A 3D MODEL OF THE AQUIFER OF MILAN (NORTHERN ITALY)

Dr. Forcella[1]

Full Prof. Dr. Francani[1]

Ass. Prof. Dr Gattinoni[1]

Full Prof. Dr. Scesi[1]

[1] DICA - Politecnico di Milano, **Italy**

ABSTRACT

The goal of this study is to obtain a consistent hydrogeologic 3D model for the aquifer of the city of Milan (northern Italy) and a nearby area of about 580 km^2 automatically. The input dataset is discrete and provided into 4 layers. Each observation is characterized by three coordinates and the type of layer it belongs. It is necessary to divide the process into several steps to obtain the 3D model automatically. First of all, the input dataset is checked to detect and remove outlier. Secondly, the point cloud is divided into clusters. Thirdly, each cluster is interpolated using a triangulation method. Fourthly, closed paths between points that belong to a specific cluster are built. Fifthly, points that belong to consecutive clusters are relationally matched to generate the vertical boundary. Sixthly, new information is obtained using the parametric equation of a straight line passing through two points. Lastly, the average method and the information from the previous steps are used to obtain new data at an unobserved location. The application of this methodology to the case study allowed a deterministic reconstruction of the hydrogeologic 3D model consistent with in situ measurements.

Keywords: aquifer, hydrogeologic 3D model, Delaunay triangulation, parametric equation of a straight line

A COMPARATIVE STUDY OF THE FAILURE MODE OF CONVENTIONAL ROAD STRUCTURES AND OF ROAD STRUCTURES REINFORCED WITH POLYPROPYLENE RECTANGULAR MESH GEOGRIDS

Lecturer Dorin-Vasile Moldovan[1]

Phd. Candidate Andor-Csongor Nagy[1]

Assist. Lavinia-Elena Muntean[2]

Lecturer Vasile-Stelian Farcas[1]

Assist. Radu-Vasile Cot[1]

[1] Technical University of Cluj-Napoca, **Romania**
[2] University of Agricultural Science and Veterinary Medicine, **Romania**

ABSTRACT

As a member of the European Union, Romania benefits from the allocation of non-reimbursable structural funds to rehabilitate and modernize the present county roads network. Among the most important criteria to be considered in the design stage there are included the strength and resistance in time of the design solutions. It one takes into account the exponential increase of the number of vehicles and of the axle load, then it is necessary to fulfill the requirement to build modern, high performance and ecological structures first studied in laboratory at a natural scale (1:1). This article presents comparatively the behavior of two road structures built in the laboratory and highlights the grids contribution to bearing capacity and the manner in which the structure fails as well as the causes that lead to the collapse of the structure. The results were compared to data supplied by the model analysis with the finite elements method (FEM).

Keywords: geogrids, propylene, collapse, road structures, FEM

ABSTRACT SPACES AS ALTERNATIVE METHOD OF DATA PROCESSING ACQUIRED FROM UNDERGROUND ENGINEERING

Ing. Katarína Feriančiková, PhD. [1]

Prof. Ing. Igor Leššo, CSc. [2]

Ing. Edita Lazarová, PhD. [1]

Prof. Ing. Víťazoslav Krúpa, DrSc. [1]

Ing. Lucia Ivaničová, PhD. [1]

[1] Institute of Geotechnics, Slovak Academy of Sciences, **Slovakia**
[2] Institute of Control and Informatization of Production Processes, Faculty BERG, Technical university of Košice, **Slovakia**

ABSTRACT

Hilbert spaces represent an individual chapter of modern mathematics, specifically within the functional analysis. In such space the process signal is considered as a function, i.e. a vector of abstract signal space. This fact allows to classify the process states based on geometric relations, without need for extracting the attributes. The method was applied in such process conditions, where it was impossible to use conventional mathematical methods in data processing due to process non-linearity, non-stationarity and stochastic behaviour, as well as due to inhomogeneities in the environment. Mechanized excavation of underground structures served as an example of such hard-to-identify process. The paper presents the application of abstract spaces for processing of data acquired from the tunnel excavation monitoring.

Keywords: functional analysis, geometric relations, abstract spaces

ADVANCED BACK ANALYSIS OF RETAINING STRUCTURES BASED ON HIGH PRECISION GEOMONITORING

Miroslav Kozel,

Ph.D. Jan Zalesky

Czech Technical University in Prague, **Czech Republic**

ABSTRACT

Geotechnical monitoring is implemented in cases of important structures proposed in the geologically complex environment, which is difficult to describe or predict the behavior. Readings are usually displacements or deformations and or anchor forces, if the structure is anchored. These data are then compared with the project.

The measured deformations do not give an idea of the stresses in the structure. For a successful assessment of the structural design is appropriate to estimate the internal forces in the structure or estimate of the total load. Analysis of internal forces and the total load on the structure, however, is usually not carried out due to the difficulties associated with limited, although high precision measurement methods used. Errors contained in measured values cause due to large bending stiffness of retaining structure significant variations of values of directly calculated loads.

The subject of this paper is a proposal of the method of calculation of an estimate of the total load on the structure based on measured deformations with highly accurate methods of geotechnical monitoring. This method is suitable for reverse engineering structures where substantial additional measurements in the vicinity of the structure is not performed or their explanatory power is low due to the considerable heterogeneity of the environment or unforeseen effects of water pressure. Making the FEM model in this case is hard to complete or not possible and definitely not efficient.

The principal points that needed to be overcome in the design of methods are:

- Typification of appropriate structures for the analysis and its generalizations,
- Appropriate interpretation of measured structural deformation,
- Proposal of governing equations and effective actions to eliminate the influence of measurement errors on the resulting internal forces and structural loads.

Keywords: monitoring, back analysis, retaining wall, internal forces, loads

ANALYSIS OF EARTH PRESSURE AT RETAINING WALLS REINFORCED WITH GEOSYNTHETICS

Ing. Jozef Vlcek[1], **Ing. Dominik Niemiec**[2], **Ing. Petra Zástěrová**[2],
Ing. Barbara Matuszková[3], **Ing. Silvie Heviánková, Ph.D**[3],
Prof. Ing. Miroslav Kyncl, Ph.D. [3], **Assoc. Prof. Ing. Marian Marschalko, Ph.D**[2],
Prof. Dr. Isik Yilmaz[4], **Ing. Miroslava Bendová, Ph.D.** [5],
Prof. Ing. Vojtech Dirner, Ph.D. [3], **Ing. Alena Sochorková** [3],
Prof. RNDr. Peter Andráš, Ph.D.[3], **Ing. Orlando Montero Arencibia, Ph.D.**[6],
Assoc. Prof., RNDr. Martin Bednárik, PhD. [7]

[1] University of Zilina, Faculty of Civil Engineering, Department of Geotechnics, **Slovak Republic**
[2] VŠB-Technical University of Ostrava, Faculty of Mining and Geology, Institute of Geological Engineering, **Czech Republic**
[3] VŠB-Technical University of Ostrava, Faculty of Mining and Geology, Institute of Environmental Engineering, **Czech Republic**
[4] Cumhuriyet University, Faculty of Engineering, Department of Geological Engineering, **Turkey**
[5] VŠB-Technical University of Ostrava, Faculty of Mining and Geology, **Czech Republic**
[6] VŠB-Technical University of Ostrava, Faculty of Economics, Department of Mathematical Methods in Economy, **Czech Republic**
[7] Comenius University, Faculty of Natural Sciences, Department of Hydrogeology, **Slovak Republic**

ABSTRACT

Recent design methods of reinforced retaining walls are based on several approaches at the earth pressure determination. Newer methods are developed to bring the design model closer to real conditions. The monitoring of the structures reinforced with the geosynthetics but shows some anomalies at wall displacements and reinforcement loads. A series of real structure monitoring and numerical modelling was involved to verify the recent design methods. This paper represents the results of these analyses aimed at the earth pressure due to the backfill of the wall and at the stress distributions along the reinforcements.

Keywords: earth pressure, geosynthetics, retaining wall, stress distribution

ANALYSIS OF GEOTECHNICAL STRUCTURES USING MESHLESS LOCAL PETROV-GALERKIN RADIAL POINT INTERPOLATION METHOD

Dr. Juraj Mužík

University of Zilina, Faculty of Civil Engineering, **Slovak Republic**

ABSTRACT

The paper deals with use of the meshless method for soil stress-deformation analysis. There are many formulations of the meshless methods. The article presents the Meshless Local Petrov-Galerkin method (MLPG) – local weak formulation of the equilibrium equations. The main difference between meshless methods and the conventional finite element method (FEM) is that meshless shape functions are constructed using randomly scattered set of points without any relation between points. The shape function construction is the crucial part of the meshless numerical analysis in the construction of shape functions. The article presents the radial point interpolation method (RPIM) for the shape functions construction.

Keywords: meshless analysis,meshless Petrov-Galerkin method, soil settlement

ANALYSIS OF MEASURED DATA AND SIGNAL PROCESSING FOR THE CONTROL OF MECHANIZED ROCK CUTTING PROCESSES

Ing. Katarína Feriančiková, PhD. [1]

Prof. Ing. Igor Leššo, CSc. [2]

Ing. Milan Labaš, PhD. [1]

Ing. Edita Lazarová, PhD. [1]

Ing. Lucia Ivaničová, PhD. [1]

[1] Institute of Geotechnics, Slovak Academy of Sciences, Watsonova 45, 040 01, Košice, **Slovakia**

[2] Institute of Control and Informatization of Production Processes, Fakulty BERG, Technical university of Košice, Letná 9, 040 01, Košice, **Slovakia**

ABSTRACT

The process of rotary drilling of rocks induces the accompanying noise and vibrations. Such signals contain the information on the process characteristics and may be used for effective process control. The advanced signal processing involves the application of methods using the abstract mathematical space as the signal space. In application of abstract spaces, the signals are considered as functions of time or frequency. Data acquired from rotary drilling of different rock types in laboratory conditions were processed using such methods. Signal space provides a possibility to classify the rocks or the process conditions based on geometric relations with no need to extract the features and visualize them.

Keywords: rock drilling, information signals, abstract spaces, geometric relations between signals

ANALYSIS OF PILED EMBANKMENT ON SOFT SOIL

Assoc. Prof. Dr. Marian DRUSA[1]

Dr. Jozef VLČEK[1]

Ing. Ladislav KAIS[1]

[1] University of Žilina, Faculty of Civil Engineering, Department of Geotechnics, **Slovakia**

ABSTRACT

There are various types of solutions for the design of embankment foundation on soft subsoil. Good results are obtained using combined soil structures reinforced by geosynthetics. Advantages of these structures lie in simplicity of construction, cost-effectiveness, the ability of better resistance against non-homogeneous foundation conditions. Additionally, resistance to extreme situations (seismic load, floods, etc.), as well as resistance to dynamic load effects from transport and uneven settlements is vastly improved. Currently, there are many design recommendations by several authors, but only a few standard procedures. New recommended methods can still be introduced for design of piled embankment demonstrated on real construction part of modernized high-speed railway line.

Keywords: soft subsoil, piled embankment, load transfer platform, high strength geogrids.

ANALYSIS OF THE FOUNDATION SOLUTIONS FOR AN ASSEMBLY OF TALL BUILDINGS

Lecturer Dr. Eng. Alexandra Ciopec[1]

Assist. Dr. Eng. Luiza Roman[1]

Lecturer Dr. Eng. Ciprian Costescu[1]

[1] Politehnica University Timisoara, Civil Engineering Faculty, Department of Land Communication Ways, Foundations and Cadastre, **Romania**.

ABSTRACT

Realization of some tall buildings that transmit loads to the foundation ground through a foundation mat has as consequence the formation of some deep active zones below the base of the buildings. These active zones lead to the appearance of significant settlements of the foundation ground, respectively of the buildings. In the case when in their neighbourhood will be realized new similar buildings, the overlap of the active zones will produce differentiate settlements not only to the existent building, but also to the new building. This differential settlement will produce a rotation of the foundation mat, respectively a lateral displacement of the buildings, which for a 10 storey building can reach 5-10 cm at the top. To eliminate or to reduce this risk, in the paper will be analyzed the foundation solution using a pile foundation system for the new building. In this way the active zone of the new building will be placed at a greater depth, respectively downwards from the piles tip. So, it will be avoided the overlap of the active zones of both buildings.

Keywords: tall building, foundation mat, bearing capacity, settlement, pile foundation

ANALYSIS OF TRANSFER COEFFICIENTS BASED ON SEISMIC MEASUREMENTS IN THREE TUNNELS

Ing. Martin Stolárik Ph.D.[1]

Ing. Miroslav Pinka[1]

[1] Technical University of Ostrava – faculty of Civil engineering, **Czech Republic**

ABSTRACT

The paper presents the analysis of the transfer coefficients K obtained by experimental seismic measurements on three mined tunnels. The tunnels are part of the IVth railway corridor in the Czech republic, that is a part of the Trains-European Railway E55. All three tunnels were made using the New Austrian Tunnelling Method and blasting operation was used. Seismic measurements of the response of blasting were carried out within a shallow depth under the surface during the works conducted in the underground (future excavation of the tunnel, partial excavation of the floor) and outside of the tunnel. All measurements were realized in the near zone, i.e. at a small distance from the source of vibration (first meters to number of ten meters). The records were evaluated in the amplitude and frequency domain. Langefor's relationship was chosen as the basis for the interpretation of the measurements data and also Czech national standard 73 0040 - Loads of technical structures by technical seismicity and their response. Transfer coefficients K, based on this standard, were drawed in the graphs depending on the distance from the source of dynamic load. These coefficients (drawed in curve) were compared with the calculated real transfer coefficients for all three tunnels.

Keywords: tunnel, blasting operation, seismic measurement, Langefor's relationship.

ANTI-EROSION PROTECTION - SOLUTIONS WITH GEOSYNTHETIC MATERIALS

Assis.Dr. Luiza Roman

Phd. stud. Alin Buzuriu

Assoc. Prof. Dr. Ciprian Costescu

Politehnica University Timisoara, **Romania**

ABSTRACT

The work of construction has escalated in recent years in the area of road construction, landfills, embankments, where the requirements for safety, economic and environmental considerations have increased significantly. How in such circumstances a high percentage is represented by slopes, their efficiency and performance depends also on the surface erosion protection. In order to solve such issues, geosynthetic materials represent a good solution, easy to put in execution and extremely effective. The types of geosynthetic materials cover a large range of systems, each with its own unique characteristics. There are used for this purpose both synthetic materials as well as those of organic origin.

Keywords: geomats, geocell, geosynthetic materials

APPLICATION OF THE MESHLESS LOCAL PETROV-GALERKIN METHOD FOR SUBSOIL BEARING CAPACITY ANALYSIS

Dr. Juraj Mužík

University of Zilina, Faculty of Civil Engineering, **Slovak Republic**

ABSTRACT

The paper deals with use of the meshless method for subsoil bearing capacity analysis. There are many formulations of the meshless methods. The article presents the Meshless Local Petrov-Galerkin method (MLPG) – local weak formulation of the equilibrium equations. The main difference between meshless methods and the conventional finite element method (FEM) is that meshless shape functions are constructed using randomly scattered set of points without any relation between points. The shape function construction is the crucial part of the meshless numerical analysis in the construction of shape functions. The article presents the solution of the Prandtl ultimate load of the fully saturated soil strip.

Keywords: meshless analysis,meshless Petrov-Galerkin method, bearing capacity

APPLICATION OF LATIN HYPERCUBE SAMPLING METHOD IN TUNNEL ANALYSES

Doc. Dr. Ing. Jan Pruška[1]

Ing. Jan Vrbata[2]

[1] CTU in Prague, Faculty of Civil Engineering, **Czech Republic**
[2] Metrostav a.s. and CTU in Prague, Faculty of Civil Engineering, **Czech Republic**

ABSTRACT

The paper is focused on the Latin Hypercube Sampling method (LHS) that can be successfully utilised for description of the variability of the soil and rock mass in the geotechnical design. LHS is a good alternative to the time-demanding Monte Carlo simulation method. Their spreading in the geotechnical design is due to it's understandable and easily implementation to the commonly used software. The paper gives a brief description of the LHS method algorithm. The main part of the paper is then focused on the performed application of LHS in the two analysis of underground structures constructed in the Czech Republic.

Keywords: Input parameters, LHS, FEM, Sampling method

ASPECTS REGARDING SOIL INVESTIGATION AND FOUNDATION DESIGN FOR SMALL HYDROPOWER PLANTS

Lecteur Dr. Vasile Farcas[1]

Lecteur Dr. Nicoleta Ilies[1]

Teach. Assist .dr. eng. Calin Gherman[1]
Teach. Assist .dr. eng. Olimpiu Mureşan[1]

Ing.geol. Paul Grovu[2]

[1] Technical University of Cluj-Napoca, **Romania**

[2] Geodesign, **Romania**

ABSTRACT

Nowadays, small hydropower plants represent a source of green energy. From construction point of view, to reach all the advantages given by this solution a lot of problems must be solved. The paper presents the geotechnical particularities in the process of designing a small hydropower plant in ordinary soil conditions. Moreover, the paper describes special aspects regarding small hydropower plant's foundations and the geotechnical investigations on slopes and difficult soil conditions along the pipe path.

Keywords: small hydropower plant, foundation design, slope stability.

ASSESSEMENT OF GEOLOGICAL AND GEOTECHNICAL FACTORS THAT AFFECTS ROMANIAN BLACK SEA SHORE

Assoc. Prof. Dr. Mihaela Stãnciucu

Faculty of Geology and Geophysics /University of Bucharest, **Romania**

ABSTRACT

The Romanian border of the Black Sea is subjected since 1970 to an irreversible erosion process that affects mainly the southern part of it, from Constanta to Vama Veche. In spite of all efforts and measures, erosion rates of the beaches varies in the range of 20 m/year on the northern coast, to 5 m/year on the southern coast [8] while progressive landslides affects one by one all high cliff areas between them. One of the latest studies along the Black Sea border includes geotechnical boreholes with standard penetration tests and laboratory analyses on soils, light penetration tests, interpreted and correlated with geophysical investigations - longitudinal and transversal refraction seismic profiles, on 25 sites. This paper presents the synthesis of results of onshore and offshore geological and geotechnical investigations made by the author in order to provide correlations between geologic structure, geotechnical and geophysical properties of soils subjected to marine erosion. Variations of main geotechnical parameters derived from above mentioned investigations (grain size distributions, relative density, effective friction angle, stiffness moduli, dynamic moduli, etc.) are presented for the main geologic units. The most interesting results was provided by offshore seismic investigations which depicted in the southern part, the presence of a fault network inside the major structural units, on which vertical tectonic movements can be a major cause of long term coastal erosion and large scale landslides developed wherever the shore raise substantially above the sea level.

Keywords: erosion rate, stiffness moduli, seismic profiles.

ASSESSMENT OF CLIFF STABILITY AFTER THE DEMOLITION OF THE ENGINEERING FACILITIES

Artur Janowski[1]
Agnieszka Jurkowska[2]
Dawid Lewczuk[3]
Jakub Szulwic[2]
Aleksandra Zaradny[3]

[1] University of Warmia and Mazury, Faculty of Geodesy and Land Management, Institute of Geodesy, Olsztyn, **Poland**
[2] Gdansk University of Technology, Faculty of Civil and Environmental Engineering, Department of Geodesy, Gdansk, **Poland**
[3] Gdansk University of Technology, Faculty of Civil and Environmental Engineering, Department of Geodesy, Geodetic Circle Hevelius, Gdansk, **Poland**

ABSTRACT

As a part of an experiment, cliff in Gdynia Redlowo (southern coast of Baltic Sea, Gdansk Bay) was measured using terrestrial laser scanner. The main reason for taking up the subject of the Orlowo Cliff's stability was a decision about controlled removal one of the war fortification elements. The main purpose of that analysis was to specify suitability of laser scanning in determination of slope's stability after a violent event.

Location of the bunker and the cliff's condition was in danger of slumping the construction onto a narrow beach. To prevent the collapse a part of war fortifications, built during "Cold War" (50's, XX century), had to be demolished and dumped from the top of the cliff. Considering a huge weight of a building, its localization and concern about safety of construction company team, the massive structure made of steel-reinforced concrete had to be demolished using other methods than traditional ones. Despite of knocking the bunker down under supervision of construction company team, taking into consideration the weight and size of the structure, it was obvious that not only degradation of the cliff could exist but also disarrangement of its structure. Due to the above-mentioned reasons, it was assumed that survey of cliff's geometry before and after bunker demolition is indispensable.

Object registration, accomplished by ground-based laser scanner, were carried out in close vicinity of the shoreline on the toe of cliff. Two series of measurement works were performed with the co-operation of Geodetic Circle Hevelius (Gdansk University of Technology) and companies (including producer of laser scanner). Within the article, comparison of two registration series were presented. It was also assumed that there is possibility of further repetition of surveys.

As a result of work in software Leica Cyclone, MeshLab, Bentley Points and the authorial one, charts of the cliff were prepared. On the basis of received data, ground movements were specified. The localization of potential landslide was ascertained and the quick method of identification areas prone to erosion was indicated.

Keywords: slope stability, sea cliff stability, terrestrial laser scanning, measurement of ground movements

ASSESSMENT OF STRESS STATE IN A HETEROGENEOUS CROSS-SECTION FROM STEEL AND SHOTCRETE AT PRIMARY TUNNEL LINING

Assoc. Prof. Karel Vojtasik[1]

Assoc. Prof. Eva Hrubesova[1]

Marek Mohyla[1]

Lukas Duris[1]

[1] Technical University of Ostrava - Faculty of Civil Engineering, **Czech Republic**.

ABSTRACT

A heterogeneous cross-section of a primary lining structure made of shotcrete and steel elements is a standard design in tunnel construction. The cross section is put together of shotcrete installed minimally in two strata and steel lattice arches reinforcement embodied in shotcrete. The shotcrete combines all steel elements into one structure unit and it embedded to the ground around an excavation. This design provides consistency between lining structure and ground. The article displays two approaches an analytical and a numerical to evaluate the stress state in a materially heterogeneous cross-section. The analytical approach figures out the stress in the concentric multi ring formation via functions of the complex variable. The numerical approach employs 3D model to perform the same task. The both approaches take into account all essentials to exemplify a structure of the heterogeneous cross-section of a tunnel lining. They satisfy cross-section construction phases, hardening of shotcrete strata, arrangement of steel elements in cross-section. On display there are results of stress state computation of an example being performed simultaneously by both approaches and a comparison of them.

Keywords: tunnel construction, primary lining, cross-section, stress state.

ASSUMPTIONS AND REAL BEHAVIOUR OF THE STARINA DAM

Dr. Marian Minarik

Prof. Dr. Emilia Bednarova

Dr. Danka Gramblickova

Slovak University of Technology, Faculty of Civil Engineering, Bratislava, **Slovakia**

ABSTRACT

There are a few engineering structures that are in the design and operation so closely connected with the natural environment, such as embankment dams and levees. Due to the variability and randomness of natural factors (hydrology, geology, hydrogeology, morphology, properties and environment, etc.) they are unrepeatable and their occurrence in the same form and the same natural conditions is unrealistic. During the design phase, it is necessary to identify their development, mutual interconnections, the effect of time on their changes (particularly geotechnical properties), the effect of reservoir operation on the behaviour of dam etc. However, with their wide variability cannot be completely excluded differing behaviour of the hydraulic structure from the assumptions of the project. Some differences are discovered already during construction, others with the passage of time - in the period of the operation of the structure. In this paper are presented lessons learned and experiences from the operation of Starina dam. For clarification of anomalies have been applied special in-situ methods of measurements and statistical methods.

Keywords: dam operation, geophysical methods, statistics

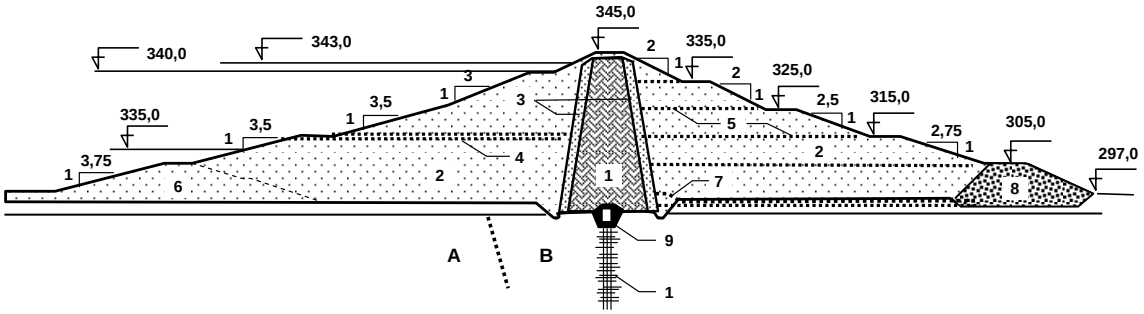
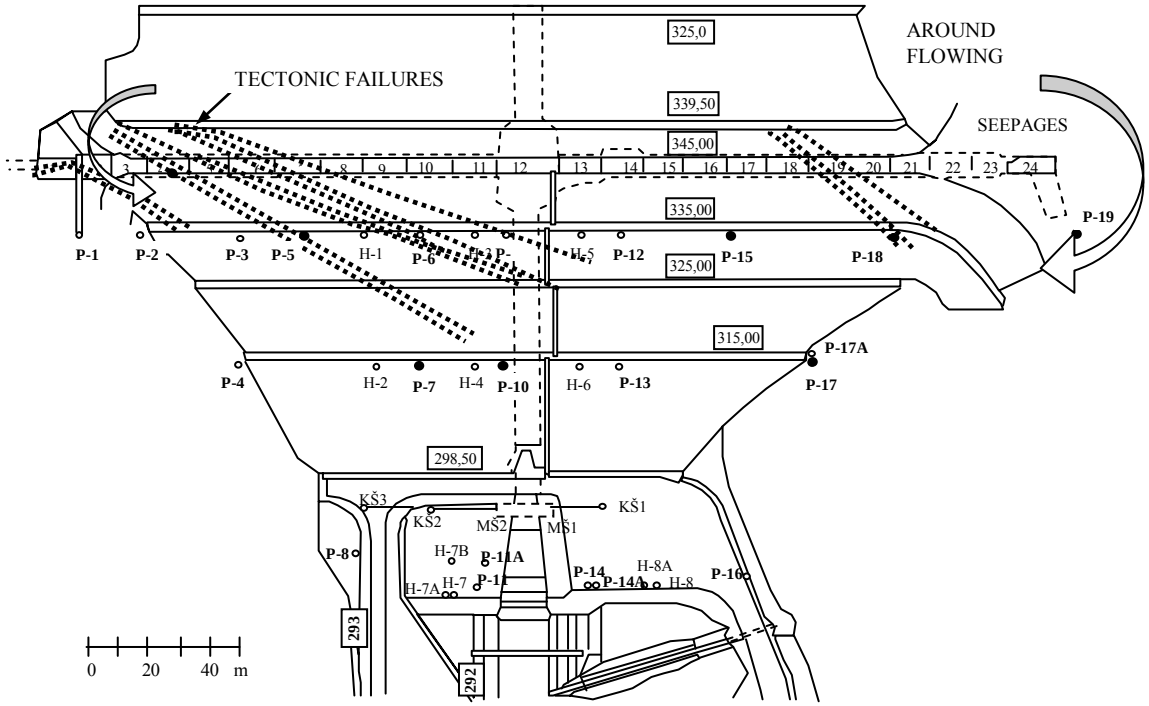


Fig.1 Characteristic cross section of dam Starina

1 – silt sealing, 2 – stabilizing prisms (silty gravels), 3 – filter, 4 – consolidation-drainage measure, 5 – gravel layers, 6 – cofferdam, 7 – drainage system (collection drain + drainage carpet), 8 – toe drain, 9 – grouting gallery, 10 – grouting curtain, A – prevail of claystones, B – prevail of sandstones



P-1 to P-19 observation wells for rock subsoil H-1 to H-8 observation wells for gravel subsoil
MŠ1, MŠ2 shafts for measurement of seepages 1 to 24 blocks of grouting gallery

Fig.2 Situation of the dam showing the tectonic faults in the subsoil

EXPERIENCES FROM OPERATION

Immediately after putting the dam into operation on the filtration mode was reflected both, morphology of the territory as well as the existence of tectonic faults in the subsoil. This was confirmed by the results of the filtration flow measurements in the left abutment. It was necessary to confirm or disprove the hypothesis that the cause of these

anomalies is indeed the impact of existing geological and morphological conditions, or failure in the function of the sealing element or grouting curtain. In addition to the processing of trend in the development of filtration flow, it was used for this purpose a statistical approach and special methods of the measurements of seepage velocities.

Methods of statistical processing of in-situ measurements

Mutual interconnection between water levels in wells and in reservoir, if any, can be traced from the graphical processing of the results of in situ measurements. For large datasets of measured values can be as a complementary method used statistical approach. It is a calculation of correlation coefficients between the groundwater and seepage water levels and the water level in the reservoir. So it can be demonstrated if there is a correlation between them and if so, what is the degree of its significance and what is the trend of its development. Based on the knowledge and experience from Slovak conditions, these criteria were selected: If the values of correlation coefficients are $1 \geq r \geq 0.6$, the correlation between the monitored parameters is significant. When the values of correlation coefficients are $0.6 > r \geq 0.3$ the bond between the monitored parameters is average and if the correlation coefficients $r < 0.3$ the relationship is negligible, respectively does not exist.

Above mentioned criteria to be accepted or considered as questionable. However, their choice was based on the fact that the groundwater and seepage water level regime, observed in monitoring objects (wells), is besides the water level in reservoir affected by many other factors – rainfall, effect of water from slopes, leakage to the monitoring objects etc. Their effect may be negligible as well as significant.

Using the calculations of correlation coefficients between the water level in the reservoir and in monitoring objects can also be specified the development of this phenomenon. The principle of the method is based on analysing of the correlation between the investigated variables at different time intervals. These can be selected either at random or chronological order, or depending on the loading states. As mutual continuity between the monitored parameters clearly exists, the correlation coefficient should be at various time intervals, regardless of the load state significant. Similar results can be expected in those cases where a correlation between the monitored phenomena does not exist, its value should be regardless the conditions negligibly small. Such analysis of values of correlation coefficients was performed at Starina in all monitoring objects. Table 1 shows the selection of monitoring objects located in the abutments. The results show that the values of correlation coefficients of monitoring objects, situated in the areas of abutments are various. Values representing significant correlations of observed phenomena throughout the entire operation of the dam irrespective of the time periods are recorded in the monitoring object P19, which is located on the left side of the dam. In the monitoring objects P17 and P17A achieve correlation coefficients variable values. On the contrary, in the monitoring objects P1, P2 and P4, which are located in the right abutment, are correlation coefficients small.

From the presented results it can be clearly concluded that while in the left abutment the seepages are undisputed (P19, P17 and P17A), in the right abutment (P1, P2 and P4) the seepages are improbable. It is also clear from the graphical dependencies between the water levels in the monitoring objects and the water level in the reservoir for the years 1989 - 2007, which are documented in Fig. 3. The results of measurements of water levels and uplifts in other monitoring objects indicate that in this area are not present

seepages through sealing element in the body of the dam, or grouting curtain in its subsoil. This simple method of statistical processing of the measured values of the water levels may help to clarify the hidden bounds that are not always possible to determine from their graphical processing [2].

Table 1 Correlation coefficients expressing connection between water levels in the monitoring objects in abutments and water level in the reservoir

roky	89-07	89-93	94-98	99-03	04- 07	1989	1990	1991	1992	1993	1994	1995
P1	0.16	0.221	0.231	0.05	0.242	0.003	0.558	0.029	0.01	0.328	0.169	0.158
P2	0.12	-0.01	0.101	0.105	0.376	-0.21	0.033	0.114	0.042	-0.44	0.157	0.031
P4	0.164	0.319	0.124	0.139	0.298	0.238	0.34	0.27	0.257	0.396	0.279	0.375
P17	0.305	0.508	0.217	0.52	0.436	0.757	0.813	0.445	0.607	0.33	0.822	0.676
P17A	-0.09	0.284	0.132	0.448	0.449	0.889	0.571	0.598	0.662	0.298	0.767	0.617
P19	0.962	0.931	0.907	0.978	0.939	0.975	0.837	0.921	0.894	0.911	0.966	0.887
roky	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
P1	0.07	0.218	0.325	-0.05	0.153	-0.02	0.057	0.122	0.005	0.441	0.383	0.372
P2	0.079	0.004	0.252	-0.04	0.19	0.231	-0.14	0.13	0.218	0.487	0.097	0.552
P4	0.258	0.214	0.298	0.099	0.353	0.118	0.171	0.132	-0.02	0.371	0.435	0.66
P17	0.441	0.67	0.202	0.465	0.759	0.725	-0.01	-0.07	0.109	0.455	0.493	0.645
P17A	0.626	0.584	0.263	0.395	0.663	0.514	0.101	-0.05	0.11	0.455	0.652	0.767
P19	0.955	0.945	0.879	0.985	0.985	0.968	0.986	0.979	0.996	0.845	0.909	0.905

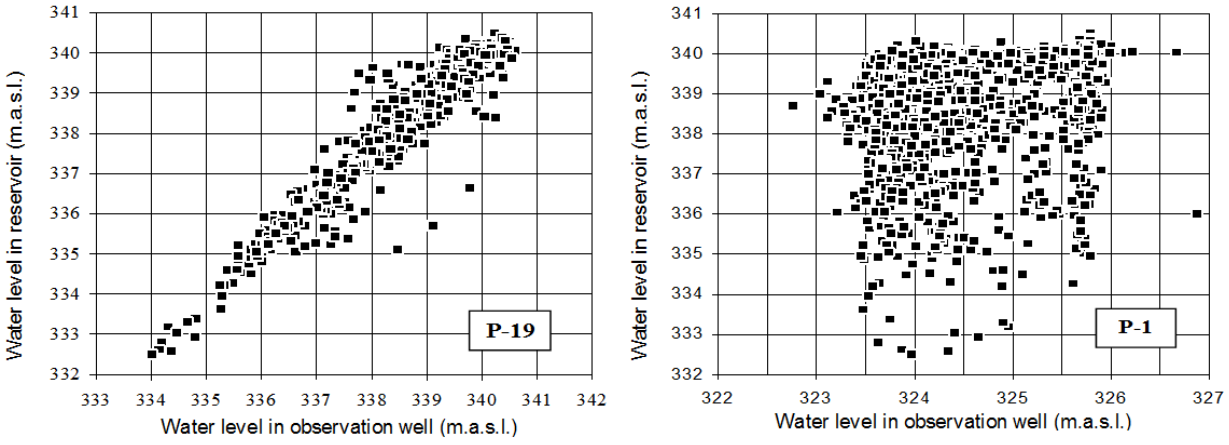


Fig.3 Dependence between the water level in the monitoring object and water level in the reservoir

Special measurements of filtration velocities

Utilisations of special measurements of filtration velocities in observation boreholes inbuilt for monitoring of filtration flow parameters in the bodies and subsoil of dams and their abutments have their substantiation. Basic monitoring, consisting of measurements of water levels, uplifts, seepages, eventually pore water pressures may not be sufficient for recognising of real filtration regime in the investigated area. It is sufficient for the review of dam's safety from the viewpoint of filtration stability of soils and filling of rock mass. Without understanding of filtration flow intensity in it is very difficult to correctly review filtration stability. Geophysical methods are almost 40 years used for this purpose in Slovakia. Their principle is based on observation of process of dilution or vertical movement of stable water solution of sodium chloride in the borehole. Two methods are applied in Slovak practice – dilution method and method of observation of vertical flow in the borehole.

Dilution method is used in boreholes with low water column, where usually horizontal flow of water prevails. Sodium chloride in powder form is applied into borehole for observation of flow velocity. The salt solution is formed directly in the borehole. Its initial concentration is diluted by flowing water. Filtration velocity is calculated from the process of solution dilution.

The method of observation of vertical movement of indicated water is applied for the measurement of filtration velocities in boreholes with high water column. For observation of vertical movement of water in permeable part of borehole (in its perforation) the immersion probe is used. It has two electrodes above and under outlets of indicator solution. Distances between outlets and electrodes are constant. After squirt of electrolytic solution in horizontal direction its flow in ascending or descending direction occurs. Ascending or descending direction of vertical flow is identified with corresponding electrode. Vertical velocity of flow and vertical discharges are calculated based at known parameters of probe, registered direction of flow and time of indicated water inflow. Increase or decrease of these parameters along the depth of borehole confirm inflow eventually outflow from the borehole. From depth dependency of vertical discharges for corresponding position also value of filtration velocity of flowing water in the borehole surrounding is estimated consequently.

In this way measured values of filtration velocities of water in borehole allow obtaining knowledge on allocation of filtration flow intensity in observed location in positional and also vertical arrangement. If we know hydraulic criteria for filtration stability, we can review if measured maximal values of filtration velocities fulfil evaluation criteria. At the same time, knowledge on trends of development of average and maximal values of filtration velocities is obtained by systematic measurements. Consolidated state or rising trends of filtration velocities can be confirmed based at measurements. Rising trends indicate risk of occurrence of suffusion.

Fig. 4 documents results of measurements of the maximum levels of filtration velocities in the left abutment of Starina dam and their comparison with critical values [3]. It is clear from that the intensity of the filtration flow in this area of dam does not represent a risk of failures in filtration stability. Seepages in the left abutment caused by morphology of the area and geological composition of dam's subsoil, however, still need to be carefully monitored.

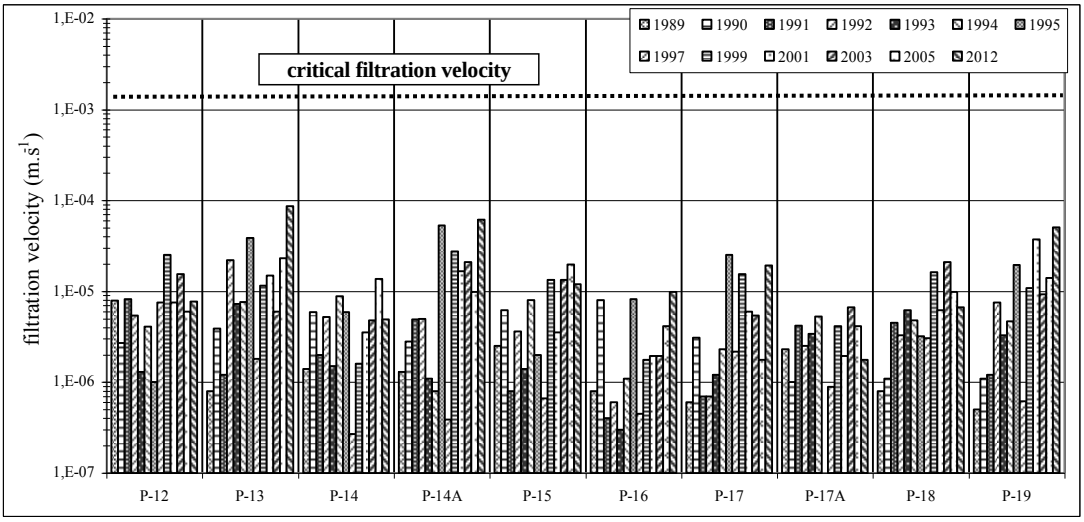


Fig.4 Comparison of maximal and critical values of filtration velocities

Geophysical measurements of filtration velocities in boreholes provide wide dataset of values, which can be processed statistically. On Starina dam such dataset consist of 500 – 700 values. By their processing in the form of distribution functions, we can obtain overview of filtration flow character, values of medians and eventually probability of occurrence of the arbitrary (permissible or average) filtration velocity. Distribution functions of the filtration velocities measured in the left abutment are processed on Fig. 5. From them results, that even after 25 years of operation of hydraulic structure the filtration regime isn't in this area completely stabilised [1]. At the same time, it should be noted that the results are significantly affected by differences in the conditions under which indicator measurements of filtration velocities were carried out (water level in the reservoir, rainfall, etc.).

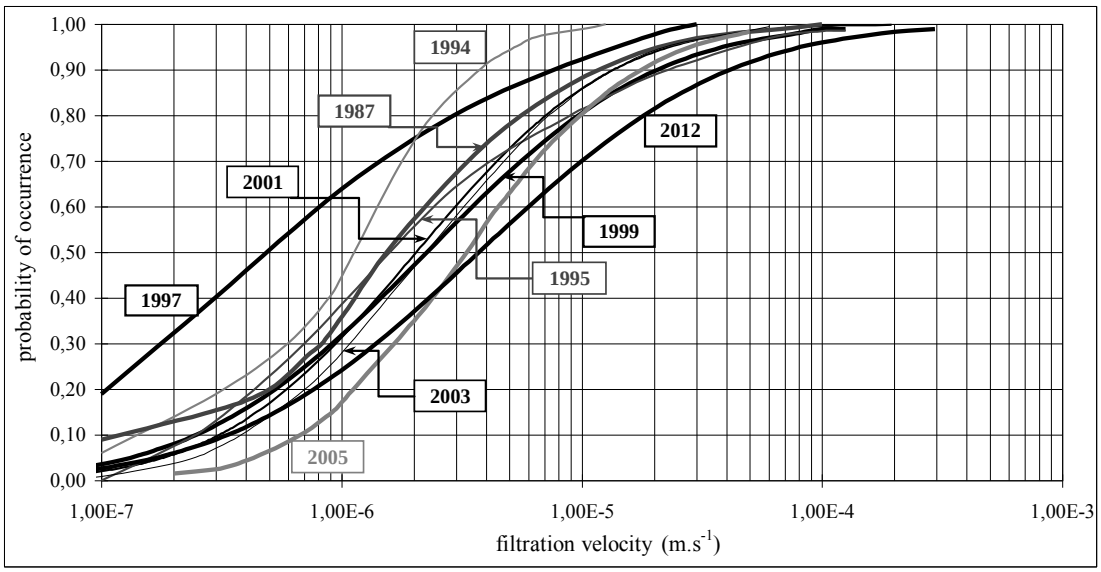


Fig.5 Distribution functions of seepage velocities distribution in the body and subsoil of dam Starina

Among significant knowledge, resulting from measurements of filtration velocities along depth of boreholes belong these, which repeatedly point out on regions with increased intensity of filtration flow. Based at position of probe and depth with increased intensity of filtration flow and trend of development (for example in body of dam, in slope of valley or directly in grouting curtain) further operational decisions can be implemented. If the intensity of filtration flow is not changing in time and does not exceed critical filtration velocity, there is no reason for execution of remedial measures. In case, where trend of development is rising, it is actual to increase attention and require repeating measurements of filtration velocities. If the risk of occurrence of piping is confirmed, the realization of remedial measures is necessary.

It can be concluded from above mentioned results, that there are several considerable reasons, why knowledge of filtration velocity regime development is essential in connection with the safety of hydraulic structures. Experiences gained from application of measurements of filtration velocities in Slovakia indicate, that by these measurements it is possible to gather information about:

- expected and in situ achieved values of intensity of filtration flow,
- potential hidden risks of filtration regime development (piping), which need not necessarily propagate in the changes of water levels, uplifts or seepages,
- maximum intensity of filtration flow and trends of its development, which are essential for filtration stability review,
- potential existence of local preferred seepage paths, their position and trends of development,
- complex view of filtration flow patterns in the sub regions of dam and its subsoil, knowledge on time trend of their development,
- effect of extreme hydrodynamic stress on filtration flow mode in dam body, its subsoil and adjacent area and comparison with presumption of project,
- possible informative calculation of seepages through dam body and subsoil, where drainage system is not working properly.

In addition, values of filtration rates can be used for optimisation of remedial works. Their understanding together with variability of geological conditions can be used as control system by numerical modelling, by inverse models.

CONCLUSIONS

The statistics of failures and accidents of dams points out that overflowing or seepages are their most often reasons. Issue of seepages is closely related with wide variability of properties of materials contained by the body and subsoil of dam. This fact considerably complicates not only designing, but also reviewing the safety of dams. Monitoring plays important role here. Piping belongs to the most frequent reasons of dam's failures, therefore control of filtration flow and its development is essential for dam safety monitoring. Without correct recognising of intensity of filtration flow the reviewing of hydraulic criteria is problematic. Basic parameters – water levels, uplifts and seepage or pore water pressures are not sufficient for this reviewing. It can be concluded, that

geophysical method of measurement of filtration velocities on dams can significantly contribute to increasing of their safety.

Numerical and statistical methods represent reliable instruments in process of increasing of dam's safety. Their application in stage of preparation, design and also operation is nowadays inherent. Their application can be effectively utilised mainly in such cases, where wide dataset of in-situ measurements exists.

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BENTONITE GAP FILLING FOR HIGH-LEVEL WASTE DISPOSAL

Jiri Stastka

Czech Technical University in Prague, Faculty of Civil Engineering, Centre of Experimental Geotechnics, **Czech Republic**

ABSTRACT

The safe disposal of high-level radioactive waste is based on the multi-barrier concept in which bentonite (clay) will be used as the construction material for one of the barriers. The bentonite will surround the waste package containing spent nuclear fuel in the disposal hole in the deep geological repository. Bentonite, because of its unique characteristics, will be used as the damping, sealing, filling and construction material within the disposal system. The principal geotechnical challenge will be to limit the penetration of water into the container from the surrounding rock and thus to extend the lifetime of the container as well as to restrict the transportation of water and gases from the disposal location. In addition, the sorption capacity of bentonite is important in terms of the capture of certain radionuclides which might escape from the container as a result of natural corrosion processes. The main requirements of the bentonite with regard to geotechnical properties consist of very low hydraulic conductivity (max 10^{-12} m/s), high swelling ability (σ_{SW}> 1MPa), rheological stability, high plasticity, and good thermal conductivity. The construction of the disposal hole will exert an influence on the geotechnical properties of the buffer material. According to the vertical disposal system (Sweden, Finland, etc.) the disposal well will be drilled into the rock massif with a diameter which will allow for the installation of bentonite blocks around the container. However, certain tolerances and a degree of clearance will be required due to the practical requirements of bentonite block and container installation. The objective of this study therefore was to investigate both the methods and materials which might be used for the filling of the gap between the rock wall of the disposal well and the bentonite blocks. The experimental work was split into three parts, the first of which involved the selection of Czech bentonite as the basic material; this was followed by extensive laboratory tests which aimed to determine the relevant geotechnical parameters. The second part consisted of the selection and testing of methods for the compaction of the bentonite, and the final part concerned the selection of methods for the placing of the compacted bentonite into the gap.

Keywords: bentonite, gap filling, bentonite pellets, bentonite chips, free fall pouring

CASE STUDY ANALYSIS OF THERMAL ACTIVITY OF A DUMP IN RELATION TO ITS VARIOUS APPLICATION OPTIONS AND FOUNDATION ENGINEERING WORK

Ing. Petra Zástěrová [1],

Assoc. Prof. Ing. Marian Marschalko, Ph.D [1],

Ing. Silvie Heviánková, Ph.D [2],

Dr. Ing. Petr Jelínek [3],

prof. Dr.Ing. Miroslav Kyncl [2],

[1] VŠB-Technical University of Ostrava, Faculty of Mining and Geology, Institute of Geological Engineering, **Czech Republic**

[2] VŠB-Technical University of Ostrava, Faculty of Mining and Geology, Institute of Environmental Engineering, **Czech Republic**

[3] DIAMO, state enterprise, Division ODRA, **Czech Republic**

ABSTRACT

The article studies certain significant aspects of engineering-geological conditions in the specific geological environment of black coal mining dumps in the Ostrava-Karviná Coal District, Czech Republic. This is done via a case study on the Heřmanice Dump, which is one of the largest and most important ones in the Ostrava-Karviná Coal District. However, its subsequent utilisation is limited by the marginal condition of thermal activity. Due to thermal activity, dumps are restricted as sources of secondary building raw materials and it must also be taken into consideration when planning the future use of this environment because of foundation engineering aspects, etc. Learning about such processes is important from the scientific point of view as there are several analogous environments in the Ostrava-Karviná Coal District and other countries also face similar problems.

Keywords: case study, thermal activity, engineering-geological conditions, dump, utilisation, foundation engineering

CATIONIC SURFACTANT WELL KILL FLUID ENHANCEMENT RESOURCE

Kovalev K., PhD Makarshin S.
VNIINEFT JSC**, Russia**

ABSTRACT

High content of clay minerals in pay zone rocks makes clay swelling a serious problem for the West Siberian oil fields. Water based well kill fluids are very popular, easy to use and they need to be upgraded. Laboratory and filtration studies to upgrade water based well kill fluids were carried out. Laboratory clay swelling tests were made on Jigach and Yarov apparatus. Clay swelling test scheme included initial clay aquation with distilled water for 24 hours then water was changed to testing fluid for 7 days and then changed back to water for the next 32 days. During the laboratory tests a cationic surfactant in sodium chlorite brine synergetic effect on clay inhibition was discovered. All filtration tests were made on oil recovery factor test equipment and according to similar procedures. Filtration studies showed sodium and calcium chlorite brines oil permeability restoration low effect after single and multiple flushes on Jurassic polimict rock samples. Also a wettability impact on oil permeability restore after well kill fluid flush was shown. Cationic surfactant well kill fluid enhancement resources were observed.

Keywords: Kill fluid, cationic surfactant, clay swelling inhibition, permeability restore, wettability.

CLIMATIC INFLUENCES ON THE FINAL TUNNEL LINING

Ing. Lukáš Ďuriš[1]

Prof. Josef Aldorf[1]

Ing. Jiří Géryk[2]

[1] Technical University of Ostrava – faculty of Civil engineering, **Czech Republic**
[2] Inset, Ltd., **Czech Republic**

ABSTRACT

Designing the final lining of the mined tunnels is a complex task. Static behavior depends on the interaction of the tunnel lining and the rock mass load is dependent on the stiffness of the lining, the size of the excavation, geotechnical conditions, and construction progress and not least on the climatic conditions.

Keywords: tunnel, temperature, final lining, strain gages

COMPARISON OF RESULTS OF TWO METHODS OF FIBRE OPTICS DEFORMATION MONITORING IN GEOTECHNICS

Kristyna Capova[1]

Dr. Jan Zalesky[1]

Dr. Marek Zalesky[2]

[1] Czech Technical University in Prague, Faculty of Civil Engineering, **Czech Republic**

[2] ARCADIS CZ a.s., division Geotechnika, Prague, **Czech Republic**

ABSTRACT

The paper introduces selected results of applications fiber optics deformation monitoring in geotechnics. Series of Fiber Bragg Gratings sensors and Brillouin Optical Time Domain Analysis were used for monitoring of a side slope deformations of an open cast mine. These monitoring technologies with developed ways of protection of fibers / optic cables, installation procedures and data evaluation were tested under laboratory conditions and in the underground research center of the Czech Technical University in Prague prior to on site deployment. The first type of applications was used for the surface monitoring of the potentially unstable area installed just below the ground surface. The outputs of these applications were the determination of the active part in the monitored area, the deformation development in time in selected lines drawn through the potentially unstable areas. The check of the assumption of so called reference part of the installation was provided with use of the Global Navigation Satellite System (GNSS), which is sufficiently accurate for larger deformations. Extensometer tape and laser distometer were used for cross-checking the monitored results. The second type of application was instrumentation of fiber optics into two boreholes. The boreholes are usually vertical and have to be deep enough. The common condition is the fixing of the lower end of the borehole to the stable area which is not and is not going to be affected by any deformations and therefore may be considered as the so called fixed end. An independent check of the measurement results is provided by the simultaneous accurate line-wise geotechnical 3-D monitoring. The gathered results are discussed and evaluated from the points of view of problems connected with data interpretation, sensitivity and repeatability of deformation sensing in cases of our developed methods of in-situ fiber optics applications.

Keywords: geotechnical monitoring, deformation monitoring, BOTDA, FBG, fibre optics, slope stability

CONCEPT OF FIBRE OPTICS GEOTECHNICAL DEFORMATION MONITORING AND IN-SITU DEPLOYMENT IN OPEN CAST MINE

Dr. Jan Zalesky[1]

Kristyna Capova[1]

Dr. Marek Zalesky[2]

[1] Czech Technical University in Prague, Faculty of Civil Engineering, **Czech Republic**
[2] ARCADIS CZ a.s., division Geotechnika, Prague, **Czech Republic**

ABSTRACT

The paper presents a concept of Fiber Bragg Grating sensors (FBG) and Brillouin Optical Time Domain Reflectometry (BOTDR) application for deformation monitoring on a side slope of an open cast mine. The fiber optics measurement techniques, instruments of our own construction and methods of instrumentations developed within two past research projects were used in-situ. Different means of geotechnical instrumentation for subsoil deformation monitoring were installed in a former open-cast-mine in the Czech Republic in order to test our instrumentations and to gather information about the mine slope behavior. The first type is the sub-surface monitoring of the potentially unstable area and the second one is performed in boreholes to determine a slip surface location and to describe deformation development in time. The instrumentations were done both with fiber optics and geotechnical deformation measurement tools, so that the results can be cross-checked. FBG sub-surface extensometer for shallow slope movement monitoring, FBG borehole instrumentation with FBG chains in GFRP protective sleeve for axial deformation measurements and BOTDA borehole instrumentation for subsoil deformation measurement are described and discussed. Deployment and critical points of fiber optics deformation sensing as well as advantages and disadvantages are indicated and evaluated.

Keywords: FBG, BOTDA, monitoring, field instrumentation

CONDITIONS OF RELIEF FORMATION OF BOTTOM AND BANKS IN UPPER PART OF BRATSK RESERVOIR, RUSSIA

Dr. Babicheva A. Victoria[1]

Dr. Martyna A. Rzetala[2]

[1] Institute of the Earth's Crust SB RAS, Irkutsk, **Russia**
[2] University of Silesia, **Poland**

ABSTRACT

Changes in hydrodynamic conditions are of great importance in the relief formation of coasts and bottom in the areas of variable backwater of reservoirs: irregular decrease in the rate of discharge currents, and concurrent fluctuating water levels, as well as gradual growth of wind and wave loads with the increasing width and depth of the water area. It is directly related to the peculiarities of morphology and dynamics of bottom topography forms, and indirectly – to the variety of types of banks. The paper presents analysis of the dynamics of bottom ridges in the variable backwater of the Bratsk reservoir at the Angara River as well as the main types of banks specific to this area.

Keywords: variable backwater area, hydrodynamic conditions, bottom-living forms of relief, exogenous geological processes, types of banks

CONSOLIDATION OF A STREET SECTION AFFECTED BY LANDSLIDES IN CLUJ-NAPOCA MUNICIPIUM

Assist. Radu Vasile Cot[1], Lecturer Dorin Vasile Moldovan[1], Lecturer Nicoleta Maria Ilies[1], Assist. Bianca Roxana Parv[1], Assist. Lavinia Elena Muntean[2]
[1] Technical University of Cluj-Napoca, **Romania**
[2] University of Agricultural Science and Veterinary Medicine, **Romania**

ABSTRACT

The article presents the solution decided for consolidation, that is two support structures laid as follows. A shoulder retaining structure of length L=35.00m will be built; it is made up of a Φ800 pile retaining structure, 14.00m long, at the inter distance of 1.50 m between the axes, incorporated in the good setting layer made of marl and fixed with 15.00m bar-type active anchors placed at 3.00m. On the top, a small 35.00m long retaining wall will be erected having both pile ends incorporated in it and anchor provision.
The shoulder support structure is fitted with a foot base consolidation structure of 40.00m length, place at the slide base.
The foot base consolidation consists in a support structure with Φ220 piles, of length 11.50m, at 0.60m inter distance, laid in three rows, incorporated in the good foundation layer that is marl. On the top, a small retaining wall will be erected with the piles ends embedded in it.

Keywords: Φ800 bored piles, Φ220 bored piles, retaining wall, active anchors

CONSOLIDATION WORKS ON A ROAD IN BOTOSANI COUNTY AFFECTED BY LANDSLIDES

Prof. Dr. N. Botu[1] ,

D. E. Grigore[1]

R. M. Chirila[1]

[1] Department of Transportation Infrastructure and Foundations, Technical University "Gheorghe Asachi", Civil Engineering and Building Services Faculty, Iasi, **Romania**

ABSTRACT

As a result of changes that occur at the land surface, deforestationand and flooding, in lately started to appear more often landslides. In the present article will present a landslide that affected a road in Botosani county from Romania and solutions were required to be taken to stop these unwanted phenomena. The landslide is carried out over a length of approximately 400 m, the first separation stage being at a distance of 5-10 m from the edge of the carriageway. The calculation of local and general stability of the slope was performed using GEO5 program. In order to land geotechnical prospecting were carried out surface and deep research through the implementation of two drillings in the dry system, cased, with a diameter of 140 mm, and two mechanical uncased drillings with a diameter of 60-36 mm. In order to strengthen the slope and eliminate its causes instability favors, the following consolidation works were designed: concrete retaining wall on large diameter bored piles, works to eliminate excess groundwater using siphon drains, concrete caissons, maintenance / repair of roads, canals collection of water on the left side of the road and systematization and vegetalizarea left side of the road..

Keywords: slope stability, landslides, retaining wall, bored piles, siphon drains

CONTRIBUTION OF TRIAXIAL TEST FOR ROCK POROELASTIC PROPERTIES EVALUATION

Prof. Dr. Maria Matilde Costa e Silva

Prof. Dr. Paula Falcão Neves

Dr. Gustavo Paneiro

MSc. Samuel Guerreiro

DECivil/CERENA, Instituto Superior Técnico, Universidade de Lisboa, **Portugal**

ABSTRACT

In the scope of mining and petroleum engineering and to some extend of civil engineering, rock properties are relevant for the design of safe underground cavities, for hydraulic fracturing control, for rock masses stabilization and rock blasting operations. For petroleum engineering, porosity and permeability are associated with production and hydrocarbon reservoirs recovery. In what concerns the environmental restoration and waste disposal the poroelastic properties are also relevant for its safe management.

The objective of this work is to evaluate the variation of stress state, in the poroelastic properties of rocks, due to several anthropogenic activities in engineering and science fields.

In this study, variations on strain paths, porosity, permeability, P-wave velocities in triaxial tests over a set of microbialite limestone specimens were observed. Triaxial compression tests for three different conditions of confining pressure and injection of water pressure (50 and 100 kPa) were executed. The results highlighted that all the poroelastic properties depends not only on the axial stress and injection of water pressure but mostly due to confining pressure. It was also observed the poroelastic properties variation during the different phases described on Bieniawski brittle mechanism of rupture.

Keywords: Rock triaxial test, Porosity, Permeability, P-wave velocity

CONTROL OF FANS DOMINATED BY LANSLIDE ON THE QUATERNARY SEQUENCE IN ALPINE VALLEYS (VALTELLINA, NORTHERN ITALY)

Dr. Erika De Finis[1],

Prof. Alfredo Bini[2]

[1] Politecnico di Milano, **Italy**
[2] Università degli Studi di Milano, **Italy**

ABSTRACT

Alpine fans characterize so greatly some Alpine valley floors (i.e. Valtellina, Val Venosta) as to have contributed to modelling the profile, since the end of the Last Glaciation. They were considered anomalous with reference to the considerable ratio between area of fan and area of basin, so the definition of new category of catastrophic slope failure outcome was suggested for them. These morphologies can be classified therefore like fans dominated by landslide, differentiated from classical debris-flow or alluvial fans. These fans, characterized by steep slopes and small catchment basin with the head surrounded by imposing scarps, have often diverted and sometimes blocked the main stream, with the formation of landslide dams. The process of silting concerning the landslide dams has contributed to construct, inside the same valley, one or a series of morphological steps, that can be different even for a hundred metres in height. This research improved the classification of the landslide dams, proposed by Costa [1] with the introduction of a new tipology. This allowed also to reconstruct, through stratigraphic data, part of the geomorphological setting of the Quaternary Sequence in the Alpine valley floor of Valtellina between the fans of Ponte in Valtellina and Migiondo (Valtellina, Northern Italy). The surveys, carried out along 50 km of this part of the valley floor, indicate the presence of fine-deposits. They can be correlated each other for example upstream of the fans of Ponte, like also upstream of the fan of Sernio. This fact indicates the presence of ancient lakes, created as a result of the formation of cones dominated by landslide.

Keywords: alluvial fans, landslide dam, debris flow, Alpine valley floor.

CONTROL OF SUFFOSION ALONG RIVERBANKS: THE CASE OF THE OLONA RIVER (ITALY)

Dr. Loris Colombo [1]
Prof. Vincenzo Francani [1]
Prof.ssa. Paola Gattinoni [1]
[1] D.I.C.A., Dept. of Civil and Environmental Engineering, Politecnico di Milano, **Italy**

ABSTRACT

Piezometric fluctuations may affect the stability of the riverbanks by determining suffosion, i.e. the removal of fine particles from the soil when the filtration rate is high. Since the suffosion, or underground erosion, can reduce the mechanical properties of the soil and promote its landslide, horizontal drainage systems should be installed nearby riverbanks in order to reduce the piezometric levels fluctuations during the floods of watercourses. The new analytical formulation presented in this paper has allowed to design a drainage system that can increase the slopes stability, reducing suffosion occurring in the riverbanks. A comparison of the results obtained with the new relation and a numerical model has shown a very good agreement, indicating that the new modifications have been sufficiently accurate for using it in a preliminary design of the drainage system. With a simple analytical relation, this study has shown that horizontal drains can be designed to improve the prevention of anomalous suffosion in the riverbanks of Olona River. Additional work is required to develop lower-cost method of installing the drains.

Keywords: analytical solution, horizontal drain, suffosion, piezometric fluctuations

CORRELATION BETWEEN INSAR SATELLITE REMOTE SENSING AND IN-SITU MEASUREMENTS

Dr. eng. Adrian Andronic[1]**,**
Lect. Dr. eng. Ioan Boți[1]**,**
Asst. Prof. Dr. eng. Daniel-Marcel Manoli[1,]
Prof. Dr. Cristina Gârlea[2]
[1] Technical University of Civil Engineering Bucharest, **Romania**
[2] Romanian Academy, **Romania**

ABSTRACT

The usage of satellite borne SAR monitoring techniques has become wider spread in the last years due to the data becoming more accessible both for research purposes and commercial projects. The paper presents the correlation between the displacements velocity maps obtained from satellite monitoring and the in-situ measurements (inclinometric and piezometric monitoring). The research site has been chosen to be Galați city escarpment, due to the occurrence of several phenomena producing soil mass instability. The escarpment is mainly an artificial ground structure built about 50 years ago using infill with the purpose of extending and remodel this Danube escarpment, using unfit materials and steep slopes. Also, the existing urban networks are old and faulty, generating spills in the collapsible soils present in the area. These deformations are monitoring on a macro scale using the InSAR system and validated through local in-situ monitoring. The research is part of a project financed by the Romanian Space Agency and bears the acronym ILUSTRO.

Keywords: InSAR monitoring, landslide, in-situ measurements

CORRELATION BETWEEN PHYSICAL AND MECHANICAL PROPERTIES OF BROWN COAL FUEL ASHES

Assoc. Prof. Ing. PhD. Ivan Slávik
Department of Geotechnics, / Slovak University of Technology in Bratislava, **Slovakia**

ABSTRACT

The results presented here have been obtained on the brown coal fuel ash samples collected on the largest impoundments of Slovakia. The paper presents the grain size distribution of the brown coal fuel ashes. In addition, the correlation between grain size distribution and shearing strength, correlation between grain size distribution and permeability, correlation between void ratio and stress in compressibility test, correlation between oedometric modulus and stress in compressibility test are presented.

Keywords: brown coal fuel ash, grain size distribution, shearing strength, permeability, oedometric modulus

DATA ANALYSIS FROM THE MONITORING OBSERVATIONS OF GROUNDWATER LEVELS IN THE SARMATIAN AQUIFER IN NORTHEASTERN BULGARIA

Veselina Pavlova[1]

Prof. Dr. Aleksey Benderev[2]

[1] National Institute of Meteorology and Hydrology, Bulgarian Academy of Sciences, , **Bulgaria**
[2] Geological Institute, Bulgarian Academy of Sciences, **Bulgaria**

ABSTRACT

Sarmatian aquifer in northeastern Bulgaria is an important source of water supply for the settlements in this part of the country- Dobrudzha region. To interpret the mode of groundwater it is established a monitoring network comprising of more than 20 drilling wells with different periods and frequency of observation, as the most thorough and complete data is collected for the past few years. Geomorphological and hydrogeological conditions cause water levels to be at various depths - from 1-2 m to more than 70 m. Temporal water level changes differ among the numerous monitoring points. Amplitudes of their changes are in the range of from 1 m to about 9 m, as well as depending on the thickness of the unsaturated zone and as by changes of the groundwater recharge conditions. In most of the wells in recent years (since 2003) there is a trend of increasing of the water level. It mainly refers to areas in southern and central parts of the distribution of the aquifer, where are revealed most of the outcrop areas of the Sarmatian limestones. Water level fluctuations around a constant value are observed in monitoring stations located near the Black sea line, some coastal lakes and wet zones. Changes of water levels in some of the northern part wells differ in character from the rest wells, where the periods of observation were relatively the shortest. The results are a step ahead in clarifying the influence of various natural and anthropogenic factors on the quality and quantity of groundwaters in the Sarmatian aquifer in northeastern Bulgaria.

Keywords: groundwater, regime, sarmatian aquifer, Dobrudzha

DEFORMATION ANALYSIS OF GABION WALLS ON TRANSPORT STRUCTURES

Ing. Jozef Vlcek[1], **Ing. Roman Bulko**[1], **Ing. Dominik Niemiec**[2],
Ing. Petra Zástěrová[2], **Ing. Ladislav Kais**[1], **Ing. Barbara Matuszková**[3],
Ing. Silvie Heviánková, Ph.D[3], **prof. Ing. Miroslav Kyncl, Ph.D.** [3],
Assoc. Prof. Ing. Marian Marschalko, Ph.D[2], **Prof. Dr. Isik Yilmaz**[4],
Ing. Miroslava Bendová, Ph.D. [5], **prof. Ing. Vojtech Dirner, Ph.D.** [3],
Ing. Alena Sochorková [3], **prof. RNDr. Peter Andráš, Ph.D.**[3],
Ing. Orlando Montero Arencibia, Ph.D.[6],
Assoc. Prof. , RNDr. Martin Bednárik, PhD. [7]

[1] University of Zilina, Faculty of Civil Engineering, Department of Geotechnics, **Slovak Republic**
[2] VŠB-Technical University of Ostrava, Faculty of Mining and Geology, Institute of Geological Engineering, **Czech Republic**
[3] VŠB-Technical University of Ostrava, Faculty of Mining and Geology, Institute of Environmental Engineering, **Czech Republic**
[4] Cumhuriyet University, Faculty of Engineering, Department of Geological Engineering, **Turkey**
[5] VŠB-Technical University of Ostrava, Faculty of Mining and Geology, **Czech Republic**
[6] VŠB-Technical University of Ostrava, Faculty of Economics, Department of Mathematical Methods in Economy, **Czech Republic**
[7] Comenius University, Faculty of Natural Sciences, Department of Hydrogeology**, Slovak Republic**

ABSTRACT

Gabion walls bring convenient way to realize the retaining walls with high level of global stability and aesthetic value. The design methods are based on the exerted approaches for gravity walls without reflection that gabion blocks have some special characteristics that need to be take into account. The major difference is that the blocks are not a rigid bodies and therefore the area of affected loads has its limitations. This paper presents the results of parametric study of gabion walls aimed at the material characteristics of gabions, especially at the deformation properties, that are neglected in recent design approaches.

Keywords: deformation modulus, FEM, gabion wall, global stability

DEGREE OF HAZARD MANIFESTATION OF GEOLOGICAL PROCESSES DEPENDING ON THE GEOLOGICAL-HYDROGEOLOGICAL STRUCTURE

Anna Shilova
Perm State National Research University, **Russia**

ABSTRACT

According to research carried out on the industrial site located in Berezniki considered geotechnical conditions. In the study area fixed manifestations of danger expressed in the form of different breaking and deformations on a surface of the earth and in the thickness of breeds of technogenic and natural character. Further analysis found the relationship between geological-hydrogeological structure and manifestations of danger. The result of the analysis is to ranking of categories of hazard.

Keywords: hazard assessment, geological processes, geological-hydrogeological conditions, factors of danger, ground deformation.

DELTA OF THE KŁODNICA RIVER IN THE DZIERŻNO DUŻE RESERVOIR – A CASE OF NATURAL RESPONSE TO HUMAN IMPACT ON LAND RELIEF (SOUTHERN POLAND)

Dr. Martyna A. Rzetala

University of Silesia, **Poland**

ABSTRACT

The formation of several thousand artificial water bodies in the Upper Silesia region (southern Poland) resulted in the emergence of new types of morphogenetic processes that drive the morphological evolution of depressions. Against the background of previously analysed delta areas in Poland, deltas within water bodies in the Upper Silesia region are relatively new objects of study, which are particularly important to global geomorphological research owing to the fact that the area where they are present is a model example of human impact on the natural environment. This makes it possible to conduct studies that are unique due to the peculiar features of those deltas that provide evidence of spontaneous natural response to anthropogenic changes in land relief resulting from diverse but sustained human impact. The most spectacular such delta in terms of size is the Kłodnica River delta that developed in the area where the river flows into the Dzierżno Duże Reservoir. Owing to the fact that the Dzierżno Duże Reservoir, which has a capacity of more than 90 million m^3, is situated in an urban/industrial catchment (the western part of the Upper Silesian conurbation) and functions as a sedimentation tank for the polluted Kłodnica River, a delta formed which consists of sewage sludge and fine coal. The delta has a surface area of more than 1 km^2; the size of the section that is situated above the water level and dries periodically varies depending on the water stage. The volume of the delta alone is estimated at slightly more than 2 million m^3 although this is increased by more than an additional 2 million m^3 if the bottom sediments accumulated in its immediate vicinity are taken into account. Compared to other such formations around the world, the delta is also unique in terms of its mechanical (municipal sewage sludge from the Kłodnica River mixed with coal sludge) and chemical (high contents of certain substances) composition. Tests of the sediments accumulated by the Kłodnica River demonstrate that they are polluted.

Keywords: delta, water body, water reservoirs, bottom sediments, Silesian Upland

DESIGN OF THE FOUNDATION STRUCTURES AND INTERACTION WITH THE SUBSOIL

Assoc. Prof. Dr.Julius Soltesz, PhD.

Dr. Miroslav Ignacak

Dr. Katarína Gajdosova, PhD.

Department of Concrete Structures and Bridges, Faculty of Civil Engineering, Slovak University of Technology, **Slovak Republic**

ABSTRACT

The main objective of this paper is to present the design concepts and methods of modeling of the soil-structure interaction with focus on foundation slab in combination with bored piles systems. The concept of linear global and local interaction will be described and discussed. The impact of relative subsoil rigidity on soil-structure interaction phenomena will be discussed as well. The authors will present the analysis and construction of foundations of spatial structures as: Bridge structures foundation, Deposit of used nuclear fuel rods, Bridge pier foundation, High rise building foundation, Radar tower foundation.

Keywords: subsoil and bored piles, soil-structure interaction, continuous and non-continuous interaction, FEM modeling

DETERMINATION OF THE DEPENDENCES G = f (γ) AND D = f (γ) ON A TAILING IN A TRIAXIAL DYNAMICS SHEAR APPARATUS

Assoc. Prof. Ph.D. Civ.Eng. Vladimir Kostov
Ass. Prof. Civ.Eng. Dimitar Dikov
University of Architecture Civil Engineering and Geodesy, **Bulgaria**

ABSTRACT

Main task in the design and construction of a tailing pond is to ensure that the tailings dam can withstand seismic actions, in an area with high seismic activity, such as Bulgaria.

Modern FEM analysis software packages, that can evaluate the seismic stability of such type of structures require as an input parameter the dependencies G = f (γ) and D = f (γ) in the range from 10^{-4}% to10^{1}%. One method to derive with these dependencies in a laboratory conditions is the dynamic triaxial shear.

In this article we present, the results from the tests carried out on undisturbed tailings samples taken from different depths (20 to 90m) of "Lyulyakovitza" tailing.

The obtained results were evaluated and statistically analyzed in order to derive with the dependencies for G = f (γ) and D = f (γ).

Keywords: tailing, tailings material, dynamic, tailing dam, shear, strain, statistics

DIFFERENCES IN DETERMINATION OF GEOTECHNICAL PARAMETERS IN SLOVAKIA AND POLAND

Assoc. Prof. Dr. Giang Nguyen[1, 2]
[1] University of Bielsko-Biela, **Republic of Poland**
[2] University of Žilina, **Slovak Republic**

ABSTRACT

The paper deals with some differences in determination of soils shear strength parameters and deformation characteristics in Slovakia and Poland. Poorly-graded sand (SP) and clay of high plasticity (CH) as subsoil in an area of industrial and technology park belonging to territory of town Tarnobrzeg (Poland) will serve as example soils. The results show that for the same soils, values of geotechnical parameters determined by well-known procedures, quoted in the Slovak standard STN 73 1001, Polish standard PN-81/B-03020 and applied in Slovakia and Poland are different. The biggest differences are in the values of a deformation modulus, where difference for the soil SP is -24.566 MPa (-79.5%) and for the soil CH is -12.671 MPa (-372.6%). Difference in an angle of internal friction for the soil SP is 3.38^{o} (9.8%). The comparison of shear strength parameters of the soil CH (and generally of cohesive soils) is questionable since, by the analysed Polish procedure, the values of shear strength parameters are not exactly neither effective nor total. Based on the results of analysis, one can state that it is not suitable to apply the values of geotechnical parameters obtained in Poland to design geotechnical structures according to the Slovak standard and vice-versa.

Keywords: shear strength parameters, deformation characteristics, STN 73 1001, PN-81/B-03020, spread foundation.

DYNAMIC BEHAVIOUR OF SOILS REINFORCED BY RIGID INCLUSIONS. SMALL SCALE EXPERIMENT AND NUMERICAL MODELLING.

PhD. Iulia-Victoria Neagoe[1,2]
Prof. Loretta Batali[2]
Assoc. Prof. Horatiu Popa[2]
[1] Spiru Haret University, PhD student Technical University of Civil Engineering Bucharest, **Romania**
[2] Technical University of Civil Engineering Bucharest, **Romania**

ABSTRACT

Soft soils used as foundation support require special attention, especially when high load structures are built. Traditional solutions include either replacement or pile foundations, both onerous. Improvement is also a possibility and here can be cited the improvement by rigid inclusions. This technique is used for foundations on soft soils of large engineering works (bridges, wind farms, industrial platforms etc.) in safe conditions and with low cost. The method combines the inclusions in form of piles, soil-mixing columns or other and a granular load transfer platform. If the static behaviour of such systems has been extensively studied these last years, it is not the same for the dynamic one. Paper presents briefly the technique and its applications and the validation and calibration of a 3D numerical model based on experimental tests performed on shaking table on a small-scale equivalent model. The calibration was made for the first mode of vibration and for an elastic behaviour of used materials, taking into account both frequencies and displacements. Also, comparisons between numerical and theoretical methods (homogenization method) are presented. Thus, resulted a 3D model which can be further used for more deep analyses on the dynamic behaviour of soils reinforced by rigid inclusions.

Keywords: rigid inclusions, dynamic numerical modelling, physical modelling

ENERGY THEORY OF ROCK CUTTING BY TBM

Prof. Vitazoslav Krupa[1]

Dr. Edita Lazarova[1]

Dr. Maria Krulakova[1]

Dr. Lucia Ivanicova[1]

[1] Institute of Geotechnics, Slovak Academy of Sciences, Kosice, **Slovakia**

ABSTRACT

Rock cutting by disc cutters of tunnel boring machines has been investigated for over 50 years worldwide. The development of advanced computing techniques moved the research from laboratories into the real in-situ conditions, where the monitoring systems of TBM operation enabled to study the simultaneous action of disc cutters installed on the TBM cutterhead during rock excavation. Force action of disc cutters rolling on rock surface on concentric tracks induces the disintegration of rock and thus causes the cutter wear. As rock cutting is an energy-demanding process, the possibilities for optimizing the TBM operation have been investigated in order to minimize the cutter wear and to provide an effective rock mass excavation. The paper describes our findings on the cutter-rock interaction using the energy theory of rock disintegration.

Keywords: rock cutting, TBM, cutting energy

ENGINEERING GEOLOGICAL CHARACTERISTICS OF ARTIFICIAL SOILS IN KAZAN CITY (RUSSIA)

Assoc. Prof. Dr. Nadezda Zarkova,
Assoc. Prof. Dr. Ivan Zharkov
Dr. G.Cherniychuk
Kazan Federal University, Kazan, Republic of Tatarstan, **Russia**

ABSTRACT

Zoning by type and thickness of artificial soils was conducted in 2012. Following categories of artificial soils were identified : sandy and loamy fill-up soils, sandy hydraulically filled soils, soils from industrial dumps, modern dissimilar fill-up soils, which contain household and construction debris, cultural layer soils. Special attention in this article is given to geological and engineering assessment of heterogeneous fill-up soils and industrial wastes. Our investigations show that these soils are characterized by high chemical and microbiological aggressiveness to underground constructions, which undoubtedly require anti-corrosion actions.

Keywords: artificial soils, chemical aggressiveness of soils, microbiological aggressiveness of soils

EUROCODE 7 - GEOTECHNICAL DESIGN, PROBLEMS AND ITS IMPLEMENTATION IN THE REPUBLIC OF MACEDONIA

Eng. Goran Angelov[1]
Dr. Todor Delipetrov[1]
MSc. Gorgi Dimov[1]
MSc. Blagica Doneva[1]
Dr. Marjan Delipetrev[1]
Dr. Krsto Blazev[1]
[1] Faculty of natural and technical sciences, University of Goce Delcev, **Republic of Macedonia**

ABSTRACT

With aim to harmonize standards in the area of civil engineering and its associated activities, Europa implemented Eurocodes. Their implementation in the countries of lower standard is followed with many problems. The experiences of applying eurocodes, in general, showed a very large selection of parameters which in direct practice don't have a greater impact. Our findings suggest that there will be a revision of most of the parameters involved in eurocodes.

The Republic of Macedonia is in the period preceding the adoption of national parameters of eurocodes and long time discussing how to define the national parameters. From that perspective, the far has come with Eurocode 7.

Basic problems, in our opinion, for the implementation of eurocodes, including eurocode7, is essential to reduce the number of parameters, also is need training to engineering staff for implementation of these Eurocodes in their applications. The realization of this is necessary to prepare an abridged version of the eurocode in order to be easily accessible and receptive of the engineering profession.

Keywords: eurocode, geotechnics, parameters, defining

EVALUTATION OF THE IMPROVEMENT FOR A DIFFICULT FOUNDATION SOIL USING VIBRATED BALLAST COLUMNS

Assoc. Prof. PhD. Ana Nicuţă[1]

Eng. Andrei Ilaş[1]

Prof. PhD. Marinela Bărbuţă[1]

Sen. Lect. PhD. Daniel Lepădatu[1]

Ph.D. student Alexandra-Alisa Găină[1]

[1] "Gheorhe Asachi" Technical University of Iaşi, Faculty of Civil Engineering and Building Services, **Romania**

ABSTRACT

The objective of the present paper consisted in the verification of a foundation soil improved with vibrated ballast columns. The construction site under consideration is characterized by localization in an area with high hydrostatic level and uneven difficult foundation soils. In case of construction works on sites with these particular features, the used improvement methods must be adapted to the specific area and construction site. Their purpose is to increase the soil bearing capacity in relation with the effective stresses and strains transmitted by the future constructions. For the current specific site, the analysis and studies have been performed using a series of tests with the dynamic cone penetration test (DCPT) and plate loading test (PLT). Based on the analysis results, the current research intended to highlight the main features related to the correlation between the physical and mechanical characteristics of soil stratification and improved bearing capacity of the specific site.

Keywords: vibrated ballast columns, difficult foundation soil, dynamic cone penetration, bearing capacity

EXPERIMENTAL ESTIMATION OF THE MECHANICAL CONDITION OF REINFORCED CONCRETE LINING IN UNDERGROUND EXCAVATIONS

Baryshnikov V.D.

Baryshnikov D.V.

Khmelinin A.P.

Chinakal Institute of Mining, Siberian Branch, Russian Academy of Sciences, Russia

ABSTRACT

The paper describes the field research into mechanical condition of reinforced concrete lining in an underground excavation. The deformation properties of concrete are estimated and the actual stresses in the lining are evaluated using the method of parallel hole drilling.

In order to avoid intersection of measurement hole and rock bolts, the authors offer the procedure for choosing the measurement hole location based on the results of geo-radar scanning of the lining.

From the trials, the proposed method and procedure enable reliable control of actual stress state of underground excavation lining and its safety factor assessment.

Keywords: underground excavation, reinforced concrete lining, parallel hole drilling method, stress state, deformation properties.

FEATURES OF HYDRODYNAMIC ENVIRONMENTS OF HYDROTHERMAL DEPOSITS IN THE CENTRAL TUVA, RUSSIA

Prof. Dr. Vladimir Lebedev[1]

Maria Lebedeva[1]

[1] Tuvinian Instiute for Exploration of Natural Resources of Siberian branch of the Russian Academy of Sciences, **Russia**

ABSTRACT

The features of geological structure and regularity of endogenous deposits location are studied where mineral paragenesis of productive stages are represented by cobalt arsenides, nickel and iron arsenides, as well as associate sulfoarsenides, sulphosalts and sulfides of chalco- and siderophile elements, native metals - silver, bismuth, gold and arsenic, in some cases by pitchblende mineralization. Cobalt manifestations on the mentioned territory are mainly referred to [3-4] two genetic types: hydrothermal and less popular contact-metasomatic. The first of these types is represented by nickel-cobalt arsenide, copper-cobalt sulfoarsenide, cobalt-copper sulfoarsenide-fahlore and bismuth-sulphosalt cobalt-bearing vein ore formations, and the second – cobalt-sulfoarsenide skarn, sulfoarsenide-magnetite cobalt-bearing scarn and sulfoarsenide cobalt-bearing listvenite-beresite ore formations. Cobalt ore deposits are usually limited to interblock zones locking activated areas of deep faults, or to splits of confirmed blocks basement. Therefore abundant arsenide nickel-cobalt ores are of some industrial interest, they are concentrated in ore clusters and intersection areas of zones of deep and large regional faults with a huge history of geological development, complex and differentiated intrusive magmatism and intense hydrothermal-metasomatic transformations.

Keywords: cobalt-bearing structures, ore controlling faults, ore clusters, genetic types, mineral parageneses, hydrothermal solutions, Paleo-Asian ocean, stratiform polymetallic.

FEM MODEL OF VIBRATION PROPAGATION IN THE SOIL CAUSED BY PREFABRICATED DRIVEN PILES

PhD Marian Łupieżowiec,
PhD Stefan Pradelok,
PhD Piotr Bętkowski,
MSc. Grzegorz Poprawa

Silesian University of technology, Gliwice, **Poland**

ABSTRACT

This paper discusses the analysis of vibration propagation in the subsoil in relation to the finite element method. Theoretical analyses of the problem mentioned in the title are of key importance in the design of geoengineering technologies involving impacts. These technologies involve prefabricated driven piles, which are extremely effective and readily used, especially in bridges. In order to rationally use the impacts in construction works, the extent of the impact and the magnitude of acceleration amplitudes generated in adjacent objects or engineering structures should be determined at first.

The most important factor influencing the propagation of impacts is the phenomenon of damping of the propagating wave in the ground. The mechanism of damping proposed by Rayleigh was used in the analysis, which, when selecting the appropriate parameters of the model, is able to realistically simulate the observed phenomena. Ground, in which the propagation of impacts occurred, was described with the use of linear- elastic model. Modules of deformation correspond to the values of small deformations, which occur at the wave propagation in the subsoil. The impulse causing vibrations was caused by the falling hammer on the driven pile. The axial symmetry of the border condition was used in the analyses.

The results of numerical simulations were compared with the results of field measurements of accelerations at different distances from the source of vibration. These results were the subject of another paper published at this conference. The obtained results will be used in the future to assess the extent of the impacts on the environment and values of acceleration on elements located in the vicinity of the structure.

Keywords: FEM dynamic analysis, technological impacts, vibrations of the ground substrate

FILTRATION MODEL OF OPALIZED VOLCANIC TUFFS

Dr. Krsto Blazev[1]

Dr. Marjan Delipetrev[1]

MSc. Blagica Doneva[1]

Dr. Todor Delipetrov[1]

MSc. Gorgi Dimov[1]

[1] Faculty of natural and technical sciences, University of Goce Delcev, **Republic of Macedonia**

ABSTRACT

This paper shows main physical - mechanical characteristics of tuff as a material useful for making filters. Important feature of the tuff is that, chemically, is very stable material, it is composed of SiO2 which not react with water, it doesn't lose its weight and not releases harmful and hazardous organic and inorganic substances.
Briefly are described fundamental physical phenomena briefly explained the fundamental physical phenomena that define the filtration as mechanical retention of particles, sedimentation, adsorption and absorption.
Presented is mathematical model for making filter from this material, and application in the two-layer filters in combination with quartz sand as a bottom layer and active carbon as a surface layer. In this type of filters, active coal has the function of removing chemical and biologic contaminants. In the model is defined needed height of the filters fillers, hydraulic resistance in the filter layers, drop of pressure through the filter layers, or defined are all needed parameters for making real filter.
This model is tested in laboratory and real conditions.

Keywords: tuff, filter, mathematical model, layer, parameters

FINISHING SURFACE INFLUENCE ON STONE THERMAL BEHAVIOUR

Prof. Dr. Maria Matilde Costa e Silva

Prof. Dr. Paula Falcão Neves

Dr. Gustavo Paneiro

DECivil/CERENA, Instituto Superior Técnico, Universidade de Lisboa, **Portugal**

ABSTRACT

Stone has been fundamental in construction since the beginning of civilization. Proper selection of rock materials contributes positively to environment by saving energy. Actual legislation is mandatory in what concerns Buildings Energetic Certification. Therefore, it seems relevant to discuss some thermal parameters as technological parameters. The purpose of this work is the evaluation of the rock finishing textures influence on heat transfer by temperature rate changes analysis along time. A comparative thermal behaviour analysis with different surface finishing was made. For this purpose common ornamental Portuguese stones used in building were tested for different types of finishing. Tests description is made, results are analysed, and some conclusions are presented.

Keywords: Rock triaxial test, Porosity, Permeability, P-wave velocity

FOUNDATION SOLUTION FOR INCREASING THE BEARING CAPACITY OF THE FOUNDATION GROUND USING GEOGRIDS

Lecturer Dr. Eng. Alexandra Ciopec[1]

Assoc. Prof. Dr. Eng. Ioan Petru Boldurean[1]

Assist. Dr. Eng. Luiza Roman[1]

[1] Politehnica University Timisoara, Civil Engineering Faculty, Department of Land Communication Ways, Foundations and Cadastre, **Romania**.

ABSTRACT

The appearance of new materials in the field of construction works lead to the use of those new materials, the object of this paper being the use of geosynthetics. These materials have many applications in the field of earth and infrastructure works. Function of the destination and the purpose of their use, geosynthetics can be classified into three categories. The first category consists in geotextiles used to assure the drainage of the water contained by the soils. The second category is that of geomembranes used especially in the construction of ecological waste landfills. The third category is represented by geogrids used as reinforcement elements in reinforced earth structures. Their aim is to assure an increase of the bearing capacity and the stability of the reinforced earth structures, respectively to reduce their deformations (settlements). The geogrids used as reinforcements overtake the tension stresses, respectively the shear stresses that appear in the soil masses. The paper presents the calculus of the bearing capacity for a shallow foundation of an industrial hall, placed on a site with a reduced ground bearing capacity. This foundation is placed on a granular material cushion reinforced with geogrids. The geogrids were placed on four levels under the foundation block. The calculus of the foundation system had two calculus steps. In the first step was calculated the necessary lateral extension of the geogrids beyond the foundation block edges. The second step consisted in the calculus of the bearing capacity of the reinforced fill granular material placed below the foundation.

Keywords: geosynthetics, bearing capacity of the foundation ground, reinforced earth structures, active zone, granular material cushion

GEOCHEMICAL FACTORS OF SOCIALLY-ECONOMICAL RISKS IN NORTHERN EURASIA

PhD Tatyana Baraboshkina
Stud. Anastasia Kuznatsova
Lomonosov Moscow State University , **Russia**

ABSTRACT

Natural disasters fall into the following types based on their characteristics, management and mitigation system. The most considerable hazards are listed below: 1. Flood; 2. Earthquake; 3. Pollution; 4. Harvest loss; 5. Forest cutting; 6. Shortage of quality of water resources. Hazardous areas are susceptible to erosion, slides, earthquakes, or other geological processes. These are regions of Northern Eurasia where mineral deposits are spread are deu to the most rigid ecogeochemical conditions. The health and safety of citizens are endangered by commercial, residential, or industrial development inappropriately sitting in hazard prone areas. The geological factors (of naturally or technogenically transformed lithosphere), organisms are forced to adapt to are possible to consider as ecological-geological risk factors (ERF). They cause various diseases, oppression life of phyto-, zoo- and microbocoenoses. Nowadays the majority of ERF investigators allocate paramount importance of studying negative effect of technogenic (geochemical, geophysical) factors. The geoindicator concept is a result of researchers' significant contributions. This method can be an improvement of the natural fluctuations prevalence and the difficulty of separating them from human-induced environmental change. This paper is an attempt to introduce the role of geoindicators which might be useful to reduce risk of the disaster. Some geologic hazards can be reduced or mitigated by engineering, design, or modified construction. If technology fails to reduce risks to the stable level, such area will be unacceptable for development. Scientists can help mankind to realize the importance and complexity of natural landscape change.

Keywords: geological factors, georisk, ecological risk, disaster

GEOLOGICAL PROFILES AS EFFICIENT MEANS FOR EXPOUNDING RESULTS PROVIDED BY HYDROGEOLOGICAL MODEL OF LATVIA

Dr.sc.ing. Aivars Spalvins,, Dr.sc.ing. Janis Slangens,
Dr.geol. Olgerts Aleksans, Inta Lace, Kaspars Krauklis
Riga Technical University**, Latvia**

ABSTRACT

In 2010-2012, scientists of Riga Technical University (RTU) have developed the hydrogeological model (HM) of Latvia (LAMO). LAMO represents the active groundwater zone of Latvia, as the source for providing drinking water. LAMO covers the area of 475km×300km and includes 27 geological layers; the plane approximation step is 500 meters. In 2013, the first practically important results have been provided by LAMO. The set of hydrogeological maps has been prepared to update the current water management plans for Latvia. For aquifers, maps of groundwater head and infiltration flow distributions have been prepared. Numerous maps for geological profiles have been obtained, because they are the most informative ones. To obtain correct maps for the profiles, it was necessary to develop a new interpolation method accounting for different comportment of the isolines within aquifers and aquitards of LAMO. Customary methods of making the isoline distributions for profiles result in wrong designs due to ignorance of this unlikeness. Theory of the proposed interpolation method is considered and results of its practical appliance are reviewed.

Keywords: hydrogeological model, hydrogeological maps, geological profiles, interpolation of data

GEOPHYSICAL IN URBAN AREAS

Z.M. Slepak,
D.K.Nourgaliev,
E.V.Utemov
Kazan Federal University, **Russia**

ABSTRACT

For the first time in the world practice, geophysical monitoring in urban conditions of the Kazan Kremlin was made. Negative impact of ground and technogenic waters on the architectural monuments, buildings and fortification walls were revealed. This results have turned helpful for reconstructions and repairs buildings of the Kazan Kremlin.

Keywords: architectural monuments, engineering geophysics, ground waters, geophysical monitoring, archeology

GEOTECHNICAL DESIGN AND MONITORING OF A DEEP EXCAVATION. COMPARISON BETWEEN MEASUREMENTS AND CALCULATION

Assoc. Prof. Dr. Eng. H. Popa

Prof. Dr. Eng. L. Batali

Prof. Dr. Eng. S. Manea

Technical University of Civil Engineering of Bucharest, Geotechnical and Foundations Department, **Romania**

ABSTRACT

Designing high buildings, with 10 – 20 stories aboveground and several underground stories in dense urban areas supposes deep excavation enclosures, having neighboring structures at the property limit. Designing and building such works imply a series of activities which have to be lead and controlled rigorously from technical and scientific point of view.

Paper presents the authors' approach for a case study, starting from the geotechnical investigation of the site, mathematical modeling and design, to the building survey, monitoring and model validation. The case study presents 2 office buildings with 8 – 15 stories, with a common basement developed on 4 underground levels, leading to a 15 m deep excavation. Paper presents the geotechnical conditions and parameters issued from in situ and laboratory tests.

Working enclosure has been designed using diaphragm walls. The chosen working technology was the "top – down" method and the calculations have been performed accordingly. The numerical modeling has been performed using both reaction coefficient and finite element methods.

The execution is accompanied by a rigorous monitoring program for the enclosure and for the neighboring buildings, including piezometers, inclinometers within the diaphragm walls, topographic marks for horizontal and vertical displacements of the walls and buildings. The paper presents how the measurements were used to validate the modeling hypotheses, according to technological phases.

Keywords: deep excavation, retaining wall, numerical modelling, experimental measurements

GLOBAL ANALYSES OF BOTTOM SEDIMENTS OF THE TRANSFLUENT DRINKING WATER RESERVOIR GOCZAŁKOWICE, POLAND

Assoc. Prof. Dr Beata Kozłowska, Prof. Dr Grażyna Chełkowska,
Prof. Dr Ewa Talik, Dr Anna Bajorek,
Assoc. Prof. Dr Artur Chrobak, Dr Joanna Klimontko,
Dr Agata Walencik, Prof. Dr Alicja Ratuszna

Institute of Physics, University of Silesia, Katowice, **Poland**

ABSTRACT

The transfluent drinking water reservoir Goczałkowice has served as a model basin for several different studies that have permitted an estimation and prognosis of the short-term and long-term changes that have occurred in it.

This work presents studies using the physical-chemical spectroscopic methods to investigate bottom sediments that were taken within a period of one year in the spring, summer and autumn, and at particular points of water intakes. Winter sampling was not possible since the reservoir was covered with a layer of ice, which prevented a boat from being launched.

The identification of elements that were included in the material was done using the X-Ray photoelectron spectroscopy and the X-ray diffraction measurements to determine the chemical compounds, while the magnetic properties of the samples were examined using a Superconducting Quantum Interference Device magnetometer. Moreover, the activity of radioactive elements was determined using nuclear spectrometry techniques. Finally, the Scanning Electron Microscopy was used for microstructural observations and a microcompositional analysis of the studied samples.

The experimental data that was obtained permitted a global description of the bottom sediments of the water reservoir depending on the season of the year during which the intake was performed or the place from which the samples were collected. The investigations were very important since this transfluent reservoir in Goczałkowice serves as the drinking water basin for the post-mining area populated by 3.4 million inhabitants.

Keywords: XPS; XRD; SQUID; nuclear spectrometry techniques; SEM/EDX.

GROUNDWATER LEVEL REGIME IN THE FORELAND OF THE MALE KARPATY MOUNTAINS, SLOVAKIA

Dr. Dagmar Stojkovova, MSc. Sona Smidovicova, MSc. Dana Vrablikova,

Prof. Dr. Miriam Fendekova, Assoc. Prof. Marian Fendek

Comenius University in Bratislava, Faculty of Natural Sciences, **Slovakia**

ABSTRACT

The main aim of the study was to evaluate temporal element of groundwater regime formation in Quaternary and Neogene sediments of the Danube lowland in the area adjacent to Male Karpaty Mts., Slovakia. Data on groundwater heads in five observation wells and yields of one spring located along the Male Karpaty Mts. foreland and climatic data in five stations in Male Karpaty Mts. and in its foreland were used in the study. Data were statistically processed. Because of skewed frequency distribution of the most of them, Spearman rank correlation was used to identify the mutual relationships. Cross-correlation method was also used to identify the delay of groundwater head fluctuation and spring yields after the precipitation events.

Keywords: groundwater level, regime type, inflow retardation, statistical methods

HAZARD MITIGATION STRATEGY ON TERRITORIES WITH DEEP LANDSLIDES

Ph.D. Andrey Kazeev, D.Sc. German Postoev, Ksenia Fedotova

Sergeev Institute of Environmental geosciences RAS, Moscow, **Russia**

ABSTRACT

The article contains scientific explanation of effective reinforcement of territories with deep block-type landslides. The suggested protection strategy bases on theoretical solutions of preparing of a destructive phase of landslide deformations, on taking into account mechanism peculiarities of deep block-type landslide development, and also on investigation experience of such landslides in different engineering-geological conditions.

Keywords: deep block-type landslides, mechanism, reinforcement measures.

HIGHWAY DAMAGES IN VIETNAM DUE TO GEOTECHNICAL CAUSES AND TECHNICAL SOLUTIONS TO AVOID THEM

Assoc. Prof. Dr. Giang Nguyen[1, 2]
[1] University of Žilina, **Slovak Republic**
[2] University of Bielsko-Biela, **Republic of Poland**

ABSTRACT

The paper deals with damages of highway section Ho Chi Minh City - Trung Luong in South Vietnam due to geotechnical causes. Main damages are located in places next to culverts and bridges abutments which are founded on piles while embankments next to them are founded on soft soils. The reasons of highway damages are not only complicated engineering-geological conditions (soft soils with big and variable thickness) but also not taking into account influence of pavement load and traffic load on deformation of soft soils. It is shown, that higher values of allowable settlement (residual settlement) up to 30cm for the highway with speed 120km/h enable quick and cheap highway construction but such practice not only requires more means for highway maintenance and operation but also has bad impact on transport safety. The paper also introduces the temporary regulations of the Ministry of Transport of Vietnam on technical solution for transition section between road and bridges (culverts), by application of which damages should be avoided.

Keywords: embankment, soft soils, residual settlement, prefabricated vertical drain, sand drain.

HYDRODYNAMIC CONDITIONS OF AQUIFERS SYSTEMS FROM SOUTHERN SLOPE OF BUCEGI MASSIV, ROMANIA

Dr. Alexandru Istrate

Dr. Mădălina Nicoleta Frînculeasa

Departament of Geography, Faculty of Humanities, University Valahia of Târgovişte, **România**

ABSTRACT

Geo-structural region taken under study is located on the southern border of Bucegi Mountains immediately to the north of a major tectonic nature contact, marked by overthrust fault, after which Central-Carpathian unit mounts over internally flysch unit.

A stack thick sediment accumulation has occurred in the conditions of initiation of collision, which Carpathian foreland from South and East down under the intra-Alpine plate, when a marine border is formed with a relatively narrow shelf and a continental slope which leading down to fore-syncline, that opened outside the Carpathian arch.

Sedimentation occurred in the conditions of a high cliff consists of a coating of Jurassic deposits and probably Triassic, which stayed directly on crystalline basement. Thus, in the shelf perimeter, on the Lower Cretaceous level was accumulated, under marine transgression conditions, a stack of detrital deposits like breccia, sandstones and conglomerates, totaling over 1500 m in thickness. Outside, on the continental slope and into the fore-syncline were accumulated rhythmic flysch deposits totaling 2500 m in thickness.

Analyzed aquifer systems are located on the outer edge of the shelf, where on the synclinore level expressed in the crystalline foundation consisting of two syncline folds, form the structure of Raciu, Piscu cu Brazi, and Orlea mountains, from Ialomita – Dâmboviţa interfluve.

The filling of the two folds was made under transgressive conditions, the sedimentation debuting with calcareous breccia and continuing with sandstones and conglomerates.

To determine the hydrodynamic conditions in the confined aquifer systems from Raciu - Piscu cu Brazi synclines were combined geological and geophysical methods of investigation, into a tectonic juncture complicated by major longitudinal and transverse faults.

Thus, it could be highlighted the role of crustal fault along the Ialomita valley which serves as a contour condition and divide on the syncline level two independently hydrodynamic aquifers systems. However, geophysical investigations allowed the determination of other boundary condition, namely, the thickness of the aquifer along the Ialomita valley, which made it possible to assess the potential of the underground aquifer. This allowed quantitative assessment of groundwater structures to develop projects for capacity expansion of water supply for downstream communities.

Keywords: subduction fault, shelf, continental slope, fore-syncline, syncline, aquifer system, hydrodynamic conditions, contour condition, aquifer potential.

HYDROGEOCHEMICAL CHARACTERISTICS OF VOLCANOCLASTIC SEDIMENT COMPLEX AND IMPACT OF NATURAL RADIONUCLIDES ON THE ENVIRONMENT OF VRANJSKA SPA

Milka Vidovic[1], Vojin Gordanic[1],

Vesna Spasic-Jokic[2], Ivana Trajkovic[1],

Vladimir Petrovic[1]

[1]University of Belgrade, Institute of Chemistry, Technology and Metallurgy, Department for Ecology and Technoeconomics, **Serbia**
[2]University of Novi Sad, Faculty of Technical sciences, **Serbia**

ABSTRACT

Based on the results of Aerogamma spectrometric examination of morphological and geological-structural analysis, for explore the content of natural radionuclides in groundwater and surface water, the basin of Vranje area (Southern Serbia) was selected. On the area of 500 km^2, the samples were collected from springs, wells, boreholes and surface flows. The water contents were determined by U, ^{226}Ra, ^{222}Rn, gases (O_2, CO_2, H_2O), anion-cation composition, trace elements, pH value, Eh, Ec, water hardness and mineralization. Data analysis was performed according to the geology, in volcanoclastic sedimentary and metamorphic complex of the area of Vranjska Spa-Leskovac.
In the area of Vranje Spa anomalous uranium content in groundwater and surface water, and mineralization in the volcanoclastic sediments have been identified. The warmest water source in borehole with temperature of 91-93 ºC is located in the area of Vranje Spa.
The research results will be shown with tables and geochemical map 1: 50000.

Keywords: hydrogeochemistry, radionuclides, uranium (U), radium (^{226}Ra), radone (^{222}Rn), springs, wells, surface flows, volcanoclastic sediments, metamorphic co

IDENTIFICATION OF ALKALI-SILICA REACTIONS IN SANTA MARIA ISLAND AIRPORT

Msc Sara Medeiros[1]
Assistant Prof. Dr. Isabel Fernandes[2]
Assistant Prof. Dr. João Nunes[1]
[1] Universidade dos Açores, Departamento de Geociências, Ponta Delgada, Açores, **Portugal**
[2] DGAOT/FCUP, Centro de Geologia da Universidade do Porto, Porto, **Portugal**

ABSTRACT

Volcanic rocks have been found to be the cause of concrete deterioration in several countries (Argentina, Iceland, Japan, New Zealand and Turkey), due to the occurrence of alkali-silica reactions. Alkali-silica reaction (ASR) is a deterioration phenomenon that occurs between alkaline (Na^+ and K^+) and hydroxyl (OH^-) ions in the cement and certain reactive forms of silica in the aggregates. The reactivity of volcanic rocks is usually associated with the presence of dacitic or rhyolitic volcanic glass (SiO_2>62-65%), altered minerals and the occurrence of free silica forms such as opal, tridymite and cristobalite.

The characterization of the reactivity of Azores volcanic aggregates has been implemented through the research project ReAVA (Characterization of Potential Reactivity of the Volcanic Aggregates from the Azores Archipelago: Implications on the Durability of Concrete Structures) that comprises mainly the petrographic assessment of the aggregates. The petrographic study of the aggregates is complemented by petrographic examination of samples from large structures in order to confirm the potential reactivity of the aggregates. In Santa Maria Island a program was carried out to produce thin sections from: (1) rock samples of two quarries of the island and (2) concrete core samples from the local airport pavement.

The petrographic examination and the geochemical analyses of the two rock samples showed a significant alteration of both rocks. The examination of the concrete thin sections showed that the sand fraction is mainly composed by volcanic glass and that the cement paste has almost completely been replaced by an alkali-silica gel, as confirmed by scanning electron microscopy.

Keywords: volcanic aggregates, alkali-silica reaction, petrography, Azores

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Msc Sara Medeiros[1]
Assistant Prof. Dr. Isabel Fernandes[2]
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[1] Universidade dos Açores, Departamento de Geociências, Ponta Delgada, Açores, **Portugal**
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Keywords: volcanic aggregates, alkali-silica reaction, petrography, Azores

IMPACT ASSESSMENT OF PROPOSED UNDERGROUND RAILWAY LINE IN BRATISLAVA ON GROUNDWATER REGIME

Ing. Dana Baroková, PhD.

Slovak University of Technology in Bratislava, Faculty of Civil Engineering, Department of Hydraulic Engineering.

ABSTRACT

A connection between the airport and railway network is planned as part of the improvement to the transport infrastructure in the Bratislava Region. One section should be built in an underground tunnel along the Carpathian Mountains and it will affect the groundwater flow regime. This was the rationale behind a 2-D finite element numerical model for evaluating the impact of the railway tunnel on the groundwater level regime as well as for introducing technical measures to minimise the impacts. This model was developed and the results show the analysis and prognosis as well as the options for controlling the groundwater level regime in the aquifer affected by the tunnel construction.

Keywords: surface and groundwater interaction, vertical cut-off wall, numerical modelling, finite element method

IN-SITU TESTING OF VIBRATION PROPAGATION WHILE DRIVING THE PREFABRICATED PILES

PhD Stefan Pradelok[1]

PhD Marian Łupieżowiec[1]

PhD Piotr Bętkowski[1]

MSc. Adam Rudzik[1]

[1] Silesian University of Technology, **Poland**

ABSTRACT

This paper presents results obtained with the use of accelerometers during in-situ testing. Horizontal accelerations of propagating impacts caused by driving the prefabricated piles were recorded. Range of the shocks as well as amplitudes of longitudinal and transverse horizontal accelerations of propagating vibrations on the terrain surface were determined. This paper presents only the field tests results of vibration propagations caused by the shocks induced by pile driving near the road bridge. The recorded results were used to calibrate the numerical model of the finite element method. A good consistency of acceleration amplitudes in the direction of vibration propagation was achieved and it depended on the distance from location of the driven pile. The results of numerical analyses of wave propagation in the ground will be presented in another paper at this conference.

Keywords: pile driving, technological shock, ground vibrations, field tests

INCREASING THE STABILITY OF EMBANKMENT IN LANDSLIDE AREA

Prof. Dr. Peter Turček

Dr. Monika Súľovská

Slovak University of Technology in Bratislava, **Slovakia**

ABSTRACT

Shortly after finishing of highway construction started cracks on pavement. Using results from additional engineer-geological investigation was identify the sliding plane and after that were made the analysis of embankment slope stability and its subgrade. Results from stability evaluation were input data to design of pile wall with anchors for supporting the embankment. After 5 years is possible submit that maintenance works were successful.

Keywords: embankment of highway, failures, slip plane, stability of slope, pile wall

INDICATORS FOR KARST PROCESSES EVALUATION

Assoc. Prof. Ruslan Sharapov [1]

[1] Murom Institute of Vladimir State University, **Russia**

ABSTRACT

Karst processes have a significant impact on the safety of civil and industrial facilities. Actual tasks are objective assessment of karst hazard of a particular territory and reducing to a minimum the probability of catastrophes on newly constructed buildings caused by the development of karst processes. The paper presents a system of indicators used for monitoring and evaluation of karst processes. It details the quantitative indicators of the surface forms of karst processes, undersurface karst processes and underground hydrology displays. The indicators characterizing the surface forms of karst processes include the following: karst area infestation rate, karst form intensity rate, average frequency of karst formation, areal rate of karst area infestation, the average annual rate of karst area infestation, the volumetric rate of karst infestation, karst formation volume factor, an average annual expansion of karst area, the depth and the diameter of specific karst forms, indicator of the sinkholes depth, the rate of karst expansion size. The indicators characterizing the underground forms of karst processes are: the linear coefficient of internal karst formation, the linear coefficient of external karst formation, the linear coefficient of the total karst formation, the linear coefficient of surface karst formation, the abnormality coefficient, the linear density of karst cavities, the areal density of karst cavities, the volume density of karst cavities, karst processes activity rate, the total deposition of study area, the dissolution layer rate. The indicators characterizing the hydrological regime of the area involve the groundwater level, the rate of groundwater flow, the groundwater temperature, the chemical composition of groundwater, filtration rate of groundwater, fluctuations rate of karst springs flow rate, underground karst denudation, water saturation deficit of calcium sulfate, fluctuation rate of karst water mineralization, activity production of calcium and sulfate, calcium and carbonate, the leaching gradient.

Keywords: karst, karst processes, monitoring, evaluation, groundwater.

INFLUENCE OF FROZEN AND UNFROZEN WATER IN ROCK PORES ON ROCK EXPANSION AND DETERIORATION

Martin Ondrasik, Miloslav Kopecky, Martin Brcek

Slovak university of Technology, **Slovakia**

ABSTRACT

Rock aggregates or dimensional stones as any other material used for buildings starts to deteriorate when exposed to processes of exogenous forces. The most outstanding is frost, especially repeated freezing and thawing. This process deteriorate rocks by way which is not explained sufficiently yet. The article presents results of extensive research performed on 88 rock samples focused on relationship between rock pore structure, thermodynamic properties of pore water, rock expansion on freezing of pore water and resistance of rock aggregates against frost. The results of the research proved importance of pore structure and thermodynamic properties of pore water for rock frost resistance. Rocks in which pore water did not freeze at temperature -20°C and have no frost expansion have high degree of saturation and high weight lost on freeze-thaw test. On the contrary, largest frost expansions have rocks which have low degree of saturation and large open pores. It was proved, that expansion of rocks on freezing has no influence on rock frost resistance. It is rock pore structure which must be known to understand the rock deterioration on freezing.

Keywords: rock deterioration, adsorbed water, absorbed water freezing, rock porosity, freeze-thaw loss

INFLUENCE OF SAND PHYSICAL PARAMETERS ON LIQUEFACTION PHENOMENON

Assoc. Prof. Dr. Eng. Manole – Stelian Şerbulea

Eng. Niculescu Alexandru, MSc. PhDC

MSc. PhDC Priceputu Adrian,

Eng. Cosmin – Victor Roşu, MSc. PhDC

Technical University of Civil Engineering Bucharest, **Romania**

ABSTRACT

The term "spontaneous liquefaction" was first used by Terzaghi in 1948 to indicate sudden loss of bearing capacity in young saturated sand deposits, caused primarily by small amplitude earthquake vibrations.

Total loss of bearing capacity for a foundation soil is a very important aspect, which has to be taken into account when dealing with a dynamic analysis. Along a period of 3 decades, the procedures for determining the liquefaction potential have evolved significantly, since the the basic approach of Seed and Idriss.

The article aims to present a laboratory study on two different types of sand, having the maximum loose particle arrangement obtained, with the aim of establishing a link between the secant modulus of deformation $\mathbf{E_d}$ and three other load related parameters: confining pressure $\boldsymbol{\sigma_3}$, force amplitude and frequency, in order to define sand liquefaction.

Keywords: Liquefaction, uncohesiv, triaxial

RETAINING WALL - NEIGHBOURING SHALLOW FOUNDATION INTERACTION. NUMERICAL MODELLING

Assoc. Prof. Dr. Eng. H. Popa[1]
Prof. Dr. Eng. L. Batali[1]
Assist. Prof. Eng. I.V. Neagoe [1,2]
[1] Technical University of Civil Engineering of Bucharest, Geotechnical and Foundations Department, **Romania**
[2] Faculty of Architecture, Spiru Haret University, Bucharest, **Romania**

ABSTRACT

Diaphragms walls are often used for supporting deep excavations, especially in urban areas. The correct estimation of their behaviour is very important taking into account the impact on the neighbouring buildings. Despite their large use, the retaining structures are among the most complex engineering works. Construction of retaining structures requires alternating various types of stages (excavation, anchorage tensioning, loading etc., each one influencing the next stages and the overall structure behaviour. This behaviour is also related to the soil – wall interaction.

The paper presents some numerical modelling results using FEM for an embedded wall at the proximity of a strip footing. Two aspects were taken into account: the influence of the excavation on the neighbouring foundations and the effect of the foundation load on the behaviour of the retaining wall.

Different parameters of influence were considered: soil nature, distance between the retaining wall and the strip footing, foundation depth and width. The validation of the finite element model and of the numerical results was based on the comparison with experimental data obtained by centrifuge tests.

Keywords: retaining wall, strip foundation, numerical modelling

INTERPRETATION OF CPT TESTS IN HOLOCENE DEPOSITS.

CASE STUDY URLATI-ROMANIA

Assoc. Prof. Dr. Mihaela Stãnciucu

Faculty of Geology and Geophysics /University of Bucharest, **Romania**

ABSTRACT

The Cone Penetration Test (CPT), have become in the last decades, a versatile instrument for subsurface geotechnical investigations, which provide a large amount of information about the soils. Correlations between CPT data and soil parameters obtained through other tests are worldwide spread but their accuracy and applicability depends on local geological conditions: age of formations, degree of consolidation, source area of sediments, mineralogical composition, etc. This paper presents some comparisons between CPT results and laboratory tests or SPT tests executed on the same location in Romania, Prahova County, Urlati town. The sequence consists in Holocene alluvial deposits (alternances of cohesive and uncohesive layers), which was geotechnical investigated with boreholes up to 30m and with CPT on 15m depth. The investigation was completed with common laboratory test (granulosity, oedometric and direct shear tests) which offered a comparison base for the correlations sustained by the main formulas cited in the scientific literature. Results obtained may be considered representative for subconsolidate shallow deposits in foreland areas.

Keywords: consolidation, CPT, SPT.

KARST SINKS OF THE PERM REGION (THE WESTERN URAL)

Prof. Valerii Kataev

Irina Ermolovich

Perm State National Research University, **Russia**

ABSTRACT

Perm region is not only well-known as one of the regions of the classical lithological types of karst (carbonate, sulphate and chloride) development, but also as territory of displays of cement dissolution (in passing with siffosion) in terrigenous rocks of the Permian system. It is territory where the karst deposits quite often considered as independent karst thickness are widely distributed, e.g. karst breccia and karst-landslide formation. On the karsted territories (up to 25 % of the area of region) the basic karst deformations of a surface are widely distributed. Karst deformations are represented by karst sink-holes, sinks, local and the common subsidence. The mechanism of their formation and its kinds are distinguished by complexity and a variety. The analysis has shown, that 70% of catastrophic situations are connected with the sulphate karst, 25-30% with carbonate, individual, but the most scale on destructions with chloride. In sulphate and chloride karst the catastrophic phenomena carry, as a rule, sinking character. In carbonate karst sink-holes are rare, arise subsidences are more often. In any case, distribution of catastrophic karst phenomena occurs according to geological-structural features of the massifs, but intensity and speed of process in each case is caused by type and intensity of technogenetic changes of the natural environment. It is possible, that at absence of technogenetic influences karst sink-holes would be shown in scale of geological time.

Keywords: region, karst sink-hole, factors, karst hazard

LANDSLIDE HAZARD CRITERIA FOR TRANSPORTATION SAFETY OF THE 2014 OLYMPICS IN SOCHI

Ph.D. Andrey Kazeev
D.Sc. German Postoev
Ksenia Fedotova

Sergeev Institute of Environmental geosciences RAS, Moscow, **Russia**

ABSTRACT

In preparation for the 2014 Winter Olympics in Sochi, a new road that combine highway with railway was constructed between Adler and Krasnaya Polyana. The combined road further goes on to the Alpika-Servis train station. It passes the valley of the river Mzymta. It is one of the most important objects in transportation infrastructure for the 2014 Olympics in Sochi. Olympic structures such as ski jumps, alpine skiing tracks and etc. are situated in the mountainous part of Sochi.

The goal of our study was to identify monitoring technologies and criteria for landslide hazard assessment for effective early-warning monitoring of the combined road. The aim of this monitoring system is to support the transportation safety for the 2014 Olympics in Sochi.

The results of the research have shown that as primary monitoring instrumentations should be used horizontal extensometers and inclinometers. They provide the highest accuracy of landslide deformation measurements. The criteria for landslide hazard assessment were developed on basis of 2010-2013 monitoring results. Mechanisms of landslides in the region have also been taken into account.

Keywords: landslide hazard, early-warning monitoring, geotechnical instrumentation, Sochi.

LIQUEFACTION PROBABILITY IN BUCHAREST AND INFLUENCING FACTORS

Dr. Andrei Bala[1]

Dr. Dieter Hannich[2]

Dr. Dominik Ehret[3]

Dr. Gerhard Huber[4]

[1] National Institute for Earth Physics, Bucharest-Magurele, **Romania**
[2] Karlsruhe Institute of Technology (KIT), **Germany**
[3] Geological Survey of Baden-Wuerttemberg, Freiburg , **Germany**
[4] Karlsruhe Institute of Technology (KIT), Inst. of Soil and Rock Mechanics, **Germany**

ABSTRACT

Bucharest, the capital of Romania with about 2.5 million inhabitants, is frequently struck by intense, damaging earthquakes (in recent years in 1940, 1977, 1986 and 1990). In 1995 a Collaborative Research Center 461 (CRC-461) entitled: "Strong Earthquakes - a Challenge of Geosciences and Civil Engineering" was established in July 1996 and ended in December 2007. It was funded by the German Research Foundation and supported by the State of Baden-Württemberg, as well as the University of Karlsruhe (TH), actually Karlsruhe Institute of Technology (KIT). The CRC aimed strategic research in the field of strong earthquakes with regional focus on the Vrancea seismic events in Romania. Between 1995-2007 several research works were done in Romania, with the support of several Romanian research institutes and the University of Bucharest. One of the research questions was, if liquefaction can occur during strong earthquakes within the shallow sandy layers in Bucharest. As known, strong earthquakes can cause, under certain geologic conditions, liquefaction and therewith ground failure as sand boils, lateral spreading, or differentiated subsidence. Thus in 2005 a research work begun to analyze the liquefaction risk for Bucharest. For this purpose, at 10 representative sites in Bucharest, Seismic Cone Penetration Tests (SCPTu) were executed. An area-wide evaluation of the liquefaction probability in Bucharest was established. The "factor of safety" (F_s) against liquefaction and the "probability of liquefaction" (P_L) were computed from the obtained test-data. For the first time, maps of the "liquefaction potential index" (L_i) and of the "liquefaction severity index" (L_s) for Bucharest were outlined. These maps show how severe liquefaction phenomena can occur during strong Vrancea earthquakes in Bucharest.

Keywords: hydrogeologic conditions, liquefaction probability, maps of liquefaction hazard in Bucharest City, strong earthquakes.

MECHANICAL BEHAVIOR OF DESTRUCTURATED EXPANSIVE CLAY

Lecturer. PhD. Ernest Olinic[1]
Teaching Assist. PhD. Tatiana Ivasuc[2]
Professor. PhD. Sanda Manea[1]
[1] Technical University of Civil Engineering, **Romania**
[2] University of Agronomic Sciences and Veterinary Medicine, **Romania**

ABSTRACT

Clayey soils are very sensitive to environmental conditions, especially to variations in moisture content, temperature and vegetation. Cycles of drying-wetting and freezing-thawing influence the structure and texture of clays causing important damages. The aim of this study was to observe the changes appeared in the soil structure when a representative sample of clay was subjected to drying-wetting and freezing-thawing cycles. The simulations made in this study reveal the influence that destructuration have on the behavior of an unprotected embankment constructed from expansive clays or stabilized clays after a number of hydration-dehydration and freezing-thawing cycles. Also it was observed the variation on shearing strength parameters of destructurated clay. The study points out the importance of variation of moisture content and temperature in ensuring the stability of the slope areas.

Keywords: clay destructuration, drying-wetting, freezing-thawing, shear strength parameters

METHODS OF ENGINEERING GEOLOGICAL MODELS OF ROCK

MSc. Gorgi Dimov[1]

Dr. Krsto Blazev

Eng. Roberto Tosevski[1],

Dr. Todor Delipetrov[1]

MSc. Blagica Doneva[1]

[1] Faculty of natural and technical sciences, University of Goce Delcev, **Republic of Macedonia**

ABSTRACT

Model of the natural geological environment reflects all the important characteristics of the natural geological environment that are relevant to specific aspects of the problem that is studied or addressed. It represents a synthesis of the results of detailed field measurements and surveys, laboratory analysis, complex geophysical research and application of methods of mathematical statistics and probability theory.

Usually this method is used for the design of high dams, but this paper presents a good opportunity for this method to be promote for the exploration of mineral resources and the design of surface mines. The results of the tested parameters with different types on investigations usually show on engineering-geological sections and engineering-geological models.

To get to the stage on modeling on natural geological environment i.e. before we can produce engineering-geological sections and models, we must be well acquainted with the geological and engineering-geological characteristics of the area investigating.

Model of the natural geological environment are made in the form of engineering geological sections (EGC) and engineering geological models (EGM).

Engineering geological cross sections are made by different investigated parameters of the rock mass during the survey received a greater number of data (numeric or descriptive). In this particular case made engineering geological cross sections of three investigated parameters:

- Lithology parameter
- Cracking parameter
- Physical-chemical disintegration (quasi homogeneous zones)

Obtained engineering-geological models actually represent more parametric representation of condition of rocky massif, i.e. not made separate models for each parameter but on one common model are presented all tested parameters. The engineering-geological model clearly reflects all the important properties of the natural geological environment that are relevant to specific aspects of the problem being addressed.

Keywords: engineering geological cross sections (EGC), engineering geological models (EGM), lithology, cracking

MICRO-TO-MACRO SCALE GEOMECHANICAL CHARACTERISATION OF FAULT ROCKS

Ass. Prof. Dr Gattinoni[1]

Full Prof. Dr. Scesi[1]

Dr. Scorciolla[1]

[1] DICA - Politecnico di Milano, **Italy**

ABSTRACT

The goal of this study is to obtain a complete full-scale characterization of rock faults involved in the excavation works of the Brenner Base Tunnel, which crosses one of the main tectonic alignments of the alpine area, the Periadriatic fault. The characterization was carried out at different scale, from macro (through drillings and geomechanical surveys) to meso (lab tests on specimens) and micro-scale (through thin sections), in order to find a correlation between the different scales properties of the rocks. Finally, a relation between the voids ratio at the micro-scale and the fault rocks conditions at the macro-scale was pointed out by mean of the Geological Strength Index. As a result, using micro-scale properties, whose cost is much lower than the cost of geotechnical tests, good estimation of the fault rock strength was achieved, avoiding quite typical overestimation arising from the use of literature values.

Keywords: Brenner Base Tunnel, compressive strength, fault rocks, geomechanical classification, Italy, thin section.

MINE WATERS OF KOSVA FIELD OF KIZEL COAL BASIN DURING AND AFTER ITS OPERATION, FORCAST OF HYDROCHEMICAL REGIME OF MINE WATERS THAT ARE DISCHARGED ON THE SURFACE

Assoc. Prof.Dr. Aleksandr Imaykin

Perm State National Research University, **Russia**

ABSTRACT

The article considers the issue of mine waters' formation during and after the usage of Kosva deposit in Kizel coal basin. Rationalization for the possibility of using logarithmic regression equation is given for the prediction of changes of pollutant concentration in the mine waters of the man-made horizon.

Keywords: the Kizel coal basin, Kosva coal deposit, mine waters, man-made horizon, hydrogeological forecast.

MONITORING THE STABILITY OF THE ROCK MASS EXCAVATING OF UNDERGROUND PREMISES IN THE ORE BODY T1, JAMA BOR

Sladana Krstic[1]**,**
Milenko Ljubojev[1]**,**
Vesna Ljubojev[1]**,**
Dusan Tasic[1]**,**
Zoran Stojanovic[1]
[1] Mining and Metallurgy Institute Bor, **Serbia**

ABSTRACT

Results of geotechnical observations and measurements that are continuously performed in mining are used to verify the projected geotechnical characteristics of the rock mass. In situ geotechnical measurements were performed on the excavated levels of the ore body T1 (K-110, K-130 and K-145). This work is part of project No. 33021 "Research and monitoring changes in the stress-strain state of rock mass in-situ around Undergrounds facilities to develop models with special reference to Krivelj tunnel River and Pine pit", which is funded by the Ministry of Education and Science Serbia. As part of the monitoring during the excavation of ore in ore bodies T_1 and T_2 from November 2013 to February 2014 the engineering-geological mapped underground excavations.
The report was included in the mapping of underground excavation at elevations of K-110, K-130, K-145 in the ore body T_1. During the mapping of underground excavation at levels K-110, K-130 and K-145 ore body T_1 was carried out a detailed survey of mechanical discontinuities in the rock mass. Based on 186 measurements of elements falling on the levels of K-110, K-130 and K-145 was performed statistical analysis of ore body T_1. Graphical representation of engineering-geological mapping levels within the ore bodies is presented engineering-geological plans.
Results executive engineering geological mapping of rock mass underground dug the ore body T_1 (statistical analysis of the spatial orientation of the measured rupture), are partially mapped for each level and a total of mapping levels of the ore body T_1. At the level of K-110, statistical analysis of data sampled three systems of cracks: EP_1 24/70, EP_2 17/47 and EP_3 41/86. Cracks are mainly with plaster, rarely clay infill width of 2-5 mm, often with visible traces of movement (stretch marks). The meter area of observation is flat. A lot of present and minor cracks unfilled, rough walls, irregular schedules. There was one mylonitization zone along the fault with intensely degraded rock mass. They appear decametric zone large fissure of the rock mass. The level of K-130, Statistical analysis identifies four systems of cracks: EP_1 126/34, EP_2 42/49, EP3 205/50 and EP_4 322/75. The cracks are filled in with the dominant form of gypsum and clay widths up to 2 cm. It is often observed traces of movement (stretch marks). The participants were wider zone (zone large fissure) andesite in which there are fissures filled with clay. At the level K -145 Statistical analyses identifies four systems of cracks: EP_1 187/70, EP_2 143/43, EP_3 15/70 and EP_4 69/57. Cracks are generally tight with filling in the form gypsum and subordinate pyrite, up to 1 cm. There are also cracks filled with plaster and clay with visible traces of movement (stretch marks). Characteristic is the presence of faulting zone (width of up to 4 m), as well as the

presence of large multi-zone cracking. In these areas there is a drip (leak) of water from the ceiling of the underground excavation.
In general, the geological structure of the rock mass in the studied horizons largely homogeneous (andesite). Andesite massif is commonly silicified. In the areas of large fissures of the rock mass of hydrothermal alteration is the most common sulfatization (gypsum and/or anhydrite), while rarely present kaolinization and piritization. Results RMR rock mass classification defines the rock mass of underground excavation of the ore body in the T_1 class III (moderate rock).

Keywords: stability of the rock mass, geotechnical observations, in situ the measurements, underground premises

MORPHOLOGICAL FEATURES OF THE KOPAONIK MOUNTAIN - PART OF KOSOVO

Assoc. Prof. Dr. Shpejtim Bulliqi[1]

Assoc. Prof. Dr. Florim Isufi[1]

Msc. Bashkim Kastrati[2]

Msc. Hamdi Jaha

[1] Department of Geography, University of Pristina "Hasan Prishtina", **Republic of Kosovo**

[2] Hydro meteorological Institute of Kosovo, **Republic of Kosovo**

ABSTRACT

These mountains represent the most important morphological and morph-structural unit of the North East part of Kosovo. These mountains have a length of about 60 km between the jaw of Lebana in the South East and the borderline in North West, 10-30 km wide, and 1200-2000 m altitude, thus being characterized by a mountainous landscape with an average height. Generally, these mountains are characterized for an alpine landscape, with the great value of depth and density of fragmentation, which have defined morphological contrasts quite evident between the abruptness of the mountain ranges and divisive valleys quite deep. Under these conditions, the Kopaonik Mountains are distinguished for the features of a diversified landscape from the morphological and morphogenesis viewpoint, which are explained by the complex geological construction and quite different external morphogenetic phenomena. A special morphological role in these ranges has also played the tight combination of the scaly structure with over-positioning towards the South West, with those transverse in all their length, giving Kopaonik a block character in their morphological complexity.

Key words: Kopaonik Mountains, morphological, geological, alpine landscape

MORPHOMETRIC ANALYSIS OF RELIEF IN KARST AIMS

Assoc. Prof. Denis Zolotarev

Elena Drobinina

Perm State National Research University, **Russian Federation**

ABSTRACT

In this paper were applied methodical techniques of morphometric analysis of relief for the reveal of raised neotectonic blocks in order to determine their influence on the karst process. Allotment of raised blocks represents a multistep task, the basic elements of it is the cartographic models of orders valleys and base surfaces.

Keywords: karst forms, raised blocks, orders valleys, base surface

NATURAL RISK ASSESSMENT USING REMOTE SENSING DATA FOR CASE STUDY OF THERMOKARST HAZARD

Prof. Dr. Alexey Victorov
Dr. Veronika Kapralova
Dr. Timofey Orlov
Dr. Olga Trapeznikova
The Institute of Environmental Geoscience, **Russia**

ABSTRACT

Linear structures (pipelines, railways, roads) are highly developing at the permafrost zone of Russia. A lot of specific geohazards are there, including thermokarst. Risk assessment regarding as an impact probability for linear structures as a result of geological hazards is an urgent issue both from scientific and practical points of view.

Keywords: risk assessment, thermokarst, mathematical modeling, remote sensing

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NATURAL STONES' CHEMICAL COMPOSITION EFFECT ON THEIR HYGROSCOPIC ADSORPTION ABILITY

Assist. Prof. Dr. Ercan Emir

Eskisehir Osmangazi University, **Turkey**

ABSTRACT

In Anatolia, there has been a widespread usage of natural stones for various purposes. In every part of country, it is possible to come across with different type of stone buildings belong to different historical periods. In this study, it is aimed at finding the relationship between chemical composition and hygroscopic adsorption ability of these natural building stones. Hereby, this study was conducted on some different types of natural stones from Anatolia such as granite, basalt, travertine, limestone and tuff. Tuff is the one having most hygroscopic ability among these studied rocks and it is followed by granite and basalt. Chemical compositions of the studied rocks were obtained from X-ray spectrometer (XRF) analyses. The oxides existing in all of them (SiO_2, CaO, Fe_2O_3, MnO and SO_3) were compared with each other by simple regression analysis and it was concluded that there is only significant relationship between SiO_2 and CaO wt%. Furthermore, the oxides were compared with the physical properties of the studied rocks by simple regression analysis, and no meaningful relationship was obtained between physical properties and the oxides except for significant relationships between hygroscopic adsorption property and the oxides such as SiO_2 and CaO. Consequently, it is suggested that hygroscopic adsorption property has a significant relation with chemical composition of rocks, such as SiO_2 and CaO contents.

Keywords: hygroscopic adsorption, calcium oxide, natural stone

NEW TECHNOLOGIES IMPLEMENTED IN GEOTECHNICAL MONITORING ON TRANSPORT CONSTRUCTIONS

Assoc. Prof. Dr. Marian DRUSA[1]
Dr. Vlastimil CHEBEŇ [1]
Roman BULKO[1]
[1] University of Žilina, Faculty of Civil Engineering, Department of Geotechnics, **Slovakia**

ABSTRACT

A new route of D1 motorway in the north of Slovakia must across territory with high susceptibility to landslide movements. Several slope deformations with different activity were identified in the studied area of Šútovo and Kraľovany landslide [2], [8]. Due to narrow valley relief, existing railroad line and water dam, it is not an easy task to design the route of the future motorway. Geotechnical monitoring of landslide movements by vertical inclinometer, TDR inclinometers, terrestrial geodetic monitoring and observation of ground water regime were designed and implemented according to the provided detailed engineering geological survey. Both the standard methods for monitoring and new progressive technologies were used, and they are further described in this article.

Keywords: geotechnical monitoring, geohazards, landslide, TDR inclinometer

NON-DESTRUCTIVE DETERMINING CBR VALUES OF GROUND STRUCTURES OF ENGINEERING CONSTRUCTIONS

Assoc. Prof. Dr. Katarina Zgutova[1]

Prof. Dr. Martin Decky[1]

Ing. Lubomir Pepucha, PhD.[1]

Ing. Dominika Durekova[1]

[1] University of Zilina, Faculty of Civil Engineering, Univerzitna 8215/1, 01026 Zilina, **Slovakia**

ABSTRACT

In the contribution, there are presented the newest issues of experimental activities of the authors, objectified in terms of solving the project, in area of assessment the quality of ground structures of the engineering constructions by the device WS 32830 according to CLEGG. This device quantifies the value of rate of compaction on the basis in situ tests of CIV values (Clegg Impact Value), which can be re-counted on CBR values (Californian Bearing Ratio). In submitted contribution are published conclusions of objectified calculation CIV on CBR determined by STN 72 1016 and on the values of dynamic deformation modulus E_{vd} measured by apparatus LDP 100.

Keywords: waste recycling, subbase, testing, clegg, LDP 100

NUMERICAL ANALYSIS OF DRILLED DISPLACEMENT SYSTEM PILES

Ing. Jakub Stacho

Ing. Erika Ladicsova

Slovak University of Technology in Bratislava, Faculty of Civil Engineering, Department of Geotechnics, **Slovakia**

ABSTRACT

Drilled Displacement System (DDS) piles are an innovative technology for execution of pile foundations. DDS piles can be optimally designed in fine-grained soils and sandy soils where horizontal soil displacement is possible and causes increased pile resistance. Instrumented static load tests were carried out for verification of pile design by calculation. Tested piles were 16 to 18 m long with diameter of 410 mm. Load-settlement curves and load distribution curves obtained by static load tests are compared with results of numerical modelling and analytical calculations. Geological conditions of the area consist of soft clays to depth more than 10 m below surface. Dense to very dense sands and gravels are located under the clays. Geotechnical software Plaxis was used for numerical analysis. Impact of technology which has a significant impact to pile resistance was taken into account by using Cavity Expansion Theory by Mecsi. The article presents parametric study where influence of pile-soil interface and impact of the technology are analysed. Calculated load-settlements curves are equal to results of static load tests with more than 95 % accuracy in all cases.

Keywords: drilled displacement system piles, numerical analysis, numerical modelling, pile foundations, static load test, cavity expansion theory

NUMERICAL ANALYSIS OF SUBSOIL WITH THREE DIFFERENT CONSTITUTIVE MODELS

Ing. Zuzana Galliková, PhD.[1]

[1] Slovak University of Technology in Bratislava. Faculty of Civil Engineering, **Slovakia**

ABSTRACT

The foundation of high-rise buildings in terms of Bratislava (in Slovakia) is in many cases realized by raft foundation. Load transfer of structure to the ground is through direct contact; a base plate and a ground. Subsoil of the considered building is formed by a geological layer of fine-grained soils, which are known for their higher degree of overconsolidation, which influences the value of the coefficient of earth pressure at rest. Unavailability of in situ measurements of the coefficient K_0 is in the analysis taken into account by using the limits for a normally consolidated and a overconsolidated soils. Input parameters for ground layers are calibrated from the laboratory experimental measurements. Numerical analysis of the contribution compare prognoses of vertical deformation using three constitutive models of soils – Mohr – Coulomb, Cam Clay model and more advanced non–linear hypoplastic model. Subsoil deformation for the different phases of realization is confronted with the deformetric measurement. Discrepancy between prognoses and monitoring of the selected models is supplemented by optimization of the selected soil parameters with back analysis.

Keywords: numerical analysis, earth pressure at rest, settlement, constitutive models.

OPTIMIZATION OF RIVER BANK PROTECTION DESIGN BY DISCRETE ELEMENT METHOD

Adrian Priceputu

Adrian Liviu Bugea

Cosmin Victor Roșu

Manole Stelian Șerbulea

Technical University of Civil Engineering Bucharest, **Romania**

ABSTRACT

The river bank protection options are limited, in general, due to the ground conditions of the river bank and the necessity of limiting the stream velocity. The classical approach of using rip rap, and filling the river bank landscape up to the designed geometry is subjected to the random conditions of dropping and settlement of the boulders. In this case, the design, considering especially the quantitative estimation of the material needed, is based only on the designer's experience.

The paper aims to propose an up-to-date method of designing the rip rap, in order to reduce the stochastic impact of the technology and in situ conditions. The work is based on a forensic investigation of a real case study, which involved the local reconstruction of the Danube river bank by means of rip rap. The goal is attained by determining, using Monte Carlo simulations, the most probable rip rap configuration, through DEM (discrete element method) simulations. Furthermore, a validation process is carried out, based on the obtained results (number and size distribution of the boulders forming the rip rap), using coupled FEM-DEM analysis.

The DEM Monte Carlo simulations are performed using a non-commercial software created by the authors, part of a research still in progress, while the coupled FEM-DEM computations used for validation purposes are ran using Abaqus software. The paper also shows strengths and weaknesses of both used methods and software, while providing some guidelines for future similar works.

Keywords: riprap, discrete element method, numerical modelling, Monte Carlo analysis

OUR EXPERIENCE WITH MATLAB PROGRAMMING IN GEOTECHNICAL APPLICATIONS

Dr. Maria Krulakova[1]

Dr. Edita Lazarova[1]

Prof. Vitazoslav Krupa[1]

Dr. Lucia Ivanicova[1]

[1] Institute of Geotechnics, Slovak Academy of Sciences, Kosice, **Slovakia**

ABSTRACT

The paper describes our experience with the modelling of TBM performance prediction using the algorithms developed by Matlab programming. The results were verified on real data from TBM excavation. The Matlab software was used for development of programs for processing and analysis of monitored data recorded during the TBM excavation of exploratory tunnels Branisko and Visnove in Slovakia. Application of such programs should provide real-time parameters applicable for the control and optimization of the TBM excavation process. The paper also delivers the results and algorithms of fully automated scanning control of large-scale maps using the camera Canon G9 and Matlab programming for further digitization of geological/geotechnical mapping.

Keywords: modelling, analysis, excavation, large-scale maps

PARAMETRIC RATIO OF RELIEF ELEMENTS AND KARST FORMS

Assoc. Prof. Dr. Sergey Shcherbakov

Perm State National Research University, **Russia**

ABSTRACT

The work is aimed to study geomorphological conditions of territory and estimation of its influence on the activity and hazard of karst evolution. Geomorphological conditions are considering from the position of next four factors: slope of relief, distance from river net, excess above the average water level in rivers, slope of basin. Relationships between these factors and karst forms were studied with using methods of mathematical statistics and correlation-regression analysis. In the result were obtained integral distributions of karst form by values of studied factors and regression equations, which allows to prognosis karst hazard on the base of geomorphology of the area.

Keywords: karst, geomorphological factors, karst massif, karst hazard, indexed values.

PERFORMANCE OF GEOCELL FOUNDATION ON COMPRESSIBLE SOIL

Dr. Vlastimil Chebeň

University of Žilina, **Slovakia**

ABSTRACT

Contemporary geotechnical engineering is challenged with building in difficult geological environment while design has to be structurally and economically effective. Such proposals require use of new materials and methods that fulfill all the requirements of the project. Compressible high plasticity clay is generally unwanted foundation soil for many professionals. Costly solutions such as soil replacement, lime stabilization and other can be an option when high ground water level does not occur. Proposed paper compares gravel mattress and geocell reinforced embankment for subbase of heavily loaded floor/pavement. A full-scale field tests were carried out to research deformation characteristics and its performance on soft subgrade. Concept of hardening effect of geocell reinforced structure has been verified as measurements were performed with the time span of almost 2 years.

Keywords: geocell, plate load test, gravel mattress, soft soil

PETROGRAPHIC IDENTIFICATION OF ALKALI-REACTIVE AGGREGATES, INCLUING SILICEOUS CARBONATES

Prof. Isabel Fernandes[1]
Dr. Maarten A.T.M. Broekmans[2]
Prof. Maria dos Anjos Ribeiro[1]
Prof. Helena Martins[1]
Dr. Ian Sims[3]

[1] CGUP/DGAOT-FCUP, University of Porto, Porto **Portugal**
[2] Geological Survey of Norway – NGU, Trondheim, **Norway**
[3] RSK Environment Ltd, Hemel Hempstead, **United Kingdom**

ABSTRACT

Modern day Portland-cement concrete was for decades considered to be a long lasting material, until in the 1940s it was recognised that concrete could deteriorate as the result of chemical reactions between Portland cement and some components of the aggregates. Research has been undertaken since then in order to find the best test methods for identifying the potential reactivity of aggregates before their use in new constructions. According to international guidelines, rocks are classified as 'innocuous' or 'potentially reactive' according to their mineralogical composition, texture and performance. The first method in the assessment of aggregate is optical thin-section petrography, a quick method when compared to laboratory expansion methods.

Like any analytical method, petrographic assessment is subject to a number of potential errors from sample handling, analytical protocol and instrumentation, which can be minimized using rigorous procedures. However, operator error (related to petrographer experience and skill) usually exceeds analytical error. To reduce operator error, a worldwide petrographic atlas of potentially reactive aggregates was developed by an expert team of RILEM technical committee TC-219 ACS. It collates a large number of samples from all continents, from different types of rocks, revealing the microscopic differences that explain their varying performance as concrete aggregate.

The present paper focuses on the main findings of this work, referring particularly to the microscopic characterisation of siliceous carbonate rocks. Supplementary analyses by SEM and EDS proved to be essential for the unequivocal identification of constituents in these very-fine grained rocks.

Keywords: Aggregates, alkali-silica reactions, texture, concrete petrography

PETROGRAPHY AND CATHODOLUMINESCENCE MICROSCOPY IN THE STUDY OF ALKALI REACTIVE GRANITIC ROCKS IN CONCRETE

Assist. Prof. Dr. Isabel Fernandes[1]

Assoc. Prof. Dr. Helena Couto[1]

Msc. Ana Santos[2]

[1] Universidade do Porto, Faculdade de Ciências, Departamento de Geociências, Ambiente e Ordenamento do Território e Centro de Geologia da Universidade do Porto, Porto, **Portugal**

[2] Centro de Geologia da Universidade do Porto, Porto, **Portugal**

ABSTRACT

Alkali–silica reaction (ASR), a deleterious chemical reaction in concrete that involves certain mineral phases in the aggregates and the alkalis from the cement paste, is in the origin of the deterioration of many large structures such as dams, bridges and pavements, some of which have already been demolished. Many of these structures contain fast reactive aggregates such as greywacke, sandstone, chert/flint, siliceous limestone and quartzite. ASR has been identified with slow reactive deformed rocks showing manifestations of deformation such as undulatory extinction, strain lamellae and sub-graining and also with granitic rocks with light deformation manifestations. In order to understand the features in granitic rocks that can be related with the occurrence of ASRs, concrete samples from expansion laboratory tests were selected. Alkali-silica gel was identified in the thin sections mainly in rims partially surrounding the coarse and fine aggregate particles, mainly related to crystals of quartz.

Cathodoluminescence (CL) microscopy was applied in an attempt to explain the occurrence and location of alkali-silica gel and to find the possible correlation between the presence of ASRs and the crystalline defects of the quartz grains in the rock. The quartz grains showed heterogeneous luminescence, although always very weak, in reddish-brown. The study performed evidenced there are open spaces between the quartz grains, close to the places where gel was found. In fact, the contacts between the different grains are opened and highlighted by a lighter brown material. Cracks, not visible under polarizing microscope, were observed, showing a lighter luminescence colour.

The study showed that CL microscopy is an important tool to complement the optical microscopy observation used in concrete petrography as it contributes to the identification of the features in the aggregates that can be in the origin of ASR. This technique can therefore constitute a promising useful input for the future identification of the compositional and textural features in new aggregates and can allow the classification of their potential alkali reactivity before the use in concrete.

Keywords: Alkali-silica reaction, deformed quartz, cathodoluminescence

PROGRESSES IN APPLICABILITY AND EFFICIENCY OF THE DEEP DRAINAGE SYSTEMS USING SIPHON DRAINS ÎN ROMANIA

Eng. George MAFTEI[1, 3]

Eng. Alina COBZARU[2]

PhD. Dan CARASTOIAN[3]

[1]Technical University Gh. Asachi, Faculty of Civil Engineering and Building Services of Iaşi, Department of Roads and Foundations**, Romania**

[2]National Institute for Research and Development in Constructions, Urban Planning and Sustainable Spatial Development NIRD URBAN-INCERC, Laboratory for research and hygrothermal climatic, mechanical and seismic testing of building materials, elements and equipment, Iaşi Branch, **Romania**

[3]PROEXROM Company- design, execution, geological engineering and foundation prospecting, Iasi, **Romania**

ABSTRACT

The paper was initiated, as a study based on the results developed in the last 10 years in Romania, as applied drainage methods on lowering ascending groundwater's level, used in residential or commercial areas, roads and access ways subjected of serious buildings or monuments' damages or landslides. The paper shows how monitoring the works of deep drainage gives an effective control of groundwater level variation and hydro geological conditions of sites. The study includes the results of a comparative data analysis, obtained from direct or remote monitoring, on 8 gravity drainage systems realized so far in Romania.

Keywords: drainage methods, compared improved efficiency, siphon drain system.

PROPPED DIAPHRAGM WALLS. CHARACTERISTIC PARAMETERS OF INFLUENCE

Assoc. Prof. Dr. Eng. H. Popa

Prof. Dr. Eng. L. Batali

Technical University of Civil Engineering of Bucharest, Geotechnical and Foundations Department, **Romania**

ABSTRACT

Diaphragm walls used for retaining deep excavations are often supported using struts, which mean in fact to create punctual supports. The analysis of the 3D effect of the props requires a 3D numerical modelling. The analysis has to take into account wall versus soil or strut stiffness ratios, which influence and determine the final response of the retaining wall. Also, the horizontal distance between struts has a major impact on earth pressure distribution on the wall.

Paper presents the numerical modelling of a diaphragm wall simply propped by struts at its upper part. To emphasize the 3D effect of the struts, the horizontal distance between struts and the wall stiffness are varied. The earth pressure redistribution (arching effect) is also emphasized.

Keywords: 3D numerical modelling, diaphragm wall, characteristic parameters

RECOMMENDATIONS FOR GROUND VIBRATIONS SURVEY IN COURSE OF GEOTECHNICAL WORKS

Assoc. Prof. Dr. Wlodzimierz Brzakala

Assist. Prof. Dr. Aneta Herbut

Assist. Prof. Dr. Jaroslaw Rybak

Wroclaw University of Technology, Faculty of Civil Engineering, **Poland**

ABSTRACT

Measurement techniques are developing to enable the monitoring of the vibrations transferred to the surroundings in course of geotechnical works, thus making it possible to carry out those works in a safer manner. A separate problem is posed when dealing with historic buildings, which may potentially come within the impact of vibrations. Intensive construction works carried out in the neighborhood of not infrequently old and valuable structures may threaten the historic housing, hence their safety aspect should be thoroughly considered. That concern for the existing buildings of historical value stimulated the development also of the new research area, namely the impact of deep foundations on the structure of the existing buildings. Inappropriate selection of technology for particular development conditions may lead to such problems as cracking of the adjacent structures or their settlement for unknown reasons. That negative impact can be reduced or even avoided when the vibration is investigated before (in order to get the picture of the so called „environment background") and at the time when the construction works are initiated. Then, in carrying out construction works, the range of permissible vibration velocities and frequencies should be taken into account. As the old proverb says, necessity is the mother of invention; and so, on the market appeared a lot of firms offering a wide array of geotechnical technologies.

The research conducted at the Faculty of Civil Engineering at Wroclaw University of Technology aim at defining the influence of ongoing works on the surroundings, as well as at preparing the guidelines on the selection and/or calibration of the technology. The experience gained so far is sufficient to offer services for companies. Those services are supposed to both: help with the calibration of the technology, as well as to protect the contractors from unjustified claims from the neighbors of the construction site. At the same time, the stored database of the surveys may, after being systematized, play a significant role in the non-destructive diagnostic testing of buildings.

Keywords: rapid impact compaction, pile driving, vibration monitoring

REGULARITIES OF SLOPE PROCESSES FORMING ON THE "KAZAN" SKI COMPLEX AREA (RUSSIA)

Assoc. Prof. Dr. Nadezda Zharkova

Assoc. Prof. Dr. Airat Latypov

Kazan Federal University, **Russia**

ABSTRACT

In the beginning of the 21 century, on the right bank of the Sviyaga river, the building up of the sport ski complex “Kazan” was organized and almost at once after that, an active landslides with considerable shifts of the soil began to happen.

Previous researches were based on the conventional geology aspects of this area – sub horizontal deposits of Permian measures. Thus the critical angle and nature of the formed landslides are absolutely did not correspond to the typical destruction of rock massive of the area nearby.

Our researches showed that on the area of sport ski complex, the geological aspect is absolutely different. Permian measures have an “invention” and considerably folded. It can testified to that we have a deal with an old landslide, forming of which had started in the period of late Neo-Pleistocene with the beginning of the depositing of the right flowing of Sviyaga river – Sulitsa river.

In this work are presented the results of a comprehensive assessment of landslides danger on that area, which are based on a large volume of field and laboratory researches.

As a result it was established that one of the reason of the landslides developing (not determinate during previous researches) is a strong dislocation and durability loss of carbonate and terrigene Permian measures. Therefore at calculation of stability of slopes it is necessary to consider possibility of formation of a circular cylindrical surface of sliding, by analogy to disperse soil. Mechanical properties of massive material have to be defined taking into account their fracturing.

Also conducted researches led to revision of the earliest wrong ideas of a geological structure of this area and to make correction of geological maps.

Keywords: slope processes, landslide, deposits of Permian measures, mechanical properties

RELATION BETWEEN SEISMIC AND GEOMECHANICAL PARAMETERS OF THE MEDIUM

Eng. Roberto Tosevski[1],

Eng. Goran Angelov[1]

Dr. Todor Delipetrov[1]

MSc. Gorgi Dimov[1]

MSc. Blagica Doneva[1]

[1] Faculty of natural and technical sciences, University of Goce Delcev, **Republic of Macedonia**

ABSTRACT

The subject of the research in this paper are correlated relations between seismic and geomechanical features of the medium. Special interest for analysis is made on carbonate rock complexes covering an extensive area in the Republic of Macedonia, especially in the western part. Terrain seismic investigations are made on specific locations defining Vp and Vs velocities. On the same locations are made geomechanical and engineering - geological explorations. In the paper is presented dependence between Vp and Vs velocities and geomechanical parameters of the medium: E - Young's modulus of elasticity, G - shearing modulus and ν - Poisson coefficient. Calculated are dependence of these paramform Vp and Vs velocities, or an attempt is made to assess the geomechanical parameters through analysis of seismic speeds.

Qualitative assessment is made on the degree of dependence of seismic velocities Vp and Vs with RQD, RMR and Q parameters of carbonate massifs, as well as with φ - angle of internal friction and c - cohesion of material.

Keywords: correlation, seismic velocities, geomechanical parameters, assessment

REMARKS ON MAIN METHODS OF EXPANSIVE SOILS IMPROVEMENT

Teaching Assist. PhD. Tatiana Ivasuc[1]

Lecturer. PhD. Ernest Olinic[2]

Professor PhD. Ioana Siminea[1]

[1] University of Agronomic Sciences and Veterinary Medicine, Bucharest, **Romania**
[2] Technical University of Civil Engineering Bucharest, **Romania**

ABSTRACT

Construction of embankments composed of clayey soils can generally cause unfavorable effects (differential settlement and ground heaving) due to their vulnerability to ground movements sourced from swelling and shrinking of the expansive clay soils. To prevent or reduce the effect of swelling or shrinking of these soils some measures must be taken by stabilizing expansive soils and to produce and improve to the construction material. This paper reviews principal methods to improve clayey soils as follows: soil stabilization by physical, chemical, mechanical and thermal treatments, preventing access of water to the soil and removal of expansive soil and replacement with a non-expansive material. The use of industrial wastes such as waste construction materials, slag from industries and mineral mining waste has a positive impact on the environment.

Keywords: expansive soils, stabilization, soil mixtures, industrial waste

RESEARCH OF THE INSTABILITY PHENOMENON IN ROAD EARTHWORKS AND STRENGTHENING SOLUTION

Lecturer Dr. Monica Mirea[1]

Lecturer Dr. Cristina Otilia Voicu[1]

[1] "Politehnica" University of Timisoara, Civil Engineering Faculty, **Romania**

ABSTRACT

The beginning of the paper presents certain general aspects of the instability phenomena occurring with high frequency on large areas of Romania. Further on, the paper analyses, from a geological and geotechnical point of view, the nature and causes of an instability phenomenon which affected the earthworks of a county road in western Romania. The final part of the paper shows the technical solution applied to stabilize the instability and strengthen the earthworks of the respective road.

Keywords: instability phenomenon, earthworks, road, foundation, strengthen, to stabilize

RESULTS OF LABORATORY TESTING OF STRENGTH AND STRAIN PROPERTIES OF THE DUMP MATERIAL FROM THE COAL MINES IN NORTHERN BOHEMIA

Assoc. Prof. Hynek Lahuta[1], **MSc., Ph.D. Assoc. Prof. Dr. Eva Hrubesova**[1], **Ph.D., MSc. Marek Mohyla**[1], **MSc. Tomas Petrik**[1], **MSc. Jan Marsalek**[1], **MSc. Josef Vasina**[2]

[1] VŠB - Technical University of Ostrava, Faculty of Civil Engineering, **Czech Republic**
[2] Waltec Company, Ltd., **Czech Republic**

ABSTRACT

This paper deals with the evaluation of laboratory tests of materials from the internal dump of the coal mine Bílina, localized in the northern part of the Czech Republic. Reliable determination of the properties of the dump materials is the basis for the objective and reliable behavioural analysis of the dump Bílina and of the dump increasing process prognosis. It is expected that around the end of the mining activity (around 2035) the final height of the dump will reach about 220m. So, finally, the dump Bílina will be one of the highest dumps in the world. Any dump instability may lead to a widespread threat to people, property damage and, in the end, to the problem with the operation of the whole mine; therefore, from this point of view an intensive research is needed in this area. The paper presents the results of both direct shear box test and oedometer test of the dump material, which was classified immediately after extraction, as claystone. On the basis of direct shear test the Mohr envelopes of shear strength, corresponding to the peak and residual strength parameters (cohesion and friction angle), were evaluated for the various soil moisture. Based on the oedometer test the Young´s modulus of dump material was obtained. In addition the results of unconsolidated undrained triaxial tests for the determination of total shear strength characteristics are presented.

Keywords: dump, shear stress properties, oedometric modulus, triaxial test, direct shear test, oedometer

SIMPLIFIED NUMERICAL MODEL OF THERMAL CONDUCTION AROUND THE GEOTHERMAL BOREHOLES AND ITS VERIFICATION BY PROGRAM FEFLOW

Ing. Augustin Leiter

Institute of Geotechnics, Brno University of Technology, Faculty of Civil Engineering, **Czech Republic**

ABSTRACT

One of exploitation methods of geothermal energy is the use of a grid of geothermal wells. The grid is to be used when the demanded power is high. The grid is characterized by its shape and dimensions. Compliance with the exact dimensions, however, is difficult. The real grid of geothermal wells usually has a distorted geometry. Boreholes are also often drilled with a deviation. This degrades thermal properties of such a system. This paper contains a simplified mathematical model used for studying the temperature field around the borehole. The model takes into consideration only heat conduction in a thin bordered plate and is based on a commonly known heat equation. Only the steady-state is considered. One reference and next six variants of borehole systems are solved by the model. The results show lowest thermal resistance of systems with larger numbers of boreholes placed evenly and worsening of the system parameters in cases of distorted geometry among the boreholes. Studied variants are verified by specialized software FEFLOW.

Keywords: geothermal borehole geometry, distortion of grid geometry, borehole deviation, numerical model of the borehole system.

SLOPE STABILITY ANALYSIS FOR TAILINGS DAMS

Assoc. Prof. PhD. Augustina Sandina TRONAC[1]
Lect. PhD. Sebastian MUSTATA[1]
Lect. PhD. Claudiu Sorin DRAGOMIR[1]
Lect. PhD. Sevastel MIRCEA[1]
Assoc. Prof. PhD. Nicolae PETRESCU[2]
Lect. PhD. Dragos DRACEA[1]

[1] University of Agronomic Sciences and Veterinary Medicine of Bucharest, Faculty of Land Reclamation and Environmental Engineering, **Romania**

[2] Valahia University of Targoviste, Faculty of Environmental Engineering and Food Science, **Romania**

ABSTRACT

The paper outlines through multiple analyzes the fundamental parameters influencing important changes in slope safety of tailings retention structures associated with thermoelectric plants. Essential element leading to variation of stability factor is the position of the seepage curve level, as a result of numerical previous calculations, which may bear discussion about the influence of the values obtained. It was also analyzed the influence of operating regulation of the entire hydraulic scheme. Study conclusion points out that beach length, height reserve (clearance) and drainage systems in operation ensure the tailings dam safety. Any change in these conditions could lead the structure to its limit equilibrium state.

Keywords: tailings dam, hydraulic disposal, seepage curve, operating regulation, slope stability

SOIL MIX WITH QUICKLIME FOR MOISTURE CONTENT REDUCTION TO OPTIMUM OF COMPACTION. LABORATORY AND CASE STUDY

Lecturer. PhD. Ernest Olinic[1]

Teaching Assist. PhD. Tatiana Ivasuc[2]

[1] Technical University of Civil Engineering, **Romania**
[2] University of Agronomic Sciences and Veterinary Medicine, **Romania**

ABSTRACT

Soil compaction is effective and is realized on site at moisture levels close to optimum of compaction. In periods of excess moisture produced by heavy rainfall or snowmelt, moisture reduction is obtained by adding quicklime. This method was applied to build a compacted cushion consisting of two types of cohesive materials: silty clay with moisture content with 5% greater than the optimum of compaction and loess (collapsible soil) with moisture content with 5…10% greater than the optimum of compaction. The paper presents extensive laboratory tests conducted to determine the optimum percentage of quicklime to reduce the excessive moisture to the optimum of compaction, the degree of compaction achieved by mixing in comparison to the compacted untreated material and the methodology for conducting the mixture and the compaction on site.

Keywords: soil mix, quicklime, degree of compaction

SOLID – WIRE ELEMENTS INTERACTION USED FOR NUMERICAL ANALYSIS OF A JACKET TYPE FOUNDATION OF AN OFFSHORE STEEL PLATFORM

Assoc. Prof. Ionuț Radu Răcănel, PhD. Eng.

Silviu Alexandru Constantinescu, BSc. Eng.

Asst. Prof. Daniel-Marcel Manoli, PhD. Eng.

Assoc. Prof. Manole – Stelian Şerbulea, PhD. Eng.

Technical University of Civil Engineering Bucharest, **Romania**

ABSTRACT

Classical analysis of pile driven offshore platforms implies several simplified hypotheses that cannot provide accurate results for those types of structures. The interaction between the jacket legs inner surface and the piles shaft as well as the interaction between piles and soil are is difficult to assess in terms of displacements and interaction stresses.

The article presents a numerical research study on an existing offshore platform in the Black Sea, using coupled wire-solid elements aiming to obtain an accurate structural response efforts with maximum efficiency, combining the benefits of simple 1 dimensional elements with complex 3 dimensional elements that can describe more accurately the material and contact behaviour between the elements of the structure. The results of the coupled analysis shall be compared with the classical simplified wire model in order to highlight the important results differences.

Keywords: offshore structures, jacket foundations, wire to solid element coupling

SOME EXPERIENCE IN DESIGNING PROTECTION ZONES IN THE SLOVAK KARST

Ladislav Tometz[1],
Lucia Mihalová[2]
Technical University of Kosice, **Slovakia**

ABSTRACT

Eastern Water Company uses numerous amounts of underground water resources for drinking water supply. It is now in the territory of scope company 70.8% connection of inhabitants. For public supply of water are used underground and surface water resources in the total number of 1071, of which the vast majority are the springs (531), 454 wells and 47 surface water sources. One of the key areas in which they are located springs and hydrogeological boreholes capturing a significant amount of quality drinking water is the territory of the Slovak Karst. The quantity and quality of water abstracted depend predominantly on the measures protecting used water sources. The function of these measures are ensured by protection zones of water resources. These provide priority protection of water resources used for population drinking water supply in full. Slovak Karst as the area but also has a specific hydrogeological characteristics, which in turn require specific measures to establish and protect. From this reason, present contribution provides insight into the problems of their creation in condition of the Slovak Karst.

Slovak Karst abounds with numerous sources of groundwater used for drinking water supply. The most frequently used are natural outflow of karst water to the surface in the form of springs - karst springs. However, a significant component in the circumstances constitute also karst-fissure waters, captured by hydrogeological boreholes. The basic prerequisite for the quality of drinking water is the source of water supply with effectively proposed buffer zones. In order to protect public health, it is necessary to focus on such water sources, from which water quality in their natural conditions and its physical, chemical, microbiological composition and properties approximates to the requirements for drinking water. Therefore, the proposed protection zones of drinking water in this area has its own characteristics, which we evaluate in the present contribution.

Keywords: Slovak Karst, protection zones, Eastern Water Company, drinking water

SOURCE OF DRINKING WATER "PRIBITU" BOSNIA AND HERZEGOVINA – REPUBLIC OF SRPSKA

Prof. Nedjo Djuric, Ph. D.[1]
B.Sc. Luka Jovanovic[1]
M. Sc. Dijana Djuric[1]
[1]Technical Institute Bijeljina, **Bosnia & Herzegovina**

ABSTRACT

The source "Pribitu" is one of the most significant sources in the eastern Herzegovina. It is highly reach in groundwater and a subject of interest in terms of water exploitation and bottling. It is connected to Cretaceous limestones where an aquifer was formed. Limestones are cracked and karstified, well permeable, thus providing movement of water towards the source, with a discharge in hydrological minimum of 22.3 l/s.
The source was sufficiently explored and determination of its geological, hydrogeological, chemical and microbiological properties was performed. Conducted analyses indicated that water of the source Pribitu is of high quality and that it meets all requirements prescribed by applicable legislation of the European Union.

Keywords: source, rock masses, Tectonics, aquifer, capacity

SPECIAL METHODOLOGICAL APPROACHES FOR CLARIFYING OF ANOMALIES IN THE SEEPAGE REGIME OF HYDRAULIC STRUCTURES

Prof. Dr. Emilia Bednarova

Dr. Marian Minarik

Dr. Danka Gramblickova

Slovak University of Technology, Faculty of Civil Engineering, Bratislava, **Slovakia**

ABSTRACT

Experiences from safety evaluation of dams in Slovak geological conditions proved, that most often reasons resulting in realisation of remedial measures were seepages. Seepages through the body of dam were recorded occasionally. Generally, seepages occurred in the subsoil of dam or in its abutments. The reasons of seepages were different. Sometimes it were excessive groundwater and seepage water levels, other times high filtration velocities which exceeded limit values, eventually other anomalies in the development of the filtration flow. In order to minimize the potential occurrence of such anomalies are in Slovakia for the long time utilised special geophysical measurements, which are part of controlling of the development of filtration regime. In this paper are presented selected lessons learned and experiences related to their application within the control of the dam safety.

Keywords: seepage, dam safety, geophysical methods

STABILITY ANALYSIS OF A NATIONAL ROAD USING SHEAR STRENGTH REDUCTION TECHNIQUE

Prof. Dr. N. Botu[1] ,

R. M. Chirila[1]

D. E. Grigore[1]

[1] Department of Transportation Infrastructure and Foundations, Technical University "Gheorghe Asachi", Civil Engineering and Building Services Faculty, Iasi, **Romania**

ABSTRACT

Traditional calculation methods in slope stability analysis are based on limit equilibrium where shear strength mobilization has the same value for any location considered. Shear strength reduction - finite element method (SSR-FEM) solve the limitations of the limit equilibrium methods. The example highlights the slope stability analysis by reducing shear strength caracteristics and the safety factor determination on a slope from Romanian territory. The upper part of the slope is crossed by one national road with intense traffic. The factor of safety (Fs) of a soil slope is defined as the number by which the original shear strength parameters must be divided in order to bring the slope to the point of failure. The widespread availability of computer programs by finite elements method and the ability to apply the shear strength reduction can solve complex stability analysis and can reveal the behavior of a slope.

Keywords: slope stability, shear strength reduction, finite elements, limit equilibrium

STUDY BEHAVIOUR OF LATERAL PRESSURE IN COARSE-GRAINED SOIL TRUE TRIAXIAL COMPRESSION

Postgraduate student, Victoriya Babenko

PhD, Victoriya Funikova

Prof. Dr., Eugene Voznesensky

Lomonosov Moscow State University, **Russia**

ABSTRACT

In this paper results of true triaxial testing conducted on physical models of coarse-grained soils are used to describe under load. Results show with increasing amounts of filling aggregate value of lateral pressure increases, the smallest values for the lateral pressure are typical for saturated pebbles.

Keywords: true triaxial test; filling aggregate; coarse-grained soils; lateral stress; moving the stamp

STUDY ON SLOPE STABILITY FOR SMALL DAMS WITH NON PERMANENT LAKES

Phd Stud. Marius Lucian Botos

Assoc. Prof. Dr. DorinVingan

Technical University of Cluj-Napoca, Faculty of Civil Engineering, Cluj-Napoca, **Romania**

ABSTRACT

Small dams with permanent and non-permanent lakes constructed in order to regulate the maximum discharge for small rivers or streams are often avoided by detailed studies in the design phase due the limited founding. Designed in most cases using solution of the homogeneous earth, the cross section is the result of the calculation of upstream and downstream slope stability. These results are influenced by the type of soil used and especially by the seepage. Not only the water level in lake is important, but the position of water table in the dam's body is the one having the biggest influence. Small dams are characterized by short times in which the water level varies in the lake; steady seepage cannot be obtained for maximum levels in lake. Methods to estimate the main parameters that influence the flow through unsaturated soils, based on size and pore distribution, became available in order to conduct complex studies on small dams. The study was conducted for homogeneous earth small dams, heights smaller than 10 meters, made of different soils, subjected to unsteady seepage as a result of sudden or linear raise of water level in lake, for different operations modes. The study of the impact on slope stability results obtained using classical methods, considering unsteady seepage can highlight whether or not this type of approach necessary.

Keywords: small dams, slope stability, unsteady.

SUFFOSION HAZARD FOR BUILDING AND INFRASTRUCTURE IN THE HIGH LOMBARDY PLAIN (NORTHERN ITALY)

Dr. Loris Colombo[1]
Prof. Vincenzo Francani[1]
Prof. Paola Gattinoni[1]
[1] Politecnico di Milano - *D.I.C.A.,* Dept. of Civil and Environmental Engineering, **Milano, Italy**

ABSTRACT

Suffosion is a geological hazard in which soils particles are removed by groundwater flow or chemicals-typical dissolution processes. The voids enlargement involved in the phenomenon brings about a wide range of landforms (i.e. caves, subsidence hallows, collapse sinks, swallow holes). These suffosional features are well known to be dangerous for infrastructures and buildings, both during their construction and life-time. In the present paper a description of suffosion features is given with reference to a case study in the Upper Lombardy Plain, where detailed surveys were carried out in order to design an important road infrastructure. The results of in situ surveys (SPT, geoelectrical tomographies, drillings) are discussed in order to make out caves and voids distribution in the study area, to define indexes useful for detecting their presence, and finally to quantify the effects of the phenomenon on structure design.

Keywords: geophysical survey, geological hazard, SPT, suffosion

TECHNICAL SOLUTION TO ENSURE STABILITY IN EXISTING CONSTRUCTIONS IN CASE OF DEEP DIGGINGS IN CLOSE VICINITY

Lecturer Dr. Monica Mirea[1]

Lecturer Dr. Cristina Otilia Voicu[1]

[1] "Politehnica" University of Timisoara, Civil Engineering Faculty, **Romania**

ABSTRACT

The paper presents the technical solution adopted in order to protect and ensure the stability of tall buildings in the city of Deva, next to which a subterranean road passage and underground parking place are realized. The technical solution was determined based on detailed studies concerning the geological and geotechnical conditions of the locations of the two underground units. Also, the depths of the diggings, the height and foundation levels of the neighboring buildings including the distances from the edges of the diggings have been analyzed. The adopted technical solution consisted in realizing supporting walls on the contour of the diggings. The walls were made up of large diameter piles placed tangentially through drilling.

Keywords: foundation, drilling, piles, stability, underground parking

THE COMPACTION OF COLLAPSING LOESS SOILS BY COMPLEX TRIPLE TECHNOLOGY: WATERING, DEEP EXPLOSIONS, SOIL COLUMNS

Dr. Janusz Kozubal [1]

Dr. Dmitri Steshenko [2]

[1] Wroclaw University of Technology, Faculty of Civil Engineering, **Poland**
[2] Caucasus Federal University, Building, Transport and Mechanical Engineering Institute, **Russia**

ABSTRACT

The article describes the complex technology applied for the compaction of collapsing soils such as mixed: watering, deep explosions, and soil columns in the industrial area in south Russia. The presented method on the example of its use is attractive because of low cost, low consumption of materials, and interesting use a local materials to change subsoil properties. As a result a semi homogeneous structure of ground with a thickness more than 20m was achieved. Monitoring of the neighbouring buildings, according to previous experience, did not show the negative effects of the micro explosions even at the distance of 15m from the source. This is due to the use of precisely controlled energy of underground explosion as a function of depth and density of material. The monitoring was conducted continuously after compaction and it confirms the effect of strengthening stability.

Keywords: word loess, collapsing soils, deep explosions, watering, consolidation, soil columns, monitoring

THE CORRELATION OF SURFACE AREA WITH HYDRAULIC CONDUCTIVITY OF FINE-GRAINED SOILS

Assoc. Prof. Dr. Jana Frankovská
Assoc. Prof. Dr. Miloslav Kopecký
Prof. Dr. Peter Turček
Slovak University of Technology in Bratislava, **Slovakia**

ABSTRACT

Fine-grained soils containing clay minerals have very high (specific) surface area and good sorption properties, which are important for environmental applications such as rehabilitation of contaminated areas or construction of geological and technical barriers of the repository for the inert and hazardous waste. The specific surface area, which is rarely used in geotechnics, helps to describe the soil and this characteristic is in good correlation with some geotechnical characteristics. In the article, the relationship between specific surface area and some geotechnical properties is analysed, in particular for use in determining the characteristics of the coefficient of permeability.

Keywords: specific surface area, coefficient of permeability, fine-grained soils, geotechnical properties

THE CRITERIA OF STRENGTH AND STRAIN OF SOILS IN A GROUNDMASS

D.Sc. German Postoev, Ph.D. Andrey Kazeev

Sergeev Institute of Environmental geosciences RAS, Moscow, **Russia**

ABSTRACT

The article discusses such important criteria of soil strength, as the soil structural strength, the soil strength condition according to the Coulomb-Mohr criterion (the condition of soil strength in a sample or in a point). The article also provides new equations of a limiting state, which are the criteria of the soil strength when appear the force disturbance in the form of reducing of vertical stresses in a local area.

The development of destructive deformations during the formation of a landslide or a karst hole is preceded by the reach of a limiting state in a locally bounded area of the groundmass (massif). The mechanism of transformation of the initial state of the soil massif (groundmass) into new criteria of soil strength in a groundmass are given in the article. These criteria were concretized for the corresponding types of landslides and for different formation conditions of karst holes in the regions of karst-prone rocks distribution.

The model of changing of the stress-strain state of a groundmass (with the formation of an active zone along the border of the core under the foundation and the passive rebuff loading at the side of a foundation) is considered for estimating of the limiting pressure along the bottom of a foundation and for calculating of foundation settlements.

Keywords: stress-strain state of a groundmass, soil structural strength, landslides, karst, foundation settlement.

THE DANUBE WATER INTEGRATED MANAGEMENT (WATER) PROJECT – THE LITHOLOGICAL AND HYDROGEOLOGICAL CHARACTERIZATION OF THE QUATERNARY DEPOSITS ON THE LEFT SIDE OF THE DANUBE , BETWEEN VEDEA AND ARGES RIVERS (ROMANIA)

Dr. eng. Emil RADU,
Eng. Catalina RADU,
Eng. Bogdan ION,
Dr. eng. Ada PANDELE

National Institute of Hydrology and Water Management, Bucharest, **Romania**

ABSTRACT

THE DANUBE WATER INTEGRATED MANAGEMENT (WATER) PROJECT is a Romania – Bulgaria international common project. The main objectives of the project is to improving water monitoring and warnings system and environmental data dissemination on the Romanian – Bulgarian border counties in order to sustainable use and protection of natural resources and environment and promotion of efficient risk management in the cross-border area**.**

The paper present a part of the groundwater research results, respectively lithological and hydrogeological considerations concerning the Quaternary deposits on the left side of the Danube, between Vedea and Arges rivers, base on the observation wells belonging to the National Hydrogeological Network for shallow aquifer. The wells intercepted both alluvial deposits belonging to the Danube flood plain, and alluvial deposits belonging to different terrace levels.

From the lithological point of view, the flood plain deposits are mainly made of sands with gravels, locally with intercalations of sands with gravels. In their upper part subordinately develop sands with gravels, sands, argillaceous sands, argillacous sandy silts, silty sands.

The alluvial deposits from the composition of the terraces are made of at the base by sands with gravels and boulders. Towards the upper part granulometry decrease, passing from sands with gravels and boulders to sands with gravels, sands and argillaceous sands.

The upper part is made of loessoid deposits, represented by sandy silts, argillaceous silts, argillaceous sandy silts with calcareous concretions, silty sands.

The alluvial deposits from the flood plain and terraces, of Quaternary age, rest on deposits of Pliocene age (clays, marls, sands) and of Lower Cretaceous age (limestones).

In the case in which the alluvial deposits from the flood plain and the terrace rest on Pliocen sands or on the Lower Cretaceous limestones, there is a direct hydraulic link between the shallow aquifer localized in these deposits and the aquifer localized in the prequaternary deposits.

Keywords: shallow aquifer, hydrogeological cross – sections, lithological and hydrogeological characteristics

THE INFLUENCE OF GEOTECHNICAL INVESTIGATIONS MAGNITUDE ON CHARACTERISTIC VALUES OF SOILS PARAMETERS

Lecturer. Dr. Ernest Olinic

Technical University of Civil Engineering Bucharest, **Romania**

ABSTRACT

The main purpose of the geotechnical studies is to determine the physical and mechanical properties of the foundation soil. According to European regulations, geotechnical design shall be based on design values of geotechnical parameters derived from the characteristic values which are directly influenced by the number of determinations and the coefficient of variation (ratio of standard deviation and the mean value). The coefficient of variation, through the recommended maximum values for physical characteristics of soil, underlies the delimitation of geological strata. The aim of this paper is to show how the number of measurements and the coefficient of variation influence the characteristic values which, if are closer to the average, will lead to an effective and economic geotechnical design. If the difference between mean value and characteristic value is very high, this will lead to oversized geotechnical structures, and will generate much higher execution costs than the economy brought by the underevaluated geotechnical study.

Keywords: geotechnical study, geotechnical parameters, characteristic values, geotechnical design

THE INFLUENCE OF LOADING SPEED IN THE CLASSICAL BRAZILIAN TESTS ON AN ESTIMATE VALUE OF FRACTURE TOUGHNESS INDICATOR (K_{IC}) FOR EXAMPLE POLISH FLYSCH SANDSTONES

Ph.D. Artur Dziedzic

Ph.D. Student Łukasz Pieczara

University of Warsaw, Faculty of Geology, Department of Geomechanics, **Poland**

ABSTRACT

The article presents the results of research of fracture toughness of flysch sandstones (Krosno Sandstones) from the Polish part of the Western Carpathians, with characteristic laminar structure. The research was realized as suggested by the ISRM method Chevron Bend (CB), marking K_{IC}^{CB1} in Level 1 and a classical Brazilian test (BR) to give a tensile strength σ_τ and on this basis denoting the indicator K_{IC}^{BR}. The sample loading speed in the CB method was in accordance with the recommendation of ISRM. In Brazilian method, rock samples were compressed transversely in two variants of speed: according to the Polish Industry Standard – 7.5 kN/min and with reference to the speed of CB tests - 400 kN/min.

It is important that in Brazilian method the obtained results, are comparable to the values of K_{IC} from CB tests carried out at 400 kN/min. Using in the BR tests recommended, standard speed (7.5 kN/min) causes, that the value of $K_{IC}^{BR7,5}$ differs significantly from the value of the indicator from CB Level 1 (K_{IC}^{CB1}). The influence of the rock sample loading speed is therefore important to estimate the value of K_{IC}^{BR} in the classical Brazilian method.

Keywords: Chevron Bend, fracture toughness, Brazilian method, geomechanics, cracking of rocks, anisotropy

THE INFLUENCE OF SOIL MECHANICAL PROPERTIES ON RETAINING WALL DESIGN ACCORDING TO EUROCODE 7 DESIGN APPROACHES

Assist. Prof .dr. eng. Iulia-Consuela Molnar[1]

Assist. Prof. .dr. eng. Olimpiu-Cristian Mureșan[1]

Lecturer .dr. eng. Vasile Farcaș[1]

MsC. Stud. Eng. Florin Matiș[1]

[1] Faculty of Civil Engineering, Technical University of Cluj-Napoca, **Romania**

ABSTRACT

The following paper presents a comparison in designing retaining walls according to Eurocode 7, detailing the result differences obtained by each design approach combination for a number of soils each with its own specific parameters. For each calculation the required height of the retaining wall and the surcharge force is considered the same. Using the MDC software, a number of simulations were ran in order to obtain the most economical dimensions of the structure for each type of soil. As results, the quantity of materials, the foot length of the wall and the coefficients for the most unfavorable action (sliding, overturning, limit state) are detailed. The paper concludes with an overview on the most likely design approach and unfavorable action to cause the worst case scenario in designing retaining walls.

Keywords: retaining walls, Eurocode 7, design approach combinations, soil parameters.

THE RESEARCH UNDERFLOODING PROCESSES OF ARCHITECTURE MONUMENTS ON THE TERRITORY OF TOMSK WITH USING GIS-TECHNOLOGY

Vitaly Pokrovskiy

Dmitry Pokrovskiy

Ekaterina Dutova

Aleksey Nikitenkov

Tomsk Polytechnic University, **Russia**

ABSTRACT

Like many other cities and towns in the world, Tomsk is confronted by one and the same geological problem – anthropogenic underflooding. Anthropogenic underflooding is the rise of shallow groundwater levels provoked by the town's activities under the influence of natural and anthropogenic factors, including territorial geological structure and drainage system, underground water intensity and its poor water flow and evaporation. All data was based on previous research materials, as well as, the application of modern GIS - technology. GIS systems MapInfo and ArcView made it possible to transfer the paper-copy maps into electronic ones, and create an electronic base of Tomsk architecture monuments and buildings as a geographical coordinate system with the help of GPS satellite system. Developed inform-search system program makes it possible to find all necessary information about the hydrogeological conditions in any location of Tomsk, especially in the locations of architecture monuments and buildings.

Keywords: anthropogenic underflooding, GIS – technology.

THE RHEOLOGICAL RESPONSE OF THE CONCRETE SLAB FOUNDED ON THE VISCOELASTIC SUBSOIL

Prof. Eng. Jendželovský Norbert, PhD.

Prof. Dr. Eng. Sumec Jozef, DSc.

Eng. Hruštinec Ľuboš, PhD.

Slovak University of Technology in Bratislava, Faculty of Civil Engineering, **Slovakia**

ABSTRACT

The solid (reinforce concrete) slab on the foundation modeling as a viscoelastic media is analyzed. Circular foundation plate is loaded non-symmetric external linear load of the circle shape (90°). The time dependence distribution of the generalized stress–stein under the constant external load is investigated. Delayed elasticity modeling of the reinforced concrete circular plate lying on the viscoelastic subsoil is taken into account. The subsoil is modeled as a viscoelastic half-space. The finite elements method was used (ANSYS® software) for numerical solution of the problem. The obtained numerical results are graphically interpreted.

Keywords: foundation – subsoil interaction, creep, rheological modeling, Finite Element Method (FEM), ANSYS® software

THE USE OF HISTORICAL CARTOGRAPHIC AND ICONOGRAPHIC SOURCES IN SEARCH OF ABANDONED OR FORGOTTEN STONE QUARRIES FOR CONSTRUCTION PURPOSES

Lucie Arnošová [1)],
Jiří Bláha [1)],
Svatoslav Chamra [2)],
Michal Panáček [3)]

[1] The Institute of Theoretical and Applied Mechanics AS CR, Centre of Excellence Telč, **Czech Republic**
[2] Czech Technical University in Prague, Department of Geotechnics, **Czech Republic**
[3] National Technical Museum, Prague, **Czech Republic**

ABSTRACT

When repairing historic buildings with dressed stone masonry or stone cladding there is often the need for a thorough petrographic and mineralogical analysis of the rock material used, sometimes even including the locating of the quarries from where the rock was originally obtained in the past. However the vast majority of quarries used in the past as a source of building material were abandoned over time. Often they were only small stone pits located in the near surroundings of the construction site. If the stone was not taken from one of the major quarries, whose history is well known and has been described in related literature, there are two options remaining: direct terrain surveys of nearby areas and at times areas further afield or research of possible written and pictorial archival sources.

This paper focuses on where to obtain these documents, how they usually look, how to proceed in searching for them and finally how to interpret them. Also some examples of how stone quarries are depicted on old maps and pictures will be shown, including pointing out the historical and contemporary urban planning and landscaping context. Nowadays the situation of abandoned quarries in relation to a current settlement structure or a protected natural area can create serious obstacles in the pursuit of recovering stone for the repairs of historical monuments from their authentic sources.

Keywords: dressed stone, quarry, written sources, old maps, natural resources

THE USE OF MOHR'S THEORY OF LIMIT STRESS STATE FOR EVALUATION OF SEISMIC SOIL PRESSURE ON RETAINING WALLS

Assoc. Prof. Dr. Mihai Vrabie
Sen. Lect. Dr. Bogdan Teodoru
Assist. Dr. Sergiu Băetu
"Gheorghe Asachi" Technical University of Iasi, **Romania**

ABSTRACT

The retaining walls located in seismic areas are loaded, during earthquakes, by supplementary forces of dynamic nature. In order to evaluate the dynamic active pressure, respectively of the dynamic passive strength, the most frequently is used the pseudo-static method Mononobe-Okabe.

In the present paper are done some developments, systematisations and specifications to the use of Mohr's theory of limit stress state in order to determine the active and passive earth pressure on gravity retaining walls. It starts from the Rankine hypothesis, according to which the pressures on the surface elements, parallel to the free surface of the soil, have vertical direction. As an effect of the horizontal seismic acceleration, in the soil appear inertial forces which are combining with the vertical pressures, generating in this way normal and shearing stresses on the parallel planes with the soil surface behind the retaining wall.

Using the intrinsic curve appropriate to the slip plane and the stresses from this plane, can be obtained the limit Mohr's circles and, than the active and passive pressures generated by the earthquake on the retaining wall. The algorithm for solving can be graphical, but can be analytical too. It permits the determination of the slip plane position and also of magnitude for principal normal and shearing stresses in the points of this plane, in which the stress state is limit.

Keywords: seismic active pressure; slip plane; limit stress state; Mohr's circle; intrinsic curve.

THE USE OF STOCHASTIC SIMULATION METHOD LATIN HYPERCUBE SAMPLING IN THE STUDY OF THE RESPONSE OF SOIL EXPOSED TO DYNAMIC LOAD

Ing. Tomas Petrik

Assoc. Prof. Dr. Eva Hrubesova, Ph.D.

Ing. Marek Mohyla

Technical University of Ostrava – Faculty of Civil Engineering, **Czech Republic**

ABSTRACT

The paper deals with the dynamic load response in rock mass using both the methods of mathematical modeling and stochastic simulation methods. This dynamic response of rock mass is dependent both on the properties of the rock mass and on the parameters of dynamic loading. In the deterministic numerical modeling approach each input parameter is characterized by one more or less representative value only. But the reliability and predicative ability of the modeling results are governed by the reliability of input values. Stochastic simulation methods take into account the stochastic nature of the input parameters, the input characteristics and associated response of the model (modeling results) can be considered as a random variable with some probability distribution. The paper presents the results of the stochastic modeling of dynamic impact in the rock mass based on the application of Latin Hypercube Sampling (LHS) simulation method. The mentioned stochastic simulation method is applied both on the deformation and strength characteristics of the rock environment. Stochastic simulation LHS method is much more efficient in numerical modeling in comparison with widely used Monte Carlo simulation method, because it allows reducing the number of required repeated parametric calculations while maintaining the required accuracy.

In the presented model the vibration source corresponds to the impact of the reverse vibratory plate type VDR22. On the basis of the mathematical modelling results the velocity amplitude of vibration response in the rock mass corresponding to the different distances from the source are then evaluated. The modeling is performed by application of Plaxis dynamic module and for the generation of random values of stochastic elastic modulus, cohesion and friction angle there was used software GLHS. This software was developed on the Department of Geotechnics and Underground Engineering of the Faculty of Civil Engineering, VSB-TU of Ostrava, for the data generation based on LHS simulation method. For each input parameters there were generated 20 input values, obtained calculating amplitudes of velocities were statistically analyzed in each distance (there were evaluated the basic statistical characteristics). On the basis of this stochastic analysis the attenuation curve of the vibration velocity with the certain level of probability were determined. Obtained attenuation curves can be used in geotechnical practice for predicting the values of vibration velocity of analogous geological environment with the identical parameters of dynamic load.

Keywords: dynamic loading, numerical model, stochastic simulation method LHS, vibration velocity amplitude, the attenuation curve

THIRTY YEARS FROM BEGINNING OF OPERATION OF ONE OF MOST IMPORTANT CZECH REPUBLIC DUMP – ERVĚNICE CORRIDOR

Ing. T. Růžička[1],
Ing. D. Paus[1], Ing. P. Kounovský[1],
Ing. P. Foitová Dernerová[1],
RNDr. Michal Řehoř, Ph.D[2]
[1]student of VŠB – Technical University of Ostrava, Czech Republic
[2]Brown Coal Research Institute j.s.c., Most,Czech Republic

ABSTRACT

The Ervěnice corridor is situated in the North Bohemian part of the Czech Republic between the towns of Most and Chomutov. It is massive fill of overburden rocks between partially worked out open pit mines ČSA and Šverma. The maximal height of the fill is 170 m from coal seam floor to present level. The total length of transferred underground utilities reached about 11 km 30 years ago, the length of the fill reached about 5 km. The paper briefly summarises the history of Ervěnice corridor, the progress of consolidation from 1984 to these days and the prognosis of future consolidation of the corridor in future.
Keywords: Ervěnice corridor, open pit mines, consolidation

THREE DIMENSINAL ORTHOTROPIC CONSOLIDATION MODEL FOR WELL POINT NETWORKS

Manoli D.M.
Priceputu A.
Ungureanu C.
Andronic A.
Technical University of Civil Engineering Bucharest**, Romania**

ABSTRACT

Accurate prediction of settlement, both in terms of magnitude and evolution in time may be considered the decisive design factor for large load civil engineering works such as embankments, multi-storey buildings and so on. This goal is difficult to achieve both from the numerical description point of view and the input mechanical parameters. The key divergence points between numerical modelling and recorded measurements refer mainly to the non-linearity of the stress-strain behaviour and the transient flow formulation for low permeability soils. On the other hand the soil anisotropy induces computation deviations especially in the cases of radial or three dimensional consolidation. The model used in this paper deals with the aforementioned problems using Biot's equation [1] with a non-linear stress-strain law and different permeability coefficients for vertical and horizontal directions.

Keywords: Biot, radial consolidation, settlement, numerical model

TIME DEPENDENT FACTORS IN DRIVEN PILE CAPACITY CONTROL

Assist. Prof. Dr. Jaroslaw Rybak[1]

M.Sc. Tomasz Zyrek[2]

[1]Wroclaw University of Technology, Faculty of Civil Engineering, **Poland**

[2]Silesian University of Technology, Faculty of Civil Engineering, **Poland**

ABSTRACT

Load tests (capacity tests) belong to the set of indispensable control procedures which verify the design before the execution of pile foundations. Organizational difficulties may however arise from the necessity to adjust the building site only in order to install the piles in the testing site. That disadvantage is crucial especially when the number of piles is small and the costs of re-adjustment of the building site or the standstill in the works caused by the testing methodology are irrelevantly expensive in comparison with the contract value. The conditions presented above form the basis for the undertaken attempt at the analysis of the influence of the time - elapsing between the driven pile installation and the static load test – on the test results. Such an influence reported by Skov [7] and Svinkin [8] is significant, especially in the case of stiff cohesive soils where so called soil "setup effect" accompanied by dissipation of pore pressure at the soil pile interface zone may last in terms of years. The detailed analysis of setup in sands is a subject of studies by Jardine [2] and König [3]. Bearing in mind the applied piling technology and the soil conditions, it is necessary to define the minimal time span between the piling and the beginning of the tests. At the same time, the pressure from the contractors often causes the control procedures to begin and finish before that time.

Keywords: static load test, setup, driven pile, sheet pile, ultimate capacity

UPDATE ON STATIONARY TEMPERATURE MODEL ON CARBONATES DOMINATED, STRATIFIED, LOW ENTHALPY HYDROGEOTHERMAL SYSTEM OF THE BEŠEŇOVÁ ELEVATION, NORTHERN SLOVAKIA.

Dipl. Ing. Branislav Fričovský, M.S.[1]

Assoc. Prof. Ladislav Tometz, Ph.D. [1]

Assoc. Prof. Ladislav Vizi, Ph.D.[1]

M.Sc. Jana Štiaková [2]

[1] Institute of Geosciences, Technical University of Košice, **Slovak Republic**

[2] VEIDEC SK, s.r.o., Žilina, Košice, **Slovak Republic**

ABSTRACT

The Bešeňová elevation is exploited since 1979, however, modeling of geothermal field modeling aimed at vertical distribution of geothermic settings only. Here, deep reservoir temperatures are used to calculate overheating- a controlling factor on reservoir convection onset. Even in neither region of the system the critical condition of $Ra > Rc$ and $Nu > Nc$ is reached, implementation of tolerance ($\delta Ra < 3$ and $\delta Nu < 0{,}03$) points on minor convection onset possibility in the central, production zone.

Keywords: Bešeňová elevation, heat flux, overheating, reservoir temperature

USE OF GEOTHERMOMETERS FOR CHARACTERIZATION OF GEOTHERMAL CONDITIONS OF THE POPRAD BASIN, SLOVAKIA

Assoc. Prof. Dr. Marian Fendek,
Ing. Veronika Blanarova
Comenius University in Bratislava, Faculty of Natural Sciences, Dept. of Hydrogeology, **Slovakia**

ABSTRACT

Geothermic conditions of geothermal aquifers can either be characterized by temperature of geothermal water measured in existing deep wells or estimated using geothermometers based on the chemical composition of geothermal water. Geothermometers were applied on five geothermal boreholes PP-1 Poprad, VSC-1 Velky Slavkov, FGP-1 Stara Lesna, Vr-1 Vrbov and Vr-2 Vrbov in the Poprad Basin, north-eastern Slovakia. The temperature on the Pre-Palaeogene basement, composed mostly of Mesozoic carbonates, varies from 40 °C to 117 °C in this area, the highest temperatures are at the depth of 3 200 – 3 300 m. Temperature values estimated by geothermometers were compared with real geothermal water temperatures. The K/Mg, chalcedony, and α-cristobalite geothermometers were chosen as the most suitable ones for the Poprad Basin conditions.

Keywords: geothermal water, geothermal borehole, temperature, geothermometer, Poprad Basin in Slovakia

USE OF THE EXPERT EVALUATION IN THE FORECAST OF SULFATE-CARBONATE KARST DEVELOPMENT

Tatyana Kovaleva

Prof. Dr. Valerii Kataev

Perm State National Research University, **Russia**

ABSTRACT

Within the limits of various geological conditions development and distribution of surface and underground karst forms and consequently, karst forecasting possesses specific features. At the present stage of development of engineering karstology there was a necessity of change of paradigm of karst forecast from the reduced variant of the «practical» analysis of parameters of the surface karst forms and their formal distribution on territory on the «complete» analysis considering features of spatial distribution, morphology and parameters surface and underground karst forms arising under influence of features of the geological-hydrogeological structure of the karst massifs. Authors, as an example, for territory of classical development of sulfate-carbonate karst in Preduralie identified the intervals of values of parameters optimum geological-hydrogeological conditions occurrence and developments of karst forms which can be used at the initial stages of the karstologic forecast are certain.

Key words: geologic structure, karst forms, karst danger, forecast

USING A LIGHT FALLING WEIGHT DEFLECTOMETER FOR THE IDENTIFICATION OF THE SLEEPER SUBSOIL LAYER QUALITY DEGREE IN RAILWAY STRUCTURES

Petr Břešťovský, Ph.D.

CTU in Prague, Faculty of Civil Engineering, **Czech Republic**

ABSTRACT

The paper presents the method of assessing the quality of a newly built sleeper subsoil layer. The method is based on using the light falling weight deflectometer (LFWD) dropped on a bearing plate and causing a deflection in the layer. The currently only applied test for checking the quality of a layer used in the railway construction in the Czech Republic is the plate load test (PLT). It is a test both technically and time-consuming. One PLT for 200 m of track without a precisely specified place is prescribed for checking newly built sleeper subsoil layers on railway tracks in the Czech Republic. A complex assessment of the layer requires the identification of the worst place of the construction where PLT should be performed. For this purpose, the newly introduced term of the quality degree of the Z_z layer obtained by means of LFWD is used. The layer quality degree is the ratio between the bearing plate's deflection in the layer due to the first impact and an average impact obtained from the fourth, fifth and sixth impact. The paper describes a modified methodology of working with LFWD with an emphasis on obtaining the bearing plate's deflection. In conclusion, the verification on a real sleeper subsoil construction carried out during the construction of a railway track in the Czech Republic is described.

Keywords: railway, sleeper subsoil, light falling weight deflectometer

USING OF GROUNDWATER FLOW MODELING TO OPTIMIZE THE METHODS OF LIQUIDATION OF OPEN PIT MINE RECLAIMED BY POST-MINING WASTES

M.Sc. Eng. Katarzyna Niedbalska[1)]

Ass. Prof. DSc. Przemysław Bukowski[1)]

DSc. Eng. Andrzej Haładus[2)]

[1] Central Mining Institute in Katowice, Dept. of Geology and Geophysics, **Poland**
[2] Cracow University of Science and Technology; Faculty of Geology, Geophysics and Environmental Protection, **Poland**

ABSTRACT

Diverse variants and methods of securing water-land environment against the impact of pollutants washed out from dumping ground located inside the open pit were considered within the model research works. A detailed analysis included conceptual models of reducing water flooding of the open pit, which were the basis for numerical model studies. Different concepts concerning the reduction of water inflow into the pit were considered at the simulation phase, including the inflow reduction by sealing the landfill plateau, construction of barriers or anti-filtration screens in various systems or application of a combined variant. The multivariate studies concerning the changes of hydrodynamic conditions within the area of the open pit were supposed to be the basis for the assessment of the numerical simulation studies reliability, their possibilities and influence on the selection of an optimal method of liquidation of the open pit and the best possible protection of underground water against pollution within its surrounding area.

Keywords: open-cast mining, waste management, numerical modeling, contaminants migration, water protection

VIBRATION MONITORING AS A TOOL FOR A CALIBRATION OF GEOTECHNICAL TECHNOLOGIES

Assist. Prof. Dr. Jaroslaw Rybak

Assist. Prof. Dr. Joanna Pieczynska-Kozlowska

Wroclaw University of Technology, Faculty of Civil Engineering, **Poland**

ABSTRACT

Economic progress observed in recent years triggered the need for the expansion of transportation infrastructure as well as the growing interest in the land located in close proximity to already existing buildings. Erecting new buildings within compact housing imposes on the investors the obligation to create a particular amount of parking places. The expansion of road and motorway network requires developing the areas with complex geology, whose use was previously economically unjustified. The above mentioned aspects cause the need for technologies that make it possible to take maximum advantage of small free city spaces or to found engineering structures almost in any possible geo-hydrological conditions. Most of the available soil improvement techniques are accompanied with noise and vibrations. When the amplitudes of vibrations go beyond the levels defined as safe in the code of practice, or when the vibrations become exceedingly perceptible by the humans, it is however possible to correct the technology of the works' execution. This work presents selected aspects of the active designing, using the investigation of the impact of vibrations that occur during the soil improvement and piling works, on adjacent engineering structures.

Keywords: ground vibrations, vibration monitoring, technology calibration

VULNERABILITY OF THE GROUNDWATER TO NUTRIENT POLLUTION OF A COUNTY IN THE SOUTH-EASTERN OF ROMANIA

Stanescu Bogdan[1], Gheorghe Batrinescu,
Kim Lidia, Cuciureanu Adriana
National Research and Development Institute for Industrial Ecology - ECOIND, **Romania**
[1]corresponding author

ABSTRACT

This paper presents a functional model for the investigation of the groundwater quality expanded to the size of the county from the South-Eastern of Romania, considered as a case study. Were followed a several steps: defining the area of the study, establishing the methodology of the investigation (the sampling method and the quality indicators), the design of the experimental field, the applied methodology and finally getting a functional geochemical model of the groundwater of the entire county. Were determined for each groundwater sample a total of 17 physical and chemical quality indicators. Each sampling point was located with a GPS receiver, so all the results are a georeferenced database for the entire county. We have mapped the distribution of the pollutant concentrations to a number of relevant nutrient pollution category and a map of the "nitrates" indicator, the pollutant with the highest amplitudes of the concentrations recorded.

Keywords: vulnerability, nitrates, underground water, pollution, map

WATER BODIES IN SUBSIDENCE BASINS IN THE SILESIAN UPLAND AS AN EXAMPLE OF ANTHROPOGENIC CHANGE IN THE NATURAL ENVIRONMENT

Dr. Robert Machowski

Dr. Martyna A. Rzetala

University of Silesia, **Poland**

ABSTRACT

The Silesian Upland (southern Poland) is an area where underground coal deposits as well as zinc and lead ores are mined (in the past, iron ores were exploited there as well). Subsidence basins form in places where minerals are mined below the ground surface. Purposes of the study included assessing the impact of underground mining on the rate of surface subsidence, examining the conditions in which water bodies form in subsidence basins and determining the role of such basins in shaping habitat conditions and biodiversity. Within the framework of field work, detailed geomorphological and hydrological mapping was carried out, floristic composition was determined and the animals present in the area were characterised. Cartometric analyses were carried out based on the cartographic material collected. Laboratory tests were also conducted with respect to both water (using the potentiometric, spectrophotometric, turbidimetric and flame photometry methods) and sediments (using sieve analysis, the combined areometric-sieve method, INAA and ICP). The study revealed that in the region, a total area of more than 1000 km^2 is threatened with ground deformation and the depth of some basins exceeds 30 meters. Water bodies at the bottom of subsidence basins exhibit morphometric parameters that depend on the size of the subsidence and their shorelines are most often oval in shape. Very small and small water bodies prevail. A vast majority of them have areas which do not exceed 10 hectares. They are also fairly shallow (usually up to 2–3 metres) and greater depths are very rare. Water bodies in subsidence basins alter the local water cycle significantly. These hydrographic phenomena are undoubtedly a new element that contributes to changes in the direction of water migration in the area in question. The water bodies examined were subject to transformations at each stage of the development of the subsidence zone. It has been found that they set a new erosion base level and act as local sedimentary basins. The bottom sediments accumulated in such water bodies are significantly contaminated, particularly with heavy metals such as lead, zinc and cadmium. The studies conducted have demonstrated that these water bodies may fulfil functions similar to natural lakes. The changes triggered by land subsidence affect the evolution of vegetation, and in the final stage, aquatic and land vegetation ecosystems are shaped. In the wake of these changes, many new animal species, both vertebrates and invertebrates, migrate into the area.

Keywords: lakes, water reservoirs, water body, subsidence basins, bottom sediments, human impact, Silesian Upland

WINKLER MODELLING OF A HYBRID RETAINING WALL

Assoc. Prof. Dr. Wlodzimierz Brzakala

Assist. Prof. Dr. Aneta Herbut

Assist. Prof. Dr. Jaroslaw Rybak

Wroclaw University of Technology, Faculty of Civil Engineering, **Poland**

ABSTRACT

The paper deals with flexible vertical walls embedded in soils which are stiffened by a horizontal cantilever platform. A special role is played by this horizontal structural member that reduces bending moments. This concept can be – to a certain extend – an alternative for expensive soil anchors. Such technical solutions are useful for long linear excavations (subways, highways, tunnels *etc*.) and also as single piles. Although limited to linearly deformable subsoil models – the simplest Euler-Bernoulli beams on the Winkler subsoil – the presented analytical solutions yield a prediction of the wall behaviour (displacements, internal forces), as well as can initiate parametric studies, sensitivity analysis and optimization. The obtained results make the design process more reliable and the use of retaining structures more environment-friendly.

Keywords: geoengineering, soil-structure interaction, design