biotite from 12 samples (granites, granitic gneiss, migmatic paragneiss) range from 300 to 230 Ma, arguing for a prolonged cooling history of the hidden Bohemian spur.

By comparing the hidden part of the Bohemian spur which is indicated by the exotic blocks with the adjacent Variscan basement shows obvious differences. The granites of the Moravian unit, which are closest, are clearly different, with I-type composition (FINGER et al., 1989) and Neoproterozoic magmatic ages (FRIEDL et al., 2004). The Moldanubian unit contains a wide range of I- and S-type granites (VELLMER & WEDEPOHL, 1994). They are characterized by magmatic ages of 340–310 Ma (FINGER et al., 2009) but their cooling ages (320–310 Ma, SCHARBERT et al., 1997) are different from the granites of the exotic blocks. Younger cooling ages (around 290 Ma) are known only in the southwestern part of the Moldanubian unit in Upper Austria. The granitic gneisses of the Subpenninic unit in the Eastern Alps are predominantly early Permian in age (VESELÁ et al., 2011) and show mainly I-type composition. At least in the surrounding Variscan basement is no magmatic suite with granites comparable to the investigated exotic blocks.

FINGER, F., FRASL, G., HÖCK, V. & STEYRER, H.P. (1989): The granitoids of the Moravian zone of northeast Austria – products of a Cadomian active continental margin? – Precambrian Research, 45: 235-245, Amsterdam.

FINGER, F., RENÉ, M., GERDES, A. & RIEGLER, G. (2009): The Saxo-Danubian Granite Belt: magmatic response to postcollisional delamination of mantle lithosphere below the southwestern sector of the Bohemian Massif (Variscan orogen). – Geologica Carpathica, 60: 205–212, Bratislava.

FRIEDL, G., FINGER, F., PAQUETTE, J.-L., QUADT, A. VON, MCNAUGHTON, N.J. & FLETCHER, I.R. (2004): Pre-Variscan geological events in the Austrian part of the Bohemian Massif deduced from U-Pb zircon ages. – Int. J. Earth Sci. (Geol. Rundsch.), 93: 802–823, Stuttgart.

GEBHARDT, H., KRENMAYR, H.G., CORIC, ST. & ROETZEL, R. (2008): Grobklastika in der allochthonen Vorlandmolasse am Ostende der Alpen. – Journal of Alpine Geology, 49: 137–154, Wien.

SCHARBERT, S., BREITER, K. & FRANK, W. (1997): The Cooling History of the Southern Bohemian Massif. - Journal of the Czech Geological Society, 42: 24, Prague.

TARI, G. (2008): Influence of the Bohemian Spur on the evolution of the Eastern Alps. – Journal of Alpine Geology, 49: 110–111, Wien.

VELLMER, C. & WEDEPOH l, K.H. (1994): Geochemical characterization and origin of granitoids from the South Bohemian Batholith in Lower Austria. Contr. Miner. Petrol., 118: 13–32, Berlin.

VESELÁ, P., SÖLLNER, F., FINGER, F. & GERDES, A. (2011): Magmato-sedimentary Carboniferous to Jurassic evolution of the western Tauern window, Eastern Alps (constraints from U-Pb zircon dating and geochemistry). – Int. J. Earth. Sci. (Geol. Rundsch.), 100: 993–1027, Stuttgart.

WESSELY, G. (1987): Mesozoic and Tertiary evolution of the Alpine-Carpathian foreland in eastern Austria. - Tectonophysics, 137: 45-59.

Analogue modelling of continental subduction with laterally changing subduction polarity

Willingshofer, E.[1], Sokoutis, D.[1], Luth, S.[2] & Cloetingh, S.[1]

[1] Faculty of Geosciences, University of Utrecht, Budapestlaan 4, 3584CD Utrecht, The Netherlands (e.willingshofer@uu.nl)
[2] Swedisch Geological Survey, Uppsala, Sweeden

Tomographic images from the Alps reveal southeasterly-directed subduction of the European mantle lithosphere in the central Alps and a north-easterly dipping subduction of the Adriatic mantle lithosphere underneath the Eastern Alps. We studied the deformation and surface expression of this lateral change in subduction polarity by using lithospheric-scale physical models. The main parameters investigated for uni-polar and bi-polar subduction systems of the continental lithosphere are: (a) the weakness of the plate interface, (b) the presence of weak lower crust (c) the width of the transition zone between the oppositely dipping slabs.

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