

Conference Programme

9th Euroconference on Rock Physics and Geomechanics

SUNDAY 16 OCTOBER

1900 Icebreaker Reception

MONDAY 17 OCTOBER

0900 Registration

1000 Opening

1020 Session 1: Rocks at Depth

Chair: Yves Gueguen, Rune M Holt

1020 **KEYNOTE:** Sau-Wai Wong* (Shell International E&P, USA), Peter Schutjens
20 Years of Geomechanics Technology - Integrating Laboratory Development, Numerical Modelling and Field Observation

1100 Elli-Maria Charalampidou* (GFZ, GERMANY), Stephen A. Hall, Sergei Stanchits, Gioachino Viggiani, Helen Lewis

Shear Enhanced Compaction Band Identification at the laboratory scale

1120 Bo-Hyun Kim* (Mirarco, CANADA) Peter Kaiser

Numerical investigation on confinement dependent rock mass strength at depth

1140 Pamela Tempone* (BP Exploration Operating Company, UNITED KINGDOM), Erling Fjær
Overburden shear wave splitting due to a compacting reservoir above a rigid basement

1200 Rob van Eijs* (Shell-NAM, THE NETHERLANDS), Antony Mossop, Dirk Doornhof
Fracture pressure estimation in Dutch depleted gas reservoirs

1220 Poster Session 1

Tran Thi-Thu-Hang* (Ales School of Mines, FRANCE), Stephanie Mahe, Frederic Dubois, Marc Vinches, A Chauvet

Methodology for tunnel excavation modeling in a fractured rock mass using a discrete element approach: application to the Saint-Béat tunnel - France

Santanu Sinha* (NTNU, Norway), Alex Hansen

Two-phase flow in porous media: Multifractality in flow distribution

Elin Skurtveit* (NGI and CIPR, NORWAY), Reza Alikarami, Anita Torabi

Deformation pattern and mechanical properties of Navajo Sandstone and their impact on CO₂ storage

Fedora Quattrocchi, Sergio Vinciguerra* (Istituto Nazionale di Geofisica e Vulcanologia, ITALY), Claudio Chiarabba, Mauro Buttinelli, Barbara Cantucci

The remaining gaps for a "safe" geological storage of CO₂: The CO2GAPS vision challenges of "learning by doing"

C.S. Vishnu* (Indian Institute of Technology, Kharagpur, INDIA), Manish Mamtani, Arindam Basu
Application of Anisotropy of Magnetic Susceptibility and Microcrack Quantification by Fractal Methods in Rock Mechanics

Suzanne Hangx* (Shell Global Solutions International, NETHERLANDS), Arjan van der Linden, Andreas Bauer, Fons Marcelis
Mechanical weakening of sandstone by carbonate cement dissolution - CO₂ injection into the Captain Sandstone, Goldeneye

Alexandra Rolland* (EOST Strasbourg, FRANCE), Renaud Toussaint, Patrick Baud, Jean Schmittbuhl, Nathalie Conil
A model to estimate paleostresses from stylolite morphologies and its application on stylolites from the Bure Underground Research Laboratory

Guido Musso* (Politecnico di Torino, ITALY), Renato Maria Cosentini, Gabriele Della Vecchia, Sebastiano Foti, Cesare Comina
Use of ultrasonic data to generate pseudo logs for the verification of rock integrity

Ahmad Zarei* (The University of Tehran, IRAN), Hamed Nekooee
Effect of Blasting on Stability of an Open Pit Mine Bench

Jørn Stenebråten* (SINTEF Petroleum Research, NORWAY), Rune M Holt
Laboratory simulations of geomechanical effects of relevance for monitoring of CO₂ injection into the subsurface

Claudio Rabe* (Baker Hughes, USA), Jose Cherrez
Application of Thermal Rock Physics on Heavy Oil Project

1300 Lunch

1400 Poster Session 1 cont'd

1430 Session 2: Near Surface Rock & Soil

Chair: Sergio Vinciguerra, Pierre Cerasi

1430 **KEYNOTE:** Eiliv Skomedal* (Statoil, NORWAY), Kenneth Duffaut
Shallow water flow investigation with multicomponent seismic

1510 Thomas Benz, Anteneh Biru Tsegaye (NTNU, NORWAY)*, Omid Pourhosseini
A thermodynamically motivated approach to dilatancy in rocks and rock masses

1530 Vikas Thakur (Statens vegvesen, NORWAY)*, Cino Viggiani, Steinar Nordal
Formation and Propagation of Localized Deformation in marine clays under plane strain condition

1550 Alexander Rozhko* (M-I Swaco, a Schlumberger Company, NORWAY)
Capillary pressure and apparent rock strength during drainage and imbibition

1610 Coffee Break

1630 Session CO2: Subsurface CO₂ Storage

Chair: Sergio Vinciguerra, Pierre Cerasi

1630 Sietse de Vries* (Shell Global Solutions International, NETHERLANDS), Joel Ita, Ashok Shinde, Rob van Eijs, Mark Davison

Geomechanical aspects of the injection of CO₂ in an underground depleted gas reservoir

1650 Bjarne Almqvist* (ETH Zurich, SWITZERLAND), Lukas Aschwanden, Karl Ramseyer, Alba Zappone, Philip Benson

Physical and chemical properties of the Upper Muschelkalk aquifer in Northern Switzerland

1710 Suzanne Hangx* (Shell Global Solutions International, NETHERLANDS), Christopher Spiers, Alwin ten Hove, Anne Pluymakers

Effects of composition and texture on strength of anhydrite caprock and implications of lateral variations for long-term CO₂ storage

1730 End of Day 1

1830 Mayor's Reception, Organ recital in the Nidaros Cathedral

Note: Doors close at 1830, meet no later than 1820!

TUESDAY 18 OCTOBER

0830 Session 3: Computational Rock Physics

Chair: André Vervoort, Alexandre Lavrov

0830 **KEYNOTE:** Karen Mair* (University of Oslo - Dept Geosciences, NORWAY), Steffen Abe
Breaking up: Modelling fragmentation processing in faults

0910 Carlo Vinci* (Ruhr-University Bochum, GERMANY), Jörg Renner, Holger Steeb

Hydraulic fracturing: Towards a numerical modeling approach

0930 Antony Mossop* (Shell / NAM, NETHERLANDS)

An explanation for generalized failure criteria

0950 Amélie Neuville* (Dpt of Physics, University of Oslo, NORWAY), Eirik G. Flekkøy, Renaud Toussaint, Jean Schmittbuhl

Hydrothermal exchanges in rough fractures using Lattice-Boltzmann methods

1010 Cathrine Ringstad* (Numerical Rocks, NORWAY), Pål-Eric Øren, Thomas Ramstad

Pore-scale modelling of macroscopic rock properties

1030 Liming Li* (SINTEF Petroleum Research, NORWAY), Idar Larsen, Rune M. Holt

Grain scale modelling of rock mechanical and petrophysical behaviour

1050 Poster Session 2

Günther Kampfer* (Weatherford Petroleum Consultants, NORWAY), Yves M. Leroy
Fracture spacing limited by delamination in unconfined layers, based on experiments and FE-calculations

Günther Kampfer* (Weatherford Petroleum Consultants, NORWAY), Yves M. Leroy
Competition between fault-propagation folding and thrusting based on the maximum strength theorem

Günther Kampfer* (Weatherford Petroleum Consultants, NORWAY), Florian K. Lehner
A new experimental device for studying the development of joints in layered rocks

Martin Stanek* (Institute of Geophysics, ASCR, CZECH REPUBLIC), Yves Géraud, Stanislav Ulrich, Ondrej Lexa

Petrophysical Properties of Granite Intended for Radioactive Waste Stocking

Anzar Syed* (Schlumberger, UNITED KINGDOM), Carys Thomas, Mereke Akshayeva

Evaluation of critically stressed fractures in North Sea Basement reservoir

Sebastien Haffen* (University of Strasbourg CNRS IPGS, FRANCE), Yves Geraud, Marc Diraison, Chrystel Dezayes

Determination of fluid flow levels in a sandstone geothermal reservoir from thermal conductivity and temperature logs

Lucas Pimienta* (CSIRO, AUSTRALIA), Joel Sarout, Lionel Esteban, Claudio Delle Piane
Prediction of rock thermal conductivity from mineral composition, elastic wave velocities and microstructure

Philipp Siebert, Nikolai Weber, Rainer Schött, Martin Feinendegen, Karen Willbrand* (Geotechnical Engineering, RWTH Aachen, GERMANY)

Development of a design tool for HDR fracture systems

Siegfried Maiolino* (CETE de Lyon (min. Ecology), FRANCE)

Computational elastoplasticity of rocks: new theoretical and numerical framework

Sigmund Hope* (NTNU, NORWAY), André Auto Moreira, José Soares Andrade Jr., Alex Hansen
Reservoir Mapping by Global Correlation Analysis

Vahidoddin Fattahpour (The University of Tehran, IRAN), Mahdi Moosavi, Mahdi Mehranpour
A numerical investigation for sand production based on strain hardening and softening models

Fatemeh Sadat Rassouli, Mohammad Hadi Mehranpour, Mehdi Moosavi (Tehran University, IRAN)

A comparison between compression and impression creep techniques using finite element method

Adeline Pons* (Laboratoire de Géologie - CNRS/école normale supérieure, FRANCE), Yves M. Leroy

Predicting fluid over-pressures for the stability of accretionary wedges

Nicholas Thompson* (Statoil, NORWAY), Peter Zweigel

Analysis of slip perturbation development in scenarios of intersecting faults through distinct element analysis

Agust Gudmundsson* (Royal Holloway University of London, UNITED KINGDOM), Ingrid F. Lotveit, Trine H Simmenes, Magnhild Sydnes, Adelina Geyer

Using field, analytical, and numerical results for realistic fault-zone models

1200 Session 4: Fractures, Faults and Localized Damage

Chair: Eiliv Skomedal, Alex Hansen

1200 **KEYNOTE:** Gioacchino Viggiani* (Laboratoire 3SR, FRANCE), Pierre Bésuelle, Stephen Hall
Insights on localized deformation in rock using 2D and 3D digital image correlation

1240 Alan Baird* (University of Bristol, UNITED KINGDOM), Doug Angus, Michael Kendall
Frequency dependent seismic anisotropy due to fracture related fluid flow versus scattering

1300 Lunch

1400 Session 4 cont'd: Fractures, Faults and Localized Damage

Chair: Eiliv Skomedal, Alex Hansen

1400 André Vervoort* (KU Leuven, BELGIUM), Bjørn Debecker
Fracture behaviour of slate: combined analysis of experiments and simulations

1420 Anita Torabi* (Uni CIPR, Uni Research, NORWAY)
Deformation of porous sandstone and its effect on fluid flow

1440 Olivier Lengliné* (IPGS-CNRS, FRANCE), Johann Valentin, Jean Schmittbuhl, Michel Bouchon

Acoustic monitoring of a rupture nucleation

1500 Erika Tudisco* (Laboratoire 3S-R, FRANCE), Stephen A. Hall, Philippe Roux, Giulia M.B. Viggiani

Full-field characterization of localized deformation and damage in soft granular rock

1520 Coffee Break

1540 Session 5: Laboratory Experiments – Influenced by Temperature

Chair: Sau-Wai Wong, Erling Fjær

1540 **KEYNOTE:** Sergio Vinciguerra* (Istituto Nazionale di Geofisica e Vulcanologia, ITALY), Silvio Mollo, Michael J. Heap, Philip Benson
Changes of geophysical signatures and thermo-mechanical properties of volcanic rocks: What can we learn from active volcanoes?

1620 Jackie E. Kendrick* (Ludwig Maximilian University, GERMANY), Yan Lavallee, Kai-Uwe Hess, Asher Flaws, Michael J. Heap

Deformation mechanisms in crystalline magma

1640 Yan Lavallee* (LMU-Munich, GERMANY), Thomas Mitchell, Michael Heap, Jackie Kendrick, Ben Kennedy

Magma failure and frictional processes in volcanic settings

1700 Xiaoqiong Wang* (Laboratory of geology ENS, FRANCE), Alexandre Schubnel, Yves Gueguen, Jerome Fortin, Hongkui Ge

Fracture in Thermally Cracked Granite: Physical and Mechanical Properties Evolutions

1720 Alireza Hassanzadegan* (GFZ - German Research Centre for Geosciences, GERMANY), Guido Blöcher, Harald Milsch, Günter Zimmermann

The Effect of Temperature on Poroelastic Parameters and Transport Properties of Flechtinger Sandstone

1740 Andreas Bauer* (Shell Global Solutions International, NETHERLANDS), Christian Lehr, Frans Korndorffer, Arjan van der Linden

Temperature dependence of acoustic velocities in gas-saturated sandstones

1800 End of Day 2

WEDNESDAY 19 OCTOBER

0830 Session 6: Improved Understanding from Novel Laboratory Techniques

Chair: Cino Viggiani, Anthony Siggins

- 0830 **KEYNOTE:** Maxim Lebedev* (Curtin University, AUSTRALIA), Andrej Bóna, Roman Pevzner, Boris Gurevich
3 component laboratory experiments by laser interferometry: Anisotropy estimations using polarization of quasi P-waves and S-waves
- 0910 Guido Blöcher* (GFZ German Research Centre for Geosciences, GERMANY), Thomas Reinsch, Harald Milsch, Alireza Hassanzadegan, Günter Zimmermann
The application of fibre optic sensors in laboratory experiments
- 0930 Idar Larsen* (SINTEF Petroleum Research, NORWAY), Jørn F. Stenebråten, Audun Bakk
Stress dependent dynamic anisotropy in shales
- 0950 Erik Hallberg* (Statoil, NORWAY), Olav-Magnar Nes, Eyvind F. Sønstebo, Rune M.Holt
Using a Punching Technique on Small Samples for Evaluation of Temperature Dependent Shale Strength
- 1010 Nicola Tisato* (ETH Zurich, SWITZERLAND), Madonna Claudio, Erik H. Saenger
Measurements and mechanisms investigation of seismic wave attenuation at low frequencies
- 1030 Maxim Lebedev* (Curtin University, AUSTRALIA), Vassili Mikhaltsevitch, Boris Gurevich
An experimental study of wave dispersion and attenuation in water saturated sandstone at seismic and teleseismic frequencies

1050 Poster Session 3

Louis Zinsmeister Jérémie Dautriat* (IFPEN, FRANCE), Michel Bornert, Nicolas Gland, Alexandre Dimanov
Effects of chemical alteration on mechanical and flow properties of a limestone, a multi-scale approach

Min Li* (MIT, USA), Yves Bernabe, Wenlian Xiao
Non-linear effective pressure law for permeability: Experimental methods and applications

André Vervoort* (KULeuven, BELGIUM), Abbass Tavallali
Evaluation of Brazilian tensile strength and fracture pattern in schistose sandstone

Christian David* (Universite de Cergy-Pontoise, FRANCE), Laurent Louis, Petr Spacek, Teng-fong Wong Jérôme Fortin
Elastic Anisotropy of Core Samples from the Taiwan Chelungpu Fault Drilling Project (TCDP): Direct 3-D Measurements and Weak Anisotropy Approximations

Sergio Vinciguerra* (Istituto Nazionale di Geofisica e Vulcanologia, ITALY), Pierdomenico Del Gaudio, Alessandro Iarocci, Christian David, Piergiorgio Scarlato
Physical properties of Campi Flegrei tuff from variable depths

Philip Benson* (ETH Zurich, SWITZERLAND), Michael Heap, Yan Lavallee, Asher Flaws, Kai Hess
Laboratory simulations of tensile (hydro) fracture via cyclical fluid pressurisation

Silvia Loaiza* (Laboratoire de Geologie Ecole Normale Supérieure, FRANCE), Jérôme Fortin, Alexandre Schubnel, Sergio Vinciguerra, Yves Guéguen
Mechanical behavior and localized failure modes in a porous basalt from the Azores

Claudio Madonna, Nicola Tisato* (ETH Zurich, SWITZERLAND), Erik H. Saenger
Low frequency measurements of seismic wave attenuation

Jérôme Wassermann, Yves Le Gonidec, Christophe Nussbaum, Christophe Barnes,
Christian David* (University of Cergy-Pontoise, FRANCE)
**Damage mechanisms during gallery excavation in Opalinus clay formation at the Mont
Terri Underground Rock Laboratory**

Celine Mallet* (Laboratoire de Geologie de l'Ecole Normale Supérieure, FRANCE), Jerome
Fortin, Yves Gueguen
Behaviour of intact and damaged glass under triaxial compression

Mohammad Hossain Bhuiyan* (NTNU, NORWAY), Rune M Holt
Techniques for laboratory measurement of the anisotropic parameter δ

12:00 Session 7: Rock Mechanical Characterization

Chair: Manika Prasad, Olav-Magnar Nes

- 1200 **KEYNOTE:** Christian David* (Universite de Cergy-Pontoise, FRANCE), Lisa Casteleyn,
Philippe Robion, Pierre-Yves Collin, Beatriz Menendez
**A study of the petrophysical, microstructural and geomechanical properties of oolitic
limestones from the Paris basin**
- 1240 Yves Gueguen* (Ecole Normale Superieure, FRANCE), Audrey Ougier-Simonin, Jerome Fortin
Permeability of cracked rocks and glass

13:00 Lunch

14:00 Session 7 cont'd: Rock Mechanical Characterization

Chair: Manika Prasad, Olav-Magnar Nes

- 1400 Alexandre Dimanov* (Laboratoire de Mécanique des Solides, FRANCE), Mathieu Bourcier,
Eva Hériprié, Michel Bornert, Wolfgang Ludwig
**Mechanisms of plastic deformation of synthetic halite polycrystals: Experimental and
computational approaches**
- 1420 Nguyen Van Hung* (IFP Energies nouvelles, FRANCE), Jean Guélard, Nicolas Gland,
Jérémie Dautriat, Christian David
Compaction, permeability evolution and stress path effects in unconsolidated sands
- 1440 C Rabe* (Baker Hughes USA), J O Cherrez
Dynamic and Static Rock Mechanical Properties of Heavy Oil Sandstones

1500 Coffee Break

15:30 Session 7 cont'd: Rock Mechanical Characterization

Chair: Yves Bernabé, Jørn Stenebråten

- 1530 Alexandra Rolland* (EOST Strasbourg, FRANCE), Patrick Baud, Michael Heap, Marion Nicolé,
Thomas Ferrand
**Deformation and failure in limestone surrounding the ANDRA Underground Research
Laboratory at Bure**
- 1550 Nikolai Bagdassarov* (University Frankfurt am Main, GERMANY)
**Constraints on magnetotelluric inversion from laboratory measurements of xenolith
electrical impedance**

- 1610 Øistein Johnsen* (Norwegian Geotechnical Institute, NORWAY), Fabrice Cuisiat
Effects of loading rate and saturating fluid on chalk mechanical behavior
- 1630 Erling Fjær* (Pontifical Catholic University, BRAZIL), Anna M. Stroisz
Stress sensitivity of non-elastic processes in a weak sandstone
- 1650 Srutarshi Pradhan (SINTEF, NORWAY)
Hydraulic fracturing in reservoir rocks: experiment & simulation
- 1710 Elli-Maria Charalampidou* (GFZ, GERMANY), Sergei Stanchits, Thomas Goebel, Georg Dresen
Monitoring induced micro-seismicity from fluid injection experiments.
- 1730 **End of Day 3**

1900 Bus Departure from Conference venue

1930 Conference dinner at Ringve Music Historical Museum including a guided tour

ca 2330 End of Evening...

THURSDAY 20 OCTOBER

0830 Session 8: Shales & Clay **Chair: David Dewhurst, Russ Ewy**

- 0830 **KEYNOTE:** Manika Prasad* (Colorado School of Mines, USA), Patricia Castillo, Piya Dechongit, Saeed Zargari
Reinventing Source Rocks as Reservoirs: Rock physics and Petrophysics of Organics, CarbOnates, cLays, Sands and SHales (O-CLASSH)
- 0910 Maya Kobchenko* (Physics of Geological Processes, University of Oslo, NORWAY), Hamed Panahi, Francois Renard, Olivier Galland, Dag Kristian Dysthe
Experimental studying of shale fracturing caused by internal gas generation
- 0930 Ida Fabricius* (DTU, DENMARK)
High kinematic viscosity of air may cause dry clay to be stiffer than water saturated clay
- 0950 Guido Musso*(Politecnico di Torino, ITALY), Enrique Romero, Gabriele Della Vecchia
Double structure effects on the chemo-hydro-mechanical behaviour of a compacted active clay

1010 Poster Session 4 + Coffee Break

Rolf Bruijn, Bjarne Almqvist* (ETH Zurich, SWITZERLAND), Phil Benson
High temperature and pressure re-compaction of Rochester Shale: Texture and magnetic fabric development

Priscilla Paniagua* (NTNU, NORWAY), Annika Bihs, Steinar Nordal
Interpretation of cone penetration test in clay by finite element simulations

Pavel Golikov* (NTNU, NORWAY), Per Avseth, Alexey Stovas, Ran Bachrach
Rock physics templates for interpretation of turbidite reservoirs

Nicola Tisato* (ETH Zurich, SWITZERLAND), Stefano Marelli
Seismic wave velocities of compacted bentonite: an experimental study

Aminul Islam* (NTNU, NORWAY), Pål Skalle
An experimental investigation of shale characterization using drained and undrained test mechanisms

1100 Session 8 cont'd: Shales & Clay

Chair: Andreas Bauer, Per Horsrud

- 1100 Diansen Yang* (Laboratoire de Mécanique des Solides, FRANCE), Michel Bornert, Serge Chanchole
Experimental investigation of the hydric and delayed behavior of unsaturated argillaceous rocks by means of multiscale full-field measurement techniques
- 1120 Dave Dewhurst* (CSIRO, AUSTRALIA), Claudio Delle Piane, Ben Clennell, Claudio Madonna, Erik Saenger
Impact of Saturation on Shale Strength and Stiffness
- 1140 Aminul Islam* (NTNU, NORWAY), Pål Skalle
Poisson's ratio values for Shale
- 1200 Olav-Magnar Nes* (SINTEF, NORWAY), Ole Kristian Søreide, Jørn Stenebråten
Experimental and numerical investigation of the effect of shale anisotropy on borehole stability
- 1220 Joel Sarout* (CSIRO Earth Science & Resource Engineering, AUSTRALIA), Lionel Esteban, Claudio Delle Piane, Bruce Maney, Dave Dewhurst
Elastic, mechanical, petrophysical and micro-structural anisotropy of shales under in situ conditions
- 1240 Claudio Delle Piane (CSIRO, AUSTRALIA), Bjarne S.G. Almqvist*, Mark Raven, David Dewhurst
Shale anisotropy: linking mineral fabric and elastic properties

1300 Lunch

1400 Session 8 cont'd: Shales & Clay

Chair: Audun Bakk, Yves Gueguen

- 1400 Mohsen Kalani* (Department of Geosciences, University of Oslo, NORWAY), Nazmul Haque Mondol, Jens Jahren, Jan Inge Faleide
Petrophysical properties of clay dominated stratigraphic units in the Egersund and Norwegian-Danish Basins
- 1420 Anders Samstad Gylland* (NTNU, NORWAY), Hans Petter Jostad, Steinar Nordal
Strain localization in the presence of excess pore water pressure under quasi static conditions
- 1440 Andreas Bauer* (Shell Global Solutions International, NETHERLANDS), Arjan van der Linden, Frans Korndorffer
Thermal Rock Physics of Shales: Laboratory Experiments under undrained conditions
- 1500 Anthony Siggins* (CSIRO Earth Science & Resource Eng., AUSTRALIA), Rune M Holt, David Dewhurst
The visco-elastic response of two shales at ultrasonic frequencies
- 1520 Rune M Holt* (NTNU & SINTEF, NORWAY), Morten I Kolstø, Erling Fjær
Physical Mechanisms controlling Effective Stresses for Wave Velocities in Clays and Shales

1540 Coffee Break

1600 Closing Session

1700 End of Conference

FRIDAY 21 OCTOBER

This day is set aside for visits to NTNU & SINTEF and to STATOIL's Research Centre. Delegates who wish to attend will need to sign up during the conference, no later than Wednesday at noon. Transport will be organized.

0900 Presentation of NTNU and SINTEF, including research activities within rock physics and geomechanics. Visit to the Formation Physics Laboratory at SINTEF Petroleum Research.

1145 Lunch at Statoil's Research Centre, followed by a presentation of Statoil and some ongoing activities.

ca 1430 End of the Day