



Slovensko geotehniško društvo

PROCEEDINGS OF THE XIII<sup>TH</sup> DANUBE-EUROPEAN CONFERENCE ON  
GEOTECHNICAL ENGINEERING, 29-31 MAY, 2006, LJUBLJANA, SLOVENIA

# ACTIVE GEOTECHNICAL DESIGN IN INFRASTRUCTURE DEVELOPMENT

Volume 2: Papers



TAGUNGSBAND DER XIII. DONAU-EUROPÄISCHE KONFERENZ FÜR  
GEOTECHNIK, 29.-31. MAI 2006, LJUBLJANA, SLOWENIEN

# AKTIVE GEOTECHNISCHE PLANUNG IN DER INFRASTRUKTUR-ENTWICKLUNG

Band 2: Beiträge

*Edited by*

Janko Logar

*University of Ljubljana, Faculty of Civil and Geodetic Engineering, Ljubljana, Slovenia*

Ana Gaberc

*Slovenian Geotechnical Society, Ljubljana, Slovenia*

Bojan Majes

*University of Ljubljana, Faculty of Civil and Geodetic Engineering, Ljubljana, Slovenia*

Ljubljana, 2006

# Table of contents

## Inhalt

Site characterization for geotechnical and geoenvironmental purposes	1
Standortcharakterisierung aus geotechnischen und umweltgeotechnischen Gesichtspunkten	
Effect of confining pressure on the strength behavior of granular materials simulated by DEM <i>Alim, A., Bari, W., Suzuki, K., Iwashita, K.</i>	3
The systematization and storing methods of information concerning the geotechnical parameters <i>Andrei,S., Cazacu,B.G., Zarajanu,D.</i>	7
On the deformation of the loessial soils <i>Bally,R.J., Udrea,L.</i>	11
Silt mixture CPT characterization for a reliability evaluation of pile total stress bearing capacity <i>Cherubini,C., Vessia,G.</i>	19
Swelling characteristics of Belgrade marly clays established by Huder-Amberg method <i>Čaki,L., Rosić,B.</i>	25
Swelling and compaction phenomena in some bentonites from Tagus Basin (Madrid, Spain) <i>de Santiago,C., Santana Ruiz de Arbulo,M.</i>	29
Cyclic behavior of nonplastic silty sand under direct simple shear loading <i>El-Mamlouk,H.H., Hussein,A.K., Moddather,A.</i>	35
Studying optimum conditions of compression of clay screens <i>Gabibov,F.G., Kulchitski,L.I.</i>	41
Effect of unloading on the behaviour of Warsaw clays <i>Garbulewski,K., Lendo,M., Skutnik,Z.</i>	45
Failure surfaces formed by the pullout of rock anchors: scale model tests <i>García Wolfrum,S., Serrano,A., Olalla,C.</i>	49
Site response analysis using a visco-hypoplastic model <i>Grandas,C., Reyes,D., Lizcano,A.</i>	55
Laboratory investigations of clayfills <i>Herle,I., Herbstová,V.</i>	61
Evaluation of CFA Pile Behaviour using CPTU data <i>Imre,E., Szabó,V., Szalay,E., Puszta,J., Mahler,A.</i>	65
Evaluation of non-monotonous dissipation test results <i>Imre,E., Trang,Q., Rózsa,P., Bates,L., Fityus,S.</i>	71
Experimentelle Standsicherheitsuntersuchungen an historischen Infrastrukturbauwerken <i>Katzenbach,R., Werner,A.</i>	77

Numerical modelling of vertically cyclically loaded saturated soil <i>Lenart,S., Logar,J.</i>	83
An interrelationship between shear and deformation parameters of gyttja and peat from CPT and DMT tests <i>Mlynarek,Z., Tschuschke,W., Wierzbicki,J., Marchetti,S.</i>	89
The effect of crushed particles content and moisture content upon the deformation characteristics of Mura gravel at repeated load conditions <i>Pagon,E., Pavšič,P., Lenart,S., Logar,J.</i>	95
Transition Filters <i>Pavchich,M.</i>	101
Influence of water on mechanical behaviour of soils and aggregates <i>Pavšič,P.</i>	109
Long term pore water pressure measurements for effective stress evaluation at Warsaw clays <i>Skutnik,Z., Borowczyk,M., Krysiak,S.</i>	113
Geophysical studies of foundation conditions at St'Johns Cathedral, Brisbane, Australia <i>Starr,D., Yelf,R.</i>	119
New Method for Measuring of Dynamic Compaction Rate with LFWD <i>Subert,I.</i>	125
Soft subsoil improvement and factors which determine the consolidation <i>Szymanski,A., Sas,W., Drozdz,A., Malinovska,E.</i>	131
Static load tests on bored piles <i>Stern,K.</i>	137
Deformation-strength evaluation of volcanic soil grounds damaged by the 2003 Tokachi-Oki Earthquake <i>Timpong,S., Miura,S., Yagi,K.</i>	143
Assessemnt of an elastoplastic behaviour model for Tunis soft clay <i>Toumekti,F., Klay,M., Bouassida,M.</i>	147
Modelling of clay: settlements and stability factors <i>Varga,G., Czap,Z.</i>	153
Influence of desiccation on swelling behavior of initially saturated swelling rocks <i>Vrklijan,I., Kavur,B., Znidarcic,D.</i>	159
The influence of fly ash compaction on fly ash-HDPE geomembrane interface shear strength <i>Zabielska-Adamska,K.</i>	165
An analysis of the influence of compaction and moisture content on the shearing strength of coal ashes <i>Zawisza,E., Zydrone,T.</i>	171
Small-Scale Cone Penetration Tests into Martian analogue Materials Laboratory Tests and Numerical Simulation <i>Zoehrer,A., Semprich,S., Kargl,G.</i>	177

Ground improvement and reinforcement, reuse of brownfield sites	183
Bodenverbesserung und Bodenbewehrung, Wiederverwendung von Altlastflächen	
Piled Embankments: Overview of Methods and Significant Case Studies	185
<i>Alexiew, D.</i>	
Investigation of the behaviour of geosynthetic/soil systems in reinforced-soil structures	193
<i>Aschauer,F., Wu,W., Oberreiter,K.</i>	
Mechanically stabilized earth wall reinforced with Fortrac geogrids - Crossroad over the Motorway E75, Belgrade	199
<i>Bakrač,M., Schröer,S.</i>	
A landfill for residues resulted from drilling and production of gas wells. Case study – Scheia landfill, Romania	203
<i>Batali,L., Manea,S., Olinic,E.</i>	
Drucksondierungen zur Prüfung des Verdichtungserfolgs bei der Tiefenverdichtung mittels Rüttelstopfverfahren	209
<i>Buschhäuser,K.</i>	
Use of high strength geotextile for soil characteristic improvement	215
<i>Dimitrievski,L., Lamov,L., Ilievski,D.</i>	
A numerical study of deformation and stress behavior of the subsoil reinforced by gravel columns	221
<i>Gaszyński,J., Gwóźdż-Lasoń,M.</i>	
Geokunststoffummantelte Vakuum-Säulen Ein neues Gründungsverfahren für sehr weiche bindige Böden	227
<i>Geduhn,M.</i>	
Is the European regulatory capping design of landfills equivalent to geosynthetic alternatives?	237
<i>Heerten,G., Reuter,E.</i>	
Verhalten von Bodengewölben unter ruhender und nicht ruhender Belastung	245
<i>Heitz,C., Kempfert,H.-G.</i>	
Long-term performance of reinforced soil structures	251
<i>Herle,V.</i>	
Design of mass stabilized peat	257
<i>Jelasic,N.</i>	
Strength and flexural behaviors of fiber-cement-stabilized fly ashes	263
<i>Kaniraj,S.R., Gayathri,V., Saha,S.</i>	
Brownfield redevelopment - an interdisciplinary task in inner city development	269
<i>Klapperich,H.</i>	
Technical and biological reinforcement of rebuilt landfill slopes	275
<i>Koda,E., Głażewski,M.</i>	
Behaviour of GCL mineral component treated with site-specific liquid	281
<i>Kovačević Zelić,B., Matešić,L., Veličković,B., Kovačić,D.</i>	
long-term stability of wind power stations in former mining areas	287
<i>Lippmann,R., Schuhmacher,I., Kley,M.</i>	
Foundations of oil tanks by stone columns in the Czech Republic	293
<i>Mica,L., Racansky,V., Kois,R., Nemec,I., Bucek,J.</i>	

Foundation strengthening and grouting by means of jet piles for a 9+1-storey building with strengthened-concrete framing <i>Müller, M.</i>	299
Recommendations for designing of grout curtains in foundation of embankment dams <i>Pavchich, M., Radchenko, V.G.</i>	307
Underpinning of buildings by means of jet grouted piles <i>Popa, A.</i>	313
Verfüllung eines Hafenbeckens als Baugelände <i>Rumpelt, T., Schmidt, H.-H., Hauck, C.-D.</i>	319
Ground Improvement using Electro-Chemical Injection <i>Rustamaji, R.M., Azzam, R.</i>	325
Geogitterbewehrte Erdbauwerke in topographisch schwierigem Gelände <i>Saathoff, F., Leue, A.</i>	333
Study on behavior of Persian Gulf artificially cemented carbonated sands under triaxial loading <i>Salehzadeh, H., Nobakht Sarkandi, M.R., Ghazanfari, E.</i>	339
Experimental study on performance of sand drain on kaolinite with varying drain diameter <i>Shah, M., Khan, T., Shroff, A.V.</i>	349
Sicherung von Altlasten und Begleitdämmen <i>Thurner, R., Irrgeher, C., Winkler, F., Hautz, W.</i>	355
Soil mixing - challenges of applications ranging from ground improvement to structural elements <i>Topolnicki, M.</i>	361
Exploration of loess soils strengthened by thermal method <i>Tregub, A., Stepura, I., Grechko, V.</i>	367
Stiffness and strength of a cement treated dredged material <i>Verastegui Flores, R.D., Van Impe, W.F.</i>	373
Living noise barrier by geosynthetics reinforced earth wall <i>Wu, W., Aschauer, F., Oberreiter, K., Gruber, J., Schön, H.</i>	379
Designing the compacted subsoil's using mathematical simulation method <i>Zotsenko, N., Vynnykov, Y.</i>	385
The importance of physical and numerical models for ground improvement <i>Žnidarčić, D.</i>	391
 Interactive geotechnical design practice Interaktive geotechnische Planungspraxis	397
Active geotechnical design of the Vienna by-pass tunnel Rannersdorf <i>Adam, D., Dittrich, W., Stoifl, M., Schreitl, B.</i>	399
Instability phenomena in the Čabranka valley, Croatia <i>Arbanas, Ž., Benac, Č., Grošić, M., Močibob, T.</i>	405
Interactive design for deep excavations <i>Arbanas, Ž., Kovačević, M.-S., Szavits-Nossan, V.</i>	411
A comprehensive monitoring system of mechanized tunnelling in urban area – Automated control of geotechnical measures, topographic surveys, rail tracks geometry and TBM data <i>Borgonovo, G., Contini, A., Locatelli, L., Ramelli, E.</i>	417

Comparison of the observed and numerical analysis of a deep excavation <i>Chaichi,P., Shariatmadari,N.</i>	421
Interactive geotechnical design with geosynthetics for the covering of sludge lagoons and tailings ponds <i>Heerten,G., Klompmaker,J.</i>	427
Monitoring of landslides on corridor 10 passing through Serbia <i>Jelisavac,B., Vučić,V., Milenković,S., Jotić,M.</i>	433
Examples of active design in tunneling <i>Jovičić,V.</i>	439
Calculation of bearing capacity of pile foundations as a result of static probing test of soil <i>Khamov,A.P.</i>	445
Interactive design – Croatian experience <i>Kovačević,M.S., Szavits-Nossan,V.</i>	451
Pumpspeicherwerk Waldeck II - Drei Jahrzehnte angewandte felsmechanische Langzeitüberwachung <i>Lege,C., Gras,J.</i>	457
Design of a retaining structure for an excavation pit for the construction of the VIPNET underground garage <i>Mihaljević,I., Dašić,G., Kvasnička,P., Matešić,L.</i>	463
Osterberg load tests as basis for the foundation design of a new cable stayed bridge linking North and South America <i>Moormann,Ch., Saul,R., Humpf,K.</i>	469
Experiences with the observational method during construction of the Lauenburg Lock <i>Ott,E., Siebenborn,G., Schulze,P.</i>	475
In situ yielding and field stress paths of clayey soils under embankment loading <i>Oztoprak,S., Cinicioglu,S.F.</i>	481
Comparison behaviour during installation and static loading test performances of eight impact and vibratory driven piles in stiff clay <i>Rocher-Lacoste,F., Bourdouxhe,M.P.</i>	487
Monitoring of dams and dikes – water content determination using Time Domain Reflectometry (TDR) <i>Scheuermann,A., Bieberstein,A.</i>	493
Urban infrastructure objects monitoring on territories formed by loess soil <i>Shokarev,V., Havkin,A., Kurkin,N., Kuznetsov,R., Hilko,S.</i>	499
Hangüberwachung an der Schleuse Lauenburg <i>Siebenborn,G., Schulze,P., Ott,E.</i>	503
Effects of the instruments bias on the reliability of manual inclinometer measures <i>Simeoni,L.</i>	509
Deep excavation case histories in the city of Zagreb <i>Tomac,I., Marić,B.</i>	515
Estimation of effectiveness of slope stability improvement method <i>Turček,P., Ravinger,R., Matejčeková,M.</i>	521
Unstable slope monitoring and remedial measures design <i>Zalesky,J., Bohadlova,M., Bubenicek,M., Zalesky,M., Kurka,J.</i>	525

Accelerated settlement of soil on the motorway between Smednik and Velika vas <i>Žiberna,S., Kraljić-Kenk,M.</i>	531
Active design of a cut-and-cover tunnel portal in demanding geotechnical conditions <i>Žvanut,P., Petkovšek,B., Logar,J.</i>	537
 Soil-structure interaction under static and dynamic loading Boden-Bauwerk-Interaktion unter statischer und dynamischer Belastung	543
Model study on reinforced earth wall under surcharge strip and square plate loading <i>Arekar,V.A., Joshi,N.H., Shroff,A.V.</i>	545
Die Beständigkeit der Mittelfundamente nach dem Beispiel von Brückenwiderlagern <i>Bauer,J., Wyjadłowski, M.</i>	551
Numerical modeling of pile foundation and basis interaction <i>Boyko,I.</i>	557
Influence of the deformation parameters of soil in selection of the static scheme in Maliq's bridge <i>Bozo,L., Ahmetaj,L., Allkja,S.</i>	561
Settlement analysis of rigid shallow foundations on sands <i>Ćorić,S.</i>	567
Determination of soil lateral pressure regarding displacements of retaining wall <i>Dobrovsky,M.</i>	571
Design of pile foundations following Eurocode 7 <i>Frank,R.</i>	577
The effect of strength anisotropy on slope stability analysis in soils <i>Galavi,V., Schweiger,H.F.</i>	587
Some experience of numerical modeling of dynamic soil-underground structure interaction <i>Glagovsky,V.B., Kassirova,N.A.</i>	593
Boden-Bauwerk-Interaktion bei parallel-wandigen Verbundsystemen <i>Hauser,C., Walz,B.</i>	599
Evaluation of the base design parameters in the numerical modeling of a structure and a pile base interaction with karst deformations <i>Ilijchev,V.A., Gotman,N.Z.</i>	605
Laterally loaded pile analysis due to embankment induced soil movements <i>Kelesoglu,M.K., Cinicioglu,S.F.</i>	611
Arrangement of jacked-in piles for buildings and structures <i>Kornienko,M., Golub,V., Presnjakov,O., Raschenko,A.</i>	617
Bemessung der Gründung von Offshore-Windenergieanlagen <i>Lesny,K., Richwien,W.</i>	621
Examination, projecting and building of vertical ferroconcrete well bores above operating sewage collectors <i>Luchovsky,I., Nikitenko,V.</i>	627
Influence of mechanical characteristics of rock piece on rock-fall analysis results <i>Macuh,B., Žlender,B.</i>	633
Determination of the zone of influence during arrangement of bored cast-in-site piles in soft soils <i>Mangushev,R., Sbitnev,A., Lebedev,M., Osokin,A., Tatarinov,S.</i>	637

Analysis of grounds collapse action on a concrete structure <i>Markova,M., Lisunov,J., Markov,A.</i>	641
Assessment of landslide load on pile construction according to GLE method <i>Matsiy,S., Derevenets,P.</i>	645
Planar Slope Stability Analysis of Soft and Highly Fractured Rock Masses <i>Melentijevic,S., Serrano,A., Olalla,C.</i>	651
Innovative geotechnical structures – importance of the kinematic analysis <i>Németh,G., Scharle,P., Szepesházi,R.</i>	657
Ground movement of deep excavation in reclamation <i>Pickles,A.R., Lee,S.W., Sun,R.Y.F.</i>	661
Improvement of pile foundations in urban areas <i>Ponomaryov,A.B., Ofrikhter,V.G., Savinov,A.V.</i>	667
Permeable embedded wall enclosure for a multistoried parking in Bucharest, Romania <i>Popa,H., Manea,S., Ciortan,R.</i>	671
Retaining systems for the deep excavations in vicinity the city buildings structure <i>Pula,O.</i>	677
Zyklische und statische horizontale Pfahlprobelastungen für Lärmschutzwände der Neubaustrecke Nürnberg–Ingolstadt <i>Raithel,M., Leusink,E., Kempfert,H.-G.</i>	681
Soil-Structure dynamic interaction: application to design and construction of the facilities of a gas power plant <i>Roma,V., Locatelli,L., Bergamaschi,M., Quadrelli,D.</i>	687
Modeling of multistory building on nonlinear base in an annex conditions <i>Sakharov,V.O.</i>	693
Seismic Stability Analysis of the Assalouyeh Harbor Quay Wall <i>Shahnazari,H., Maleki,R.</i>	699
Ductility and terrain - interaction of soil vs. structure <i>Vujanic,V., Nedeljkovic,S., Jotic,M.</i>	705
Features of interaction of the frame building with the loess collapsible soil base <i>Zhuk,V.V.</i>	711
Stressed and deformed condition of the ground around driven piles <i>Zhusupbekov,A.Zh., Zhusupbekov,A.A., Zhakulin,A.S., Tanaka,T., Ojima,K.</i>	715
<b>Risk assessment and management</b>	<b>721</b>
<b>Risikobewertung und Risikomanagement</b>	
Prognose Bauwerkserschütterungen infolge Ramm-und Vibrationsverdichtungsarbeiten <i>Achmus,M., Kaiser,J.</i>	723
Using fuzzy sets in the determination of the density of surveys at site <i>Boumezerane,D.</i>	729
Application of GIS-based database at Šentvid exploration gallery <i>Genser,W., Pöschl,I., Kleberger,J.</i>	735
Risikobewertung aus geologischer-geotechnischer Sicht bei Naturgefahren <i>Hofmann,R., Angerer,H.</i>	741

Risk assessment of a heterogeneously stratified rock cliff under an elevated road <i>Koudelka,P., Koudelka,T.</i>	747
Risikoanalysen zu großräumigen Rutschungen am Ufer der Wolga in Ulyanovsk/Russland <i>Krajewski,W., Azizov,Z., Rajesh,S., Plamitzer,R.</i>	753
Hangdeformationen – Beobachtungsmethoden und Risikoanalyse <i>Krauter,E., Lauterbach,M., Feuerbach,J.</i>	759
Information-based design in geotechnical works: some examples <i>Merouani,Z., Hintze,S.</i>	765
Prediction of geomechanical parameters using a KBS system. Application to two case studies of underground structures. <i>Miranda,T., Gomes Correia,A., Ribeiro e Sousa,L., Lima,C.</i>	771
Calculation methods for landsliding deformations on base of equations for viscoplastic soil deformation <i>Slyusarenko,Yu., Cherny,G.</i>	777
Risk assessment for harbour structures <i>Soriano,A.</i>	781
Structure basement reliability in the complicated engineering - geological conditions – conceptual probability approach <i>Trofimchuk,O.M., Cherny,V.H.</i>	787
Embankment of transport infrastructure and waste or recycled materials <i>Vaniček,I., Vaniček,M.</i>	793
Risk assessment for the case of waste utilization for embankment construction <i>Vaniček,M.</i>	799
Machine learning methods for predicting the liquefaction triggering <i>Vilhar,G., Lenart,S., Žlender,B.</i>	807
Development of modern transportation infrastructure: role of geotechnical engineering	813
Entwicklung moderner Verkehrsinfrastruktur: Die Rolle der Geotechnik	
Tunneling in mixed and weak rock formations: a case study in Antalya, Turkey <i>Altun,S., Göktepe,A.B.</i>	815
Modeling of the stress-strain state of earth mass on landslide-prone territories <i>Areshkovych,O.</i>	821
Remedial design and construction experience for the center section of Hukou tunnel <i>Atzl,G., Graf,F.</i>	827
Current experiences in the interaction of soil, groundwater and structure in shallow tunneling <i>Boley,C., Schmitz,S., Meyer, F.</i>	835
Substructure and superstructure interactions of high speed railways <i>Brandl,H., Paulmichl,I.</i>	841
Main geotechnical aspects of high speed railways covered by CEDEX and ADIF for the European Supertrack project <i>Cuellar,V., Lozano,A.</i>	847

Renovation of the Weinsberg railway tunnel <i>Dauwe,L., Fröhlich,B.</i>	859
Erosion control using FORTRAC – 3D on the motorway E–75 in Macedonia <i>Dimitrevski,L., Tomov,S., Schröer,S.</i>	865
Peculiarities of technical maintenance of quay walls made of steel sheet piling <i>Doubrovsky,M., Poizner,M., Pushkin,G.</i>	871
Analysis of shipwreck removal and structural rehabilitation of an old grains quay on the Danube in Galatz Port area <i>Dumitrescu,V.</i>	875
Tunneling in soft rock in Slovenia <i>Fifer Bizjak,K., Čarman,M., Petkovšek,B.</i>	881
Dimensioning of flexible surface stabilization systems made from high-tensile wire meshes in combination with nailing and anchoring in soil and rock <i>Flum,D., Riegger,R.</i>	887
Design of shallow tunnel linings constructed with the application of soil grouting <i>Fotieva,N., Bulychev,N., Deev,P.</i>	893
Stabilization of a landslide using injection anchors in Bulgaria <i>Frangov,G., Hamova,M.</i>	899
Assessment of the effect of pore pressures on the behaviour of railway embankment <i>Gavin,K., Xue,J.F., Jenning,P.</i>	905
Stabilization of a landslide section along a road passing through the Stara Planina mt., Bulgaria <i>Hamova,M., Frangov,G., Zayakova,H.</i>	911
Control of groundwater in sands for tunnelling: case histories <i>Hartwell,D.J.</i>	915
Sealing of tunnels under very high hydraulic loading <i>Heerten,G., Opheys,S., Tepper,T.</i>	921
Neuartiges Bettungsmaterial für Fernwärmeleitungen Vergleichende bodenmechanische Eignung und thermische Vorteile <i>Henögl,O.</i>	927
Erfahrungen bei der Konstruktion und der Bemessung von Uferschutzmaßnahmen an Binnenwasserstraßen in Deutschland <i>Kayser,J.</i>	933
Analyses of a TBM tunnel excavation in structured soil of Singapore using FEM <i>Klotz,C., Vermeer,P.A., Klotz,U.</i>	941
Complex geotechnical investigations for the railway reconstruction Osijek – Beli Manastir – State border <i>Kralj,N., Goluža,D.</i>	947
Dimensioning of the railway load bearing substructure, section Osijek-Beli Manastir-State border <i>Kralj,N., Goluža,D.</i>	953
Geotechnical project in development of Ukrainian seaport infrastructure <i>Kryvosheyev,P., Shkola,O.</i>	959
Assessment of liquefaction potential of a loose soil in the base of a railroad <i>Lenart, S., Petkovšek, B.</i>	965

Geotechnical experience gained in a ten-year period of implementation of the Slovene motorway network <i>Ločniškar,A.</i>	971
Detailed hazard maps for landslides in Romania <i>Manea,S., Batali,L., Olinic,E.</i>	979
Sanierung der Fundamente der Karlsbrücke in Prag <i>Masopust,J.</i>	985
Seepage analysis of Sacramento river setback levee <i>Money,R.L., Porbaha,A.</i>	989
Bemessung horizontaler Entlastungsbrunnen für ein Kanalbrückenwiderlager mittels numerischer, teilgesättigter, 3D-Strömungsberechnung <i>Montenegro,H., Odenwald,B.</i>	995
Using dielectric measurements to predict seasonal water movement in unbound road base and sub-grade layers <i>Petkovsek A., Pavšič,P., Kokot,D., Leben B.</i>	999
U-Bahn Section U2/3 Praterstern Station <i>Rausch,A., Girsch,E.</i>	1005
Structural measures for protection of sewer tunnel against seismic effects <i>Rozenvasser,G., Serdyuk,A., Bukan,A.</i>	1011
NATM-tunneling versus pipe-jacking. A comparison at the cable tunnel system Graz main railway station <i>Vergeiner,R., Steiner,H.</i>	1017
Šentvid tunnel <i>Žigon,A., Propreter,M., Žibert,M., Jemec,P.</i>	1025
List of authors	1030
Autoren Verzeichnis	