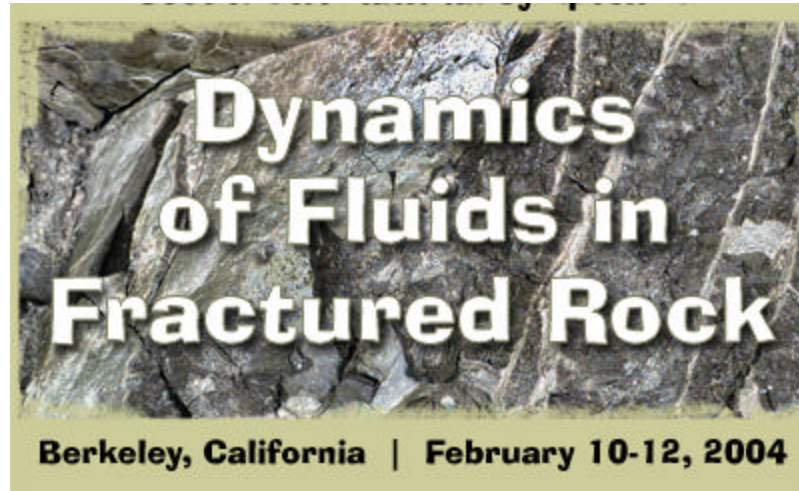


Second International Symposium



Organized by Earth Sciences Division of Lawrence Berkeley National Laboratory

TUESDAY, 10 FEBRUARY 2004

Location: Lawrence Berkeley National Laboratory Building 50 - Auditorium

1. Welcoming Remarks and Keynote Presentation

8:30 AM Welcoming Remarks
Sally Benson, Lawrence Berkeley National Laboratory, USA

8:45 AM 1.1 Development of Underground Research Laboratories for Radioactive Waste Isolation
P.A. Witherspoon, Lawrence Berkeley National Laboratory, USA

2. Field and Laboratory Experiments

Presiding—John E. Gale, Memorial University of Newfoundland, Canada

9:10 AM 2.1 Active Flow Path Evaluation in the Unsaturated Zone at Yucca Mountain
J. Wang (Invited speaker), Lawrence Berkeley National Laboratory, USA

9:30 AM 2.2 Grimsel Test Site: 20 years of research in fractured crystalline rocks - Experience gained and future needs
S. Vomvoris (Invited speaker), W. Kickmaier, I.G. McKinley, Nagra, Switzerland

9:50 AM 2.3 A fractured-chalk field laboratory for flow and transport studies on the 10- to 100-m scale
D. Kurtzman, the Hebrew University of Jerusalem, Israel, R. Nativ, Hebrew University of Jerusalem, Israel, E. Adar, Ben Gurion University of the Negev, Israel

10:10 AM Break

Presiding–Rien van Genuchten, U.S. Salinity Laboratory, Riverside, CA

10:30 AM 2.4 Using fracture pore space geometry to assess degassing and scaling relationships in fractured rocks
J.E. Gale (Invited speaker), E.J. Seok, Memorial University of Newfoundland, Canada

10:50 AM 2.5 Flow across an unsaturated fracture intersection
M.I. Dragila, Oregon State University, USA, N. Weisbrod, Ben-Gurion University of the Negev, Israel

11:10 AM 2.6 Effects of pore volume variability on transport phenomena
I. Lunati¹, W. Kinzelbach¹, I. Soerensen², ¹ETH Zurich, Switzerland, ²Technical University of Denmark, Denmark

11:30 AM 2.7 Linear flow injection technique for the determination of permeability and specific storage of a rock specimen: flow control versus pressure control
I. Song¹, J. Renner¹, S. Elphick², I. Main², ¹ Ruhr-University Bochum, Germany, ² University of Edinburgh, United Kingdom

11:50 AM 2.8 Imaging permeability structure in fractured rocks: inverse theory and experiment
T. Yamamoto, RSMAS, University of Miami, USA, J. Sakakibara, JFE Civil Corporation, Japan, T. Katayama, Kanden Kogyo, Inc, Japan

12:10 PM Lunch Break

3. Geochemistry, Coupled and Microbial Processes, and Geothermal Resources

Presiding–University of California, Berkeley, CA

1:10 PM 3.1 Progress toward understanding coupled thermal, hydrological, and chemical processes in unsaturated fractured rock at Yucca Mountain
E. Sonnenthal (Invited speaker), N. Spycher, Lawrence Berkeley National Laboratory, USA

1:30 PM 3.2 Plumbing the depths: dynamics of magma migration in deformable porous media
M. Spiegelman (Invited speaker), Columbia University - The Lamont-Doherty Earth Observatory, USA

1:50 PM 3.3 The Potential for Widespread Groundwater Contamination by the Gasoline Lead Scavengers Ethylene Dibromide and 1,2-Dichloroethane
R. Falta Jr., Clemson University, USA

2:10 PM 3.4 Diffusion between a fracture and the surrounding matrix: the difference between vertical and horizontal fractures
A. Polak, Technion-Israel Institute of Technology, Israel, A.S. Grader, Pennsylvania State University, USA, R. Wallach, Hebrew University of Jerusalem, Israel, R. Nativ, Hebrew University of Jerusalem, Israel

2:30 PM 3.5 Numerical Simulations of Fluid Leakage from a Geologic Disposal Reservoir for CO₂
K. Pruess, Lawrence Berkeley National Laboratory, USA

2:50 PM Break

Presiding—Eilion Adar, Ben-Gurion University, Israel, and Terry Hazen, LBNL, CA.

3:10 PM 3.6 Development of an Interfacial Tracer Test for DNAPL Entrapped in Discrete Fractured Rock

B. Sekerak, S. Dickson, McMaster University, Canada

3:30 PM 3.7 Competition among flow, dissolution and precipitation in fractured carbonate rocks

O. Singurindy, B. Berkowitz, Weizmann Institute of Science, Israel

3:50 PM 3.8 Dry-steam wellhead discharges from liquid-dominated geothermal reservoirs: a result of coupled nonequilibrium multiphase fluid and heat flow through fractured rock

J.W. Pritchett (Invited speaker), Science Applications International Corporation, USA

4:10 PM 3.9 Fluid flow patterns calculated from patterns of subsurface temperature and hydrogeologic modeling -example of the Yuzawa-Ogachi geothermal area, Akita, Japan-

S. Tamanyu, Geological Survey of Japan, AIST, Japan

4:30 PM 3.10 Microbial Processes in Fractured Rock Environments

N.E. Kinner (Invited speaker), T.T. Eighmy, Bedrock Bioremediation Center, USA

4:50 PM 3.11 The impact of microbial activity on fractured chalk transmissivity

S. Arnon¹, E. Adar¹, Z. Ronen¹, A. Yakirevich¹, R. Nativ², ¹ Ben-Gurion University, Israel, ² Hebrew University of Jerusalem, Israel

TUESDAY, 10 FEBRUARY 2004 5:00 PM - 8:00 PM

Location: Lawrence Berkeley National Laboratory Building 54 - Cafeteria

4. Field and Laboratory Experiments (Poster Session)

4.1 Characterizing Fractures in Saturated Chalk Formations by Multi-Tracer Field Experiments

A. Bernstein, E. Adar, Ben-Gurion University, Israel

4.2 RIMAPS and Variogram Characterization of Water Flow Paths on a Fracture Surface

N.O. Fuentes, Comisión Nacional de Energía Atómica, Argentina; B. Faybishenko, Lawrence Berkeley National Laboratory, USA

4.3 Evolution of fracture permeability

K.A. Ebel, S.R. Brown, New England Research, Inc, USA

4.4 Synchrotron-based micro-tomography of geologic samples for modeling fluid transport in real pore space

F. Enzmann¹, M. Kersten¹, M. Stapanoni², ¹ University of Mainz, Germany, ² SLS-PSI, Switzerland

4.5 Seismic Detection of Fault and Fracture Systems

R. Gritto, E.L. Majer, Lawrence Berkeley National Lab, USA

4.6 Fracture Analysis of a VMS-Related Hydrothermal Cracking Horizon, Upper Bell River Complex, Matagami, Quebec: Application of Permeability Tensor Theory

- S.E. Ioannou, E.T.C. Spooner, University of Toronto, Canada
- 4.7 Measuring and analyzing transient changes in fracture aperture during hydraulic well tests: Preliminary results
L. Murdoch III¹, T. Schweisinger¹, E. Svenson¹, L. Germanovich², ¹ Clemson University, USA, ² Georgia Tech, USA
- 4.8 Laboratory and Numerical Evaluation of Borehole Methods for Subsurface Horizontal Flow Characterization
W.H. Pedler, RAS, Integrated Subsurface Evaluation, USA, R. Jepsen, Sandia National Laboratory, W. Mandell, US Army Environmental Center
- 4.9 Preferential Flow in Welded and Non-Welded Tuffs: Observations from field experiments
R. Salve, Lawrence Berkeley National Laboratory, USA
- 4.10 Modelling of Chemical Mixing at Fracture Intersections
N. Singhal, D. Gunasekera, University of Auckland, New Zealand
- 4.11 Determination of Moisture Diffusivity for Unsaturated Fractured Rock Surfaces
R. Trautz, S. Flexer, Lawrence Berkeley National Laboratory, USA
- 4.12 Numerical and Experimental Simulation of Dissolution and Precipitation: Implications for Fracture Sealing at Yucca Mountain, Nevada
T.J. Kneafsey, P.F. Dobson, E.L. Sonnenthal, N. Spycher, J.A. Apps, Lawrence Berkeley National Laboratory, USA

5. Geochemistry, Coupled and Microbial Processes, and Geothermal Resources (Poster Session)

- 5.1 Pulse Testing Analysis for Fractured Geothermal Reservoir - A Case Study at the Uenotai Geothermal Field
S. Nakao, T. Ishido, Y. Takahashi, Japan
- 5.2 Contaminant Discharge from Fractured Clays Contaminated with DNAPL
R. Falta Jr., Clemson University, USA
- 5.3 Biodegradation of 2,4,6-tribromophenol during transport: Results from a column experiments in fractured chalk
S. Arnon¹, Z. Ronen¹, E. Adar¹, A. Yakirevich¹, R. Nativ², ¹ Ben-Gurion University, Israel, ² Hebrew University of Jerusalem, Israel
- 5.4 Abiotic and biotically mediated rock mineral oxidation
M. Sidborn, Royal Institute of Technology, Sweden, I. Neretnieks, Royal Institute of Technology, Sweden
- 5.5 DNAPL Invasion into a Partially Saturated Dead-end Fracture
G.W. Su, I. Javandel, Lawrence Berkeley National Laboratory, USA
- 5.6 The fate of industrial-organo bromides in a fractured chalk aquifer
S. Ezra¹, S. Feinstein¹, I. Bilkis², E. Adar¹, J. Ganor¹, ¹ Ben Gurion University of the Negev, Israel, ² The Hebrew University of Jerusalem, Israel
- 5.7 Evaporation from surface exposed fractures: Potential impact of atmospheric convection and salt accumulation
N. Weisbrod¹, M.I. Dragila², C. Cooper³, C. Graham², J. Cassidy², ¹ Ben-Gurion University of the Negev, Israel, ² Oregon State University, USA, ³ Desert Research Institute, USA

WEDNESDAY, 11 FEBRUARY 2004

Location: Lawrence Berkeley National Laboratory Building 50 - Auditorium

6. Recent Advances in Modeling, Scaling, and Uncertainty Evaluation

Presiding– Andy Tomson, Lawrence Livermore National Laboratory, Livermore, CA

- 8:30 AM 6.1 Why use stochastic fractal models for heterogeneous log(conductivity) and what might cause such structure
F.J. Molz III¹ (*Invited speaker*), M.M. Meerschaert², T.J. Kozubowski², ¹ Clemson University, USA, ² University of Nevada, USA
- 8:50 AM 6.2 Percolation-Continuum Modeling of Evaporative Drying: Homogeneous or Patchy Saturation?
H.F. Wang¹ (*Invited speaker*), T.E. Strand¹, J.G. Berryman², ¹ University of Wisconsin-Madison, USA, ² University of California Lawrence Livermore National Laboratory, USA
- 9:10 AM 6.3 Qualification and validity of a smeared fractures modeling approach for transfers in fractured media
A. Fournio, CEA-ANDRA, France, C. Grenier, CEA, France, F. Delay, HYDRASA, France, E. Mouche, CEA, France, H. Benabderrahmane, ANDRA, France
- 9:30 AM 6.4 Navier-Stokes Simulations of Fluid Flow through a Rock Fracture
R.W. Zimmerman, A.H. Al-Yaarubi, C.C. Pain, C.A. Grattoni, Imperial College, United Kingdom
- 9:50 AM 6.5 Lattice Boltzmann simulation of flow and solute transport in fractured porous media
D. Zhang, Q. Kang, Los Alamos National Lab, USA
- 10:10 AM Break

Presiding–Robert W. Zimmerman, Imperial College, London, United Kingdom

- 10:30 AM 6.6 Quantification of Non-Fickian Transport in Fractured Formations
B. Berkowitz (*Invited speaker*), H. Scher, Weizmann Institute of Science, Israel
- 10:50 AM 6.7 Modelling of solute transport using the Channel Network Model. Limited penetration into the rock matrix
L. Moreno, J. Crawford, I. Neretnieks, Royal Institute of Technology, Sweden
- 11:10 AM 6.8 Modelling flow and transport in a sparsely fractured granite. -A discussion of concepts and assumptions
U. Svensson, Computer-aided Fluid Engineering AB, Sweden
- 11:30 AM 6.9 Upscaling discrete fracture network simulations of solute transport
S. Painter, Southwest Research Institute, USA, V. Cvetkovic, Royal Institute of Technology, Sweden, J.O. Selroos, Swedish Nuclear Fuel and Waste Management Company, Sweden
- 11:50 AM 6.10 Uncertainty evaluation of groundwater flow by multiple modeling approach at Mizunami Underground Research Laboratory Project, Japan
A. Sawada, JNC (Currently LBNL), USA, H. Saegusa, JNC, Japan, Y. Ijiri, Taisei Corporation, Japan
- 12:10 PM Lunch

Presiding– Ronald Falta, Clemson University, SC.

- 1:10 PM 6.11 Uncertainty and sensitivity analysis of groundwater flow and radionuclide transport in the saturated zone at Yucca Mountain, Nevada
B.W. Arnold, Sandia National Laboratories, USA, S.P. Kuzio, Sandia National Laboratories, USA
- 1:30 PM 6.12 Assessment of retention processes for transport in a single fracture at Äspö (Sweden) site : from short time experiments to long time predictive models
C. Grenier¹, E. Mouche¹, A. Fourno², H. Benabderrahmane³, ¹ Commissariat à l'Energie Atomique (CEA), France, ² CEA-ANDRA, France, ³ ANDRA, France
- 1:50 PM 6.13 A Probabilistic Analytical Method to Calculate Dispersion Coefficients in Fractured Rock
J.R. Kunkel, Knight Piésold and Co, USA
- 2:10 PM 6.14 Comparing Unsaturated Hydraulics of Fractured Rocks and Gravels
T.K. Tokunaga, K.R. Olson, J. Wan, Lawrence Berkeley National Laboratory, USA
- 2:30 PM Break

Presiding– Yannis C. Yortsos, University of Southern California, CA

- 2:50 PM 6.15 Improved Description of the Hydraulic Properties of Unsaturated Structured Media Near Saturation
M.T. van Genuchten, M.G. Schaap, US Salinity Laboratory, Riverside, CA, USA
- 3:10 PM 6.16 Theoretical, Numerical and Experimental Study of Flow at the Interface of Porous Media
U. Shavit, R. Rosenzweig, Technion, Israel
- 3:30 PM 6.17 Evaluating hydraulic head data as an estimator for spatially variable equivalent continuum scales in fractured architecture using discrete feature analysis
T. Wellman, E. Poeter, Colorado School of Mines, USA
- 3:50 PM 6.18 The mathematical model of the flow of gas-condensate mixtures in fissurized porous rocks with an application to the development of tight sand gas deposits
G.I. Barenblatt, UC Berkeley, USA
- 4:10 PM 6.19 Reservoir Characterization and Management
M. Nikraves, UC Berkeley & LBNL, USA
- 4:30 PM 6.20 Numerical Simulation of Air Injection in Light Oil Fractured Reservoirs
S. Lacroix, B. Bourbiaux, P. Delaplace, Institut Français du Pétrole (IFP), France
- 4:50 PM 6.21 Two-Phase Flow Through Fractured Porous Media
P.M. Adler, IPGP, France

WEDNESDAY, 11 FEBRUARY 2004 5:00 PM - 8:00 PM
Location: Lawrence Berkeley National Laboratory Building 54 - Cafeteria

7. Recent Advances in Modeling and Optimization of Fractured Rock Investigations (Poster Session)

- 7.1 Constraints on Flow Regimes in Wide-Aperture Fractures
T.A. Ghezzehei, Lawrence Berkeley National Lab, USA
- 7.2 Deformation and Permeability of Fractured Rocks
I. Bogdanov, IPGP, France, P.M. Adler, IPGP, France
- 7.3 Modeling poroelastic earth materials that exhibit seismic anisotropy
P.A. Berge, Lawrence Livermore National Laboratory, USA
- 7.4 Homogenization Analysis for Fluid Flow in a Rough Fracture
B.G. Chae, Korea Institute of Geoscience and Mineral Resources, South Korea, Y. Ichikawa, Nagoya University, Japan, Y. Kim, Korea Institute of Geoscience and Mineral Resources, South Korea
- 7.5 Micro scale modeling of fluid transport in fractured granite using a lattice boltzmann method with x-ray computed tomography data
F. Enzmann, M. Kersten, University of Mainz, Germany
- 7.6 Modeling Flow and Transport in Fractured Media Using Deterministic and Stochastic Approaches
S.M. Ezzedine, LLNL, USA
- 7.7 Fuzzy systems modeling of flow in fractured rock
B.A. Faybishenko, Lawrence Berkeley National Laboratory, USA
- 7.8 Possible Scale Dependency of the Effective Matrix Diffusion Coefficient
H.H. Liu, G.S. Bodvarsson, Lawrence Berkeley National Laboratory, USA
- 7.9 Simulation of Hydraulic Disturbances Caused by the Underground Rock Characterisation Facility in Olkiluoto, Finland
J. Löfman, VTT Processes, Finland, F. Mészáros, The Relief Laboratory, Hungary
- 7.10 Constraining a fractured-rock groundwater flow model with pressure-transient data from an inadvertent well test
C. Doughty, K. Karasaki, Lawrence Berkeley National Laboratory, USA
- 7.11 Equivalent Heterogeneous Continuum Model Approach for Flow in Fractured Rock - Application to Regional Groundwater Flow Simulation at Tono, Japan
M. Shimo¹, H. Yamamoto², K. Fumimura¹, ¹ Taisei Corporation, Japan, ² Lawrence Berkeley National Laboratory, USA
- 7.12 On damage propagation in a soft low-permeability formation
D. Silin¹, T. Patzek¹, G.I. Barenblatt², ¹Lawrence Berkeley National Laboratory, ²UC Berkeley, USA
- 7.13 Improved estimation of the activity range of particles: The influence of water flow through fracture-matrix interface
L. Pan, Y. Seol, G.S. Bodvarsson, Lawrence Berkeley National Laboratory, USA
- 7.14 Comparison between dual and multiple continua representations of nonisothermal processes in the repository proposed for Yucca Mountain, Nevada
S. Painter, Southwest Research Institute, USA
- 7.15 Identification of the WCFs and evaluation of hydraulic parameters using FEC logging

S. Takeuchi¹, M. Shimo², C. Doughty³, T. Chin-Fu³, ¹ JNC, Japan, ² Taisei Corporation, Japan, ³ Lawrence Berkeley National Laboratory, USA

- 7.16 Observation and Modeling of Unstable Flow during Soil Water Redistribution
Z. Wang, W.A. Jury, A. Tuli, California State University at Fresno, USA
- 7.17 Analytical Solutions for Transient Flow through Unsaturated Fractured Media
Y.S. Wu, L. Pan, Lawrence Berkeley National Laboratory, USA
- 7.18 Propellant Fracturing Demystified For Well Stimulation
A. Zazovsky, Schlumberger, USA
- 7.19 Education and Outreach in Environmental Justice
H.F. Wang, University of Wisconsin-Madison, USA

THURSDAY, 12 FEBRUARY 2004 8:30 AM - 11:30 AM
Location: Lawrence Berkeley National Laboratory Building
50 - Auditorium

8. Optimization of Fractured Rock Investigations and Data Analysis

Presiding–Chin-Fu Tsang, LBNL, Berkeley, CA

- 8:30 AM 8.1 Advective Porosity Tensor for Flux-weighted Transport
S.P. Neuman, University of Arizona, USA
- 8:50 AM 8.2 Hydrologic characterization of fractured rock using flowing fluid electric conductivity logs
C. Doughty, C.F. Tsang, Lawrence Berkeley National Laboratory, USA
- 9:10 AM 8.3 Ground-water Inflow into Tunnels – Case Histories and Summary of Developments of Simplified Methods to Estimate Inflow Quantities
J.Y. Kaneshiro, Parsons Corporation, USA
- 9:30 AM 8.4 The Porous Fractured Chalk of the Northern Negev Desert: Lessons Learnt From 10 Years of Study
R. Nativ, Hebrew University of Jerusalem, Israel, E. Adar, Ben Gurion University of the Negev, Israel
- 9:50 AM 8.5 Fracture and bedding plane control of ground water flow in a chalk aquitard: A geostatistical model from the Negev desert, Israel
M. Weiss, Hebrew University of Jerusalem, Israel, Y. Rubin, University of California at Berkeley, USA, R. Nativ, Hebrew University of Jerusalem, Israel, E. Adar, Ben Gurion University of the Negev, Israel
- 10:10 AM Break

Presiding–Shlomo P. Neuman, University of Arizona, AZ

- 10:30 AM 8.6 Predicting Fractured Zones in the Culebra Dolomite
R.L. Beauheim, Sandia National Laboratories, USA, D.W. Powers, Consulting Geologist, USA, R.M. Holt, University of Mississippi, USA
- 10:50 AM 8.7 Hydraulic Test Interpretation with Pressure Dependent Permeability - Results from the Continental Deep Crystalline Drilling in Germany
W. Kessels¹, R. Kaiser², W. Gräsele¹, ¹ Leibniz Institute for Applied Geosciences, Germany, ² University of Hannover, Germany

- 11:10 AM 8.8 Quantification of Contact Area and Aperture Distribution of a Single Fracture by Combined X-ray CT and Laser Profilometer
A. Polak¹, H. Yasuhara², D. Elsworth², Y. Mitani³, A.S. Grader², P.M. Halleck², ¹ Technion-Israel Institute of Technology, Israel, ² Pennsylvania State University, USA, ³ Kyushu University, Japan
- 11:30 AM 8.9 A Comparison Between Hydrogeophysical Characterization Approaches Applied to Granular Porous and Fractured Media
J. Chen, S. Hubbard, J. Peterson, Lawrence Berkeley National Lab, USA
- 11:50 AM Lunch Break

THURSDAY, 12 FEBRUARY 2004 1:00 PM - 2:30 PM
Location: Lawrence Berkeley National Laboratory Building 50 - Auditorium

9. Panel Discussion on Cross-Cutting Problems in Geosciences

Presiding–Bo Bodvarsson, LBNL

Panelists: Don DePaolo, University of California, Berkeley; Fred Molz, Clemson University, Sothern Carolina; Ronit Nativ, Hebrew University of Jerusalem, Israel; Shlomo P. Neuman, University of Arizoa, Arizona; John W. Pritchett, SAIC, San Diego; and Rien van Genuchten, U.S. Salinity Laboratory, Riverside, California.