The results of the analogue experiments show that upper crustal deformation initiated at the plate interface by the formation of a pop-up structure. Along the inclined plate boundary lithosphere-scale underthrusting and a significant amount of Moho displacement occurred. The downgoing plate experienced upper crustal thrusting and a foredeep basin developed. The thickness of the weak-zone interface plays a key role in the amount of continental subduction, and consequently on the onset of intraplate deformation, which occurs only after the weak interface is consumed or sufficiently thinned. However, continental collision and coinciding mantle lithosphere subduction beneath an orogenic wedge takes place only if the lower crust is weak enough to allow crust-mantle decoupling. During collision weak lower crust partly subducts, while the detached part thickens below the orogen affecting the upper crustal deformation pattern and topography.

From the bi-polar subduction models it can be observed that the first pop-up structure is laterally continuous pointing out its independence on the vergence and obliquity of subduction. Ongoing deformation causes the formation of a second pop-up structure on the downgoing plates resulting in lateral asymmetry and the development of a narrow transition zone. Cross sections of the model illustrate an asymmetry in the upper crustal wedge with a clear pro- and retro- side. On the contrary, a wide and symmetrical orogen overlying a vertical slab of mantle lithosphere is characterizing the zone of subduction polarity change, which is also the region of relative low topography. These lateral variations in crustal architecture are expected to be a direct response of lateral input variations of lower crust and mantle lithosphere. However, the width of the zone where interaction of crustal structures related to the different subduction domains occurs exceeds the initial with of the transition zone considerably. In additions, cross-sections reveal the underlying importance of lateral coupling between the mantle lithospheres of opposing dipping slabs resulting in subduction resistance forces on one hand, but in down bending of the neighbouring overriding plate on the other hand.

Our modelling results can be compared with the crustal and lithosphere-scale structure of the Alps, where the orogenic wedge in the Western Alps is asymmetric and a relatively large pro-wedge overlays the downgoing European plate. Eastwards, the upper crustal deformation is more symmetrically distributed above the colliding plates, and the orogen widens reaching maximum values along the TRANSALP profile. Hence, lateral variations of the crustal architecture (symmetry of mountain belts) may be indicative for changes in the subduction polarity of the lower lithosphere.

Pre-Alpine and Alpine Tectonic evolution of the western and northern parts of the Gurktal and Bundschuh nappe system

Wipfler, K., Fischer, S., Gruber, C., Kurz, W. & Fritz, H.

Institute of Earth Sciences, University of Graz, Heinrichstrasse 26, A-8010 Graz, Austria (walter.kurz@uni-graz.at)

The western and northern margin the Gurktal Nappe is classically defined as a structure of Alpine nappe emplacement with Permomesozoic sediments (nappe separators) decorating the thrust. The tectonic boundary stretches from Radenthein northwards and bends sharply to the east heading towards the Turrach sattle. Structural studies along that boundary display a complex tectonic history. (1) The contact between the Pfannock Gneiss and the Königstuhl Conglomerate is interpreted as late-Carboniferous cataclastic fault zone 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