At the beginning of the Late Miocene, the sedimentation has been changed and the brackish Lake Pannon developed. Between 11.6 and 9.7 Ma the former basin highs were progressively inundated and the surface and volume of the lake increased. Since 9.7 Ma onwards clastic input via extensive fluvial networks progressively filled the lake, large scale normal regression took place.

Late Miocene deposition pattern, facies relationship and coeval structural geometry and kinematics, as well as their influence on sedimentation was studied by the help of surface structural, sedimentological and palaeontological observations, by 2D and 3D seismic reflection data sets. Our research extended into the Transdanubian Range (TR), the largest high in the Miocene, and sub-basins W, S and SE of it.

The transgressive phase resulted in in a spatially variable facies pattern. Deep lacustrine marls of large thickness accumulated in the deep sub-basins and condensed marls in the less than 100 m deep waters covering the basement highs. This lithofacies is characteristic along the western margin of the TR during 9.5–9 Ma. The clastic input reached the western Pannonian basin from the NW and N. As rivers entered the lake deltas of ca. 20–50 m thick coarsening upwards successions were formed. These shelf deltas prograded towards basin-margin-slopes of several hundred meters high in the deep sub-basins, and also towards flooded basement highs where slopes were missing. Deltas were prograding across both type of areas, but above deep basins deltaic successions has a large thickness, while on highs a reduced sequences.

Systemathic mapping of shelf-to-basin clinoforms clearly indicate the influence of basement highs which deflected slope progradation into a direction sub-parallel to highs. These basement highs were partly inherited from the syn-rift deformation, however, seismic sections clearly demonstrate active syn-sedimentary faulting during the transgressive phase and partly during slope progradation, ca. between 11.6 and 8.5 Ma. Fault-controlled abrasional gravels and fault breccias are found along the margins of TR, were most likely coeval with the flooding of highs and and might have occurred between 9.5 and 8.8 Ma. Surface measurements suggest an E–W to ESE–WNW extensional (transtensional) stress field in agreement with seismic fault mapping. South from the TR, thickness of basinal marls decreased above E–W trending active transpressional ridges between ca. 12 and 9 Ma. After the ceasion of deformation during slope progradation between 9 and 8 Ma, growing of E–W trending anticlines started from 8 Ma. However, regional subsidence counterbalanced anticlinal growth and deltas overstepped folds.

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Garnet systematics of a polymetamorphic basement unit: Evidence for coherent exhumation of the Adula Nappe (Central Alps) from eclogite-facies conditions

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The Adula Nappe in the Central Alps is derived from the former continental margin of the European Plate that was subducted beneath the Adriatic Plate during the Alpine orogenic cycle. It consists of pre-Mesozoic basement (various gneisses with layers of garnet-micaschist, and bodies of mafic and locally of ultramafic rocks) and few Mesozoic cover rocks. High-pressure and ultra-high-pressure conditions are preserved in eclogite and ultramafic rocks but are apparently not recorded in the gneisses that build up the bulk of the nappe. It is unclear whether the unit constitutes a tectonic mélange that is compiled of rocks

with different Alpine PT histories or wether it represents a coherent unit that was subjected to eclogite facies conditions as a whole. Within the nappe, eclogite-facies conditions and post-peak pressure amphibolite-granulite-facies conditions display increasing peak temperatures between 500 °C and >750 °C from north to south.

We present Lu-Hf garnet ages and detailed garnet chemistry of eclogite samples from several locations throughout the Adula Nappe. Samples from the central Adula Nappe are characterised by the presence of two populations of garnet. A first generation yields a Variscan Lu-Hf age and a second one an Alpine (Late Eocene) age, a result already established at the locality Trescolmen and here shown for more locations. In eclogites from the southern Adula Nappe, Alpine metamorphic conditions completely reequilibrated Variscan assemblages and garnet reveals exclusively Eocene Lu-Hf ages. In contrast, garnet is almost unaffected by Alpine metamorphism and is consistently of Variscan age in the northern Adula Nappe. Hence, the degree of Alpine metamorphic overprint and an associated re-equilibration of the Lu-Hf system is maximal in the southern part of the unit and decreases towards the north. Isotopic ages are in line with microstructural observations and major-element maps of garnet. Element maps display fully equilibrated garnet in the southern Adula Nappe, i.e. garnet with a homogeneous composition due to diffusive reequilibration during Alpine metamorphism. In the central nappe, relicts of an older, partly reequilibrated Variscan garnet generation are overgrown by a second Alpine generation with perfectly preserved prograde zoning and no diffusive overprint at all. Towards the north, the Alpine generation becomes less abundant and is absent in the northermost eclogite sample.

Eocene garnet ages are about the same through the entire nappe, 35-38 Ma. This and the continuous gradient of Alpine metamorphic overprint in high-pressure assemblages strongly suggest that the Adula Nappe essentially remained coherent during Eocene high-pressure metamorphism and exhumation despite very intense deformation. The gneissic host rocks of eclogites very likely experienced the same high-pressure metamorphic conditions but did not completely equilibrate, and later re-equilibrated during exhumation (see also abstract by KURZAWSKI et al., same volume).

A review of magmatic zircon ages from the Rhodope Metamorphic Complex: tectonic implications

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The Rhodope Metamorphic Complex is a stack of thrust sheets assembled during a protracted history of tectonic deformation during the Mesozoic and Cenozoic. Most studies on the geology of the Rhodope Metamorphic Complex (including the Rhodope Massif and the Serbo-Macedonian Massif) are regional investigations and address local problems. As a result the number of local nominations and tectonic subdivisions made large scale tectonic interpretations difficult. JANAK et al. (2011) proposed a simplified tectonic subdivision, merging all the known units of the Rhodope Metamorphic Complex into four super units (allochthons), namely the Lower (LA), Middle (MA), Upper (UA), and Uppermost Allochthon (UMA).

Due to the scarcity of distinctive lithologies, geochronological characterization is particularly important and the amount of data is rapidly increasing. The majority of zircon U/Pb ages obtained by conventional ID-TIMS, SHRIMP or LA-ICP-MS from orthogneisses, amphibolites, and metagabbros rather date protolith formation than metamorphism. Another