

JONNY RUTQVIST, PH.D.
Energy Geosciences Division
Lawrence Berkeley National Laboratory
Berkeley, CA 94720
(510) 486-5432
jrutqvist@lbl.gov
<http://eesa.lbl.gov/profiles/jonny-rutqvist/>

EDUCATION

Docent, Engineering Geology, 2000, Royal Institute of Technology, Sweden. The Swedish academic title Docent corresponds to the level of Senior Lecturer (UK) or Associate Professor (US).

Ph.D. Engineering Geology, 1995, Royal Institute of Technology, Sweden. Thesis title: "Coupled Stress-Flow Properties of Rock Joints from Hydraulic Field Testing"

Technical Licentiate, Rock Mechanics, 1990, Luleå University of Technology, Sweden

Ms. Geotechnology, 1988, Luleå University of Technology, Sweden

CURRENT POSITION

1998-present: Geological Scientist (Staff Scientist level since 2004), Lawrence Berkeley National Laboratory, California.

PREVIOUS POSITIONS AND WORK EXPERIENCE

- 1996-1998 Post-doctoral research at Lawrence Berkeley National Laboratory, Berkeley, California
- 1991-1995 Research and teaching at Royal Institute of Technology, Stockholm, Sweden
- 1988-1990 Research and teaching at Luleå University of Technology, Sweden
- 1986-1987 Seasonal Rock Mechanics Consultant at LKAB's underground iron mine, Malmberget, Sweden.

RESEARCH ACTIVITIES

Research on **coupled thermal, hydraulic, mechanical and chemical (THMC) processes in geological media** with special expertise on **hydromechanical (HM) couplings**. The coupled phenomena in fractured rock, soil or clay are studied through *in situ* field experiments and field data and numerical modeling of those experiments. Two main numerical simulators developed and applied in these simulations are 1) **ROCMAS**—a finite element code for modeling of fully coupled THM processes in unsaturated and saturated medium, 2) **TOUGH-FLAC**—a simulator using sequential coupling techniques for analysis of coupled THM processes under multi-phase flow conditions. Currently

collaborative efforts include coupled THMC processes with coupling of **FLAC** to the reactive transport simulator **TOUGHREACT**, as well as linking the TOUGH multiphase flow and heat transport simulator to a number of geomechanical simulators leveraging on previous experience with TOUGH-FLAC sequential coupling.

Current special research topics:

- **Coupled THM and THMC processes around nuclear waste repositories:** Non-isothermal multiphase fluid flow and geomechanics in fractured crystalline, clay and salt host rocks. Implementation and application of advanced constitutive models for bentonite, clay and salt geomechanical behavior under partially saturated conditions, some including damage sealing and healing, as well as chemically induced permeability changes and mechanical swelling.
- **Deep underground injection of CO₂:** rock mechanical aspects and coupled HM processes including potential fault activation and induced seismicity.
- **Hydraulic fracturing and stimulation associated extraction of methane gas from tight rock (shale):** Coupled fluid flow and geomechanical modeling of hydraulic fracturing and potential fault activation.
- **Coupled THM and THMC processes in geothermal reservoirs:** Injection/production induced seismicity and surface deformations.
- **Coupled geomechanical modeling of hydrate-bearing sediments:** Mechanical stability of hydrate-bearing sediments during gas production.
- **Coupled THM processes associated with compressed air energy storage (CAES) in underground caverns:** Thermodynamics and geomechanics associated with compression and decompression in storage operations.
- **Hydraulic injection in rock fractures:** Coupled HM phenomena during well testing and hydraulic fracturing stress measurements.

Have performed coupled THM analysis of the following major sites and field experiments:

- Full Scale Emplacement (FE) Experiment, **Mont Terri**, Underground Research Laboratory, Switzerland (2012-Present). A large-scale heater test in a bentonite-buffer and rock (Opalinus Clay) system.
- Engineered Barrier System (EBS) experiment at **Horonobe Underground Research Laboratory**, Hokkaido, Japan (2013-present). A heater test for a bentonite-backfilled and rock (mudstone) system.
- Half-scale Emplacement (HE-E) Experiment, **Mont Terri**, Underground Research Laboratory, Switzerland (2013-2015). A heater test in a bentonite-buffer and rock (Opalinus Clay) system.

- HE-D Experiment, **Mont Terri** Underground Research Laboratory, Switzerland (2012-2013). A heater test in Opalinus Clay.
- Coupled reservoir-geomechanical modeling of the **In Sala** industrial CO₂ storage site, Algeria (2007-present).
- Coupled THM analysis of induced seismicity at **The Geysers** Geothermal field, California (2006-Present).
- Coupled HM modeling of excavation disturbed zone at the tunnel sealing experiment (TSX) in massive granite at the **Manitoba URL** in Canada (2006-2007).
- Coupled HM modeling of major fault reactivation during the 1960 **Matsushiro** Earthquake Swarm at Matsushiro Japan (2006-2007).
- Hydraulic injection tests and mechanical measurements at the **Coaraz** fractured rock site in France (2004-2009).
- Drift Scale Test (DST), **Yucca Mountain**, Nevada (1997-2005). A high temperature (above water boiling) heater test conducted in highly fractured unsaturated rock
- Full Scale Engineering Barriers Experiment (**FEbEX**), Grimsel Test Site, Switzerland (1997-2003). A large-scale heater test in a bentonite-buffer and rock system.
- **Kamaishi Mine** heater test, Japan (1995-1998): A heater test in a bentonite-buffer and fractured rock system
- Hydraulic injection test in a 1700-meter deep borehole at the Laxemar site, **Äspö Hard Rock Laboratory**, Sweden (1995-1996): Injection tests for *in situ* determination of normal stiffness of natural fractures and for studies of coupled HM effects during hydraulic stiffness measurements.

INTERNATIONAL RESEARCH COLLABORATIONS

Active in a number of international collaborative projects, starting with the DECOVALEX project on development and validation of coupled models, a project that has been ongoing since 1992 with high scientific output, including numerous journal publications and books. Hosted numerous international visiting scientists and students at LBNL and thereby fostering long-term research collaborations in the field of coupled processes in geological media.

1991-Present Active in a Research Team as well as Task Leader for the international collaboration project **DECOVALEX I, II, III, THMC, 2011, and 2015** (Development of COupled models and their VALidation against EXperiments in nuclear waste isolation). The project currently involves over 40 Research and Funding agencies in 9 countries. Served as Research Team on the behalf of Funding Organizations in Sweden, USA and U.K.

- 2003-Present Collaboration with a number of international researchers on the development of linked TOUGH and FLAC simulations for coupled reservoir-geomechanical analysis under multi-phase flow conditions.
- 2011-Present Collaboration with AIST, Japan for modeling of coupled geomechanical processes and ground surface deformations associated with underground CO₂ injection using the TOUGH-FLAC.
- 2011-Present Collaboration with the Korean Institute of Geosciences and Mineral Resources (KIGAM) on compressed air energy storage and thermal storage in underground caverns.
- 2011-2013 Partner in the In Salah Joint Industry Project for CO₂ storage, Algeria, including BP and Statoil for the geomechanical analysis associated with the CO₂ injection.
- 2009-2011 Collaboration with Taisei Corporation, Japan for modeling of coupled geomechanical processes and ground surface deformations associated with underground CO₂ injection using the TOUGH-FLAC.
- 2009-2011 Collaboration with Taisei Corporations, Japan for modeling of coupled THM processes in engineered barrier systems using TOUGH-FLAC and the Barcelona Basic Model for unsaturated clay behavior in the Japanese nuclear waste program.
- 2006-2007 Joint research project on 1960s Matsushiro Earthquake Swarm as a natural analogue for CO₂ storage and leakage with Mizuho Info and Research Institute, funded Ministry of Trade and Industry Ministry (METI) of Japan.
- 2004-2010 Collaboration with the Geoscience Azur Laboratory, and University of Nice, France for modeling of coupled processes at the Coaraz fractured rock site in Southern France.
- 2000-2002 Active as a Research Team in an international code comparison project for numerical models related to geological sequestration of greenhouse gases. The project involves 10 Research Organizations in 7 countries. Also task coordinator for Test Case on hydromechanical aspects.
- 1991-1995 Technical Secretary and task coordinator of the international collaboration projects **DECOVALEX I** and **II** (Development of COupled models and their VALidation against EXperiments in nuclear waste isolation). The work included arrangements of international workshops, technical coordination and reporting of work conducted by 10 Research Teams in 8 countries.

PROFESSIONAL ACTIVITIES

- 2014-present Editorial Board, *Journal of Rock Mechanics and Geotechnical Engineering (JRMGE)* since 2014.
- 2014-present Board of Area Editorial Advisor: *Geomechanics for Energy and the Environment (GETE)* since 2014.
- 2014-present Review Editorial Board of *Frontiers in Carbon Capture, Storage, and Utilization*, Nature Publication Group since 2014.
- 2017 Member of the International Scientific Committee for 6th Biot Conference on Poromechanics, July 9-13 Ecole Nationale des Ponts et Chaussées, Paris, France.
- 2017 Member of Scientific Committee for 2017 International Society of Rock Mechanics (ISRM) International Symposium “EUROCK 2017,” 20-22 June, 2017, Ostrava, Czech Republic.
- 2016 Co-convener of session at European Geophysical Union (EGU) General Assembly 2016, Vienna, April 17-22, 2016. Session title: Process quantification and modelling in subsurface utilization.
- 2016 Co-chair of International Forum on Rock Mechanics Aspects of CO₂ Geological Storage, May 23-24, 2016, Chinese Academy of Sciences, Wuhan, China.
- 2016 Guest Co-Editor of Special Issue on Rock Mechanics Aspects of CO₂ Geologic Storage for the *Journal of Rock Mechanics and Geotechnical Engineering*.
- 2015 Organizing Committee Member of the 2015 TOUGH Symposium, September 28–30, 2015, Lawrence Berkeley National Laboratory, CA, USA
- 2015 Co-convener of session at American Geophysical Union (AGU), 2015 Fall Meeting, San Francisco, California, December 14-18, 2015. Session title: “Coupled thermo-hydro-mechanical-chemical processes related to geo-energy and geo-engineering applications.”
- 2015 Co-convener of session at the 49th US Rock Mechanics/Geomechanics Symposium, San Francisco, CA, USA, 28 June- 1 July 2015. Session title: Coupled Process Modeling.
- 2014 Guest Co-Editor of Special Issue on TOUGH Symposium 2012 in *Nuclear Technology* (International Journal).
- 2013 Co-convener of session at the 47th US Rock Mechanics/Geomechanics Symposium, San Francisco, CA, USA, 23-26 June 2013. Session title: Coupled processes affecting fluid flow and geomechanics.
- 2012 Organizing Committee Member of the 2012 TOUGH Symposium, September 17–19, 2012, Lawrence Berkeley National Laboratory, CA, USA

- 2011 Organizing Committee Member of the 45th US Rock Mechanics/Geomechanics Symposium, San Francisco, CA, USA, 28-29 June 2011.
- 2011 Co-convener of session at the 45th US Rock Mechanics/Geomechanics Symposium, San Francisco, CA, USA, 28-29 June 2011. Session title: CO₂ Sequestration.
- 2009 Co-convener of programmatic theme at the 43rd US Rock Mechanics Symposium, Asheville, NC, USA, 28 June-1 July 2009. Theme title: Coupled Processes.
- 2008 Co-convener of session at the 42nd US Rock Mechanics/Geomechanics Symposium, San Francisco, CA, USA, 28-29 June 2008. Session title: Coupled Processes - Flow and Transport
- 2007 Guest co-editor of special issue containing research results generated using the TOUGH codes in *Energy Conversion Management* (International Journal).
- 2003-2007 Research Area Leader on Geomechanical Modeling. Department of Geophysics, Earth Sciences Division, Lawrence Berkeley National Laboratory.
- 2003 Member of Organizing Committee, International Conference on Coupled T-H-M-C Processes and Modeling of Geosystems (GEOPROC), October 13-15, 2003, Stockholm, Sweden.

HONORS AND AWARDS

- 2015 Lawrence Berkeley National Laboratory, Spot Recognition Award for excellent and highly successful team effort orchestrating and organizing the 2015 TOUGH Symposium.
- 2013 American Rock Mechanics Association Applied Rock Mechanics Research Award for work related to modeling of fault reactivation and seismicity associated with geologic CO₂ sequestration.
- 2012 Lawrence Berkeley National Laboratory, Director's Award for Exceptional Tech Transfer Achievement, as part of the TOUGH developer's team.
- 2010 American Rock Mechanics Association Case History Award for work reported in the paper entitled "Coupled analysis of change in Fracture Permeability during the cooling phase of the Yucca Mountain Drift Scale Test."
- 2009 American Rock Mechanics Association Applied Rock Mechanics Research Award for work reported in the paper entitled "Fractured rock hydromechanics: from borehole testing to solute transport and CO₂ storage" - by the Geological Society, London.

- 2006 American Rock Mechanics Associations Rock Mechanics Award for paper on “Coupled thermal-hydrological-mechanical analysis of the Yucca Mountain Drift Scale Test.”
- 2004 Recognition of commitment of performance excellence in contributing to the Regulatory Integration Team effort of the Yucca Mountain Project.
- 2001 Outstanding Performance Award—for work on coupled THM processes—Lawrence Berkeley National Laboratory.
- 1996-1997 Wennergren Post-doctoral award (Sweden) for research commitment at Lawrence Berkeley National Laboratory, California.

REVIEW AND DISSERTATION COMMITTEES

- 2016 Thesis committee member for Ph.D. defense on “Model Development of Coupled Hydromechanical Processes in Heterogeneous Media Using Numerical Manifold Method” at Ho-Hai University, Nanjing, China, May 29, 2016.
- 2016 Member of the Technical Program Committee’s Technical Advisory Group (TAG) on the topic of geomechanics for the 13th International Conference on Greenhouse Gas Control Technologies (GHGT - 13), 14-18 November, Lausanne, Switzerland.
- 2014 Member of the Technical Program Committee’s Technical Advisory Group (TAG) on the topic of geomechanics for the 12th International Conference on Greenhouse Gas Control Technologies (GHGT - 12), 5-9 October, Austin, Texas, USA
- 2012 Thesis committee member for Ph.D. defense on “Thermo Hydro Mechanical Impacts of CO₂ Injection in Deep Saline Aquifers” at University of Catalonia, Barcelona, Spain, July 2012.
- 2011 Faculty opponent for Ph.D. defense on “Tunnel Grouting: Engineering Methods for Characterization of Fracture Systems in Hard Rock and Implications for Tunnel Inflow,” at Chalmers University of Technology, Sweden.
- 2007-2008 Member of the Radiation and Nuclear Safety Authority (STUK) review team as an expert on thermo-hydro-mechanical evolution associated with the Finish nuclear waste program.
- 2007 Faculty opponent for Ph.D. defense on “Thermomechanics of Swelling Unsaturated Porous Media-Compacted bentonite clay in spent fuel disposal,” Helsinki University of Technology, Finland.
- 2006-2010 Member of the Swedish Nuclear Power Inspectorate (SKI) review team as an expert on thermo-hydro-mechanical evolution and rock mechanics associated with the Swedish nuclear waste program.

- 2005 Opponent (French “Reporteur”) for Ph.D. defense on “Coupled Hydromechanical Processes in Heterogeneous Fractures Networks,” at University of Nice, France.
- 1999 Faculty opponent for Ph.D. defense on “Hydro-mechanical Behavior of a Pressurized Single Fracture: An In situ Experiment,” at Chalmers University, Sweden.

INVITED (1st Author) TALKS

- 2016
1. “Fault activation and induced seismicity in geologic carbon storage.” Invited Keynote Speaker at the International Forum on CO₂ Geological Storage Geomechanics, Wuhan, China, May 23-24, 2016.
 - 2 “Modeling injection-induced Seismicity Associated with Geologic CO₂ Sequestration, Shale-gas Fracturing and Stimulation of a Geothermal Reservoir.” Invited presentation at China University of Mining & Technology, Beijing, China, May 26, 2016.
 - 3 “Fractured-rock permeability-versus-stress relationships from in situ experiments.” Oral solicited presentation in Session NH3.10/GM8.2 - Hydro-geomechanical aspects of fractured bedrock systems: geotechnical, geomorphological and geohazard implications at the European Geosciences Union (EGU) General Assembly 2016 in Vienna, Austria, April 18-22, 2016.
 - 4 “Modeling of Injection-Induced Fault Reactivation and Seismicity in Geologic Carbon Storage and Shale-gas Fracturing.” Invited presentation at SEG/SPE Workshop: Injection Induced Seismicity-Engineering Integration, Evaluation and Mitigation. Fort Worth, Texas, 28-30 March, 2016.
- 2015
5. “Modeling Caprock Failure, Fault Activation, Induced Seismicity and Leakage Associated with Geologic CO₂ Storage.” Invited keynote speech at the International Workshop on Fracturing Geomechanics, Shandong University of Science and Technology, Qingdao, China, November 25, 2015.
 6. “Modeling Fault Reactivation, Induced Seismicity, and Leakage during Underground CO₂ Injection.” Invited keynote presentation at the UK Carbon Capture and Storage Research Centre (UKCCSRC) specialist meeting, Leeds, U.K., November 3, 2015.
 7. “Modeling injection-induced Seismicity Associated with Geologic CO₂ Sequestration, Unconventional Hydrocarbons and a Geothermal System.” Invited seminar at University of Leeds, Institute for Applied Geosciences, School of Earth and Environment, November 4, 2015.
 8. “Modeling Injection-induced Seismicity Associated with Geologic CO₂ Sequestration, Shale-gas Fracturing and Stimulation of a Geothermal Reservoir.” Invited presentation at the German Research Center for Geosciences (GFZ), Potsdam, Germany, June 25, 2015.

9. "Modeling Injection-induced Seismicity Associated with Geologic CO₂ Sequestration, Shale-gas Fracturing and Stimulation of a Geothermal Reservoir." Invited presentation at University of Uppsala, Department of Earth Sciences, Uppsala, Sweden, June 18, 2015.
10. "Modeling Fault Reactivation and Induced Seismicity during Underground CO₂ Injection." Invited guest speaker at Stanford Center for Carbon Storage (SCCS) Annual Meeting, Stanford, California, May 28, 2015.
11. "Modeling Fault Reactivation, Induced Seismicity, and Leakage during Underground CO₂ Injection." Invited seminar Department of Earth Sciences (HPT Laboratory), Faculty of Geosciences, Utrecht University, The Netherlands, March 27, 2015.
12. "Geomechanical Aspects of CO₂ Leakage." Invited presentation at Center for Nanoscale Control of Geologic CO₂ (NCGC) Scenarios Workshop, Berkeley, February 24, 2015.
- 2014
13. "TOUGH-FLAC Coupled Fluid Flow and Geomechanical Simulations Related to Geologic CO₂ Storage." Invited presentation at the State Key Laboratory of Geomechanics and Geotechnical Engineering, Institute of Rock and Soil Mechanics, Chinese Academy of Sciences, Wuhan, China, December 4, 2014
14. "Geomechanical Aspects of Geologic CO₂ Storage." Invited presentation at Hohai University, Geotechnical Engineering Institute, Nanjing, China, December 8, 2014.
15. "Modeling Fault Reactivation, Induced Seismicity, and Leakage during Underground CO₂ Injection." Invited presentation at the International Energy Agency (IEA) Greenhouse Gas R&D Programme's Monitoring Network and Modelling Network – Combined Meeting, Morgantown, West Virginia, August 7, 2014.
16. "Modeling of Fault Responses and Induced Seismicity during Underground CO₂ Injection." Invited talk at Istituto Nazionale di Geofisica e Vulcanologia) in Bologna (Italy), July 4, 2014.
- 2013
17. "Coupled Reservoir-geomechanical Analysis Associated with Geologic CO₂ Storage in Deep Sedimentary Formations." Invited special speaker at the 6th International Symposium on In-situ Rock Stress (RS2013), Sendai, Japan, 20-22 August, 2013.
18. "Recent TOUGH-FLAC Coupled Fluid Flow and Geomechanical Simulations Related to Geologic CO₂ Storage." Invited talk at the National Institute of Advanced Industrial Science and Technology (AIST), Tsukuba, Japan, August 26, 2013.
19. "Modeling of Fault Reactivation and Induced Seismicity During Hydraulic Fracturing of Shale-Gas Reservoirs." Invited speaker at

American Rock Mechanics Association (ARMA), Unconventional Resources Geomechanics Workshop, San Francisco, June 21, 2013.

20. "Modeling of Coupled Thermal-Hydrological-Mechanical (THM) Processes of Fractured Rocks for Multiphase Flow Applications." Invited seminar at Sejong University, Seoul, South Korea, April 19, 2013.

21. "Geomechanical aspects of geologic CO₂ storage critically important for safety and public acceptance." Invited plenary speaker at the 3rd Korea CCS Conference, Jeju Island, Korea, 13-15 March, 2013.

22. "Coupled THM Processes During Deep Injection Near Brittle-Ductile Rock Transition at The Geysers Geothermal Field, California" 10th International Workshop on Water Dynamics, Deep Carbon Cycle, and ICDP Japan Beyond-Brittle Project (JBBP). Sendai, Japan, 12-16 March, 2013.

2012 23. "Modeling of Geomechanical Performance of Sloping Oceanic Hydrate Deposits Subjected Production Activities." Invited presentation at American Geophysical Union (AGU), 2012 Fall Meeting, San Francisco, California December 6, 2012.

24. "Geomechanical modeling of fault responses and the potential for notable seismic events during underground CO₂ injection." Invited presentation at American Geophysical Union (AGU), 2012 Fall Meeting, San Francisco, California, December 3, 2012.

25. "Coupled THM Processes During Deep Injection Near Brittle-Ductile Rock Transition at The Geysers Geothermal Field, California." Seoul National University, Seoul, South Korea, October 19, 2012.

26. "Demonstration of an Enhanced Geothermal System at the Northwest Geysers Geothermal Field, CA." Invited talk at the Geothermal Stimulation Workshop Entitled "Reservoir Stimulation Current Understanding and Practice, and the Path Forward," Reno, Nevada, September 28 and 29, 2012.

27. "Modeling of the Potential Fault Reactivation in CO₂ sequestration and Shale Gas Fracking." Invited speaker at American Rock Mechanics Association (ARMA), Unconventional Resources Geomechanics Workshop, San Francisco, June 22, 2012.

28. "Coupling geomechanics and flow and transport: some recent studies at the Berkeley Laboratory." Invited Lecture at the post-TIMODAZ Workshop, Saint Ursanne, Switzerland, February 6, 2012.

2011 29. "Stress-versus-permeability relationships of fracture rock from in situ experiments and effects of chemical-mechanical coupling." Invited presentation at the American Geophysical Union (AGU), Fall Meeting, San Francisco December 16, 2011.

30. "Geomechanical Modeling and Monitoring of Fault Responses and the Potential for Earthquakes During Underground CO₂ Injection." Invited

presentation at the American Geophysical Union (AGU), Fall Meeting, San Francisco December 16, 2011.

31. "Modeling of Coupled THM Processes in Deep Systems," Invited presentation at the Uppsala Deep Hydrogeology Workshop, Uppsala, Sweden, September 22, 2011.

32. "Geomechanical Aspects and Modeling Associated with Geological Sequestration of CO₂," Invited presentation at University of Uppsala, Department of Earth Sciences, Uppsala, Sweden, September 23, 2011.

33. "Modeling Coupled Thermal-Hydro-Mechanical-Chemical Processes Associated with Geological Sequestration of CO₂," Invited Keynote presentation at the 8th International Conference on Calibration and Reliability in Groundwater Modeling MODEL CARE2011, Leipzig, Germany, September 18-22, 2011.

34. "NW Geysers EGS Demonstration Project," Invited presentation at the 2nd Annual Enhanced Geothermal Systems Conference, San Jose, California, June 29-30, 2011.

35. "CO₂ Sequestration Geomechanics and Modeling" Keynote speaker at American Rock Mechanics Association (ARMA), Unconventional Resources Geomechanics Workshop, San Francisco, June 24, 2011.

2010

36. "Geomechanical Aspects of CO₂ Sequestration and Modeling." Invited Keynote Lecturer of the International Workshop on Numerical Analysis for Geomechanics-Establishing Ceremony for Shi Gen-hua Numerical Manifold Method Research Center in Nanjing, China, October 14, 2010.

37. "Pre-Stimulation Coupled Geomechanical Modeling Associated with the North West Geysers EGS Demonstration Project." Invited presentation at GFZ German Research Center for Geosciences, Potsdam, Germany, September 24, 2010.

38. "Geomechanical Aspects of CO₂ Sequestration and Modeling." Guest lecture in the framework of rock mechanics II & applied rock mechanics in petroleum engineering, Institute of Petroleum Engineering, Technical University of Clausthal, Germany, September 23, 2010.

39. "Coupled Non-Isothermal Modeling of Ground Surface Deformations and Induced Seismicity at the In Salah CO₂ Storage Operation." American Association of Petroleum Geologists (AAPG) Geoscience Technology Workshop on Carbon Sequestration, Colorado School of Mines, Golden, CO, August 10-12, 2010.

40. "Modeling of Coupled Multiphase Fluid Flow and Geomechanical Processes Associated with Geologic CO₂ Sequestration." Keynote Lecture at the Research Institute of Innovative technology for the Earth (RITE) Technical Workshop on Geomechanics and CO₂ Sequestration, Kyoto, Japan, January 22, 2010.

41. "Status of TOUGH-FLAC and Recent Applications." Invited presentation at Kyoto University, Department of Civil and Earth Resources Engineering, Kyoto, Japan, January 21, 2010.
42. "Modeling of Coupled Multiphase Fluid Flow and Geomechanical Processes Associated with Geologic CO₂ Sequestration." Keynote Lecture at the Research Institute of Innovative technology for the Earth (RITE) Technical Workshop on Geomechanics and CO₂ Sequestration, Kyoto, Japan, January 22, 2010.
- 2009 43. "Coupled Hydro-Geomechanical Modeling of Geological Carbon Sequestration Systems." The 2009 Philomathia Forum on Energy and Environment: Berkeley-Stanford-Beijing U.S.-China Workshop on Carbon Dioxide Capture and Storage, Peking University, Beijing, China, November 11-12, 2009.
44. "Geomechanical modeling and geophysics associated with CO₂ sequestration." The Society of Exploratory Geophysicists (SEG) Summer workshop in Banff, Canada, August 23-27, 2009.
45. "Modeling of Coupled Thermal-Hydrological-Mechanical (THM) Processes of Fractured Rocks for Multiphase Flow Applications at Four Major Field Sites." Seoul National University and Korean Institute of Geology, Mining and Materials, Seoul and Taejon, South Korea, March 24, 2009.
46. "Coupled THM Processes Associated with Geologic CO₂ Storage." The Ohio State University Conference on Advancing the Science of Geologic Carbon Sequestration. Columbus, Ohio, March 8-10, 2009.
47. "Analysis of Thermal-Hydraulic-Mechanical Processes in Porous and Fractured Rocks and Geomechanical Performance of Hydrate-Bearing Sediments." StatoilHydro's Gas Recovery Workshop, Oslo, Norway, 5-6 March, 2009.
48. "Geomechanical Modeling Associated with Geological CO₂ Sequestration." The 1st Workshop of The International Energy Agency (IEA) CO₂ Modeling Network, Orleans, France, February 8 to 14, 2009.
49. Estimating stress-versus-permeability relationships of fractured rock using data from in situ experiments and effects of chemical-mechanical coupling." Special Lecture at the International Conference on Rock Joints and Jointed Rock Masses, Tucson, Arizona, Jan 4-10, 2009.
- 2007 50. "Stress-versus-permeability Relationships of Fractures from In Situ Experiments." American Geophysical Union (AGU), Fall Meeting, San Francisco December 15, 2007.
- 2006 51. "TOUGH-FLAC: A Computer Simulator for Analysis of Coupled THM Processes under Multi-phase Conditions with Applications to CO₂ Sequestration." Mizuho Information & Research Institute, Inc., Tokyo, Japan, September 8, 2006.

2005 52. "TOUGH-FLAC: A Computer Code for Soil and Rock Mechanics Coupled with Multiphase Fluid Flow." University of Nice, France, November 3, 2005.

PUBLICATIONS

Publication Metrics

- +400 technical publications, including 152 refereed journal papers and book chapters.
- 119 publications with **3004 citations** and **H-index = 31** in Thomson Reuters Institute for Scientific Information (ISI) Web of Science Core Collection (as of June 2016). Google Scholar **h-index 42** with **6785 citations**.
- Researcher ID: F-4957-2015 (<http://www.researcherid.com/rid/F-4957-2015>)
- Google Scholar:
(<https://scholar.google.com/citations?user=hU1EjukAAAAJ&hl=en&oi=ao>)

Refereed Journal Papers

1. **Rutqvist J.**, Jeanne P., Dobson P.F., Garcia J., Hartline C., Hutchings L., Singh A., Vasco D.W., and Walters M. The Northwest Geysers EGS Demonstration Project, California - Part 2: Modeling and interpretation. *Geothermics*, **51**, [doi:10.1016/j.geothermics.2015.08.002](https://doi.org/10.1016/j.geothermics.2015.08.002), in press (2016).
2. Garcia, J., Hartline, C., Walters, M., Wright, M., **Rutqvist, J.**, Dobson, P.F., Jeanne, P. The Northwest Geysers EGS Demonstration Project, California - Part 1: Characterization and reservoir response to injection. *Geothermics*, **51**, [doi:10.1016/j.geothermics.2015.08.003](https://doi.org/10.1016/j.geothermics.2015.08.003), in press (2016).
3. Blanco-Martín L., Wolters R., **Rutqvist J.**, Lux K.-H., Birkholzer J.T. Thermal–hydraulic–mechanical modeling of a large-scale heater test to investigate rock salt and crushed salt behavior under repository conditions for heat-generating nuclear waste. *Computers and Geotechnics*, **77**, 120–133 (2016).
4. Wang Y., Hu M., Zhou Q., and **Rutqvist J.** A new second-order numerical manifold method model with an efficient scheme for analyzing free surface flow with inner drains. *Applied Mathematical Modelling*, **40**, 1427–1445 (2016).
5. Park J.-W., **Rutqvist J.**, Ryu D., Park E.-S., and Synn J.-H. Coupled thermal-hydrological-mechanical behavior of rock mass surrounding a high-temperature thermal energy storage cavern at shallow depth. *International Journal of Rock Mechanics & Mining Sciences*, **83**, 149-161 (2016).
6. Kim H.-M., **Rutqvist J.**, Kim H., Park D., Ryu D.-W., and Park E.-S. Failure monitoring and leakage detection for underground storage of compressed are energy in lined rock caverns. *Rock Mechanics and Rock Engineering*, *Rock Mech Rock Eng*, **49**, 573–584 (2016).
7. Basmanov O.L., A.V. Kiryukhin A.V., Maguskin M.A., Dvigalo V.N., and **Rutqvist J.** Thermo-hydrogeomechanical modeling of vertical ground deformation during the

- operation of the Mutnovskii Geothermal Field. *Journal of Volcanology and Seismology*, **10**, 137–148 (2016).
8. Vilarrasa V., **Rutqvist J.**, Blanco-Martin L., and Birkholzer J. Use of a dual structure constitutive model for predicting the long-term behavior of an expansive clay buffer in a nuclear waste repository. *ASCE's International Journal of Geomechanics* doi.org/10.1061/(ASCE)GM.1943-5622.0000603, online Dec 31 (2015).
 9. Urpi L., Rinaldi A.P., **Rutqvist J.**, Cappa F., and Spiers C.J. Dynamic simulation of CO₂-injection-induced fault rupture with 1 slip-rate dependent friction coefficient. *Geomechanics for the Energy and Environment*, (accepted April 28, 2016). <http://dx.doi.org/10.1016/j.gete.2016.04.003>.
 10. Hu M., Wang Y., and **Rutqvist J.** Development of a discontinuous approach for modeling fluid flow in heterogeneous media using the numerical manifold method. *International Journal for Numerical and Analytical Methods in Geomechanics*, **39**, 1932-1952 (2015).
 11. Jeanne P., **Rutqvist J.**, Rinaldi A.P., Dobson P.F., Walters M., Hartline C. and Garcia J. Seismic and aseismic deformations and impact on reservoir permeability: The case of EGS stimulation at The Geysers, California, USA, *Journal of Geophysical Research Solid Earth*, **120**, 7863–7882 (2015).
 12. Jeanne P., **Rutqvist J.**, Dobson P.F., Garcia J., Walters M., Hartline C., and Borgia A. Geomechanical simulation of the stress tensor rotation caused by injection of cold water in a deep geothermal reservoir. *Journal of Geophysical Research Solid Earth*, **120**, 8422–8438 (2015).
 13. Zheng L., **Rutqvist J.**, Birkholzer J.T., Liu H.H. On the impact of temperatures up to 200°C in clay repositories with bentonite engineer barrier systems: a study with coupled thermal, hydrological, chemical, and mechanical modeling. *Engineering Geology*, **197**, 278–295, (2015).
 14. **Rutqvist J.** Fractured rock stress-permeability relationships from in situ data and effects of temperature and chemical-mechanical couplings. *Geofluids*, **15**, 48–66 (2015).
 15. Figueiredo, B., Tsang C.F., **Rutqvist J.**, and Niemi A. A study of Numerical study of changes in deep fractured rock permeability due to coupled hydro-mechanical effects. *International Journal of Rock Mechanics & Mining Sciences*, **79**, 70-85 (2015).
 16. Figueiredo, B., Tsang C.F., **Rutqvist, J.**, Bensabat J., and Niemi A. Coupled hydro-mechanical processes and fault reactivation induced by CO₂ Injection in a three-layer storage formation. *International Journal of Greenhouse Gas Control*, **39**, 432–448 (2015).
 17. Rinaldi A.P., Vilarrasa V., **Rutqvist J.** and Cappa F. Fault reactivation during CO₂ sequestration: Effects of well orientation on seismicity and leakage. *Greenhouse Gas Sciences and Technology*, **5**, 1–12 (2015).
 18. Blanco-Martín L., **Rutqvist J.**, Birkholzer J.T. Long-term modelling of the thermal-hydraulic-mechanical response of a generic salt repository for heat-generating nuclear waste. *Engineering Geology*, **193**, 198–211 (2015).
 19. Synn J.-H., Park C., Jung Y.-B., Sunwoo C., Kim K.-S., Choi S.Y., Song M.-K., Shin I.-J. and **Rutqvist J.** Integrated 3-D stress determination by hydraulic fracturing in

- multiple inclined boreholes beneath an underground cavern. *International Journal of Rock Mechanics & Mining Sciences*, **75**, 44–55 (2015).
20. Rinaldi A.P., **Rutqvist J.**, Sonnenthal E., L., and Cladouhos T.T. Coupled THM modeling of hydroshearing stimulation in tight fractured volcanic rock. *Transport in Porous Media*, **108**, 131–150 (2015).
 21. Vilarrasa V., **Rutqvist J.**, and Rinaldi A.P. Thermal and capillary effects on the caprock mechanical stability at In Salah, Algeria. *Greenhouse Gas Science and Technology*, **5**, 1–13 (2015).
 22. Hu M., Wang Y., and **Rutqvist J.** On continuous and discontinuous approaches for modeling groundwater flow in heterogeneous media using the Numerical Manifold Method: Model development and comparison. *Advances in Water Resources*, **80**, 17–29 (2015).
 23. **Rutqvist J.**, Dobson P.F., Garcia J., Hartline C., Jeanne P., Oldenburg C.M., Vasco D.W., Walters M. The northwest Geysers EGS demonstration project, California: Pre-stimulation modeling and interpretation of the stimulation. *Mathematical Geosciences*, **47**, 3–26 (2015).
 24. Kim J., Sonnenthal E., and **Rutqvist J.** A sequential implicit algorithm if chemo-thermo-poro-mechanics for fractured geothermal reservoir. *Computers & Geosciences*, **76**, 59–71 (2015).
 25. **Rutqvist J.**, Rinaldi A.P., Cappa F., and Moridis G.J. Modeling of fault activation and seismicity by injection directly into a fault zone associated with hydraulic fracturing of shale-gas reservoirs. *Journal of Petroleum Science and Engineering*, **127**, 377–386 (2015).
 26. Hu M., Wang Y., and **Rutqvist J.** An effective approach for modeling fluid flow in heterogeneous media using numerical manifold method. *International Journal for Numerical Methods in Fluids*, **77**, 459–476 (2015).
 27. Blanco-Martín L., Wolters R., **Rutqvist J.**, Lux K.-H., Birkholzer J.T. Comparison of two simulators to investigate thermal-hydraulic-mechanical processes related to nuclear waste isolation in saliniferous formations. *Computers and Geotechnics*, **66**, 219–229 (2015).
 28. Jeanne P., **Rutqvist J.**, Hutchings L., Singh A., Dobson P.F., Walters M., Hartline C., Garcia J. Degradation of the mechanical properties imaged by seismic tomography during an EGS creation at The Geysers (California) and geomechanical modeling. *Physics of the Earth and Planetary Interiors*, **240**, 82–94 (2015).
 29. Park J.-W., **Rutqvist J.**, Ryu D., Synn J.-H., and Park E.-S. Coupled thermal-hydrological-mechanical behavior of rock mass surrounding cavern thermal energy storage. *Tunnel & Underground Space* (in Korean), **25**, 155–167 (2015).
 30. Park J.-W., **Rutqvist J.**, Lee H.B., Ryu D., Synn J.-H., and Park E.-S. Effects of hydrological condition on the coupled thermal-hydrological-mechanical behavior of rock mass surrounding cavern thermal energy storage. *Tunnel & Underground Space*, **25**, 168–185 (2015).
 31. **Rutqvist J.**, Cappa F., Rinaldi A.P., and Godano M. Modeling of induced seismicity and ground vibrations associated with geologic CO₂ storage, and assessing their effects on surface structures and human perception. *International Journal of Greenhouse Gas Control* **24**, 64–77 (2014).

32. Kim H.-M., **Rutqvist J.**, and Bae Wi-Sup. Sensitivity analysis for fault reactivation in potential CO₂-EOR site with multi-layers of permeable and impermeable formations. *Geosystem Engineering*, **17**, 253–263, (2014).
33. Wang Z., **Rutqvist J.**, Wang Y., Leung C., Hoch A., and Dai Y. The effect of stress on flow and transport in fractured rock masses using an extended multiple interacting continua method with crack tensor theory. *Nuclear Technology*, **187**, 158-168, (2014).
34. Jeanne P., **Rutqvist J.**, Dobson P.F., Walters M., Hartline C., Garcia J. The impacts of mechanical stress transfers caused by hydromechanical and thermal processes on fault stability during hydraulic stimulation in a deep geothermal reservoir. *International Journal of Rock Mechanics & Mining Sciences*, **72**, 149–163 (2014).
35. Zheng L., **Rutqvist J.**, Liu H.-H., Birkholzer J.T., and Sonnenthal E. Model evaluation of geochemically induced swelling/shrinkage in argillaceous formations for nuclear waste disposal. *Applied Clay Science*, **97–98**, 24–32 (2014).
36. Vilarrasa V., Olivella S., Carrera J., and **Rutqvist J.** Long term impacts of cold CO₂ injection on the caprock integrity. *International Journal of Greenhouse Gas Control*, **24**, 1–13 (2014).
37. Jeanne P., **Rutqvist J.**, Vasco D., Garcia J., Dobson P.F., Walters M., Hartline C., and Borgia A. A 3D hydrogeological and geomechanical model of an Enhanced Geothermal System at The Geysers, California, *Geothermics*, **51**, 240–252 (2014).
38. Jeanne P., **Rutqvist J.**, Hartline C., Garcia J., Dobson P.F., and Walters M. Reservoir structure and properties from geomechanical modeling and microseismicity analyses associated with an enhanced geothermal system at The Geysers, California, *Geothermics*, **51**, 460–469 (2014).
39. Wang Y, Hu M., Zhou Q., and **Rutqvist J.** Energy-work-based numerical manifold seepage analysis with an efficient scheme to locate the phreatic surface. *International Journal for Numerical and Analytical Methods in Geomechanics*, **38**, 1633–1650 (2014).
40. Wang Y., and **Rutqvist J.** Operator matrix and non-uniqueness of Beltrami–Schaefer stress functions. *Acta Mechanica*, **225**, 1761–1768 (2014).
41. Asahina D., Houseworth J.E., Birkholzer J.T., **Rutqvist J.**, and Bolander J.E. Hydro-mechanical model for fracture development and fluid transport in geomaterials. *Computers & Geosciences*, **65**, 13-23 (2014).
42. Jeanne P., Guglielmi Y., Cappa F., Rinaldi A.P., **Rutqvist J.** The effects of lateral property variations on fault-zone reactivation by fluid pressurization: application to CO₂ pressurization effects within major and undetected fault zones. *Journal of Structural Geology*, **62**, 97-108 (2014).
43. Pan, P.-Z., **Rutqvist, J.**, Feng X.-T., and Yan F. TOUGH–RDCA modeling of multiple fracture interactions in caprock during CO₂ injection into a deep brine aquifer. *Computers & Geosciences*, **65**, 24-36 (2014).
44. Guglielmi Y., Cappa F., Lanc H., Janowczyk J.B., **Rutqvist J.**, Tsang C.-F. and Wang J.S.Y. ISRM suggested method for step-rate injection method for fracture in-situ properties (SIMFIP): Using a 3-component Borehole Deformation Sensor. *Rock Mechanics and Rock Engineering* **47**, 303–311 (2014).
45. Konstantinovskaya E., **Rutqvist J.**, and Malo M. CO₂ storage and potential fault instability in the St. Lawrence Lowlands sedimentary basin (Quebec, Canada):

- Insights from coupled reservoir-geomechanical modeling. *International Journal of Greenhouse Gas Control*, **22**, 88–110 (2014).
46. Rinaldi A.P., Jeanne P., **Rutqvist J.**, Cappa F., and Guglielmi Y. Effects of fault-zone architecture on earthquake magnitude and gas leakage related to CO₂ injection in a multilayered sedimentary system. *Greenhouse Gases: Science and Technology*, **4**, 99-120 (2014).
 47. Rinaldi A.P., **Rutqvist J.**, and Cappa F. Geomechanical effects on CO₂ leakage through fault zones during large-scale underground injection. *International Journal of Greenhouse Gas Control*, **20**, 117–131 (2014).
 48. **Rutqvist J.**, Zheng L., Chen F, Liu H.-H, and Birkholzer J. Modeling of Coupled Thermo-Hydro-Mechanical Processes with Links to Geochemistry Associated with Bentonite-Backfilled Repository Tunnels in Clay Formations. *Rock Mechanics and Rock Engineering*, **47**, 167–186 (2014).
 49. Pan P.-Z., **Rutqvist J.**, Feng X.-T., and Yan F. An approach for modeling rock discontinuous mechanical behavior under multiphase fluid flow conditions. *Rock Mechanics and Rock Engineering*, **47**, 589–603 (2014).
 50. Pan P.-Z., **Rutqvist J.**, Feng X.-T., Yan F., and Jiang Q. A discontinuous cellular automaton method for modeling rock fracture propagation and coalescence under fluid pressurization without remeshing. *Rock Mechanics and Rock Engineering*, **47**, 2183–2198 (2014).
 51. Kim H.-M. and **Rutqvist J.** Geomechanical model analysis for the evaluation of mechanical stability of unconsolidated sediments during gas hydrate development and production. *Tunnel & Underground Space* (in Korean) **24**, 143-154 (2014).
 52. Rinaldi A.P. and **Rutqvist J.** Modeling of deep fracture zone opening and transient ground surface uplift at KB-502 CO₂ injection well, In Salah, Algeria. *International Journal of Greenhouse Gas Control*, **12**, 155–167 (2013).
 53. Pan P.-Z., **Rutqvist J.**, Feng X.-T., and Yan F. Modeling of caprock discontinuous fracturing during CO₂ injection into a deep brine aquifer. *International Journal of Greenhouse Gas Control*, **19**, 559–575 (2013).
 54. Wang Z., **Rutqvist J.**, and Dai Y. A Multi-continuum method for studying the effect of inactive fractures on solute transport in 2-D Discrete Fracture Network. *CMES: Computer Modeling in Engineering & Sciences*, **92**, 539-556 (2013).
 55. Wang Z., **Rutqvist J.**, Zuo J., and Dai Y. A modified equivalent permeability model of fracture element and its verification. *Chinese Journal of Rock Mechanics and Engineering* (in Chinese), **32**, 728–733 (2013).
 56. Derode B., Cappa F., Guglielmi Y. and **Rutqvist J.** Coupled seismo-hydromechanical monitoring of inelastic effects on injection-induced fracture permeability. *International Journal of Rock Mechanics & Mining Sciences*, **61**, 266–274 (2013).
 57. Vasco D.W., **Rutqvist J.**, Dobson P., Oldenburg C., Ferretti A., Rucci A., Bellotti F., Garcia J., Walters M., and Hartline C. Monitoring deformation at The Geysers geothermal field, California using C-band and X-band Interferometric Synthetic Aperture Radar. *Geophysical Research Letters*, **40**, 1–6 (2013).
 58. Wang Y. and **Rutqvist J.** Non-uniqueness of Beltrami-Schaefer stress functions. *Journal of Elasticity*, **11**, 283–288 (2013).

59. **Rutqvist J.**, Rinaldi, A.P., Cappa, F., and Moridis G.J. Modeling of fault reactivation and induced seismicity during hydraulic fracturing of shale-gas reservoirs. *Journal of Petroleum Science and Engineering*, **107**, 31–44 (2013).
60. Kim H.-M., **Rutqvist J.**, Jeong J.-H., Choi B.-H., Ryu D.-W., and Song W.-K. Characterizing excavation damaged zone and stability of pressurized lined rock caverns for underground compressed air energy storage. *Rock Mechanics and Rock Engineering*, **46**, 1113–1124 (2013).
61. Lee J., Min K.-B., and **Rutqvist J.** Probabilistic analysis of fracture reactivation associated with deep underground CO₂ injection. *Rock Mechanics and Rock Engineering*, **46**, 801–820 (2013).
62. Zhao Z., **Rutqvist J.**, Leung C., Hokr M., Neretnieks I., Hoch A., Havlíček J., Wang Y., Wang Z. and Zimmerman R. Stress effects on solute transport in fractured rocks: A comparison study. *Journal of Rock Mechanics and Geotechnical Engineering*, **5**, 110–123 (2013).
63. Liu H.-H., Wei M.-Y. and **Rutqvist J.** Normal-stress dependence of fracture hydraulic properties including two-phase flow properties. *Hydrogeology Journal*, **21**, 371–382 (2013).
64. **Rutqvist J.**, Leung C., Hoch A., Wang Y., and Wang Z. Linked multicontinuum and crack tensor approach for modeling of coupled geomechanics, fluid flow and transport in fractured rock. *International Journal of Rock Mechanics and Geotechnical Engineering*, **5**, 18–31 (2013).
65. Liu H.H. and **Rutqvist J.** Coupled hydro-mechanical processes associated with multiphase flow in a dual-continuum system: Formulations and a sensitivity study. *Rock Mechanics and Rock Engineering*, **46**, 1103–1112 (2013).
66. **Rutqvist J.** The geomechanics of CO₂ storage in deep sedimentary formations. *International Journal of Geotechnical and Geological Engineering*, **30**, 525–551 (2012).
67. **Rutqvist J.** and Tsang C.-F. Multiphysics processes in partially saturated fractured rock: Experiments and models from Yucca Mountain. *Reviews of Geophysics*, **50**, RG3006 (2012).
68. Mazzoldi A., Rinaldi A.P., Borgia A. and **Rutqvist J.** Induced seismicity within geologic carbon sequestration projects: Maximum earthquake magnitude and leakage potential. *International Journal of Greenhouse Gas Control*, **10**, 434–442 (2012).
69. Cappa F. and **Rutqvist J.** Seismic rupture and ground accelerations induced by CO₂ injection in the shallow crust. *Geophysical Journal International*, **190**, 1784–1789 (2012).
70. **Rutqvist J.**, Moridis G.J., Grover T., Silpngrarmert S., Collett T.S., and Holdich S.A. Coupled multiphase fluid flow and wellbore stability analysis associated with gas production from oceanic hydrate-bearing sediments. *Journal of Petroleum Science and Engineering*, **92–93**, 65–81 (2012).
71. Kim J., Moridis G.J. and **Rutqvist J.** Coupled flow and geomechanical analysis for gas production in the Prudhoe Bay Unit L-106 Well Unit C gas hydrate deposit in Alaska. *Journal of Petroleum Science and Engineering*, **92–93**, 143–157 (2012).
72. **Rutqvist J.**, Kim H.-M., Ryu D.-W., Synn J.-H., Song W.-K. Modeling of coupled thermodynamic and geomechanical performance of underground compressed air

- energy storage in lined rock caverns. *International Journal of Rock Mechanics & Mining Sciences*, **52**, 71–81 (2012).
73. Kim J., Sonnenthal E., and **Rutqvist J.** A modeling and sequential numerical algorithms of coupled fluid/heat flow and geomechanics for multiple porosity materials. *International Journal of Numerical. Methods in Engineering*. **92**, 425–456 (2012).
74. Kim J., Moridis G.J., Yang D. and **Rutqvist J.** Numerical studies on two-way coupled fluid flow and geomechanics in hydrate deposits. Society of Petroleum Engineers, SPE-141304-PA, *SPE Journal*, **17**, 485–501 (2012).
75. Kim H.-M., **Rutqvist J.**, Ryu D.-W., Choi B.-H., Sunwoo C., and Song W.-K. Exploring the concept of compressed air energy storage (CAES) in lined rock caverns at shallow depth: A modeling study of air tightness and energy balance. *Applied Energy*, **92**, 653–667 (2012).
76. Cappa F. and **Rutqvist J.** Impact of CO₂ geological sequestration on the nucleation of earthquakes. *Geophysical Research Letters*, **38**, L17313, (2011).
77. **Rutqvist J.** Status of the TOUGH-FLAC simulator and recent applications related to coupled fluid flow and crustal deformations. *Computers & Geosciences*, **37**, 739–750 (2011).
78. **Rutqvist J.**, Ijiri Y. and Yamamoto H. Implementation of the Barcelona Basic Model into TOUGH-FLAC for simulations of the geomechanical behavior of unsaturated soils. *Computers & Geosciences*, **37**, 751–762 (2011).
79. Kim H.-M., **Rutqvist J.**, Ryu D.-W., Sunwoo C., and Song W.-K. Sensitivity analysis of design parameters of air tightness in underground lined rock cavern (LRC) for compressed air energy storage (CAES). *Tunnel & Underground Space* (in Korean), **21**, 287-296 (2011).
80. Wang W., **Rutqvist J.**, Görke U.-J., Birkholzer J.T. and Kolditz O. Non isothermal flow in low permeable porous media: A comparison of Richards' and two-phase flow approaches. *Environmental Earth Sciences*, **62**, 1197–1207 (2011).
81. Moridis G.J., Collett T.S., Pooladi-Darvish M., Santamarina C., Boswell R., Kneafsey T.J., **Rutqvist J.**, Kowalsky M.B., Reagan M.T., Sloan E.D., Sum A. and Koh, C. Challenges, Uncertainties, and Issues Facing Gas Production From Gas-Hydrate Deposits. Society of Petroleum Engineers, SPE-131792-PA *SPE Res Eval & Eng*, **14**, 76–112 (2011).
82. Liu H.H., **Rutqvist J.** and Birkholzer J.T. Constitutive Relationships for Elastic Deformation of Clay Rock: Data Analysis. *Rock Mechanics and Rock Engineering*, **44**, 463–468 (2011).
83. Cappa F. and **Rutqvist J.** Modeling of coupled deformation and permeability evolution during fault reactivation induced by deep underground injection of CO₂. *International Journal of Greenhouse Gas Control*, **5**, 336–346 (2011).
84. Kim H.-M., **Rutqvist J.**, Ryu D.-W., Synn J.-H., and Song W.-K. Geomechanical stability of underground lined rock caverns (LRC) for compressed air energy storage (CAES) using coupled thermal-hydraulic-mechanical analysis. *Tunnel & Underground Space* (in Korean), **21**, 394-405 (2011).
85. Fransson Å, Tsang C.-F., **Rutqvist J.** and Gustafson G. Estimation of deformation and stiffness of fractures close to tunnels using data from single-hole hydraulic testing

- and grouting. *International Journal of Rock Mechanics & Mining Sciences*, **47**, 887–893 (2010).
86. **Rutqvist J.**, Vasco D., and Myer L. Coupled reservoir-geomechanical analysis of CO₂ injection and ground deformations at In Salah, Algeria. *Int. J. Greenhouse Gas Control*, **4**, 225–230 (2010).
87. Liu H.-H. and **Rutqvist J.** A new coal-permeability model: Internal swelling stress and fracture-matrix interaction. *Transport in Porous Media*, **82**, 157-171, 2010.
88. Cappa F., **Rutqvist J.**, and Yamamoto K. Modeling crustal deformation and rupture processes related to upwelling of deep CO₂ rich fluids during the 1965-1967 Matsushiro Earthquake Swarm in Japan. *Journal of Geophysical Research*, **114**, B10304, (2009).
89. Chijimatsu M., Börgesson L., Fujita T., Jussila P., Nguyen S., **Rutqvist J.**, and Jing L. Model development and calibration for the coupled thermal, hydraulic and mechanical phenomena of the bentonite. *Environmental Geology*, **57**, 1255–1261 (2009).
90. **Rutqvist J.**, Moridis G.J., Grover T., and Collett T. Geomechanical response of permafrost-associated hydrate deposits to depressurization-induced gas production. *Journal of Petroleum Science and Engineering*, **67**, 1–12 (2009).
91. Nguyen T.S., Börgesson L., Chijimatsu M., Hernelind J., Jing L., Kobayashi A. and **Rutqvist J.** A case study on the influence of THM coupling on the near field safety of a spent fuel repository in sparsely fractured granite. *Environmental Geology*, **57**, 1239–1254 (2009).
92. Hudson J.A., Bäckström A., **Rutqvist J.**, Jing L., Backers T., Chijimatsu M., Christiansson R., Feng X.-T., Kobayashi A., Koyama T., Lee H.-S., Neretnieks I., Pan P.-Z., Rinne M. and Shen B. Characterising and modelling the excavation damaged zone (EDZ) in crystalline rock in the context of radioactive waste disposal. *Environmental Geology*, **57**, 1275–1297 (2009).
93. **Rutqvist J.**, Börgesson L., Chijimatsu M., Hernelind J., Jing L., Kobayashi A. and Nguyen S. Modeling of damage, permeability changes and pressure responses during excavation of the TSX tunnel in granitic rock at URL, Canada. *Environmental Geology*, **57**, 1263–1274 (2009).
94. **Rutqvist J.**, Bäckström A., Chijimatsu M., Feng X.-T., Pan P.-Z., Hudson J., Jing L., Kobayashi A., Koyama T., Lee H.-S., Huang X.-H., Rinne M. and Shen B. Multiple-code simulation study of the long-term EDZ evolution of geological nuclear waste repositories. *Environmental Geology*, **57**, 1313–1324 (2009).
95. **Rutqvist J.**, Barr D., Birkholzer J.T., Fujisaki K., Kolditz O., Liu Q.-S., Fujita T., Wang W. and Zhang C.-Y. A comparative simulation study of coupled THM processes and their effect on fractured rock permeability around nuclear waste repositories. *Environmental Geology*, **57**, 1347–1360 (2009).
96. Wessling S., Junker R., **Rutqvist J.**, Silin D., Sulzbachera H., Tischner T., and Tsang C.-F. Pressure analysis to determine the hydromechanical fracture behaviour in stimulated tight sedimentary geothermal reservoirs. *Geothermics*, **38**, 211–226 (2009).
97. Liu H.H., **Rutqvist J.** and Berryman J.C. On the relationship between stress and elastic strain for porous and fractured rock. *International Journal Rock Mechanics & Mining Sciences*, **46**, 289–296 (2009).

98. Min K.-B., **Rutqvist J.**, and Elsworth D. Chemically and mechanically mediated influences on the transport and mechanical characteristics of rock fractures. *International Journal Rock Mechanics & Mining Sciences*, **46**, 80–89 (2009).
99. **Rutqvist J.** and Moridis G. Numerical Studies on the Geomechanical Stability of Hydrate-Bearing Sediments. *SPE Journal*, **14**, 267–282 (2009).
100. **Rutqvist J.**, Freifeld B., Min K.-B., Elsworth D., and Tsang Y. Analysis of thermally induced changes in fractured rock permeability during eight years of heating and cooling at the Yucca Mountain Drift Scale Test. *International Journal of Rock Mechanics & Mining Sciences*, **45**, 1373–1389 (2008).
101. **Rutqvist J.**, Barr D., Birkholzer J.T., Chijimatsu M., Kolditz O., Liu Q.-S., Oda Y, Wang W.-Q. and Zhang C.-Y. Results from an international simulation study on coupled thermal, hydrological, and mechanical (THM) processes near geological nuclear waste repositories. *Nuclear Technology*, **163**, 101–109 (2008).
102. Cappa F., Guglielmi Y., **Rutqvist J.**, Tsang C.-F., and Thoraval A. Estimation of fracture flow parameters through numerical analysis of hydromechanical pressure pulses, *Water Resources Research*, **44**, W11408, (2008).
103. Tsang C.-F., Birkholzer J., and **Rutqvist J.** A comparative review of hydrologic issues involved in geologic storage of CO₂ and injection disposal of liquid waste. *Environmental Geology*, **54**, 1723–1737 (2008).
104. Zhou Q.-L., Birkholzer J., Tsang C.-F., and **Rutqvist J.** A Method for Quick-Assessment of CO₂ Storage Capacity in Closed and Semi-Closed Porous Formations. *International Journal of Greenhouse Gas Control*, **2**, 626–639 (2008).
105. Guglielmi Y., Cappa F., **Rutqvist J.**, Tsang C.-F. and A. Thoraval. Mesoscale characterization of coupled hydromechanical behavior of a fractured-porous slope in response to free water-surface movement. *Int. J. Rock Mech. & Min. Sci.* **45**, 862–878 (2008).
106. **Rutqvist J.**, Birkholzer J.T., and Tsang C.F. Coupled Reservoir-Geomechanical Analysis of the Potential for Tensile and Shear Failure Associated with CO₂ Injection in Multilayered Reservoir-Caprock Systems. *Int. J. Rock Mech. & Min. Sci.* **45**, 132–143 (2008).
107. Fransson Å, Tsang C.-F., **Rutqvist J.** and Gustafson G. A New Parameter to Assess Hydromechanical Effect in Single-hole Hydraulic Testing and Grouting. *Int. J. Rock Mech. & Min. Sci.* **44**, 1011-1021 (2007).
108. **Rutqvist J.**, Birkholzer J., Cappa F., and Tsang C.-F. Estimating maximum sustainable injection pressure during geological sequestration of CO₂ using coupled fluid flow and geomechanical fault-slip analysis. *Energy Conversion and Management* **48**, 1798–1807 (2007).
109. Daley T.M., Schoenberg M.A., **Rutqvist J.** and Nihei K.T. Fractured reservoirs: An analysis of coupled elastodynamic and permeability changes from pore-pressure variation. *Geophysics*, **71**, O33-O41 (September-October 2006).
110. Cappa F., Guglielmi Y., **Rutqvist J.**, Tsang C.-F. and Thoraval A. Hydromechanical modeling of pulse tests that measure both fluid pressure and fracture-normal displacement at the Coaraze Laboratory site, France. *Int. J. Rock Mech. & Min. Sci.* **43**, 1062-1082 (2006).
111. **Rutqvist J.**, Barr D., Datta R., Gens A., Millard M., Olivella S., Tsang C.F. and Tsang Y. Coupled thermal-hydrological-mechanical analysis of the Yucca Mountain

- Drift Scale Test – comparison of field results to predictions of four different models. *Int. J. Rock Mech. & Min. Sci.*, **42**, 680-697 (2005).
112. **Rutqvist J.**, Chijimatsu M., Jing L., De Jonge J., Kohlmeier M., Millard A., Nguyen T.S., Rejeb A., Souley M., Sugita Y. and Tsang C.F. Numerical study of the THM effects on the near-field safety of a hypothetical nuclear waste repository – BMT1 of the DECOVALEX III project. Part 3: Effects of THM coupling in fractured rock *Int. J. Rock Mech. & Min. Sci.*, **42**, 745-755 (2005).
 113. Alonso E.E., Alcoverro J., Coste F., Malinsky L., Merrien Soukatchoff V., Kadiri I., Nowak T., Shao H., Nguyen T.S., Selvadurai A.P.S., Armand G., Sobolik S.R., Itamura C.M., Stone C.M., Webb S.W., Rejeb A., Tijani M., Maouche Z., Kobayashi A., Kurikami H., Ito A., Sugita Y., Chijimatsu M., Börgesson L., Hernelind J., **Rutqvist J.**, Tsang C.F. and Jussila P. The FEBEX Bechmark test. Case Definition and comparison of modelling approaches. *Int. J. Rock Mech. & Min. Sci.*, **42**, 611-638 (2005).
 114. Min KB, **Rutqvist J.**, Tsang C.-F. and Jing L. Thermally induced mechanical and permeability changes around a nuclear waste repository – a far-field study based on equivalent properties determined by a discrete approach. *Int. J. Rock Mech. & Min. Sci.*, **42**, 765-780 (2005).
 115. Chijimatsu M., Nguyen T.S., Jing L., De Jonge J., Kohlmeier M., Millard A., Rejeb A., **Rutqvist J.**, Souley M., and Sugita Y. Numerical study of the THM effects on the near-field safety of a hypothetical nuclear waste repository – BMT1 of the DECOVALEX III project. Part 1: Conceptualization and characterization of the problems and summary of results. *Int. J. Rock Mech. & Min. Sci.*, **42**, 720-730 (2005).
 116. Millard A., Rejeb A., Chijimatsu M., Jing L., De Jonge J., Kohlmeier M., Nguyen T.S., **Rutqvist J.**, Souley M., and Sugita Y. Numerical study of the THM effects on the near-field safety of a hypothetical nuclear waste repository – BMT1 of the DECOVALEX III project. Part 2: Effects of THM coupling in continuous and homogeneous rock. *Int. J. Rock Mech. & Min. Sci.*, **42**, 731-744 (2005).
 117. Todesco M., **Rutqvist J.**, Chiodini G., Pruess K., and Oldenburg C.M. Modeling of recent volcanic episodes at Phlegrean Fields (Italy): geochemical variations and ground deformation. *Geothermics* **33**, 531-547 (2004).
 118. Min KB, **Rutqvist J.**, Tsang C.-F., and Jing L. Stress-dependent permeability of fracture rock masses: a numerical study. *Int. J. Rock Mech. & Min. Sci.*, **41**, 1191-1210 (2004).
 119. Pruess, K., García J, Kovscek J.T., Oldenburg C, **Rutqvist J.**, Steefel C. and Xu T. Code Intercomparison Builds Confidence in Numerical Simulation Models for Geologic Disposal of CO₂, *Energy*, **29**, 1431-1444 (2004).
 120. **Rutqvist J.** and Stephansson O. The role of hydromechanical coupling in fractured rock engineering. *Hydrogeology Journal*, **11**, 7–40 (2003).
 121. **Rutqvist J.** and Tsang C.F. Analysis of thermal-hydrologic-mechanical behavior near an emplacement drift at Yucca Mountain. *Journal of Contaminant Hydrology*, **62–63**, 637–652 (2003).
 122. **Rutqvist J.**, Wu Y.-S., Tsang C.-F. and Bodvarsson G. A Modeling approach for analysis of coupled multiphase fluid flow, heat transfer, and deformation in fractured porous rock. *Int. J. Rock Mech. & Min. Sci.* **39**, 429-442 (2002).

123. **Rutqvist J.** and Tsang C.-F. A study of caprock hydromechanical changes associated with CO₂ injection into a brine aquifer. *Environmental Geology*, **42**, 296-305 (2002).
124. **Rutqvist J.**, Börgesson L., Chijimatsu M., Nguyen T. S., Jing L., Noorishad J., and Tsang C.-F. Coupled Thermo-hydro-mechanical Analysis of a Heater Test in Fractured Rock and Bentonite at Kamaishi Mine – Comparison of Field Results to Predictions of Four Finite Element Codes. *Int. J. Rock Mech. & Min. Sci.* **38**, 129-142 (2001).
125. **Rutqvist J.**, Börgesson L., Chijimatsu M., Kobayashi A., Nguyen T. S., Jing L., Noorishad J., and Tsang C.-F. Thermohydromechanics of partially saturated geological media – Governing equations and formulation of four finite element models. *Int. J. Rock Mech. & Min. Sci.* **38**, 105-127 (2001).
126. Nguyen T.S., Börgesson L., Chijimatsu M., **Rutqvist J.**, Fujita T., Hernelin J., Kobayashi A., Onishi Y., Tanaka M. and Jing L. Hydro-mechanical response of a fractured rock mass to excavation of a test pit – The Kamaishi Mine Experiment in Japan. *Int. J. Rock Mech. & Min. Sci.* **38**, 79-94 (2001).
127. Börgesson L., Chijimatsu M., Nguyen T.S., **Rutqvist J.** and Jing L. Thermo-hydro-mechanical characterization of a bentonite-based buffer material by laboratory tests and numerical back analyses. *Int. J. Rock Mech. & Min. Sci.* **38**, 105-127 (2001).
128. **Rutqvist J.**, Stephansson O. and Tsang C.-F. Uncertainty in estimate of maximum principal stress from hydraulic fracturing due to the presence of the induced fracture. *Int. J. Rock Mech. & Min. Sci.* **37**, 107-120 (2000).
129. **Rutqvist J.**, Noorishad J., Stephansson O. and Tsang C.-F. Determination of fracture storativity in hard rocks using high pressure testing. *Water Resources Research*, **34**, 2551-2560 (1998).
130. **Rutqvist J.**, Tsang C.-F. and Stephansson O. Hydraulic field measurements of incompletely closed fractures in granite. *Int. J. Rock Mech. Min. Sci. & Geomech. Abstr.* **34**, p. 411 paper no. 267 (1997).
131. **Rutqvist J.** and Stephansson O. Cyclic hydraulic jacking to determine virgin stress normal to a fracture. *Int. J. Rock Mech. Min. Sci. & Geomech. Abstr.* **33**, 695-711 (1996).
132. **Rutqvist J.** Hydraulic pulse testing of single joints in porous and deformable rocks. *Quarterly Journal of Engineering Geology*, **29** 181-192 (1996).
133. **Rutqvist J.** Determination of hydraulic normal stiffness of fractures in hard rock from hydraulic well testing. *Int. J. Rock Mech. Min. Sci. & Geomech. Abstr.* **32**, 513-523 (1995).
134. Makurat A, Ahola M., Khair. K. Noorishad J., Rosengren L. and **Rutqvist J.** The DECOVALEX Test-Case one. *Int. J. Rock Mech. Min. Sci. & Geomech. Abstr.* **32**, 399-408 (1995).
135. **Rutqvist J.**, Noorishad J., Stephansson O. and Tsang C. -F. Theoretical and field studies of coupled hydromechanical behaviour of fractured rocks - 2. Field experiment and modelling. *Int. J. Rock Mech. Min. Sci. & Geomech. Abstr.* **29**, 411-419 (1992).

Book Chapters (Refereed)

136. **Rutqvist J.** Coupled Thermo-Hydro-Mechanical Behavior of Natural and Engineered Clay Barriers. In Tournassat, Steefel, Bourg and Bergaya editors. Natural and Engineered Clay Barriers. Elsevier. pp, 329-255 (2015).
137. **Rutqvist J.**, Bäckström A., Chijimatsu M., Feng X.-T., Pan P-Z, Hudson J., Jing L., Kobayashi A., Koyama T., Lee H.-S., Huang X.-H., Rinne M., Shen B., Sonnenthal E. Assessment of modeling approaches for analysis of coupled THMC processes in the EDZ of geological nuclear waste repositories. In: Shao J-F, Burlion N, editors. Thermo-Hydromechanical and Chemical Coupling in Geomaterials and Applications. Willey, Hoboken, USA, p. 687–696 (2008).
138. **Rutqvist J.**, Barr D., Birkholzer J.T., Fujisaki K., Kolditz O., Liu Quan-Sheng, Fujita T., Wang Wenqing, Zhang Cheng-Yuan. Comparative Simulation Study on THM-Induced Changes in Hydrological Properties of Fractured Rock near Nuclear Waste Repositories. In: Shao J-F, Burlion N, editors. Thermo-Hydromechanical and Chemical Coupling in Geomaterials and Applications. Willey, Hoboken, USA, p. 669–678 (2008).
139. Feng X-T, **Rutqvist J.** and Pan P-Z. Numerical study of the influence of fractures on the EDZ around a nuclear waste emplacement drift. In: Shao J-F, Burlion N, editors. Thermo-Hydromechanical and Chemical Coupling in Geomaterials and Applications. Proc. 3rd International Symposium GeoProc'2008. Willey, Hoboken, USA, p. 363–371 (2008).
140. Tsang C.-F., Doughty C., **Rutqvist J.** and Xu, T. Modeling to Understand and Simulate Physico-chemical Processes of CO₂ Geological Storage. In: Wilson E. and Gerard D., editors Carbon Capture and Sequestration-Integrating Technology, Monitoring, Regulation. Blackwell Publishing, 35–72 (2007).
141. Tsang C.-F., **Rutqvist J.**, and Min K.B. Fractured Rock Hydromechanics: from Borehole Testing, Solute Transport, to CO₂ Storage, In Rock Physics and Geomechanics in the Study of Reservoirs and Repositories, Geological Society of London, Special Publications, 284, 15–34 (2007).
142. **Rutqvist J.** and Tsang C.F. Coupled hydromechanical effects of CO₂ injection. In: Tsang C.F., Apps J.A., editors. Underground Injection Science and Technology. Elsevier, 649–679 (2005).
143. **Rutqvist J.** and Tsang C.-F. A fully coupled three-dimensional THM analysis of the FEBEX in situ test with the ROCMAS code: prediction of THM behaviour in a bentonite barrier. In: Stephansson O, Hudson JA, Jing L, editors. Coupled T-H-M-C Processes in Geo-Systems: Fundamentals, Modelling, Experiments and Applications. Elsevier Geo-Engineering Book Series, Oxford, p. 143–148 (2004).
144. **Rutqvist J.**, Rejeb A., Tijani M. and Tsang C.-F. Analyses of coupled hydrological-mechanical effects during drilling of the FEBEX tunnel at Grimsel. In: Stephansson O, Hudson JA, Jing L, editors. Coupled T-H-M-C Processes in Geo-Systems:

Fundamentals, Modelling, Experiments and Applications. Elsevier Geo-Engineering Book Series, Oxford, p. 131–136 (2004).

145. **Rutqvist J.**, Tsang C.-F. and Tsang Y. Analysis of stress- and moisture-induced changes in fractured rock permeability at the Yucca Mountain drift scale test. In: Stephansson O, Hudson JA, Jing L, editors. Coupled T-H-M-C Processes in Geo-Systems: Fundamentals, Modelling, Experiments and Applications. Elsevier Geo-Engineering Book Series, Oxford, p. 161–166 (2004).
146. **Rutqvist J.**, Chijimatsu M., Jing L., Millard A., Nguyen T.S., Rejeb A., Sugita Y. and Tsang C.F. Evaluation of the impact of thermal-hydro-mechanical processes in bentonite and near-field rock barriers of a nuclear waste repository in a sparsely fractured hard rock. In: Stephansson O, Hudson JA, Jing L, editors. Coupled T-H-M-C Processes in Geo-Systems: Fundamentals, Modelling, Experiments and Applications. Elsevier Geo-Engineering Book Series, Oxford, p. 217–224 (2004).
147. Liu H.H., **Rutqvist J.**, Zhou G. and Bodvarsson G.S. Upscaling of normal stress-permeability relationship for fracture network obeying the fractional levy motion. In: Stephansson O, Hudson JA, Jing L, editors. Coupled T-H-M-C Processes in Geo-Systems: Fundamentals, Modelling, Experiments and Applications. Elsevier Geo-Engineering Book Series, Oxford, p. 263–268 (2004).
148. Millard A. and **Rutqvist J.** Comparative analyses of predicted and measured displacements during the heating phase of the Yucca Mountain Drift Scale Test. In: Stephansson O, Hudson JA, Jing L, editors. Coupled T-H-M-C Processes in Geo-Systems: Fundamentals, Modelling, Experiments and Applications. Elsevier Geo-Engineering Book Series, Oxford, p. 187–192 (2004).
149. Millard A., Rejeb A., Chijimatsu M., Jing L., de Jounge J., Kohlmeier M., Nguyen T.S., **Rutqvist J.**, Souley M., and Sugita Y. Evaluation of THM coupling on the safety assessment of a nuclear waste repository in a sparsely fractured rock. In: Stephansson O, Hudson JA, Jing L, editors. Coupled T-H-M-C Processes in Geo-Systems: Fundamentals, Modelling, Experiments and Applications. Elsevier Geo-Engineering Book Series, Oxford, p. 211–216 (2004).
150. Chijimatsu M., Jig L., Millard A., Nguyen T.S., Rejeb A., **Rutqvist J.**, Souley M. and Sugita Y. Building confidence in the mathematical model by calibration with a T-H-M field experiment. In: Stephansson O, Hudson JA, Jing L, editors. Coupled T-H-M-C Processes in Geo-Systems: Fundamentals, Modelling, Experiments and Applications. Elsevier Geo-Engineering Book Series, Oxford, p. 193–198 (2004).
151. Min K.B., **Rutqvist J.**, Tsang C.F. and Jing L. A block-scale stress-permeability relationship of fracture network. In: Stephansson O, Hudson JA, Jing L, editors. Coupled T-H-M-C Processes in Geo-Systems: Fundamentals, Modelling, Experiments and Applications. Elsevier Geo-Engineering Book Series, Oxford, p. 269–274 (2004).
152. Nguyen T.S., Chijimatsu M., de Jounge J. Jing L., Kohlmeier M., Millard A., Rejeb A., **Rutqvist J.**, Souley M. and Sugita Y. Implication of coupled thermo-hydro-mechanical processes on the safety of a hypothetical nuclear fuel waste repository. In: Stephansson O, Hudson JA, Jing L, editors. Coupled T-H-M-C Processes in Geo-

Systems: Fundamentals, Modelling, Experiments and Applications. Elsevier Geo-Engineering Book Series, Oxford, p. 225–230 (2004).

153. **Rutqvist J.**, Follin S., Khair K., Nguyen S. and Wilcock P. Experimental investigation and mathematical simulation of a borehole injection test in deformable rocks. In coupled thermo-hydro-mechanical processes of fractured media media (Eds. Stephansson, Jing and Tsang) Elsevier. 425-448 (1996).

Papers in Conference Proceedings (refereed and non-refereed)

154. Mamun M., Blanco-Martín L., Foxall W., **Rutqvist J.**, Mullen C., and Hutchings L. Dynamic hydro-geomechanical simulation of earthquakes induced by fluid injections in geothermal reservoirs. Proceedings, Fortieth Workshop on Geothermal Reservoir Engineering Stanford University, Stanford, California, January 26-28, (2015).
155. Blanco-Martín L., **Rutqvist J.**, Doughty C., Zhang Y., Finsterle S., and Oldenburg C.M. iTOUGH2-FLAC modeling of thermal-hydraulic-mechanical processes related to steam-assisted heavy oil recovery from diatomite. Proceedings of the TOUGH Symposium 2015, Lawrence Berkeley National Laboratory, Berkeley, California, September 28-30 (2015).
156. Kim K., **Rutqvist J.**, Nakagawa S., Houseworth J. and Birkholzer J. Simulation of fluid-driven fracturing within discrete fracture networks using TOUGH-RBSN. Proceedings of the TOUGH Symposium 2015, Lawrence Berkeley National Laboratory, Berkeley, California, September 28-30 (2015).
157. Blanco-Martín L., **Rutqvist J.** and Birkholzer J.T. Extension of the TOUGH-FLAC simulator to account for finite strains. Proceedings of the TOUGH Symposium 2015, Lawrence Berkeley National Laboratory, Berkeley, California, September 28-30 (2015).
158. Rutqvist J., An overview of TOUGH-based geomechanics models. Proceedings of the TOUGH Symposium 2015, Lawrence Berkeley National Laboratory, Berkeley, California, September 28-30 (2015).
159. Jeanne P. and Rutqvist J. Stress field respond to massive injection of cold water into a geothermal reservoir: TOUGH-FLAC simulation. Proceedings of the TOUGH Symposium 2015, Lawrence Berkeley National Laboratory, Berkeley, California, September 28-30 (2015).
160. Oldenburg C.M, Lee K.J., and **Rutqvist J.** Geologic carbon dioxide sequestration in natural gas reservoirs: Pressure rise due to CO₂-CH₄ mixing. Proceedings of the TOUGH Symposium 2015, Lawrence Berkeley National Laboratory, Berkeley, California, September 28-30 (2015).
161. Rinaldi A.P., **Rutqvist J.**, Finsterle S., and Liu H.-H. Inverse modeling of coupled fluid flow and geomechanics with iTOUGH-Pest and TOUGH-FLAC: Application to In Salah CO₂ storage site. Proceedings of the TOUGH Symposium 2015, Lawrence Berkeley National Laboratory, Berkeley, California, September 28-30 (2015).

162. Mamun M., Blanco-Martín L., Foxall W., **Rutqvist J.**, Rinaldi A.P., and Mullen C. Development of a Hydro-geomechanical Model to Simulate Coupled Fluid Flow and Reservoir Geomechanics. Proceedings, TOUGH Symposium 2015, Lawrence Berkeley National Laboratory, Berkeley, California, September 28-30, 2015.
163. Ashida A., Kashihara K., and **Rutqvist J.** Coupled fluid flow and geomechanical modeling for understanding depletion-induced reservoir compaction. Proceedings of IEA Collaborative Project 36th EOR Workshop & Symposium, Sapporo, Japan, September 7-11 (2015).
164. Hu. M., Wang Y., and **Rutqvist J.** Numerical manifold modeling of coupled hydro-mechanical processes in fractured porous rock masses. Proceedings of the 49th US Rock Mechanics/Geomechanics Symposium, San Francisco, CA, USA, 28 June- 1 July 2015. American Rock Mechanics Association ARMA, Paper No. 15-123 (2015).
165. Blanco-Martín L., **Rutqvist J.**, Birkholzer J.T., Wolters R., and Lux K.-H. Coupled modelling of the thermal simulation for drift emplacement underground test. In (eds); Proc. 8th Int. Conf, Mechanical Behaviour of Salt, Rapid City, South Dakota, 26-28 May 2015. London: Taylor & Francis Group (Balkema): xxx-xxx.
166. Blanco-Martín, L., **Rutqvist, J.**, Birkholzer, J.T, and Battistelli, A. Long-term modeling of coupled processes in a generic salt repository for heat-generating nuclear waste: preliminary analysis of the impacts of halite dissolution and precipitation. Proceedings of the 49th US Rock Mechanics/Geomechanics Symposium, San Francisco, CA, USA, 28 June- 1 July 2015. American Rock Mechanics Association ARMA, Paper No. 15-440 (2015).
167. Jeanne P., Rinaldi A.P., **Rutqvist J.**, Hutchings L., Singh A., and Dobson P.F. Mechanisms of EGS Creation at The Geysers (California) revealed by seismic tomography, spatiotemporal evolution of the microseismic events and geomechanical simulations. Proceedings of the 49th US Rock Mechanics/Geomechanics Symposium, San Francisco, CA, USA, 28 June- 1 July 2015. American Rock Mechanics Association ARMA, Paper No. 15-658 (2015).
168. **Rutqvist J.**, Rinaldi A.P., and Cappa F. Comparison of injection-induced fault reactivation and seismicity in CO₂ sequestration and shale-gas fracturing. Proceedings of the 49th US Rock Mechanics/Geomechanics Symposium, San Francisco, CA, USA, 28 June- 1 July 2015. American Rock Mechanics Association ARMA, Paper No. 15-556 (2015).
169. Zheng L., **Rutqvist J.** and Birkholzer J.T. Modeling THMC changes in EBS bentonite at high temperature. Proceedings of the 2015 International High-Level Radioactive Waste Management Conference (IHLRWM), April 12 – 16, 2015, Charleston, South Carolina (2015).
170. Kiryukhin A., **Rutqvist J.**, and Maguskin M.A. Modeling of the Vertical Deformations During Exploitation of the Mutnovsky Geothermal Field, Kamchatka. Proceedings World Geothermal Congress 2015 Melbourne, Australia, 19-25 April (2015).

171. Jeanne P., Rinaldi A.P., **Rutqvist J.** and Dobson P.F. Seismic and Aseismic Deformations Occurring During EGS Stimulation at The Geysers: Impact on Reservoir Permeability. Proceedings, Fortieth Workshop on Geothermal Reservoir Engineering Stanford University, Stanford, California, January 26-28, (2015).
172. Hu. M., Wang Y., and **Rutqvist J.** On the new approaches for modeling water flow in heterogeneous media with numerical manifold method. Proceedings of 13th Congress of the ISRM, Montreal, Quebec, Canada, May 10 - 13, (2015).
173. Blanco-Martín L., **Rutqvist J.**, Birkholzer J.T., Wolters R., Lux K.-H., Rutenberg M., and Zhao J. Three-dimensional modeling of a heater test to investigate crushed salt reconsolidation and rock salt creep for the underground disposal of high-level nuclear waste. Proceedings of 13th Congress of the ISRM, Montreal, Quebec, Canada, May 10 - 13, (2015).
174. Lee J., Min K.-B., and **Rutqvist J.** TOUGH-UDEC simulator for the coupled multiphase fluid flow, heat transfer, deformation in fracture porous media. Proceedings of 13th Congress of the ISRM, Montreal, Quebec, Canada, May 10 - 13, (2015).
175. Figueiredo B., Tsang C.-F., Niemi A., **Rutqvist J.**, and Bensabat J. Study of the potential fault reactivation induced by CO₂ injection in a three-layer storage formation. Proceedings of 13th Congress of the ISRM, Montreal, Quebec, Canada, May 10 - 13, (2015).
176. **Rutqvist J.**, Cappa F., Rinaldia, A.P., and Godano M. Dynamic modeling of injection-induced fault reactivation and ground motion and impact on surface structures and human perception. GHGT12. Austin, Texas, October 2014. Energy Procedia 63, (2014) 3379 – 3389.
177. Lee J., Min.K.-B., and **Rutqvist J.** TOUGH-UDEC simulator for the coupled thermal-hydraulic-mechanical analysis in fractured porous media. Proceeding of the 8th Asian Rock Mechanical Symposium: ARMS8, Sapporo, Japan, 14-16 October (2014).
178. Rinaldi A.P., **Rutqvist J.**, Finsterle S., and Liu H.H. Forward and inverse modeling of ground surface uplift at In Salah (Algeria). Proceedings of the 48th US Rock Mechanics/Geomechanics Symposium, Minneapolis, Minnesota, USA, 1-4 June, 2014: American Rock Mechanics Association ARMA, Paper No. 14-7172 (2014).
179. Hu M.S., Wang Y., **Rutqvist J.** Derivation and comparison of new approaches for boundary constraints in numerical simulations of water flow in heterogeneous media using Numerical Manifold Method. Proceedings of the 48th US Rock Mechanics/Geomechanics Symposium, Minneapolis, Minnesota, USA, 1-4 June, 2014: American Rock Mechanics Association ARMA, Paper No. 14-7380 (2014).
180. Blanco-Martín L., **Rutqvist J.**, Birkholzer J.T., Wolters R., Rutenberg M., Zhao J., and Lux, K.-H. Comparison of two modeling procedures to evaluate thermal-hydraulic-mechanical processes in a generic salt repository for high-level nuclear waste. Proceedings of the 48th US Rock Mechanics/Geomechanics Symposium, Minneapolis, Minnesota, USA, 1-4 June, 2014: American Rock Mechanics Association ARMA, Paper No. 14-7411 (2014).

181. Blanco-Martín L., **Rutqvist J.** and Birkholzer J.T. Long-term analysis of thermal-hydraulic-mechanical processes in a generic salt repository for high-level nuclear waste. Proceedings of the 48th US Rock Mechanics/Geomechanics Symposium, Minneapolis, Minnesota, USA, 1-4 June, 2014: American Rock Mechanics Association ARMA, Paper No. 14-7206 (2014).
182. Kiryukhin AV., **Rutqvist J.**, and Maguskin M.A. Thermal-hydrodynamic-mechanical modeling of subsidence during exploitation of the Mutnovsky Geothermal Field, Kamchatka. Proceedings, Thirty-Ninth Workshop on Geothermal Reservoir Engineering, Stanford University, Stanford, California, February 24-26, (2014).
183. Jeanne P., **Rutqvist J.**, Vasco D., Garcia J., Dobson P.F., Walters M., Hartline C., Borgia A. Development of a 3D hydrogeological and geomechanical model of an enhanced geothermal system using microseismic and ground deformation data from a 1-year injection program Proceedings, Thirty-Ninth Workshop on Geothermal Reservoir Engineering, Stanford University, Stanford, California, February 24-26, (2014).
184. Garitte B., Pan P., Graupner B., Lee C., Manepally C., Nakama S., Nguyen T.S., Chen F., **Rutqvist J.**, Wang W. Benchmark modeling of an in-situ heating test in Opalinus Clay. Proceedings of the 3rd ISRM Symposium on Rock Mechanics, 18-20 June 2013, Shanghai, China (2013).
185. Graupner B.J., Lee C., Maekawa K., Manepally C., Pan P., **Rutqvist J.**, Wang W., and Garitte B. Mont Terri HE-D Experiment as a Benchmark for the Simulation of Coupled THM. Paper presented at the European Association of Geoscientists & Engineers (EAGE) International Workshop Geomechanics & Energy, Lausanne, Switzerland, 26-28 November (2013).
186. **Rutqvist J.**, Dobson P.F., Garcia J., Hartline C., Oldenburg C.M., Vasco D.W., and Walters M. Pre-stimulation coupled THM modeling related to the northwest Geysers EGS demonstration project. Proceedings, Thirty-Eighth Workshop on Geothermal Reservoir Engineering, Stanford University, Stanford, California, February 11-13, (2013).
187. **Rutqvist J.**, Cappa F., Rinaldi A.P., Mazzoldi A., Cappa F., and Rinaldi A.P. Reservoir-geomechanical Analysis Associated with Geologic CO₂ Storage in Deep Sedimentary Formations Proceeding of the 6th International symposium on In-Situ rock stress, Sendai, Japan, 20-22 August, (2014).
188. **Rutqvist J.**, and Rinaldi A.P. Modeling ground deformations and potential for induced micro-seismicity at the In Salah CO₂ storage operation, Algeria. 5th Biot Conference on Poromechanics. Vienna, Austria, July 10-12, (2013).
189. **Rutqvist J.**, Dobson P.F., Jeanne P., Oldenburg C.M., Vasco D.W., Garcia J., Hartline C., Walters M. Modeling and monitoring of deep injection at the Northwest Geysers EGS Demonstration, California. Proceedings of the 47th US Rock Mechanics/Geomechanics Symposium, San Francisco, California, USA, 23-26 June, 2013: American Rock Mechanics Association ARMA, Paper No. 13-307 (2013).

190. Pan P-Z., **Rutqvist J.**, Yan F., Feng X-T. The influence of caprock initial damage on its fracturing process during CO₂ injection into a brine aquifer. Proceedings of the 47th US Rock Mechanics/Geomechanics Symposium, San Francisco, California, USA, 23-26 June, 2013: American Rock Mechanics Association ARMA, Paper No. 13-617 (2013).
191. Wang Y., Hu M., and **Rutqvist J.** Energy-work-based confined-unconfined seepage modeling using numerical manifold method. Proceedings of the 47th US Rock Mechanics/Geomechanics Symposium, San Francisco, California, USA, 23-26 June, 2013: American Rock Mechanics Association ARMA, Paper No. 13-498 (2013).
192. Blanco-Martín L., **Rutqvist J.**, Birkholzer J.T., and Houseworth J.E. Thermal-Hydraulic-Mechanical Processes Modeling to Evaluate Salt-based Repositories in the Long-Term. Proceedings of the 47th US Rock Mechanics/Geomechanics Symposium, San Francisco, California, USA, 23-26 June, 2013: American Rock Mechanics Association ARMA, Paper No. 13-621 (2013).
193. Wang Y., Hu M., and **Rutqvist J.** Confined-unconfined seepage analysis using numerical manifold method with an energy-work-based model. In Proceedings of the 11th International Conference on Analysis of Discontinuous Deformation (ICADD-11), Fukuoka, Japan, August 27-29, (2013).
194. Jeanne P., Rinaldi A.P., **Rutqvist J.**, and Cappa F. Relation between fault zone architecture, earthquake magnitude and leakage associated with CO₂ injection in a multilayered sedimentary system. Proceedings of the 47th US Rock Mechanics/Geomechanics Symposium, San Francisco, California, USA, 23-26 June, 2013: American Rock Mechanics Association ARMA, Paper No. 13-246 (2013).
195. Wang Z., **Rutqvist J.** and Dia Y. A Multi-continuum Method for Studying the Effect of Inactive Fractures on Solute Transport in 2-D Discrete Fracture Network. In proceeding of ICCES'13 (International Conference on Computational and Experimental Engineering & Sciences), Symposium on Advances in Geotechnical Engineering. Seattle, USA, May 24-28, (2013).
196. Rinaldi A.P., **Rutqvist J.**, Jeanne P. and Cappa F. Geomechanical effects on CO₂ leakage through fault zones during large-scale underground injection. Proceedings of the 47th US Rock Mechanics/Geomechanics Symposium, San Francisco, California, USA, 23-26 June, 2013: American Rock Mechanics Association ARMA, Paper No. 13-255 (2013).
197. **Rutqvist J.** Rock mechanical aspects of geological storage of CO₂ in deep sedimentary formations. Proceeding of the 7st Asian Rock Mechanical Symposium: ARMS 2012, Seoul, Korea (2012).
198. Birkholzer J., Asahina D., Chen F., Gardner P., Houseworth J., Jove-Colon C., Kersting A., Nair P., Nutt M., Li L., Liu H.H., Painter S., Reimus P., **Rutqvist J.**, Steefel C., Tynan M., Wang Y., and Zavarin M. An overview of US disposal research activities linked to international URLs. Proceedings of the 2013 International High-Level Radioactive Waste Management Conference (IHLRWM), April 28 – May 2, 2013, Albuquerque, New Mexico (2013).

199. **Rutqvist J.**, Chen F., Birkholzer J., Liu H.H., Müller H., Garitte B., and Vietor T. Modeling of coupled thermo-hydro-mechanical processes at Mont Terri heater experiment in Opalinus Clay using TOUGH-FLAC. Proceedings of the 2013 International High-Level Radioactive Waste Management Conference (IHLRWM), April 28 – May 2, 2013, Albuquerque, New Mexico (2013).
200. Zheng L., **Rutqvist J.**, Liu H.H., Birkholzer J.T., and Sonnenthal E. Chemical-mechanical Coupling Related to THMC Modeling of Clay Formations. Proceedings of the 2013 International High-Level Radioactive Waste Management Conference (IHLRWM), April 28 – May 2, 2013, Albuquerque, New Mexico (2013).
201. **Rutqvist J.**, Cappa F., Mazzoldi A., and Rinaldi A.P. Geomechanical modeling of fault responses and the potential for notable seismic events during underground CO₂ injection. GHGT11. Kyoto, November (2012).
202. Lee J., Min K.-B., and **Rutqvist J.** Ground heaving and leakage analysis for sequestration of CO₂ in geological media considering fractures in caprock. GHGT11. Kyoto, November (2012).
203. Ryosuke A., Imai R., **Rutqvist J.**, Kobayashi H., Kitamura O., and Nobuhisa G. Development of TOUGH-FrontISTR, a numerical simulator for environmental impact assessment of CO₂ geological storage. GHGT11. Kyoto, November (2012).
204. Kim H.-M., **Rutqvist J.**, and Choi B.-H. Feasibility Analysis of Underground Compressed Air Energy Storage in Lined Rock Caverns using the TOUGH-FLAC Simulator. Proceedings, TOUGH Symposium 2012, Lawrence Berkeley National Laboratory, Berkeley, California, September 17-19, (2012).
205. Kim H.-M., Park D.-H., Ryu D.-W., Song W.-K., and **Rutqvist J.** Geomechanical Stability Analysis for Pressurized Underground Rock Storage Caverns. Proceeding of the 7st Asian Rock Mechanical Symposium: ARMS 2012, Seoul, Korea (2012).
206. Lee J., Min K.-B. and **Rutqvist J.** Evaluation of leakage potential considering fractures in the caprock for sequestration of CO₂ in geological media. Proceedings of the 46th US Rock Mechanics/Geomechanics Symposium, Chicago, Illinois, USA, June 24-June 27, 2012: American Rock Mechanics Association ARMA, Paper No. 12-459 (2012).
207. Pan P.-Z., **Rutqvist J.**, Yan F., and Feng X.-T. An approach for modeling rock discontinuous behavior under multiphase fluid flow conditions. Proceedings, TOUGH Symposium 2012, Lawrence Berkeley National Laboratory, Berkeley, California, September 17-19, 2012.
208. Kim J., Sonnenthal E., and **Rutqvist J.** A sequential implicit algorithm of chemo-thermo-poro-mechanics for fractured geothermal reservoirs. Proceedings, TOUGH Symposium 2012, Lawrence Berkeley National Laboratory, Berkeley, California, September 17-19, 2012.
209. Wang Z., **Rutqvist J.**, Wang Y., Leung L., Hoch A. and Dai Y. The effect of stress on flow and transport in fractured rock masses using TOUGH-FLAC and a modified crack tensor theory. Proceedings, TOUGH Symposium 2012, Lawrence Berkeley National Laboratory, Berkeley, California, September 17-19, 2012.

210. A. P. Rinaldi A.P., **Rutqvist J.**, Sonnenthal E.L., and Cladouhos T.T. TOUGH-FLAC coupled THM modeling of proposed stimulation at the Newberry Volcano EGS demonstration. Proceedings, TOUGH Symposium 2012, Lawrence Berkeley National Laboratory, Berkeley, California, September 17-19, 2012.
211. Wang Z., **Rutqvist J.**, Wang Y., and Dia Y. The effect of stress on flow and transport in fractured rock masses using a modified crack tensor theory. In proceeding of ICCES'12 (International Conference on Computational and Experimental Engineering & Sciences), Symposium on Fundamental Theory for the Performance Evolution and Sensing-control of Urban Metro Structures. Crete, Greece, April 30-May 4, (2012).
212. **Rutqvist J.**, Moridis G.J., and Kim J. A numerical study of gas production from collapsing oceanic hydrate-bearing sediments. Proceedings of the 7th International Conference on Gas Hydrates (ICGH 2011), Edinburgh, Scotland, United Kingdom, July 17-21, (2011).
213. **Rutqvist J.** Geomechanical Aspects of CO₂ Sequestration and Modeling. Proceedings of 12th Congress of the ISRM, pp.1803-1808, 18-21 October 2011, Beijing, China. (2011).
214. **Rutqvist J.**, Birkholzer J.T., Houseworth J. and Liu H.H. Modeling of coupled geomechanical processes associated with bentonite-backfilled repository tunnels in clay formations. Proceedings of the 2011 International High-Level Radioactive Waste Management Conference (IHLRWM), April 10 – 14, 2011, Albuquerque, New Mexico (2011).
215. Yamamoto H., Onuma T., Kumagai T., and **Rutqvist J.** Numerical study on applicability of CO₂ monitoring approach based on surface deformations detected by InSAR technology. The 40th Japan Symposium on Rock Mechanics. (2010).
216. Cappa F. and **Rutqvist J.** Impact of CO₂ geological sequestration on the nucleation of seismic fault ruptures. Proceedings of the 45th US Rock Mechanics/Geomechanics Symposium, San Francisco, California, USA, June 27-June 30, 2011: American Rock Mechanics Association ARMA, Paper No. XXX. (2011).
217. **Rutqvist J.**, Moridis G.S., Kim J., Reagan M.T. Geomechanical performance analysis of potential long-term tests of gas production from hydrate deposits in North Slope, Alaska. Arctic Technology Conference, 7–9 February 2011, Houston, Texas, USA (2011).
218. Yamamoto H., Onuma T., Kumagai T., and **Rutqvist J.** Numerical investigation of the potential applicability of surface deformation measurement by InSAR technology for monitoring CO₂ behavior in deep underground. Proceedings of 12th Congress of the ISRM, pp. 545-549, 18-21 October, Beijing, China. (2011).
219. Kim H. M., **Rutqvist J.**, Ryu D.W., Synn J. H., and Song W.K. Coupled Nonisothermal, Multiphase Fluid Flow and Geomechanical Analysis of Underground Compressed Air Energy Storage (CAES) in Lined Rock Caverns. Proceedings of the 45th US Rock Mechanics/Geomechanics Symposium, San Francisco, California, USA, June 27-June 30, 2011: American Rock Mechanics Association ARMA, Paper No. XXX. (2011).

220. Kim J., Yang D., Moridis G.J., and **Rutqvist J.** Numerical studies on two-way coupled fluid flow and geomechanics in hydrate deposits. SPE Reservoir Simulation Symposium, The Woodlands, Texas, USA, 21–23 February (2011).
221. **Rutqvist J.**, Liu H.-H, Vasco D.W., Pan L., Kappler K., Majer E. Coupled non-isothermal, multiphase fluid flow, and geomechanical modeling of ground surface deformations and potential for induced micro-seismicity at the In Salah CO₂ storage operation. 10th International Conference on Greenhouse Gas Control Technologies (GHGT-10), Amsterdam, September 19-23, 2010. Energy Procedia, Volume 4, 2011, Pages 3542-3549.
222. **Rutqvist J.**, Dobson P.F., Oldenburg C.M., Garcia J., and Walters M. The Northwest Geysers EGS Demonstration Project Phase 1: Pre-stimulation coupled geomechanical modeling to guide stimulation and monitoring plans. Geothermal Research Council, Annual Meeting, Sacramento, California, October 24–27, GRC Transactions, Vol 34, (2010).
223. **Rutqvist J.**, and Moridis G.J. A modeling study of geomechanical performance of sloping oceanic hydrate deposits subjected to production activities. OTC-21048. Paper presentation at the 2010 Offshore Technology Conference held in Houston, Texas, U.S.A., 3–6 May, (2010).
224. **Rutqvist J.**, Oldenburg C.M, Dobson P.F., Garcia J., and Walters M. (2010) Predicting the Spatial Extent of Injection-Induced Zones of Enhanced Permeability at the Northwest Geysers EGS Demonstration Project. Proceedings of the 44th U.S. Rock Mechanics Symposium, Salt Lake City, Utah, USA, June 27-June 30, 2010: American Rock Mechanics Association ARMA, Paper No. 502.
225. Hou, M.Z. b, Gou Y., and **Rutqvist J.** Integration of the codes FLAC3D and TOUGHREACT for THMC coupled geo-process simulations in reservoirs 72nd EAGE Conference & Exhibition incorporating SPE EUROPEC 2010 Barcelona, Spain, 14 - 17 June (2010).
226. Moridis G.J., Collett T.S., Pooladi-Darvish M., Hancock S., Santamarina C., Boswell, R., Kneafsey, T., **Rutqvist J.**, Kowalsky M., Reagan, M.T., Sloan E.D. Sum A.K., and Koh, C. (2010) Challenges, Uncertainties and Issues Facing Gas Production From Hydrate Deposits in Geologic Systems. SPE Unconventional Gas Conference, 23-25 February 2010, Pittsburgh, Pennsylvania, USA.
227. **Rutqvist J.** (2009) Status of TOUGH-FLAC and recent applications. Proceedings, TOUGH Symposium 2009, Lawrence Berkeley National Laboratory, Berkeley, California, September 14-16, 2009.
228. **Rutqvist J.**, Ijiri Y., and Yamamoto H., (2009) Implementing the Barcelona Basic Model into TOUGH-FLAC for analysis of the geomechanical behavior of unsaturated soils. Proceedings, TOUGH Symposium 2009, Lawrence Berkeley National Laboratory, Berkeley, California, September 14-16, 2009.
229. Liu, H.H. and **Rutqvist J.** (2009). A dual-continuum approach for modeling coupled hydromechanical processes, Proceedings. TOUGH Symposium 2009, Lawrence Berkeley National Laboratory, Berkeley, California, September 14-16, 2009.

230. Leung C.T.O., **Rutqvist J.**, Zimmerman R. W., and Hoch A R. (2009) The use of TOUGH-FLAC for coupled hydro-mechanical modeling of fractured rock masses. Proceedings, TOUGH Symposium 2009, Lawrence Berkeley National Laboratory, Berkeley, California, September 14-16, 2009.
231. **Rutqvist J.** (2009) Estimating stress-versus-permeability relationships of fractured rock using data from in situ experiments and effects of chemical-mechanical coupling. In proceedings of the International Conference on Rock Joints and Jointed Rock Masses, Tucson, Arizona, Jan 4-10 (invited).
232. **Rutqvist J.**, Vasco D., and Myer L. 2009. Coupled reservoir-geomechanical analysis of CO₂ injection at In Salah, Algeria. 9th International Conference on Greenhouse Gas Control Technologies (GHGT-9), Washington D.C., Nov 16-20, 2008. Energy Procedia, Volume 1, Issue 1, February 2009, Pages 1847-1854.
233. **Rutqvist J.**, Moridis G., Grover T., and Collet T. Geomechanical response of known permafrost hydrate deposits to depressurization-induced production. Proceedings of the 6th International Conference on Gas Hydrates (ICGH 2008), Vancouver, British Columbia, CANADA, July 6-10, (2008).
234. Guglielmi Y., Cappa F., Gaffet S., Monfret T., Virieux J., **Rutqvist J.**, and Tsang C.-F., A new approach for very large broadband geophysical monitoring of rock slopes deformations: The “High-Pulse Poroelasticity Protocol” (HPPP). China slope The 10th INTERNATIONAL SYMPOSIUM ON LANDSLIDES AND ENGINEERED SLOPES, June 30 – July 4, 2008 Xi’am, China, Notification Paper No. C135.
235. Wu Y.S., **Rutqvist J.**, Karasaki K., Lei Q., Xiong W., Yuan J., Liu M., Di Y. A Mathematical Model for Rock Deformation’s Effect on Flow in Porous and Fractured Reservoirs. Proceedings of the 42th U.S. Rock Mechanics Symposium, San Francisco, California, USA, June 29-July 2, 2008: American Rock Mechanics Association ARMA, Paper No. 142. (2008).
236. Min K.-B., **Rutqvist J.**, and Elsworth D. Chemically- and Mechanically-mediated Influences on Rock Fractures and their Implications on Thermomechanical Loading Cycle. Proceedings of the 42th U.S. Rock Mechanics Symposium, San Francisco, California, USA, June 29-July 2, 2008: American Rock Mechanics Association ARMA, Paper No. 254. (2008).
237. Guglielmi Y., Cappa F., Virieux J., **Rutqvist J.**, Tsang C.-F., and Thoraval A. A new in-situ approach for hydromechanical characterization of mesoscale fractures: the High-Pulse Poroelasticity Protocol (HPPP). Proceedings of the 42th U.S. Rock Mechanics Symposium, San Francisco, California, USA, June 29-July 2, 2008: American Rock Mechanics Association ARMA, Paper No. 254. (2008).
238. **Rutqvist J.** and Oldenburg CM. Analysis of injection-induced micro-earthquakes in a geothermal steam reservoir, Geysers Geothermal Field, California. Proceedings of the 42th U.S. Rock Mechanics Symposium, San Francisco, California, USA, June 29-July 2, 2008: American Rock Mechanics Association ARMA, Paper No. 151. (2008).

239. **Rutqvist J.** and Moridis G. Development of a Numerical Simulator for Analyzing the Geomechanical Performance of Hydrate-Bearing Sediments. Proceedings of the 42th U.S. Rock Mechanics Symposium, San Francisco, California, USA, June 29-July 2, 2008: American Rock Mechanics Association ARMA, Paper No. 139. (2008).
240. **Rutqvist J.**, Freifeld B., Min K.-B., Elsworth D. and Tsang Y. Coupled Analysis of Change in Fracture Permeability during the Cooling Phase of the Yucca Mountain Drift Scale Test. Proceedings of the 42th U.S. Rock Mechanics Symposium, San Francisco, California, USA, June 29-July 2, 2008: American Rock Mechanics Association ARMA, Paper No. 138. (2008).
241. **Rutqvist J.**, Grover T. and Moridis G. Coupled Hydrological, Thermal and Geomechanical Analysis of Wellbore Stability in Hydrate-Bearing Sediments. OTC-19572. Paper presentation at the 2008 Offshore Technology Conference held in Houston, Texas, U.S.A., 4–8 May 2008.
242. **Rutqvist J.** and Oldenburg C. Analysis of cause and mechanism for injection-induced seismicity at the Geysers geothermal field, California. Geothermal Research Council, Annual Meeting, Sparks, Nevada, September 30–October 3, 2007, GRC Transactions, Vol 31, 2007.
243. **Rutqvist J.** and Moridis G. Numerical Studies on the Geomechanical Stability of Hydrate-Bearing Sediments. OTC-18860. Paper presentation at the 2007 Offshore Technology Conference held in Houston, Texas, U.S.A., 30 April–3 May 2007.
244. Rejeb A. and **Rutqvist J.** Spatio-temporel evolution of the Excavation damaged Zone (EDZ): Lessons learned from the French Tournemire site in indurated clay. Proceedings of 11th Congress of the ISRM, Volume 2, pp.1031 - 1034, July, 9-13, 2007, Lisbon, Portugal. 2007.
245. **Rutqvist J.**, Majer E., Oldenburg C., Peterson J., and Vasco D. Integrated modeling and field study of potential mechanisms for induced seismicity at The Geysers Geothermal Field, California. Geothermal Research Council, Annual Meeting, San Diego, California, September 10–13, GRC Transactions, Vol 30, 2006.
246. **Rutqvist J.**, Birkholzer J.T., Tsang C.-F. Modelling Hydrological and Geomechanical Processes Related to CO₂ Injection in a Faulted Multilayer System. 8th International Conference on Greenhouse Gas Control Technologies (GHGT8), Trondheim, Norway, June 19-22, 2006.
247. **Rutqvist J.**, Birkholzer J.T., Cappa F., Oldenburg C., Tsang C.-F. Shear-slip analysis in multiphase fluid-flow reservoir engineering applications using TOUGH-FLAC. Proceedings of the TOUGH symposium 2006, Lawrence Berkeley National Laboratory, Berkeley, California, May 15–17 (2006).
248. **Rutqvist J.**, Birkholzer J.T., Chijimatsu M., Kolditz O., Liu Quan-Sheng, Oda Y., Wang W. and Zhang Cheng-Yuan. Results from an international simulation study on coupled thermal, hydrological, and mechanical (THM) processes near geological nuclear waste repositories. Proceedings of the 11th International High-Level Radioactive Waste Management Conference (IHLRWM), April 30 – May 4, 2006, Las Vegas, Nevada, pp. 755-762 (2006).

249. Birkholzer J.T., **Rutqvist J.**, Sonnenthal E.L., Barr D., Chijimatsu M., Kolditz O., Liu Q., Oda Y., Wang W., Xie M., Zhang C. Geomechanical/geochemical modeling studies conducted within the international DECOVALEX project. Proceedings of the 11th International High-Level Radioactive Waste Management Conference (IHLRWM), April 30 – May 4, 2006, Las Vegas, Nevada, pp. 747-754 (2006).
250. Yamamoto K., Koide H., Tosha T., Aoyagi R., Nakanishi S., Todaka N., Benson S., **Rutqvist J.**, and Lewicki J. Natural analogue study for geological sequestration of CO₂ at the Matsushiro earthquake fault zone, Japan: CO₂ Seepage Mechanism. 8th International Conference on Greenhouse Gas Control Technologies, Trondheim, Norway, June 19-22, 2006.
251. Birkholzer J., Pruess K., Lewicki J., **Rutqvist J.**, Tsang C-F and Karimjee A. Large release from CO₂ storage reservoirs: analogs, scenarios, and modeling needs. 8th International Conference on Greenhouse Gas Control Technologies, Trondheim, Norway, June 19-22, (2006).
252. Birkholzer J.T., Barr D., **Rutqvist J.**, Sonnenthal E. Motivation, description, and summary status of geomechanical and geochemical modeling studies in Task D of the international DECOVALEX-THMC project. In Proceedings of the GEOPROC2006 International symposium: 2nd International Conference on Coupled Thermo-hydro-mechanical-chemical processes in Geosystems and Engineering, HoHai University, Nanjing, China, May 22-25, 2006, p. 91-96 (2006).
253. Nguyen T.S., Borgesson L., Chijimatsu M., Fujita T., Hernelind J., Jussila P., **Rutqvist J.**, and Jing L. Influence of coupled THM phenomena on the safety of a spent fuel repository: A near-field study. In Proceedings of the GEOPROC2006 International symposium: 2nd International Conference on Coupled Thermo-hydro-mechanical-chemical processes in Geosystems and Engineering, HoHai University, Nanjing, China, May 22-25, 2006. P. 141-149, (2006).
254. Guglielmi Y., Cappa F., **Rutqvist J.**, C-F Tsang, and Thoraval A. Field and numerical investigations of free-water surface oscillation effects on rock slope hydromechanical behaviour – consequences for rock slope stability analyses. In Proceedings of the GEOPROC2006 International symposium: 2nd International Conference on Coupled Thermo-hydro-mechanical-chemical processes in Geosystems and Engineering, HoHai University, Nanjing, China, May 22-25, 2006. p. 174-182, (2006).
255. Chijimatsu M., Børgesson L., Fujita T., Hernelind J., Jussila P., Nguyen T.S., **Rutqvist J.**, and Jing L. Model calibration of small and large-scale laboratory THM experiments of the MX-80 Bentonite. In Proceedings of the GEOPROC2006 International symposium: 2nd International Conference on Coupled Thermo-hydro-mechanical-chemical processes in Geosystems and Engineering, HoHai University, Nanjing, China, May 22-25, 2006. p. 254-260, (2006).
256. **Rutqvist J.**, Feng X.-T., Hudson J., Jing L., Kobayashi A., Koyama T., Pan P.-Z., Lee H.-S., Rinne M., Sonnenthal E., Yamamoto Y. Multiple-code benchmark simulation study of coupled THMC processes in the excavation disturbed zone associated with geological nuclear waste repositories. In Proceedings of the

GEOPROC2006 International symposium: 2nd International Conference on Coupled Thermo-hydro-mechanical-chemical processes in Geosystems and Engineering, HoHai University, Nanjing, China, May 22-25, 2006. p. 397-402, (2006).

257. **Rutqvist J.**, Birkholzer J.T., Chijimatsu M., Kolditz O., Quansheng Liu, Y. Oda, Wenqing Wang, and Chengyuan Zhang. Comparative simulation study of coupled THM processes in the near back-filled and open-drift nuclear waste repositories in Task D of the international DECOVALEX project. In proceedings of the GEOPROC2006 International symposium: 2nd International Conference on Coupled Thermo-hydro-mechanical-chemical processes in Geosystems and Engineering, HoHai University, Nanjing, China, May 22-25, 2006. p. 428-433, (2006).
258. Cappa F., Guglielmi Y., **Rutqvist J.**, Tsang C.-F. Thoraval A. A new in situ test for determination of rock-fracture hydromechanical properties: the “hydromechanical pulse injection test (HMPIT)” In Proceedings of the GEOPROC2006 International symposium: 2nd International Conference on Coupled Thermo-hydro-mechanical-chemical processes in Geosystems and Engineering, HoHai University, Nanjing, China, May 22-25, 2006. p. 428-433, (2006).
259. Xie M., Sonnenthal E., Wang W., Kolditz O., Birkholzer J.T., **Rutqvist J.**, Oda Y., Chijimatsu M. Geochemical predictions for a hypothetical repository located in crystalline rock – comparative evaluation of different research teams. In Proceedings of the GEOPROC2006 International symposium: 2nd International Conference on Coupled Thermo-hydro-mechanical-chemical processes in Geosystems and Engineering, HoHai University, Nanjing, China, May 22-25, 2006. p. 403-410, (2006).
260. **Rutqvist J.**, Tsang CF, and Tsang Y. Analysis of Coupled Multiphase Fluid Flow, Heat Transfer and Mechanical Deformation at the Yucca Mountain Drift Scale Test. Proceedings of the 40th U.S. Rock Mechanics Symposium, Anchorage, Alaska, USA, 25-29 June, 2005: American Rock Mechanics Association ARMA, Paper No. 893. (2005).
261. Cappa F., Guglielmi Y., Gaffet S., Thoraval A., **Rutqvist J.**, Tsang C-F., 2005. In situ characterization of a single fracture hydromechanical behavior from hydraulic pulse tests coupled to simultaneous pressure - normal displacement measurements. In: Konecny P. (eds), Proceedings of the International Symposium of the International Society for Rock Mechanics, Eurock 2005, Brno, Czech Republic. Balkema, 69-75.
262. Min K.B., Jing L., **Rutqvist J.**, Tsang C.F. and Stephansson O. Representation of fractured rock masses as equivalent continua using a DFN-DEM approach. The 11th International Conference of IACMAG, Turin, Italy, June 19-24, 2005. (2005).
263. **Rutqvist J.** and Tsang C.-F. TOUGH-FLAC: A numerical simulator for analysis of coupled thermal-hydrologic-mechanical processes in fractured and porous geological media under multi-phase flow conditions. Proceedings of the TOUGH symposium 2003, Lawrence Berkeley National Laboratory, Berkeley, May 12–14 (2003).
264. Bodvarsson G.S., Birkholzer J.T., Finsterle S., Liu H.H., **Rutqvist J.** and Wu Y.S. The use of TOUGH2/iTOUGH2 in support of the Yucca Mountain Project:

Successes and limitations. Proceedings of the TOUGH symposium 2003, Lawrence Berkeley National Laboratory, Berkeley, May 12–14 (2003).

265. Todesco, M., **Rutqvist J.**, Pruess, K., Oldenburg, C. Multi-phase fluid circulation and ground deformation: a new perspective on bradyseismic activity at the Phlegrean Fields (Italy). Proceedings of the 28th Workshop on Geothermal Research Engineering, Stanford, CA, USA. (2003).
266. Pruess, K., Bielinski, A., Ennis-King, J., Fabriol, R., Le Gallo, Y., Garcia, J., Jessen, K., Kovscek, T., Law, D., Lichtner, P., Oldenburg, C.M., Pawar, R., **Rutqvist, J.**, Steefel, C., Travis, B., Tsang, C.-F., White, S. and Xu, T. Code intercomparison builds confidence in numerical models for geologic disposal of CO₂. Sixth International Conference on Greenhouse Gas Control Technologies (GHGT-6). Kyoto, Japan Abs. (2002).
267. **Rutqvist J.**, Noorishad J. and Tsang C.F. Coupled analysis of a THM field experiment in unsaturated buffer-rock system. Rock Mechanics in the National Interest: Proceedings of the 38th US Rock Mechanics Symposium, DC Rocks 2001, Washington D.C., 7-10 July, 2001 A. A. Balkema publisher, pp. 623-630 (2001).
268. **Rutqvist J.**, Tsang. C.F, Ekman D. and Stephansson O. Evaluation of in situ hydromechanical properties of rock fractures at Laxemar in Sweden. Proceeding of the 1st asian rock mechanical symposium: ARMS '97, Seoul, Korea. A. A. Balkema publisher, 619-624 (1997).
269. **Rutqvist J.** and Stephansson O. Influence of fracture aperture and normal stiffness on the reopening pressure in classical hydraulic fracturing stress measurements. Proceeding of the International symposium on rock stress, Kumamoto, Japan. A. A. Balkema publisher 127-132 (1997).
270. Tsang C.F. and **Rutqvist J.** Progress in coupled analysis of a thermohydromechanical experiment in fractured rocks. Proceeding of the Ninth International Conference of the International Association for Computer Methods and Advances in Geomechanics. Beijing, China 1187-1192 (1997).
271. Ekman D., **Rutqvist J.** and Ljunggren C. Determination of hydromechanical parameters down to 1340 m depth in borehole KLX02 in Laxemar, Sweden. Swedish Rock Engineering Research (SveBeFo). Paper presented at the annual Rock Mechanics Meeting in Stockholm March 1997 (1997).
272. **Rutqvist J.** A method to determine stress-transmissivity relationship of joints from hydraulic field testing. Proc. 8th International Congress on Rock Mechanics, Tokyo. Balkema, Rotterdam. Vol. 1, 755-758 (1995).
273. **Rutqvist J.** and Stephansson O. Hydraulic borehole injection tests for determination of mechanical parameters of rocks. Swedish Rock Engineering Research (SveBeFo). Paper presented at the annual Rock Mechanics Meeting in Stockholm March, 1995. 265-284 (1995).
274. Stephansson O., Jing L. and **Rutqvist J.** DECOVALEX - Coupled HTM modelling for nuclear waste repositories. The Finnish Symposium on Rock Mechanics 1992. (Kuula, Posa and Suominen Eds) (1992).

275. **Rutqvist J.**, Noorishad J., Stephansson O. and Tsang C.F. Modelling of hydrothermo-mechanical effects in a fracture intersecting a nuclear waste deposition hole. Proceedings of the International High-Level Radioactive Waste management Conference, Las Vegas, USA. 547-554 (1991).
276. **Rutqvist J.** och Stephansson O. Hydraulic injection tests and modelling with ROCMAS - A new method for determination of mechanical parameters of rocks. Swedish Rock Engineering Research (SveBeFo). Paper presented at Rock Mechanics Meeting in Stockholm March 21, 1991. 45-53 (1991).
277. **Rutqvist J.**, Noorishad J., Ljunggren C., Stephansson O. and Tsang C.F. Theoretical and field investigation of fracture hydromechanical response under fluid injection. Proceeding of the International Society of Rock Mechanics Conference on Rock Joints, Loen, Norway. (1990).
278. **Rutqvist J.**, Digby P., Stephansson O. and Singh U. Simulation of borehole breakouts with a damage model. Proceedings of the International Symposium on Rock at Greta Depth, Pau, France. Balkema, Rotterdam, 1439-1445 (1990).

Abstracts

279. Lee J.-W., Kim K.-I., Min K.-B., **Rutqvist J.** Development of TOUGH-UDEC Simulator for the injection-induced fracture shear slip for CO₂ geosequestration Presented at the 6th Korea CCS International Conference, Jeju Island, Korea, 27-29 January (2016).
280. Zheng L., **Rutqvist J.**, Birkholzer J. Studying long-term geochemical alterations and geochemically-induced stress changes in bentonite using coupled THMC models XXI International Conference Computational Methods in Water Resources, CMWR 2016, will take place at the University of Toronto, Canada, from 20th – 24th June 2016.
281. Vilarrasa V., Rinaldi A.P., **Rutqvist J.** Coupled thermo-hydro-mechanical modeling of geological CO₂ storage at In Salah, Algeria. Abstract presented at the 43rd International Association of Hydrologists (IAH) Congress, le Corum, Montpellier, France, 25-29 September, 2016
282. **Rutqvist J.**, Rinaldi A.P., and Cappa F. Comparative modeling of fault reactivation and seismicity in geologic carbon storage and shale-gas reservoir stimulation. European Geosciences Union (EGU), Abstract EGU2016-18083 presented at the General Assembly 2016, Vienna, Austria, April 18-22, (2016).
283. Rinaldi A.P., Urpi L., **Rutqvist J.**, Cappa F., Vilarrasa V., Jeanne P. Numerical modeling of seismicity induced by large-scale CO₂ injection in a multilayered sedimentary system. Abstract ESC2016-266 presented at the 35th General Assembly of the European Seismological Commission, Trieste, Italy, 4-10 September (2016).
284. Rinaldi A.P., Urpi L., **Rutqvist J.**, Cappa F., Vilarrasa V., Jeanne P. Induced seismicity modeling triggered by large-scale CO₂ injection in multilayered

sedimentary formations. Congress of the Italian Geological Society, Napoli, Italy, 7-10 September (2016).

285. Zheng L., **Rutqvist J.**, and Birkholzer J. Studying long-term geochemical alterations and geochemically-induced stress changes in bentonite using coupled THMC models.
286. Rinaldi A.P. and **Rutqvist J.** Modeling stress/strain-dependent permeability changes for deep geoenergy applications. European Geosciences Union (EGU), Abstract EGU2016-15108 presented at the General Assembly 2016, Vienna, Austria, April 18-22, (2016).
287. **Rutqvist J.** Fractured-rock permeability-versus-stress relationships from in situ experiments. European Geosciences Union (EGU) Abstract EGU2016-18065 presented at the General Assembly 2016, Vienna, Austria, April 18-22, (2016).
288. Rinaldi A.P., **Rutqvist J.**, Finsterle S., Liu H.-H. Modeling ground surface uplift during CO₂ sequestration: the case of In Salah, Algeria. European Geosciences Union (EGU) Abstract EGU2016-18249 presented at the General Assembly 2016, Vienna, Austria, April 18-22, (2016).
289. Urpi L., Rinaldi A.P., **Rutqvist J.**, Cappa F., and Spiers C.J. Synthetic modeling of a fluid injection-induced fault rupture with slip-rate dependent friction coefficient. European Geosciences Union (EGU) Abstract EGU2016-16043 presented at the General Assembly 2016, Vienna, Austria, April 18-22, (2016).
290. Kim K., Rutqvist J., Nakagawa S., Houseworth J., and Birkholzer J. Discrete modeling of hydraulic fracturing processes in a complex pre-existing fracture network. American Geophysical Union (AGU), Abstract MR41A-2626 presented at 2015 Fall Meeting, AGU, San Francisco, Calif., 14-18 December (2015).
291. Lin J.-S., Choi J.H., Seol Y. and **Rutqvist J.** Modeling dissociation of hydrate bearing sediments under shear. American Geophysical Union (AGU), Abstract B13B-0606 presented at 2015 Fall Meeting, AGU, San Francisco, Calif., 14-18 December (2015).
292. Blanco-Martín L., **Rutqvist J.**, Battistelli A., and Birkholzer J. Long-Term Modeling of Coupled Processes in a Generic Salt Repository for Heat-Generating Nuclear Waste: Analysis of the Impacts of Halite Solubility Constraints. American Geophysical Union (AGU), Abstract T13E-08 presented at 2015 Fall Meeting, AGU, San Francisco, Calif., 14-18 December (2015).
293. Zheng L., **Rutqvist J.**, and Birkholzer J. Coupled THMC models for bentonite in clay repository for nuclear waste (Invited). American Geophysical Union (AGU), Abstract T13E-06 presented at 2015 Fall Meeting, AGU, San Francisco, Calif., 14-18 December (2015).
294. Jeanne P., and **Rutqvist J.** Stress field respond to massive injection of cold water into a geothermal reservoir study by geomechanical simulation. American Geophysical Union (AGU), Abstract H23A-1547 presented at 2015 Fall Meeting, AGU, San Francisco, Calif., 14-18 December (2015).

295. Zheng L., **Rutqvist J.**, and Birkholzer J.T. Coupled THMC Models for Bentonite in Clay Repository for Nuclear Waste: Illitization and Its Effect on Stress under High Temperature. Presented at The 5th International Conference on Coupled Thermo-Hydro-Mechanical-Chemical (THMC) Processes in Geosystems (GEOPROC): Petroleum and Geothermal Reservoir Geomechanics and Energy Resource Extraction, February 25-27, 2015.
296. Oldenburg C.M., Lee K.J., and **Rutqvist J.** On pressure rise in natural gas reservoirs due to CO₂-CH₄ mixing. 14th Annual Conference on Carbon Capture Utilization & Sequestration, Pittsburgh, Pennsylvania, April 28 to May 1, 2015.
297. Jeanne P., **Rutqvist J.**, Dobson P.F., Walters M., Hartline C., and Garcia J. The impacts of mechanical stress transfers caused by hydromechanical and thermal processes on fault stability during hydraulic stimulation in a deep geothermal reservoir. American Geophysical Union (AGU), Abstract S53E-03 presented at 2014 Fall Meeting, AGU, San Francisco, Calif., 15-19 December (2014).
298. Rinaldi A.P., Villarrasa V., **Rutqvist J.**, Jeanne P., and Cappa F. 3D modeling of fault reactivation during CO₂ injection. American Geophysical Union (AGU), Abstract H11K-05 presented at 2014 Fall Meeting, AGU, San Francisco, Calif., 15-19 December (2014).
299. Birkholzer J.T., Guglielmi Y., **Rutqvist J.**, Zheng L., and Spycher N.F. Improved understanding of carbon storage risk via controlled-release experiments. American Geophysical Union (AGU), Abstract H24A-01 presented at 2014 Fall Meeting, AGU, San Francisco, Calif., 15-19 December (2014).
300. Figueiredo B., Tsang C.-F., **Rutqvist J.**, and Niemi A. Study of pore-pressure induced hydromechanics effects on permeability of fractured rock with curved and dead-end fractures. American Geophysical Union (AGU), Abstract H32F-02 presented at 2014 Fall Meeting, AGU, San Francisco, Calif., 15-19 December (2014).
301. Lin J.-S., Xing P., **Rutqvist J.**, Seol Y., and Choi J.H. A new critical state model for geomechanical behavior of methane hydrate-bearing sands. American Geophysical Union (AGU), Abstract B11B-0012 presented at 2014 Fall Meeting, AGU, San Francisco, Calif., 15-19 December (2014).
302. Blanco Martín L., **Rutqvist J.**, Birkholzer J.T., Wolters R., and Lux K.-H. Modeling of the TSDE heater test to investigate crushed salt reconsolidation and rock salt creep for the underground disposal of high-level nuclear waste. American Geophysical Union (AGU), Abstract H41F-0889 presented at 2014 Fall Meeting, AGU, San Francisco, Calif., 15-19 December (2014).
303. Kim K., **Rutqvist J.**, Houseworth J., and Birkholzer J. Discrete fracture modeling of hydro-mechanical damage processes in geological systems. American Geophysical Union (AGU), Abstract H53C-0872 presented at 2014 Fall Meeting, AGU, San Francisco, Calif., 15-19 December (2014).
304. Zheng L., **Rutqvist J.**, Birkholzer J., Liu H.-H. Illitization within bentonite engineered barrier system in clay repositories for nuclear waste and its effect on the swelling stress: a coupled THMC modeling study. American Geophysical Union

(AGU), Abstract H21B-0734 presented at 2014 Fall Meeting, AGU, San Francisco, Calif., 15-19 December (2014).

305. Asahina D., Houseworth J., Kunhwi K., **Rutqvist J.**, and Birkholzer J. Hydro-mechanical model for fracture development and fluid flow in geomaterials XX International Conference on Computational Methods in Water Resources (CMWR 2014) Stuttgart, Germany, June 9-13, 2014.
306. Jeanne P., **Rutqvist J.**, Vasco D.W., Garcia J., Dobson P.F., Walter M., Hartline C.S., and Borgia A. Development of a 3D hydrogeological and geomechanical model of an Enhanced Geothermal System using micro-earthquake and ground deformation data from a 1-year injection program. American Geophysical Union (AGU), Abstract H51D-1221 presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 December (2013).
307. Vilarrasa V., **Rutqvist J.**, Carrera J. and Olivella S. Modeling ground displacement at In Salah CO₂ injection. 13th Annual Conference on Carbon Capture Utilization & Sequestration, Pittsburgh, Pennsylvania, April 28 to May 1, 2014.
308. Lux K.H., Düsterloh U., Wolters R., Birkholzer, J.T., **Rutqvist J.**, Blanco Martín L THM-coupled processes in rock salt with special attention to two-phase flow: Benchmark of two different modelling approaches concerning the long-term analysis of THM-coupled processes in the near-field of a generic salt repository for high-level nuclear waste. 2014 US/German Workshop on Salt Repository Research, Design and Operation Workshop, Santa Fe, New Mexico, September 7-11, 2014.
309. Zheng L., **Rutqvist J.**, Birkholzer J.T., Liu H.-H. Illitization within bentonite engineered barrier system in clay repositories for nuclear waste and its effect on the swelling stress: a coupled THMC modeling study. Abstract presented at The California Goldschmidt Conference June 8-13, 2014. Goldschmidt 2014 Abstracts 2862 (2014).
310. Hu M., Wang Y., and Rutqvist J. On the new approaches for modeling water flow in heterogeneous media using numerical manifold method. DDA Workshop at Asian Rock Mechanics Symposium, Sapporo, Japan, October 12, (2014).
311. Birkholzer J.T., Mukhopadhyay S., **Rutqvist J.** and Tsang C.-F. Model comparison in subsurface science: The DECOVALEX and Sim-SEQ initiatives (Invited). American Geophysical Union (AGU), Abstract H32G-02 presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 December (2013).
312. Birkholzer J.T., Asahina D., Houseworth J., Liu H.H., and **Rutqvist J.** "Modeling Coupled Hydro-Mechanical Phenomena in the Near Field of a High-Level Radioactive Waste Repository in Clay Formations" in SIAM Conference on the Mathematical and Computational Issues in the Geosciences (GS13), 17-20, 2013, University of Padova, Italy. Geophysical Research Abstracts.
313. Borgia A., **Rutqvist J.**, Oldenburg C.M., Hutchings L., Garcia J., Walters M., Hartline C., Jeanne P., Dobson P., and Boyle K. Three-dimensional numerical reservoir simulation of the EGS Demonstration Project at The Geysers geothermal field. European Geophysical Union, Geophysical Research Abstracts, Vol. 15, EGU2013-5782, EGU General Assembly (2013).

314. Rinaldi A.P., **Rutqvist J.**, Jeanne P., Cappa F., and Guglielmi Y. Induced seismicity and CO₂ leakage through fault zones during large-scale underground injection in a multilayered sedimentary system. European Geophysical Union, Geophysical Research Abstracts, Vol. 16, EGU2014-3164, EGU General Assembly (2014).
315. Konstantinovskaya E., **Rutqvist J.**, and Malo M. Fault stability and CO₂ storage in the Early Paleozoic sedimentary basin of the St. Lawrence Lowlands (Quebec, Canada): insight from coupled reservoir-geomechanical modeling. American Geophysical Union (AGU), Abstract H51O-03 presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 December (2013).
316. Blanco Martin L., **Rutqvist J.**, and Birkholzer J.T. On the importance of coupled THM processes to predict the long-term response of a generic salt repository for high-level nuclear waste. American Geophysical Union (AGU), Abstract 1. H43F-1527 presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 December (2013).
317. Vilarrasa V., **Rutqvist J.**, and Zheng L. Implementation and application of a dual structure model for simulating the behavior of expansive soils. American Geophysical Union (AGU), Abstract H14A-08 presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 December (2013).
318. Rinaldi A.P., **Rutqvist J.**, Jeanne P., and Cappa F. Induced seismicity and CO₂ leakage through fault zones during large-scale underground injection in a multilayered sedimentary system. American Geophysical Union (AGU), Abstract H11M-02 presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 December (2013).
319. Moridis G.J., **Rutqvist J.**, Kim J., Reagan M.T., and Freeman C.M. Potential Environmental Impact of Hydraulic Fracturing on Groundwater: Investigations of Coupled Flow, Geomechanics and Contaminant Transport (Invited). American Geophysical Union (AGU), Abstract A54H-05 presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 December (2013).
320. **Rutqvist J.**, Cappa F., Rinaldi A.P., Godano M. Dynamic modeling of seismicity triggered by underground CO₂ injection and impact on surface structures and human perception. American Geophysical Union (AGU), Abstract S31F-08 presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 December (2013).
321. Vilarrasa V., **Rutqvist J.**, Carrera J., Olivella S. Thermo-hydro-mechanical effects of cold CO₂ injection on the caprock mechanical stability. The Annual CCUS Conference, Pittsburgh, Pennsylvania, April 28 to May 1, 2014.
322. Konstantinovskaya E., **Rutqvist J.**, and Malo M. Influence of CO₂ injection on fault stability and induced seismicity in the Early Paleozoic sedimentary basin of the St. Lawrence Lowlands (Quebec, Canada): insight from coupled reservoir-geomechanical modeling. The 85th annual meeting of the Eastern Section of the Seismological Society of America will be held 6-8 October 2013 at the Manoir Richelieu located in La Malbaie, Québec, Canada.
323. Lee J., Lee M. Min K.-B., and **Rutqvist J.** Effect of in-situ stress on the leakage potential associated with CO₂ geosequestration investigated by probabilistic leakage

analysis. Presented at the 3rd Korea CCS Conference, Jeju Island, Korea, 13-15 March, (2013).

324. **Rinaldi A.P.**, Rutqvist J., Finsterle S., Liu H.H. Modeling ground displacement at In Salah CO₂ injection. 12th Annual Conference on Carbon Capture Utilization & Sequestration, Pittsburgh, Pennsylvania, May 13 to 16, 2013.
325. **Rutqvist J.** Geomechanical aspects of geologic CO₂ storage critically important for safety and public acceptance. Invited presentation at the 3rd Korea CCS Conference, Jeju Island, Korea, 13-15 March, (2013).
326. Rinaldi A., and **Rutqvist J.** Stress-dependent permeability and ground displacement during CO₂ storage operation at KB-502 injection well, In Salah, American Geophysical Union (AGU), Abstract H23D-1410 presented at 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 December (2012).
327. Konstantinovskaya E., **Rutqvist J.**, Malo M., Comeau F.-A., Claprod M. Geomechanical aspects of the St. Lawrence Lowlands in the context of geological sequestration of CO₂. 81st Association francophone pour le savoir AFCAS Congress, Laval University, Québec City, Canada, 6 to 10 May (2013).
328. Vasco D.W., **Rutqvist J.**, Dobson P.F., Oldenburg C.M., Ferretti A., Rucci A., Novli F., Garcia J., Walters M., and Hartline C. Monitoring deformation at The Geysers geothermal field, California using C-band and X-band Interferometric Synthetic Aperture Radar. American Geophysical Union (AGU), Abstract H12F-06 presented at 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 December (2012).
329. **Rutqvist J.**, Cappa F., Mazzoldi A., and Rinaldi A. Geomechanical modeling of fault responses and the potential for notable seismic events during underground CO₂ injection. American Geophysical Union (AGU), Abstract H13L-08 presented at 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 December (2012).
330. Guglielmi Y., Cappa F., Derode B., Jeanne P., and **J. Rutqvist.** A. Underground testing of permeability and earthquake nucleation in fault zones. American Geophysical Union (AGU), Abstract H32G-05 presented at 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 December (2012).
331. **Rutqvist J.** and Moridis G.J. Modeling of Geomechanical Performance of Sloping Oceanic Hydrate Deposits Subjected Production Activities. American Geophysical Union (AGU), Abstract OS43D-1850 presented at 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 December (2012).
332. Pan P., **Rutqvist J.**, Yan F., and Feng X. A study of caprock continuous-discontinuous fracturing process during CO₂-injection into a brine aquifer. American Geophysical Union (AGU), Abstract NG51D-1789 presented at 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 December (2012).
333. Kim J., Sonnenthal E.L., and **Rutqvist J.** A modeling and numerical algorithm for thermoporomechanics in multiple porosity media for naturally fractured reservoirs. American Geophysical Union (AGU), Abstract H33B-1306 presented at 2011 Fall Meeting, AGU, San Francisco, Calif., 5-9 December (2011).

334. **Rutqvist J.** Geomechanical modeling and monitoring of fault responses and the potential for earthquakes during underground CO₂ injection. American Geophysical Union (AGU), Abstract H53M-01 presented at 2011 Fall Meeting, AGU, San Francisco, Calif., 5-9 December (2011).
335. **Rutqvist J.** Modeling of the potential fault reactivation in CO₂ sequestration and shale gas fracking. American Rock Mechanics Association (ARMA), 2nd Unconventional Resources Geomechanics Workshop, Chicago, June 22, 2012.
336. **Rutqvist J.** Stress-versus-permeability relationships of fracture rock from in situ experimental and effects of chemical-mechanical coupling. American Geophysical Union (AGU), Abstract H53L-04 presented at 2011 Fall Meeting, AGU, San Francisco, Calif., 5-9 December (2011).
337. Guglielmi Y., Cappa F., and **Rutqvist J.** The influence of stress transfer in naturally fractured rock on injection-induced fracture reactivation. American Geophysical Union (AGU), Abstract S33A-2304 presented at 2011 Fall Meeting, AGU, San Francisco, Calif., 5-9 December (2011).
338. Rinaldi A.P., and **Rutqvist J.** Modeling of transient evolution of uplift and subsidence during CO₂ storage operation at In Salah, Algeria. American Geophysical Union (AGU). Abstract H33B-1306 presented at 2011 Fall Meeting, AGU, San Francisco, Calif., 5-9 December (2011).
339. Mazzoldi A., Rinaldi A.P., and **Rutqvist J.** Max magnitude of induced seismic events within CC2 projects, related to the permeability of faults. American Geophysical Union (AGU), Abstract H33B-1307 presented at 2011 Fall Meeting, AGU, San Francisco, Calif., 5-9 December (2011).
340. Guglielmi Y., Cappa F., and **Rutqvist J.**, HPPP Hydromechanical tests and developments at the LSBB Underground Research Laboratory (France) Y. American Geophysical Union (AGU), Abstract H11m-04 presented at 2010 Fall Meeting, AGU, San Francisco, Calif., 13-17 December (2010).
341. **Rutqvist J.**, CO₂ Sequestration Geomechanics and Modeling. American Rock Mechanics Association (ARMA), Unconventional Resources Geomechanics Workshop, San Francisco, June 24, 2011.
342. Mazzoldi A., and **Rutqvist J.** Evaluation of maximum expected magnitude of induced seismic events resulting from CO₂ injection for geologic carbon sequestration. American Geophysical Union (AGU), Abstract NH31B-1360 presented at 2010 Fall Meeting, AGU, San Francisco, Calif., 13-17 December (2010).
343. **Rutqvist J.**, Vasco D., Liu H.H., Pan L., Kappler K., and Majer E. Coupled, Non-isothermal Modelling of Surface Deformations and Induced Seismicity at the In Salah CO₂ storage operation. 9th annual conference on carbon capture and sequestration, Pittsburgh, Pennsylvania, May 10 to 13, 2010.
344. Chiaramonte L., Kowalsky M.B., **Rutqvist J.**, and Moridis G.J. Design of a potential long-term test of gas production from a hydrate deposit at the PBU-L106 site in North Slope, Alaska: Geomechanical system response and seismic

monitoring. American Geophysical Union (AGU), EOS Trans. AGU, 90(52), Fall Meeting, Suppl., Abstract OS24A-08, (2009).

345. Cappa F., **Rutqvist J.**, and Yamamoto K. Crustal deformation and rupture processes related to upwelling of deep CO₂-rich fluids during the 1965-1967 Matsushiro Earthquake Swarm in Japan: A hydromechanical model with multiphase flow. American Geophysical Union (AGU), EOS Trans. AGU, 90(52), Fall Meeting, Suppl., Abstract T53C-1604, (2009).
346. Guglielmi Y., Cappa F., **Rutqvist J.**, Wang J.S. Hydromechanical Imaging of Fractured-Porous Rocks Properties and Coupled Processes. American Geophysical Union (AGU), EOS Trans. AGU, 90(52), Fall Meeting, Suppl., Abstract H21J-06, (2009).
347. **Rutqvist J.** and Vasco D. Numerical Analysis of Deep Underground CO₂ Injection and Ground Surface Deformations at In Salah, Algeria. 8th annual conference on carbon capture and sequestration, Pittsburgh, Pennsylvania, May 4 to 7, 2009.
348. Liu H.H. and **Rutqvist J.** (2009). Use of a Dual-Continuum Approach for Modeling Coupled Hydro-mechanical Processes of CO₂ Injection at In Salah, Algeria. 8th annual conference on carbon capture and sequestration, Pittsburgh, Pennsylvania, May 4 to 7, 2009.
349. Siriwardane H., Morris J.P., **Rutqvist J.**, Zyvoloski G., Bromhal G., Guthrie G. (2009). National Risk Assessment Program: Geomechanics Group. 8th annual conference on carbon capture and sequestration, Pittsburgh, Pennsylvania, May 4 to 7, 2009.
350. Guglielmi Y., Cappa F., **Rutqvist J.**, Tsang C.F., and Gaffet S. (2008). In-situ ultra low frequency poroelastic response of a natural macro-fracture. American Geophysical Union (AGU), EOS Trans. AGU, 89(53), Fall Meeting, Suppl., Abstract NS51A-05H, (2008).
351. **Rutqvist J.** and Vasco D. (2008). Coupled Reservoir-Geomechanical Analysis of CO₂ Injection Performance at In Salah, Algeria. American Geophysical Union (AGU), EOS Trans. AGU, 89(53), Fall Meeting, Suppl., Abstract H14C-02, (2008).
352. Wang Y. and **Rutqvist J.** (2008). Inverse model of fully coupled fluid flow and stress in fractured rock masses. American Geophysical Union (AGU), EOS Trans. AGU, 89(53), Fall Meeting, Suppl., Abstract NS51A-02, (2008).
353. Vasco, D.W., Ferretti A., Novali F., and **Rutqvist J.** (2008). Monitoring CO₂ injection from space: Using Interferometric Synthetic Radar to image subsurface volume and pressure change. Presentation at The 33rd International Geological Congress, Oslo August 6-14.
354. Birkholzer, J.T., Zhou, Q., **Rutqvist, J.**, Zhang, K., Tsang, C.-F. (2008): Large-Scale Hydrological Evaluation of CO₂ Injection-Storage and Modeling of Impact on Groundwater Systems, Abstract in Earth Sciences Division Research Summaries 2006-2007, LBNL-771E, Lawrence Berkeley National Laboratory, Berkeley, CA, USA.

355. **Rutqvist, J.**, Birkholzer, J.T., Tsang, C.-F. (2008): Coupled Reservoir-Geomechanical Analysis of Geomechanical Damage Associated with CO₂ Geological Storage, Abstract in Earth Sciences Division Research Summaries 2006-2007, LBNL-771E, Lawrence Berkeley National Laboratory, Berkeley, CA, USA
356. **Rutqvist J.**, and Moridis J.T. (2008). A Numerical Model for Analysis of the Geomechanical Performance of Hydrate-Bearing Sediments, Abstract in Earth Sciences Division Research Summaries 2006-2007, LBNL-771E, Lawrence Berkeley National Laboratory, Berkeley, CA, USA
357. **Rutqvist J.**, and Oldenburg C. (2008) Simulations of Induced Seismicity by Injection and Production at The Geysers Geothermal Field, Abstract in Earth Sciences Division Research Summaries 2006-2007, LBNL-771E, Lawrence Berkeley National Laboratory, Berkeley, CA, USA.
358. **Rutqvist J.**, Cappa F., Lewicki J., and Benson S. (2008) Analysis of Fault Rupture and CO₂ Upwelling during the 1960s Matsushiro Earthquake Swarm as a Natural Analogue of CO₂ Storage and Leakage, Abstract in Earth Sciences Division Research Summaries 2006-2007, LBNL-771E, Lawrence Berkeley National Laboratory, Berkeley, CA, USA.
359. **Rutqvist J.** and Tsang C.-F. (2006). Coupled Thermal-Hydrological-Mechanical Modeling of an In Situ Experiment in Fractured Rock, Abstract in Earth Sciences Division Research Summaries 2004-2005, LBNL-59633, Lawrence Berkeley National Laboratory, Berkeley, CA, USA.
360. Birkholzer J.T., **Rutqvist J.**, Sonnenthal, E., Tsang, C.-F. (2008): Geomechanical/Geochemical Modeling Studies Conducted with the International Cooperative DECOVALEX-THMC Project, Abstract in Earth Sciences Division Research Summaries 2006-2007, LBNL-771E, Lawrence Berkeley National Laboratory, Berkeley, CA, USA.
361. **Rutqvist J.** Stress-versus-permeability Relationships of Fractures from In Situ Experiments. American Geophysical Union (AGU), EOS Trans. AGU, 88(52), Fall Meeting, Suppl., Abstract H13J-05, Invited presentation, (2007).
362. Guglielmi Y., Cappa F., Virieux J., **Rutqvist J.**, and Tsang C.-F. A new approach for very large broadband geophysical monitoring of rock deformation into deep boreholes: The high-pulse poroelasticity protocol (HPPP). American Geophysical Union (AGU), EOS Trans. AGU, 88(52), Fall Meeting, Suppl., Abstract H13J-04, (2007).
363. Zhou Q, Birkholzer J.T., Tsang C.-F., and **Rutqvist J.** Quick Assessment of CO₂ Storage Capacity in Pressure-Constrained Saline Aquifers with Different Hydrogeologic Properties. American Geophysical Union (AGU), EOS Trans. AGU, 88(52), Fall Meeting, Suppl., Abstract H13F-1662, (2007).
364. Zhou Q, Birkholzer J.T., **Rutqvist J.**, and Tsang C.-F. (2007): Sensitivity Study of CO₂ Capacity in Brine Aquifers with Closed Boundaries: Dependence on Hydrogeologic Properties, Proceedings 6th Annual Conference on Carbon Capture and Sequestration, Pittsburgh, PA, May 2007.

365. Birkholzer J., Tsang C.-F. and **J. Rutqvist**. A Comparative Review of Hydrologic Issues Involved in Geologic Storage of CO₂ and Injection Disposal of Liquid Waste 12th International Congress on Energy and Mineral Resources Oviedo, October 7-11, 2007.
366. Yamamoto K., Aoyagi R., Koide H., Tosha T., Nakanishi S. Todaka N., Benson S., **Rutqvist J.**, and Lewicki J. Matsushiro earthquake swarm (1965-1967) as natural analogue of CO₂ storage and leakage. American Geophysical Union (AGU), EOS Trans. AGU, 87(52), Fall Meeting, Suppl., Abstract H21A-1359, (2006).
367. **Rutqvist J.**, Birkholzer JT, Tsang C-F. Modeling of geomechanical processes during injection in a multilayered reservoir-caprock system and implications on site characterization, Proceedings CO2SC 2006, International Symposium on Site Characterization for CO₂ Geological Storage, Berkeley CA, March 20-22, 2006.
368. Birkholzer J.T., Pruess K., Lewicki J.L., **Rutqvist J.**, Tsang C.-F., and Karimjee A. (2006). Large releases from CO₂ storage reservoirs: Analogues, scenarios, and modeling needs, Proceedings Petrobras International Seminar on Carbon Sequestration and Climate Change, October 2006, Rio de Janeiro, Brazil.
369. Birkholzer J.T., Pruess K., Lewicki J.L., **Rutqvist J.**, Tsang C.-F., and Karimjee A. (2006). Large Releases from CO₂ Storage Reservoirs: A Discussion of Natural Analogs, FEPS, and Modeling Needs, Proceedings Fifth Annual Conference on Carbon Capture and Sequestration, May 2006, Washington, D.C., USA.
370. Birkholzer J.T., **Rutqvist J.**, and Tsang C.-F. (2005). CO₂ Injection in a Faulted Multi-Layer System: Simulation of Hydrological and Geochemical Processes. American Geophysical Union (AGU), EOS Trans. AGU, 86(52), Fall Meeting, Suppl., Abstract GC13A-1212.
371. Cappa F., Guglielmi Y., **Rutqvist J.**, Tsang C.-F., and Thoraval A. In situ coupled hydromechanical effects in a high-permeability deformable fracture: Numerical analysis of pulse test signals. American Geophysical Union (AGU), EOS Trans. AGU, 86(52), Fall Meeting, Suppl., Abstract H24C-06, (2005).
372. Tsang C.-F., Cappa F., **Rutqvist J.**, Guglielmi Y., and Thoraval A. Experimental and modeling investigation of direct and indirect hydromechanical coupling effects in a multi-permeability fractured aquifer. American Geophysical Union (AGU), EOS Trans. AGU, 86(52), Fall Meeting, Suppl., Abstract H21C-1357, (2005).
373. **Rutqvist J.** and Tsang C.-F. (2003) Coupled Thermal-Hydrological-Mechanical Analysis with TOUGH-FLAC, Abstract in Earth Sciences Division Research Summaries 2002-2003, LBNL-53859, Lawrence Berkeley National Laboratory, Berkeley, CA, USA.
374. Tsang Y., Mukhopadhyay S., **Rutqvist J.**, Sonnenthal E., and Spycher N. (2003) Yucca Mountain Heater Test Cooling Phase, Abstract in Earth Sciences Division Research Summaries 2002-2003, LBNL-53859, Lawrence Berkeley National Laboratory, Berkeley, CA, USA.
375. Daley, T.M., Schoenberg M., **Rutqvist J.** and Nihei K. (2003) Fractured Reservoir Modeling: Coupled Seismic and Fluid Response, Abstract in Earth Sciences

Division Research Summaries 2002-2003, LBNL-53859, Lawrence Berkeley National Laboratory, Berkeley, CA, USA.

376. **Rutqvist J.**, Todesco M., Tsang C.-F. Application of a model for multiphase fluid flow, heat transport, and mechanical deformation to surface deformations associated with volcanic activities. American Geophysical Union (AGU), EOS Trans. AGU, 84(46), Fall Meeting, Suppl., Abstract G42A-0044, (2003).
377. Daley T.M., Schoenberg M.A., **Rutqvist J.**, Nihei KT. Coupled modeling of time-lapse change in seismic propagation and permeability in fractured reservoirs due to fluid injection. Eos Trans. AGU, 84(46), Fall Meeting, Abstract S41E-0134 (2003).
378. Tsang, Y., Mukhopadhyay S., **Rutqvist J.**, Sonnenthal E., and Spycher N., 2003. The cooling phase of the Yucca Mountain heater test. IAEA Waste Management Research. Berkeley, CA. LBNL-53875 Abs.
379. **Rutqvist J.** and Tsang C.-F. (2002) Modeling of coupled thermal-hydrologic-mechanical processes at Yucca Mountain, Abstract in Earth Sciences Division Research Summaries 2000-2001, Lawrence Berkeley National Laboratory, Berkeley, CA, USA.
380. **Rutqvist J.** and Tsang C.-F. (2002) Modeling of Hydromechanical Changes Associated with Brine Aquifer Disposal of CO₂, Abstract in Earth Sciences Division Research Summaries 2000-2001, Lawrence Berkeley National Laboratory, Berkeley, CA, USA.
381. **Rutqvist J.**, Wu Y.S., Tsang C.-F., and Bodvarsson G. (2002) Coupling of TOUGH2 and FLAC3D for Coupled THM Analysis with Multi-phase Flow, Abstract in Earth Sciences Division Research Summaries 2000-2001, Lawrence Berkeley National Laboratory, Berkeley, CA, USA.
382. **Rutqvist J.** and Tsang C.F. Modeling of Multi-phase Fluid Flow, Heat Transfer and Rock Deformation during CO₂ Injection in Deep Aquifers (Abstract). Presented at the 2001 AAPG (The American Association of Petroleum Geologists) Annual Convention, June 3-6, Denver, Colorado (2001).
383. **Rutqvist J.**, Noorishad J. and Tsang C.-F. (2000) Coupled analysis of a THM field experiment in unsaturated buffer-rock system. Abstract in Earth Sciences Division Annual Report 1998-1999, Lawrence Berkeley National Laboratory, Berkeley, CA, USA.
384. **Rutqvist J.**, Noorishad J. and Tsang C.-F. (2000) Testing of a coupled THM model for unsaturated media against laboratory experiments, Abstract in Earth Sciences Division Annual Report 1998-1999, Lawrence Berkeley National Laboratory, Berkeley, CA, USA.
385. Noorishad J., **Rutqvist J.**, and Tsang C.-F. (2000) A coupled THM model for unsaturated geological media Abstract in Earth Sciences Division, Annual Report 1998-1999, Lawrence Berkeley National Laboratory, Berkeley, CA, USA.
386. **Rutqvist J.** and Tsang C.F. Application of the ROCMAS code to coupled thermo-hydro-mechanical problems. Proceeding of the International Symposium on

dynamics of fluids in fractured rocks-Concepts and recent advances (Ed. Faybishenko) pp. 232-233 (1999).

387. **Rutqvist J.** and Tsang C.F. A study of memory-retention in variable-rate pressure transient tests for injection wells in non-homogeneous injection zone with formation damage. 98 annual forum of the ground water protection council (GWPC), Sacramento, California, September 19-23 (1998).

Theses

388. **Rutqvist J.** Coupled stress-flow properties of rock joints from hydraulic field testing. Doctoral Thesis TRITA-AMI PHD 1002, Royal Institute of Technology, Stockholm, Sweden, (1995).
389. **Rutqvist J.** Modelling and field testing of coupled hydromechanical behaviour of rock joints. Luleå University of Technology, Sweden. Licentiate Thesis: 1990:17L (1990).
390. **Rutqvist J.** och Sjöberg J. The hangingwall of Kaptensmalmen. An analysis of the hangingwall problems in the city of Malmberget. Luleå University of Technology, Sweden. Masters Thesis: 1987:153 E. P. 430 (1987).

Reports (Selected)

391. Zheng L., **Rutqvist J.**, Kim K., and Houseworth J. Investigation of Coupled Processes and Impact of High Temperature Limits in Argillite Rock. FCRD-UFD-2015-000362. LBNL-187644, Lawrence Berkeley National Laboratory (2015).
392. **Rutqvist J.**, Blanco Martin L., Molins S., Trebotich D., and Birkholzer J. Modeling Coupled THMC Processes and Brine Migration in Salt at High Temperatures. Prepared for U.S. Department of Energy, Used Fuel Disposition, FCRD-UFD-2015-000366, LBNL-191216, Lawrence Berkeley National Laboratory, (2015).
393. **Rutqvist J.**, Blanco Martin L., Mukhopadhyay S., Houseworth J., and Birkholzer J. Modeling Coupled THMC Processes and Brine Migration in Salt at High Temperatures. Prepared for U.S. Department of Energy, Used Fuel Disposition, FCRD-UFD-2014-000341, Lawrence Berkeley National Laboratory, LBNL-6718E (2014).
394. Zheng, L., **Rutqvist J.**, Greenberg H., and Birkholzer J. Thermo-Hydrological-Mechanical Response in Argillaceous Sedimentary Rock Repository for Direct Disposal of Dual-Purpose Canisters FCRD-UFDC-2014-000515, Lawrence Berkeley National Laboratory (2014).
395. **Rutqvist J.**, Blanco Martin L., Mukhopadhyay S., Houseworth J., and Birkholzer J. Modeling and Field Test Planning Activities in Support of Disposal of Heat-Generating Waste in Salt. Prepared for U.S. Department of Energy, Used Fuel Disposition, FCRD-UFD-2014-000622, Lawrence Berkeley National Laboratory, LBNL-6718E (2014).

396. **Rutqvist J.**, Davis J., Zheng L., Vilarrasa V., Houseworth J., Birkholzer J. Investigation of Coupled THMC Processes and Reactive Transport: FY14 Progress. Prepared for U.S. Department of Energy, Used Fuel Disposition, FCRD-UFD-2014-000497, Lawrence Berkeley National Laboratory, LBNL-6720E (2014).
397. Zheng L., **Rutqvist J.**, Steefel C., Kim K., Chen F., Vilarrasa V., Nakagawa S., Houseworth J., and Birkholzer J. Investigation of Coupled Processes and Impact of High Temperature Limits in Argillite Rock Prepared for U.S. Department of Energy, Used Fuel Disposition, FCRD-UFD-2014-000493, Lawrence Berkeley National Laboratory, LBNL-6719E (2014).
398. Davis J., **Rutqvist J.**, Steefel C., Tinnacher R., Vilarrasa V., Zheng L., Bourg I., Liu H.-H., and Birkholzer J. Investigation of Reactive Transport and Coupled THMC Processes in the EBS: FY13 Report. Prepared for U.S. Department of Energy, Used Fuel Disposition, FCRD-UFD-2013-000216, Lawrence Berkeley National Laboratory (2013).
399. **Rutqvist J.**, Blanco Martín L., Kim J., and Birkholzer J. Modeling Coupled THMC Processes and Brine Migration in Salt at High Temperatures. Prepared for U.S. Department of Energy, Used Fuel Disposition, FCRD-UFD-2013-000262, Lawrence Berkeley National Laboratory (2013).
400. Liu H.H., Houseworth J., **Rutqvist J.**, Zheng L., Asahina D., Li L., Vilarrasa V., Chen F., Nakagawa S., Finsterle S., Doughty C., Kneafsey T., Birkholzer J. Report on THMC Modeling of the Near Field Evolution of a Generic Clay Repository: Model Validation and Demonstration. Prepared for U.S. Department of Energy, Used Fuel Disposition Campaign, FCRD-UFD-2013-000244, Lawrence Berkeley National Laboratory (2013).
401. **Rutqvist J.**, Steefel C., Chen F., Houseworth J., Vilarrasa V., Liu H.-H., Birkholzer J. THM and Reactive Transport Model Development and Evaluation: International Activities. Prepared for U.S. Department of Energy, Used Fuel Disposition Campaign, FCRD-UFD-2013-000372, Lawrence Berkeley National Laboratory (2013).
402. Houseworth J., **Rutqvist J.**, Asahina D., Chen F., Vilarrasa V., Liu H.H., Birkholzer J. Report on International Collaboration Involving the FE Heater and HG-A Tests at Mont Terri. Prepared for U.S. Department of Energy, Used Fuel Disposition Campaign, FCRD-UFD-2014-000002, Lawrence Berkeley National Laboratory (2013).
403. **Rutqvist J.**, Blanco Martín L. and Houseworth J. THM Coupled Process Modeling with TOUGHFLAC to Evaluate the Fate and Transport of Water in a Salt-Based Repository. Prepared for U.S. Department of Energy, Used Fuel Disposition Campaign, FCRD-UFD-2012-000297, Lawrence Berkeley National Laboratory (2012).
404. Liu H.H., Houseworth J., **Rutqvist J.**, Li L., Asahina D., Chen F., and Birkholzer J. Report on Modeling Coupled Processes in the Near Field of a Clay Repository. Prepared for U.S. Department of Energy, Used Fuel Disposition Campaign, FCRD-UFD-2012-000223, Lawrence Berkeley National Laboratory (2012).

405. Zhen L., Li L., **Rutqvist J.**, Liu H.H., and Birkholzer J. Modeling Radionuclide Transport in Clays. Prepared for U.S. Department of Energy, Used Fuel Disposition Campaign, FCRD-UFD-2012-000128, Lawrence Berkeley National Laboratory (2012).
406. **Rutqvist J.**, Steefel C., Davis J., Bourg I., Tinnacher R., Galindez J., Holmboe M., Birkholzer J., and Liu H.H. Investigation of Reactive Transport and Coupled THM Processes in EBS: FY12 Report, Prepared for U.S. Department of Energy, Used Fuel Disposition Campaign, FCRD-UFD-2012-000125, Lawrence Berkeley National Laboratory (2012).
407. Zheng L., **Rutqvist J.**, Houseworth J., Davis J., Tinnacher R., Li L., and H-H Liu H.-H. Investigation of Nearfield THMC Coupled Processes, Prepared for U.S. Department of Energy, Used Fuel Disposition Campaign, Lawrence Berkeley National Laboratory (2011).
408. Rutqvist J., Steefel C., Galindez J., Birkholzer J., and Liu H-H. Modeling Coupled THM Processes and Reactive Diffusive Transport in Engineered Barrier Systems (EBS), Prepared for U.S. Department of Energy, Used Fuel Disposition Campaign, Lawrence Berkeley National Laboratory (2011).
409. Disposal Systems Evaluations and Tool Development □ Engineered Barrier System (EBS) Evaluation. Jové Colón C.F., Caporuscio F.A., Levy S.S., Xu H., Blink J.A., Halsey W.D., Buscheck T., Sutton M., Serrano de Caro M.A., Wolery T.J., Liu H., Birkholzer J., Steefel C.I., **Rutqvist J.**, Tsang C.-F., Sonnenthal E. SANDIA Report SAND2010-8200. Sandia National Laboratories, Albuquerque, New Mexico (2011).
410. Steefel C., **Rutqvist J.**, Tsang C.-F., Liu H.-H., Sonnenthal E., Houseworth J., and Birkholzer J. Reactive Transport and Coupled THM Processes in Engineering Barrier Systems (EBS). Prepared for U.S. Department of Energy, Used Fuel Disposition Campaign, LBNL Paper LBNL-3901E. Lawrence Berkeley National Laboratory (2010). <http://escholarship.org/uc/item/6sm5k7bh>
411. Liu H.-H., **Rutqvist J.**, Zheng L., Sonnenthal E., Houseworth J., and Birkholzer J. Modeling Coupled Processes in Clay Formations for Radioactive Waste Disposal. Prepared for U.S. Department of Energy, Used Fuel Disposition Campaign, LBNL Paper LBNL-3900E <http://escholarship.org/uc/item/6qp4r8c7>. Lawrence Berkeley National Laboratory (2010).
412. **Rutqvist J.** and Tsang C.-F. Review of SKB's Work on Coupled THM Processes Within SR-Can: External review contribution in support of SKI's and SSI's review of SR-Can. Swedish Nuclear Power Inspectorate (SKI) Technical Report 2008:08 (2008).
413. Elsworth, D., **Rutqvist J.**, K-B Min, A. Grader, C.J. Marone, and E. Sonnenthal, (2007). Integrated assessment of critical chemical and mechanical processes affecting drift performance: laboratory and modeling studies, DOE-RW-0594, LBNL-63656, p. 119-120.
414. Birkholzer J., **Rutqvist J.**, and Sonnenthal E. (2007). Task D: Long-Term Permeability/Porosity Changes in the EDZ and Near Field due to THM and THC

Processes in Volcanic and Crystalline-Bentonite Systems. Swedish Nuclear Power Inspectorate (SKI) Technical Report 2007:10 (2007).

415. Majer, E. ;Peterson, J. ;Stark, M. ;Smith, B. ;**Rutqvist, J.** ;Kennedy, M. Integrated High Resolution Microearthquake Analysis and Monitoring for Optimizing Steam Production at The Geysers Geothermal Field, California. Report submitted to the State of California, California Energy Commission April 26, (2004). LBNL-55295.
416. Wu Y-S., Sonnenthal E., **Rutqvist J.**, Zhang K., Mukhopadhyay S, Dobson P., and Zhang G. Mountain-scale coupled processes (TH/THC/THM), MDL-NBS-HS-000007 Rev 01. Bechtel SAIC. Las Vegas NV LBID-2521 (2004).
417. **Rutqvist J.** *Drift Scale THM Model*. MDL-NBS_HS_000017 REV 00 ICN01. Bechtel SAIC, Las Vegas, NV, LBID-2477 (2003).
418. G.S. Bodvarsson, J. Wang, A. Unger, J. Liu, Y-S. Wu, J. Hinds, C. Haukwa, E. Sonnenthal, C-F. Tsang, **J. Rutqvist**. "Unsaturated Zone Flow." In Chapter 3 of Supplemental Science and Performance Analyses, Consisting of Volume 1, Scientific Bases and Analyses, TDR-MGR-MD-000007, REV 00. CRWMS M&O: Las Vegas, Nevada. (2001).
419. Pruess, K., Garcia, J., Kowsek, T., Oldenburg, C., **Rutqvist, J.**, Steefel, C. and Xu, T. Intercomparison of numerical simulation codes for geologic disposal of CO₂. Lawrence Berkeley National Laboratory Technical Report, LBNL-44203. p. 86, (2002).
420. S. Finsterle, G.S. Bodvarsson, C.F. Ahlers, G. Li, C-F. Tsang, Y. Tsang, E.L. Sonnenthal, **J. Rutqvist** (In Preparation). "Seepage." In Chapter 4 of Supplemental Science and Performance Analyses, Consisting of Volume 1, Scientific Bases and Analyses, TDR-MGR-MD-000007, REV 00. CRWMS M&O: Las Vegas, Nevada.(2001).
421. **Rutqvist J.**, Noorishad J. and Tsang C.-F. Coupled Analysis of a Thermohydrromechanical Experiment in Rock at Kamaishi Mine-Final Report. Swedish Nuclear Power Inspectorate (SKI) Technical Report 99:50. Also a Lawrence Berkeley National Laboratory Technical Report, LBNL-44203. p. 103, (1999).
422. **Rutqvist J.**, Ekman D. and Stephansson O. Drilling KLX02 –Phase 2 Lilla Laxemar, Oscarshamn. High pressure hydraulic injection in deep boreholes for hydromechanical characterization of hard rocks. Swedish Nuclear Fuel and Waste Management Company (SKB) Research Report U-97-26. 169 p. (1997)
423. **Rutqvist J.** Experiments and numerical analyses of the borehole injection test (TC6). In DECOVALEX - Report of Phase III. Swedish Nuclear Power Inspectorate. SKI Technical Report: 95:80 (1995).
424. Jing L., **Rutqvist J.**, Stephansson O., Tsang C.-F. and Kautsky F. DECOVALEX - Mathematical models of coupled T-H-M processes for nuclear waste repositories. Report of Phase III. Swedish Nuclear Power Inspectorate. SKI Technical Report 95:80 (1995).

425. Jing L., **Rutqvist J.**, Stephansson O., Tsang C.-F. and Kautsky F. DECOVALEX - Mathematical models of coupled T-H-M processes for nuclear waste repositories. Report of Phase II. Swedish Nuclear Power Inspectorate. SKI Technical Report: 94-16. (1994).
426. Jing L., **Rutqvist J.**, Stephansson O., Tsang C.-F. and Kautsky F. DECOVALEX - Mathematical models of coupled T-H-M processes for nuclear waste repositories. Report of Phase I. Swedish Nuclear Power Inspectorate. SKI Technical Report: 93-31. (1993).
427. **Rutqvist J.** Test Case 6 - Borehole Injection Test. DECOVALEX Secretariat Doc93/139. Division of Engineering Geology, Royal Institute of Technology, Sweden (1993).
428. **Rutqvist J** and Makurat A. Test Case 1:2, Coupled stress-flow test, Phase 2, DECOVALEX Secretariat Doc92/111. Engineering Geology, Royal Institute of Technology, Sweden (1992).
429. **Rutqvist J.**, Noorishad J., Stephansson O. and Tsang C.F. Modelling of hydrothermo-mechanical response of rock mass around a nuclear waste deposition hole. Swedish Nuclear Power Inspectorate. SKI Technical Report: 91:2 (1991).
430. **Rutqvist J.** Test Case 1, Coupled stress-flow model, DECOVALEX Secretariat Doc91/105. Engineering Geology, Royal Institute of Technology, Sweden (1991).
431. **Rutqvist J.**, Noorishad J., Stephansson O. and Tsang C.F. Modelling and field investigation of hydromechanical response of a fracture. Swedish Nuclear Power Inspectorate: Technical Report (1990).
432. **Rutqvist J.** Hydromechanical modelling of a single fracture. Swedish Nuclear Power Inspectorate, Technical Report, SKI TR 89:5. (1989).