclature, (4) the correlation of units underneath and above the UHP/HP unit, (5) the potential role of postulated Jurassic-Cretaceous transform faults, which, e.g., brought the Drauzug into its current position, (6) the role of mostly Mid-Late Triassic to Cenozoic evaporite tectonics, and (7) the role of Late Cretaceous-Paleogene Gosau basins (syn-orogenic compressional vs. extensional/collapse). A great advance was the clarification of degree and timing of the Cretaceous metamorphism ranging from very low-grade/greenschist in uppermost units to eclogite facies in middle levels to greenschist facies in lowermost units. The timing of metamorphism ranges from ca. 120 Ma to 78 Ma with a clear trend of downward decreasing ages in distinct structural units testifying overall footwall propagation and in-sequence thrusting. The age range of metamorphism also implies that Lower Cretaceous Rossfeld turbidites in NCA are synchronous with ductile deformation in uppermost ANC units. Late Cretaceous Gosau basins, all deposited in uppermost structural units, postdate metamorphism and are synchronous with synmetamorphic nappe stacking of deepest structural units (Lower Austroalpine) and exhumation of the HP/UHP wedge in the middle part. In Central Alps, Gosau basins were deposited in a (trans-)extensional setting following Early Cretaceous nappe stacking, folding and an erosional phase down up to the Middle Triassic Wetterstein Fm. The Lower Gosau Group deposition was associated with a huge (>340 km) E-directed detachment system reactivating the former earliest Late Cretaceous thrust planes at the base of the uppermost structural units. In contrast, northwestern NCA Gosau-type basins are syncompressional and correlate with Lower Austroalpine thrusting. Consequently, there is no need to assume that Penninic subduction started earlier than Santonian.

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