PREFACE

Eurock has always been an important occasion for the whole rock mechanics community to exchange new ideas, for an update on the latest development in the field and, even more importantly, for meeting active people in this sector.

The Italian rock mechanics community was really honored to host such an important event in Turin after more than 20 years since the last Eurock held in Italy. The organizing committee has been working hard to guarantee an event in presence, but the pandemic situation has forced us to prefer an online event to guarantee its realization and the best healthy conditions for all the attendants. The conference has been organized with live sections and downloadable recording material in order to guarantee to all the authors to present their contributions and the attendants the possibility to actively participate in the Symposium. Although having done our best it is evident that this is not comparable with an in-person event especially in Italy. Our country in addition to the well-known heritage sites, natural beauties and gastronomic delights is also a "rocky country" and numerous important works involving rock engineering aspects are ongoing and would have been of extreme interest to participants.

Even in this complex condition, most of the authors have confirmed their participation sending more than 200 papers and, as organizers of Eurock 2021, we believe that this conference will further stimulate the rock mechanics community through the development of scientific knowledge and the exchange of technical information. We therefore wish to acknowledge the ISRM board and its President for giving us the opportunity to organise this event in Italy.

As in the previous editions, the conference topics address the most recent developments in rock mechanics and rock engineering through plenary and parallel sessions, stimulating fruitful technical and scientific interaction with the fields of some important topics such as:

- Rock properties and testing methods
- Rock mass characterization
- Rock mechanics for heritage
- Rock mechanics for infrastructures
- Geophysics in rock mechanics
- Numerical modeling and back analysis
- Nonlinear problems in rock mechanics
- Mining rock mechanics
- Design methods and analysis
- Monitoring and back analysis
- Underground excavation and support
- Risk and hazard
- Petroleum engineering and hydrofracking
- Applicability of EUROCODE-7 in rock engineering

The plenary sessions hosted one Opening lecture and four Keynotes lectures, delivered by international top scientists with well-known background on the most representative topics of the conference. In the opening lecture special emphasis is given to the connection between structural geology and rock mechanics whilst in the Keynote lectures basic and applied topics are analyzed by maximum experts of the sector.
The parallel Regular Sessions are opened by an introductive description of the chairman on the relevant topic, followed by the presentation of selected contributions and an open discussion. All of the above contributions are included in this electronic volume.

The Organising Committee is grateful to the International Society of Rock Mechanics (ISRM) and to the Italian Geotechnical Society (Associazione Geotecnica Italiana - AGI) for having co-sponsored the event. As Chairman and Co-Chair of the Conference, we would like to warmly acknowledge the fundamental support to EUROCK 2021 provided by the members of the Scientific and Organising Committees.

We finally wish to express our deepest thanks to the Authors, Assessors and Reviewers of the manuscripts, as well as to the Conference Secretary, Susanna Antonielli, and the Publishers for their patience in preparing this volume.

Anna Maria Ferrero, Nicola Moraci, Claudio Scavia

VIRTUAL ASPECTS

The Eurock 2021 volume contains invited and regular papers from the International Conference on Rock mechanics and rock engineering that should have been held in Turin (Italy) from September 21 to 23, 2021.

Although the organizing committee has been working hard to guarantee an event in presence the pandemic situation has forced us to prefer an online event to guarantee its realization. When the difficult decision to go for an online event was taken, we have been worried to lose many contributions whilst most of the authors have confirmed their participation sending more than 200 papers from 37 countries.

The book deals with recent developments and advancements as well as case histories, about the field surveying and monitoring, the experimental characterization, the physical and analytical modelling, and the applications related to the variety of environmental phenomena in the rock mechanics field and their effects on engineered systems interacting with them.

We believe that this volume will provide a significant up-to-date collection of recent experiences and developments to an audience of engineers and geologists, consultants, public and private contractors, local national and international authorities, and to all those involved in research and practice related to rock mechanics and rock engineering. This is particularly important since we have been going through this very special and tough time.

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EUROCK 2021: Rock Mechanics and Rock Engineering from theory to practice

Proceedings of the EUROCK 2021 Conference on Rock Mechanics and Rock Engineering