



Associated research Centers
for the Urban Underground Space
Association des Centres de recherche
sur l'Utilisation Urbaine du Sous-sol



GEAM

ASSOCIAZIONE GEORISORSE E AMBIENTE
TORINO



POLITECNICO DI TORINO

ACUUS 2002
International Conference

**Urban Underground Space:
a Resource for Cities**

In memory of Prof. Lelio Stragiotti

November 14th-16th, 2002
Torino, Italy

Program

Politecnico di Torino
Corso Duca degli Abruzzi, 24
10129 Torino – I

Under the Auspices of



United Nations Educational, Scientific and Cultural Organization.

Ministero delle Infrastrutture e dei Trasporti
(requested)



Sponsorship of the



International Tunnelling Association (ITA - AITES)

In cooperation with



Società Italiana Gallerie

The growing need for underground transportation systems as an alternative to surface alignments, for space for trade, offices, social and recreational facilities and for service networks such as telephone cables, sewers, water, gas pipes, etc under existing surface structures, has increased the frequency of underground construction in highly urbanized areas.

The attraction of underground structures is closely related to the community's evaluation of the drawbacks of surface and aerial structures in terms of environmental degradation. Unfortunately, most of the numerous advantages of underground structures, especially those concerning the protection of the environment, often cannot be quantified in monetary terms.

As the construction costs of underground structures are generally higher than those of building on the surface, underground structures are in some ways "penalized" when compared to surface construction. However, when surface and underground projects are compared over the expected life of the projects, underground construction can prove more economic. Underground structures are generally energy conserving due to their removal from the effects of the changing surface climate. Similarly, by putting facilities underground, valuable surface land can be used for other purposes.

The decision-making process, when evaluating an underground project against a surface or aerial alternative, should not only refer to the construction cost, but should take into account the various advantages offered by the underground alternative, particularly those related to the effects on the environment.

For the above reasons it is particularly important that people involved in the design and development of underground space should work together and exchange their experiences as a means to promote the development and use of more underground facilities. In addition, technological development aimed at facilitating more risk-free underground construction must be pursued

With this goal in mind, ACUUS (Associated research Centres for Urban Underground Space) and GEAM (Associazione Georisorse e Ambiente) are honored to invite the International Tunnelling and Underground Space Use community to participate at the ACUUS 2002 International Conference: **“Urban Underground Space: a Resource for Cities”**.

The Congress will be a chance for International co-operation and exchange amongst the world's community of planners, researchers, builders, investors, decision-makers and other parties involved in the development and use of urban underground space.

In addition to the Conference technical sessions the participants will have the chance to visit the great urban developments of the City of Torino where the underground space is intensively exploited with the design an underground rail link and a metro line, which are presently under construction.

Takeshi KUROKAWA
President of ACUUS
Chairperson of the Scientific Committee

Evasio LAVAGNO
Vice President of ACUUS
Chairperson of the Organizing Committee

Sebastiano PELIZZA
Politecnico di Torino
Co-chairperson of the Scientific Committee

Jacques BESNER
General Secretary of ACUUS
Co-chairperson of the Organizing Committee

SCIENTIFIC COMMITTEE

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Co-Chairperson

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Sabine BARLES, Institut Français d'Urbanisme, Université de Paris VIII, Paris, France

Giorgio SQUINZI, President of MAPEI S.p.A., Milano, Italy

Adolfo COLOMBO, President of SIG - Società Italiana Gallerie, Milano, Italy

Alessandro DE MAGISTRIS, Professor, Politecnico di Torino, Italy

Sergio DEQUAL, Head of the Environmental and Land Department, Politecnico di Torino, Italy

Pierre DUFFAUT, Vice President of Espace Souterrain, Paris, France

Gian Paolo GIANI, President of GEAM - Associazione Georisorse e Ambiente, Torino, Italy

Jean-Paul GODARD, Vice President of ITA - International Tunnelling Association, RATP (Régie Autonome des Transports Parisiens), Paris, France

Piergiorgio GRASSO, President of Geodata S.p.A., Torino, Italy

Giancarlo GUIATI, Managing Director of SATTI S.p.A., Torino, Italy

Pierre von MEISS, Professor, EPFL - Ecole Polytechnique Federale de Lausanne, Lausanne, Switzerland

Susan NELSON, Executive Director of AUA - American Underground Construction Association, Minneapolis, USA

Qian QIHU, Delegate of CSUEUS - Chinese Society of Underground Engineering and Underground Space, Wuhan, People's Republic of China

Raymond STERLING, Professor, Trenchless Technology Center, Louisiana Tech. University, Ruston, USA

Sergey A. YUFIN, Professor, Moscow State University of Civil Engineering, Moscow, Russian Federation

Secretary

Daniele PEILA, Politecnico di Torino, Italy

ORGANIZING COMMITTEE

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Co-Chairperson

Jacques BESNER, General Secretary of ACUUS, Montréal, Canada

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Marilena CARDU, Secretary of GEAM - Associazione Georisorse e Ambiente, Torino, Italy

Claudio OGGERI, Politecnico di Torino, Italy

Laura SCHRANZ, Politecnico di Torino, Italy

Secretariat

Ornella RONZA, GEAM - Associazione Georisorse e Ambiente, Torino, Italy

Nathalie THÉORÊT, General Manager of ACUUS, Montréal, Canada

Thursday, November 14, 2002

Room: Aula Magna

ACADEMIC CEREMONY

CONFERMENT OF THE LAUREA AD HONOREM

**IN ENVIRONMENTAL AND MINING ENGINEERING
(INGEGNERIA PER L'AMBIENTE E IL TERRITORIO)**

to

Mr. Richard LOVAT

9.30 Welcome Address
Giovanni DEL TIN, *Rector of Politecnico di Torino*

Introduction
Romualdo CONTI, *Dean of 1st Engineering Faculty, Politecnico di Torino*

Laudatio
Sebastiano PELIZZA, *Full Professor of Underground Construction, Politecnico di Torino*

Lectio
Richard LOVAT
Recent developments on TBMs

Conferment of the Laurea ad Honorem
in Environmental and Mining Engineering (Ingegneria per l'Ambiente e il Territorio)
by Antonio DI MOLFETTA, *Chairman of Environmental and Land Degree Course,
Politecnico di Torino*

CONFERENCE PROGRAM
of ACUUS 2002
Urban Underground Space: a Resource for Cities
Thursday, November 14, 2002

9.00 Registration

OPENING CEREMONY

Room: Aula Magna

11.00 Sebastiano PELIZZA, Evasio LAVAGNO, Scientific and Organizing Committees, *Italy*
Welcome Addresses
National and Local Authorities
Technical Associations: (ACUUS, GEAM, ITA, SIG)

Opening Lecture

Why go underground in urban areas?

Jean Paul GODARD, *France*

13.00 *Working Lunch sponsored by Tamrock Italiana / Antec S.p.A.*

14.30 **SESSION I**

City planning and underground infrastructure in urban areas

Chairpersons: Jacques BESNER, *Canada*

Evasio LAVAGNO, *Italy*

Room: Aula Magna

Keynote Lecture

The Architectural Development of Underground Metro Stations

Adolfo COLOMBO, *Italy*

15.00 Presentation of technical notes (two parallel sessions)

Rooms: Aula Magna and Sala Consiglio di Facoltà

17.00 *Coffee Break*

17.30 Presentation of technical notes (two parallel sessions)

18.30 Discussion

Department of Georesources and Land Meeting Room

Interdisciplinary Workshops:

15.30 – *Workshop - Exhibition on Advanced Solutions in 3D Representation*

17.30 – *Urban Underground City Planning*

National and International Experts will discuss the Topic of Urban Underground City Planning on the basis of Torino and other relevant Italian and European examples

The workshop will be chaired by representative of Torino Municipality

20.30 *Conference Dinner sponsored by the City of Torino*

Friday, November 15, 2002

9.00 SESSION II

Safety and advanced technical solutions for underground constructions

Chairpersons Sebastiano PELIZZA, *Italy*
Qian QIHU, *People's Republic of China*

Room 2N

Keynote Lecture

Influence of Safety Aspects in Design and Construction Stages of an Underground Metro
Ilario SIGNORETTI, *Italy*

9.30 Presentation of technical notes (two parallel sessions)

Rooms 2N and 3N

11.00 *Coffee Break*

11.30 Presentation of technical notes (two parallel sessions)

12.30 Discussion

13.00 *Working Lunch sponsored by contractors Grandi Lavori Fincosit, Grassetto, Rodio, Seli*

14.30 SESSION III

**Advanced imaging techniques for underground space.
Educating people and training professionals.
Cultural heritage in underground space**

Chairpersons: Giuseppa NOVELLO, *Italy*
Sergey A. YUFIN, *Russian Federation*

Room 2N

Keynote Lecture

Planning of Tokyo Central Station Area: Ground Level and Underground
Takeshi KUROKAWA, *Japan*

15.00 Presentation of technical notes (two parallel sessions)

Rooms 2N and 3N

16.30 *Coffee Break*

16.45 Presentation of technical notes (two parallel sessions)

18.00 Discussion

Department of Georesources and Land Meeting Room

16.45 ACUUS Board of Directors and ACUUS General Assembly

18.30 CLOSING CEREMONY

Evasio LAVAGNO, Sebastiano PELIZZA, *Italy*
Takeshi KUROKAWA, *Japan*

Saturday, November 16, 2002

9.30 - 12.30 **Technical Visits to:**

- ♦ **the Torino Metro Underground Work Sites**
 - Tunnel (visit a)
 - Underground Metro station (visit b)

- ♦ **the Military XVI-XVII Centuries tunnels of Torino Citadel - Museo Pietro Micca** (visit c)

EVENTS

Wednesday, November 13, 2002

14.30 - 18.30 **TECHNICAL SEMINARY**

"Recent Innovation in the Concrete Technology for Special Applications"

Organized by Mapei S.p.A., Milano

Friday, November 15, 2002

9.00 - 18.30 **EXHIBITION OF DRAWINGS ON UNDERGROUND WORKS BY TURIN PRIMARY SCHOOL CHILDREN**

Under the Auspices and the help of

- Città di Torino
- Ministero dell'Istruzione, dell'Università e della Ricerca, Direzione Generale Regionale per il Piemonte
- SATTI S.p.A., Torino



Topics

- Torino e la metropolitana (Torino and its Metro)
- L'uomo e il suo lavoro negli ambienti sotterranei (Man and his work in the underground space)

The Awards of the three best drawings will be given in the Conference Closing Ceremony

GENERAL INFORMATION

Venue

The ACUUS 2002 Conference will be held at:

Politecnico di Torino
Corso Duca degli Abruzzi, 24 - 10129 TORINO
Tel +39.011.5647681; Fax + 39.011.5647689

The Congress will be held on **November 14, in the Aula Magna and Sala Consiglio di Facoltà (Faculty Council Meeting Room), C.so Duca Degli Abruzzi, 24 - Torino, and in Rooms 2N and 3N, Via Paolo Borsellino, 59 - Torino on November 15.**

The Politecnico di Torino, is situated in the central district of Torino, close to the Porta Nuova and Porta Susa Railway Stations.

Caselle Airport is connected to the Railway Stations by a fast train and bus service.

Further information on how to reach the Politecnico di Torino can be found on the internet sites: www.polito.it and www.geam.org which has also some additional INFO.

Organizing Secretariat

GEAM – Associazione Georisorse e Ambiente
Dipartimento di Georisorse e Territorio
Politecnico di Torino
Corso Duca degli Abruzzi 24 - 10129 Torino
tel + 39.011.564.7681; fax+39.011.564.7689
e-mail geam@polito.it web site www.geam.org

Registration and Information Desk

The Secretariat will be at the disposition of the participants in the Sala Consiglio di Facoltà (Faculty Council Meeting Room) - Politecnico di Torino from 13 p.m. to 19 p.m. on Wednesday November, 13, and Thursday November, 14; in the Hall of Rooms 2N - 3N, Via Paolo Borsellino, 59 - Torino, on Friday, November, 15.

Simultaneous Translation

Simultaneous translation from English into Italian and vice versa will be provided for the Aula Magna meetings on November, 14 and for the Room 2N Session on November, 15.

Proceedings

The Conference Proceedings will only be provided in an electronic format and will be distributed during registration at the Registration Desk.

Some Personal Computers will be available to consult the CDs of the proceedings.

Technical Seminary

A Technical Seminary on “Recent Innovations in Concrete Technology for Special Applications” is available free of charge for congress participants.

The Seminary is organized by MAPEI S.p.A. – Milano.

It is necessary to book for this Seminary no later than **October, 30, 2002.**

Technical Visits

Two technical visits to Torino metro underground work sites will be organized: one visit to a tunnel under construction and the other to an underground metro station.

A technical visit to the Military XVI and XVII Centuries tunnels of Torino will be organized.

Each tour will be organized for a maximum of 50 participants. The reservations for the tours will be accepted in order of arrival till the maximum number is reached.

Exhibition of Drawings by Torino primary school children

An Exhibition of Drawings by Torino primary school children on the following topics, will be organized in the Room 1N, Via P. Borsellino, 59 - Torino, on Friday, November 15:

- Torino and its Metro
- Man and his work in the Underground Space

The three best drawings will be awarded a prize during the Closing Ceremony.

Accompanying Person's Tour

A tour of the center of Torino has been organized for the Accompanying people for Friday, November 15, in the afternoon.

The tour will include a visit to the historical Barocco city and the former Italian King's palace.

Climate and clothing

In November the temperature in Torino is around 4 C° - 10 C° during the day. Therefore warm clothing is recommended.

HOTEL ACCOMMODATION

Torino has a large number of Hotels of various standards.

The Politecnico is close to the Center of the city and can easily be reached by public transport.

The Organizing Committee has charged the

Travel Agency Cityrama

C.so A. De Gasperi, 42

10129 Torino

Tel +39.011.505926, Fax +39.011.500963

to coordinate reservations at the following Hotels:

	<u>Single</u>	<u>Double</u>
**** JOLLY LIGURE	€ 163,90	176,00
**** JOLLY AMBASCIATORI	€ 110,00	143,00
*** LANCASTER	€ 90,00	132,00
** STATUTO	€ 66,00	76,00

The indicated rates include one overnight stay, continental breakfast, taxes and VAT.

Participants can contact the Travel Agency Cityrama before **October, 14, 2002**. The Travel Agency requires address, telephone number and credit card number with the expiry data, or the payment of a one day rate to be sent to the Travel Agency in advance as confirmation of the hotel reservations.

REGISTRATION

Anyone wishing to take part in the Conference is kindly requested to send the attached Registration Form to the Organizing Secretariat, duly compiled and accompanied with the corresponding fee before **October 30, 2002**.

Registration fees

Delegate

- ACUUS / GEAM member: € 300,00 + VAT 20% = **€ 360,00**
- non member: € 350,00 + VAT 20% = **€ 420,00**

Author

- ACUUS / GEAM member: € 200,00 + VAT 20% = **€ 240,00**
- non member: € 250,00 + VAT 20% = **€ 300,00**

Student or Accompanying Person: €50,00 + VAT 20% = **€ 60,00**

The fees include

Delegate and Author

- Participation in the Scientific Program
- Proceedings in electronic format
- Congress Documentation
- Technical Seminary on Wednesday, November, 13
- Working Lunches and Coffee Breaks
- Conference Dinner
- One Technical Visit

Student

- Participation in the Scientific Program
- Proceedings in electronic format
- Technical Seminary on Wednesday, November, 13
- Working Lunches and Coffee Breaks

Accompanying Person

- Congress Dinner
- Tour of the Center of Torino in the afternoon of Friday, November, 15

Methods of Payment

The Registration Fees can be paid as follows:

- Non transferable bank cheque to GEAM - Associazione Georisorse e Ambiente
- Bank transfer to
GEAM - Associazione Georisorse e Ambiente
c/o Cassa di Risparmio di Torino - Agenzia 60
c.c. n. 2551068 - CAB 01160 ABI 6320 (Re ACUUS 2002)

The cheque or copy of the bank transfer paper must be attached to the Registration Form and sent to the Organizing Secretariat.

Invoice

Participants who wish to receive an invoice must fill in the appropriate space on the Registration Form.

Cancellation and Refund

Cancellation received by the Organizing Secretariat **before October 30, 2002** will be refunded, less 30% for administrative charges. No refunds will be accepted for cancellation received after this deadline.

CASELLE "S. PERTINI" INTERNATIONAL AIRPORT

A5 TORINO-IVREA-AOSTA

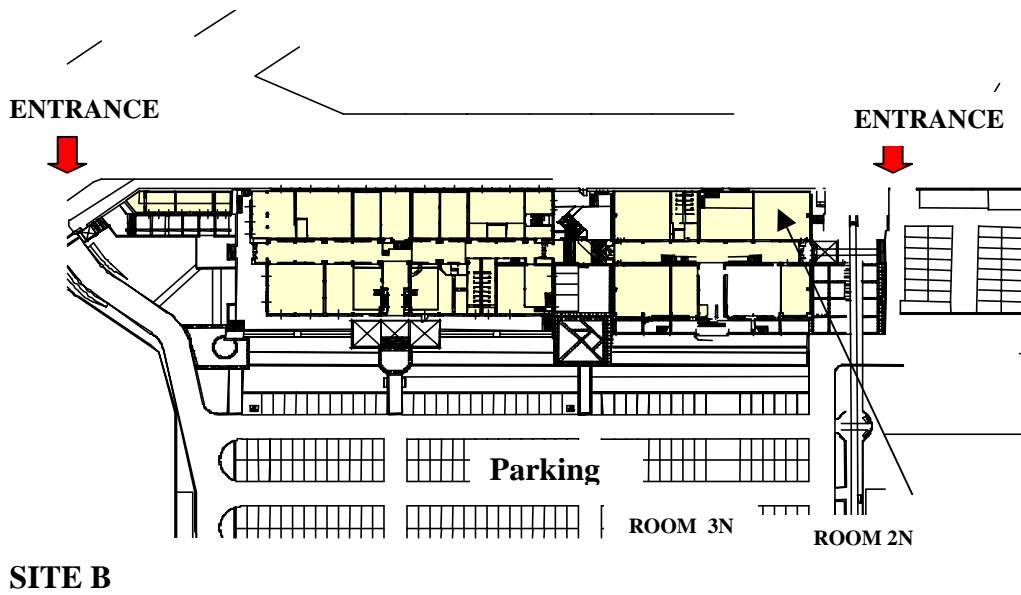
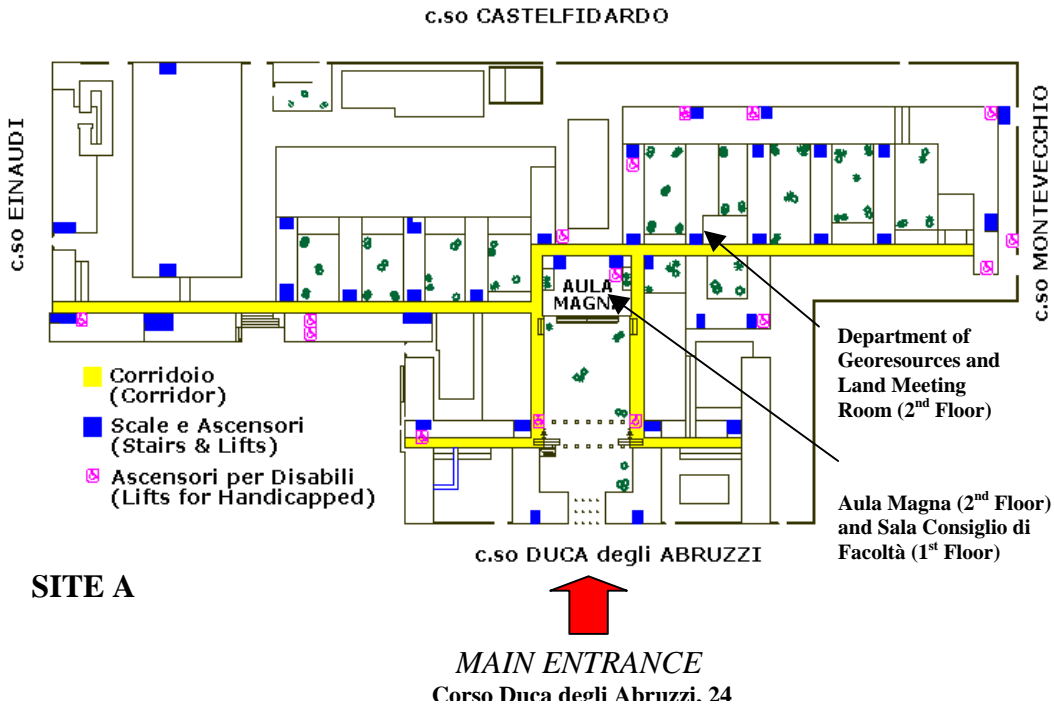
A4 TORINO-MILANO-VENEZIA



A32 TORINO -FREJUS

A21 TORINO-ASTI-ALESSANDRIA-GENOVA

A6 TORINO-FOSSANO-CEVA-SAVONA



List of Papers accepted for publication in the Conference Proceedings

SESSION I

CITY PLANNING AND UNDERGROUND INFRASTRUCTURE IN URBAN AREAS

- ARGENTI M. – *Italy*
Underground Spaces: a Journey Between History and Myths, Literature and Architecture
- BELLOTTI P., IANNOTTA F., SERRA M. - *Italy*
Urban High Speed Pass of Florence: an Underground Solution with respect to the Environment and Urban Condition
- BIANCHI W., CAPALDINI P., DALENZ CULTRERA A., MACCHIA G., PENDENZA A., et al. - *Italy*
Alternative Mobility for Spoleto, a Town Open to Humans
- BESNER J. - *Canada*
The Sustainable Usage of the Underground Space in Metropolitan Area
- BOISVERT M. - *Canada*
From Connexity to Connectivity: Enhancing the Efficiency of Interior Walkways with the Current Extensions of the Montreal's Indoor City
- BOSCO B. B. , GALBIATI D., PASQUALINI A. - *Italy*
Compaction Grouting for "Broletto" (Town Hall) - Pavia
- DUFFAUT P., LABBÉ M. – *France*
From Underground Road Traffic to Underground City Planning
- FOTIEVA N., BULYCHEV N., SAMMAL A., ANTZIFEROV S. - *Russian Federation*
Planning the Location of a New Building Respectively to the Existing Tunnels
- GERARD M., NGUYEN T. - *France*
What about "Clé de Sol"?
- KALIAMPAKOS D. C., BERNARDOS A.G., MAVRIKOS A. A. - *Greece*
Underground Storage Warehouses in Attica, Greece: a Feasible Long-Term Solution
- KOHN B., VAYSSE J.P. - *France*
Architectural Concepts of the New Underground
- LAEZZA R. - *Italy*
The Architecture of the Groundline: Sperimental Spaces for Architecture Underground
- MADINAVEITIA J. - *Spain*
The Bilbao Metro Station at Ansio
- MAMMINO A., TONON F., OMETTO L., BOVO F. - *Italy, U.S.A.*
Moving the Padova Train Station and Link Underground: a City Planning and Engineering Proposal to Make the Town more Organic and Livable

- MAMMINO A., TONON F., SIVIERO E., BRISEGHELLA B., FACCIO P., ZORDAN T.- *Italy, U.S.A.*
A New Tunnel for the City of Mestre
- MIZUGUCHI M., NISHIDA Y., TOMITA T., NOGUCHI H., YAMAMOTO M. - *Japan*
Public Underground Spaces Around Tokyo Central Station: Enhanced Utilization for a Severe Earthquake Scenario
- NISHI J., TANAKA T., SEIKI T., FURUMAI T., YASHIRO K. - *Japan*
The Advantages and Disadvantages in the Use of Deep Underground Space
- NISHIDA Y., MASAKI M., YAMAMOTO M., TOMITA T. - *Japan*
Futuristic Underground Arcades: Thoughts for an Ideal Realization
- ORESTE P., SOLDI L. - *Italy*
The Use of Underground Spaces for Environmental Protection Purpose
- PELIZZA S., PEILA D., ORESTE P., OGGERI C. - *Italy*
Importance of Preliminary Investigations in Tunneling Design
- QIAN QIHU - *People's Republic of China*
Underground Infrastructures for Sustainable Development in China
- SCHOLEY J. - *United Kingdom*
The Development of Underground Space for Intermodal Transport Interchanges
- SIGNORETTI I., GRASSO P., DE LA MENARDIERE J. - *Italy*
Turin Automated Metro
- SUDDLE S. I. - *Holland*
Multiple Use of Space: Spatial Perception and Complexity
- TUNG LIN-HSU - *People's Republic of China*
The New Achievements in Development of Urban Underground Space Resources in China
- WANG XUAN, SHU YU, GONG JIEHUA - *People's Republic of China*
The Sub-Road Space Utilization in Shanghai
- WANG XUAN, SHU YU, ZHAO PENGLIN - *People's Republic of China*
The New Development of Underground Space Planning in China
- de WILDE S. - *Holland*
Underground Spaces at the Heights
- ZACHARIAS J. - *Canada*
Choosing a Path in the Underground: Visual Information and Preference
- ZHI-YI CHEN, ZU-YAN SHEN, YU HUANG - *People's Republic of China*
Underground Space Utility and Sustainable Development in Shanghai
- ZHU WEN-JUN - *People's Republic of China*
A Survey and Evaluation of Underground Space Resources in Beijing Central District for Urban Planning

SESSION II

SAFETY AND ADVANCED TECHNICAL SOLUTIONS FOR UNDERGROUND CONSTRUCTIONS

- **BATTISTELLI L., CARLUCCIO O., LAURIA D., PROTO D., - *Italy***
Environmental Safety for Urban Underground Space
- **BATTISTELLI L., LAURIA D., et al. -*Italy***
Information and Communication in the Underground Space
- **BECCATI M. - *Italy***
Multimedia, Communications and Safety Systems Integration in a Modern Underground
- **BROTO A. – *France***
The A86 Underground Link-up to the West of Paris - Safety in Tunnel Reserved for Light Vehicles
- **BRUNNER W. G. – *Germany***
Development of the Slurry Wall Technique and Slurry Wall Construction Equipment
- **BULYCHEV N. - *Russian Federation***
Theory and Methods of Underground Structures Design
- **CARPIGNANO A., DEBERNARDI M. L., PATRUCCO M. - *Italy***
Risk quantifying and Management in Underground Excavations: a Possible Approach
- **CHEN S.G., ONG H.L., TAN K.H. – *Singapore***
A Study on Tunnel Separation Distance in Urban Underground Development
- **DAL NEGRO E., MALTESE C., PISTOLESI C. - *Italy***
Use of Advanced Alkali free Accelerators for High Performance Shotcrete
- **DELLA VALLE N. – *Spain***
Barcelona Metro Line 9 - The Largest Metro Project in Spain
- **DIAS D., KASTNER R., MAGHAZI M. – *France***
Slurry Shield Tunneling: Simulation of the Effect of Slurry Infiltration on The Face Stability
- **GALBIATI D., PASQUALINI A. – *Italy***
Torre di Pisa (leading tower of Pisa) Foundations; Anchoring and Consolidation
- **KOLYMBAS D., MAEHR M., HERLE I. - *Austria***
Tail Gap Grouting
- **LING XU, HONGWEI HUANG - *People's Republic of China***
Construction Monitoring of a Long Road Tunnel in China
- **LUNARDI P. - *Italy***
The Construction of Large Span Stations for Underground Railways
- **MAESOBA H., SUNAGAWA Y., NISHI J., TANAKA T. – *Japan***
A Study about the Cause of the Difficulty to transfer in the Subway Station - Targeting Oedo Line
- **MAHMOUD E. H., EL-KADY A. A. – *Egypt***
Mitigation of Blast in Underground Spaces - Analysis and Simulation using the AUTODYN Simulation Package

- MANGORA V., DE BIASE A., CHERUBINI S., LOMBARDO C., CIAMEI A. - *Italy*
High Mechanization of Underground Works in Torino
- MINGJU ZHANG, TIECHENG SUN, QIAN YANG, LIANG DONG - *People's Republic of China*
A Field Test of Soil Nailing for Deep Excavation
- NAKAMURA H. – *Japan*
A Study about the Effects of Barrier-Free Facilities taking a Sense of Fatigue of a Person who uses a Wheelchair into Consideration
- NASRI V., SCHABIB J. - *U.S.A.*
Different Alternatives for the Launch Wall of the Queens Cut and Cover Tunnels, East Side Access Project, New York
- OKADA K., FUJITA T., TANAKA M. – *Japan*
Introduction of Barrier-Free to Underground Stations
- OZTURK H., TANNANT D. D. - *Canada*
Implementation of Hoek-Brown Failure Criterion in FLAC
- PATRUCCO M., SORLINI A. - *Italy*
Workers Safety Conditions in Urban Underground Construction: Risk Evaluation, Management and Monitoring as applied in Northern Italy
- PELIZZA S., PEILA D., ORESTE P., OGGERI C., VINAI R. - *Italy*
Environmental Aspects of Underground Construction and Exploration for Underground Structures - State of the Art
- SMITH T. W. - *United Kingdom*
Ventilation of Enclosed Car Parks and Service Areas
- TANAKA M., SHINOHARA Y., MIYAGAWA M., HIRASHIMA Y., HAGIMORI J., MASAKI N., SUZUKI M., TOMITA T. – *Japan*
Studies on the Development of Multi-level Pedestrian Spaces in Districts Congested with Railroads and Highways
- TANAKA T., SHIBAGAKI M., NISHI J., OKUYAMA K. - *Japan*
A Consideration about the Amenity of Lightning Space in Underground - At the Point of the Visual Elements
- TOMIHISA N., NIITANI Y., SHIMIZU K., SHINDO A., IIDA Y., TOMITA T. - *Japan*
A Study on Improving Transportation Nodes for Barrier-Free Movement in Large Cities
- XIAOLONG ZANG, HONGWEI HUANG, ZIXIN ZHANG - *People's Republic of China*
The Influence Analysis on the Longitudinal Settlement of the Shield Tunnel
- YASHIRO K., KAJITA F., NAKAYAMA N., SUGIYAMA J. – *Japan*
Study on Urban Tunneling Under and Parallel to a Railway Line
- YUFIN S., SOUSA L., RECHITSKY V., BRAXEIN A., JENSEN J. - *Russian Federation, Portugal, Germany*
Risk Criteria Assessment for Urban Underground Construction

SESSION III

ADVANCED IMAGING TECHNIQUES FOR UNDERGROUND SPACE EDUCATING PEOPLE AND TRAINING PROFESSIONALS CULTURAL HERITAGE IN UNDERGROUND SPACE

- ALDORF J., VOJTASIK K. - *Czech Republic*
The training of Geotechnical and Municipal Engineers at the VSB Technical University of Ostrava
- AQEEL SHAKIR AL-ADILI – *Iraq*
Two Dimensional Models to Assess the Ground Behavior around Tunnel (Baghdad Metro)
- BALDI A. M., DEZZI BARDESCHI C., DEZZI BARDESCHI M., GIORGI F., GIORNI L., RICCI F. - *Italy*
The Tunneling for Enlargement Archeological Museum of Chianciano Terme (Siena)
- BARDAZZA G., GIOIA U., SCESI L. - *Italy*
Abandoned Mining Tunnels as a Resource for Industrial and Technological Plants
- BROUSSE G. - *France*
S.I.A.A.P.'s Part in the Utilisation of the Greater Paris Underground Space
- CARRUBBA S. - *Italy*
The Ancient Underground Spaces of Palermo: Study of a Wise Exploitation of the Territory
- DE RIENZO F. - *Italy*
Spatial Modeling of the Cementation Degree and the Lithotypes in the Subsoil Turin Urban area (Northern Italy)
- ESCOBAR M. - *Canada*
The Next Urban Frontier - The Inner City and the Role of the Evolution of Real-Property Law in the 21st Century - A Montreal Perspective
- FARAGGIANA G. - *Italy*
Underground Living Spaces in Low Alps Inside the Old Mines of Brosso
- GUANFENG AN, KUNLONG YIN - *People's Republic of China*
The Application of GIS to Urban Underground Space
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