The granulites of the Dunkelsteiner Waldes, Gföhl Unit, Bohemian massiv

KAIN, B. & THALHAMMER, O.

Montanuniversität Leoben,
Lehrstuhl für Mineralogie und Petrologie

The Dunkelsteiner Wald belongs to one of four granulite complexes of the Bohemian massive in Austria. The granulite complexes are the top of the Moldanubian Zone. Together with the Raabs Serie and the Gföhl Gneis the granulites forms the Gföhl Unit. Gföhl Gneis and the granulites are standing in a close contact to each other and there are indications that the Gföhl Gneis is a retrograde product of the granulites. The granulites attain higher granulite facies with 950- 1050 °C and 15-20 kbar.
The granulites of the Dunkelsteiner Wald are mainly investigated at the Quarry Wanko and its survey. They are grouped in two different types, one with pyroxene and one without. A special type is the biotitfree Weißstein, which achieves only minor thickness. The investigation deals mainly with the geochemistry of the granulites. They are comparable to other granulites from the Moldanubian Zone. Based on the A/NK and A/CNK ratio and the negative Eu- Anomaly the protolith of the granulites is an S-type Granite. Geotectonically the protolith was situated in a convergent margin.
At the margins of the granulite complexes there are serpentinized peridotites with a harzburgite to lhearzolithe character. LREE are anomaly enriched. The geochemistry of serpentinized bodies within the Dunkelsteiner Wald is equal to others in Moldanubian Zone of Austria, but is significantly different to similar peridotite bodies of the Czech Republic.

Microstructures and mineralogy of deformation bands in drill cores from the Matzen hydrocarbon reservoir, Austria

KAISER, J.[1], EXNER, U.[1], GIER, S.[1] & HUJER, W.[2]

[1] Department of Geodynamics and Sedimentology,
University of Vienna, Austria;
[2] OMV, LEP-FC, Vienna, Austria

In porous sedimentary rocks, fault zones are frequently accompanied by deformation bands. These structures are tabular zones of displacement, where grain rotation and in some cases grain fracturing result in a significant reduction porosity. However, as deformation bands usually only show displacements of some few millimeters to centimeters, and similar thickness, they are not captured by seismic measurements.
We analyzed drill core samples close to large normal faults from the most productive hydrocarbon reservoir in the Vienna Basin (Austria), the Matzen oil field. The terrigeneous sandstones contain predominately quartz, feldspar and dolomite as sub-rounded, detrital grains and are weakly cemented by dolomite and kaolinite. Deformation bands occur as single bands of ca. 1-3 mm thickness and negligible displacement, as well as strands of several bands with up to 2 cm thickness and displacement of 1-2 cm. A dramatic porosity reduction can already be recognized macroscopically. In some samples, the corresponding reduction in permeability is highlighted by different degree of oil staining on either side of the bands.
The mineralogical composition of the deformation bands differs from the host rock exclusively by a dramatic increase in dolomite cement, which reduces the porosity within the bands to a minimum. Additionally, cataclastic grain size reduction is observed within the bands.
Identification of the mechanical and diagenetic processes of porosity and permeability reduction, in combination with the analysis of the spatial distribution and orientation of the deformation bands may provide valuable information on the reservoir properties and fluid migration paths.

High-resolution studies comparing magnetic susceptibility and paleoenvironmental change with focus on small scale cyclicity in Lake Pannon

KERN, A.[1], HARZHAUSER, M.[1],
SOLIMAN, A.[2] & PILLER, W.E.[2]

[1] Natural History Museum Vienna, Geological-Paleontological Department, Burgring 7, 1014 Vienna, Austria;
andrea.kern@nhm-wien.ac;
mathias.harzhauser@nhm-wien.ac.at;
[2] Institute for Earth Sciences (Geology and Paleontology), University of Graz, Heinrichstraße 26, 8010 Graz, Austria;
ali.soliman@uni-graz.at; werner.piller@uni-graz.at

The evolution of Lake Pannon and its associated environments have been studied for a long time. Drillings and geophysical data within the whole Pannonian Basin complex document a quickly reacting system. More precisely, the observed variations in sedimentology and facies revealed a clear linkage to the influence of orbital forcing and therefore to climatic change.
The main focus of our project now is to identify such shifts on a much smaller scale (decadal to centennial) within a relatively well-constrained age model. Based on this key concept we preformed high-resolution studies on sediment cores from Hennersdorf (south of Vienna, 10.4 Ma) with a sampling distance of 1 cm, considering pollen, dinoflagellates, the total number of ostracods and molluscs. In addition, gamma ray and magnetic susceptibility measurements were taken corresponding to the other samples.
The magnetic susceptibility (MS) record shows a fairly regular pattern between high and low MS values, but with a significant power at 33 cm, 40 cm and a third peak at 123 cm passing the 95 % interval in the spectral analysis. Within the current age model, this points to a cyclicity of c. 500, 625, and 2000 years. Gamma ray measurements, however, lack such rhythm. The decoupling of the MS signal from the gamma ray signal, which is also depending on detrital input, suggests a quite complex system.
The mechanism causing the different signals can only be

deciphered by an integration of information through analysing patterns in the dinoflagellates (lake surface) and ostracods (lake bottom) with pollen data (shore and hinterland). Different processes within the lake will be compared to vegetational dynamics to reveal potential linkages and feedback mechanisms between both.

FWF-Projekt P 21414-B16: Millennial- to centennial-scale vegetation dynamics and surface water productivity during the Late Miocene in and around Lake Pannon.

Interdisciplinary archaeometric research on early-medieval pottery from Nikitsch (Burgenland)

KERN, A.[1,2], TSCHEGG, C.[1], GIER, S.[2] & NTAFLOS, T.[1]

[1] Department for Lithospheric Research, University of Vienna, Austria;
[2] Department for Geodynamics and Sedimentology, University of Vienna, Austria

Interdisciplinary archaeometrical research has become more and more important over the last years. Motivated by a thorough study of the Lombards in Burgenland, Lombard sherds from Nikitsch (Burgenland) were analyzed in order to reveal raw material origin and manufacturing technology. As the Amber Road, a trading route passing through the Burgenland on its way from the north to the south, already started to form in late Neolithic and persisted for about 7000 years, it neither can automatically be assumed that local material was used for pottery production nor that the pottery itself was of local origin. Exactly these questions, origin and applied technologies during the manufacturing of goods, are at the very core of archeology, but can unfortunately rarely be answered with the methods of classical archeology. Archaeometry though provides advanced tools to tackle questions concerning the used raw-materials and thus can give ideas about provenance and technology. To provide a basis of reference, sherd samples from a time period of roughly 6500 years were analyzed, dating from the early Neolithic to the Migration period. Six sherds were analyzed, five of them were found in Nikitsch. Of those five samples, two are dated to be Lombard and three are Prehistoric ranging from Neolithic (Linear band pottery) over Copper Age (Badener Culture) to the Iron Ages (Kalenderberg Culture). As reference specimen for typical Lombard techniques, a distinct Lombard sherd from Steinbrunn (Burgenland) was analyzed.

The applied methods were petrography, x-ray diffraction and electron-probe microanalysis.

The main mineralogy assemblage of all analyzed samples is virtually identical, with quartz, K-feldspar, plagioclase and muscovite as the main minerals. The minor mineral fraction comprises epidote, biotite and chlorite. This observation and the fact that the sherds span several thousands of years suggests the material is of local origin, although this specific makeup is common enough to prevent a definite pinpointing of a single sand pit. This result fits well into the archaeological classification of the sherds. The Kalenderberg sherd for example is a regional group of the Hallstatt-Culture and is not as widespread as e.g., Roman pottery.

Evaluating the technology of the studied findings it can unsurprisingly be seen that the quality of the used materials, the methods of raw-material preparation respectively tended to increase over time, with the exception of one sherd likely produced by the Lombards, which features quartz of uncharacteristically large size. The Neolithic sherd was analyzed showing well aligned micas, which indicates that it has been created on a potter's wheel.

Intentional tempering reflects a technology that also gradually changed over time: The Neolithic pottery does not contain temper material like grog, which is commonly used to improve the physical properties of sherds during drying and firing. The analyzed pottery from Badener Culture and Kalenderberg Culture contained large quantities of rock fragments and grog, indicating a well-controlled usage of different temper materials. Compared to these sherds, or roman pottery for that matter, the Lombard's tended to be finer in grainsize but without any temper material. Especially one Lombard sherd features a grainsize small enough to imply that the raw material has been sieved or levigated.

Assessed from oxidized mineral phases and sherd color, all sherds but one have been fired in an oxidizing atmosphere, which is usually easier to maintain than reducing firing; firing temperatures for all sherds were estimated to be below 600 °C. This observation is based on textural and mineral-chemical evidence.

Even though it was not possible to discover typical Lombard manufacturing techniques or to prove beyond doubt that the raw material provenance is in the vicinity of Nikitsch, this work presents a good basis for further archaeometrical research in Burgenland. Comprehensive analyses of sand pits in this region are not yet available, making the pinpointing of specific sources for the used materials impossible. Further research and analytical work is required here to build a database of local materials with which pottery findings can be compared.

Unterschiede in Modellergebnissen von Grundwasserneubildung und Nitrataustrag bei unterschiedlicher Verwendung gleicher Landnutzungs-Inputdaten

KLAMMLER, G., DRAXLER, J.C. & FANK, J.

JOANNEUM RESEARCH, Institut für Wasser, Energie und Nachhaltigkeit, Elisabethstraße 16/II, A-8010 Graz

Qualität und Quantität von Grundwasser (GW) wird von verschiedenen Faktoren beeinflusst. Vor allem die Anwendung von stickstoffhältigen Düngemitteln in landwirtschaftlich genutzten Regionen führt oft zu einer Gefährdung des GWs durch Nitrat. Diese Gebiete, wie z. B. das Grazer Feld, das Leibnitzer Feld oder das Untere Murtal, beinhalten auch sehr große Trinkwasserreserven, welche sowohl zur regionalen, als auch zur überregionalen Wasserversorgung verwendet werden. Daher ist die langfristi-