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Re-interpretation of the TRANSALP seismic section in the light of a new tectonic subdivision of the western Northern Calcareous Alps

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Since the early Late Cretaceous, during Eoalpine orogeny, the Permo-Mesozoic sedimentary succession of the Northern Calcareous Alps (NCA) and its basement were involved in nappe stacking and folding. The nappe stack was refolded and faulted in the Late Cretaceous-Eocene collision of Adria and the European distal margin, continued by post-collisional processes, which lead to an eastward extrusion of crustal blocks in Oligocene-Miocene. The subdivision of nappes in the western part of the Northern Calcareous Alps is under discussion since it was proposed over 100 years ago. Recent findings have shown, that some of the established nappe thrusts are actually younger thrusts, cutting older nappe boundaries in an out-of-sequence fashion, and therefore leading to a new subdivision of nappe sheets in the western NCA, and a reduction in number of thrust sheets. In this study we present an interpretation of a re-processed part from the TRANSALP seismic section, between the Austria-Germany border and the Zillertal, which offers new insights into the deep structure of the NCA around the lower Inn valley. We show that Paleogene out-of-sequence thrusting plays an important role in understanding the relation between different tectonic units, overprinting pre-existing nappe boundaries, and being falsely interpreted as the latter. We propose to accept the internal subdivision of a continuous unit (Tirolic Staufeu-Höllengebirgs- and Bajuvaric Lechtal thrust sheets) by an out-of-sequence structure. This means to abandon the concept of a tectonic subdivision entirely based on Cretaceous (in-sequence) nappe stacking. Oligocene-Miocene thrusting along the Subtauern ramp and eastward extrusion along steep strike-slip structures - like the Inntal shear zone - are complicating the tectonic history of the region, displacing older in- and out-of-sequence structures, and finally exhuming the basement units underneath the NCA, south of the Inn valley.

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