



## TABLE OF CONTENTS

WELCOME	02
COMMITTEE MEMBERS	06
GENERAL INFORMATION	09
- Conference Venue	09
- Registration	09
- On-site Registration Rate	09
- Conference Information Booth	10
- Conference Proceedings	10
- Oral Presentation	10
- Poster Session	10
- Exhibition	10
- Catering	10
- Bank	11
- Mobile Phone	11
- Duplication and Recording	11
- Emergencies	11
- Wi-Fi Network	11
- Conference Hall	12
CONFERENCE AGENDA	15
SOCIAL PROGRAM	17
- Welcome Reception	17
- Banquet Dinner	17
- Post-Conference Technical Visit	17
- Urban Thinkers Campus	18
TECHNICAL PROGRAM	19
KEYNOTE LECTURES	31
SHORT COURSES	34
TRANSPORTATION & ACCOMMODATION	35
- Transportation	35
- Weather Forecast	37
- Accommodation	37
PLATINUM SPONSOR	38
CONTACT INFORMATION	39

# WELCOME

## Dear Colleagues and Friends,

We take great pleasure in inviting you to the 1st International Conference on Exploration and Utilization of Underground Space (EUUS2019), held on 15–18 November 2019, at the Hongshan Hotel, Wuhan, China.

From the perspective of humankind building development history, the 19th century was marked by bridge building and its development, and the 20th century was dominated by a rapid growth in ground buildings. As predicted in the Tokyo Declaration by the Associated Research Centers for Urban Underground Space (ACUUS) in 1991, the 21st century, however, is marked as the development and utilization of the underground space. In the past 30 years, underground engineering has been developing greatly and is characterized as a large scale, deeper stratum, complex environment and extensive fields. Acquiring space and resources and security from underground are the common demand during the modernization development of all countries and regions in the world. Therefore, the efficient development and sustainable utilization of underground space has become an international issue.

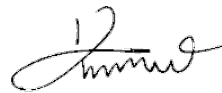
Our primary objective of EUUS2019 is to provide a platform for exchanging new experiences and discussing future developments on the high-quality development and sustainable utilization of underground space. Through a combination of 10 keynote lectures, two special sessions, ten technical sessions for oral presentation, UN-HABITAT World Urban Campaign - Urban Thinkers Campus 4.0 and Editors Panel Discussion in the following three days, we hope that this objective will be achieved and that every delegate will benefit from the activities and interactions at the conference. Besides, a new declaration on sustainable development and utilization of underground space (the Wuhan Declaration) will also be launched which would be an inheritance of the Tokyo Declaration.

Finally, we thank everyone for joining us at EUUS2019. We would like to express our appreciation for the support from UN-HABITAT, ACUUS-GEO and SinoProbe. We thank the organizing committee, students and staff, whose names may not be listed here, for their hard work and help in making the conference a success. We also greatly appreciate the financial support from all the organizers and sponsors. With these joint efforts, we believe that EUUS2019 will be a great success and that it will develop into the most important continuing conference in the world on exploration and utilization of underground space.

We wish you the most enjoyment at the conference during three wonderful days in Wuhan!



**Xiaozhao Li,**  
Chair of EUUS2019 SC  
Chair of ACUUS-GEO



**Qiang Xue,**  
Chair of EUUS2019 OC  
Director of IRSM-CAS and SKLGME

## - SPONSORED BY -



Working Group on Urban Geology and Underground Space of  
Associated research Centers for Urban Underground Space, based in  
SinoProbe Center (ACUUS-GEO and SinoProbe)

## - ORGANIZED BY -



Institute of Rock and Soil Mechanics, Chinese Academy of Sciences  
(IRSM, CAS)



State Key Laboratory of Geomechanics and Geotechnical Engineering  
(SKLGME)

## - SUPPORTED BY -



World Urban Campaign



Federation of International Geo-Engineering Societies



International Society for Soil Mechanics and Geotechnical Engineering



International Society on Underground Freight Transportation System



National Natural Science Foundation of China



Chinese Society for Rock Mechanics and Engineering



China Civil Engineering Society



Seismological Society of China



Geological Society of China



China Association for Geospatial Information Society

# WELCOME

## - CO-ORGANIZED BY -



Young Earth Scientists Network



China Railway Siyuan Survey and Design Group Co., Ltd.



Chinese Academy of Geological Sciences



Nanjing University



Shandong University



China Geological Survey (Wuhan and Nanjing)



Wuhan Sinorock Technology Co., Ltd.



Beijing United Info Technology Co., Ltd.



TESCAN China, Ltd.



Earth Products China, Ltd.



Hengda-Century (Beijing) Geophysics Technology Co., Ltd.



DTCC (Shenzhen) Co., Ltd.



Beijing Brilliant Sun Technology Co., Ltd.



**Institute of Rock and Soil Mechanics (IRSM)**, located in Wuhan, is affiliated with the Chinese Academy of Sciences. IRSM is a comprehensive scientific research institution dedicated to the basic research and applications of geomechanics and geotechnical engineering.

Since 1958, the IRSM has been focusing on providing solid technical support and excellent professional service for designing infrastructure systems, protecting environment and fostering the exploitation of natural resources. As a premier institution for the research and development in the field of geomechanics and geotechnical engineering, the IRSM has been solving major engineering problems with economic, social, political, scientific and engineering dimensions. The IRSM is the host of the State Key Laboratory of Geomechanics and Geotechnical Engineering, the Key Laboratory of Geo-environmental Engineering of Hubei province, and three regional research centers, and one of the co-hosts of the Chinese Society of Rock Mechanics and Engineering (CSRME). The IRSM is also the publisher of three prestigious scientific journals. The IRSM is also active in the professional training and academic exchange, and has been actively engaged in long-term joint research or cooperation with many prestigious universities and institutions all around the world. [www.whrsm.cas.cn](http://www.whrsm.cas.cn)



**State Key Laboratory of Geomechanics and Geotechnical Engineering (SKLGME)**, founded in 2007 under the auspices of Ministry of Science and Technology of the People's Republic of China, is hosted by the Institute of Rock and Soil Mechanics, Chinese Academy of Sciences.

As one of premier research institutions in China, the SKLGME is dedicated to fundamental research and technology innovation in the field of geomechanics and geo-engineering, with orientation to the national and global strategic needs in the construction of significant infrastructures, geohazard mitigation, development and utilization of natural resources, underground storage of oil and natural gas, geological disposal of radioactive nuclear waste, CO<sub>2</sub> capture and sequestration and far beyond. The SKLGME is also a vibrant institution for professional training and academic exchange. [www.sklgme.org](http://www.sklgme.org)



# COMMITTEE MEMBERS

## - Honorary Chair -

Qihu Qian      Academician of Chinese Academy of Engineering

## - Advisory Committee -

Aurèle Jean Parriaux (Switzerland)	Peng Cui (China)
Charles W.W. NG (China)	Qihu Qian (China)
Chengshan Wang (China)	Raymond Sterling (USA)
Chunhe Yang (China)	Shucaï Li (China)
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Eduardo de Mulder (Netherlands)	Tadahiko Okumura (Japan)
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Ming Lu (Norway)	

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### Chair

Xiaozhao Li      Nanjing University, China

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Aiqing Wu (China)	Haibo Li (China)
Bin Shi (China)	Hanlong Liu (China)
Bingxu Zheng (China)	Hehua Zhu (China)
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Dan Zhu (China)	Jianhui Deng (China)
Defu Liu (China)	Jianlin Li (China)
Devendra Narain Singh (India)	Jin'an Wang (China)
Dianqing Li (China)	Johan Visser (Netherlands)
Diarmad Campbell (UK)	Ju Wang (China)
Dingli Zhang (China)	Junfeng Zhu (USA)
Fangle Peng (China)	Liangwen Jiang (China)
Faquan Wu (China)	Lingwei Kong (China)
Furen Xie (China)	Louis Wong (China)
Gang Tian (China)	Marko Komac (Italy)
Gengshe Yang (China)	Matthew Myers (Australia)

# COMMITTEE MEMBERS

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Mingyang Wang (China)  
Monique Labbé (France)  
Nehemia Beyene (Ethiopia)  
Nengxiong Xu (China)  
Nikolai Bobylev (Russia)  
Ning Li (China)  
Peifen Xu (China)  
Pitichon Klomjit (Thailand)  
Priscilla Nelson (USA)  
Qian Sheng (China)  
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Qiang Xue (China)  
Qiang Yang (China)  
Qigui Yang (China)  
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Samuel Ariaratnam (USA)  
Shaojun Li  
Shengwen Qi (China)  
Shengwu Song (China)  
Shengxiang Lei (China)  
Shigui Du (China)  
Shiyong Wu (China)  
Tanvi Arora (India)  
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Wenbo Lu (China)  
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Wout Broere (Netherlands)  
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Xiaochun Li (China)  
Xiaogang Wang (China)  
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Xibing Li (China)  
Xiling Guo (China)  
Xinping Li (China)  
Xiuli Du (China)  
Yang Ju (China)  
Yangqing Xu (China)  
Yingping Li (China)  
Yingxin Zhou (Singapore)  
Yishan Pan (China)  
Yueping Yin (China)  
Yuyong Jiao (China)  
Zhilong Chen (China)  
Ren Wang (China)  
Jianchun Wang (China)  
Jinfa Li (China)  
Yifeng Chen (China)  
Shaojun Li (China)  
Zixin Zhang (China)

# COMMITTEE MEMBERS

## - Organizing Committee -

### Chair

Qiang Xue                      Institute of Rock and Soil Mechanics, CAS, China

### Organizing Committee Members

Bin Liu (China)	Mingjian Hu (China)
Bin Wang (China)	Mingjie Gao (China)
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Bingrui Chen (China)	Peng Li (China)
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Dawei Hu (China)	Quan Jiang (China)
Diansen Yang (China)	Rongyi Qian (China)
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Dongjun Guo (China)	Shijun Chen (China)
Dongping Mao (China)	Shouchun Deng (China)
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Feng Liang (China)	Tongtao Wang (China)
Guanhua Sun (China)	Weiya Ge (China)
Guofang Xu (China)	Wensheng Tang (China)
Haifeng Zhang (China)	Xianjun Tan (China)
Hao Wang (China)	Xiaoran Liu (China)
Hejuan Liu (China)	Xiaosheng Yu (China)
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Liang Zhao (China)	Zheng Lu (China)
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## - Secretariat -

### Secretary General

Qi Li                              Institute of Rock and Soil Mechanics, CAS, China  
Amy Li                              ACUUS, Canada

### Deputy Secretary General

Jianjun Liu (China)      Chaobin Guo (China)      Yan Guo (China)      Xia Bian (China)

### Secretary

Hang Ruan (China)      Lina Chen (China)      Zhong Ren (China)      Kai Lu (China)  
Qin He (China)      Peng Lin (China)      Xiaoyan Dong (China)



# GENERAL INFORMATION

## Conference Venue



Wuhan Hongshan Hotel  
Zhongbei Road No. 1, Wuchang District, Wuhan, Hubei, China

Tel.: +86 27 8731 1888

Fax: +86 27 8731 6888

E-mail: hotel@hshotel.com

Website: <http://www.hshotel.com>

## Registration

The registration desk is located at the lobby of the Hongshan Hotel (South Gate). Delegates should register before accessing the technical sessions, purchasing tickets for social functions, or for participating in any conference activities. There will be no refunds once register. On-site registration and the pick-up of conference documents will proceed during the following time period:

Friday, 15 November	14:00–22:00
Saturday, 16 November	08:00–18:00
Sunday, 17 November	08:00–18:00
Monday, 18 November	08:00–12:00

**Note:** Please show relevant documents to the organizing staff (especially the person who registers as a full-time student and ACUUS member) and register orderly after reading the Registration Guide at the hotel entrance.

## On-site Registration Rate

Domestic Participant: RMB 3000 for ordinary participant, RMB 1800 for student.

Oversea Participant: USD 500 for ordinary participant, USD 280 for student.

ACUUS Member and SKLGME visiting scholar: USD 450/CNY 2500.

The registration fee covers the conference materials, lunches (16–17 November), coffee breaks, dinner (17 November) and welcome reception during EUUS2019.

**Note:** The costs of international and local transportation, hotel, banquet (16 November, \$50/¥300), and technical visit are not included in the registration fee.

Participants registered as the employers of State Key Laboratory of Geomechanics and Geotechnical Engineering, Institute of Rock and Soil Mechanics, Chinese Academy of Sciences just need to present themselves and leave their signatures. The conference will charge their relevant fees by means of internal transfer.

# GENERAL INFORMATION

## Conference Information Booth

The Conference Information Booth is located near the registration desk and will be open during registration hours.

## Conference Proceedings

The complete EUUS2019 proceedings are included in a flash drive of the meeting packet. Selected papers will be recommended to publish in *'Journal of Rock Mechanics and Geotechnical Engineering'*, *'Tunnelling and Underground Space Technology'*, *'Journal of Applied Geophysics'*, *'Bulletin of Engineering Geology and the Environment'*, *'Environmental Geotechnics'*, *'Chinese Journal of Rock Mechanics and Engineering'* and *'Chinese Journal of Underground Space and Engineering'* after the conference

## Oral Presentation

Each keynote lecture, invited lecture and oral presentation will be 30 minutes, 25 minutes and 20 minutes in total, including questions and discussion, respectively. Multi-media projector with personal computer will be available for presentations. The presentations should be prepared in English with the Windows compatible format and named with the presentation title. Your PowerPoint slides may be prepared according to your preferring layout with standard 4:3 or widescreen 16:9.

Please ensure that you are available in your session room at least 10 minutes before the start of the session. The presentation file should be **pre-loaded in the conference computer (along with on-site registration or 8:00 am for morning speeches/1:00 pm for afternoon speeches)** so as to confirm whether or not it matches properly with the computer provided in the conference hall.

## Poster Session

Poster sessions will be arranged in the poster area of Chu Lv Hall and Chu Feng Hall. A display board **120 cm wide by 90 cm high** with pins will be provided for each poster presentation. All poster lettering should be typewritten. Since your poster will be read by viewers a few meters away, it is suggested to use the appropriate font size. Poster presentation should contain **the title, abstract, main text, figures and/or tables, diagrams and conclusions**. Please include contact information (names, institute, address, e-mail). Use of color in the poster presentation makes visual communication more effective. Textual and graphic illustrations should be kept simple but effective. **The poster should be printed and fixed on the board between 18:00 and 19:00 on 15 November or 12:00-13:30 on 16 November by the presenter**. Presenters should be around the posters more often as others may be interested in your work. Presenters are responsible for removing their posters after the conference.

## Exhibition

The conference exhibition will be located around the Chu Tian Hall and will be open at the following time:

Saturday, 16 November:	08:00-17:30
Sunday, 17 November:	08:00-17:30
Monday, 18 November:	08:00-12:00

## Name Badges

Delegates, accompanying persons and exhibitors are asked to show their name badges when attending conference events.

## Catering

The local organizing committee has prepared welcome reception buffet, buffet lunches, banquet dinner and Coffee Breaks for the delegates. Please kindly note that the banquet is not included in the registration fee.

# GENERAL INFORMATION

The buffet lunches will be provided in Sunshine 1958 Restaurant on the first floor. If you need halal food or vegetarian meal, please contact the conference staffs in the registration area in advance.

## **Bank**

There are banks around the conference venue. The nearest, is on the left side of Hongshan Hotel and there is a Currency Exchange desk.

## **Mobile Phone**

The phones are required to be switched off or to the silent mode during sessions and during each talk, please take notes instead of photos.

## **Non-Smoking**

Smoking is not permitted in or out of the conference room or in the conference dining room.

## **Duplication and Recording**

Unauthorized photography, audiotaping, video recording, digital taping or other form of duplication is strictly forbidden during the conference.

## **Emergencies**

On discovering fire: Dial Ext. 119. Familiarize yourself with nearest fire exit and notify the organizing committee immediately. Please do not use the elevators.

Medical emergencies: Dial Ext. 120. The staffs in the registration area will give a hand at the registration time if you need.

## **Conference Language**

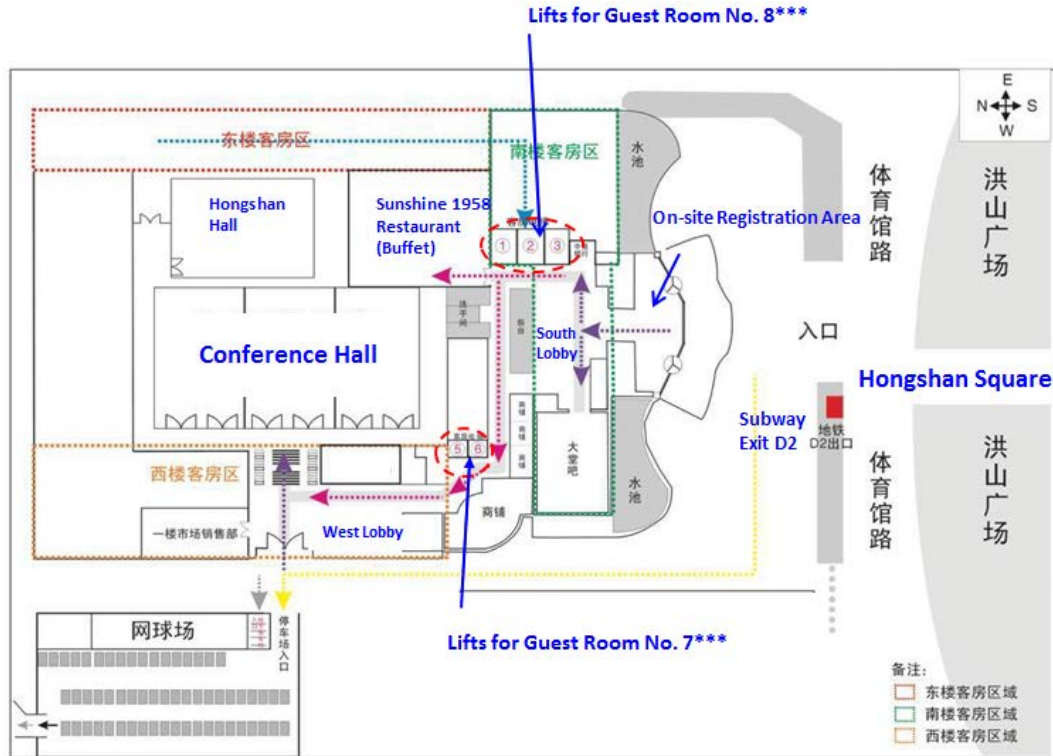
The official language of the EUUS2019 is English and all printed materials will be published in English.

## **Wi-Fi Network**

Free Wi-Fi can be used in or out of the conference rooms.

SSID: HSBG

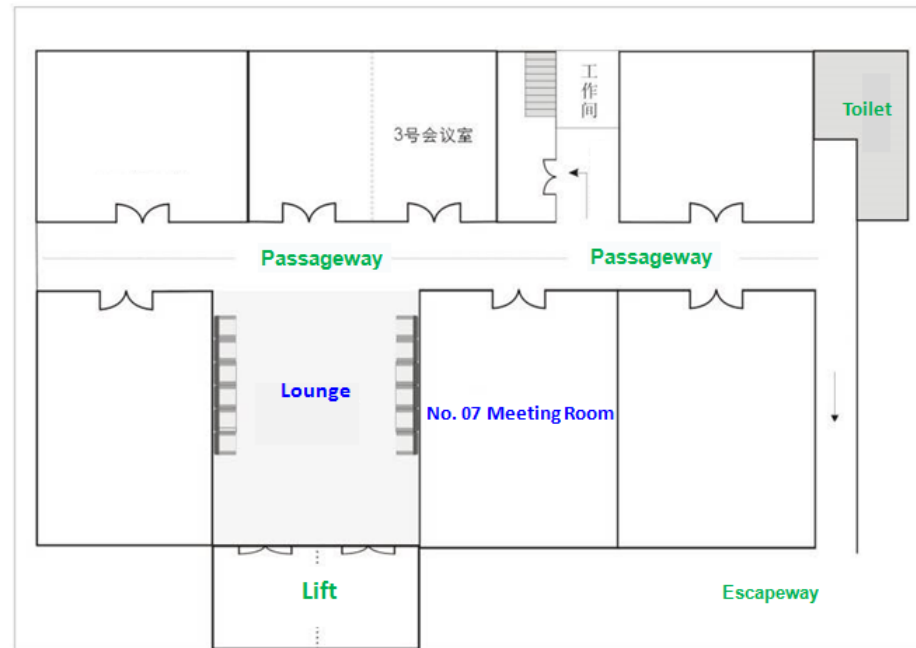
# Conference Venue



## Conference Halls: 2nd floor in Hongshan Hotel



## No. 07 Meeting Room: B1 floor in Hongshan Hotel



## Conference Agenda (13–16 November)

AGENDA	13 Nov. Wed.	14 Nov. Thu.	15 Nov. Fri.			16 Nov. Sat.				
<b>MORNING</b>	Training Course on Urban Geological Research and the Using of Underground Space for Smart City	Training Course on Urban Geological Research and the Using of Underground Space for Smart City	Training Course on Urban Geological Research and the Using of Underground Space for Smart City	Short Course on Modelling and Analysis of Special Underground Space	UTC Opening Ceremony and Lectures		EUUS2019 Opening Ceremony			
<b>AFTERNOON</b>				On-site Registration 14:00	UTC Lectures	Organizing Committee Meeting	Forum on Geomechanics and Geotechnical Engineering	Session 1: Construction and Maintenance of Underground Space (1)	Session 3: Underground Space Technology Development	Registration & Poster & Exhibition
<b>AFTERNOON</b>	Session 2: Construction and Maintenance of Underground Space (2)	Session 4: Intelligent Modeling and Big Data Mining of Underground Space	Global Young Scholar Forum							
<b>EVENING</b>	Welcome Reception				Banquet Dinner					

## Conference Agenda (17–18 November)

<b>AGENDA</b>	<b>17 Nov. Sun.</b>					<b>18 Nov. Mon.</b>	
<b>MORNING</b>	Event on 'Wuhan Declaration'					Registration & Poster & Exhibition	Keynote Lectures
	Keynote Lectures						Technology & Solutions Report
	Editors Panel Discussion						EUUS2019 Closing Ceremony
<b>AFTERNOON</b>	Forum on Geomechanics and Geotechnical Engineering	Session 5: Typical Cases and Exemplars of Underground Space Development	Session 7: Frontier Exploration and Special Underground Space Utilization	Session 9: Experimental and Numerical Investigation of Underground Space (1)	Registration & Poster & Exhibition	Technical Visit	
		Session 6: High-resolution Investigation of Underground Space	Session 8: Multidisciplinary Innovation and Development	Session 10: Experimental and Numerical Investigation of Underground Space (2)			
<b>EVENING</b>	Founding Meeting of International Standards Working Group on Underground Space						
	Scientific Committee Meeting						



# SOCIAL PROGRAM

## Welcome Reception

Date: Friday, 15 November, 2019  
Time: 19:00–20:00  
Location: Chu Yun Hall

All delegates and accompanying persons are cordially invited to the welcome reception. This event will give you an opportunity to communicate, discuss and network with colleagues while enjoying the buffet party. The cost of welcome reception is included in the registration fee.

## Banquet Dinner

Date: Saturday, 16 November, 2019  
Time: 18:30–20:00  
Location: Chu Yun Hall  
Tickets: Delegates are required to buy a ticket 50 USD or 300 RMB at the registration desk before the banquet  
Dressing: Formal

During the Banquet Dinner, Award Ceremony for a part of EUUS2019 prizes will be held. The Banquet fee is not included in the registration fee.

## Post Conference Technical Visit

Date: Monday, 18 November, 2019  
Time: 14:00–16:00  
Site: Deep Tunnelling of East Lake  
Tickets: Delegates are required to buy a ticket 30 USD or 200 RMB while registering on-site

Delegates will be picked up at 14:00 pm at the south gate of Hongshan Hotel. Welcome all delegates and accompany people to participate.



## UN-HABITAT World Urban Campaign - Urban Thinkers Campus 4.0

Friday, 15 November, 2019

### **COLLABORATIVE EXPLORATION AND SUSTAINABLE DEVELOPMENT OF UNDERGROUND SPACE: NEW URBAN AGENDA (NUA), DRIVERS OF CHANGE AND GEOSCIENCES**

**Objectives of the Campus:**

High-quality development and sustainable utilization of underground space has become an international consensus. To promote this challenge, we thought that UN-HABITAT was the ideal vehicle to achieve this. Our regular presence in UN-HABITAT's activities began at WUF7 in Medellin in April 2014, where we organized a networking event, titled "Equity and Equality Opportunities – Cities Think Underground". On September 16, 2014, UN-HABITAT and ACUUS signed a MOU to raise awareness of best practices of the sustainable uses of underground space for urban development, in particular for adequate urban drainage management, city planning, and sustainable mobility solutions, among decision-makers, local authorities as well as UN-HABITAT staff. ACUUS was invited to organize an Urban Lab Session during the opening day of the Urban Thinkers Campus, in preparation of HABITAT III, in Caserta, Italy, in October 2014. The Session was titled "Advanced Local Energy Planning and Underground Space Utilization: suitable and feasible solution for future sustainable and resilient cities". On October 2015, our Secretary General participated in New York, as a Member of the Working Group 1 "The City We Need (TCWN) 2.0 Drafting Committee", to the meeting of the WUC 13th steering committee. More recently, in February 2018, we hosted another Networking Event in the AFINUA Room at the World Urban Forum 9, in Kuala Lumpur, titled "Cities need underground – Equity and equality opportunities for the New Urban Agenda".

Our second MoU with UN-HABITAT was signed on October 27 during World Cities Day Global Cities Forum 2019 in Shanghai. This Campus proposed by ACUUS will be an occasion to expose the struggles of cities and megalopolises, their advances in developing concepts of sustainability in an orderly underground space development, and to present some of the best practices through dialogue between experts, city leaders and stakeholders, and within the framework of UN-HABITAT. Convened by universities and research institutions and supported by Hubei Provincial Industry and Technology Innovation Strategic Alliance for Underground Space Development (hosted at IRSM, CAS), this UTC4.0 will help to enhance the public-private awareness of NUA and to advance underground space solutions for achieving UN' Sustainable Development Goals (SDG 6, 9, 11, 15 and 17).



# TECHNICAL PROGRAM

## SATURDAY, 16 NOVEMBER

08:30-09:30	<b>Opening Ceremony</b> (Host: Xiaozhao Li)			
<b>Keynote Lectures</b> (Chair: Dimitris Kaliampakos   National Technical University of Athens, Greece; Co-chair: Charles Ng   Hong Kong University of Science and Technology, China)				
09:30-10:00	<b>Improving the design of underground facilities: Learning from experience</b> <i>Raymond Sterling (Louisiana Tech University, USA)</i>			
10:00-10:30	<b>Safe development and utilization of deep underground space and typical engineering</b> <i>Xia-Ting Feng (Northeastern University, China)</i>			
<b>Coffee Break</b>				
<b>Keynote Lectures</b> (Chair: Haibo Li   Institute of Rock and Soil Mechanics, CAS, China; Co-chair: Aurèle Jean Parriaux   Swiss Federal Institute of Technology, Switzerland)				
10:50-11:20	<b>Future cities that live sustainably and in harmony with the ground they are built on—From vision to reality</b> <b>Diarmad Campbell*, Stephanie Bricker, Martin Smith</b> <i>(* British Geological Survey, UK; Task Leader of European Sub-Urban Project)</i>			
11:20-11:50	<b>Reliable exploration and comprehensive application of underground salt caverns</b> <i>Chunhe Yang (Institute of Rock and Soil Mechanics, CAS, China)</i>			
<b>Lunch Break</b>				
<b>Technical Sessions</b>				
13:30-15:40	<b>Forum on Geomechanics and Geotechnical Engineering</b>	<b>Session 1: Construction and Maintenance of Underground Space (1)</b>	<b>Session 3: Underground Space Technology Development</b>	<b>Global Young Scholar Forum</b>
<b>Coffee Break</b>				
16:00-17:50	<b>Forum on Geomechanics and Geotechnical Engineering</b>	<b>Session 2: Construction and Maintenance of Underground Space (2)</b>	<b>Session 4: Intelligent Modeling and Big Data Mining of Underground Space</b>	<b>Global Young Scholar Forum</b>
18:30-20:00	<b>Banquet Dinner   Room: Chu Yun Hall</b> (Host: Yingxin Zhou)			

	<b>Chu Tian Hall</b>
	<b>Chu Yun Hall</b>
	<b>Chu Lv Hall</b>

	<b>Chu Feng Hall</b>
	<b>Yellow Crane Hall</b>

# TECHNICAL PROGRAM

## AFTERNOON, SATURDAY, 16 NOVEMBER

**Forum on Geomechanics and Geotechnical Engineering | Room: Chu Yun Hall**

Chairs: Qingshan Meng, Hui Zhou (Institute of Rock and Soil Mechanics, CAS, China)

13:30-13:40 **Welcome Ceremony**

13:40-14:00 **Impact of destress blasting on the stress field**  
*Petr Konicek (The Czech Academy of Science, Czech Republic)*

14:00-14:20 **On a pseudo-3D hydraulic fracturing simulator**  
*Xi Zhang (Commonwealth Scientific and Industrial Research Organization, Australia)*

14:20-14:40 **Impacts of fracture density on heat exchange in fractured rock masses**  
*Chi Yao (Nanchang University, China)*

14:40-15:00 **Energy matching mechanism and concentration intelligent control in the extraction pipe network of coal seam gas**  
*Tongqiang Xia (China University of Mining and Technology, Xuzhou, China)*

15:00-15:20 **Meso-scale numerical simulation of defective concrete based on distinct element method**  
*Yang Gao (Shijiazhuang Tiedao University, China)*

15:20-15:40 **The temperature effect and hydraulic effect of rockburst under coupled THM conditions**  
*Guoqing Chen (Chengdu University of Technology, China)*

### Coffee Break

16:00-16:20 **Damage of sandstone induced by repetitive impact loading**  
*Yang Yu (East China Jiaotong University, China)*

16:20-16:40 **Numerical simulation analysis and rock cutting force prediction of TBM disc cutter**  
*Xiaojing Li (Shandong Jianzhu University, China)*

16:40-17:00 **DEM modelling of particle breakage and rock cutting mechanism**  
*Lige Wang (University of Sheffield, UK)*

# TECHNICAL PROGRAM

## AFTERNOON, SATURDAY, 16 NOVEMBER

### Session 1 | Construction and Maintenance of Underground Space (1) | Room: Chu Lv Hall

Chairs: Dan Zhu (China Railway SIYUAN Survey and Design Group Co., Ltd., China); Aleksei Arkhipov ("Geodiagnostika" LLC, Russia)

#### Invited Lecture

13:30-13:55 **Sweden Underground – sustainable and innovative use of underground space**  
*Per Tengborg (Rock Engineering Research Foundation, Sweden)*

13:55-14:20 **Rock engineering for development of underground caverns in Singapore**  
*Yingxin Zhou (Nanyang Technological University, Singapore)*

#### Oral Presentation

14:20-14:40 **Evaluation of parameters that define a quantity of excess excavation ratio in TBM tunnel excavation**  
*Dmitry Konukhov and Alexander Polyankin (JSC Mosinzhproekt, Russia)*

14:40-15:00 **Stability analysis in underground engineering based on time-varying Hurst exponent: A tentative exploration**  
*Zhen Li (Henan Polytechnic University, China)*

15:00-15:20 **Integration of 3D models of structures and geological composition as an underground infrastructure model**  
*Toshiaki Hakoda (JGC Corporation, Japan)*

15:20-15:40 **Stress-induced discontinuous failure of hard rock in large underground powerhouse under high geostress condition: Onsite observation and back analysis**  
*Quan Jiang (Institute of Rock and Soil Mechanics, CAS, China)*

### Session 2 | Construction and Maintenance of Underground Space (2) | Room: Chu Lv Hall

Chairs: Jian Chen (Institute of Rock and Soil Mechanics, CAS, China); Per Tengborg (Rock Engineering Research Foundation, Sweden)

#### Invited Lecture

16:00-16:25 **Technical communication on the construction of the test section of the deep reservoir and sewage tunnel beneath the Suzhou River in Shanghai**  
*Zixin Zhang (Tongji University, China)*

16:25-16:50 **Application of optical fiber sensing technology in the safety monitoring of urban rail transit during whole life cycles**  
*Bin Chen (Ningbo Rail Transit Group Corporation, China)*

#### Oral Presentation

16:50-17:10 **Method for calculating the safety factor of a three-dimensional slope with simultaneous changes in height and angle**  
*Chenxi Zhang (Institute of Rock and Soil Mechanics, CAS, China)*

17:10-17:30 **Enabling in situ and dynamic micro-CT imaging applications for geoscience**  
*Arno Merkle (Business Development Director, Tescan)*

# TECHNICAL PROGRAM

## AFTERNOON, SATURDAY, 16 NOVEMBER

### Session 3 | Underground Space Technology Development | Room: Chu Feng Hall

Chairs: Toshiaki Hakoda (JGC Corporation, Japan); Yi Dong (Institute of Rock and Soil Mechanics, CAS, China)

#### Invited Lecture

13:30-13:55 **Discussion on cooperative development and utilization of underground space in Nanjing**  
*Weiya Ge (Nanjing Center, China Geological Survey, China)*

13:55-14:20 **Geological detection for tunnelling disaster prevention**  
*Yuyong Jiao (China University of Geosciences, Wuhan, China)*

#### Oral Presentation

14:20-14:40 **Determination of location and study of soils and internal space condition of buried tunnels by crosshole sounding method in underground space at the section between “Lesnaya” and “Ploschad Muzhestva” metro stations in St. Petersburg**  
*Aleksei Arkhipov (“Geodiagnostika” LLC, Saint-Petersburg, Russia)*

14:40-15:00 **Assessment theory and safety control technology of deep urban underground space excavation**  
*Xiongyao Xie (Tongji University, China)*

15:00-15:20 **Extension of 3D geotechnical modelling to BIM environment**  
*Jian Chen (Institute of Rock and Soil Mechanics, CAS, China)*

15:20-15:40 **Research on the construction idea and strategy of urban underground space color system from the perspective of psychological perception**  
*Yuan Lv (Xi’an University of Science and Technology, China)*

### Session 4 | Intelligent Modeling and Big Data Mining of Underground Space | Room: Chu Feng Hall

Chairs: Jian Chu (Nanyang Technological University, Singapore); Guanhua Sun (Institute of Rock and Soil Mechanics, CAS, China)

#### Invited Lecture

16:00-16:25 **Can we successfully forecast earthquakes? The Omega-theory**  
*Marko Komac (European Federation of Geologists, Italy)*

16:25-16:50 **Geological survey of urban underground space resources and 3D geological model development in Chengdu**  
*Donghui Wang (Chengdu Center, China Geological Survey)*

#### Oral Presentation

16:50-17:10 **Modeling of fracture system at different scales in underground space**  
*Wentao Xu and Xiaozhao Li (Nanjing University, China)*

17:10-17:30 **The challenges to 3D GIS for underground space information management**  
*Yuchang Sun, Jiangfeng She, Xiaozhao Li (Nanjing University, China)*

17:30-17:50 **Discussion on 3D modeling technology and method of geological survey of underground space resources in Chengdu, China**  
*Shengyong Pan (Zondy Cyber Group, China)*

# TECHNICAL PROGRAM

## AFTERNOON, SATURDAY, 16 NOVEMBER

### Global Young Scholar Forum | Room: Yellow Crane Hall

Chairs: Eduardo de Mulder (Delft Technical University, Netherlands); Zhenhao Xu (Shandong University, China)

14:00-14:20	<b>CROWDTHERMAL - Empowering citizens to participate in the development of geothermal projects with crowdfunding and social engagement tools</b> <i>Invited Lecture: Marko Komac (University of Nova Gorica, Slovenia)</i>
14:20-14:40	<b>Gas explosion loads of methane-air mixtures in a partly filled large scale tube</b> <i>Invited Lecture: Li Chen (Southeast University, China)</i>
14:40-15:00	<b>Hydrogeophysical tools to identify the shrinking underground space with relevance to critical zone</b> <i>Invited Lecture: Tanvi Arora (CSIR-National Geophysical Research Institute, Hyderabad, India)</i>
15:00-15:20	<b>The human factor in underground workspaces</b> <i>Invited Lecture: Adam Roberts (Nanyang Technological University, Singapore)</i>
15:20-15:40	<b>Construction strategy of urban underground space color system from the psychological perception</b> <i>Invited Lecture: Yuan Lv (Xi'an University of Science and Technology, China)</i>

### Coffee Break

### Global Young Scholar Forum (Continue) | Room: Yellow Crane Hall

Chairs: Marko Komac (European Federation of Geologists, Italy); Meng Wang (YES-Network)

16:10-16:30	<b>The role of structural geology during the planning and construction of deep repositories for the storage of high-grade nuclear waste in crystalline rocks</b> <i>Invited Lecture: Giulio Viola (University of Bologna, Italy)</i>
16:30-16:50	<b>Technique and practice of geostress measurement in deep boreholes based on borehole cross-sectional shape analysis</b> <i>Invited Lecture: Zengqiang Han (Institute of Rock and Soil Mechanics, CAS, China)</i>
16:50-17:10	<b>Benefits of local geological knowledge for major linear infrastructures including tunnel: An example from a proposed freight railway alignment in Brisbane, Australia</b> <i>Invited Lecture: Nehemia Beyene (Coffey Services Australia)</i>
17:10-17:30	<b>Electrochemical compatibility of patching repaired reinforced concrete</b> <i>Invited Lecture: Pitichon Klomjit (National Science and Technology Development Agency, Thailand)</i>
17:30-17:50	<b>Bayesian estimation of spatially varying soil parameters with spatio-temporal monitoring data</b> <i>Invited Lecture: Lulu Zhang and Haoqing Yang (Shanghai Jiao Tong University, China)</i>



# TECHNICAL PROGRAM

## SUNDAY, 17 NOVEMBER

08:30-09:30 **Event on 'Wuhan Declaration'** (Host: Xiaozhao Li)

### Coffee Break

### Keynote Lecture

(Chair: Diarmad Campbell | British Geological Survey, UK; Co-chair: Shengxiang Lei | China Railway Construction Corporation Ltd., China)

09:50-10:20 **The role of geosciences in the sustainable use of the underground space**  
*Dimitris Kaliampakos (National Technical University of Athens, Greece)*

10:20-10:50 **Development of the urban underground space in China and some ideas**  
*Xiangsheng Chen (Shenzhen University, China)*

10:50-11:20 **Application of the DEEP-CITY methodology to the touristic Station of Verbier (Swiss Alps)**  
*Aurèle Jean Parriaux (Swiss Federal Institute of Technology, Switzerland)*

### Editors Panel Discussion (Host: Songqing Lin | Institute of Rock and Soil Mechanics, CAS, China)

11:20-12:00 **Sustainable development of high-level academic journals**  
*Qianbing Zhang, Wanjie Wang, Xinrong Liu, Ping Zhou, Xiaoli Liu*

### Lunch Break

### Technical Sessions

13:30-15:20	<b>Forum on Geomechanics and Geotechnical Engineering</b>	<b>Session 5: Typical Cases and Exemplars of Underground Space Development</b>	<b>Session 7: Frontier Exploration and Special Underground Space Utilization</b>	<b>Session 9: Experimental and Numerical Investigation of Underground Space (1)</b>
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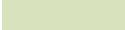
### Coffee Break

15:40-18:30	<b>Forum on Geomechanics and Geotechnical Engineering</b>	<b>Session 6: High-resolution Investigation of Underground Space</b>	<b>Session 8: Multidisciplinary Innovation and Development</b>	<b>Session 10: Experimental and Numerical Investigation of Underground Space (2)</b>
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18:30-19:30 **Dinner**

19:30-20:30 **Founding Meeting of International Standards Working Group on Underground Space**

20:30-21:00 **Scientific Committee Meeting**

 **Chu Tian Hall**  
 **Chu Yun Hall**  
 **Chu Lv Hall**

 **Room: No. 07 (B1 Floor)**  
 **Chu Feng Hall**  
 **Hongshan Hall**



# TECHNICAL PROGRAM

## AFTERNOON, SUNDAY, 17 NOVEMBER

### Forum on Geomechanics and Geotechnical Engineering | Room: Chu Yun Hall

Chairs: Changfu Wei, Shaojun Li (Institute of Rock and Soil Mechanics, CAS, China)

13:30-13:50	<b>Assessment of subsurface carbon storage capacity for Paleozoic sedimentary basins in Kentucky, USA</b> <i>Junfeng Zhu (University of Kentucky, USA)</i>
13:50-14:10	<b>Research on consolidation analysis of double soil layers</b> <i>Guofu Zhu (Wuhan University of Technology, China)</i>
14:10-14:30	<b>Multi-scale investigation of swelling property of shales</b> <i>Linlin Wang (China University of Petroleum, China)</i>
14:30-14:50	<b>The particle-based numerical manifold method (PNMM) and its application to dynamic rock fracturing</b> <i>Xing Li (Southeast University, China)</i>
14:50-15:10	<b>Study on the application of block theory in rock engineering</b> <i>Dongdong Xu (Yangtze Academy of Sciences, China)</i>
<b>Coffee Break</b>	
15:40-16:00	<b>An X-CT/MRI core flooding study on the migration of supercritical carbon dioxide in anisotropic sandstones</b> <i>Matthew Myers (CSIRO Energy, Australia)</i>
16:00-16:20	<b>Dynamic interaction between soil and pile foundation under wind and wave</b> <i>Xianglian Zhou (Shanghai Jiao Tong University, China)</i>
16:20-16:40	<b>Cracking and water seepage of compacted clay used as landfill cover under the coupling of temperature and water flow</b> <i>Haijun Lu (Wuhan Polytechnic University, China)</i>
16:40-17:00	<b>Solidification/stabilization of heavy metals contaminated sediment by using ISSA based materials: From fundamental science to application</b> <i>Jiangshan Li (Institute of Rock and Soil Mechanics, CAS, China)</i>
17:00-17:20	<b>Fine detection of disaster sources in urban underground space and green coordinated management</b> <i>Liping Li (Shandong University, China)</i>
17:00-17:30	<b>Discussion and Conclusion</b>

# TECHNICAL PROGRAM

## AFTERNOON, SUNDAY, 17 NOVEMBER

**Session 5 | Typical Cases and Exemplars of Underground Space Development | Room: Chu Lv Hall**  
Chairs: Adam Roberts (Nanyang Technological University, Singapore); Ming Lu (SINTEF, Norway)

### Invited Lecture

- 13:30-13:55 **State of art on underground space uses in Japan**  
*Tadahiko Okumura (Engineering Advancement Association of Japan)*
- 13:55-14:20 **Examples of use of abandoned mines**  
*Ming Lu (SINTEF, Norway)*

### Oral Presentation

- 14:20-14:40 **A suitability evaluation method of urban underground space based on rough set theory and conditional entropy: A case study in Wuhan Changjiang New Town**  
*Fei Tan (China University of Geosciences, China)*
- 14:40-15:00 **"Value Chain" based engineering proposal for underground road along Qingdao Qianhai coastline**  
*Hao Ding (China Merchants Chongqing Communications Technology Research & Design Institute Co, Ltd.)*
- 15:00-15:20 **Utilization and sustainable development of underground space in Nanjing**  
*Rui Wang (Nanjing Center, China Geological Survey, China)*
- 15:20-15:40 **Practice and thinking on the development of underground space in Jiangsu province**  
*Jun Huang (Jiangsu Underground Space Society, China)*

**Session 6 | High-resolution Investigation of Underground Space | Room: Chu Lv Hall**  
Chairs: Gang Tian (Zhejiang University, China); Peifen Xu (Institute of Geology and Geophysics, CAS, China)

### Invited Lecture

- 16:00-16:25 **Extracting the dispersion curves of multi-modes Rayleigh from microtremor using SPAC method**  
*Peifen Xu (Institute of Geology and Geophysics, CAS, China)*
- 16:25-16:50 **Active source seismic and ambient noise tomography technology for urban underground detection**  
*Rongyi Qian (China University of Geosciences, Beijing, China)*
- 16:50-17:15 **S-wave seismic reflection and VSP in the geological survey of urban underground space**  
*Zhihui Wang (Chinese Academy of Geological Sciences, China)*

### Oral Presentation

- 17:15-17:35 **Shallow Vs structure imaged with the ambient noise recorded by the distributed acoustic sensing in urban area**  
*Xiangfang Zeng (Institute of Geodesy and Geophysics, CAS, China)*
- 17:35-17:55 **Full-resolution 3D GPR attribute characterization for underground target**  
*Wenke Zhao (Zhejiang University, China)*
- 17:55-18:15 **Application research of transient pulse radar in oil and gas exploration**  
*Chunguang Ma (University of Electronic Science and Technology of China)*
- 18:15-18:35 **A novel UAV-based TEM survey in challenging terrain tunnel site investigation**  
*Huafeng Sun (Shandong University)*
- 18:35-18:55 **Geophysics in underground space utilization**  
*Sixin Liu (Jilin University)*

# TECHNICAL PROGRAM

## AFTERNOON, SUNDAY, 17 NOVEMBER

### Session 7 | Frontier Exploration and Special Underground Space Utilization | Room: Chu Feng Hall

Chairs: Qi Li (Institute of Rock and Soil Mechanics, CAS, China); Junfeng Zhu (University of Kentucky, USA)

#### Invited Lecture

- 13:30-13:55 **Geomechanical properties will constrain CO<sub>2</sub> Injection into the lower Ordovician Rose Run sandstone deep saline reservoir, Appalachian Basin, Kentucky, U.S.A**  
*J. Richard Bowersox (Kentucky Geological Survey, USA)*
- 13:55-14:20 **Techniques for surface gas monitoring in a faulted underground gas storage reservoir**  
*Matthew Myers (CSIRO Energy, Australia)*

#### Oral Presentation

- 14:20-14:40 **Pore structure of spontaneous imbibition of coals: Experimental investigation**  
*Tongqiang Xia (China University of Mining and Technology, China)*
- 14:40-15:00 **Investigation of complex clay interlayers during supercritical CO<sub>2</sub> flooding in sandstone**  
*Liang Xu (Institute of Rock and Soil Mechanics, CAS, China)*
- 15:00-15:20 **Underground pore space: Assessment for CO<sub>2</sub> geological storage and proposals of management**  
*Xin Ma (Center for Hydrogeology and Environmental Geology Survey, CGS, China)*
- 15:20-15:40 **An open-source porous media simulator OpenGeoSys (OGS): model development and potential applications in underground engineering**  
*Miao Jing (Institute of Rock and Soil Mechanics, CAS, China)*

### Session 8 | Multidisciplinary Innovation and Development | Room: Chu Feng Hall

Chairs: Tadahiko Okumura (Engineering Advancement Association of Japan); Chuanqing Zhang (Institute of Rock and Soil Mechanics, CAS, China)

#### Invited Lecture

- 16:00-16:25 **A workflow for CT-characterization of cement degradation under corrosive environment**  
*Liwei Zhang (Institute of Rock and Soil Mechanics, CAS, China)*
- 16:25-16:50 **On the performance of the lubrication during pipejacking in Quaternary alluvial deposits**  
*Wen-Chieh Cheng (Xi'an University of Architecture and Technology, China)*

#### Oral Presentation

- 16:50-17:10 **Warning of rockbursts in deep tunnels using in situ monitored microseismicity**  
*Guangliang Feng (Institute of Rock and Soil Mechanics, CAS, China)*
- 17:10-17:30 **New frontiers in in-situ analysis of geomaterials**  
*Franco Talarico (University of Siena, Italy)*
- 17:30-17:50 **Reconstruction of Underground Mechanical Parking Lot from The Existing Civil Air Defence Works in Yucheng Road, Qingdao**  
*Houxi Zhang (Qingdao Huatong Group, China)*
- 17:50-18:10 **Theory and Practice of Cooperative Development of Underground Multi-resources in Qingdao**  
*Dou Yanguang (Qingdao Institute of Marine Geology, China Geological Survey)*
- 18:10-18:30 **Experiences with 3D laser scanning technology for monitoring of mining works in the Czech Republic**  
*Vlastimil Kajzar (Institute of Geonics of the Czech Academy of Sciences, Czech Republic)*

# TECHNICAL PROGRAM

## AFTERNOON, SUNDAY, 17 NOVEMBER

**Session 9 | Experimental and Numerical Investigation of Underground Space (1) | Room: Hongshan Hall**  
Chairs: Nehemia Beyene (Coffey Services Australia, Australia); Bin Wang (Institute of Rock and Soil Mechanics, CAS, China)

### Invited Lecture

13:30-13:55 **Geological Boundary Conditions for Sustainable Underground Development**  
*Eduardo de Mulder (Delft Technical University, The Netherlands)*

### Oral Presentation

13:55-14:15 **Numerical analysis of seabed responses subjected to wind and wave loads**  
*Xianglian Zhou (Shanghai Jiao Tong University, China)*

14:15-14:35 **Experimental study on the advance speed-production pause time effect of overburden energy release from hard roof working face**  
*Feng Cui (Xi'an University of Science and Technology, China)*

14:35-14:55 **Study on excavation disturbance characteristics of high ground stress soft rock tunnels**  
*Jianhe Li (Changjiang Institute of Survey, Planning, Design and Research, China)*

14:55-15:15 **Numerical study of initiation pressure by dual criterion for non-circular wellbore**  
*Zaile Zhou (Institute of Rock and Soil Mechanics, CAS, China)*

15:15-15:35 **Static mechanical properties and failure modes of layered sandstones in freeze-thaw cycles**  
*Sen Chang (Air Force Engineering University, China)*

**Session 10 | Experimental and Numerical Investigation of Underground Space (2) | Room: Hongshan Hall**  
Chairs: Franco Talarico (University of Siena, Italy); Wei Bai (Institute of Rock and Soil Mechanics, CAS, China)

16:00-16:20 **Study of the shear strength and its mechanism of frozen silty clay at high moisture content**  
*Sui Zhang (Institute of Rock and Soil Mechanics, CAS, China)*

16:20-16:40 **Tri-axial experiment on the influence of stress paths on clay in deep excavation**  
*Na Xu (Tongji University, China)*

16:40-17:00 **The application of borehole wall stress relief method in the deep vertical borehole**  
*Yuqiao Qin (Institute of Rock and Soil Mechanics, CAS, China)*

17:00-17:20 **Empowering the new concept of "four intelligences", forging a new visiting card for Xi'an**  
*Huiyong Ma (Xi'an Xingfu Lindai Construction & Investment Co., Ltd, China)*

17:20-17:40 **The comprehensive utilization of salt cavern**  
*Jie Chen (Chongqing University, China)*

# TECHNICAL PROGRAM

**MONDAY, 18 NOVEMBER**

## Keynote Lectures | Room: Chu Tian Hall

(Chair: Weizhong Chen | Institute of Rock and Soil Mechanics, CAS, China;  
Co-chair: Yingxin Zhou | ACUUS, Singapore)

08:30-09:00 **3D Geological model and geodata system for Singapore**  
*Jian Chu (Nanyang Technological University, Singapore)*

09:00-09:30 **Moving goods underground, the next of first step towards unhindered logistics**  
*Johan Visser (Institute for Transport Policy Analysis, MIE, Netherlands)*

## Technology & Solutions Report (Chair: Chaobin Guo | SinoProbe)

09:30-09:55 **Quality evaluation system of urban underground space**  
*Wensheng Li (China Railway SIYUAN Survey and Design Group Co., Ltd.)*

09:55-10:20 **Geotechnical analysis with SIMULIA**  
*Tao Zhang (Dassault Systemes (Shanghai) I.T. Co., Ltd.)*

## Coffee Break

10:40-11:20 **Closing Ceremony** (Chair: Yuyong Jiao | China University of Geosciences, Wuhan, China)



# TECHNICAL PROGRAM

## POSTER PROGRAM

Afternoon, 16–17 November 2019 | Room: Chu Lv Hall & Chu Feng Hall

Chairs: Jiangshan Li, Hejuan Liu, Hang Ruan (Institute of Rock and Soil Mechanics, CAS, China); Peng Lin, Xiaoyan Dong (Shandong University, China)

BOARD	TITLE/AUTHOR
PP-01	<b>Study on the health evaluation system of Loess tunnel structure based on model tests</b> <i>Wenhui Yang (Southeast University, China)</i>
PP-02	<b>Demand, key issues and prospect of high-resolution exploration of urban underground space</b> <i>Tianxiang Ren (SinoProbe Center, Chinese Academy of Geological Sciences and China Geological Survey, China)</i>
PP-03	<b>Refocus imaging method for underground target investigation with borehole GPR radar</b> <i>Tao Sun (Wuhan University, China)</i>
PP-04	<b>Study on the correlation between permeability and resistivity of porous media in urban underground space</b> <i>Jing Fan (Nanjing University, China)</i>
PP-05	<b>Numerical modeling of anchoring bolting in rock masses based on an extended rigid block spring method</b> <i>Chi Yao (Institute of Rock and Soil Mechanics, CAS, China)</i>
PP-06	<b>3D velocity modeling of the northwestern South China Sea based on 2D multi-channel seismic exploration</b> <i>Bin Zhao (Guangzhou Marine Geological Survey, China)</i>
PP-07	<b>Mechanism and performance of pile foundations in the transition zone due to pit-in-pit excavation</b> <i>Hongjiang Li (Southeast University, China)</i>
PP-08	<b>Investigation on uneven settlement caused by group drilling pumping and its impact on Metro tunnel</b> <i>Yunxiao Xin (Nanjing University, China)</i>
PP-09	<b>A modified rock mass classification considering seismic effect in the basic quality (BQ) system</b> <i>Zhen Cui (Institute of Rock and Soil Mechanics, CAS, China)</i>
PP-10	<b>Microstructure and shear strength of widely graded soils during desaturation</b> <i>Zhixin Zhou (Sun Yat-sen University, China)</i>
PP-11–PP-51	<b>Poster Presentations of Forum on Geomechanics and Geotechnical Engineering</b>



# KEYNOTE LECTURES

**SATURDAY, 16 NOVEMBER, | 09:30–10:30 | ROOM: CHU TIAN HALL**

**Chaired by Dimitris Kaliampakos | National Technical University of Athens, Greece**  
**Co-chaired by: Charles Ng | Hong Kong University of Science and Technology, China**



## **Improving the Design of Underground Facilities: Learning from Experience**

**Prof. Raymond Sterling**  
Louisiana Tech University, USA

Past Chairman of the International Society for Trenchless Technology / Past President of the Associated research Centers for Urban Underground Space (ACUUS) / Past Vice Chair of ITACUS / Past Chairman of the U.S. National Committee on Tunneling Technology / Former Editor-in-Chief of Tunneling and Underground Space Technology



## **Safe Development and Utilization of Deep Underground Space and Typical Engineering**

**Prof. Xia-Ting Feng**  
Northeastern University, China

President of Federation of International Geo-Engineering Societies (FedIGS) / Vice President of Northeastern University / President of Chinese Society for Rock Mechanics and Engineering / Past President of International Society for Rock Mechanics (ISRM 2011-2015) / President of ISRM Commission on Design Methodology

**SATURDAY, 16 NOVEMBER, | 10:50–11:50 | ROOM: CHU TIAN HALL**

**Chaired by Haibo Li | Institute of Rock and Soil Mechanics, CAS, China**  
**Co-chaired by Aurèle Jean Parriaux | Swiss Federal Institute of Technology, Switzerland**



## **Future Cities That Live Sustainably and in Harmony with the Ground They Are Built on—from Vision to Reality**

**Dr. Diarmad Campbell**  
British Geological Survey, UK

Co-Chair of ACUUS-GEO / Chief Geologist in Scotland/ Chair of Management Committee of COST ACTION TU1206 'SUB-URBAN' at COST (European Cooperation in Science and Technology)



## **Reliable Exploration and Comprehensive Application of Underground Salt Caverns**

**Prof. Chunhe Yang**  
Institute of Rock and Soil Mechanics, CAS, China

Vice Director of State Key Laboratory of Geomechanics and Geotechnical Engineering / Leader of Rheological Mechanics Section and Director of Scientific Committee in IRSM, CAS

# KEYNOTE LECTURES

SUNDAY, 17 NOVEMBER, | 09:50–11:20 | ROOM: CHU TIAN HALL

Chaired by Diarmad Campbell | British Geological Survey, UK  
Co-chaired by Shengxiang Lei | China Railway Construction Corporation Ltd., China



## **The Role of Geosciences in the Sustainable Use of the Underground Space**

**Prof. Dimitris Kaliampakos**

National Technical University of Athens, Greece

President of ACUUS / Director of the Laboratory of Mining and Environmental Technology at NTUA



## **Development of the Urban Underground Space in China and Some Ideas**

**Prof. Xiangsheng Chen**

Shenzhen University, China

Academician of Chinese Academy of Engineering / Dean of College of Civil and Transportation Engineering in Shenzhen University / Chief Engineer at Shenzhen Metro Co. Ltd. (Group) / Director of Beijing Research Institute of Shaft Construction at Central Coal Mining Research Institute (CCMRI)



## **Application of the DEEP-CITY Methodology to the Touristic Station of Verbier (Swiss Alps)**

**Prof. Aurèle Jean Parriaux**

Swiss Federal Institute of Technology, Switzerland

Past Chair of Swiss Hydrogeological Society



# KEYNOTE LECTURES

MONDAY, 18 NOVEMBER, | 8:30–10:30 | ROOM: CHU TIAN HALL

Chaired by Weizhong Chen | Institute of Rock and Soil Mechanics, CAS, China  
Co-chaired by Yingxin Zhou | ACUUS, Singapore



## 3D Geological Model and Geodata System for Singapore

**Prof. Jian Chu**

Nanyang Technological University, Singapore

Director of the Centre for Usable Space at NTU / Vice Chair for ISSMGE TC217 on Land Reclamation



## Moving Goods Underground, the Next of First Step towards Unhindered Logistics

**Prof. Johan Visser**

Institute for Transport Policy Analysis, Ministry of Infrastructure and the Environment, Netherlands

President of International Society for Underground Freight Transportation (ISUFT) / Senior Researcher in Delft University of Technology



# SHORT COURSES

## Training Course on Urban Geological Research and the Using of Underground Space for Smart City

**Theme:** Urban Geology: the Foundation of Smart City

**Sponsor:** Nanjing Geological Center of China Geological Survey, Institute of Rock and Soil Mechanics Chinese Academy of Sciences, ZDNDY Cyber

**Support:** National Council of Geologist of Italy (CNG), Young Earth Scientists (YES) Network, Chinese Committee of YES Network, Geoteck

**Venue:** Meeting Center of MapGIS S&T Park, Wuhan, China

### General Program (13–15 November)

Time	1 <sup>st</sup> day Seminar (13 Nov.)	2 <sup>nd</sup> day Seminar (14 Nov.)	3 <sup>rd</sup> day Seminar (15 Nov.)
8:30–12:30	(starts 9:00) Morning session	Morning session	Morning session
12:30–13:30	Lunch	Lunch	Lunch
13:30–17:30	Afternoon session	Afternoon session	Afternoon session
18:30–20:30	Welcome Dinner	Social Dinner	Farewell dinner

## Workshop: Carbon Deep Storage Field Tests and CO<sub>2</sub>-Brine-Rock Interactions

### General Program (13 November)

Time	Lecturer	Title
08:30-09:20	John Richard Bowersox	Field Tests and Results for Assessing Carbon Dioxide Storage Capacity in Deep Saline Reservoirs, Kentucky, USA
09:30-10:20		
10:30-11:20	Junfeng Zhu	Modeling CO <sub>2</sub> -Brine-Rock Interactions in the Knox Group, Western Kentucky
11:30-11:50		Discussion
14:00-14:50	Junfeng Zhu	Modeling CO <sub>2</sub> -Brine-Rock Interactions in the Knox Group, Western Kentucky
15:00-15:50	Junfeng Zhu (for Thomas Martin Parris)	Geochemical Response to CO <sub>2</sub> Injection, Sugar Creek Field, Hopkins County, KY
16:00-16:50		
17:00-17:20	Discussion	

# TRANSPORTATION & ACCOMMODATION

## Non-Stop Flights to Wuhan

Passengers from 53 countries, such as USA, Russia, UK, France, Japan, South Korea and Singapore, can enjoy up to 144 hours free transit without visa application when they take an international transfer at the Tianhe International Airport.



## Train to Wuhan

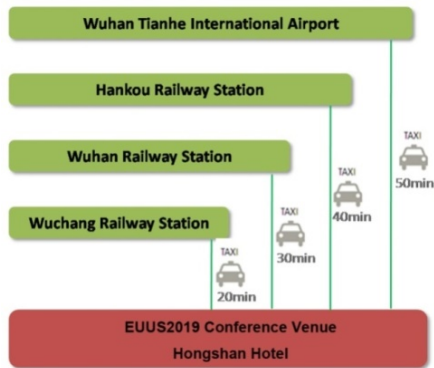
It is easier to take a train from/to Wuhan in China. Trains travel between Wuhan and the cities within Hubei Province, as well as most major cities in China, including Beijing, Shanghai, Guangzhou, Shenzhen, Xi'an, Chongqing, Chengdu and Qingdao. The operation of high speed trains between Wuhan and Beijing, Shanghai, Xi'an, Shenzhen, Guangzhou and Hongkong makes the city a widely recognized China's transportation hub, especially the high speed trains to Beijing, Guangzhou and Hongkong, whose duration time is only 4 hours and 4.5 hours.

The EUUS2019 will be held in the Hongshan Hotel, Wuhan. Transportation from and to the international airport and railway stations will not be arranged by the conference. There are two main transport vehicles from airport or train stations to the conference venue, i.e. Taxi or Subway.

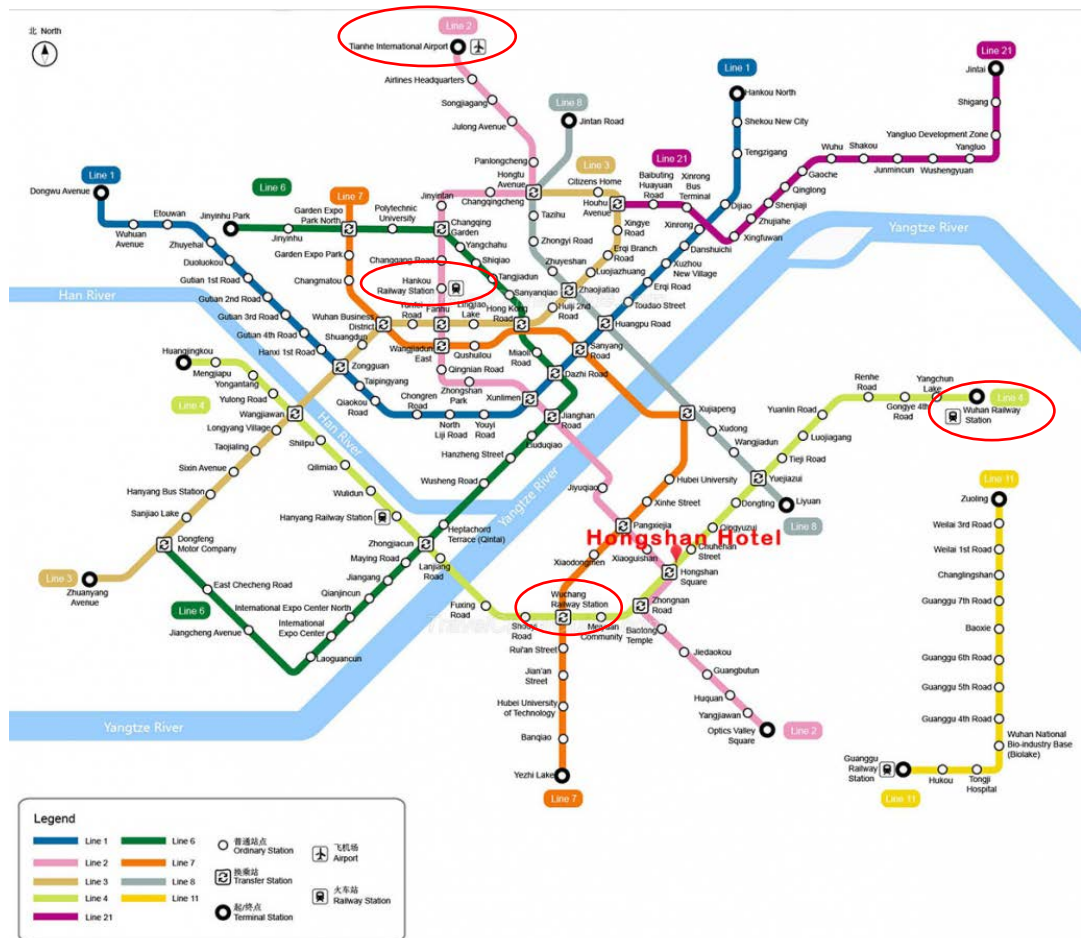
## Taxi to Hongshan Hotel

The taxis in Wuhan run 24 hours every day.

# TRANSPORTATION & ACCOMMODATION



## Subway to Hongshan Hotel



The subway operation time is below:

Tianhe Int. Airport (Line 2): 06:00-22:30

Wuhan Railway Station (Line 4): 06:00-22:30

Wuchang Railway Station (Line 4): 06:00-23:00

Hankou Railway Station (Line 2): 06:00-23:00



# TRANSPORTATION & ACCOMMODATION

There are subway lines from Tianhe International Airport, Wuhan Railway Station, Hankou Railway Station and Wuchang Railway Station. The arrival station is **Hongshan Square Station and the Exit is D2**.

## Weather Forecast

周一	周二	周三	周四	周五	周六	周日
11 阴 22/12°C	12 小雨 21/13°C	13 阴 20/14°C	14 间歇性多云 20/10°C	15 大部分晴 17/11°C	16 间歇性多云 20/12°C	17 大部分多云 20/12°C
18 阵雨 20/12°C	19 大部分多云 19/11°C	20 部分晴 19/11°C	21 雨 19/10°C	22 多云 17/8°C	23 阵雨 13/7°C	24 大部分多云 12/7°C

## Accommodation Information

There are many hotels showed below near the conference venue. If you would like to book a room at Hongshan Hotel for low prize although the quantity of rooms reserved by conference is limited, please tell them that you are the attendee for the EUUS2019 conference organized by Institute of Rock and Soil Mechanics, Chinese Academy of Sciences.



## Hall of Fame, SIYUAN (2016)

### 1. Feature Wall Preface

This Hall has been established to retrospect the glorious days in the past 60 years since its founding, to display the brilliant achievements and strength of SIYUAN, as well as to inherit the outstanding corporate culture. The Hall of Fame has gathered material data, historical documents and photos with the total amount of more than 2,500 pieces, which have presented the development history and achievements of SIYUAN in various styles.

The Hall was completed and opened at the 60<sup>th</sup> anniversary of SIYUAN.

### 2. SIYUAN Profile

China Railway SIYUAN Survey and Design Group Co., Ltd. (referred to as SIYUAN hereinafter) was established in 1953, subordinated to the former Ministry of Railways. It was restructured from a public institution into an enterprise in 2002 and transferred from under the former Ministry of Railways to under China Railway Construction Corporation (CRCC) in 2003. In 2007, it was restructured again into a modern corporate group and was overall listed with CRCC, becoming its wholly-owned subsidiary.

SIYUAN was among the first state-level design institutes established after the founding of The People's Republic of China, as well as one of the first organizations which have possessed Grade A qualifications for design. It is the state-validated enterprise technical center and the professional state-entrusted consultation and evaluation organization for railway and urban rail transit investment, of which the comprehensive strength ranks among the top 100 national survey and design institutions. With more than 40 survey and design disciplines and more than 20 Grade A and special qualifications, SIYUAN has been equipped with integrated technical advantages in serving the entire industrial chain of modern transportation construction.

During the development history of more than 60 years, SIYUAN has been actively engaged in the construction of transportation infrastructure especially in the field of railway and has been the leader of railway survey and design in China. It has designed more than 40 high-speed railways (HSR) with the length of more than 10,000km, including Beijing-Shanghai HSR, Beijing-HongKong HSR, Beijing-Fuzhou HSR, Southeast Coast High Speed Rail Link, Shanghai-Kunming HSR, Shanghai-Wuhan-Chengdu HSR, Xuzhou-Lanzhou HSR, making up nearly half of the HSR in operation in China. It has totally undertaken the more than 80 integrated design of urban rail transit in 30 cities, with the business volume on top within the industry. It has established "Six Core Brands" as HSR, modern railway station, underwater tunnel, intercity railway, suburban railway and maglev rail transit, as well as "Eight Complete Sets of Technologies" as railway network planning, railway hubs, complicated mountainous railway, heavy haul railway, modern railway logistics, urban rail transit, bridge and integration of systems (including communication, signaling, power supply and electrification).

SIYUAN has vigorously promoted the development strategy of "One Focus, Two Branches": its services covers various aspects of infrastructure, including railway, highway and municipal engineering, urban rail transit, underwater tunnels, high-rise buildings, airports, ports, urban underground pipeline network, Sponge city and urban integration development; it has built the synergetic development pattern for the seven major businesses, including survey and design, EPC contracting, supervision and consultancy, overseas projects, capital management, real estate and advanced fabrication.

As a group member of International Federation of Consulting Engineers (FIDIC), SIYUAN has actively exploited overseas markets and has been committed to serving for "the Belt and Road". It works across over more than 20 countries and areas in Asia, Europe, America, Australia and Africa. It has successively been awarded the honors of "National Model Organization of Moral Quality", "National May 1<sup>st</sup> Labor Certificate of Merit", "Advanced Collective of Central Enterprises", "National Excellent Survey & Design Institute", "China Grade AAA Credit Enterprise", "National Contract Abode and Credit Oriented Enterprise", "National Model Organization of Integrity" and one of the "Top Ten Independent Innovation Enterprises" of national survey and design industry at the 60<sup>th</sup> anniversary of the founding of China. Now, it is striding forward to the creation of an international engineering company which enjoys high reputation in the world in the field of transportation.

# CONTACT INFORMATION

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