The geotectonic position of the St. Veit Klippenzone can be discussed based on our results and comparison samples from the Pieniny Klippen Belt (PKB). Neither the Gresten Klippenzone (Helvetic/Ultrahelvetic units of the European continental margin) nor the Ybbsitz Zone (Penninic units including Ophiolite remnants) provide similar successions. In contrast to former interpretations, a more reasonable correlation can be done with Austroalpine units, i.e. facies successions of the Lower Austroalpine Units (e.g. Mesozoic of Semmering and Radstädter Tauern), and the northernmost marginal units of the Northern Calcareous Alps, based on the occurrences of Keuper sandstones and Rhaetian limestones, and Jurassic strata. Thus, a "northern" Austroalpine derivation seems to be reasonable for the SVK. Comparing with the Western Carpathians we find strong similarities with the Drietoma unit, a unit which has affinities to Lower Austroalpine-Fatric elements such as the Krizna Nappe (i.e. Keuper strata), but was lateron affected by Klippen-style tectonism and incorporated into the PKB. Thus, the St. Veit Klippenzone can be seen as the westernmost extension of the Pieniny Klippen Belt (in a tectonic sense) in Austria and neither belongs to the Helvetic nor to the oecanic Penninic paleogeographic realms.

Composition of the Bohemian spur in the subsurface of the Eastern Alps: indications from exotic blocks

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The Bohemian Massif continues below the Eastern Alps as a basement promontory often referred as Bohemian spur (TARI, 2008). According to surface geology and wells in the Alpine foreland it consists of Variscan basement rocks of the Moldanubian and Moravian unit overlain on both sides by transgressive post-Variscan sediments (WESSELY, 1987). However, the continuation of the Bohemian spur below the Alps can be inferred from exotic blocks embedded in the Allochthone Molasse representing the northernmost and youngest tectonic units of the Alps. The exotic material allows an insight in the geology of a hidden segment of the former southern margin of Europe towards the Penninic Ocean.

The Allochthone Molasse consists of sediments deposited in the Alpine foreland basin, incorporated as tectonic slices into the orogenic wedge after 17.5 Ma. Its main part (Schuppenmolasse) is composed of Eggenburgian to early Ottnangian claystones, sandstones and conglomerates. North of the Danube an overlying slice (Waschbergzone) containing additional Paleogene sediments and tectonic slices of the Jurassic and Cretaceous cover of the underlying basement is present. Layers with exotic blocks of crystalline basement appear in early Ottnangian sediments. Such blocks from several outcrops in Lower Austria have been investigated by geochemical and geochronological methods to get information on their source area.

At Waschberg exotic material shows a polymict composition dominated by granites, often with amphibole and pinkish K-feldspar, and granitic gneisses. Further granite-porphyries, migmatic paragneisses and minor amphibolite and marble occur. The blocks are mostly well rounded, badly sorted and reach up to more than 1 m in size. Most probably this material represents debris flows generated from preexisting local gravel accumulations. At Heuberg blocks of monomict biotite-granite are exposed. They are not rounded or sorted and the largest ones are more than 10 m in length. This debris flows originated from a fault scarp (GEBHARDT et al., 2008).

Granite and granitic gneiss blocks and pebbles show an overall peraluminous composition. Additionally higher SiO_2-contents connected with increased Rb/Sr-ratios indicate considerable magmatic fractionation of largely S-type granites. Nevertheless granites with pinkish K-feldspar exhibit low $^{87}Sr/^{86}Sr$-initial ratios (0.705 – 0.707, 300 Ma) pointing to a significant I-type component in the magmatic source. Rb/Sr cooling ages of 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.

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Analogue modelling of continental subduction with laterally changing subduction polarity

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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.