

3rd NORDIC ROCK MECHANICS SYMPOSIUM

NRMS 2017



FINAL PROGRAMME

OCTOBER 10–12, 2017
HELSINKI
WWW.ROCK2017.FI



Suomen Kalliomekaniikkatoimikunta
Finnish National Group of ISRM

Welcome

The 3rd Nordic Rock Mechanics Symposium (NRMS 2017) is a continuation for the rock mechanics activity that has been taken place in the Nordic countries for long time. This Symposium now held in Helsinki is the third Nordic rock mechanics symposium - first one was held in Kongsberg, Norway 2010 and the second one in Gothenburg, Sweden 2013. Use of underground space for various purposes is a natural choice in Nordic countries and understanding of rock mechanics is vital and plays important role in this concept. This symposium gathers experts not only from Nordic countries but also experts outside Nordic countries to discuss within the area of rock mechanics with the topical themes related to current state of research, rock caverns, tunnelling, mining, use of underground space for different type of storage and case histories.

The NRMS 2017 Symposium is organized by the Finnish National Group of ISRM and the Finnish Association of Civil Engineers RIL. The Symposium has also a status of the ISRM Specialized Conference and sponsored by ISRM (International Society for Rock Mechanics). Nordic Advisory Committee with talented members from all Nordic countries helped us to make this event scientifically of good quality. Organizing Committee warmly wants to thank them for their effort.

The 3rd Nordic Rock Mechanics Symposium consists of five keynote presentations, 20 technical presentations from 9 countries, technical excursion and a workshop on Numerical Modelling. On the behalf of the Organizing Committee I wish to thank all the authors for their contributions and making this symposium possible. Also, I want to thank all the participants and the sponsor companies for their support. Looking forward to interesting discussions and seeing you next time in some Nordic city!

Erik Johansson

Chairman of the Organizing Committee
NRMS 2017

Contact

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Keynote presentations

October 11 at 9.30

Principles of Ground Support Design

Professor **Charlie Chunlin Li**
Norwegian university of Science and
Technology, Norway

October 11 at 10.15

Role of Rock Mechanics in the Design Process of Underground Rock Facilities

Lic.Tech. **Jukka Pöllä**
Finland

October 11 at 13.30

Deformation modulus of rock masses: recent developments

Professor **Candan Cokceglu**
Hacettepe University, Turkey

October 12 at 8.30

Synthetic Rock Mass in the Swedish Nuclear Fuel and Waste Management Program

Dr. **Diego Mas Ivars**
SKB, Sweden

October 12 at 9.00

Rock mechanics related mining engineering

Professor **Zongxian Zhang**
University of Oulu, Finland

Numerical modelling workshop

October 10 at 13.00

Moderated by:



Get together

October 10 at 19.00

Get together is free for participants (excluding master students). Get together is organized at the Symposium venue, Hotel Haaga. There is a limited amount of beverages and snacks available. Dress code is business casual.

Dinner

October 11 at 18.30

Dinner is organized at restaurant Sipuli. Dinner is free for participants (excluding master students). Dress code is business casual. A bus transportation is organized from the symposium venue to the restaurant at 18.30.

Technical excursion

October 12 at 13.00

Excursion will start from the symposium venue after lunch and it will finish to the airport/city centre.

Excursion is free for the participants

Schedule

13.00 Departure from Symposium venue. Presentation of Länsimetro (the west metro) in the bus

14.00 Visit to Länsimetro (the west metro) Finnoo station

15.30 Departure from Finnoo. Presentation of Blominmäki wastewater treatment plant in the bus.

16.00 Visit to Blominmäki wastewater treatment plant

17.00 Departure towards the airport and city centre

18.00 (latest) Bus will reach Helsinki Airport

18.30 Bus will reach city centre

Wednesday October 11

9.00 – 9.30 Opening Words

Lic.Tech. **Erik Johansson**, Finnish National Group of ISRM

M.Sc. (CE) **Teemu Vehmaskoski**, Finnish Association of Civil Engineers RIL

9.30 – 10.45 Keynote Session 1 Chair: Erik Johansson

9.30 Principles of Ground Support Design
Professor **Charlie Chunlin Li**, NTNU, Norway

10.15 Role of Rock Mechanics in the Design Process of Underground Rock Facilities
Lic.Tech. **Jukka Pöllä**, Finland

10.45 – 11.15 Coffee

11.15 – 12.30 Session 1 Chair: Topias Siren

11.15 Rock mechanical challenges of Lippulaiva excavation
Jesse Ström and **Paavo Hurskainen**, Finland

11.30 Numerical predictions for underground thermal energy storage experiment in the Otaniemi research tunnel
Mateusz Janiszewski, Finland

11.45 Thin rock cover tunnel design in the Helsinki City Rail Loop
Klaus Einsalo, Finland

12.00 Large LPG Cavern in Southern Finland
Kari Äikäs, Finland

12.15 Drillability assessments in hard rock excavation
Francisco Javier Macias, Norway

12.30 Numerical investigation of dynamic rock fragmentation in mechanical cutting using combined FEM/DEM
Mojtaba Mohammadnejad, Australia

12.45 – 13.30 Lunch

13.30 – 15.00 Session 2 Chair: Lauri Uotinen

13.30 Invited Keynote: Deformation modulus of rock masses: recent developments
Professor Dr. **Candan Gokceoglu**, Hacettepe University, Turkey

14.00 New Rock Stress Data from Finland Related to the Update of World Stress Map
Topias Siren, Finland

14.15 ONKALO stress model based on LVDT measurements
Matti Hakala, Finland

14.30 A 2D experimental setup for investigating crack propagation from internally pressurized thick-walled rock-like samples
Farzin Hamidi, Australia

14.45 Surface asperity effect on rock joint shear behavior
Seok-Won Lee, Republic of Korea

15.00 – 15.30 Coffee

15.30 – 16.45 Session 3

Chair: Mikael Rinne

15.30 2D numerical analysis using LEM for slope subjected to toe cutting and earthquake: A case study of Bhatwari, Uttarkashi

Ankit Singh, India

15.45 New method for inferring the mean pore size of shale using imbibition-diffusion data

Liu Yang, China

16.00 Reliability assessment of rock slope stability by Dempster-Shafer theory

Rodrigo Hernandez-Carrillo, Colombia

16.15 New rigid rapid setting structural support and sealant for rock support and waterproofing

Topi Hänninen, Finland

16.30 On the use of the Ottosen failure criterion in rock mechanics

Reijo Kouhia, Finland

18.30 – 22.00 Dinner

Bus departs in front of the Symposium venue at 18.30.

Thursday October 12

8.30 – 9.30 Keynote Session 2

Chair: Pekka Särkkä

8.30 Synthetic Rock Mass in the Swedish Nuclear Fuel and Waste Management Program

Dr. **Diego Mas Ivars**, SKB, Sweden

9.00 Rock mechanics related mining engineering

Professor **Zongxian Zhang**, University of Oulu, Finland

9.30 – 10.00 Coffee

10.00 – 12.15 Session 4 and Closing

Chair: Jukka Pöllä

10.00 Numerical modelling and seismicity at the Kiirunavaara mine, Sweden

Jessa Vatcher, Sweden

10.15 Evaluation of the long-term stability of brittle materials using acoustic emission

Dae-Sun Cheon, Republic of Korea

10.30 Fatigue of rocks

Stefan Van Baars, Luxembourg

10.45 Numerical simulation of meso-damage pattern growth process of brittle rock under uniaxial compression

Long Jiang, China

11.00 Rock mechanics in Blominmäki underground wastewater treatment plant

Jari Haapala, Finland

11.15 Closing words and the Best Papers

Erik Johansson, Finland

12.00 – 13.00 Lunch

13.00 - 18.30 Technical excursion

Committees

Organizing Committee

Erik Johansson, Chair

Ville Raasakka

Mikael Rinne

Topias Siren

Pekka Särkkä

Lauri Uotinen

Teemu Vehmaskoski

Nordic Advisory Committee

Lars-Olof Dahlström, Golder Associates, Sweden

Åsa Fransson, Chalmers, Sweden

Eivind Grøv, SINTEF, Norway

Mohammadhossein Gholampoor, PCBroy Aps, Denmark

Atli Karl Ingimarsson, Mannvit, Iceland

Fredrik Johansson, KTH, Sweden

Erling Nordlund, LTU, Sweden

Roger Olsson, NGI, Norway

Sponsors



ISRM

PROGRAMME AT A GLANCE

3RD NORDIC ROCK MECHANICS SYMPOSIUM			
	TUESDAY	WEDNESDAY	THURSDAY
8.00		Registration opens	Registration opens
8.30			Keynote session 2 Chair: Pekka Särkkä
9.00-9.30		Opening Words Keynote session 1 Chair: Erik Johansson Keynote 1: Prof. Charlie Chunlin Li Keynote 2 : Lic.Tech. Jukka Pöllä	Keynote 3: Dr. Diego Mas Ivars Keynote 4: Prof. Zongxian Zhang
9.30-10.00			Coffee
10.00-10.30			Session 4 and Closing Chair: Jukka Pöllä
10.30 - 10.45			
10.45 - 11.15		Coffee	
11.15- 11.30			Session 1 Chair: Topias Siren
11.30 - 12.00			
12.00 - 12.15			Lunch
12.15 - 12.30			
12.30 - 12.45			
12.45 - 13.00		Lunch	
13.00 - 13.15			
13.00 - 13.30	Numerical modelling workshop	Session 2 Chair: Lauri Uotinen Invited keynote: Prof. Dr. Candan Gokceoglu	Excursion
13.30 - 14.00			
14.00 - 14.30			
14.30 - 15.00		Coffee	
15.00 - 15.30		Session 3 Chair: Mikael Rinne	
15.30 - 16.00			
16.00-16.45			
16.45-17.00			
17.00-17.15			
17.15 - 18.00			
18.00-18.30			
18.30 - 19.00			
19.00-20.00	Get Together	Dinner	
20.00 - 21.00			
21.00-22.00			