Petrophysical Investigations along the TRANSALP SEISMIC TRAVERSE (TST)

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The main aim of this study was to support the reinterpretation of the aeromagnetic data from an earlier investigation. The area chosen was slightly east of the seismic traverse, since this area is dominated by a number of remarkable magnetic anomalies. 180 localities with 4208 insitu measurements of the magnetic susceptibility were distributed along different valleys cutting through the same lithologic or tectonic unit. Therefore the significance of the petrophysical data for a certain lithology can be seen also in the lateral strike direction. From N to S the southern most edge of the Calcareous Alps, the Greywacke Zone, the Innsbrucker Quarzphyllites, the Hochstegen zone, Tauernschieferhülle as well as the Zentral Kristallin were investigated. From these main units 167 hand samples were taken in order to measure other petrophysical parameters like saturation density, seismic velocity, remanent magnetization and thermal conductivity, as well. In this case, cores with a diameter of 25 mm or cubes and disks were drilled or cutted to fit them into the laboratory instruments. All samples were saturated before measurement.

Discussing the parameter of major interest for the magnetic modelling the magnetic susceptibility a unimodal distribution can be seen in most of the rocks. Exceptions are noticed in the volcanites from the Kropfrader Joch, depending on a higher variability in the magnetite and titanomagnetite content, the green schists depending on the variability of ironsulfides, the carbonates depending on the Mg/Ca relation. The scatter in the Permoskythian can be reduced by eliminating the quartzites, which are pure diamagnetic. The rocks from the Tauern Schieferhülle are very homogeneous on both sides of theTauern Window.

When comparing magnetic susceptibility and saturation density, the linear correlation is obvious. Because of the large scatter, the results are shown in semilogarithmic plots. The most significant correlation can be seen in the high susceptible rocks, where the increasing content of chlorite, amphibolite and magnetite causes the increase of susceptibility and density. Further clear correlations can be seen for the different types of schists, Wildschoenauer schist (WSS), granites and gneisses and the Permoskythian rocks. Comparing density with seismic velocity, the correlation is not at all straightforeward. Different degrees of tectonic and chemical overprint have changed the original relation. There is a general increase of the velocity with density, but no significant distinction between the individual rock types. The two most significant differences are between the granite-gneisses and the Innsbrucker quarzphyllite (IQP). Whereas the granite-gneisses show a very homogeneous density with a scatter in the velocity, the latter show a higher homogenity in the velocity by a wide scatter of the density. The varying content of chlorite as well as iron sulphides may be the main reason. A clear linear relation can be seen between the seismic velocity and the thermal conductivity. Since both parameters are stronly influenced by changes in density and porosity, it had to be expected. An exception exists in the IQP and WSS where the thermal conductivity decreases with increasing velocity.

Summarizing, there is no petrophysical significance to differentiate between the main units investigated. The highest significance exists for the magnetic susceptibility, the main aim of this study. The good quality of the data, including the remanent magnetization, allowed a very convincing modelling of the magnetic anomalies as well as there geological sources.

Tiefgarage Kastner & Öhler: Anspruchsvoller innerstädtischer Tiefbau unter schwierigen geologischen Verhältnissen

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Die Firma Kastner + Öhler Warenhaus AG errichtet zur Zeit in der historischen Grazer Innenstadt eine viergeschossige Tiefgarage mit 400 Stellplätzen. Die Geschossfläche beträgt 3500 m², die Bauwerksohle liegt in ca. 17 m Tiefe.

Für die Baugrunderkundung wurden sechs Rotationskernbohrungen abgeteuft. Basierend auf den Aufschlussergebnissen wurde ein geologisch-hydrogeologisches Untergrundmodell erstellt. Das geologische Modell umfasst die lithologische Beschreibung des Baugrundes, den

Verlauf der quartären und tertiären Schichtgrenzen und den Verlauf der Felslinie des paläozoischen Grundgebirges westlich des Schlossberges, im Bereich des denkmalgeschützten Admonterhofs und des sogenannten Stöckls. Weiterhin wurde ein hydrogeologisches Modell erstellt, das den Einfluss des Bauwerks auf das Grundwasserregime prognostiziert.

Etwa ein Viertel der Grundfläche ist bebaut. Für die Errichtung ist eine vollständige Unterfangung des historischen Admonterhofs und des Stöckls notwendig. 22 Großbohrpfähle (Längen bis zu 25 m, Pfahllasten bis über 4 MN) nehmen die Bauwerkslasten des Admonterhofs (50 MN) und des Stöckl (etwa 20 MN) über Streichträger auf. Aufwendige Hebungsmaßnahmen kompensieren dabei die Pfahlsetzungen, Trägerdurchbiegungen und elastische Verformungen.

Die Baugrubenumschließung erfolgt durch eine überschnittene Bohrpfahlwand und durch Düsenstrahlwände, die z.T. auch als Unterfangungskörper der Nachbargebäude dienen. In den Bereichen, in denen das paläozoische Grundgebirge in die Bauwerkskontur hineinreicht, werden die Düsenstrahlwände auf den Fels aufgestellt und verdübelt. Nach derzeitigem Prognosestand sind ca. 3000 m³ Dolomit auszubrechen.

Zur Hintanhaltung von Wasserzutritten durch Kluftwasser und zur Sicherstellung der Auftriebssicherheit werden umfangreiche Dichtinjektionen im Fels und im Bedarfsfalle auch im tertiären Untergrund notwendig.

Zusammen mit dem enggesteckten Terminrahmen (Fertigstellung Juni 2003) und den Koordinierungsnotwendigkeiten mit dem Lieferverkehr für das Warenhaus und dem Straßenverkehr auf dem angrenzenden Kaiser-Franz-Josefs-Kai stellt das Projekt eine der anspruchsvollsten Planungsaufgaben im innerstädtischen Tiefbau der letzten Jahre dar.

Water-vapour adsorption: evaluating heavy metal adsorption on sediments and soils

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Objectives: Soils and Sediments are an important sink and source for heavy metals, due to their adsorption capacity. Therefore they are of particular interest in environmental, especially groundwater research. Lithogenic input from different geologic background can cause differences in actual metal concentrations due to changing binding capacities, which are influenced by the ligand concentration. Therefore they depend on the geochemical composition, formation of oxo-hydroxides and elements derived from the geologic background occupying potential binding sites.

Metals are bound and remobilised mainly as a result of changing chemical conditions (pH-, redox-potential, electric conductivity) and available ligands. The main ligands we analysed for are: organic matter (humic acids), clay minerals, diagenetically formed Fe-, Mn-, Al-oxohydroxides and biogenic silica (diatoms). Some of the metal scavengers are able to adsorb water-vapour by the same binding mechanisms, caused by the polarity of water molecules. Previous investigations (KRALIK, 1999) showed positive correlations of water and heavy metal uptake in sediments. The aim of this study was to qualify the importance of mineral composition and include the factor soil to the overall picture. Possible pathways and distribution of pollutants in groundwater can be evaluated by the ability of soils and sediments to hold back or release contaminants in the recharge area.

Methods: The dried fine fraction (<0,04 mm for sediments; <2 mm for soils) was stored at 70% relative humidity for three days and then dried again to obtain the specific water content of each sample. Lead and cadmium have been used as key metals with soil and sediment samples.

The batch experiments were carried out with river water from the sampling site (sediments) and distilled water (soils). The contact time never exceeded two hours. During the contact time pH, electric conductivity, redox potential and temperature were recorded.

Results: The main factor controlling the water adsorption in the *sediment samples* was the content of organic carbon binding metal ions by surface complexation on particulate organic matter. The content of clay minerals showed no significant influence on the water adsorption but indicated positive correlations with the uptake of Cadmium.

Generally the samples from crystalline background had a higher amount of metal scavengers and a higher adsorption capacity of cadmium and water compared to the carbonate dominated samples. The adsorption of lead was higher in the carbonate-dominated areas, where water adsorption was significantly lower. This might be due to precipitation of lead carbonates, a mechanism not influencing the water adsorption. Hence the parameters cannot be compared concerning lead adsorption in carbonate areas where the dissolved carbonate concentration is at saturation. The applicability in crystalline dominated background is not fully confirmed here but may be possible.