

## Jens T. Birkholzer

Senior Scientist and Division Director

Energy Geosciences Division  
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### Education

1982-1985 Aachen University of Technology (Germany), B.Sc. in Civil Engineering, 1985  
1985-1988 Aachen University of Technology, M.Sc. in Water Resources, Soil and Rock Mechanics, 1988  
1989-1994 Aachen University of Technology, Ph.D. in Subsurface Hydrology, 1994

### Ph.D. Dissertation

Continuum Modeling of Contaminant Transport in Fractured Porous Formations (in German)

### Research Interests

Dr. Jens Birkholzer is a subsurface hydrologist with deep expertise in fluid, gas, solute and heat transport in complex geologic systems such as or fractured rock or heterogeneous sediments. His research centers on evaluating the feasibility and environmental sustainability of subsurface energy applications, specifically the use of deep subsurface formations for the disposal of high-level radioactive waste and for the storage of CO<sub>2</sub> for geologic carbon sequestration. Using a numerical, theoretical, observational and experimental approaches, his focus is on the complex couplings between hydrological, thermal, mechanical and chemical processes activated by subsurface energy manipulations. Jens strives to improve our mechanistic process understanding via a combination of in situ testing and advanced physics-based modeling, while using the knowledge gained to improve subsurface energy strategies at scale and address issues of societal relevance.

### Publication Metrics:

Web of Science metrics as of December, 2019:

- Researcher ID: C-6783-2011 (<https://publons.com/researcher/2800816/jens-t-birkholzer/metrics/>)
- Total number of publications: 144, h-index: 34, total number of citations: 4078

Google Scholar metrics as of December, 2019:

- Link: <https://scholar.google.com/citations?user=WvZRIWsAAAAJ&hl=en&oi=ao>
- h-index: 43, total number of citations: 7126

## Professional Experience

Since 2015 Director, Energy Geosciences Division, Lawrence Berkeley National Laboratory (LBNL)  
Since 2015 Senior Scientist, LBNL  
2014-2015 Deputy Director, Earth Sciences Division (ESD), LBNL  
Since 2010 Co-Lead, Energy Resources Program Area, ESD, LBNL  
2008-2019 Lead, Nuclear Energy and Waste Program, ESD, LBNL  
2001-2015 Geological Staff Scientist, LBNL  
2001-2004 Geological Scientist, LBNL (Career Position)  
1999-2001 Chief Engineer and Project Manager, HOCHTIEF AG, Germany  
1996-1998 Geological Scientist, LBNL (Career-Track Position)  
1994-1996 Post-doctoral Fellow, LBNL  
1989-1994 Research Associate, Institute of Hydraulic Engineering and Water Resources Management (IWW), Aachen University of Technology, Germany

## Conferences, Symposia, Workshops

Expert Review Panel, GHGT-15, International Conference on Greenhouse Gas Control Technologies, Abu Dhabi, VAR, October 2020

Scientific Committee, 8th International Conference on Clays in Natural and Engineered Barriers for Radioactive Waste Confinement, Nancy, France, June 8-11, 2020

Chair, International Symposium on Coupled Processes in Radioactive Waste Disposal and Subsurface Engineering Applications, Brugg, Switzerland, November 4-5, 2019

Chair, DECOVALEX 2019 Workshop Series, in Berkeley, USA (May 2016); Taipei, Taiwan (November 2016); Stockholm, Sweden (April 2017); Kingston, Canada (October 2017); Nancy, France (April 2018); Seoul, Republic of Korea (November 2018); Prague, Czech Republic (April 2019); Brugg, Switzerland (November 2019)

Technical Program Committee, 17<sup>th</sup> International High-Level Radioactive Waste Management Conference, Session Title: Engineered Barrier Performance, Knoxville, TN, April 2019

Session Chair, 17<sup>th</sup> International High-Level Radioactive Waste Management Conference, Knoxville, TN, April 2019

International Scientific Advisory Committee, Conference on Coupled Processes in Fractured Geological Media: Observation, Modeling, and Application (CouFrac), Wuhan, November 12-14, 2018

Expert Review Panel, GHGT-14, International Conference on Greenhouse Gas Control Technologies, Melbourne, Australia, October 2018

Session Chair, GHGT-14, International Conference on Greenhouse Gas Control Technologies, Session Titles: Field-Scale Modeling and Geochemical Modeling, Melbourne, Australia, October 2018

Session Chair, 2018 European Geophysical Union (EGU) Meeting, Session Title: Assessment of Barrier Integrity in Geological Repositories for Nuclear Waste Disposal and Contaminant Isolation, Vienna, Austria, April 2018

Session Chair, 2017 AGU Fall Meeting, Session Title: Addressing Cross-Cutting Subsurface Energy Challenges: Dedicated Field Observatories, San Francisco, CA, December 2017

Session Chair, Mont Terri Technical Meeting 2017, Session Title: Selected Experiments of the Ongoing Mont Terri Research Program, Porrentruy, Switzerland, February 2017.

Expert Review Panel, GHGT-13, International Conference on Greenhouse Gas Control Technologies, Lausanne, Switzerland, November 2016.

Session Chair, 2015 AGU Fall Meeting, Session Title: Advances in Drilling, Characterizing, Testing, and Sealing Deep Boreholes, San Francisco, CA, December 2015

Session Chair, TOUGH Symposium, Session Title: Reactive Transport and Coupled THMC Processes, Berkeley, CA, September 2015

Scientific Committee, XX International Conference on Computational Methods in Water Resources (CMWR), Stuttgart, Germany, June 9-13, 2014

Expert Review Panel, GHGT-12, International Conference on Greenhouse Gas Control Technologies, Austin, Texas, 2014

Session Chair, 5th International Conference on Clays in Natural and Engineered Barriers for Radioactive Waste Confinement, Session Title: Geomechanics/Numerical, Montpellier, France, October 22-25, 2012

Session Chair, 11th Annual Carbon Capture, Utilization & Sequestration Conference, Session Title: CCS/CCUS Impact on Water Resources, Pittsburgh USA, April 30-May 3, 2012

Chair, 1st DECOVALEX-2015 Workshop, Berkeley, CA, April 17-19, 2012

Chair of Organizing Committee, 2011 Geological Carbon Sequestration & Water Resources Workshop, Berkeley, CA, June 1-2, 2011

Session Chair, GHGT-10, International Conference on Greenhouse Gas Control Technologies, Session Title: Modeling Tools, Amsterdam, Netherlands, September 19-23, 2010

Advisory Committee, 12th International Congress of Energy and Mining Resources, Oviedo, Spain, 2008

Chair of Organizing Committee, International Symposium on Site Characterization for CO<sub>2</sub> Geological Storage, CO2SC 2006, Berkeley, CA, March 20-22, 2006

Session Chair, 2008 AGU Fall Meeting, Session Title: Multiscale Science of Geologic CO<sub>2</sub> Sequestration, San Francisco, CA, December 2008

Session Chair, 2008 International Geological Congress, Session Title: Risk and Vulnerability Assessment Related to Geological Storage of CO<sub>2</sub>, Oslo, Norway, August 2008

Chair, 6th DECOVALEX-THMC Workshop, Berkeley, CA, March 6-9, 2007

## **Professional Activities**

Editorial Board, Energies Journal, Focus on Geo-Energy Section, since 2019

Committee Member At Large, Geological Society of America (GSA) Committee on Geology and Public Policy (GPPC), since June 2019

Guest Editor, Special Issue on DECOVALEX 2015, 22 papers, Environmental Earth Sciences, 77(14), 2018

Member of Executive Committee, NRAP – National Risk Assessment Partnership, National Laboratory Consortium for the development of quantitative risk assessment methods for geologic carbon sequestration, since 2018

Editorial Board, International Journal of Greenhouse Gas Control (IJGGC), since 2017

Editor, International Approaches for Deep Geological Disposal of Nuclear Waste - Geological Challenges in Radioactive Waste Isolation (5<sup>th</sup> World Wide Review), 24 country-specific chapters, Report DOI Number: 10.2172/1353043, December 2016

Chairman, DECOVALEX Project (Development of Coupled Models and their Validation Against Experiments), International Cooperative Research Project on Coupled Thermal-Hydrological-Mechanical and Chemical Processes in the Subsurface, since 2016, [www.decovalex.org](http://www.decovalex.org)

Editorial Board, Journal of Sustainable Energy Engineering, since 2015

Board of Editorial Policy Advisors, Journal of Geomechanics for Energy and Environment (GETE), since 2014

Associate Editor, International Journal of Greenhouse Gas Control (IJGGC), 2014-2017

DOE Representative and International Steering Committee (ISCO) Member, Grimsel Test Site Project, NAGRA, Swiss National Cooperative for the Disposal of Radioactive Waste, since 2014

DOE Representative and Steering Committee Member, SKB (Swedish Nuclear Waste Management Organization) Task Forces, since 2014

Vice-Chairman, DECOVALEX Project (Development of Coupled Models and their Validation Against Experiments), International Cooperative Research Project on Coupled Thermal-Hydrological-Mechanical and Chemical Processes in the Subsurface, 2013-2015, [www.decovalex.org](http://www.decovalex.org)

Guest Editor, Special Issue on Carbon Dioxide Geological Storage, Topical Issue: CLEAN - Enhanced Gas Recovery Storage and Geological CO<sub>2</sub> Storage, 24 papers, Environmental Earth Sciences, 67, 2012

DOE Representative and Steering Committee Member, Mont Terri Project, International Research Project for the Hydrogeological, Geochemical and Geotechnical Characterization of a Clay Formation Using an Underground Research Laboratory in Switzerland, since 2012, [www.mont-terri.ch](http://www.mont-terri.ch)

DOE Representative and Steering Committee Member, DECOVALEX Project, International Cooperative Research Project on Coupled Thermal-Hydrological-Mechanical and Chemical Processes in the Subsurface, 2012-2015, [www.decovalex.org](http://www.decovalex.org)

DOE Lead for International Activities in Nuclear Waste Disposal Research, DOE Office of Nuclear Energy, Used Fuel Disposition Campaign, since 2012

Member of Campaign Management Team, DOE Office of Nuclear Energy, Used Fuel Disposition Campaign, since 2012

Guest Editor, Special Issue on Site Characterization for CO<sub>2</sub> Geological Storage, 11 papers, Journal of Environmental Geology, 54(8), 2008

DOE's Key Expert for Yucca Mountain License Application Defense, Topical Areas: Ambient and Thermal Seepage, Designated Representative for NRC Atomic Safety and Licensing Board Hearings Regarding Yucca Mountain License Application, 2008-2009

Guest Editor, Special Issue on Recent Advances in Nuclear Waste Isolation through Simulations with the TOUGH Codes, Journal of Nuclear Technology, 164(2), 2008

DOE Representative and Modeling Task Lead, DECOVALEX Project, International Cooperative Research Project on Coupled Thermal-Hydrological-Mechanical and Chemical Processes in the Subsurface, 2005-2008

## **Advisory Boards and Review Committees**

Advisory Board "Performance Assessment and Repository Induced Effects", NAGRA, Swiss National Cooperative for the Disposal of Radioactive Waste Nagra Advisory, since 2019

Advisory Board "Geosciences", NAGRA, Swiss National Cooperative for the Disposal of Radioactive, since 2018

Advisory Board and Expert Reviewer, German Research Program "Subsurface Geosystems", Ministry for Research and Education, Germany, 2016-2020

Chair, Steering Committee, California Council on Science and Technology (CCST), Long-Term Viability of Underground Natural Gas Storage in California: An Independent Review of Scientific and Technical Information, 2017-2018

Member, Steering Committee, California Council on Science and Technology (CCST), Independent Scientific Review of Hydraulic Fracturing in California, 2014-2015

Member, International Review Committee, Japan Atomic Energy Agency, Review of Overall Plan on the Basic Research and Development for Geological Disposal, 2014

Member, Steering Committee, California Council on Science and Technology (CCST), Review of Scientific and Technical Information on Well Completion Techniques, Including Hydraulic Fracturing, 2013-2014

Advisor to EPA Office of Water, Development of CO<sub>2</sub> Sequestration Regulations, Class VI Rule, 2007-2011

## Honors and Awards

Fellow of the Geological Society of America, elected 2017

Senior Fellow of the California Council on Science and Technology, elected 2017 (<https://ccst.us/senior-fellows/>)

SPOT Award, Lawrence Berkeley National Laboratory, in recognition of excellent leadership the SB 4 hydraulic fracturing study for the State of California, 2015

International Journal of Greenhouse Gas Control, 2013 Certificate of Excellence in Reviewing

Lawrence Berkeley National Laboratory, 2012 Director's Award for Exceptional Achievement (for Tech Transfer related to TOUGH family of codes)

University of Stuttgart, 2012 VIP Program, Visiting Scientist Fellowship, 6/2012-8/2012

DOE Office of Civilian Radioactive Waste Management, Certificate of Accomplishment, in recognition of excellent contributions to Yucca Mountain contention response, 2009

DOE Office of Civilian Radioactive Waste Management, Certificate of Accomplishment, in recognition of excellent contributions to Yucca Mountain License Application, 2008

Lawrence Berkeley National Laboratory, Outstanding Performance Award, 2007

Lawrence Berkeley National Laboratory, Outstanding Performance Award, 1997

Alexander von Humboldt Foundation, Post-doctoral fellowship, 10/1995-12/1996

Aachen University of Technology, Friedrich-Wilhelm Award for Summa Cum Laude Ph.D. Thesis, 1995

Aachen University of Technology, Borchers Award for Summa Cum Laude Ph.D. Thesis, 1995

German Academic Exchange Organization, Post-doctoral fellowship, 10/1994-9/1995

German Academic Exchange Organization, Research fellowship, 1989

Aachen University of Technology, Springorum Award for Summa Cum Laude M.Sc., 1989

Aachen University of Technology, Hünnebeck Award for Best Master Thesis of 1989

Studienstiftung des Deutschen Volkes, Scholarship for Excellent Students, 1986

## Teaching and Service on Dissertation Committees

UC Berkeley, Nuclear Engineering Department, Ph.D. Committee, Alex Salazar, Thesis Title: Criticality in the Far-Field of a Granitic Repository for Used Nuclear Fuel, 2018

UC Berkeley, Nuclear Engineering Department, Fall Class for Graduate Students (NE290E): Environmental Issues in Nuclear Energy, Fall 2015 and 2014

Colorado School of Mines, Department of Civil and Environmental Engineering, Ph.D. Committee, Luca Trevisan, Thesis Title: Study of Trapping Mechanisms of Supercritical Carbon Dioxide in Deep Heterogeneous Geological Formations through Intermediate-Scale Testing and Modeling, 2014

UC Berkeley, Nuclear Engineering Department, Ph.D. Committee, Nicholas Halecky, Thesis Title: Effects of Evaporation on Drift Seepage at the Yucca Mountain Repository, 2010

KTH Stockholm, School of Chemical Science and Engineering, Ph.D. Committee, Magnus Andre, Thesis Title: New Methods for the Determination of Sorption Capacities and Sorption Related Properties of Intact Rock, 2009

Aachen University of Technology, Civil Engineering Department, Graduate-Level Class: Numerical Methods in Water Resources, 2001-2004

## Invited Presentations Since 2005 (Conferences and Symposia):

1. Geologic Carbon Sequestration at Scale: A Review of Basin-Scale Pressure Impacts, Induced Seismicity Concerns, and Pressure Management Opportunities, Keynote Lecture, 27<sup>th</sup> Meeting of the German Association for Hydrogeology 2020, Leipzig, Germany, March 25-28,
2. Overview of the DECOVALEX Project – The Past, Current, and Future, Invited Presentation, Symposium on Coupled Processes in Radioactive Waste Disposal and Subsurface Engineering Applications, Brugg, Switzerland, November 2019
3. The 2015 Mesoscale Fault Slip Experiment at Mont Terri: Main Findings, Lessons Learned, and Next Steps, Invited Presentation, Geological Society of America (GSA) Annual Meeting, Phoenix, NM, September, 2019
4. Overview of DOE's International Collaboration and Underground Research Laboratory Activities, Workshop on Recent Advances in Repository Science and Operations from International Underground Research Laboratory Collaborations, United States Nuclear Waste Technical Review Board (NWTRB), April, 2019
5. The International DECOVALEX Model Comparison Project - 25 Years of Coupled Processes Research, European Geophysical Union (EGU) Meeting, Vienna, Austria, April 2019
6. Induced Seismicity and CCS at Scale: Understanding Caprock Integrity Impacts Based on Mesoscale Experiments, Pierce Lab Seminar Series, Massachusetts Institute of Technology, Boston, MA, April, 2019
7. Induced Seismicity and CCS at Scale: Understanding Caprock Integrity Impacts Based on Mesoscale Experiments, Keynote Presentation, Schatzalp 3<sup>rd</sup> Induced Seismicity Workshop, Davos, Switzerland, March, 2019
8. International Collaboration in the U.S. Disposal Research Program: Advances Made in Testing and Predicting THM Processes in Engineered and Natural Barriers, AGU Fall Meeting, Washington, D.C., December, 2018
9. 25 Years of DECOVALEX: Research Advances and Lessons Learned from an International Model Comparison Initiative, German Ministry of Nuclear Waste Disposal, Berlin, Germany, November, 2019
10. Overview of U.S. DOE Nuclear Waste Disposal Program and Selected Berkeley Lab Research Activities, Umweltforschungszentrum Leipzig, Germany, November, 2019

11. High-Level Waste Disposal in the United States, International Workshop on Coupled Processes in Geological Disposal of Nuclear Waste and Underground Research Laboratory, Seoul National University, Seoul, Republic of Korea, October, 2018
12. The International DECOVALEX Model Comparison Project - 25 Years of Coupled Processes Research, International Workshop on Coupled Processes in Geological Disposal of Nuclear Waste and Underground Research Laboratory, Seoul National University, Seoul, Republic of Korea, October, 2018
13. Cross-Cutting Subsurface Challenges: Insights from Dedicated Subsurface Energy Field Observatories, Keynote Presentation, Interpore, 10<sup>th</sup> Annual Meeting, New Orleans, LA, May 14-17, 2018
14. Overview of Energy Geosciences at Berkeley Lab: Cross-Cutting Capabilities with Focus on Oil and Gas Research, Chevron R&D Seminar Series, May 1, 2018
15. International Research Collaboration in the U.S. Disposal Program, DOE Nuclear Energy Leadership Team, March 26, 2018
16. 25 Years of DECOVALEX - Research Advances and Lessons Learned from an International Model Comparison Initiative, AGU Fall Meeting, New Orleans, LA, December, 2017
17. Carbon Capture and Geological Sequestration: Science Status and the Complicated Road to Deployment at Scale, Center for International Security and Cooperation, Stanford University, November 13, 2017
18. Use of the Earth's Subsurface for Energy Production and Storage, UC-Berkeley College of Natural Resources, Speaker Series on Stewardship of Public Lands, UC Berkeley, September 22, 2017
19. Cross-Cutting Subsurface Challenges: Insights from Dedicated Subsurface Energy Field Observatories, Keynote Presentation, 23<sup>rd</sup> European Meeting of Environmental and Engineering Geophysics: Fourth Sustainable Earth Sciences Conference, Malmö, Sweden, September 3-7, 2017
20. Status and Future of Nuclear Waste Disposal in the United States, ISCO Meeting, Grimsel Test Site, Switzerland, June 2017
21. Subsurface Energy Applications: Cross-Cutting Research Needs and the Role of Geoscience Observatories, Chinese Environmental Scholars Forum (CESF), Berkeley, May 20-21, 2017
22. Using Field Experiments for Model Comparison: The DECOVALEX Project, Mont Terri Workshop on "Cross-Cutting Subsurface Challenges – How Can Mont Terri Help?", Berkeley, March 2017
23. The United States Nuclear Waste Disposal Program and Example Research Activities, NAGRA, Switzerland, February 2017
24. An Overview of Radioactive Waste Disposal Research Activities Linked to International Underground Research Laboratories, Geological Society of America (GSA) Annual Meeting, Denver, Colorado, September 25-28, 2016
25. Use of Component Models in System-Level Risk Assessments: Is Less Really More, Keynote Presentation, Gordon Research Conference 2016, Flow & Transport in Permeable Media, Girona, Spain, August 4, 2016
26. Energy Resilience in the United States – What Can Subsurface Science Contribute, Second International Symposium for Resilient Communities, Koriyama City, Japan, April 14, 2016
27. Reservoir Management Strategies and Optimization Involving Brine Extraction, EPRI Stakeholder Workshop on Produced Water Quality, Treatment, and End Uses, Scottsdale, AZ, February 25, 2016
28. Overview of Subsurface Geosciences at Berkeley Lab with Focus on Nuclear Waste Disposal, Distinguished Seminar Collaborative Research Center, Ruhr University Bochum, Germany, February 15, 2016
29. Subsurface Energy Applications: Cross-Cutting Research Needs and the Role of Deep Geoscience Observatories, Keynote Presentation, Mont Terri Technical Meeting and 20-Year Anniversary, Porrentruy, Switzerland, February 10, 2016
30. An Independent Scientific Assessment of Well Stimulation in California, VerdeXChange 2016, Panel Session on "Well Stimulation in California: Is There a California Consensus on Fracking Post-SB 4?", Los Angeles, CA, January 25, 2016

31. Next Step in Assessing Hydraulic Fracturing in California: A Dedicated HF Field Observatory, University of Southern California, Induced Seismicity Consortium, Los Angeles, CA, December 7, 2015
32. International Collaboration Activities in Disposal R&D, 2015 Fuel Cycle Technologies Annual Meeting, Idaho Falls, ID, November 4, 2015
33. Well-Stimulation Technologies and their Effects in the Environment, UC Berkeley Symposium on The Environmental Impacts of Shale Gas and Oil Extraction in the United States and Applications to Mexico, UC Berkeley, April 27, 2015
34. Improved Understanding of Carbon Storage Risk Via Controlled-Release Experiments, AGU Fall Meeting 2014, San Francisco, CA, December, 2014
35. Status of the Used Nuclear Fuel Disposition Program in the United States — International Activities, International Review Workshop on JAEA 1st SF Progress Report, Tokyo, Japan, December 17-18, 2014
36. Overview Presentation on Geologic Disposal Research – DOE’s Used Fuel Disposition Campaign and International Activities, SKB Joint Task Force Meeting on Engineered Barrier Systems and Groundwater Flow and Transport, Berkeley, CA, December 9-13, 2014
37. A Tiered Area-of-Review Framework for Geologic Carbon Sequestration, 13th Annual Conference on Carbon Capture, Utilization and Sequestration, Pittsburgh, PA, April 28-May 1, 2014
38. LBNL/UCB Capabilities and Plans for Radiological Resilience Initiative, Fukushima Workshop on “Environmental Assessment Methods and Sciences“, Fukushima City and Tokyo, Japan, March 9-11, 2014
39. Model Comparison in Subsurface Science: The DECOVALEX and Sim-SEQ Initiatives, AGU Fall Meeting 2013, San Francisco, CA, December 2013
40. History and Future of the United States Nuclear Waste Program, NAGRA Workshop, Switzerland, November 15, 2013
41. Modeling Coupled Hydro-Mechanical Phenomena in the Near Field of a High-Level Radioactive Waste Repository in Clay Formations, 2013 SIAM Conference on Mathematical and Computational Issues in the Geosciences (SIAMGS13), Padova, Italy, June 17-20, 2013
42. Key Issues of Modeling Long-Term Reservoir Behavior in Response to Large CO<sub>2</sub> Injection Operations, Keynote Lecture, Brainstorming Workshop on “Long-Term Fate of Stored CO<sub>2</sub> - Key Issues, Innovations and Best Practices“, Trondheim, Norway, June 3, 2013
43. An Overview of US Disposal Research Activities Linked to International URLs, International High-Level Radioactive Waste Management Conference, Albuquerque, NM, USA, April 28-May 2, 2013
44. Impact-Driven Pressure Management Via Brine Extraction: Conceptual Studies of CO<sub>2</sub> Storage with Leakage Pathways, CCS Pressure Management Workshop, Lawrence Livermore National Laboratory, Livermore, February 22-23, 2012
45. Modeling of Coupled Geomechanical Processes Associated with Bentonite-Backfilled Repository Tunnels in Clay Formations, Keynote Lecture, Post-TIMODAZ International Workshop on “THM Effects in Clay Host Rocks for Radioactive Waste Repositories“, Mont Terri, Switzerland, February 6-7, 2012
46. Modeling Coupled Geomechanical, Thermal, and Flow Processes: Examples from CO<sub>2</sub> Storage, Nuclear Waste Disposal, and Enhanced Geothermal Systems, Princeton Workshop on "Subsurface Flows and Modeling ", Princeton University, February 2-3, 2012
47. Impact-Driven Pressure Management for Leaky CO<sub>2</sub> Storage Systems, AGU Fall Meeting 2011, San Francisco, CA, December 2011
48. Analytical and Numerical Modeling Approaches for Regional-Scale Assessment of GCS, Princeton Workshop on Scales of Resolution, Model Complexity, and Solution Approaches for CO<sub>2</sub> Storage Problems, December 6-7, 2011
49. Scientific Issues Related to Geologic Storage of CO<sub>2</sub> - Learning from Nuclear Waste and Yucca Mountain R&D, Geological Society of America (GSA) Annual Meeting, Minneapolis, Minnesota, October 9-12, 2011
50. R&D Activities Supporting Disposal in Clay/Shale Repositories, Nuclear Waste Technical Review Board, NWTRB, Fall Meeting, Salt Lake City, Utah, September 13 and 14, 2011



51. Brine Migration and Well Leakage Caused by Pressure Perturbation: A Discussion of Modeling Tools and Area of Review Concepts, Midwest Carbon Sequestration Workshop, Chicago, Illinois, August 2-3, 2011
52. CO<sub>2</sub> Geological Storage and Groundwater Resources: Model Applications, 2011 SIAM Conference on Mathematical and Computational Issues in Geosciences, Long Beach, CA, March 21-24, 2011
53. On Regional Pressure Buildup and Fluid Migration in Response to Large CO<sub>2</sub> Injection Operations, Geological Society of America (GSA) Annual Meeting, Denver, Colorado, October 31-November 3, 2010
54. Groundwater Quality Changes in Response to CO<sub>2</sub> Leakage from Deep Geological Storage, Geological Society of America (GSA) Annual Meeting, Denver, Colorado, October 31-November 3, 2010.
55. Potential for Groundwater Impacts From CO<sub>2</sub> Storage: Issues and Research Examples, Philomathia Forum on Energy and Environment, U.S.-China Workshop on Carbon Dioxide Capture and Storage, Beijing University, November 11-12, 2009
56. CO<sub>2</sub> Geologic Storage and Groundwater Protection: Issues and Research Needs, Energy Frontier Research Center for Nanoscale Control of CO<sub>2</sub>, Kickoff Symposium, Berkeley, California, October 7-8, 2009
57. An Integrated Model for Basin- and Plume-scale Processes Related to Full-Scale Employment of CO<sub>2</sub> Storage – The Illinois Basin as an Example, AAPG/SEG/SPE Hedberg Conference on Geological Carbon Sequestration: Prediction and Verification, Vancouver, Canada, August 16-19, 2009
58. Modeling of Potential Impacts of CO<sub>2</sub> Storage on Drinking Water, EPRI Technical Meeting CO<sub>2</sub> Capture and Storage (P165), Edmonton, Alberta, July 28-31, 2009
59. Modeling Multi-Phase Processes in Unsaturated Heated Fracture-Matrix Systems, SIAM Conference on Mathematical and Computational Issues in the Geosciences, Leipzig, Germany, June 15-18, 2009.
60. Overview and Initial Assessments of Potential Groundwater Impacts, Ohio-State/Battelle Symposium on “Advancing the Science of Geologic Carbon Sequestration”, March 9-10, 2009
61. Model Comparison and Evaluation Using Results from CO<sub>2</sub> Field Tests, IEA GHG CO<sub>2</sub> Storage Workshop, Orléans, France, February 10-12, 2009.
62. Prediction of Groundwater Quality Changes in Response to CO<sub>2</sub> Leakage from Deep Geological Storage, American Waterworks Association 2009 Water Resources Symposium, Portland, Oregon, January 2009
63. Gaining Confidence in Performance Predictions: Integration of Numerical Models and Experimental Data, IAEA General Training Workshop on Methodologies for Geologic Disposal in North America”, Las Vegas, NV, November 2008
64. Characterizing and Selecting Appropriate Sites for Safe Geologic Storage of CO<sub>2</sub>: Key Issues and Information Needs, Workshop on Geological Storage of CO<sub>2</sub> – Safety and Monitoring Issues, German Ministry for Environment, Nature Conservation, and Nuclear Safety (BMU), Berlin, Germany, May 26-27, 2008
65. Scientific Investigations Supporting the Long-term Safety Assessment of the Proposed Geologic Repository at Yucca Mountain: Thermal-Hydrological Evaluations, 38<sup>th</sup> International IWASA Symposium, Aachen, Germany, January 3-4, 2008
66. THMC Processes Relevant for Waste Disposal, CO<sub>2</sub> Sequestration, and Geothermal Energy – LBNL Perspective, Deutsche Forschungsgemeinschaft Rundtischgespräch, Tuebingen, Germany, September 6-7, 2007
67. Characterizing and Selecting Appropriate Sites for Geologic Storage of CO<sub>2</sub>: Key Issues and Information Needs, EPA Geologic Sequestration Technical Workshop - Geological Considerations and Area of Review Studies, Washington, D.C., June 10-11, 2007
68. Large Releases from CO<sub>2</sub> Storage Reservoirs: Analogues, Scenarios, and Modeling Needs, Petrobras International Seminar on Carbon Sequestration and Climate Change, Rio de Janeiro, Brazil, October 2006.
69. Geomechanical and Geochemical Modeling Studies in the International DECOVALEX Project, Geoproc 2006, Nanjing, China, May 2006
70. Geological Storage of CO<sub>2</sub>: An Overview, NRDC Workshop on Geological Sequestration of CO<sub>2</sub>, Washington, D.C., May 12, 2006
71. Mass of Water Seeping Into Drifts Over Time, Nuclear Waste Technical Review Board, NWTRB, Spring Meeting, Las Vegas, NV, January 9, 2006

## **Selected Major Projects Since 2005 (Leadership Role As PI):**

*Geologic Disposal of Radioactive Waste in The United States: Broad Research Program Involving Activities in Clay, Crystalline and Salt Host Rocks, Engineered Barrier Materials, and Performance Assessment*, since 2012, Total Funding for LBNL: varies between \$2,000 K and \$6,000 K annually, Sponsor: U.S. Department of Energy, Office of Nuclear Energy, Spent Fuel and Waste Disposition Campaign.

*International Collaborations Integration & Coordination for Geologic Disposal of Radioactive Waste*, since 2012, Total Funding for LBNL: varies between \$200 K and \$500 K annually, Sponsor: U.S. Department of Energy, Office of Nuclear Energy, Spent Fuel and Waste Disposition Campaign.

*Fault Zone Hydrogeological Response to Earthquakes – Impacts on Site Integrity for Nuclear Waste Disposal*, 2019-2022, Total Funding for LBNL: \$2,500 K, Sponsor: Nuclear Waste Management Organization (NUMO), Japan.

*Active Seismic Monitoring of CO<sub>2</sub> Leakage through a Hydromechanically Reactivated Fault: Caprock Integrity Monitoring for a Geological Carbon Sequestration Site Analog*, 2019-2022, Total Funding for LBNL: \$1,550 K, Sponsor: U.S. Department of Energy, Office of Fossil Energy.

*CCS and CO<sub>2</sub> Leakage Consequences on Surrounding Environment*, 2019-2020, Total Funding for LBNL: \$ 800 K, Sponsor: Total S.A.

*Performance Based Earthquake Engineering Assessment Tool for Gas Storage and Transmission System*, 2019-2021, Total Funding for LBNL: \$1,100 K, Sponsor: California Energy Commission

*Toward 100 Million Tons Plus: Basin-Scale Assessments Revisited*, 2018-2020, Total Funding for LBNL: \$1,710 K, Sponsor: Total S.A.

*A New Framework for Microscopic to Reservoir-Scale Simulation of Hydraulic Fracturing and Production: Testing with Comprehensive Data from HFTS and Other Hydraulic Fracturing Field Test Sites*, 2018-2020, Total Funding for LBNL: \$2,000 K, Sponsor: U.S. Department of Energy, Office of Fossil Energy.

*The Eagle Ford Shale Laboratory: A Field Study of the Stimulated Reservoir Volume, Detailed Fracture Characteristics, and EOR Potential*, 2018-2022, Total Funding for LBNL: \$2,000 K, Sponsor: U.S. Department of Energy, Office of Fossil Energy.

*Long-Term Viability of Underground Natural Gas Storage in California: An Independent Review of Scientific and Technical Information*, 2017-2018, Total Funding for LBNL: \$880 K, Sponsor: California Council on Science and Technology.

*DECOVALEX 2019*, International Cooperative Research Project on Coupled Thermal-Hydrological-Mechanical and Chemical Processes in the Subsurface, 2016-2019, Total Funding for LBNL: \$1,270 K, Sponsors: Twelve international radioactive waste management organizations from eleven countries.

*Field Demonstration at Plant Smith Generating Station: Assessment of Opportunities for Optimal Reservoir Pressure Control, Plume Management and Produced Water Strategies*, 2016-2020, Total Funding for LBNL: \$3,000 K, Core Carbon Storage and Monitoring Research (CCSMR), Sponsor: U.S. Department of Energy, Office of Fossil Energy.

*CarbonSAFE: Establishing an Early CO<sub>2</sub> Storage Complex in Kemper County, Mississippi*, 2017-2018, Total Funding for LBNL: \$250 K, Sponsor: U.S. Department of Energy, Office of Fossil Energy.

*Regional and Site-Specific Analysis of Spatio-Temporal Relationships Between Wastewater Injection and Induced Seismicity in California*, 2016-2018, Total Funding for LBNL: \$500 K, Sponsor: California Department of Oil, Gas and Geothermal Resources

*Environmental Restoration of the Fukushima Area*, 2015-2016, Total Funding for LBNL: \$600 K, Sponsor: JAEA, Japan Atomic Energy Agency.

*Field Testing and Geomechanical Modeling of Fault Slip at Mont Terri Underground Research Laboratory: Key Coupled Processes in Seal Breaching and Loss of Inventory*, 2015-2016, Total Funding for LBNL: \$400 K, Core Carbon Storage and Monitoring Research (CCSMR), Sponsor: U.S. Department of Energy, Office of Fossil Energy.

*Optimization Framework for Improved CO<sub>2</sub> Injectivity, Storage Permanence, Monitoring, and Utilization*, 2015-2016, Total Funding: \$800 K, Core Carbon Storage and Monitoring Research (CCSMR), Sponsor: U.S. Department of Energy, Office of Fossil Energy.

*CO<sub>2</sub> Migration and Trapping in Fractured Reservoirs*, 2014-2016, in partnership with Princeton University, Professor Mike Celia, Total Funding for LBNL: \$200 K, Sponsor: U.S. Department of Energy, Office of Fossil Energy.

*Multi-Disciplinary Research to Enhance Understanding of Transport, Risks, and Mitigation of Radioisotopes for Improved Radiological Resilience*, 2014-2016, Annual Funding: \$571 K, Sponsor: LBNL Internal Research and Development Funds.

*Repository Geoscience and PA Technology Development*, 2014-2016, Annual Funding: \$360 K, Sponsor: Japan Atomic Energy Agency (JAEA), Japan.

*NRAP – National Risk Assessment Partnership*, National Laboratory Consortium for the development of quantitative risk assessment methods for geologic carbon sequestration, 2010-2017, Average Annual Funding: \$1,250 K, Sponsor: U.S. Department of Energy, Office of Fossil Energy.

*Independent Scientific Review of Hydraulic Fracturing in California*, 2014-2015, in collaboration with California Council on Science and Technology (CCST), Total Funding for LBNL: \$1,690 K, Sponsor: California National Resources Agency.

*Laboratory and Numerical Investigation of Hydraulic Fracture Propagation and Permeability Evolution in Heterogeneous and Anisotropic Shale*, 2014-2015, Total Funding: \$400 K, Sponsor: U.S. Department of Energy, Office of Fossil Energy.

*Model Complexity and Choice of Model Approaches for Practical Simulations of CO<sub>2</sub> Injection, Migration, Leakage, and Long-term Fate*, 2013-2015, in partnership with Princeton University, Professor Mike Celia, Total Funding for LBNL: \$200 K, Sponsor: U.S. Department of Energy, Office of Fossil Energy.

*Advanced Joint Inversion System for CO<sub>2</sub> Storage Modeling with Large Data Sets of Characterization and Real-Time Monitoring—Enhancing Storage Performance and Reducing Failure Risks under Uncertainties*, 2013-2015, in partnership with Stanford University, Professor Peter Kitanidis, Total Funding for LBNL: \$200 K, Sponsor: U.S. Department of Energy, Office of Fossil Energy.

*CO<sub>2</sub> Leakage Impacts on Groundwater in California*, 2013-2015, Total Funding: \$600 K, Sponsor: California Energy Commission.

*Review of Scientific and Technical Information on Well Completion Techniques, Including Hydraulic Fracturing, in California*, 2013-2014, in collaboration with California Council on Science and Technology (CCST), Total Funding for LBNL: \$500 K, Sponsor: Bureau of Land Management.

*Regional Modeling of CO<sub>2</sub>, Pressure Management and Stochastic Inversion*, 2010-2014, Average Annual Funding: \$350K, Sponsor: U.S. Department of Energy, Office of Fossil Energy.

*Sim-SEQ - A Collaborative Initiative on Evaluation of Modeling Approaches Using Results from Large-Scale CO<sub>2</sub> Field Tests in the USA*, 2010-2014, Average Annual Funding: \$150K, U.S. Department of Energy, Office of Fossil Energy.

*Intermediate Scale Laboratory Testing to Understand Mechanisms of Capillary and Dissolution Trapping during Injection and Post-Injection of CO<sub>2</sub> in Heterogeneous Geological Formations*, 2011-2013, in partnership with Colorado School of Mines, Professor Tissa Illangasekare, Total Funding for LBNL: \$150 K, Sponsor: U.S. Department of Energy, Office of Fossil Energy.

*Evaluating the Consequences of CO<sub>2</sub> Intrusion into Groundwater: Laboratory Experiments, Microspectroscopy, and Associated Geochemical Modeling*, 2011-2013, Annual Funding: \$250K, Sponsor: U.S. EPA.

*Modeling of CO<sub>2</sub> Impacts in Southern San Joaquin Valley*, 2011-2013, Total Funding: \$287 K, Sponsor: California Energy Commission.

*Analogs for Pressure Impacts from CO<sub>2</sub> Sequestration*, 2011-2013, Total Funding: \$200 K, Sponsor: California Energy Commission.

*Coupled Inversion of Hydrological and Geophysical Data for Improved Prediction of Subsurface CO<sub>2</sub> Migration*, 2011-2013, Total Funding: \$1,990 K, Sponsor: U.S. Department of Energy, Office of Fossil Energy.

*Development of a Generalized Methodology for Soil-Structure Interaction Analysis Using Nonlinear Time-Domain Techniques*, 2011-2012, Total Funding: \$200 K, Sponsor: U.S. Department of Energy, Office of Nuclear Energy, NEAMS Program.

*Analytical and Numerical Modeling in Support of Zone-of-Potential-Endangerment Estimates and Geologic Sequestration Modeling Framework*, 2010-2013, Total Funding: \$500 K, Sponsor: U.S. EPA.

*Potential Impact of Carbon Dioxide on Potable Groundwater: A Controlled Release Experiment*, 2010-2013, Annual Funding: \$195 K, Sponsor: Electric Power Research Institute (EPRI).

*Thermochemical Data Review and Assessment to Support Research on Geochemical Impacts to Groundwater*, 2010-2012, Total Funding: \$200 K, Sponsor U.S. EPA.

*A New Analytic-Adaptive Model for EGS Assessment, Development and Management Support of Geothermal Energy*, 2010-2012, Total Funding: \$300 K, Sponsor: U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy.

*Identification and Evaluation of Features, Events, and Processes (FEPs) for Geologic Disposal System Performance*, 2010-2011, FY10 Funding: \$175 K, FY11 Funding: \$100 K, Sponsor: U.S. Department of Energy, Office of Nuclear Energy, Used Fuel Disposition Campaign.

*Life-Cycle Analysis of Geological Carbon Sequestration*, 2010-2011, Total Funding: \$174 K, Sponsor: LBNL Internal Research and Development Funds.

*Advanced Simulation Capability for Environmental Management (ASCEM)*, Role as a PI in 2010, Annual Funding for LBNL in 2010: \$2,000 K, Sponsor: U.S. Department of Energy, Office of Environmental Management.

*Groundwater Chemistry Changes as a Result of CO<sub>2</sub> Injection at the ZERT Field Site in Bozeman, Montana*, 2008-2009, Total Funding: \$175 K, Sponsor: Electric Power Research Institute (EPRI).

*Regional Modeling of Large-Scale Hydrologic Impact of CO<sub>2</sub> Storage*, 2007-2009, Average Annual Funding: \$300 K, Sponsor: U.S. Department of Energy, Office of Fossil Energy.

*Research Project on CO<sub>2</sub> Geological Sequestration and Groundwater Resources*, 2007-2009, Average Annual Funding: \$350 K, Sponsor: U.S. EPA.

*Coordination and Participation in International Model Comparison Project DECOVALEX-THMC, 2005-2008, Average Annual Funding: \$150K, Sponsor: U.S. Department of Energy, Office of Civilian Radioactive Waste Management.*

*Predictive Modeling Analysis of the Drift-Scale Thermal-Hydrological Conditions in the Vicinity of Future Waste Emplacement Drifts at Yucca Mountain, 2002-2008, Average Annual Funding: \$200 K, Sponsor: U.S. Department of Energy, Office of Civilian Radioactive Waste Management.*

*Abstraction of Drift Seepage for Yucca Mountain Performance Assessment, 2002-2008, Average Annual Funding: \$150 K, Sponsor: U.S. Department of Energy, Office of Civilian Radioactive Waste Management.*

*Thermal-Hydrological Near-Field Model Studies and Impact of Natural Convection on Seepage, 2005-2007, Average Annual Funding: \$200 K, Sponsor: U.S. Department of Energy, Office of Civilian Radioactive Waste Management, Office of Science and Technology and International.*

**Peer-Reviewed Journal Publications:****2020**

1. XU, H., RUTQVIST, J., PLUA, C., ARMAND, G., **BIRKHOLZER, J.T.** (2020): Modeling of Thermal Pressurization in Tight Claystone using Sequential THM Coupling: Benchmarking and Validation against In-situ Heating Experiments in COx Claystone, submitted to Journal of Tunnelling and Underground Space Technology.
2. GUGLIELMI, Y., NUSSBAUM, C., JEANNE, P., RUTQVIST, J., CAPPÀ, F., **BIRKHOLZER, J.T.** (2020): Complexity of Fault Rupture and Fluid Leakage in Shale: Insights from a Controlled Fault Activation Experiment, submitted to Journal of Geophysical Research.
3. FAYBISHENKO, B., **BIRKHOLZER, J.T.**, PERSOFF, P., BUDNITZ, B., SASSANI, D. AND SWIFT, P. (2020): International Approaches for Nuclear Waste Disposal in Geological Formations: Geological Challenges in Radioactive Waste Isolation—Fifth Worldwide Review, submitted to Oxford Research Encyclopedia (ORE).
4. ZHENG, L., RUTQVIST, J., **BIRKHOLZER, J.T.** (2020): Coupled THMC Models for Bentonite in a Clay-Host Rock Repository for Nuclear Waste: Illitization and its Effect on Stress Under High Temperature, submitted to Journal of Rock Mechanics and Rock Engineering.
5. KIM, K., RUTQVIST, J., **BIRKHOLZER, J.T.** (2020): Lattice Modeling of Excavation Damage in Argillaceous Clay Formations: Influence of Deformation and Strength Anisotropy, accepted for publication in Tunneling and Underground Space Technology.
6. GUGLIELMI, Y., NUSSBAUM, C., RUTQVIST, J., CAPPÀ, F., JEANNE, P., **BIRKHOLZER, J.T.** (2020): Estimating Stress from Three-Dimensional Borehole Displacements Induced by Fluid Injection in Fractured or Faulted Shales, accepted for publication in Geophysical Journal International.
7. ZHENG, L., XU, H., RUTQVIST, J., REAGAN, M., **BIRKHOLZER, J.T.**, VILLAR, M.V., FERNÁNDEZ, A.M. (2020): The Hydration of Bentonite Buffer Material Revealed by Modeling Analysis of a Long-Term In Situ Test, accepted for publication in Applied Clay Sciences.
8. ZHENG, L., SPYCHER, N.F., BIANCHI, M., PUGH, J.D., VARADHARAJAN, C., TINNACHER, R.M., **BIRKHOLZER, J.T.**, TRAUTZ, R.C. (2020): Impacts of Elevated Dissolved CO<sub>2</sub> on a Shallow Groundwater System: Reactive Transport Modeling of the Field Test, accepted for publication in Chemical Geology.
9. AGARTAN, E., ILLANGASEKARE, T.H., VARGAS-JOHNSON, J., CIHAN, A., **BIRKHOLZER, J.T.** (2020): Experimental Investigation of Assessment of the Contribution of Heterogeneous Semi-Confining Shale Layers on Mixing and Trapping of Dissolved CO<sub>2</sub> in Deep Geologic Formations, International Journal of Greenhouse Gas Control, 93, 102888.  
<https://www.sciencedirect.com/science/article/pii/S1750583619303925?dgcid=author>

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10. CIHAN, A., TOKUNAGA, T.K., **BIRKHOLZER, J.T.** (2019): Adsorption and Capillary Condensation-Induced Imbibition in Nanoporous Media, 35, pp. 9611-9621.  
<https://pubs.acs.org/doi/abs/10.1021/acs.langmuir.9b00813>
11. **BIRKHOLZER, J.T.**, TSANG, C.-F., BOND, A.E., HUDSON, J.A., JING, L., STEPHANSSON, O. (2019): 25 Years of DECOVALEX - Scientific Advances and Lessons Learned from an International Research Collaboration in Coupled Subsurface Processes, Invited Review, International Journal and Rock Mechanics and Mining Sciences, 122, pp. 1-21.  
<https://www.sciencedirect.com/science/article/pii/S1365160918308451>
12. GONZÁLEZ-NICOLÁS, A., CIHAN, A., PETRUSAK, R., ZHOU, Q., TRAUTZ, R., RIESTENBERG, D., GODEC, M., **BIRKHOLZER, J.T.** (2019): Pressure Management via Brine Extraction in Geological CO<sub>2</sub> Storage:

Adaptive Optimization Strategies under Poorly Characterized Reservoir Conditions, *International Journal of Greenhouse Gas Control*, 83, pp. 176-185.

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14. BLANCO-MARTIN, L., RUTQVIST, J., BATTISTELLI, A., **BIRKHOLZER, J.T.** (2018): Modeling of Coupled Processes in Rock Salt and Crushed Salt Related to Disposal of Heat-Generating Nuclear Waste Including Halite Solubility Constraints, *Transport in Porous Media*, 124, pp. 159-182. <https://link.springer.com/article/10.1007/s11242-018-1057-7>
15. **BIRKHOLZER, J.T.**, BOND, A.E., HUDSON, J.A., JING, L., TSANG, C.-F., SHAO, H., KOLDITZ, O. (2018): DECOVALEX-2015 - An International Collaboration for Advancing the Understanding and Modeling of Coupled Thermo-Hydro-Mechanical-Chemical (THMC) Processes in Geological Systems, *Environmental Earth Sciences*, 77(14). <https://link.springer.com/article/10.1007/s12665-018-7697-7>
16. CIHAN, A., WANG, S., TOKUNAGA, T., **BIRKHOLZER, J.T.** (2018): The Role of Capillary Hysteresis and Pore-Scale Heterogeneity in Limiting the Migration of Buoyant Immiscible Fluids in Porous Media, *Water Resources Research*, 54(7), 2018WR022741, pp. 4309-4318. <https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2018WR022741>
17. JEANNE, P., GUGLIELMI, Y., RUTQVIST, J., NUSSBAUM, C., **BIRKHOLZER, J.T.** (2018): Permeability Variations Associated With Fault Reactivation in a Claystone Formation Investigated by Field Experiments and Numerical Simulations, *Journal of Geophysical Research*, 123(2), pp. 1694-1710. <https://agupubs.onlinelibrary.wiley.com/doi/10.1002/2017JB015149>.
18. Graupner, B.J., Shao, H., Wang, X.R., Nguyen, T.S., Li, Z., Rutqvist, J., Chen, F., **Birkholzer, J.T.**, Wang, W.Q., Kolditz, O., Pan, P.Z., Feng, X.T., Lee, C., Maekawa, K., Stoffhof, S., Manepally, C., Dasgupta, B., Ofoegbu, G., Fedors, R., Barnichon, J.D., Ballarini, E., Bauer, S., Garitte, B. (2018): Comparative Modelling of the Coupled THM Processes in a Heated Bentonite Pellet Column with Hydration, *Environmental Earth Sciences*, 77(3), pp. 1-16. <https://link.springer.com/epdf/10.1007/s12665-018-7255-3> .
19. SIIRILA-WOODBURN, E.R., STEEFEL, C.I., WILLIAMS, K.H., **BIRKHOLZER, J.T.** (2018): Predicting the Impact of Land Management Decisions on Overland Flow Generation: Implications for Cesium Contamination in Forested Fukushima Watersheds, *Advances in Water Resources*, 113, pp. 42-54. <https://www.sciencedirect.com/science/article/pii/S0309170817305158> .
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27. KIM, K., RUTQVIST, J., NAKAGAWA, S., **BIRKHOLZER, J.T.** (2017): TOUGH-RBSN Simulator for Hydraulic Fracture Propagation within Fractured Media: Model Validations Against Laboratory Experiments, *Computers & Geosciences*, 108, pp. 72-85.  
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28. AGARTAN, E., CIHAN, A., ILLANGASEKARE, T., ZHOU, Q., **BIRKHOLZER, J. T.** (2017): Mixing and Trapping of Dissolved CO<sub>2</sub> in Deep Geologic Formations with Shale Layers, *Advances in Water Resources*, 105, pp. 67-81. <http://www.sciencedirect.com/science/article/pii/S0309170816305152>
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**Conference Abstracts:****2020**

1. NUSSBAUM, C., GUGLIELMI, Y., RUTQVIST, J., CAPPÀ, F., BOSSART, P., **BIRKHOLZER, J.T.** (2020): Estimating Stress from Three-dimensional Borehole Displacements Induced by Fluid Injection in Faulted Claystone, Abstract, Proceedings, 8th International Conference on Clays in Natural and Engineered Barriers for Radioactive Waste Confinement, Nancy, France, June 8-11, 2020.
2. **BIRKHOLZER, J.T.**, BOND, A. (2020): Clay Research in the International DECOVALEX Model Comparison Project: An Overview of Past, Current and Future Modeling Tasks, Abstract, Proceedings, 8th International Conference on Clays in Natural and Engineered Barriers for Radioactive Waste Confinement, Nancy, France, June 8-11, 2020.
3. GRAUPNER, B., RUTQVIST, J., GUGLIELMI, Y., **BIRKHOLZER, J.T.**, KIM, T., MASSMANN, J., NGUYEN, T.S., PARK, J.-W., WEI, S., URPI, L., YOON, J.S., ZIELFE, G. (2020): Simulation of Fault Rupture and Fluid Leakage During a Fault Activation Experiment at Mont Terri Laboratory - Results from an International Simulation Study, Abstract, Proceedings, 8th International Conference on Clays in Natural and Engineered Barriers for Radioactive Waste Confinement, Nancy, France, June 8-11, 2020.
4. **BIRKHOLZER, J.T.**, GUGLIELMI, Y., NUSSBAUM, C., ZAPPONE, A., RINALDI, A.P. (2020): Probing the Long Term Loss of Faulted Host Rock Integrity of Opalinus Clay, Abstract, Proceedings, 8th International Conference on Clays in Natural and Engineered Barriers for Radioactive Waste Confinement, Nancy, France, June 8-11, 2020.
5. ZHENG, L., XU, H., RUQVIST, J., **BIRKHOLZER, J.T.** (2020): Predicting the Long-Term Evolution of Bentonite Buffer Based on THMC models Calibrated Against the FEBEX In Situ Heater Test, Abstract, Proceedings, 8th International Conference on Clays in Natural and Engineered Barriers for Radioactive Waste Confinement, Nancy, France, June 8-11, 2020.

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6. ALUMBAUGH, D.L., COMMER, M., CIHAN, A., WILT, M., UM, E.S., **BIRKHOLZER, J.T.**, TRAUTZ, R.C., PETRUSAK, R., RIESTENBERG, D. E., GODEC, M. (2019): Optimization of Borehole EM Geophysical Measurements for CO<sub>2</sub> Injection Pressure Management, Abstract, AGU Fall Meeting, San Francisco, CA, December, 2019.
7. FAYBISHENKO, B., WANG, Y., HARRINGTON, J., **BIRKHOLZER, J.T.**, JOVE-COLON, C. (2019): Deterministic-Chaotic Gas Migration in Bentonite: Evidence, Characteristics and Phenomenological Modeling, Abstract, AGU Fall Meeting, San Francisco, CA, December, 2019.
8. MORRIS, J., **BIRKHOLZER, J.T.**, BARGAR, J., CRANDALL, D., DENG, H., FU, P., HAKALA, A., HAO, Y., JEW, A.D., KNEAFSEY, T.J., LOPANO, C.L., MORIDIS, G.J., REAGAN, M.T., SETTGAST, R.R., STEEFEL, C.I. (2019): A New Framework for Microscopic to Reservoir-Scale Simulation of Hydraulic Fracturing and Production: Testing with Comprehensive Data from the Hydraulic Fracturing Field Test in the Permian Basin, Abstract, AGU Fall Meeting, San Francisco, CA, December, 2019.
9. CIHAN, A., TOKUNAGA, T.K., **BIRKHOLZER, J.T.** (2019): Capillary Condensation-Induced Imbibition in Nanoporous Media, Abstract, AGU Fall Meeting, San Francisco, CA, December, 2019.
10. **BIRKHOLZER, J.T.** (2019): Thermally-Induced Alteration of Engineered and Natural Barriers for Geologic Disposal of High-Level Radioactive Waste: Integration of THMC Simulation and *In Situ* Testing, Abstract, AGU Fall Meeting, San Francisco, CA, December, 2019.
11. ZHENG, L., XU, H., **BIRKHOLZER, J.T.** (2019): Illitization in Bentonite and its Effect on Stress Revealed by Coupled THMC Models for a Nuclear Waste Repository in Clay, Abstract, AGU Fall Meeting, San Francisco, CA, December, 2019.

12. GUGLIELMI Y., **BIRKHOLZER, J.T.**, CAPPÀ, F., DE BARROS, D., NUSSBAUM, C., RUTQVIST, J., (2019): Does the Pressure Diffusion Rate Control Induced Seismicity: Insights from Two Fault Activation Experiments, Abstract, AGU Fall Meeting, San Francisco, CA, December, 2019.
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14. Cheng, F., Correa, J., Freifeld, B.m., Wood, T., Niehi, K., Guerra, D., Hill, D., **Birkholzer, J.T.**, Ajo-Franklin, J. (2019): Using Surface Orbital Vibrators (SOV) and Distributed Acoustic Sensing (DAS) for Monitoring of Unconventional Reservoirs: Preliminary Results from the Eagle Ford Shale, Abstract, AGU Fall Meeting, San Francisco, CA, December, 2019.
15. **BIRKHOLZER, J.T.** (2019): Overview of the DECOVALEX Project – The Past, Current, and Future, Invited Presentation, Abstract, DECOVALEX 2019 Symposium on Coupled Processes in Radioactive Waste Disposal and Subsurface Engineering Applications, Brugg, Switzerland, November, 2019.
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20. PLUA, C., ARMAND, G., VU, M. N., RUTQVIST, J., **BIRKHOLZER, J.T.**, XU, H., GUO, R., THATCHER, K.E., BOND, A.E., WANG, W., NAGEL, T., SHAO, H., KOLDITZ, O. (2019): A Reliable Numerical Analysis for Large-Scale Modelling of a High-Level Radioactive Waste Repository in the Callovo-Oxfordian Claystone, Abstract, DECOVALEX 2019 Symposium on Coupled Processes in Radioactive Waste Disposal and Subsurface Engineering Applications, Brugg, Switzerland, November, 2019.
21. GUGLIELMI, Y., NUSSBAUM, C., JEANNE, P., RUTQVIST, J., CAPPÀ, F., **BIRKHOLZER, J.T.**, GRAUPNER, B. (2019): Complexity of Fault Rupture and Fluid Leakage in Shale: Insights From a Controlled Fault, Abstract, DECOVALEX 2019 Symposium on Coupled Processes in Radioactive Waste Disposal and Subsurface Engineering Applications, Brugg, Switzerland, November, 2019.
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23. **BIRKHOLZER, J.T.**, GUGLIELMI, Y., NUSSBAUM, C., DE BARROS, L., CAPPÀ, F. (2019): The 2015 Mesoscale Fault Slip Experiment at Mont Terri: Main Findings, Lessons Learned, and Next Steps, Invited Presentation, Abstract, Geological Society of America Annual Meeting, Phoenix, NM, September, 2019.

24. **BIRKHOLZER, J.T.** (2019): Understanding the Behavior of Engineered and Natural Barriers for Geologic Disposal of High-Level Radioactive Waste: The Role of Full-Scale Heater Experiments, Abstract, Geological Society of America Annual Meeting, Phoenix, NM, September, 2019.
25. **BIRKHOLZER, J.T.**, MORRIS, J. (2019): A New Framework for Microscopic to Reservoir- Scale Simulation of Hydraulic Fracturing and Production: Testing with Comprehensive Data from HFTS and Other Hydraulic Fracturing Field Test Sites, Abstract, Carbon Capture, Utilization and Storage, and Oil and Gas Technologies Integrated Review Meeting, Pittsburgh, PA, August 2019.
26. GUGLIELMI, Y., **Birkholzer, J.T.** (2019): Active Seismic Monitoring of CO<sub>2</sub> Leakage Through a Hydromechanically Reactivated Fault Caprock Integrity Monitoring for a Geological Carbon Sequestration Site Analog: Validating a CASSM Monitoring System, Abstract, Carbon Capture, Utilization and Storage, and Oil and Gas Technologies Integrated Review Meeting, Pittsburgh, PA, August 2019.
27. **BIRKHOLZER, J.T.**, BOND, A. (2019): The International DECOVALEX Model Comparison Project - 25 Years of Coupled Processes Research, Invited Presentation, Abstract, European Geophysical Union Meeting, Vienna, Austria, April, 2019.
28. **BIRKHOLZER, J.T.**, ZHENG, L., XU, H., RUTQVIST, J. (2019): Long-term Alteration of Bentonite Backfill Used for Waste Disposal: Coupled THMC Modeling of a Full-Scale In Situ Heater Test, Abstract, European Geophysical Union Meeting, Vienna, Austria, April, 2019.
29. WU, Y., COMMER, M., OTTO, S., DOZIER, B., WEAVER, D., WANG, J., RUTQVIST, J., **BIRKHOLZER, J.T.** (2019): Geophysical Monitoring of Brine Migration in Rock Salt: Results from an In Situ Heater and Tracer Experiment at WIPP, Abstract, European Geophysical Union Meeting, Vienna, Austria, April, 2019.
30. **BIRKHOLZER, J.T.**, GUGLIELMI, Y., CAPP, F., NUSSBAUM, C. (2019): Induced Seismicity and CCS at Scale: Understanding Caprock Integrity Impacts Based on Mesoscale Experiments, Invited Keynote Presentation, Abstract, Schatzalp 3<sup>rd</sup> Induced Seismicity Workshop, Davos, Switzerland, March, 2019.
31. CAPP, F., GUGLIELMI, Y., NUSSBAUM, C., **BIRKHOLZER, J.T.** (2019): Pore Fluid Pressurization Causes Host Rock Fault Microseismicity and Leakage: FS and FS-B Experiments Hydro-Mechanical Modeling, Abstract, Mont Terri Technical Meeting TM-36, Porrentruy, Switzerland, February 5-6, 2019.

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32. NUSSBAUM, C., GUGLIELMI, Y., DE BARROS, L., CAPP, F., **BIRKHOLZER, J.T.**, BOSSART, P. (2018): Aseismic and Seismic Reactivation of a Velocity-Strengthening Clay-Rich Fault Zone: Example of the Mont Terri Main Fault FS Experiment, Abstract, Annual Swiss Geosciences Meeting, Bern, Switzerland, December, 2018.
33. **BIRKHOLZER, J.T.**, RUTQVIST, J. (2018): International Collaboration in the U.S. Disposal Research Program: Advances Made in Testing and Predicting THM Processes in Engineered and Natural Barriers, Invited Presentation, Abstract, AGU Fall Meeting, Washington, D.C., December, 2018.
34. ZHENG, L., XU, H., RUTQVIST, J., **BIRKHOLZER, J.T.** (2018): Understanding the Alteration of Bentonite Backfill Using Coupled THMC Modeling for a Long Term Heater Test, Abstract, AGU Fall Meeting, Washington, D.C., December, 2018.
35. **BIRKHOLZER, J.T.**, GUGLIELMI, Y., NUSSBAUM, C., DE BARROS, L., ANTIPOLIS, S., CAPP, F. (2018): Seismic Reactivation of a Velocity-Strengthening Clay-Rich Fault Zone: Are Laboratory Experiments a Good Enough Indicator of Field-Scale Behavior?, Abstract, AGU Fall Meeting, Washington, D.C., December, 2018.

36. ZHOU, Q., OLDENBURG, C.M., RUTQVIST, J., **BIRKHOZLER, J.T.** (2018): A Generalized Multirate Memory Function for Modeling Flow and Transport in Fractured Reservoirs, Abstract, AGU Fall Meeting, Washington, D.C., December, 2018.
37. CIHAN, A., **BIRKHOZLER, J.T.**, GONZALEZ-NICOLAS, A., COMMER, M., WILT, M., RUTQVIST, J., UM, E.S., PETRUSAK, R., TRAUTZ, R.C., Riestenberg, D.E., Godec, M. (2018) Adaptive Pressure Management in Geological CO<sub>2</sub> Storage: Application to A Brine Extraction Field Experiment, Abstract, AGU Fall Meeting, Washington, D.C., December, 2018.
38. JEANNE, P., GUGLIELMI, Y., **BIRKHOZLER, J.T.**, RUTQVIST, J., NUSSBAUM, C. (2018): Relation Between Induced Seismicity and Fault Leakage and its Evolution with Time: Analysis of Repeated Controlled-Injection Fault Reactivation Experiments at Mont Terri, Switzerland, COUFRAC, International Conference on Coupled Processes in Fractured Geological Media: Observation, Modeling, and Application, Wuhan, China, November 12-14, 2018.
39. **BIRKHOZLER, J.T.** (2018): Cross-Cutting Subsurface Challenges: Insights from Dedicated Subsurface Energy Field Observatories, Invited Plenary Lecture, Abstract, Interpore, 10<sup>th</sup> Annual Meeting, New Orleans, LA, May 14-17, 2018.
40. **BIRKHOZLER, J.T.**, RUTQVIST, J., KIM, K. (2017): Comparison of Model Approaches for Gas Transport in Compacted Bentonite: A Current Task in the International DECOVALEX Project, Abstract, Interpore, 10<sup>th</sup> Annual Meeting, New Orleans, LA, May 14-17, 2018.
41. **BIRKHOZLER, J.T.**, GUGLIELMI, Y., RUTQVIST, J., JEANNE, P., NUSSBAUM, C. (2017): Lessons Learned from a Controlled-Injection Fault Reactivation Experiment at Mont Terri, Switzerland: Can Fault Leakage Occur, When, and For How Long?, Abstract, Interpore, 10<sup>th</sup> Annual Meeting, New Orleans, LA, May 14-17, 2018.
42. ZHOU, Q., OLDENBURG, C., **BIRKHOZLER, J.T.** (2018): Modeling CO<sub>2</sub> Storage in Fractured Reservoirs: Fracture-Matrix Interactions of Supercritical and Dissolved CO<sub>2</sub>, Abstract, Interpore, 10<sup>th</sup> Annual Meeting, New Orleans, LA, May 14-17, 2018.
43. AGARTAN, E., ILLANGASEKARE, T., VARGAS-JOHNSON, J., CIHAN, A., **BIRKHOZLER, J.T.** (2018): Contribution of Heterogeneity within Semi-Confining Shale Layers to Mixing and Storage of Dissolved CO<sub>2</sub>, Abstract, Interpore, 10<sup>th</sup> Annual Meeting, New Orleans, LA, May 14-17, 2018.
44. CIHAN, A., WANG, S., **BIRKHOZLER, J.T.**, TOKUNAGA, T. (2018): Capillary Hysteresis and Pore-scale Heterogeneity Limiting the Migration of Buoyant Immiscible Fluid in a Porous Medium, Abstract, Interpore, 10<sup>th</sup> Annual Meeting, New Orleans, LA, May 14-17, 2018.

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45. ZHENG, L., XU, H., RUTQVIST, J., **BIRKHOZLER, J.T.** (2017): Understanding the Alteration of Bentonite Backfill Using Coupled THMC Modeling for a Long Term Heater Test at the Grimsel Underground Research Lab, Abstract, AGU Fall Meeting, New Orleans, LA, December, 2017.
46. **BIRKHOZLER, J.T.**, GONZALEZ-NICOLAS, A., CIHAN, A. (2017): A Workflow for Subsurface Pressure Control in Geological CO<sub>2</sub> Storage: Optimization of Brine Extraction, Abstract, AGU Fall Meeting, New Orleans, LA, December, 2017.
47. CIHAN, A., **BIRKHOZLER, J.T.**, WANG, S., TOKUNAGA, T. (2017): On the Effects of Capillary Hysteresis and Pore-Scale Heterogeneity Limiting the Migration of Buoyant Immiscible Fluids in a Macroscopically Homogeneous Porous Medium, Abstract, AGU Fall Meeting, New Orleans, LA, December, 2017.
48. AGARTAN, E., ILLANGASEKAE, T.H., VARGAS-JOHNSON, J., CIHAN, A., **BIRKHOZLER, J.T.** (2017): Effects of Formation Heterogeneity in Semi-Confining Shale Layers in Enhancing Mixing and Storage of Dissolved CO<sub>2</sub>, Abstract, AGU Fall Meeting, New Orleans, LA, December, 2017.

49. GUGLIELMI, Y., NUSSBAUM, C., **BIRKHOZLER, J.T.**, DE BARROS, L., CAPP, F. (2017): Permeability Evolution Associated to Creep and Episodic Slow Slip of a Fault Affecting Clay Formations: Results from the FS Fault Activation Experiment in Mt Terri (Switzerland), Switzerland, Abstract, AGU Fall Meeting, New Orleans, LA, December, 2017.
50. DOBSON, P., OLDENBURG, C.M., WU, Y., COOK, P.J., KNEAFSEY, T.J., NAKAGAWA, S., ULRICH, C., SILER, D.L., GUGLIELMI, Y., AJO FRANKLIN, J., RUTQVIST, J., DALEY, T.M., **BIRKHOZLER, J.T.**, WANG, H.F., LORD, N., HAIMSON, B.C., SONE, H., VIGILANTE, P., ROGGENTHEN, W., DOE, T., LEE, M., INGRAHAM, M., HUANG, H., MATTSON, E., JOHNSON, T.C., ZHOU, J., ZOBACK, M.D., MORRIS, J., WHITE, J.A JOHNSON, P.A., COBLENTZ, D., HEISE, J. (2017): kISMET: Stress Analysis and Intermediate-scale Hydraulic Fracturing at the Sanford Underground Research Facility, Abstract, AGU Fall Meeting, New Orleans, LA, December, 2017.
51. OLDENBURG, C.M., ZHOU, Q., RUTQVIST, J., **BIRKHOZLER, J.T.** (2017): Fundamental Flux Equations for Fracture-Matrix Interactions with Linear Diffusion, Abstract, AGU Fall Meeting, New Orleans, LA, December, 2017.
52. ZHOU, Q., OLDENBURG, C.M., **BIRKHOZLER, J.T.** (2017): Modeling CO<sub>2</sub> Storage in Fractured Reservoirs: Fracture-Matrix Interactions of Free-Phase and Dissolved CO<sub>2</sub>, Abstract, AGU Fall Meeting, New Orleans, LA, December, 2017.
53. **BIRKHOZLER, J.T.** (2017): 25 Years of DECOVALEX - Research Advances and Lessons Learned from an International Model Comparison Initiative, Invited, Abstract, AGU Fall Meeting, New Orleans, LA, December, 2017.
54. **BIRKHOZLER, J.T.** (2017): Cross-Cutting Subsurface Challenges: Insights from Dedicated Subsurface Energy Field Observatories, Invited, Abstract, 23rd European Meeting of Environmental and Engineering Geophysics: Fourth Sustainable Earth Sciences Conference, Malmö, Sweden, September 3-7, 2017.
55. NUSSBAUM, C., GUGLIELMI, Y., DE BARROS, L., **BIRKHOZLER, J.T.**, CAPP, F. (2017): Imaging the Long-term Loss of Faulted Caprock Integrity: In-situ Experiments in the Mont Terri Rock Laboratory, Switzerland, Extended Abstract, EAGE/SEG Research Workshop 2017, Geophysical Monitoring of CO<sub>2</sub>, Trondheim, Norway, August 28-31, 2017.
56. NUSSBAUM, C., GUGLIELMI, Y., DE BARROS, L., **BIRKHOZLER, J.T.**, CAPP, F. (2017): Aseismic Fault Slip and Leakage Preceding an Earthquake Induced During an In-Situ Fault Reactivation Experiment in the Opalinus Clay, Mont Terri Rock Laboratory, Switzerland, Abstract, Schatzalp 2<sup>nd</sup> Induced Seismicity Workshop, Davos, Switzerland, March, 2017.
57. GUGLIELMI, Y., DE BARROS, L., HENRY, P., NUSSBAUM, C., CAPP, F., **BIRKHOZLER, J.T.** (2017): Exploring Induced Seismicity From Mesoscale Field Experiments, Abstract, Schatzalp 2<sup>nd</sup> Induced Seismicity Workshop, Davos, Switzerland, March, 2017.

## 2016

58. KIM, K., RUTQVIST, J., **BIRKHOZLER, J.T.** (2016): Coupled Hydro-Mechanical Simulations of Discrete Fluid-Driven Fracture Propagation Through Fractured Rock Masses Using a Lattice Modeling Approach, Abstract, AGU Fall Meeting, San Francisco, CA, December, 2016.
59. ZHENG, L., XU, H., RUTQVIST, J., **BIRKHOZLER, J.T.** (2016): Understanding the THMC Evolution of Bentonite Barriers: Modeling an In Situ Test for Bentonite Backfilled Engineered Barrier System, Abstract, AGU Fall Meeting, San Francisco, CA, December, 2016.
60. XU, H., RUTQVIST, J., ZHENG, L., **BIRKHOZLER, J.T.** (2016): Modeling of Coupled Thermo-Hydro-Mechanical-Chemical Processes for Bentonite in a Clay-rock Repository for Heat-generating Nuclear Waste, Abstract, AGU Fall Meeting, San Francisco, CA, December, 2016.

61. OLDENBURG, C.M., DOBSON, P.F., DALEY, T.M., **BIRKHOLZER, J.T.**, COOK, P.J., AJO-FRANKLIN, J.B., RUTQVIST, J., SILER, D., KNEAFSEY, T.J., NAKAGAWA, S., WU, Y., GUGLIELMI, Y., ULRICH, C., MARCHESINI, P. (2016): kISMET: Stress and Fracture Characterization in a Deep Mine, Abstract, AGU Fall Meeting, San Francisco, CA, December, 2016.
62. JEANNE, P., RUTQVIST, J., WAINWRIGHT, H., FOXALL, W., ZHOU, Q., RINALDO, A., BACHMANN, C., **BIRKHOLZER, J.T.** (2016): Assessment of the Predicted Seismic Activity Associated with a Hypothetical Industrial-Scale Geologic CO<sub>2</sub> Sequestration Operation: Effect of In-Situ Stress Measurement Uncertainties and Friction Law, Abstract, AGU Fall Meeting 2016, San Francisco, CA, December, 2016.
63. CIHAN, A., **BIRKHOLZER, J.T.**, TREVISAN, L., ALVAREZ, GONZALEZ-NICOLAS, A., ILLANGASEKARE, T.H. (2016): Importance of Considering Hysteresis in Macroscopic Models of Two-phase Flow in Porous Media, Abstract, AGU Fall Meeting 2016, San Francisco, CA, December, 2016.
64. GONZALEZ-NICOLAS, A., CIHAN, A., **BIRKHOLZER, J.T.**, PETRUSAK, R., ZHOU, Q., RIESTENBERG, D.E., TRAUTZ, R.C., GODEC, M. (2016): Adaptive Management for Subsurface Pressure and Plume Control in Application to Geological CO<sub>2</sub> Storage, Abstract, AGU Fall Meeting 2016, San Francisco, CA, December, 2016.
65. TINNACHER, R., DAVIS, J.A., TOURNASSAT, C., **BIRKHOLZER, J.T.** (2016): Effects of Clay Microstructure on Uranium(VI) Sorption and Diffusion, Abstract, 2016 GSA Annual Meeting, Denver, Colorado, September 25-28, 2016.
66. DOBSON, P., OLDENBURG, C., DALEY, T., **BIRKHOLZER, J.T.**, COOK, P.J., AJO-FRANKLIN, J., RUTQVIST, J., SILER, D., KNEAFSEY, T., NAKAGAWA, S., WU, Y., GUGLIELMI, Y., ULRICH, C., WANG, H., HAIMSON, B., SONE, H., VIGILANTE, P., ROGGENTHEN, W., DOE, T., LEE, M., MATTSON, E., HUANG, H., JOHNSON, T., MORRIS, J., WHITE, J. (2016): The Kismet (Permeability (K) and Induced Seismicity Management for Energy Technologies) Project – an Underground Field Laboratory for Investigating the Relations Between Natural and Induced Fractures, Stress Field, and Rock Fabric, Abstract, 2016 GSA Annual Meeting, Denver, Colorado, September 25-28, 2016.
67. GUGLIELMI, Y., DE BARROS, L., NUSSBAUM, C., **BIRKHOLZER, J.T.**, CAPPA, F. (2016): First Results of Aseismic Fault Slip and Leakage Preceding an Earthquake Induced During an In Situ Fault Reactivation Experiment in Shales (Mont Terri FS Experiment, Switzerland), Abstract, 2016 GSA Annual Meeting, Denver, Colorado, September 25-28, 2016.
68. ZHENG, L., XU, H., RUTQVIST, J., **BIRKHOLZER, J.T.** (2016): Understanding the THMC Evolution of Bentonite Barrier — Modeling an In Situ Test for Bentonite Backfilled Engineered Barrier System, Abstract, 2016 GSA Annual Meeting, Denver, Colorado, September 25-28, 2016.
69. **BIRKHOLZER, J.T.** (2016): An Overview of Radioactive Waste Disposal Research Activities Linked to International Underground Research Laboratories, Invited, Abstract, 2016 GSA Annual Meeting, Denver, Colorado, September 25-28, 2016.
70. **BIRKHOLZER, J.T.** (2016): Subsurface Energy Applications: Cross-Cutting Research Needs and the Role of Deep Geoscience Observatories, Abstract, 2016 GSA Annual Meeting, Denver, Colorado, September 25-28, 2016.
71. OLDENBURG, C.M., DOBSON, P.F., DALEY, T.M., **BIRKHOLZER, J.T.**, AJO-FRANKLIN, J., RUTQVIST, J., SILER, D.L., KNEAFSEY, T.J., NAKAGAWA, S., FREIFELD, B.M., WU, Y., WANG, H.F., HAIMSON, B.C., SONE, H., ROGGENTHEN, W.M., DOE, T.M., LEE, M.Y., MATTSON, E.D., HUANG, H., JOHNSON, T.J., MORRIS, J.P., WHITE, J.A., JOHNSON, P.A., COBLENTZ, D.C. (2016): kISMET - A Deep Mine Intermediate-Scale Hydraulic Fracture and Stimulation Field Laboratory, Abstract, 2016 American Association of Petroleum Geologists (AAPG) Conference, Calgary, BC, Canada, June 19-22, 2016.
72. LIN, Y., ZHENG, L., **BIRKHOLZER, J.T.** (2016): Reduced-Order Modeling for Evaluating the Impact of CO<sub>2</sub> and Brine Leakage on Groundwater Based on Sparse Polynomial Expansion, Abstract, Carbon Capture, Utilization, and Storage (CCUS) Conference, Tysons, VA, USA, June 14-16, 2016.

73. STRINGFELLOW, W.T., CAMARILLO, M.K., DOMEN, J.K., SANDELIN, W., VARADHARAJAN, C., JORDAN, P., REAGAN, M., COOLEY, H., HEBERGER, M., **BIRKHOLZER, J.T.** (2016): Quantitative Analysis Chemicals Used for Hydraulic Fracturing in California, Abstract, 251st American Chemical Society National Meeting & Exposition, San Diego, CA, March 13-17, 2016.
74. LONG, J.C.S., **BIRKHOLZER, J.T.**, FEINSTEIN, L. (2016): Environmental Aspects of Unconventional Oil and Gas Production and Hydraulic Fracturing, Abstract, 251st American Chemical Society National Meeting & Exposition, San Diego, CA, March 13-17, 2016.
75. TINNACHER, R.M, DAVIS, J.A., TOURNASSAT, C., **BIRKHOLZER, J.T.** (2016): Uranium(VI) Diffusion in Sodium-Montmorillonite at Alkaline pH, Abstract, 251st American Chemical Society National Meeting & Exposition, San Diego, CA, March 13-17, 2016.
76. **BIRKHOLZER, J.T.** (2016): Reservoir Management Strategies and Optimization Involving Brine Extraction, Invited, Abstract, EPRI Stakeholder Workshop on Produced Water Quality, Treatment, and End Uses, Scottsdale, AZ, February 25, 2016.
77. **BIRKHOLZER, J.T.** (2016): Subsurface Energy Applications – Cross-Cutting Research Needs and the Role of Deep Geoscience Observatories, Invited Keynote, Mont Terri Technical Meeting TM-34 and 20<sup>th</sup> Anniversary Workshop, Porrentruy, Switzerland, February 10-11, 2016.
78. MORIDIS, G., CIHAN, A., **BIRKHOLZER, J.T.** (2016): Managing Storage Options Via Plume Steering and Pressure Reduction, Invited, Abstract, Carbon Utilization for Resource Extraction Workshop, Abu Dhabi, UAE, January 19, 2016

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79. TSANG, C.-F., ROSBERG, J.-E., JUHLIN, C., NIEMI, A., DOUGHTY, C., DOBSON, P., **BIRKHOLZER, J.T.** (2015): A New Approach to Hydrologic Testing During Drilling of a Deep Borehole and its Application to the Swedish Scientific Deep Drilling COSC Project, Abstract, AGU Fall Meeting 2015, San Francisco, CA, December, 2015.
80. KIM, K., RUTQVIST, J., NAKAGAWA, S., HOUSEWORTH, J., **BIRKHOLZER, J.T.** (2015): Discrete Modeling of Hydraulic Fracturing Processes in a Complex Pre-existing Fracture Network, Abstract, AGU Fall Meeting 2015, San Francisco, CA, December, 2015.
81. **BIRKHOLZER, J.T.**, LONG, J., FEINSTEIN, L., STRINGFELLOW, W., JORDAN, P., VARADHARAJAN, C., FOXALL, B., DOBSON, P., HOUSEWORTH, J. (2015): Impacts of Hydraulic Fracturing in California – An Overview of a Comprehensive Science Assessment, Abstract, AGU Fall Meeting 2015, San Francisco, CA, December, 2015.
82. STRINGFELLOW, W., CAMARILLO, M.K., DOMEN, J.K., SANDELIN, W., VARADHARAJAN, C., COOLEY, H., JORDAN, P., HEBERGER, M., REAGAN, M., HOUSEWORTH, J., **BIRKHOLZER, J.T.** (2015): Treatment Process Requirements for Waters Containing Hydraulic Fracturing Chemicals, Abstract, AGU Fall Meeting 2015, San Francisco, CA, December, 2015.
83. VARADHARAJAN, C., COOLEY, H., HEBERGER, M., STRINGFELLOW, W., DOMEN, J.K., SANDELIN, W., CAMARILLO, M.K., JORDAN, P., REAGAN, M., DONNELLY, K., **BIRKHOLZER, J.T.**, LONG, J. (2015): Characteristics and Management of Flowback/Produced Water from Hydraulically Fractured Wells in California - Findings from the California SB 4 Assessment, Abstract, AGU Fall Meeting 2015, San Francisco, CA, December, 2015.
84. ZHENG, L., RUTQVIST, J., **BIRKHOLZER, J.T.**, LI, Y., ANGUIANO, H. (2015): Coupled THMC Models for Bentonite in Clay Repository for Nuclear Waste, Abstract, AGU Fall Meeting 2015, San Francisco, CA, December, 2015.
85. TINNACHER, R.M, DAVIS, J.A., TOURNASSAT, C., **BIRKHOLZER, J.T.** (2015): Uranium(VI) Diffusion in Sodium-Montmorillonite at Alkaline pH Condition, Abstract, AGU Fall Meeting 2015, San Francisco, CA, December, 2015.

86. ZHOU, Q., **BIRKHOLZER, J.T.**, Oldenburg, C.M. (2015): A Hybrid Continuum-Discrete Scheme for Simulating CO<sub>2</sub> Migration and Trapping in Fractured Sandstone Reservoirs, Abstract, AGU Fall Meeting 2015, San Francisco, CA, December, 2015.
87. SIIRILA-WOODBURN, W. E., CIHAN A., **BIRKHOLZER, J.T.** (2015): Determining the Area of Review (AoR) in Carbon Capture and Storage: A Tiered, Probabilistic Methodology to Generate a Risk Map, Abstract, AGU Fall Meeting 2015, San Francisco, CA, December, 2015.
88. BLANCO-MARTIN, L., RUTQVIST, J., **BIRKHOLZER, J.T.** (2015): Long-Term Modeling of Coupled Processes in a Generic Salt Repository for Heat-Generating Nuclear Waste: Analysis of the Impacts of Halite Solubility Constraints, Abstract, AGU Fall Meeting 2015, San Francisco, CA, December, 2015.
89. SIIRILA-WOODBURN, E.R., STEEFEL, C.I., WILLIAMS, K.H., **BIRKHOLZER, J.T.** (2015): An Integrated Hydrologic Modeling Approach to Cesium-137 Transport in Forested Fukushima Watersheds, Abstract, AGU Fall Meeting 2015, San Francisco, CA, December, 2015.
90. Oldenburg, C.M., Dobson, P.F., Daley, T.M., Birkholzer, J.T., Wang, H., Doe, T.W., Lee, M., Roggenthen, W.M. (2015): Intermediate-Scale Hydraulic Fracture and Stimulation Field Laboratory in a Deep Mine for the Investigation of Induced Seismicity and Fracture Flow, Abstract, Conference on Science at the Sanford Underground Research Facility, Rapid City, South Dakota, USA, May 18-20, 2015.
91. BLANCO-MARTIN, L., RUTQVIST, J., **BIRKHOLZER, J.T.**, WOLTERS, R., LUX, K.-H., RUTENBERG, M., ZHAO, J. (2015): 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, Abstract, IRSM Congress 2015, International Symposium on Rock Mechanics, Montreal, Canada, May 10-13, 2015.
92. STRINGFELLOW, W., MCKONE, T., SANDELIN, W., KLOC, K., DOMEN, J., HEBERGER, M., MADDALENA, R., VARADHARAJAN, C., JORDAN, P., COOLEY, H., REAGAN, M., TINNACHER, R., CAMARILLO, M.K., HOUSEWORTH, J., **BIRKHOLZER, J.T.** (2015): Composition and Associated Hazards of Well Stimulation Fluids Used in California (USA), Abstract, 249<sup>th</sup> American Chemical Society (ACS) Meeting, Denver, CO, March 22-26, 2015.
93. ZHENG, L., RUTQVIST, J., **BIRKHOLZER, J.T.** (2015): Coupled THMC Models for Bentonite in a Clay Repository for Nuclear Waste: Illitization and its Effect on Stress Under High Temperature, Abstract, 5th International Conference on Coupled Thermo-Hydro-Mechanical-Chemical (THMC) Processes in Geosystems: Petroleum and Geothermal Reservoir Geomechanics and Energy Resource Extraction, GEOPROC, Salt Lake City, UT, February 25-27, 2015.

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94. BLANCO-MARTIN, L., RUTQVIST, J., **BIRKHOLZER, J.T.**, WOLTERS, R., LUX, K.-H. (2014): Modeling of the T S D E Heater Test to Investigate Crushed Salt Reconsolidation and Rock Salt Creep for the Underground Disposal of High-Level Nuclear Waste, Abstract, AGU Fall Meeting 2014, San Francisco, CA, December, 2014.
95. KOKKINAKI, A., LI, J.Y., ZHOU, Q., **BIRKHOLZER, J.T.**, KITANIDIS, P. (2014): Large-scale Characterization of Geologic Formations for CO<sub>2</sub> Injection Using Compressed State Kalman Filter, Abstract, AGU Fall Meeting 2014, San Francisco, CA, December, 2014.
96. AGARTAN, E., CIHAN, A., **BIRKHOLZER, J.T.**, ZHOU, Q., ILLANGASEKARE, T. (2014): Effects of Lithology of Deep Layered Geologic Formations on Trapping of Dissolved CO<sub>2</sub>, Abstract, AGU Fall Meeting 2014, San Francisco, CA, December, 2014.
97. ILLANGASEKARE, T., TREVISAN, L., AGARTAN, E., VARGAS-JOHNSON, J., PAMPLIN, M.R., PINI, R., PAWAR, R., CIHAN, A., **BIRKHOLZER, J.T.**, ZHOU, Q., (2014): Experimental Investigation of CO<sub>2</sub> Trapping and Leakage Mechanisms in Deep Geologic Formations for Model Improvement, Abstract, AGU Fall Meeting 2014, San Francisco, CA, December, 2014.



98. CIHAN, A., **BIRKHOLZER, J.T.**, BIANCHI, M. (2014): A Constrained Differential Evolution Algorithm for Reservoir Management: Optimal Placement and Control of Wells for Geological Carbon Storage with Uncertainty in Reservoir Properties, Abstract, AGU Fall Meeting 2014, San Francisco, CA, December, 2014.
99. KIM, K., RUTQVIST, J., HOUSEWORTH, J., **BIRKHOLZER, J.T.** (2014): Discrete Fracture Modeling of Hydro-mechanical Damage Processes in Geological Systems, Abstract, AGU Fall Meeting 2014, San Francisco, CA, December, 2014.
100. **BIRKHOLZER, J.**, GUGLIELMI, Y., RUTQVIST, J., ZHENG, L., SPYCHER, N. (2014): Improved Understanding of Carbon Storage Risk Via Controlled-Release Experiments, Invited Talk, Abstract, AGU Fall Meeting 2014, San Francisco, CA, December, 2014.
101. ZHENG, L., **BIRKHOLZER, J.** (2014): 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, AGU Fall Meeting 2014, San Francisco, CA, December, 2014.
102. ASAHINA, D., RUTQVIST, J., HOUSEWORTH, J., **BIRKHOLZER, J.T.** (2014): Voronoi-Based Fracture Networks for Hydro-Mechanical Modeling of Geomaterials, DFNE 2014, Abstract, International Discrete Fracture Network Engineering Conference, October 2014, Vancouver, Canada.
103. BANDILLA, K., **BIRKHOLZER, J.T.**, CIHAN, A., CELIA, M.A. (2014), A Multi-tiered Approach for Carbon Sequestration Area of Review Delineation, Abstract, AGU Science Policy Conference, June 2014, Washington, D.C.
104. ZHENG, L., RUTQVIST, J., **BIRKHOLZER, J.T.**, LIU, H.-H. (2014), Illitization within Bentonite Engineered Barrier System in Clay Repositories for Nuclear Waste and its Effect on the Swelling Stress: a Study with Coupled THMC Modeling Study, Abstract, Goldschmidt Conference, June 2014, Sacramento, CA.
105. ASAHINA, D., HOUSEWORTH, J., **BIRKHOLZER, J.T.** (2014): Hydro-Mechanical Model for Fracture Development and Fluid Transport in Geomaterials, Abstract, XX International Conference on Computational Methods in Water Resources, Stuttgart, Germany, June 2014.
106. WAINWRIGHT, H.M., ZHANG, Y., FINSTERLE, S.A., **BIRKHOLZER, J.T.** (2014), Uncertainty Quantification in CO<sub>2</sub> Storage Systems: Impacts of Different CO<sub>2</sub> Storage Scenarios, Abstract, XX International Conference on Computational Methods in Water Resources, Stuttgart, Germany, June 2014.
107. LIU, X., ZHOU, Q., **BIRKHOLZER, J.T.**, ILLMAN, W. (2014), Geostatistical Reduced-Order Models in Highly-Parameterized Inverse Problems, Abstract, XX International Conference on Computational Methods in Water Resources, Stuttgart, Germany, June 2014.
108. ILLANGASEKARE, T.H., PLAMPIN, M., TREVISAN, L., AGARTAN, E., VARGAS-JOHNSON, J., MORI, H., SAKAKI, T., PAWAR, R., CIHAN, A., **BIRKHOLZER, J.T.**, ZHOU, Q. (2014), Intermediate Scale Experimental Investigation of CO<sub>2</sub> Trapping and Leakage Mechanisms in Deep Geologic Formations for Model Improvement, Abstract, Interpore, Milwaukee, WI, May 2014.
109. ZHOU, Q., **BIRKHOLZER, J.T.**, OLDENBURG, C. (2014): Analysis of Injectivity at Four Representative Geological CO<sub>2</sub> Injection Sites, Abstract, 13th Annual Conference on Carbon Capture, Utilization and Sequestration, Pittsburgh, PA, April 28-May 1, 2014.
110. **BIRKHOLZER, J.T.**, CIHAN, A., BIANCHI, M. (2014): Optimization of Well Placement and Brine Extraction for Pressure Control Along Critically Stressed Faults, Abstract, 13th Annual Conference on Carbon Capture, Utilization and Sequestration, Pittsburgh, PA, April 28-May 1, 2014.
111. **BIRKHOLZER, J.T.**, CIHAN, A., BANDILLA, K. (2014): A Tiered Area-of-Review Framework for Geologic Carbon Sequestration, Abstract, 13th Annual Conference on Carbon Capture, Utilization and Sequestration, Pittsburgh, PA, April 28-May 1, 2014.

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112. BLANCO-MARTIN, L., RUTQVIST, J., **BIRKHOZLER, J.T.** (2013): On the Importance of Coupled THM Processes to Predict the Long-term Response of a Generic Salt Repository for High-Level Nuclear Waste, Abstract, AGU Fall Meeting 2013, San Francisco, CA, December, 2013.
113. LIU, X., ZHOU, Q., **BIRKHOZLER, J.T.**, ILLMAN, W. (2013): Geostatistical Reduced-Order Models in Under-Determined Inverse Problems, Abstract, AGU Fall Meeting 2013, San Francisco, CA, December, 2013.
114. CHEN, F., WIESE, B., ZHOU, Q., **BIRKHOZLER, J.T.**, KOWALSKY, M.B. (2013): Numerical Modeling of the Pumping Tests at the Ketzin Pilot Site for CO<sub>2</sub> Injection: Model Calibration and Heterogeneity Effects, Abstract, AGU Fall Meeting 2013, San Francisco, CA, December, 2013.
115. TREVISAN, L., ILLANGASEKARE, T., AGARTAN, E., MORI, H., CIHAN, A., **BIRKHOZLER, J.T.**, ZHOU, Q. (2013): Investigation of Multiphase Modeling Approaches for Behavior of Supercritical CO<sub>2</sub> in deep Formations Using Analog Fluids In the Laboratory, Abstract, AGU Fall Meeting 2013, San Francisco, CA, December, 2013.
116. CIHAN, A., **BIRKHOZLER, J.T.**, ILLANGASEKARE, T., ZHOU, Q. (2013): A Theoretical Approach Representing Hysteresis in Capillary Pressure-Saturation Relationship Based on Connectivity in Void Space, Abstract, AGU Fall Meeting 2013, San Francisco, CA, December, 2013.
117. BIANCHI, M., LIU, H.-H., **BIRKHOZLER, J.T.** (2013): Factors Controlling Radionuclide Transport Behavior in a Generic Geological Radioactive Waste Repository, Abstract, AGU Fall Meeting 2013, San Francisco, CA, December, 2013.
118. ASAHINA, D., HOUSEWORTH, J., **BIRKHOZLER, J.T.** (2013): Discrete Fracture Hydromechanical Model for the Disturbed Zone in a Clay Rock, Abstract, AGU Fall Meeting 2013, San Francisco, CA, December, 2013.
119. **BIRKHOZLER, J.**, MUKHOPADHYAY, S., RUTQVIST, J., TSANG, C.-F. (2013): Model Comparison in Subsurface Science: The DECOVALEX and Sim-SEQ Initiatives, Invited Talk, Abstract, AGU Fall Meeting 2013, San Francisco, CA, December, 2013.
120. ZHENG, L., TINNACHER, R.M., VARADHARAJAN, C., SPYCHER, N., BIANCHI, M., NICO, P.S., **BIRKHOZLER, J.**, TRAUTZ, R.C., PUGH, J.B. (2013): Modeling and Interpretation of Laboratory and Field Data Showing CO<sub>2</sub>-induced Groundwater Changes, Abstract, AGU Fall Meeting 2013, San Francisco, CA, December, 2013.
121. ZHOU, Q., CHEN, F., JUNG, Y., LIU, X., **BIRKHOZLER, J.T.**, WIESE, B., NORDEN, B., KEMPKA, T. (2013), Inversion Applications to Modeling Pumping Tests and Early Leakage Detection at the Ketzin Site, Extended Abstract, CO<sub>2</sub>CARE Final Scientific Conference 2013, GFZ Helmholtz Center, Potsdam, Germany, November 2013.
122. LIU, H.-H. AND **BIRKHOZLER, J.** (2013): Non-Darcian Flow in Clay Media, Abstract, GSA Annual Meeting, Denver, October, 2013.
123. ZHENG, L., TINNACHER, R.M., VARADHARAJAN, C., SPYCHER, N., BIANCHI, M., NICO, P.S., **BIRKHOZLER, J.**, TRAUTZ, R.C., PUGH, J.B. (2013): Numerical Interpretation of Laboratory and Field Data Showing CO<sub>2</sub>-induced Groundwater Changes, Abstract, Goldschmidt 2013 Conference, Florence, Italy, August 25-30, 2013.
124. CIHAN, A., **BIRKHOZLER, J.T.**, TREVISAN, L., ZHOU, Q., ILLANGASEKARE, T. (2013): A Theoretical Approach Based on Description of Void Space Connectivity for Representing Hysteretic Capillary Pressure-Saturation Relationship, Abstract, Modflow and More Conference 2013, Golden, CO, June 2013.
125. AGARTAN, E., ILLANGASEKARE, T., CIHAN, A., **BIRKHOZLER, J.T.**, ZHOU, Q., TREVISAN, L. (2013): Investigation of Multi-Phase Modeling Approaches for Behavior of Supercritical CO<sub>2</sub> in Deep Formations Using Analog Fluids in the Laboratory, Abstract, Modflow and More Conference 2013, Golden, CO, June 2013.

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