Campanian samples from the paleogeographically more southern Glinzendorf and Grünbach basins have significantly lower almandine and higher pyrope and grossular contents. These garnets are partly derived from a metamorphic sole remnant of Neotethys ophiolites to the south and this hinterland supplied only southern Gosau basins until Campanian age in contrast to the ordinary granitic to metasedimentary hinterland which is present for both northern and southern basins. In addition, these structurally high ophiolitic nappes, later on completely eroded, supplied mainly the paleogeographically southern Grünbach and Glinzendorf Gosau basins with ultramafic detritus represented by chrome spinels of a mixed harzburgite/lherzolite composition and high Cr and Ni as well as high Cr/V ratios in relation to low Y/Ni in associated shales. No direct indications for a northern ophiolitic source, the Penninic or Alpine Tethys accretionary wedge to the north of the Gosau basins, could be found. In the younger part of the Gosau basins fill, from the Maastrichtian to the Eocene, only almandine-rich garnets could be observed suggesting a southern provenance from low-grade metamorphic metapelites of exhuming Austroalpine metamorphic complexes. Ophiolite detritus is reduced in the Maastrichtian and disappears in the Paleogene. Major and trace elements generally indicate a mixture of different hinterland compositions and tectonic settings as source of the Gosau basins.

The St. Veit Klippenzone in Vienna - missing piece in the Alpine-Carpathian klippen puzzle

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The St. Veit Klippenzone (SVK) comprises a succession of mainly Mesozoic rocks in western Vienna and the Wienerwald area. Outcrop situation is generally extremely bad in this area, and thus a modern analysis of these disputed klippen strata was completely missing. In recent years unique exposures of the SVK and adjacent flysch formations were available due to a large railroad tunnel (Lainz Tunnel). This contributes significantly to the correlation of the SVK to other klippen zones and it's geotectonic position (Helvetic vs. Penninic vs. Austroalpine).

Geochemistry, heavy mineral data, isotope geochemistry and microfacies studies were used to describe and interpret the strata. Biostratigraphic results include data by macrofossils (rare ammonites) radiolaria, calpionellids and nannofossils.

The SVK and its overlying flysch units build a major tectonic unit within the nappe pile of the Eastern Alps in the Wienerwald area west of Vienna. Coming from the Vienna valley (Auhof), going SE, the tunnel hit first rocks of the Kahlenberg Nappe, up to 2165.5 m, then followed by rocks of the SVK. The SVK was found in a 1097 m long section within the Lainz tunnel. It comprises largely a block in matrix structure, partly tectonically mixed with flysch units (Hütteldorf Formation, Kahlenberg Formation). Tectonic blocks of hard klippencore rocks show sizes from cm to several tens of meters. The matrix consists of strongly deformed fine-grained rocks such as Jurassic and Lower Cretaceous shales and marls. No primary sedimentary contact of the flysch formations onto the SVK could be detected which precludes the interpretation that the SVK constitutes a primary basement for the Rhenodanubian Flysch.

The composite Klippenzone succession recorded within the tunnel and reported from additional outcrops in the area of the Lainzer Tiergarten (Vienna) includes the following stratigraphy: (1) coarse quartz sandstones (Norian/Keuper), (2) fossiliferous grey limestones (Rhaetian), (3) sandy-silty grey marls and limestones with crinoids (Lower/Middle Jurassic), (4) red chert and red shale (Bajocian-Oxfordian), (5) grey marl to argillaceous limestone (Tithonian-Valanginian), (6) aptychus limestones (Neocomian), (7) white silicified limestone (Berriasian), (8) green chert (Valanginian).

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