

Jens T. Birkholzer

Senior Scientist

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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, Hydraulic Engineering, 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

Subsurface hydrology with emphasis on fluid, gas, solute and heat transport in complex subsurface systems such as saturated and unsaturated porous or fractured media:

- Coupled thermal-hydrological-mechanical and chemical processes
- (Multi-phase) fluid flow and transport in fractured rock, including fracture-matrix interaction
- Hydrological and geological evaluation of deep radionuclide waste disposal
- Assessment of CO₂ sequestration in deep geological formations
- Environmental impacts of subsurface energy applications
- Model comparison and evaluation
- Uncertainty quantification, model abstraction, and risk assessment

Publication Metrics:

Web of Science metrics as of January 13, 2015:

- Total number of publications: 88
- h-index: 23
- Total number of citations: 1641

Researcher ID: C-6783-2011 (<http://www.researcherid.com/rid/C-6783-2011>)

Google Scholar: <http://scholar.google.com/citations?user=WzRIWsAAAAJ&hl=en>

Professional Experience

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

Professional Activities

Associate Editor, International Journal of Greenhouse Gas Control (IJGGC), since 2014, ended in May 2017

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

Editorial Board, Journal of Sustainable Energy Engineering, since 2015

Expert Review Panel for GHGT-13 in Lausanne, Switzerland, November 2016.

Served as Lead for International Activities for DOE Spent Fuel and Waste Science and Technology Campaign representative for various international partnerships (DECOVALEX, Mont Terri, FEBEX, SKB Task Forces,...).

Member of DOE NE Leadership team for Spent Fuel and Waste Science and Technology Campaign.

Served as Chairman for international DECOVALEX Project.

Member of NRAP leadership team (National Risk Assessment Partnership)

Co-Chair of CCST Steering Committee for scientific assessment of natural gas storage integrity in California (CCST = California Council on Science and Technology) 2017

PhD Thesis Advisor, UC Berkeley, Nuclear Engineering Department, Alex Salazar

Member Search Committee for New Faculty Position, UC Berkeley, Nuclear Engineering Department

Session Chair, Mont Terri Technical Meeting, February 2017, Switzerland

Chair, Mont Terri Workshop on “Cross-cutting Subsurface Challenges – How Can Mont Terri Help?”, March 2017, Berkeley

Chair DECOVALEX Workshop, November 2016, Taiwan

Chair DECOVALEX Workshop, April 2017, Sweden

Member Studienstiftung des Deutschen Volkes, German Government Scholarship Organization.

Served as Vice Chairman for international DECOVALEX Project. Incoming chairman for new DECOVALEX Project phase starting in 2016.

Served on Steering Committee for SB 4 scientific assessment by CCST on hydraulic fracturing in California (CCST = California Council on Science and Technology) 2016

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

Session Chair at AGU 2015: Advances in Drilling, Characterizing, Testing, and Sealing Deep Boreholes

Session Chair TOUGH2 Symposium, September 2015

Served on Steering Committee for SB 4 scientific assessment by CCST on hydraulic fracturing in California (CCST = California Council on Science and Technology)

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

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

Session Chair and Co-Organizer, International Workshop on Nuclear Safety: From accident mitigation to resilient society facing extreme situations, UC Berkeley, March 22-24, 2015; co-editor for planned book with workshop contributions.

Member Leadership Team, Berkeley Institute for Resilient Communities

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

Scientific Committee, XX International Conference on Computational Methods in Water Resources (CMWR), held in Stuttgart, Germany, June 9-13, 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, since 2013, designated Chairman of DECOVALEX Project starting 2016, www.decovalex.org

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

Co-convenor of Session at the 11th Annual Carbon Capture, Utilization & Sequestration Conference, Session Title: CCS/CCUS Impact on Water Resources, held in Pittsburgh USA, April 30-May 3, 2012

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

Co-Guest Editor of Special Issue on Carbon Dioxide Geological Storage, Topical Issue: CLEAN - Enhanced Gas Recovery Storage and Geological CO₂ 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 Characterisation of a Clay Formation Using an Underground Research Laboratory in Switzerland, since 2012, 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, since 2012, 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

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

Co-convenor of Session at GHGT-10, International Conference on Greenhouse Gas Control Technologies, Session Title: Modelling Tools, held in Amsterdam, Netherlands, September 19-23, 2010

LBNL Lead and Member of Technical Leadership Team, NRAP – National Risk Assessment Partnership, National Laboratory Consortium for the development of quantitative risk assessment methods for geologic carbon sequestration, since 2010

Co-Guest Editor of Special Issue on Site Characterization for CO₂ 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.

Co-Chair of Organizing Committee, International Symposium on Site Characterization for CO₂ Geological Storage, CO2SC 2006, held in Berkeley, CA, March 20-22, 2006

Co-convenor of Session at the 2008 AGU Fall Meeting, Session Title: Multiscale Science of Geologic CO₂ Sequestration, held in San Francisco, USA, December 2008

Convenor of Session at the 2008 International Geological Congress, Session Title: Risk and Vulnerability Assessment Related to Geological Storage of CO₂, held in Oslo, Norway, August 2008

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

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

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

Member and Co-Chair of CCST Steering Committee for scientific assessment of natural gas storage integrity in California (CCST = California Council on Science and Technology) 2017.

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

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

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

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

Expert Review Panel, GHGT-11, International Conference on Greenhouse Gas Control Technologies, Kyoto, Japan, 2012

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

Advisor to EPA Office of Water, Development of CO₂ Sequestration Regulations, Class VI Rule, 2007-2011

Honors and Awards

The Geological Society of America (GSA) Fellow, 2016

California Council on Science and Technology (CCST) Senior Fellow

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 support, 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, PhD Thesis Advisor, Nuclear Engineering Department, Alex Salazar

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

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, Fall Class for Graduate Students (NE290E): Environmental Issues in Nuclear Energy, Fall 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. Status and Future of Nuclear Waste Disposal in the United States, ISCO Meeting, Grimsel Test Site, Switzerland, June 2017
2. Subsurface Energy Applications: Cross-Cutting Research Needs and the Role of Geoscience Observatories, Chinese Environmental Scholars Forum (CESF), Berkeley, May 20-21, 2017.
3. 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.
4. The United States Nuclear Waste Disposal Program and Example Research Activities, NAGRA, Switzerland, February 2017.
5. An Overview of Radioactive Waste Disposal Research Activities Linked to International Underground Research Laboratories, 2016 GSA Annual Meeting, Denver, Colorado, September 25-28, 2016.
6. Keynote Presentation, *Use of Component Models in System-level Risk Assessments: Is Less Really More*, Gordon Research Conference 2016, Flow & Transport in Permeable Media, Girona, Spain, August 4, 2016.
7. *An Overview of Radioactive Waste Disposal Research Activities Linked to International Underground Research Laboratories*, 2016 GSA Annual Meeting, Denver, Colorado, September 25-28, 2016.
8. *International Collaboration Activities in Disposal R&D*, 2015 Fuel Cycle Technologies Annual Meeting, Idaho Falls, ID, November 4, 2016.
9. *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.
10. *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.
11. *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.
12. *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.
13. *Birkholzer, J.T. (2016), Reservoir Management Strategies and Optimization Involving Brine Extraction*, EPRI Stakeholder Workshop on Produced Water Quality, Treatment, and End Uses, Scottsdale, AZ, February 25, 2016.
14. *Energy Resilience in the United States – What Can Subsurface Science Contribute*, Second International Symposium for Resilient Communities, Koriyama City, Japan, April 14, 2016.
15. *Use of Component Models in System-level Risk Assessments: Is Less Really More*, Gordon Research Conference 2016, Flow & Transport in Permeable Media, Girona, Spain, August 4, 2016.
16. *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.
17. *Improved Understanding of Carbon Storage Risk Via Controlled-Release Experiments*, AGU Fall Meeting 2014, San Francisco, CA, December, 2014.
18. *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.
19. *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.
20. *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.
21. *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.

22. *Model Comparison in Subsurface Science: The DECOVALEX and Sim-SEQ Initiatives*, AGU Fall Meeting 2013, San Francisco, CA, December 2013.
23. *History and Future of the United States Nuclear Waste Program*, NAGRA Workshop, Switzerland, November 15, 2013.
24. *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.
25. *Key Issues of Modeling Long-Term Reservoir Behavior in Response to Large CO₂ Injection Operations, Keynote Lecture*, Brainstorming Workshop on “Long-Term Fate of Stored CO₂ - Key Issues, Innovations and Best Practices”, Trondheim, Norway, June 3, 2013.
26. *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.
27. *Impact-Driven Pressure Management Via Brine Extraction: Conceptual Studies of CO₂ Storage with Leakage Pathways*, CCS Pressure Management Workshop, Lawrence Livermore National Laboratory, Livermore, February 22-23, 2012.
28. *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.
29. *Modeling Coupled Geomechanical, Thermal, and Flow Processes: Examples from CO₂ Storage, Nuclear Waste Disposal, and Enhanced Geothermal Systems*, Princeton Workshop on "Subsurface Flows and Modeling ", Princeton University, February 2-3, 2012.
30. *Impact-Driven Pressure Management for Leaky CO₂ Storage Systems*, AGU Fall Meeting 2011, San Francisco, CA, December 2011.
31. *Analytical and Numerical Modeling Approaches for Regional-Scale Assessment of GCS*, Princeton Workshop on Scales of Resolution, Model Complexity, and Solution Approaches for CO₂ Storage Problems, December 6-7, 2011.
32. *Scientific Issues Related to Geologic Storage of CO₂ - Learning from Nuclear Waste and Yucca Mountain R&D*, 2011 GSA Annual Meeting, Minneapolis, Minnesota, October 9-12, 2011.
33. *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.
34. *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.
35. *CO₂ Geological Storage and Groundwater Resources: Model Applications*, 2011 SIAM Conference on Mathematical and Computational Issues in Geosciences, Long Beach, CA, March 21-24, 2011.
36. *On Regional Pressure Buildup and Fluid Migration in Response to Large CO₂ Injection Operations*, 2010 GSA Annual Meeting, Denver, Colorado, October 31-November 3, 2010.
37. *Groundwater Quality Changes in Response to CO₂ Leakage from Deep Geological Storage*, 2010 GSA Annual Meeting, Denver, Colorado, October 31-November 3, 2010.
38. *Potential for Groundwater Impacts From CO₂ 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.
39. *CO₂ Geologic Storage and Groundwater Protection: Issues and Research Needs*, Energy Frontier Research Center for Nanoscale Control of CO₂, Kickoff Symposium, Berkeley, California, October 7- 8, 2009.
40. *An Integrated Model for Basin- and Plume-scale Processes Related to Full-Scale Employment of CO₂ 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.
41. *Modeling of Potential Impacts of CO₂ Storage on Drinking Water*, EPRI Technical Meeting CO₂ Capture and Storage (P165), Edmonton, Alberta, July 28-31, 2009.

42. *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.
43. *Overview and Initial Assessments of Potential Groundwater Impacts*, Ohio-State/Battelle Symposium on “Advancing the Science of Geologic Carbon Sequestration”, March 9-10, 2009.
44. *Model Comparison and Evaluation Using Results from CO₂ Field Tests*, IEA GHG CO₂ Storage Workshop, Orléans, France, February 10-12, 2009.
45. *Prediction of Groundwater Quality Changes in Response to CO₂ Leakage from Deep Geological Storage*, American Waterworks Association 2009 Water Resources Symposium, Portland, Oregon, January 2009.
46. *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.
47. *Characterizing and Selecting Appropriate Sites for Safe Geologic Storage of CO₂: Key Issues and Information Needs*, Workshop on Geological Storage of CO₂ – Safety and Monitoring Issues, German Ministry for Environment, Nature Conservation, and Nuclear Safety (BMU), Berlin, Germany, May 26-27, 2008.
48. *Scientific Investigations Supporting the Long-term Safety Assessment of the Proposed Geologic Repository at Yucca Mountain: Thermal-Hydrological Evaluations*, 38th International IWASA Symposium, Aachen, Germany, January 3-4, 2008.
49. *THMC Processes Relevant for Waste Disposal, CO₂ Sequestration, and Geothermal Energy – LBNL Perspective*, Deutsche Forschungsgemeinschaft Rundtischgespräch, Tuebingen, Germany, September 6-7, 2007.
50. *Characterizing and Selecting Appropriate Sites for Geologic Storage of CO₂: Key Issues and Information Needs*, EPA Geologic Sequestration Technical Workshop - Geological Considerations and Area of Review Studies, Washington, D.C., June 10-11, 2007.
51. *Large Releases from CO₂ Storage Reservoirs: Analogues, Scenarios, and Modeling Needs*, Petrobras International Seminar on Carbon Sequestration and Climate Change, Rio de Janeiro, Brazil, October 2006.
52. *Geomechanical and Geochemical Modeling Studies in the International DECOVALEX Project*, Geoproc 2006, Nanjing, China, May 2006.
53. *Geological Storage of CO₂: An Overview*, NRDC Workshop on Geological Sequestration of CO₂, Washington, D.C., May 12, 2006.
54. *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 or Co-PI):

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 CO₂ 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.

CO₂ 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.

Deep Borehole Disposal Demonstration Project – Site Selection and Test Design, since 2015, FY15 Funding: \$500 K, Sponsor: U.S. Department of Energy, Office of Nuclear Energy, Used Fuel Disposition Campaign.

Geologic Disposal Systems Evaluations and Tool Development – Argillite Disposal, since 2014, FY14 Funding: \$635 K, FY15 Funding: \$545 K, Sponsor: U.S. Department of Energy, Office of Nuclear Energy, Used Fuel Disposition Campaign.

Geologic Disposal Systems Evaluations and Tool Development – Crystalline Disposal, since 2014, FY14 Funding: \$275 K, FY15 Funding: \$175 K, Sponsor: U.S. Department of Energy, Office of Nuclear Energy, Used Fuel Disposition Campaign.

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

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

Evaluation of Salt as a Host Rock for Geologic Disposal of Radioactive Waste, since 2013, FY13 Funding: \$180 K, FY14 Funding: \$350 K, FY15 Funding: \$200 K, Sponsor: U.S. Department of Energy, Office of Nuclear Energy, Used Fuel Disposition Campaign.

International Collaborations Integration & Coordination for Geologic Disposal of Radioactive Waste, since 2012, Average Annual Funding: \$300 K, Sponsor: U.S. Department of Energy, Office of Nuclear Energy, Used Fuel Disposition Campaign.

NRAP – National Risk Assessment Partnership, National Laboratory Consortium for the development of quantitative risk assessment methods for geologic carbon sequestration, since 2010, Average Annual Funding: \$1,400 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 CO₂ 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 CO₂ 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.

CO₂ Leakage Impacts on Groundwater in California, 2013-2015, Total Funding: \$600 K, Sponsor: California Energy Commission.

Evaluation of High Temperature Effects Geologic for Direct Geologic Disposal of Dual Purpose Canisters, 2014, FY14 Funding: \$100 K, Sponsor: U.S. Department of Energy, Office of Nuclear Energy, Used Fuel Disposition Campaign.

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.

Collection and Review of Regional Geologic Data of Shale/Argillite Formations as Host Rock for Geologic Disposal of Radioactive Waste, 2012-2014, Average Annual Funding: \$100 K, Sponsor: U.S. Department of Energy, Office of Nuclear Energy, Used Fuel Disposition Campaign.

Regional Modeling of CO₂, 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 CO₂ Field Tests in the USA, 2010-2014, Average Annual Funding: \$150K, U.S. Department of Energy, Office of Fossil Energy.

Generic Disposal System Analysis for Geologic Repositories for Radioactive Waste, 2011-2014, Average Annual Funding: \$100 K, Sponsor: U.S. Department of Energy, Office of Nuclear Energy, Used Fuel Disposition Campaign.

Intermediate Scale Laboratory Testing to Understand Mechanisms of Capillary and Dissolution Trapping during Injection and Post-Injection of CO₂ 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 CO₂ Intrusion into Groundwater: Laboratory Experiments, Microspectroscopy, and Associated Geochemical Modeling, 2011-2013, Annual Funding: \$250K, Sponsor: U.S. EPA.

Modeling of CO₂ Impacts in Southern San Joaquin Valley, 2011-2013, Total Funding: \$287 K, Sponsor: California Energy Commission.

Analogs for Pressure Impacts from CO₂ Sequestration, 2011-2013, Total Funding: \$200 K, Sponsor: California Energy Commission.

Coupled Inversion of Hydrological and Geophysical Data for Improved Prediction of Subsurface CO₂ 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).

Geologic Disposal Systems Evaluations and Tool Development - Natural System Evaluation, 2010-2013, FY10 Funding: \$180 K, FY11 Funding: \$762 K, FY12 Funding: \$925 K, FY13 Funding: \$1,310 K, Sponsor: U.S. Department of Energy, Office of Nuclear Energy, Used Fuel Disposition Campaign.

Geologic Disposal Systems Evaluations and Tool Development – Engineered Barrier System Evaluation, 2010-2013, FY10 Funding: \$150 K, FY11 Funding: \$868 K, FY12 Funding: \$650 K, FY13 Funding: \$710 K, Sponsor: U.S. Department of Energy, Office of Nuclear Energy, Used Fuel Disposition Campaign.

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 CO₂ 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 CO₂ Storage, 2007-2009, Average Annual Funding: \$300 K, Sponsor: U.S. Department of Energy, Office of Fossil Energy.

Research Project on CO₂ 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:

1. JEANNE, P., GUGLIELMI, Y., RUTQVIST, J., NUSSBAUM, C., **BIRKHOLZER, J.T.** (2017): Relation Between Fault Reactivation and Permeability Variations in a Claystone Formation Investigated by Field Experiments and Numerical Simulations, submitted to Journal of Geophysical Research.
2. FAYBISHENKO, B., **BIRKHOLZER, J.T.**, PERSOFF, P., BUDNITZ, B., SASSANI, D. AND SWIFT, P. (2017): International Approaches for Nuclear Waste Disposal in Geological Formations: Geological Challenges in Radioactive Waste Isolation—Fifth Worldwide Review, submitted to Oxford Research Encyclopedia (ORE).
3. ZHOU, Q., OLDENBURG, C.M., RUTQVIST, J., **BIRKHOLZER, J.T.** (2017): Revisiting the Fundamental Analytical Solutions of Heat and Mass Transfer: The Kernel of Multirate and Multidimensional Diffusion, submitted to Water Resources Research.
4. JEANNE, P., GUGLIELMI, Y., RUTQVIST, J., **BIRKHOLZER, J.T.**, NUSSBAUM, C. (2017): Field Characterization of Elastic Properties Variations in a Fault Zone Reactivated by Fluid Injections, submitted to Journal of Geophysical Research.
5. SIIRILA-WOODBURN, E.R., STEEFEL, C.I., WILLIAMS, K.H., **BIRKHOLZER, J.T.** (2017): The Impact of Land Management Decisions on Overland Flow Generation: Implications for Secondary Cesium Contamination in Forested Fukushima Watersheds, submitted to Advances in Water Resources.
6. GONZÁLEZ-NICOLÁS, A., TREVISAN, L., ILLANGASEKARE, T., CIHAN, A., **BIRKHOLZER, J.T.** (2017): Enhancing Capillary Trapping Effectiveness Through Proper Time Scheduling of Injections of Supercritical CO₂ in Heterogeneous Formations, submitted to Greenhouse Gases: Science and Technology.
7. 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. (2017): Comparative Modelling of the Coupled THM Processes in a Heated Bentonite Pellet Column with Hydration, submitted to Environmental Earth Sciences.
8. ZHENG, L., RUTQVIST, J., **BIRKHOLZER, J.T.** (2017): 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.
9. JEANNE, P., RUTQVIST, J., WAINWRIGHT, H.M., RINALDI, A.P., FOXALL, W., ZHOU, Q., **BIRKHOLZER, J.T.** (2017): Effects of the Distribution and Evolution of the Coefficient of Friction Along a Fault on the Assessment of the Seismic Activity Associated with a Hypothetical Industrial-Scale Geologic CO₂ Sequestration Operation, submitted to International Journal of Greenhouse Gas Control.
10. ZHENG, L., RUTQVIST, J., XU, H., **BIRKHOLZER, J.T.** (2017): Coupled THMC Models for Bentonite in an Argillite Repository for Nuclear Waste: Illitization and Its Effect on Stress Under High Temperature, accepted for publication in Journal of Engineering Geology.
11. BLANCO-MARTIN, L., RUTQVIST, J., **BIRKHOLZER, J.T.** (2017): Extension of TOUGH-FLAC to the Finite Strain Framework, accepted for publication in Computers & Geosciences.
12. ZHENG, L., SPYCHER, N.F., BIANCHI, M., PUGH, J.D., VARADHARAJAN, C., TINNACHER, R.M., **BIRKHOLZER, J.T.**, TRAUTZ, R.C. (2017): Impacts of Elevated Dissolved CO₂ on a Shallow Groundwater System: Reactive Transport Modeling of the Field Test, accepted for publication in Chemical Geology.

13. JEANNE, P., RUTQVIST, J., WAINWRIGHT, M., FOXALL, W., BACHMANN, C., ZHOU, Q., PIO RINALDI, A., **BIRKHOLZER, J.T.** (2017): Effects of In-Situ Stress Measurement Uncertainties on the Assessment of the Seismic Activity and Risk Associated with a Hypothetical Industrial-Scale Geologic CO₂ Sequestration Operation, accepted for publication in *Journal of Rock Mechanics and Geotechnical Engineering*.
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Peer-Reviewed Book Chapters

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