AGENDA

Sunday, September 27, 2015	
Icebreaker	
6:00 PM	**Welcome Reception, DoubleTree by Hilton, Berkeley Marina**
Monday, September 28, 2015 Morning Sessions	
7:30 AM	**Registration, Building 50 Auditorium,** Lawrence Berkeley National Laboratory, Berkeley, CA
Welcome and Opening Remarks	
8:30	**Welcome** **Horst Simon**, Deputy Director, Lawrence Berkeley National Laboratory (LBNL)
8:40	**Opening Remarks** **Christine Doughty**, TOUGH Symposium Organizing Committee Chair
8:50	**Announcements** **TOUGH Symposium Organizing Committee**
Session I: Carbon Dioxide Storage	
Session Chairs: Alfredo Battistelli and Curtis M. Oldenburg	
9:00	**Thermodynamics related processes during the migration of acid gases and methane in deep sedimentary formations** **Alfredo Battistelli** (Saipem SpA), Paolo Berry, Stefano Bonduà, Villiam Bortolotti (Bologna University), Alberto Consonni (eni SpA), Carlo Cormio (Bologna University), Claudio Geloni (eni SpA), Ester Maria Vasini (Bologna University)
9:20	**A new TOUGH2-module: ECO2MG** **Daniel Loeve**, J.G. Maas, A. Obdam (TNO)
9:40	**Geologic carbon dioxide sequestration in natural gas reservoirs: Pressure rise due to CO_2-CH_4 mixing** **Curtis M. Oldenburg**, Kyung Jae Lee, Jonny Rutqvist (LBNL)
10:00	**Thermal perturbations induced by CO_2 production from the Kevin Dome CO_2 reservoir** **Quanlin Zhou**, Curtis M. Oldenburg, Jonathan Ajo-Franklin (LBNL), Stacey Fairweather, Lee H. Spangler (Montana State University, Bozeman)
10:20	***Break***
10:50	**Impacts of formation heterogeneity, injection procedure and hysteresis effect on the reservoir performance in CO_2 geological storage in the Ordos Basin in China** **Cai Li** (University of Sydney, Beijing Normal University, China Institute of Geo-environmental Monitoring), Chaobin Guo (Tongji University), Keni Zhang (Beijing Normal University), Federico Maggi (University of Sydney)
11:10	**Effect of boundary openness, domain size and relative permeability on pressure and CO_2 saturation predictions by numerical simulation under geologic carbon storage conditions** **Liwei Zhang**, Robert Dilmore, Grant Bromhal (National Energy Technology Laboratory)
11:30	**Impact of relative permeability on CO_2 phase behavior, phase distribution, and trapping mechanisms** **Nathan Moodie**, Brian McPherson, Feng Pan (University of Utah)
11:50	***Lunch***

Monday, September 28, 2015 Afternoon Sessions	
Session II: Geothermal	
Session Chairs: Andrea Borgia and Grimur Bjornsson	
1:10	**Managing large geothermal reservoir models under the iTOUGH2 platform** **Grimur Bjornsson** (Warm Arctic ehf) and Andri Arnaldsson (Vatnaskil Consulting Engineers)
1:30	**TOUGH2-EOS1 modeling of the long term exploitation of the Paratunsky Geothermal Field, Kamchatka** **Alexey V. Kiryukhin** (Institute of Volcanology & Seismology), N.P. Asaulova, L.A. Vorozheikina, N.V. Obora (SUE KamchatskBurGeoTermia), A.I. Rozhenko (United Institute of Computer Science SB RAS), N.B. Zhuravlev (Institute of Volcanology & Seismology), P.A. Kiryukhin (Exigen Services Ltd.), A.Y. Polyakov, P.O. Voronin, E.V. Kartasheva (Institute of Volcanology & Seismology)
1:50	**3D dual porosity modeling of tracer transport in Palinpinon 1 Geothermal Field, Philippines** **Anthony E. Ciriaco** and Michael O'Sullivan (Energy Development Corporation)
2:10	**Description of explicit surface features using updated field data of Rotorua Geothermal Field** **Thomas M.P. Ratouis**, Michael J. O'Sullivan, John P. O'Sullivan (The University of Auckland)
2:30	**Interpretation of production tests in geothermal wells with T2Well-EWASG** **Ester Maria Vasini** (Bologna University), Alfredo Battistelli (Saipem SpA), Paolo Berry, Stefano Bonduà, Villiam Bortolotti, Carlo Cormio (Bologna University), Lehua Pan (LBNL)
2:50	***Break***
3:20	**Simulating supercritical water in magmatic geothermal reservoirs** **Lilja Magnusdottir** and Stefan Finsterle (LBNL)
3:40	**A numerical code to incorporate gravity data into geothermal reservoir models** **Sophie C.P. Pearson-Grant** (GNS Science Wairakei Research Center)
4:00	**Simulations of CO_2 push-pull in fractures to enhance geophysical contrast for characterizing EGS sites** **Andrea Borgia**, Curtis M. Oldenburg (LBNL), Rui Zhang (University of Louisiana at Lafayette), Lehua Pan, Stefan Finsterle (LBNL), T.S. Ramakrishnan (Schlumberger-Doll Research)
4:20	**Modeling a CO_2 thermosiphon in a partially saturated reservoir using T2Well with EOS7CMA** **Lehua Pan**, Christine Doughty, Barry Freifeld, Curtis M. Oldenburg (LBNL)
4:40	**Geochemical modeling of Tourmaline formation at Elba Island** **Giordano Montegrossi**, Giovanni Ruggieri (CNR-IGG), Barbara Cantucci (INGV)
Evening Poster Session and Reception (agenda separate)	
5:30 – 8:00	***LBNL Cafeteria***
8:00	**Shuttle bus leaving for DoubleTree, Berkeley Marina & Downtown Berkeley BART**

Tuesday, September 29, 2015 Morning Session	
Session III: Numerical Methods	
Session Chairs: Ronald Falta and George Pau	
8:30	**TOUGH3: A new base version of the TOUGH suite of codes** **Yoojin Jung**, George Pau, Stefan Finsterle (LBNL)
8:50	**Implementation of a simple well-bore model in iTOUGH2 for high enthalpy wells** **Jean-Claude Berthet**, Andri Arnaldsson, Snorri Kjaran (Vatnaskil Consulting Engineers)
9:10	**Development of numerical approaches for simulation of slurry flow in fracture/porous media** Xiaoyu Wang (Beijing Normal University), **Keni Zhang** (Beijing Normal University, LBNL), Lehua Pan (LBNL), Chaobin Guo (Tongji University)
9:30	**Fast method to predict oil production from fractured reservoir** **George Shu Heng Pau**, Stefan Finsterle, Kyung Jae Lee (LBNL), Rishi Parashar (Desert Research Institute), Yingqi Zhang (LBNL)
9:50	***Break***
10:20	**Quality assurance for the TOUGH2 family of codes using the code SITA** **Martin Navarro**, Holger Seher, Stephan Hotzel, Jens Eckel (Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) gGmbH)
10:40	**MeshMaker V2.0S and V2.0P: New grid generators for complex heterogeneous domains in TOUGH2/TOUGH+ simulations** **George J. Moridis** and Noel Keen (LBNL)
11:00	**Unstructured 3D mesh generation for geological applications using LaGriT** **Carl W. Gable** (Los Alamos National Laboratory) and Manuel Sentís (ENSI)
11:20	**3D Voronoi pre- and post-processing tools for the modeling of deep sedimentary formations with the TOUGH2 family of codes** **Stefano Bonduà** (Bologna University), Alfredo Battistelli (Saipem SpA), Paolo Berry, Villiam Bortolotti (Bologna University), Alberto Consonni (eni SpA), Carlo Cormio (Bologna University), Claudio Geloni (eni SpA), Ester Maria Vasini (Bologna University)
11:40	**Generating one-column grids with fractal flow dimension** **Christine Doughty** (LBNL)
Awards	
12:00	**Student Award Ceremony** **TOUGH Symposium Organizing Committee**
12:05	***Lunch***

Tuesday, September 29, 2015 Afternoon Sessions

Session IV: Coupled Fluid Flow and Geomechanics

Session Chairs: Rainer Senger and Robert Walsh

1:20	**An overview of TOUGH-based geomechanics models** **Jonny Rutqvist** (LBNL)
1:40	**Extension of the TOUGH-FLAC simulator to account for finite strains** **Laura Blanco-Martin**, Jonny Rutqvist, Jens T. Birkholzer (LBNL)
2:00	**Development of a hydro-geomechanical model to simulate coupled fluid flow and reservoir geomechanics** **Mamun Miah** (University of Mississippi), Laura Blanco-Martín, William Foxall, Jonny Rutqvist, (LBNL), Antonio P. Rinaldi (ETH Zürich), Christopher Mullen (University of Mississippi, LBNL)
2:20	**Simulations of fluid-driven fracturing within discrete fracture networks using TOUGH-RBSN** **Kunhwi Kim**, Jonny Rutqvist, Seiji Nakagawa, James Houseworth, Jens Birkholzer (LBNL)
2:40	**TOUGH2-SEED: A coupled fluid flow mechanical-statistical model for the study of injection-induced seismicity** **Massimo Nespoli** (Istituto Nazionale di Geofisica e Vulcanologia - Sezione di Bologna, Università di Bologna), Antonio P. Rinaldi, Stefan Wiemer (Swiss Seismological Service, ETH Zurich)
3:00	***Break***

Session V: Nuclear Energy and Waste

Session Chairs: Jens Birkholzer and Nicolas Spycher

3:30	**Preliminary analyses and numerical modeling of the Gas Permeable Seal Test (GAST) at the Grimsel Test Site, Switzerland** **Thomas Spillmann** (Nagra), Rainer Senger (Intera Incorporated), George W. Lanyon (Fracture Systems), Niels Giroud, Paul Marschall (Nagra)
3:50	**Modeling of gas migration through low-permeability clay using information on pressure and deformation from fast air injection tests** **Rainer Senger** (Intera Incorporated), Enrique Romero (UPC), Paul Marschall (Nagra)
4:10	**Coupled THMC models for bentonite in clay repository for nuclear waste using TOUGHREACT-FLAC3D** **Liange Zheng**, Jonny Rutqvist, Jens T. Birkholzer (LBNL)
4:30	**Application of 1D hydromechanical coupling in TOUGH2 to a deep geological repository glaciation scenario** **Nicola Calder**, John Avis (Geofirma Engineering Ltd.), Erik Kremer (Nuclear Waste Management Organization), Robert Walsh (Geofirma Engineering Ltd.)

Banquet Dinner

6:00	**Shuttle bus pick-up at the Guest House and DoubleTree, Berkeley Marina**
6:30	**Banquet, *Mira Vista Golf & Country Club*** **7901 Cutting Blvd, El Cerrito**
8:00	**Computational modeling of induced seismicity: A sequential iterative approach to coupled flow and geomechanics** **Ruben Juanes** (Massachusetts Institute of Technology)
9:00	**Shuttle bus leaving for the Guest House, DoubleTree, Berkeley Marina & Downtown Berkeley BART**

Wednesday, September 30, 2015 Morning Sessions	
Session VI: Hydrocarbon Recovery and Reservoir Processes	
Session Chairs: Laura Blanco-Martin and Matthew Reagan	
8:30	**Numerical simulation of transport between fractured tight/shale gas reservoirs and near-surface groundwater** **Matthew T. Reagan**, George J. Moridis, Noel D. Keen (LBNL)
8:50	**Joint inversion of hydrological and geophysical data for enhanced reservoir characterization during enhanced oil recovery** **Michael Commer**, Stefan Finsterle, Yingqi Zhang (LBNL), Michael Hoversten (Chevron Energy Technology Company)
9:10	**A new simulation model of kerogen pyrolysis for the *in-situ* upgrading of oil shales** **Kyung Jae Lee** and George J. Moridis (LBNL)
9:30	**Combining TOUGH2 and FLAC3D to solve problems in underground natural gas storage** **Robert Walsh**, Othman Nasir, Nicola Calder, Sean Sterling, John Avis (Geofirma Engineering Ltd.)
9:50	***Break***
Session VII: Environmental Engineering and Vadose Zone	
Session Chairs: Stefan Finsterle and Karsten Pruess	
10:20	**A semi-analytic approach for modeling matrix diffusion effects in TOUGH2 and other groundwater transport models** **Ronald W. Falta** (Clemson University)
10.40	**Comparison between equivalent continuum and discrete crack models of transient radon transport at the soil-building foundation crack interface using the TOUGH2/EOS7Rn** **Zakaria Saâdi** and Jérôme Guillevic (Institut de Radioprotection et de Sûreté Nucléaire (IRSN))
11.00	**Determining *in situ* heating temperature for optimizing return on investment in DNAPL source zone remediation** **Amy Y. Fu** (Ellis & Associates, Inc., University of Florida), Stefan Finsterle, Yingqi Zhang (LBNL), Michael D. Annable (University of Florida)
Session VIII: Tips & Tricks	
Session Chair: Stefan Finsterle	
11:20	**Short pop-ups with TOUGH tips and tricks** **All Participants – sign up**
12:00	***Lunch***

Wednesday, September 30, 2015 Afternoon Sessions

Session IX: Reactive Transport

Session Chairs: Eric Sonnenthal and Dorothee Rebscher

1:00	**Development of syn-depositional models of carbonate diagenesis: An application of PyTOUGH to complex geological processes** **Miles Frazer** (Chevron Energy Technology Company, University of Bristol), Fiona Whitaker (University of Bristol), Cathy Hollis (University of Manchester)
1:20	**A reactive transport model of sulfur cycling and isotope fractionation during microbial reservoir souring and remediation** **Yiwei Cheng** (LBNL), Li Li (Pennsylvania State University), Nicholas Bouskill, Christopher G. Hubbard, Sergi Molins, Liange Zhang, Eric Sonnenthal (LBNL), Anna Engelbrektson (University of California, Berkeley), Mark E. Conrad (LBNL), John D. Coates (University of California, Berkeley), Jonathan Ajo-Franklin (LBNL)
1:40	**Carbon saturation affects soil C dynamics?** **Dipankar Dwivedi**, William J. Riley, Jinyun Tang (LBNL)
2:00	**Use of reactive transport modelling to study well integrity in a natural analogue for the geological CO_2 storage** **Ana Hernández-Rodriguez** (West Systems s.r.l., Università di Firenze), Giordano Montegrossi (CNR-IGG), Giorgio Virgili (West Systems s.r.l.), Orlando Vaselli (Università di Firenze), Bruno Huet (Lafarge Research Center), Luigi Marini (West Systems s.r.l.)
2:20	**Simulating CO_2-brine-rock interactions including mercury and H_2S impurities in the context of CO_2 geologic storage** **Nicolas F. Spycher** and Curtis M. Oldenburg (LBNL)
2:40	***Break***

Session X: Optimization, Parameter Estimation, Data-Worth Analysis

Session Chairs: Yingqi Zhang and Liange Zheng

3:10	**What's new in iTOUGH2?** **Stefan Finsterle** (LBNL)
3:30	**Fast large-scale inversion for deep aquifer characterization** **Jonghyun Harry Lee**, Amalia Kokkinaki, Judith Yue Li, Peter K. Kitanidis (Stanford University)
3:50	**Bayesian parameter inversion with implicit sampling for a vadose zone hydrological model** **Yaning Liu**, George Shu Heng Pau, Stefan Finsterle (LBNL)
4:10	**Determining optimal monitoring strategies for managing risk of cyclic steam injection using data-worth analysis** **Yingqi Zhang**, Laura Blanco-Martín, Christine Doughty, Stefan Finsterle, Quanlin Zhou, Curtis M. Oldenburg (LBNL)
4:30	**Closing Remarks/Adjourn** **TOUGH Symposium Organizing Committee**

POSTER SESSION

Monday, September 28, 5:30–8:00 PM
LBNL Cafeteria

BOARD	TITLE / AUTHOR
Carbon Dioxide Storage	
Board 1	**Pressure management during geological CO_2 sequestration: Optimal well placement and brine extraction in a heterogeneous reservoir** **Abdullah Cihan**, Jens Birkholzer (Lawrence Berkeley National Laboratory (LBNL)), Marco Bianchi (British Geological Survey)
Board 2	**Risk scenario analysis for heterogeneous geological model in a carbon sequestration application in Taiwan** Chi-Wen Yu and **Shih-Chang Lei** (Sinotech Engineering Consultants Inc.)
Board 3	**ECO2N V2.0: Enhancements for modeling CO_2-H_2O-NaCl system in TOUGH2** **Lehua Pan**, Nicolas Spycher, Christine Doughty, Karsten Pruess (LBNL)
Board 4	**The effect of natural groundwater flow on CO_2 migration and trapping: The case of the Jurassic saline aquifer of the Negev (Israel)** **Ravid Rosenzweig** and Ran Calvo (Geological Survey of Israel)
Geothermal	
Board 5	**Experimental study on flow friction and heat transfer performance of a single rough fracture in granitic rock under confining pressure** **Xiaoxue Huang**, Jialing Zhu, Jun Li (Tianjin University)
Board 6	**Stress field respond to massive injection of cold water into a geothermal reservoir: TOUGH-FLAC simulation** **Pierre Jeanne** and Jonny Rutqvist (LBNL)
Board 7	**Modeling laboratory experiments of fluid flow and heat transfer in supercritical-CO_2-saturated cores with ECO2N V2.0** **Mario Magliocco** (University of California, Berkeley), Christine Doughty, Tim Kneafsey (LBNL), Steve Glaser (University of California, Berkeley, LBNL)
Board 8	**Geothermal exploration through numerical modeling of cold CO_2 soil fluxes** Loic Peiffer (Universidad Nacional Autónoma de México), Christoph Wanner (University of Bern), Lehua Pan (LBNL)
Numerical Methods	
Board 9	**pTOUGH+: Status of re-engineering parallel TOUGH+** **Noel Keen**, Jeff Johnson, George Moridis, Matt Reagan (LBNL)
Board 10	**iMatTOUGH: An open-source Matlab-based graphical user interface for pre- and post-processing of TOUGH2 and iTOUGH2 models** **Anh Phuong Tran**, Baptiste Dafflon, Susan Hubbard (LBNL)
Board 11	**Using GMS as a pre- and post-processor for TOUGH2** **Andrea Borgia** (LBNL)
Coupled Fluid Flow and Geomechanics	
Board 12	**Inverse modeling of coupled fluid flow and geomechanics with iTOUGH2-PEST and TOUGH-FLAC: Application to In Salah CO_2 storage site** **Antonio P. Rinaldi** (LBNL, Swiss Seismological Service), Jonny Rutqvist, Stefan Finsterle (LBNL), H.H. Liu (Aramco Research Center)

BOARD	TITLE / AUTHOR
Coupled Fluid Flow and Geomechanics (cont.)	
Board 13	**Modelling fault reactivation and velocity dependent friction with TOUGH-FLAC** **Luca Urpi** (Utrecht University), Antonio P. Rinaldi (Swiss Seismological Service, LBNL), Brecht Wassing (TNO Geo Energy)
Board 14	**A coupled flow and geomechanics simulator for CO_2 storage in fractured reservoirs** **Philip H. Winterfeld** and Yu-Shu Wu (Colorado School of Mines)
Hydrocarbon Recovery and Reservoir Processes	
Board 15	**iTOUGH2-FLAC modeling of thermal-hydraulic-mechanical processes related to steam-assisted heavy oil recovery from diatomite** **Laura Blanco-Martin**, Jonny Rutqvist, Christine Doughty, Yingqi Zhang, Stefan Finsterle, Curtis M. Oldenburg (LBNL)
Board 16	**Modeling steam, water, and oil flow overlying a heavy oil reservoir undergoing cyclic steaming** **Christine Doughty**, Laura Blanco-Martin, Yingqi Zhang, Curtis M. Oldenburg (LBNL)
Board 17	**Water injection close to fault risk analysis, field application** **Julia Diessl**, Vahid Serajian, Mike S. Bruno (GeoMechanics Technologies)
Board 18	**Methane diffusion and adsorption in shale rocks – A numerical study using the Dusty Gas Model in TOUGH2/EOS7C-ECBM** **Weijun Shen** (Chinese Academy of Sciences, University of Chinese Academy of Sciences), Liange Zheng, Curtis M. Oldenburg, Abdullah Cihan, Jiamin Wan, Tetsu K. Tokunaga (LBNL)
Environmental Engineering and Vadose Zone	
Board 19	**Multiphase flow and transport of methane in soil under varying subsurface and atmospheric conditions: Bench-scale experimental and numerical study** **Chamindu Deepagoda**, Kathleen. Smits, Tissa llangasekare (Colorado School of Mines), Curtis M. Oldenburg, Abdullah Cihan (LBNL)
Board 20	**TOUGH2 application for an assessment of open pit slope stability using saturated/unsaturated groundwater flow modeling to estimate hydraulic forces, Arkhangelsk kimberlite pipe, Russia** **Ivan Leonidovich Kharkhordin** (Geostroyproekt Ltd), V.V. Nazima, A.N. Gurin (VNIMI Institute), I.E. Shkil (Severalmaz Co.)
Board 21	**Influence of permeability on the initial gas bubble evolution in compressed air energy storage in aquifers** **Chaobin Guo** (Tongji University), Keni Zhang (Tongji University, Beijing Normal University), Cai Li (University of Sydney)
Board 22	**Simulating water flow through a layered snowpack** Ryan W. Webb (Colorado State University) and **Stephen W. Webb** (Canyon Ridge Consulting, LLC)
Reactive Transport	
Board 23	**Modeling processes affecting carbon dynamics at a biogeochemical hotspot in a floodplain aquifer** **Bhavna Arora**, Dipankar Dwivedi, Nicolas Spycher, Carl Steefel (LBNL)
Board 24	**Analysis of fault "self-sealing" associated with CO_2-leakage in geologic carbon sequestration** Vivek V. Patil, Brian J. McPherson (University of Utah), Alexandra Priewisch (University of New Mexico), Joseph Moore, **Nathan Moodie** (University of Utah)
Board 25	**Numerical simulations of the chemical impact of impurities on geological CO_2 storage – Comparison between TOUGHREACT V2.0 and TOUGHREACT V3.0-OMP** **Dorothee Rebscher**, Jan Lennard Wolf (Bundesanstalt für Geowissenschaften und Rohstoffe, BGR), Jacob Bensabat (Environmental and Water Resources Engineering, EWRE Ltd.), Auli Niemi (Uppsala Universitet)
Board 26	**Potential chemical impacts of CO_2 leakage on underground sources of drinking water (USDWs) assessed by quantitative risk analysis** **Ting Xiao**, Brian McPherson, Feng Pan, Rich Esser (The University of Utah)

BOARD	TITLE / AUTHOR
Optimization, Parameter Estimation, Data-Worth Analysis	
Board 27	**Effect of anisotropy on multi-directional pressure-pulse-decay experiments** **Michael J. Hannon, Jr**. (The University of Alabama at Birmingham) and Stefan Finsterle (LBNL)
Board 28	**fKF-TOUGH: A software package for data assimilation in TOUGH2 using Fast Kalman Filters methods** **Amalia Kokkinaki**, J.Y. Li, H. Ghorbanidehno, E.F. Darve, P.K. Kitanidis (Stanford University)
Board 29	**Smoothing-based compressed state Kalman Filter (sCSKF) for real-time data assimilation: Applications in CO_2 reservoir monitoring and characterization** **Judith Yue Li**, Amalia Kokkinaki, Eric F. Darve, Peter K. Kitanidis (Stanford University)
Board 30	**Global sensitivity and data-worth analyses in iTOUGH2** Haruko Wainwright and **Stefan Finsterle** (LBNL)