



# 1<sup>st</sup> International Workshop on Rock Physics

August 7 - 12, 2011  
Colorado School of Mines  
Golden, Colorado USA

Author/Presenter Legend

Presenter: [John Smith](#)

Student Presenter: *John Smith*

## Program • Day 1 • Monday • August 8, 2011

8:30 - 8:40 Welcome and Introduction Ramona Graves and Manika Prasad

### Oral Session 1 • EXPERIMENTAL METHODS IN ROCK PHYSICS

Chairs: Manika Prasad and Mark Chapman

8:40 - 9:00 Comparison between static and dynamic behavior measured in Triaxial and Oedometric test systems *Bhuiyan, M. H., Holt, R.M., Larsen, I., and Stenebråten, J.F.*

9:00 - 9:20 Vs prediction in unconsolidated sands - Implications about shape, size, sorting and mineralogy of sand grains *Nazmul Haque Mondol, Per Avseth, Jens Jahren and Knut Bjørlykke*

9:20 - 9:40 Laboratory seismic monitoring of supercritical CO<sub>2</sub> flooding in sandstone cores using the Split Hopkinson Resonant Bar technique with concurrent x-ray CT imaging *Seiji Nakagawa, Timothy J. Kneafsey, Thomas M. Daley and Barry M. Freifeld*

9:40 - 10:00 Measurements of the reflectivity and transmissivity of anisotropic materials to test the effect of tilt and azimuth *Miryam Ortiz-Osornio, and Douglas R. Schmitt*

10:00 - 10:20 Session Discussion

10:20 - 10:40 Break

### Oral Session 2 • DIGITAL ROCK PHYSICS

Chairs: Boris Gurevich and Seiji Nakagawa

10:40 - 11:00 Digital Rock Physics: What physics do we need? *Mark Knackstedt*

11:00 - 11:20 Digital rock physics: Numerical vs. laboratory measurements *Claudio Madonna and Erik H. Saenger*

11:20 - 11:40 Numerical rock physics: size-dependent elastic moduli of homogeneous sandstones *Mehdi Alizadeh, Mahyar Madadi, Christoph H. Arns*

11:40 - 12:00 Digital Rock Physics Reveals Link between Reservoir Quality and Pore Type in Eagle Ford Shale *Steve Sinclair, Joel Walls, Elizabeth Diaz*

12:00 - 12:20 Session Discussion

12:20 - 1:20 Lunch in I-Club (Student Center lower level)

### Poster Session 1 • INTRODUCTION BY AUTHORS

Chairs: Ran Bachrach and Christoph Arns

- |             |   |   |
|-------------|---|---|
| 1:20 - 1:25 | Simultaneous ultrasonic measurements of wave velocities under conditions of CO <sub>2</sub> saturation      | Helen Yam, <u><a href="#">Gautier Njiekak</a></u> , Randy Kofman, Douglas R. Schmitt  |
| 1:25 - 1:30 | Methods for Seismic Velocity Estimation from Pulse Transmission Laboratory Experiments                      | Márcio Morschbacher, <u><a href="#">Guilherme Vasquez</a></u> , Júlio Justen  |
| 1:30 - 1:35 | Experimentally Determined Rock Physics Properties, MicroCT to Reservoir-Scale                               | <u><a href="#">Alan Mur</a></u> , Dustin Crandall, Chris Purcell <sup>1</sup> , Bob McClendon, Robert Warzinski, Yee Soong, William Harbert |
| 1:35 - 1:40 | Comparison of elastic moduli of sandstones obtained from microtomographic images and ultrasonic experiments | V. Shulakova, M. Pervukhina, M. Lebedev, T. Mueller, P. Golodoniuc, B. Clennell, <u><a href="#">Boris Gurevich</a></u>                      |
| 1:40 - 1:45 | Application of 3D imaging and analysis to tight gas reservoirs  | <u><a href="#">Mark Knackstedt</a></u> , Lutz Riepe   |
| 1:45 - 1:50 | Basalt, fluids and laboratory techniques  | <u><a href="#">Ludmila Adam</a></u> , Thomas Otheim, Kasper van Wijk, Michael Batzle, Travis L. McLing and Robert K. Podgorney              |

1:50 - 2:20 Poster Session 1 and Break

### Oral Session 3 • METHODS IN ROCK PHYSICS & THEIR APPLICATION

Chairs: Colin Sayers and Joel Sarout

- |             |  |   |
|-------------|--|---|
| 2:20 - 2:40 | Foundations of Rock Physics: 1. Tradition and epistemology   | <u><a href="#">William Murphy 3</a></u> , Bruce Ward, Beckett Boyd, Daniel Rosales, William Murphy 4, Matt Art, James Trotta, Salvatore Triano, Richard Nolen-Hoeksema and Kurt Schollmeyer |
| 2:40 - 3:00 | Philosophy in the Lab: Epistemological Perspectives on the Theory of Poroelasticity                | <u><a href="#">Luca Duranti</a></u>   |
| 3:00 - 3:20 | Challenges and results of measuring unjacketed compressibility for multi-mineralic rock composites | <u><a href="#">Ronny Hofmann</a></u>  |
| 3:20 - 3:40 | Qualitative and quantitative rock physics - Challenge to uncertainty                               | <u><a href="#">De-hua Han</a></u>   |

3:40 - 4:00 Break

### Oral Session 3 (Continued) • METHODS IN ROCK PHYSICS & THEIR APPLICATION

Chairs: Luca Duranti and Ludmila Adam

- |             |   |  |
|-------------|---|--|
| 4:00 - 4:20 | Construction of synthetic fractured rock to test fracture induced anisotropy models | <u><a href="#">Mark Chapman</a></u> , Phillip Tillotson, Angus Best, Jeremy Sothcott and Xiang-Yang Li |
|-------------|---|--|

4:20 - 4:40	Issues in estimating horizontal stress with anisotropic poroelastic models	<u><i>Keith Katahara</i></u>
4:40 - 5:00	Fit for Purpose Transfer of Rock Physics Knowledge & Technology to Asset Teams	<u><i>Alan J. Cohen</i></u>
5:00 - 5:20	An Integrated Approach: Transferring Rock Physics Knowledge & Technology to Asset Teams at Marathon Oil Company	<u><i>Shihong Chi</i></u> , Mark Quakenbush, Jadranka Milovac, Randall Cooper and Jeff Hamman
5:20 - 6:00	Session and End-Of-Day Discussion	

**Program • Day 2 • Tuesday • August 9, 2011**

**Oral Session 4 • ATTENUATION AND DISPERSION**

Chairs: Ronny Hofmann and Tiziana Vanorio

8:30 - 8:50	Squirt-flow attenuation and dispersion in fluid-saturated rocks: estimates and bounds	<u><i>Boris Gurevich</i></u> , Dina Makarynska, Osni Bastos de Paula and Marina Pervukhina
8:50 - 9:10	Low frequency measurements of seismic wave attenuation	<i>Claudio Madonna</i> , Nicola Tisato, Brad Artman and Erik H. Saenger
9:10 - 9:30	Attenuation and physical properties of shales from the Canning Basin, Western Australia	<u><i>Claudio Delle Piane</i></u> , Claudio Madonna, Dave Dewhurst, Erik H. Saenger, Mark Raven
9:30 - 9:50	CHOPS Processes in the Ugnu Formation: Material Behavior of Grains and Fluids	<u><i>Michael Batzle</i></u> , Matt Liberatore, Manika Prasad, De-hua Han, William Murphy 3, Bruce Ward, Daniel Rosales, Richard Nolen-Hoeksema, Beckett Boyd, Matt Art, James Trotta, and William Murphy 4
9:50 - 10:10	Break	

**Oral Session 4 (Continued) • ATTENUATION AND DISPERSION**

Chairs: Boris Gurevich and Mike Batzle

10:10 - 10:30	Frequency and pore fluid effects on elastic properties: New laboratory measurements on Icelandic basalt and Fontainebleau sandstone	<u><i>Jérôme Fortin</i></u> , Emmanuel David, Mathilde Adelinet, Alexandre Schubnel and Yves Guéguen
10:30 - 10:50	The effect of methane gas hydrate morphology on seismic attenuation - a laboratory resonant column study	<u><i>Angus I. Best</i></u> , Jeffrey A. Priest, Emily V. L. Rees & Christopher R. I. Clayton
10:50 - 11:10	Frequency-dependent amplitude-versus-offset analysis	<u><i>Mark Chapman</i></u>
11:10 - 11:30	A frequency-dependent fractured poroelastic effective medium modeling	<u><i>Ranjana Ghosh</i></u> and Mrinal K. Sen

11:30 12:00 Session Discussion

12:00 - 1:00 Lunch in I-Club (Student Center lower level)

**Poster Session 2 • INTRODUCTION BY AUTHORS**

Chairs: Alan Cohen and Alex Martinez

- 1:00 - 1:05 Rock Physics Evaluation of the South Georgia Rift Basin Triassic Rocks for Supercritical CO<sub>2</sub> Storage *Olusoga Martins Akintunde, Camelia Knapp and James Knapp*
- 1:05 - 1:10 Effect of fluid-solid friction on the stiffness of chalk *M. Monzurul Alam, Hosea Nguh Akam and Ida Lykke Fabricius*
- 1:10 - 1:15 Simple yet effective method of Vs prediction *Futoshi Tsuneyama*
- 1:15 - 1:20 Impact of Fabric Heterogeneity on Time-Lapse Flow and Elastic Properties in Carbonates *Ravi Sharma, Manika Prasad, Mike Batzle, Sandra Vega*
- 1:20 - 1:25 An experimental study of low-frequency wave dispersion and attenuation in water saturated sandstone *V. Mikhaltsevitch, M. Lebedev and Boris Gurevich*
- 1:25 - 1:30 Measurements and mechanisms investigation of seismic wave attenuation at low frequencies *Nicola Tisato, Claudio Madonna, Brad Artman and Erik H. Saenger*
- 1:30 - 1:35 Biot's and squirt flow mechanism of greensand as interpreted using NMR data *Zakir Hossain, Tapan Mukerj and Ida L. Fabricius*
- 1:35 - 2:05 Poster Session 2 and Break

**Oral Session 5 • ROCK PHYSICS DYNAMIC PROCESSES:  
4D Seismic, Fast Diagenesis, & Fluid Production Effects**

Chairs: Mauricio Florez and Angus Best

- 2:05 - 2:25 4D Rock Physics Modeling for Seismic Constrained Reservoir Description *Julia Khadeeva and Shihong Chi*
- 2:25 - 2:45 4-D rock physics modeling of stress and fluid changes on time shifts and time shift derivatives using well log data *Per Avseth and Norunn Skjei*
- 2:45 - 3:05 Depth dependent rock physics trends for Triassic reservoirs in the Norwegian Barents Sea *Sabine Klärner et al.*
- 3:05 - 3:25 Geophysical Monitoring of Multiple Phase Saturation of Rocks: Applications to CO<sub>2</sub> Sequestration *Stephen Brown*
- 3:25 - 3:45 Break

**Oral Session 5 (Continued) • ROCK PHYSICS DYNAMIC PROCESSES:  
4D Seismic, Fast Diagenesis, & Fluid Production Effects**

Chairs: Per Avseth and Jérôme Fortin

- 3:45 - 4:05 Rock Physics Analysis and Time-Lapse Rock Imaging of Geochemical Effects Due to the Injection of CO<sub>2</sub> into Reservoir Rocks *Tiziana Vanorio, Amos Nur, Yael Ebert*
- 4:05 - 4:25 Velocity Evolution during Controlled CaCO<sub>3</sub> *Ralf J. Weger, Klaas Verwer,*

	Precipitation and Dissolution	Peter Swart and Gregor P. Eberli
4:25 - 4:45	What Induced Dissolution Trends Tell us About Natural Diagenetic Trends of Carbonate Rocks	<u>Tiziana Vanorio</u> , Yael Ebert, and Denys Grombacher
4:45 - 5:25	Session and End-Of-Day Discussion	

### Program • Day 3 • Wednesday • August 10, 2011

#### Oral Session 6 (part A) • SHALES AND ANISOTROPY

Chairs: Ran Bachrach and Arthur Cheng

8:30 - 8:50	Organic maturity, hydrous pyrolysis, and elastic property in shales	<u>Saeed Zargari</u> , Manika Prasad, Kenechukwu Mba and Earl D. Mattson
8:50 - 9:10	Anisotropic static and dynamic moduli from a pair of shale plugs cut parallel and perpendicular to bedding	<u>Douglas Miller</u> and Richard Plumb
9:10 - 9:30	Textural change in mudrocks and shales through chemical compaction	Louise Duffy, Andrew Aplin, <u>Frans Kets</u> , Frans Korndorffer
9:30 - 9:50	Laboratory characterization of stress path dependent wave velocities in clay and shale	<u>Rune M Holt</u> , Audun Bakk, Jørn F Stenebråten, Erling Fjær, Mohammad H Bhuiyan, and Morten Kolstø
9:50 - 10:10	Break	

#### Oral Session 6 (part A - Continued) • SHALES AND ANISOTROPY

Chairs: Keith Katahara and Dan Ebrom

10:10 - 10:30	Stress-induced anisotropy in soft sediments	<u>Colin Sayers</u> and Ranajit Ghose
10:30 - 10:50	Stress induced velocity anisotropy in unconsolidated sands	<u>Lars Grande</u> , N.H. Mondol, T. Berre, M. Soldal , C. Madshus
10:50 - 11:10	Type III Kerogen and Exotic Elastic Anisotropy in the Douala Basin, West Africa	<u>Niven Shumaker</u>
11:10 - 11:30	Tight shale elastic properties using the soft-porosity model and single aspect ratio models	Franklin Ruiz, Ilgar Azizov, and <u>Michelle Ellis</u>
11:30 - 12:00	Session Discussion	
12:00 - 1:00	Lunch in I-Club (Student Center lower level)	

#### Poster Session 3 • INTRODUCTION BY AUTHORS

Chairs: Luca Duranti and Douglas Miller

1:00 - 1:05	Experimental measurements of seismic anisotropy in rocks	<u>Jaime Meléndez Martínez</u> and Doug Schmitt
1:05 - 1:10	Preferred Orientation of Phyllosilicates and Porosity Analysis in Posidonia Shales	<u>Waruntorn Kanitpanyacharoen</u> , Frans B. Kets, Hans-Rudolf Wenk

1:10 - 1:15	Variation of elastic moduli of clays with humidity	<i>Utpalendu Kuila</i> and Manika Prasad
1:15 - 1:20	Knowledge Transfer Between Disciplines: Experience of the EAGE Shale workshops	<u><i>Frans Kets</i></u> , Andrew C. Aplin
1:20 - 1:25	Creating a software culture beyond the experts	<u><i>Evan Bianco</i></u>
1:25 - 1:55	Poster Session 3 and Break	

**Oral Session 6 (part B) • SHALES AND ANISOTROPY**

Chairs: Mark Knackstedt and William Murphy

1:55 - 2:15	A seismic view of anisotropic rock physics modeling of shales	<u><i>Ran Bachrach</i></u>
2:15 - 2:35	Anisotropic Parameters from Borehole Measurements: How to do it and How Accurate are they?	<u><i>Arthur Cheng</i></u>
2:35 - 2:55	The Correspondence Rule for Sonic Logging in Deviated Wells	<u><i>Douglas E. Miller</i></u> , Steve A. Horne, and John Walsh
2:55 - 3:15	Use of sonic and seismic anisotropy to characterize resource shales	<u><i>Colin Sayers</i></u>
3:15 - 3:35	Break	

**Oral Session 6 (part B - Continued) • SHALES AND ANISOTROPY**

Chairs: Mauricio Florez and Folke Engelmark

3:35 - 3:55	Fracture characterization in gas shales illustrated using inversion of synthetic AVOA data	<i>Mehdi Eftekharifar</i> and Colin M. Sayers
3:55 - 4:15	Anisotropic permeability in fractured reservoirs from frequency-dependent seismic AVAZ data	Aamir Ali and <u><i>Morten Jakobsen</i></u>
4:15 - 4:35	Rock rippability and dredging productivity from reflection seismology	<u><i>William Murphy 3</i></u> , Bruce Ward, Beckett Boyd, Daniel Rosales, William Murphy 4, Matt Art, James Trotta, Salvatore Triano, Richard Nolen-Hoeksema, and Kurt Schollmeyer
4:35 - 5:15	Session and End-Of-Day Discussion	

**Program • Day 4 • Thursday • August 11, 2011**

**Oral Session 7 • SCALE DEPENDENT PHENOMENA IN ROCK PHYSICS:  
FROM PORE STRUCTURE TO GEOMECHANICS**

Chairs: Per Avseth and De-Hua Han

8:30 - 8:50	Petrophysical Study of Tight Gas Sand Formations	<i>Patricia Castillo</i> and Manika Prasad
8:50 - 9:10	Effects of pore space topology and connectivity on	<u><i>Joel Sarout</i></u>

	the validity of wave propagation theories for a heterogeneous rock model	
9:10 - 9:30	Geomechanical modeling at different scales for evaluation of formation alteration as observed from Dipole Shear Radial Profiling	<u>Lars Grande</u> , K. Huynh, H.P. Jostad, C. Madshus, Ø. Johnsen, N.H. Mondol
9:30 - 9:50	Mechanical compaction in heterogeneous clastic formations from plastic-poroelastic deformation principles	<u>Ran Bachrach</u>
9:50 - 10:10	Break	

**Oral Session 7 (Continued) • SCALE DEPENDENT PHENOMENA IN ROCK PHYSICS:  
FROM PORE STRUCTURE TO GEOMECHANICS**

Chairs: Manika Prasad and Jim Berryman

10:10 - 10:30	Deep water rock physics and sub-salt pore pressure prediction	<u>Colin M. Sayers</u> and Lennert D. den Boer
10:30 - 10:50	Importance of a geologically robust framework in applying rock physics models for quantitative interpretation of seismic data	<u>Ezequiel F. Gonzalez</u> , Ronny Hofmann and Stephane Gesbert
10:50 - 11:10	Inclusion based rock physics models as part of the seismic reservoir characterisation workflow	<u>Mark Sams</u> and Robert Hu
11:10 - 11:30	Predicting Rock Properties Away from Well Control with Coupled Diagenesis and Rock Physics Models	<u>Rob Lander</u> , Anders Dræge and Linda Bonnell
11:30 - 12:00	Session Discussion	
12:00 - 1:00	Lunch in I-Club (Student Center lower level)	

**Poster Session 4 • INTRODUCTION BY AUTHORS**

Chairs: Ronny Hofmann and Mark Sams

1:00 - 1:05	Tracing causes for the stress sensitivity of elastic wave velocities	<u>Anna Stroisz</u> and E. Fjær
1:05 - 1:10	Seismo-acoustic model for unconsolidated sediment used in neural-network inversion scheme	<u>Klaus C. Leurer</u> and Colin Brown
1:10 - 1:15	Microstructure-based modelling of the thermal conductivity of natural and synthetic aggregates	Lucas Pimienta, <u>Joel Sarout</u> , Lionel Esteban and Ludovic Ricard
1:15 - 1:20	An Efficient Laminated Sand Fluid Substitution Algorithm	<u>Rone Shu</u> , Rob Keirstead and Scott Singleton
1:20 - 1:25	Effect of pore geometry on Gassmann fluid substitution	<u>Fuyong Yan</u> , De-hua Han
1:25 - 1:30	Frame Flexibility Factor as a link between Sonic Velocities and Pore Type	<u>Ralf Weger</u> , Gregor Baechle, Yue-Feng Sun, Jose Luis Massaferrero and Gregor Eberli
1:30 - 1:35	Rock physics interpretation of heterogeneous and anisotropic turbidite reservoirs	<u>Pavel Golikov</u> , Per Avseth, Alexey Stovas and Ran Bachrach

1:35 - 2:05 Poster Session 4 and Break

**Oral Session 8 • ELECTRICAL PROPERTIES AND METHODS**

Chairs: Alan Cohen and Mark Kittridge

- 2:05 - 2:25 Determining the 3D electrical resistivity tensor of porous rock samples at elevated pressures Laurence North, Angus I. Best, and Jeremy Sothcott
- 2:25 - 2:45 An Electrical Rock Physics Model for Partially Interconnected Fluid Inclusions/Cracks Michelle Ellis
- 2:45 - 3:05 Background resistivity model building based on seismic velocities Folke Engelmark
- 3:05 - 3:25 Inductive Conductivity Tensor Measurement for Whole Rock Cores Dean M. Homan, John L. Kickhofel, and John Rasmus
- 3:25 - 3:45 Modeling Electrical Conductivity for Earth Media with Fluid-Filled Fractures James G. Berryman and G. Michael Hoversten

**CLOSING**

Chairs: Colin Sayers and Nazmul Mondol

3:45 - 4:45 Session and End-Of-Workshop Discussion

4:45 - 5:15 2IWRP Discussion

**Activities in Other Venues**

**Sunday • August 7, 2011**

5:00 - 8:00 Reception The Golden Hotel (Creekside Patio)

**Monday • August 8, 2011**

5:00 - 7:00 Reception Ben Parker Student Center, CSM Campus

**Wednesday • August 10, 2011**

6:00 - 9:00 Barbeque (Cook-out) Lion's Park, Golden, CO

**Friday • August 12, 2011**

9:00 - 4:00 Field Trip: Niobrara Shale Quarry



## Organizing Committee

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