



Preface

Dear Colleagues,

On behalf of the Organizing Committee, I am delighted to present the proceedings from the ISRM International Symposium EUROCK 2012 in Stockholm entitled "Rock Engineering & Technology for Sustainable Underground Construction". EUROCK 2012 also marks the 50th anniversary of ISRM.



The importance of rock and underground structures to Swedish society was obvious to the participants of EUROCK 2012, primarily for our mines and important infrastructure projects.

The papers from the technical programme offers a wide range of topics to you; from Laboratory Testing and Material Methods at one end to LCC and Risk Management at the other. We expect that the papers presented in these digital proceedings improve knowledge to you and by exchanging and sharing information also brings knowledge to others.

The extensive voluntary work that has been performed by committees, the team of reviewing experts and others is necessary to realise the International Symposium and is much appreciated.

Finally, I would to thank all the contributing authors, sponsors and exhibitors.

Per Tengborg
Symposium Chair



STIFTELSEN BERGTEKNISK FORSKNING
ROCK ENGINEERING RESEARCH FOUNDATION

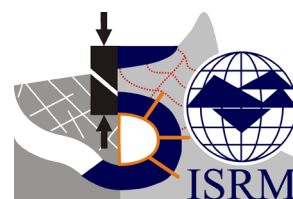




Table of Contents

Preface

Organization

Rocha Medal Lecture

ISRM Lecture

Keynote Lectures

Geological Site Characterization

Rock Excavation

Rock Support

Environmental Aspects

Material Models

Mining Rock Mechanics

Laboratory Testing

Design Methods

Hydrogeology and Grouting

Maintenance, LCC and Risk Management

Author Index

Search



Organization

Scientific Committee

Prof. Håkan Stille, Chairman, Royal Institute of Technology
Prof. Torleif Dahlin, Lund University
Adj. Prof. Lars-Olof Dahlström, NCC
Dr. Thomas Dalmalm, Swedish Transport Administration
Prof. Lars O Ericsson, Chalmers University of Technology
Dr. Jenny Greberg, Luleå University of Technology
Dr. Eva Hakami, Geosigma
Adj. Prof. Ulf Håkansson, Skanska
Dr. Fredrik Johansson, Royal Institute of Technology
Prof. Charlie Li, Norwegian University of Science and Technology
Dr. Roger Olsson, Norwegian Geotechnical Institute
Adj. Prof. Jonny Sjöberg, Itasca Consultants

Organizing Committee

Per Tengborg, Chairman, Rock Engineering Research Foundation
Eva Rydén, Secretary General, Eurock 2012
Rolf Christiansson, Swedish Nuclear Fuel and Waste Management
Eva Friedman, Rock Engineering Research Foundation
David Luterkort, Swedish Geotechnical Institute
Bengt Ludvig, Petro Team Engineering
Katarina P. Nilsson, Geological Survey of Sweden

International Advisory Committee

Xia-Ting Feng, President ISRM, The Chinese Academy of Sciences,
Wuhan, China
Tarcisio B. Celestino, University of São Paulo, Brazil
Mark Diederichs, Queen's University, Canada
Claus Erichsen, WBI, Germany
Abdolhadi Ghazvinian, Tarbiat-Modares University, Iran
Giovanni Grasselli, University of Toronto, Canada
Nuno Grossmann, ISRM, Portugal
John A. Hudson, Imperial College, UK
Luís Lamas, Secretary General, ISRM, Portugal
Derek Martin, University of Alberta, Canada
Anthony Meyers, Rocktest Consulting, Australia
Frederic Pellet, University of Lyon, France
Yves Potvin, University of Western Australia
Mikael Rinne, Aalto University, Finland
Ove Stephansson, Steph Rock Consulting, Berlin, Germany
Graham Swan, Rock Mechanics & Mine Design, Canada
Ernesto Villaescusa, Curtin University, Australia



Review Committee

Åsa Fransson, Chalmers University of Technology

Lars Hässler, Golder Associates

Lars Jacobsson, SP Technical Research Institute of Sweden

Jan Johansson, Naturgasteknik

Erik Johansson, Saanio & Riekkola, Finland

Kristina Jonsson, Rana Gruber, Norway

Harald Hökmark, Clay Technology

Flavio Lanaro, Swedish Radiation Safety Authority

Bo Lind, Swedish Geotechnical Institute

Ulf Lindblom, Gecon

Beatrice Lindström, Swedish Transport Administration

Lars Malmgren, LKAB

Per-Ivar Marklund, Boliden Mineral

Raymond Munier, Swedish Nuclear Fuel and Waste Management

Lars Olsson, Geostatistik

Håkan Schunnesson, Luleå University of Technology

Leif Stenberg, Swedish Nuclear Fuel and Waste Management

Robert Sturk, Skanska-Vinci

Henrik Szentes, Strability

Carl-Olof Söder, Sweco