

# SEG/AGU WORKSHOP

HILLO  HAWAII  
11-13 JULY 2016



## Upper Crust Physics of Rocks

Geophysicists are skilled at deducing static earth structure from observations of seismic, electromagnetic, and gravitational fields. A fuller appreciation of earth dynamics cannot, however, be realized without a rigorous understanding of the physical properties of earth materials under in situ conditions. Rock Physics investigations provide this key link between rock physical properties and geophysical, deformation and transport signatures. Over the last half-century, Rock Physicists have made considerable progress addressing problems in exploration geophysics, volcanology, crustal seismology, earthquake faulting and petrophysics. Somewhat regrettably, however, much of this work is carried out independently within these increasingly specialized communities; and our experiences are not as widely shared as they should be.

The format of the workshop is intended to foster lively and open debate. Invited speakers will kick-off each session to be followed by set periods for discussion and modified speed-geeking format poster presentations.

### MONDAY, 11 JULY

7:30 AM–8:00 AM ..... Badge Pick-up Opens

#### Welcome and Introduction Moku'ola II Room

#### 1) Rock Physics in Tectonics Chairs: Wang/ Lockner

- 8:15 AM–8:30 AM ..... Welcome
- 8:30 AM–9:00 AM ..... Teng-fong Wong (invited) \*
- 9:00 AM–9:30 AM ..... Weiren Lin (invited) \*
- 9:30 AM–9:50 AM ..... Harold Tobin (oral) \*
- 9:50 AM–10:10 AM ..... Coffee
- 10:10 AM–11:00 AM ..... Speed geeking
- 11:00 AM–12:00 PM ..... Tectonic Posters, Moku'ola I Room
- 12:00 PM–1:30 PM ..... LUNCH

#### 2) Theory and modelling

Chairs: Sahay / Bernabe

- 1:30 PM–2:00 PM ..... Yves Gueguen (invited) \*
- 2:00 PM–2:20 PM ..... Boris Gurevich (oral) \*
- 2:30 PM–2:40 PM ..... Gary Mavko (oral) \*
- 2:40 PM–3:00 PM ..... Coffee
- 3:00 PM–3:20 PM ..... Amos Nur (invited) \*
- 3:20 PM–4:00 PM ..... Speed geeking
- 4:00 PM–5:00 PM ..... Theory and modelling Posters,  
Moku'ola I Room
- 5:00 PM–7:00 PM ..... ICEBREAKER, Mala Ikena Room

### TUESDAY, 12 JULY

#### 3) Fractures and transport processes

Chairs: Prasad/Fortin

- 8:30 AM–9:00 AM ..... Erik Saenger (invited) \*
- 9:00 AM–9:30 AM ..... Laura Pyrak-Nolte (invited) \*

\* More info in glossary.  
Schedule is tentative and subject to change.

9:30 AM–10:00 AM ..... Yves Bernabe (invited) \*  
 10:00 AM–10:20 AM ..... Coffee  
 10:20 AM–11:00 AM ..... Speed geeking  
 11:00 AM–12:00 PM..... Fractures and transport Posters,  
 Moku’ola I Room

12:00 PM–1:30 PM..... LUNCH

**4) Experimental developments**

**Chairs: Schmitt/Pyrak–Nolte**

1:30 PM–2:00 PM..... Genyang Tang (invited)\*  
 2:00 PM–2:30 PM..... Ian Jackson (invited)\*  
 2:30 PM–3:00 PM ..... Angus Best (invited)\*  
 3:00 PM–3:20 PM..... Coffee  
 3:20 PM–4:00 PM..... Speed geeking  
 4:00 PM–5:00 PM..... Experimental developments  
 Posters, Moku’ola I Room  
 5:00 PM–5:30 PM..... Breakout sessions in round  
 tables by session topics

**WEDNESDAY, 13 JULY**

**5) Evolving rock systems**

**Chair: Adam/ Saenger**

8:30 AM–9:00 AM..... Qing Wang (invited)\*  
 9:00 AM–9:30 AM..... Tiziana Vanorio (invited)\*  
 9:30 AM–9:50 AM..... David Lumley (oral)\*  
 9:50 AM–10:10 AM..... Coffee  
 10:10 AM–10:30 AM..... Michael Ryan (oral)\*  
 10:30 AM–11:00 AM..... Speed geeking  
 11:00 AM–12:00 PM..... Evolving rock systems Posters,  
 Moku’ola I Room

12:00 PM–1:30 PM..... LUNCH

**6) Rock microstructure**

**Chair: Gurevich/Vanorio**

1:30 PM–2:00 PM..... Manika Prasad (invited)\*  
 2:00 PM–2:30 PM..... Takeshi Tsuji (invited)\*  
 2:30 PM–2:50 PM..... David Lockner (oral)\*  
 2:50 PM–3:10 PM..... Coffee  
 3:10 PM–4:00 PM..... Speed geeking  
 4:00 PM–5:00 PM..... Rock microstructure Posters,  
 Moku’ola I Room  
 5:00 PM–5:45 PM..... Session chairs present  
 summaries of round table  
 discussions

**INVITED PRESENTERS**

Teng-Fong Wong..... Development of strain localization  
 and permeability: Insights from CT  
 imaging of porous rock  
 Weiren Lin ..... Our Approaches to Understand  
 Why the Shallow Part of the  
 Tohoku-oki Earthquak Fault  
 Coseismically Slipped More than  
 50m  
 Yves Guegen ..... Anisotropy and Dispersion of  
 Elastic Waves in Saturated Porous-  
 Cracked Rocks  
 Yves Bernabe..... Pore Geometry and Permeability  
 of Densifying Granular Media:  
 Applications to Permeability  
 Modeling  
 Takeshi Tsuji..... Digitization of Natural Rocks for  
 Estimation of Thei Hydrologic and  
 Elastic Properties  
 Laura Pyrak-Nolte ..... Characterizing Fractures in Rock  
 Genyang Tang ..... A new Low-frequency Apparatus  
 for Bulk Modulus Measurement- the  
 Differential Acoustical Resonance  
 Spectroscopy  
 Ian Jackson ..... Forced-oscillation Techniques with  
 Application to the Viscoelastic and  
 Poroelastic Behaviour of Rocks  
 Angus Best..... Laboratory Studies for Improved  
 Seafloor Methane Hydrate  
 Quantification Using Seismic and  
 Electrical Geophysical Methods  
 Qin Wang ..... Fabrics and seismic anisotropy  
 of crustal rocks: A link between  
 geophysics and tectonics  
 Tiziana Vanorio ..... From Large Rock Strain in Volcanic  
 Regions to High-performance  
 Concrete  
 Manika Prasad..... Microstructure and Elasticity from  
 Sediments to Volcanic Rocks  
 Erik Saenger ..... Applied Computational Rock  
 Physics: Briding the Scales  
 Amos Nur ..... The Problem of Distributed Faulting

# ORAL PRESENTERS

Harold Tobin .....	Seismic Velocity Architecture of Active Large Displacement Faults in the Upper Crust: A Synthesis of Sample, Log, and Field Seismic Observations
Boris Gurevich .....	Verification of the Laboratory Measurements at Seismic Frequencies Using the Kramers-Kronig Relationship
Gary Mavko .....	Rock Physics Models for Creep and Brittleness in heterogeneous Rocks
David Lumley .....	Seismic Data Results that Inspire New Developments in Rock Physics Theory and Experimentation
Michael Ryan .....	Rock-, mineral- and melt-physics and magma Neutral Buoyancy in Hawaii
David Lockner .....	Determination of Source Parameters in Triaxial Stick-slip Experiments at High Pressure

Maria Tibbo .....	Experimental Measurement of In Situ Stress
Pratap Sahay .....	Physics of Wave Propagation in Porous Media
Juerg Hunziker .....	Numerical Modeling of Seismic Velocity Dispersion and Attenuation in 3D Fractured Media
Bernd Milkereit .....	A Rock Physics Framework for High Density Crustal Rocks
Samuel Chapman .....	The Frequency Scaling of Seismic Attenuation Measured in a Two Phase Saturated Rock
Weitao Sun .....	Dynamic Response of a Vibrating Tube Saturated by a non-Newtonian Fluid with the Fractional Maxwell Model
Nana Yoshimitsu .....	Wavefield in a Fault-included Cylindrical Sample by a 3D finite Difference Method Simulation
Zhizhen Wang .....	Modeling of elastic and viscoelastic properties of carbonate rocks at high and low frequencies
Meng Chen .....	Effective Pressure Law for Formation Factor of Low Permeability Sandstones
Sergey Turuntaev .....	Rock Fracturing by Fluid Pressure Drop
Tariq Mohammed .....	Electrical Properties of Seimentary Rocks with Applications to Carbon Capture and Storage
Doug Schmitt .....	The Effects of Phase Transformations of CO <sub>2</sub> on Ultrasonic Wave Propagation in Rocks
Ryan Hurley .....	Modeling Wave Propagation in Jointed Rock Masses at Various Spatial Resolutions
Camelia Knapp .....	South Georgia Rift-Implications of Rock Physics for Tectonics
Meredith Townsend .....	Estimating transport properties from image analysis of hydrothermally altered Mancos Shale; implications for alteration, pressurization, and fracturing around volcanic dikes
Boris Gurevich .....	Effects of fractures and background porosity on seismic dispersion: theory versus numerical simulations
Ludmila Adam .....	Non-contact Laser Ultrasonic Measurements for High Density

# POSTER PRESENTERS

Ladislav Brimich .....	Theoretical Models of the Surface Displacements, Deformations and Gravity Changes Due to Underground Heat Source
Kukuh Suprayogi .....	New Approach for Identifying Hydrocarbon Accumulation Based on Heat Propagation Analysis at PTM Field, Northwest Java Basin, Indonesia
Vladimir Bezak .....	Physical Properties of the Western Carpathian Upper Crust-Their Inscription in Development of Tectonic Structure
James Knapp .....	SOSRA: Southeast Offshore Storage Resource Assessment-North Carolina to Florida
Ryan Ferguson .....	Velocity Models of Permafrosted Crustal Rocks: Laboratory Comparison and Implications for High Arctic Seismic Surveys
Wei-Fang Sun .....	Detecting High Frequency Earthquakes at the Tatun Volcano Group in Taiwan with Dense Seismic Arrays

	Elastic Anisotropy Measurements, from Schists to Mudstones	Kevin Miller .....	Evolution of Porosity-permeability Trends Due to Experiments-driven simulation of Calcite Dissolution in Tight Carbonate Rocks
Jerome Fortin .....	Dispersion and Attenuation in Saturated Sandstones and Limestones		
Arif Rabbani.....	Ultrasonic Measurement of Bitumen Wave Speed, Density, and Shear Viscosity	James Clarke .....	Investigating the Effect of Alteration on the Physical Properties of Volcanic Rocks at White Island
Sandra Vega.....	Effect of strata and fracture orientation in elastic moduli anisotropy	Krongrath Suwannasri.....	The Effect of Confining Pressure on the Velocity and Microstructure of Organic-rich Shale During the Thermal Maturation
Reza Malehmir.....	Ultrasonic Modeling of P-wave Reflection from Orthorhombic Media	Jianguo Zhao .....	Ultrasonic Measurement of Dense Carbonates: An Analysis of Elastic Properties Dependent on Pore Structure
Peter Vajda .....	On Gravimetric Tracking of Magmatic Fluids (of volcanic unrest) in the Upper Crust		
Stan Mordensky.....	Joint Mapping, Permeability and rock Strength Surrounding Shallow Intrusions, Mt. Ruapehu	Manzur Hossain .....	Image-based Computation of Effective Elastic Properties of Porous Rock Incorporating the Effect of Surface Energy Change and Validation with Triaxial Compression Tests
Ludmila Adam .....	Monitoring the Effect of Rock-fluid Interactions on Rock Physical Properties in the Presence of Carbonic Acid	Vadim Lisitsa.....	Statistical Simulation of Core Samples-Accuracy Geometrical and Transport Property Prediction
Xiaoqiu Yang.....	Experimental Study on Temperature Response of Crustal Rock to Stress Change	Kuang Yan .....	A New Model for Estimating the Saturation Exponent of Tight Sandy Conglomerate Reservoir Based on NMR Analysis
Hao Lei.....	Pore Structure of Low Permeability Sandstone: The Relationship Between Capillary Pressure and Rock Electrification		

## Thank you to our committee

### Organizing Committee

SEG co-Chair: Ludmila Adam, University of Auckland  
AGU co-Chair: Douglas Schmitt, University of Alberta

### Committee Members

Tobias Mueller, CSIRO  
Michael Heap, University of Strasbourg  
Boris Gurevich, Curtin University  
Jerome Fortin, ENS  
Manika Prasad, Colorado School of Mines  
Luca Duranti, Chevron

Arthur Cheng, Singapore National University  
Colin Sayers, Schlumberger  
Erik Saenger, International Geothermal Centre / Ruhr-Universität Bochum  
Brett Carpenter, Istituto Nazionale di Geofisica e Vulcanologia  
Carolyn Boulton, University of Liverpool  
Ben Kennedy, University of Canterbury  
Flora Sun, China University of Petroleum

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