that formed in the course of exhumation of the crystalline and coeval deposition of Carboniferous sediments. Cataclastic pebbles are present within the Carboniferous sediments and suggest exhumation prior to deposition of rocks. The pre-Carboniferous fault can be traced all along the eastern and southern margin oft he Pfannock Gneiss. (2) The Pfannock Schuppe includes an inverted suite of Permian to Mesozoic sediments. It is interpreted as a tectonic sliver with the Pfannock Gneiss in the core of a northwest vergent fold. Shearing and folding is correlated with Cretaceous northwestward nappe stacking. (3) The actual geometry of the boundary is result of bulk extension during the late Cretaceous. Extensional structures with E- to SE displacement dominate N-S trending segments, dextral strike-slip zone the W-E trending segments. The overall geometry can be described as eastward spreading units with normal faults forming extensional bridges between strike-slip domains.

3D thermo-kinematic modelling of a crustal-scale low-angle normal fault: the Katschberg detachment, Eastern Alps.

Wölfler, A.[1], Glotzbach, Ch.[1], Dunkl, I.[2], Stüwe, K.[3] & Fügenschuh, B.[4]

[1] Institute of Geology, University of Hannover, Callinstrasse 30, D-30167 Hannover, Germany (woelfler@geowi.uni-hannover.de)
[2] Sedimentology & Environmental Geology, Geoscience Center, University of Göttingen, Goldschmidtstrasse 3, D-37077 Göttingen, Germany
[3] Institute of Earth Sciences, University Graz, Heinrichstr. 26, A- 8010 Graz, Austria.
[4] Institute of Paleontology and Geology, University of Innsbruck, Innrain 52, A-6020, Austria

In this study we investigate a low-angle normal fault of the Eastern Alps, the Katschberg detachment. This major structure developed during Miocene lateral extrusion and is largely responsible for the exhumation of the eastern Tauern Window. We investigate two E-W profiles that extend 25 km in the footwall and 20 km into the hanging wall. An extensive set of already published and new thermochronological data provides the basis for 2- and 3-D thermokinmatic models. We use a finite-element code (Pecube) to solve the heat equation in 3D and predict the thermal evolution around the Katschberg detachment under given spatially and temporally variable boundary conditions. An inversion routine is used to find the best-fitting parameter combination, which reduces the misfit between modelled and measured thermochronological ages.

According to our preliminary inversion the Katschberg normal fault was active from 21.4±2.2 Ma until 8.3±1.7 Ma with a mean slip-rate of 2.6±0.5 km/Ma, integrating to an offset along the fault of 33.8±4.1 km. This agrees with previous studies, that suggest that the Katschberg detachment was active between ~23 and 12 Ma.

Middle- to Late Miocene exhumation of the central Eastern Alps: new structural-, fission track and apatite (U-Th)He data.

Wölfler, A.[1], Kurz, W.[2], Fritz, H.[2] & Danišík, M.[3]

[1] Institute of Geology, University of Hannover, Callinstrasse 30, D-30167 Hannover, Germany (woelfler@geowi.uni-hannover.de)
[2] Institute of Earth Sciences, University Graz, Heinrichstr. 26, A- 8010 Graz, Austria
[3] Departement of Earth & Ocean Sciences, Faculty of Science & Engineering, University of Waikato, Hillcrest Road, Hamilton, New Zealand

New structural-, fission track and apatite (U-Th)/He data refine the Eocene/Oligocene to Late Miocene exhumation history of the Seckauer- and Niedere Tauern in the Eastern Alps. Both areas belong to the Austroalpine basement units but experienced different temporal and spatial exhumation. The Seckauer Tauern already cooled to upper crustal levels (2-3 km) during Eocene times, followed by stagnation and very low erosion rates. In contrast, the Niedere Tauern cooled to upper crustal levels during the Middle- and Late Miocene, contemporaneously to the Penninic units within the Tauern Window. Structural investigations suggest that the displacement between these two Austroalpine units occurred along the northern section of the Pöls-Laventtal fault system. We suggest that extrusion became not only lateral in terms of parallel to the trend of the Eastern Alps, but was characterized by a displacement vector at a high angle to the strike of the orogen. This resulted in exhumation of the Niedere Tauern and Pohorje Block that were exhumed within extensional bridges at the northern and southern termination of the Pöls-Lavanttal fault system, respectively.

Thermal modeling of an external Unit of the Eastern Alps - the Helvetic zone of western Austria and Upper Allgäu

Zerlauth, M.[1,3], Rantitsch, G.[2], Ortner, H.[3], Bertrand, A.[1], Pomella, H.[3] & Fügenschuh, B.[3]

[1] alps GmbH – Center for Climate Change Adaptation Technologies, Grabenweg 68, 6020 Innsbruck, Austria
(zerlauth@alps-gmbh.com)
[2] Department Angewandte Geowissenschaften und Geophysik, Montanuniversität Leoben, Peter Tunner-Straße 5, 8700 Leoben, Austria
[3] Institut für Geologie und Paläontologie, Universität Innsbruck, Innrain 52, 6020 Innsbruck, Austria

The Helvetic zone of the Eastern Alps is a thin-skinned fold-and-thrust belt comprising Jurassic to Cenozoic shelf deposits. They were detached from their substratum during Cenozoic nappe formation. From the Oligocene onward, they were transported to the north and thrust onto the Alpine Foreland Basin, carrying the Penninic and Austroalpine units piggy-back.

To study the thermal evolution of this external part of the Eastern Alps, maturation of organic matter was measured using vitrinite reflectance. Organic rich dark-colored shales and carbonates build a large part of the Helvetic stratigraphic succession. Fission track dating was done to obtain some time related temperature information on the thermal evolution of the Helvetic nappes. In order to get a more complete image, samples from the Subalpine Molasse in the footwall and from the overlying Penninic Rhenodanubian Flysch were included. Apart from surface outcrops deep wells (Dornbirn 1, Hohenems, V-Au1, Kierwang 1 and Maderhalm 1) were sampled as well. Modeling was done using the PetroMod 2001.1 software by Schlumberger Ltd.

Vitrinite reflectance measurements from the Helvetic zone yielded three different trends: first of all a stratigraphic trend is given – the mean reflectivity (%Rr) decreases for about 0.4% from the Malmian Quinten Limestone to the Late Cretaceous sandstones of the Garschella Fm. Secondly, coalification rises with increasing depth (ca. 0.3%Rr per km). Finally, coalification in general increases from north to south, starting at the high volatile bituminous coal stage and reaching the low volatile bituminous coal- to semi-anthracite stage along the Penninic thrust contact. Measurements deep well samples show a coalification trend that is offset along numerous faults which are known from the drill record. Therefore, a pre- to syntectonic coalification of the Helvetic units has to be claimed.

Preliminary apatite fission track data show that all investigated units were subjected to post-depositional temperatures above the APAZ (i.e. >120°C) since all grains are fully reset. Partially reset zircon samples from few analyzed samples from Helvetic and Rhenodanubian Flysch units argue for maximum temperatures between 180 and 300°C.

By combining results from coalification and fission track analyses a maximum overburden of more than 8 km could be modeled for the Early to Late Oligocene.