

Sally Merrick Benson
CURRICULUM VITAE

Research Interests

Clean Energy Innovation
Carbon Capture and Storage
Livelihood Improvement by Productive Energy Access in Emerging Economies
Macro-Energy Systems
Lifecycle Assessment of Clean Energy Technologies

Education

B.A.: Geology, Barnard College, 1977, Columbia University

M.S.: Material Science and Mineral Engineering, 1984
University of California, Berkeley
Thesis Topic: Interpretation of Non-Isothermal Well Tests

Ph.D.: Material Science and Mineral Engineering, 1988
University of California, Berkeley
Dissertation Topic: Characterization of the Flow and Transport Properties Under
Kesterson Reservoir, California

Leadership Positions

2014 – 2020	Director and Co-Director, Precourt Institute for Energy
2012 – 2013	Acting Director, Precourt Institute for Energy, Stanford University
2012—present	Co-Director, Stanford Center for Carbon Storage
2009 – 2019	Director, Global Climate and Energy Project, Stanford University, Stanford, California
2007 – 2009	Executive Director, Global Climate and Energy Project, Stanford University, Stanford, California
2001 – 2004	Deputy Director for Operations, Lawrence Berkeley National Laboratory, Berkeley, California
1997 – 2001	Associate Laboratory Director, Energy Sciences, Lawrence Berkeley National Laboratory, Berkeley, California
1993 – 2001	Director, Earth Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, California

Academic and Research Positions

2020 –	Precourt Family Professor, Department of Energy Resources Engineering, Stanford University
2013 – 2020	Professor, Department of Energy Resource Engineering, Stanford University

- 2007 – 2013 Professor (Research), Department of Energy Resource Engineering, Stanford University
- 1977 – 2007 Positions of growing responsibility to Senior Staff Scientist, Earth Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, California
- 1990 – 1998 Visiting Professor, Earth Sciences Department, Clemson University, Clemson, South Carolina

Memberships

American Geophysical Union
 Society of Petroleum Engineers
 American Association for the Advancement of Science

Awards and Citations

- 1996 DOE Certificate of Appreciation awarded for leading development of the Natural and Accelerated Bioremediation Research Program Plan
- 2007 Contributed to the reports of the IPCC that received the Nobel Peace Prize for "for their efforts to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations for the measures that are needed to counteract such change."
- 2009 Michel T. Halbouty Distinguished Lecture Award, Geological Society of America
- 2009 ARCS 2009 American Pacesetter Award
- 2011 Alberta Innovates Lecturer of 2011
- 2009 – 2011 Stanford Fellow
- 2012 Greenman Award, IEA Greenhouse Gas Program
- 2015 Honorary Doctorate Degree, Smith College, Massachusetts
- 2015 Roslyn Silver'27 Science Lectureship, Barnard College
- 2017 Distinguished CCS Lecture Tour, Peter Cook Centre, University of Melbourne, Australia
- 2018 Columbia University Arthur D. Storke Lecturer
- 2019 Society of Petroleum Engineers International Award, Health, Safety, and Environment

Selected Board Memberships, Committees and Activities

- 2019 – present Editorial Board, Energy and Environmental Science, Royal Society of Chemistry
- 2018 – 2019 Member, Sustainability Design Team for Long Range Planning, Stanford University
- 2018 – 2020 Co-Chair, National Petroleum Council Study on Carbon Capture, Utilization, and Storage
- 2018 – present Member, Payne Institute Advisory Board, Colorado School of Mines
- 2018 – present Member, Director's Scientific Advisory Board, Argonne National Laboratory
- 2018 – present Member, Advisory Board, School of Science and Engineering, Lahore University of Management Science, Pakistan
- 2018 Host, Women in Clean Energy (C3E) Conference, Stanford University
- 2017-2018 Member, Research Subcommittee for Long Range Planning, Stanford University

2017 – 2019 Member, National Research Council Study on Negative Emissions

2016 – 2017 Member, Secretary of Energy Advisory Board Task Force on Negative Emissions and Carbon Utilization

2016 – 2018 Chair, Selection Committee for the Witherspoon Mid-Career Award in Hydrogeology, American Geophysical Union

2016 – 2016 Symposium, Women in Clean Energy (C3E) Conference, Stanford University

2015 – 2018 Chair, Witherspoon Mid-Career Award Committee, American Geophysical Union

2015 – present Member, Advisory Council, Princeton University Andlinger Center for Energy and the Environment

2015 – present Ambassador, Clean Energy, Education, and Empowerment Initiative (C3E)

2014 – 2018 Chair, Advisory Board, Lahore University of Management Science, School of Science and Engineering, Pakistan

2014 – present Member, Energy, Energy and Environment Advisory Board, Pacific Northwest National Laboratory, Richland, Washington

2014 – 2017 Chair, Energy, Climate and Infrastructure Advisory Board, Sandia National Laboratory, Albuquerque, NM

2013 – 2016 Co-founding editor, MRS Energy and Sustainability Journal

2013 – 2017 Member, Organizing Committee, International Conference on Greenhouse Gas Control Technologies, IEA Greenhouse Gas Programme

2012 – 2018 Member, Energy Systems Integration Technical Review Committee, National Renewable Energy Laboratory, Golden, Colorado

2012 – 2018 Member, Visiting Committee, Department of Environmental Engineering and Earth Sciences, Clemson University

2012 – 2014 Member, Energy, Climate and Infrastructure Advisory Board, Sandia National Laboratory, Albuquerque, NM

2011 – 2017 Member, BIGCCS Scientific Committee, Research Council of Norway

2011 – 2012 Member, Organizing Committee, 11th International Conference on Greenhouse Gas Control Technologies, IEA Greenhouse Gas Programme

2011 Member, National Research Council Committee on Emerging Workforce Issues in the Energy and Mining Industries

2010 Member, State of California “Blue Ribbon” Panel on Carbon Capture and Storage

2010 – 2013 Board of Directors, Carbon Management Canada

2009 – 2010 Member, WRI Task Force on CCS in China

2009 – 2012 *Coordinating Lead Author*, Global Energy Assessment (GEA), Chapter 13, Carbon Dioxide Capture and Storage

2009 – 2014 Member, Advisory Board, Lahore University of Management Science, Pakistan

2009 – 2012 Member, Scientific Policy Board, SLAC National Laboratory, Stanford, CA

2008 – present Board of Directors, National Renewable Energy Laboratory, Colorado

2008 – present Board of Directors, Climate Central, Princeton, New Jersey

2008 – 2010 American Association of Petroleum Geologists, Climate Change Committee

2007 – 2008 Member, Organizing Committee, 9th International Conference on Greenhouse Gas Control Technologies, IEA Greenhouse Gas Programme

2007 Task Force Member, Council on Foreign Relations, Climate Change Task Force

2006 – 2007 Section Co-Chair for Carbon Sequestration, Assessment of Basic Research Needs in the Earth Sciences, commissioned by DOE Basic Energy Sciences

2006 – 2008 Chair, Scientific Advisory Board, Atmospheric Radiation Measurement User Facility

2006 Co-Chair, Technical Review of the CO₂CRC, Australia

2006 Member, Sleipner Risk Assessment Advisory Committee, Statoil

2006 – 2008 Member, FutureGen Technical Advisory Board

2005 – 2013 Member, Technical Advisory Board for the In Salah CO₂ Storage Project

- 2003 – 2005 Coordinating Lead Author, Intergovernmental Panel on Climate Change (IPCC) Special Report on CO₂ Capture and Storage: Chapter of Geologic Storage of CO₂
- 2002 – 2004 Chair, School of Earth Sciences Advisory Board, Stanford University, Stanford, California
- 2002 – present Member, Carbon Mitigation Initiative (CMI) Advisory Board, Princeton University, New Jersey
- 2002 – 2007 Member, CO₂ Capture Project (CCP) Technology Advisory Board

Congressional Testimony

- 11/2007 “Research Priorities for Sequestration of Carbon Dioxide in Deep Geological Formations,” Testimony before the U.S. Senate Committee on Commerce, Science, and Transportation—Science, Technology, and Innovation Subcommittee hearing, Washington, DC, November 7, 2007.
- 11/2003 “What are the Administration Priorities for Climate Change Technology?” Testimony before the Energy Subcommittee of the House Science Committee, November 6, 2003.

Selected Invited Talks (2006-present)

- 5/2019 Long Term Evolution of Residually Trapped Carbon Dioxide Due to Ostwald Ripening, Interpore 11th Annual Meeting, Valencia, Spain
- 1/2019 Research Needs for Scaling Up CO₂ Sequestration, Shell Science Council, Bangalore, India
- 12/2018 Getting to Zero, Achieving California’s Ambitious Climate Goals. Silicon Valley Leadership Group, Milpitas, CA.
- 10/2018 Carbon Capture, Use, and Sequestration, Game Changers Conference, Hoover Institute, Washington, DC.
- 7/2018 The Global Climate and Energy Challenge, International Summer School for Energy and Sustainability, Erice, Sicily.
- 6/2018 Keynote address, Geological Storage of CO₂ for Negative Emissions, International Conference on CO₂ Negative Emissions, Goteborg, Sweden
- 6/2018 Empowering women by clean energy access, Ideal Village Conference, Stanford University
- 6/2018 Carbon Removal in the Climate Response Portfolio, National Press Club, Washington DC
- 5/2018 Keynote Address, Geological Storage of Carbon Dioxide for Negative Emissions, International Conference on Negative Emissions, Goteborg, Sweden
- 5/2018 Keynote Address, Prospects for CO₂ Capture, Storage, Utilization, and Negative Emissions, Joint Workshop on Sustainability in the Hydrocarbon Value Chain, Mexico City, Mexico
- 4/2018 Keynote Address, The Global Climate and Energy Challenge, 1st Annual Energy Symposium, Notre Dame, Indiana
- 4/2018 Renewable Energy Integration in California, University of North Carolina Symposium on Renewable Energy Integration
- 4/2018 Geospatial Analysis of Near-Term Potential for Carbon-Negative Bioenergy in the U.S., Princeton University Carbon Mitigation Initiative Annual Meeting, BP Headquarters, London, U.K.
- 4/2018 Status of CO₂ Capture and Storage, CeraWeek, Houston, TX
- 1/2018 Recent Advances in CO₂ Sequestration Science and Engineering Lamont Dougherty, Columbia University, New York
- 10/2017 Energy Research at Stanford University, University of Brisbane, Australia

10/2017 Prospects for CO₂ Capture, Sequestration, Utilization, and Negative Emissions, CO2CRC, Australia

10/2017 Deep Decarbonization: A Role for the Fossil Fuel Industry, National Coal Council, Brisbane, Australia

10/2017 Multi-Scale Multi-Physics Investigation of Residual Gas Trapping in Reservoir Rocks, University of Melbourne, Australia

10/2017 Making Good Energy Choices, University of Melbourne, Australia

8/2017 Objectives and metrics for monitoring CO₂ storage projects, Society for Exploration Geophysics Research Workshop, Norway

7/2017 Towards resolution of conflicting information about the influence of CO₂ exposure on wetting properties, Department of Energy Research Frontier Symposium, Washington DC

7/2017 Deep Decarbonization, International Summer School for Material and Energy Science, CalTech

5/2017 Prospects for CO₂ Capture, Sequestration, Utilization, and Negative Emissions, Rutgers University, New Brunswick, New Jersey

3/2017 Engaging the Energy Industry in Transformational Energy Research, Council on Foreign Relations, New York, New York

3/2017 CO₂ Storage Status Report, Illinois Institute of Technology, Chicago, Illinois

3/2017 Recent Advances in CO₂ Storage Science, UT Austin, Austin, Texas

3/2017 Congressional Briefing, Status of Carbon Dioxide Capture and Storage, Washington, D.C.

3/2017 Making Good Energy Choices: The Role of Energy Systems Analysis, Yale University, New Haven, Connecticut

2/2017 Deep Decarbonization: A Role for the Oil and Gas Industry. NRCanada, Edmonton, Canada

12/2016 Making Good Energy Choices: The Role of Energy Systems Analysis, Technical University of Munich, Munich Germany.

11/2016 Influence of Meso-Scale Heterogeneity on Multiphase Flow of CO₂, Cambridge University, Cambridge, U.K.

9/2016 The Grid Connected Home Energy Hub, Institute for Energy Data, and Society, MIT, Boston, Massachusetts

7/2016 CCS and the last 20%, Aspen Institute Workshop on Decarbonizing the Last 20%, Aspen, Colorado

6/2016 Climate Change Science, Impacts, and Solutions, Stanford Graduate School of Business

04/2016 CO₂ Storage Capacity Assessments and Uncertainty, BP Research Workshop on CO₂ Storage, Sunbury, United Kingdom

03/2016 Status and Opportunities in CO₂ Capture and Storage, Annual Meeting, Global Family Offices, Monterey, California

03/2016 Impact of Ostwald Ripening on the Stability of Trapped CO₂, Department of Energy, Germantown, Maryland

02/2016 Making Good Energy Choices: The Role of Energy Systems Analysis, MIT IHS Seminar, Cambridge, Massachusetts

02/2016 Influence of Fine Scale Heterogeneity and Ostwald Ripening on Residual Gas Trapping, Annual Meeting, Nano-Scale Control of Geological CO₂ Storage, Berkeley, California

10/2015 Roslyn Silver'27 Scientific Lecture, Barnard College, New York

07/2015 Invited co-convenor, "Our Common Climate Future Conference, Paris, France

07/2015 "CO₂ Capture, Reuse, and Storage." MRS Energy Summer School, Colorado School of Mines, Colorado

05/2015 "50th Reunion Panel on Climate Change," Yale University, New Haven, Connecticut

05/2015 Keynote Speaker at the "I am Innovation Forum," Delft University, Netherlands

05/2015 Invited Speaker, Gordon Conference on CO₂ Capture and Storage

04/2015 “The Future of Renewable Energy Generation,” World Bank Energy and Extractives Week, Washington DC

02/2015 “A Glimpse into the Future of Energy,” Sberbank Briefing, GSB, Stanford

02/2015 “Clean Energy—Technology,” Vail Global Energy Forum, Vail, Colorado

02/2015 “Status and Opportunities in CO₂ Capture, Storage and Utilization,” Workshop on Energy Research and Applications, American Physical Society Annual Meeting, San Antonio, Texas

02/2015 “Opportunities and Challenges for CO₂ Capture, Storage, and Utilization,” Vanderbilt University, Nashville, Tennessee

02/2015 “CO₂ Storage Research,” Strathslyde University, Scotland

12/2014 “Status of Geological Storage of CO₂ as Part of Negative Emissions Strategy,” American Geophysical Union, San Francisco, California

11/2014 “Permanence and Magnitude of Capillary Trapping: Influence of Scale Scale Heterogeneity and Ostwald Ripening,” NCGC Workshop, Lawrence Berkeley National Laboratory, Berkeley, California

09/2014 “Geological Storage of CO₂: A Decade of Tremendous Progress,” GHGT-12, Closing Plenary, Austin, Texas

09/2014 “Recent Advances in CO₂ Storage,” University of Wyoming

08/2014 “Transitioning to a Sustainable Energy System: Opportunities and Challenges for CO₂ Capture, Storage and Recycle,” Graduate Student Symposium, American Chemical Society National Meeting, San Francisco, California

07/2014 “CO₂ sequestration and recycling,” School—Materials for Renewable Energy, Erice, Sicily

01/2014 “Renewable Energy—Progress and Prospects,” LUMS Popular Science Symposium, Lahore, Pakistan

01/2014 “Net Energy Analysis for Renewable Energy Systems,” NUST, Islamabad, Pakistan

12/2013 “The Future of Energy...and Why It’s Important...Challenges...Opportunities,” Palo Alto High School

12/2013 “Emerging Methods in Sub-Core Scale Imaging and Characterization of the Influence of Heterogeneity on Flow in Rocks,” AGU, San Francisco, California

08/2013 “The Impact of Geochemistry on Carbon Management,” Union Session at the Goldschmidt Conference, Florence, Italy

04/2013 “Renewable Energy: Progress, Prospects and Challenges,” ExxonMobil Sustainability Leaders, Fairfax, VA

04/2013 “Meeting the Global Energy Challenge: Role of Advanced Energy Technologies,” Sandia National Laboratory, Albuquerque, New Mexico

03/2013 “Clean, Affordable, and Abundant Energy: Can we Do It?” McKinsey, London, England

03/2013 “Global Climate and Energy Project: Energy for the 21st Century and Beyond,” Imperial College, London, U.K.s

03/2013 “Mesoscale Investigations of the Influence of Capillary Heterogeneity on Multiphase Flow of Fluids in Rocks,” Imperial College, London, U.K.

03/2013 “Research Needs and Opportunities in CO₂ Storage,” Uppsala University, Stockholm, Sweden

03/2013 “Game Changing Technologies in the transportation Sector,” Game Changers Forum, Washington DC

03/2013 “Renewable Energy: Progress and Prospects,” Vail Global Energy Forum, Vail, CO.

02/2013 “Innovation and Competitiveness in the Solar Industry,” Oslo Energy Forum, Oslo, Norway

02/2013 “Mesoscale Investigations of the Influence of Capillary Heterogeneity on Multiphase Flow of Fluids in Rocks”, SIAM Conference, Boston, Massachusetts

- 10/2012 Earth Matters, Energy Issues in the Upcoming Election, Stanford School of Earth Sciences, in partnership with the League of Women Voters
- 10/2012 "CCS:When will it Be Ready?" UC Berkeley, BERG Energy Symposium
- 10/2012 Prospects and Challenges for CO₂ Storage, Brigham Young University, Utah
- 10/2012 Invited Speaker, Mesoscale Science Workshop, SLAC National Laboratory, Mesoscale Investigations of Multiphase Flow
- 08/2012 Keynote Speaker, "Energy in a Carbon Constrained World," International Geological Congress, Brisbane, Australia
- 06/2012 "Carbon Capture and Storage," UKERC Energy Summer School, Warrick University, U.K.
- 06/2012 "Innovations in Energy R&D," Hamilton Project, Stanford University, Stanford, CA
- 06/2012 "Scalability and Implementation of CCS with Bio-Feedstocks," GCEP Workshop on Negative Emissions, Stanford University, Stanford, CA
- 06/2012 "Advanced Energy Technologies: Prospects and Challenges for Developing Countries," Center for International Security, Stanford University, Stanford, CA
- 05/2012 "Sticking to Your Convictions: Even When the Going Gets Tough," AAPG Prowess Luncheon Speaker, Long Beach California
- 04/2012 "Climate Change: What Can we Do?" Stanford's Women Club of San Francisco, San Francisco, CA
- 03/2012 "What's Next? Six Game Changing Energy Technologies," Vail Global Energy Forum, Vail, CO
- 02/2012 "Carbon Dioxide Capture and Sequestration: A Solution to Global Warming," Silicon Valley Clean Tech Speaker Series, San Jose, CA
- 02/2012 "Carbon Dioxide Sequestration in Deep Sedimentary Formations," AAAS Annual Meeting, Symposium on Stabilization of Global Carbon Dioxide Levels, Vancouver, British Columbia, Canada
- 01/2012 "Monitoring Performance of Geological Storage of CO₂," RITE International Workshop on CO₂ Storage, Tokyo, Japan
- 12/2011 "The Influence of Meso-Scale Heterogeneity on CO₂ Plume Migration and Trapping," American Geophysical Union, San Francisco, California
- 10/2011 "Recent Advance in CO₂ Storage," U.S.-Norway Science Week, Berkeley, California
- 10/2011 "Remediation Methods for CO₂ Leakage," U.S. Department of Energy R&D Workshop on Storage on Saline Aquifers, Pittsburg, Pennsylvania
- 09/2011 "Contingency Planning and Methodologies for Intervention," International Petroleum Institute for Environmental and Social Issues (IPIECA) Workshop on Carbon Capture and Storage, Washington, DC
- 08/2011 "Sub-core Scale Experimentation and Modeling of CO₂ and Brine Migration in Homogeneous and Heterogeneous Rocks," American Chemical Society Annual Meeting, Denver, Colorado
- 07/2011 "Advanced Energy Technologies," International Energy Modeling Workshop, Stanford, California
- 06/2011 "Overview of Geological Storage of CO₂," Research Experience in Carbon Storage (RECS), Birmingham, Alabama
- 05/2011 "Leak Detection and Mitigation," Carbon Capture Project (CCP3) Workshop on Contingency Planning, Houston, TX
- 05/2011 "Multiphase Flow of CO₂ and Brine," USGS Workshop on CO₂-EOR, Stanford, CA
- 03/2011 "Energy Resources and Technology Options for a Sustainable Energy Future," Alberta Innovates Distinguished Lecturer, University of Alberta, Edmonton, Alberta, Canada
- 03/2011 "What Do Carbon Dioxide Capture and Storage (CCS) and Solar Energy Conversion Have in Common?" University of Colorado, Boulder Colorado

- 02/2011 “Carbon Dioxide Capture and Sequestration, Clemson University, Clemson, South Carolina
- 01/2011 “The Global Climate and Energy Project: Creating a Sustainable Energy System for the 21st Century and Beyond,” LUMS Research Symposium 2011, Lahore, Pakistan
- 01/2011 “Can Sequestration of Carbon Dioxide in Deep Geological Formations Help Solve the Global Warming Problem?”, University of Toronto, Lectures at the Leading Edge, Toronto, Canada
- 11/2010 “The Global Climate and Energy Project,” Doha Carbon and Energy Forum, Qatar
- 10/2010 “GHGT-10 Closing Plenary From Research to Reality: Geological Storage of CO₂,” GHGT-10, Amsterdam, The Netherlands
- 10/2010 “What Makes a Good Seal for geological Storage,” DOE Infrastructure Review Meeting, Pittsburgh, PA
- 10/2010 “Technology Options for a Low Carbon Energy Future and the Potential Role of Carbon Dioxide Capture and Storage,” Climate Change Symposium, Northwestern University, Evanston, Illinois
- 10/2010 “Remediation of Leakage from Geologic CO₂ Storage Reservoirs into Groundwater Aquifers,” Chevron Seminar Series, San Ramon, California
- 07/2010 “Experimental and Numerical Investigation of CO₂ Sequestration in Saline aquifers,” Gordon Graduate Research Seminar, Bates College, Lewiston, Maine
- 06/2010 Benson, Sally M., “Geological Capture and Storage: A Primer,” Public Meeting on Carbon Dioxide Capture and Storage, Sacramento, California
- 06/2010 “Carbon Dioxide Capture and Sequestration,” UKERC Summer School, University of Warrick, United Kingdom
- 06/2010 “Application of X-Ray CT and High-Resolution Modeling to Elucidating Multiphase Flow Phenomena in CO₂ Sequestration,” Goldschmidt Conference, Knoxville, Tennessee
- 06/2010 “Monitoring Options CO₂ Sequestration Projects,” Ohio State Workshop on Characterization and Monitoring for Geological Sequestration, Columbus, Ohio
- 04/2010 “Advanced Energy Technologies for a Sustainable Energy Future: Needs and Prospects for the 21st Century and Beyond,” Energy Modeling Forum Workshop, Stanford University, CA.
- 03/2010 “What Have We Learned Lately about Prospects for Carbon Dioxide Sequestration in Deep Geological Formations?,” University of Southern California, Los Angeles, CA.
- 03/2010 “Carbon Dioxide Capture and Sequestration in Deep Geological Formations,” American Physical Society [APS], Energy Research Workshop, Oregon Convention Center, Portland, Oregon
- 01/2010 “Technologies and Pathways to a Sustainable Energy Future,” SDForum—State of the Clean Energy—Global Challenges and Opportunities, Sunnyvale, CA
- 12/2009 “Inventory Verification and Leakage Assessment: A Comparison of Complementary Strategies for Verification of Geological Sequestration Projects,” American Geophysical Union Annual Meeting, Union Session, San Francisco, CA.
- 10/2009 “Can CO₂ Sequestration Help Solve the Global Warming Problem?,” Michel T. Halbouty Distinguished Lecture, Geological Society of America Meeting (GSA), Annual Meeting, Portland, Oregon
- 10/2009 “Next Steps to Advance Carbon Storage Technology,” UC Berkeley’s Energy Frontier Research Center, Joint Kickoff Symposium, Berkeley, CA.
- 10/2009 “Designing A Sustainable Energy System for the 21st Century and Beyond,” ARCS Award Luncheon, San Francisco, CA
- 10/2009 “The Future of Energy,” Pacific Union Club, Lunchtime Lecture Series, San Francisco, CA
- 09/2009 “Emerging and Paradigm Changing Energy Technologies,” California Energy Commission, 6th Annual Climate Change Symposium, Sacramento, CA

- 06/2009 “Simulation of Core-Scale Multiphase Flow Experiments with CO₂ and Brine,” SIAM Conference on Mathematical and Computational Issues in the Geosciences, Leipzig, Germany.
- 06/2009 “Sequestration of Carbon Dioxide in Deep Geological Formations: Prospects and Priorities in 2009,” Okayama University, Okayama, Japan.
- 05/2009 “The Future of Energy,” Leading Matters—San Francisco, San Francisco, California
- 05/2009 “Steps to Accelerate Deployment of CCS...Storage,” National Energy Technology Laboratory Eighth Annual Conference on Carbon Capture and Sequestration, Pittsburgh, Pennsylvania
- 05/2009 Benson, Sally M., [discussant], “Technology Policy for RD&D of IGCC and CCS in the United States,” Joint Workshop of Harvard University, Ministry of Science and Technology, People’s Republic of China, Chinese Academy of Sciences, Cambridge, MA
- 05/2009 “The Future of Energy: Technology for a Sustainable Energy System,” 50th Anniversary of Japanese Association of Groundwater Hydrologists Memorial Lecture, Tokyo, Japan
- 04/2009 “The Coming Transition to a Sustainable Energy System for the 21st Century,” The Bruce Museum, Greenwich, Connecticut
- 03/2009 Benson, Sally M., Goodell, Jeff, Price, Tom, and Sharp, Phil, “Conventional Energy: Unconventional Demands,” Aspen Environmental Forum Panel moderated by Bill Blakemore, Aspen, CO
- 03/2009 Benson, Sally M., Flavin, Chris, Rogers, James, and Socolow, Robert, “Taking the Carbon Out of Energy: A Range of Choices,” Aspen Environmental Forum Panel moderated by Elizabeth Shogren, Aspen, CO
- 03/2009 “The Role of CCS and the Oil and Gas Industry in Carbon Management,” Society of Petroleum Engineers Western Regional Meeting, San Jose, California
- 03/2009 “Monitoring Requirements, Methods, and Strategies for Carbon Dioxide Capture and Sequestration Projects,” First International Greenhouse Gas Measurement Symposium, Burlingame, California
- 03/2009 “Cost of Monitoring for Full-Scale CO₂ Storage,” EPRI Workshop on Costs of CO₂ Transport and Storage, Stanford Park Hotel, Menlo Park, California
- 03/2009 “The Global Climate and Energy Project at Stanford University,” LUISS University Workshop, Rome, Italy
- 03/2009 “Carbon Dioxide Capture and Sequestration in Deep Geological Formations,” NRDC Public Workshops on Carbon Capture and Sequestration, Washington, DC
- 03/2009 “Carbon Dioxide Capture and Sequestration in Deep Geological Formations,” NRDC Public Workshops on Carbon Capture and Sequestration, New York
- 02/2009 “Key Technical Issues for Storage in Geological Formations,” Society of Petroleum Engineers/AIChE Carbon Management Workshop, Sonoma, California
- 02/2009 “Sequestration of Carbon Dioxide in Deep Geological Formations: Prospects and Priorities in 2009,” Energy, Environmental, and Chemical Engineering Seminar, Washington University, St. Louis, Missouri
- 01/2009 “Carbon Dioxide Sequestration in Deep Geological Formations,” American Solutions for Winning the Future—American Clean Energy Project, hosted by Newt Gingrich, Washington, DC
- 01/2009 “Carbon Dioxide Capture and Storage,” Clean Tech Forum Series, Palo Alto Research Center, Palo Alto, California
- 12/2008 “What Does a CO₂ Plume Look Like: Implications for Geophysical Monitoring,” American Geophysical Union, San Francisco, California
- 11/2008 “The Challenge Ahead: Geological Storage of CO₂,” GHGT-9 Closing Plenary, Washington, DC
- 11/2008 “CO₂ Storage in Saline Aquifers,” 3rd Symposium of the Series on Carbon Capture and Sequestration, UC Berkeley, Berkeley, California

- 11/2008 “Multi-Phase Flow of CO₂ and Brine in Saline Aquifers,” Society of Exploration Geophysicists Annual Meeting, Las Vegas, Nevada
- 10/2009 “Carbon Dioxide Capture and Sequestration: Hype or Hope?” Google Energy Seminar, Mountain View, California
- 09/2008 “Geological Sequestration of CO₂ and Potential Groundwater Impacts,” 17th Annual Groundwater Resources Association Meeting and Conference, Costa Mesa, California
- 09/2008 “Carbon Dioxide Capture and Storage in Deep Geological Formations,” Workshop on Carbon Capture and Sequestration, Boulder, Colorado
- 09/2008 “Carbon Dioxide Capture and Sequestration in Saline Aquifers: Fundamental Studies of Multi-Phase Flow of CO₂ and Brine,” University of Cambridge, Cambridge, England
- 06/2008 “Carbon Dioxide Capture and Sequestration in Saline Aquifers: Fundamental Studies of Multi-Phase Flow of CO₂ and Brine,” Los Alamos National Laboratory, Los Alamos, NM
- 05/2008 “CO₂ Capture and Geological Sequestration—Getting Past No and Getting to Yes (What Do We Need to Know Now?),” 7th Annual Conference on Carbon Capture and Sequestration, Pittsburgh, PA
- 02/2008 “Global Climate & Energy Project at Stanford University,” Society of Petroleum Engineers—Practical Strategies for Managing CO₂ Emissions, Sonoma, CA
- 02/2008 “Carbon Dioxide Capture and Storage in Deep Geological Formations,” Natural Resources Defense Council and Environmental Defense CCS Education Seminar, Sacramento, CA
- 01/2008 “Carbon Dioxide Capture From Large Emission Sources and Storage in Deep Saline Aquifers,” Land, Air and Water Resources Seminar Series, UC Davis, Davis, CA
- 01/2008 “Science and Technology for a Low GHG Emission World,” Canadian Institute, 2nd Annual Carbon Capture and Storage Conference, Calgary, Canada
- 01/2008 “Global Climate and Energy Project Overview: CCS and Bio-Ethanol Research,” RITE International Symposium—IPCC 4th Assessment Report and Challenges to Mitigate Global Warming, Tokyo, Japan
- 01/2008 “Geological Storage of CO₂ and Groundwater Issues,” CENR Subcommittee on Water Availability and Quality, Washington, DC
- 12/2007 “Adequacy of Monitoring Methods and Strategies for Detecting Carbon Dioxide Leakage from Geological Storage Reservoirs,” American Geophysical Union Fall Meeting, San Francisco, CA
- 11/2007 “Is CCS (Geological Storage) Ready for Prime Time?” MIT Carbon Sequestration Forum VIII, Stanford, CA
- 10/2007 “Geological Potential for CO₂ Storage in the United States,” Gasification Technology Council, San Francisco, California
- 10/2007 “Carbon Dioxide Capture and Storage in Deep Geological Formations,” U.S. Geological Survey Western Region Colloquium, Menlo Park, California
- 09/2007 “GCEP Overview and CCS,” Yale University, New Haven, Connecticut
- 09/2007 “Safety and Monitoring of CO₂ Storage Projects,” The Division for Sustainable Development of the United Nations Department of Economic and Social Affairs small expert group meeting (EGM) on carbon capture and storage, New York, New York
- 09/2007 Benson, Sally M., with Ehrlich, Paul, Krupp, Fred, Shultz, George, and Straubel, J.B., Panelists, Goodman, Amy (moderator), *Clean, Secure, and Efficient Energy—Can We Have It All*,” Aurora Forum, Stanford University
- 09/2007 “CCS—GCEP and Stanford,” EPRI Roundtable, San Francisco, CA
- 08/2007 “Six ‘Easy Steps’ Towards Energy Sustainability,” Event sponsored by Congressman Honda, *It’s Easy Being Green*, San Jose, CA
- 06/2007 “Potential Liabilities and Mitigation Strategies for CCS,” WRI CCS Long Term Liability Workshop, Washington, DC

- 05/2007 “Overview of Geological Storage of CO₂,” National Research Council Geological Storage Roundtable, Washington, DC
- 05/2007 “Geological Storage of CO₂: Analogues and Risk Management,” Carbon Sequestration Leadership Forum, Pittsburgh, PA
- 05/2007 “Recommendations for Basic Scientific Research Needs for Geological Storage of CO₂,” Keynote address, 6th Annual Conference on Carbon Capture & Sequestration, Pittsburgh, PA
- 05/2007 “Security and Capacity of Geological Storage of CO₂: What We Know and What We’d Like to Know,” Woods Energy Seminar, Stanford University
- 05/2007 “Overview of Geological Storage of CO₂: Technical Issues,” Natural Resources Defense Council, Washington, DC
- 05/2007 “Potentials for and Risks of Carbon Sequestration & Coal Gasification,” The Haagen-Smit Symposium, 7th Annual Meeting, Aptos, CA
- 04/2007 “Security and Capacity of Geological Storage of CO₂: What We Know and What We’d Like to Know,” General Electric Global Research Center, Niskayuna, NY
- 04/2007 “Carbon Dioxide Storage in Geological Reservoirs: Laboratory and Field Observations,” Columbia University, New York, NY
- 03/2007 “Carbon Dioxide Storage Capacity in Deep Saline Formations: Concepts and Optimization,” Society for Industrial and Applied Mathematics [SIAM] Conference, Santa Fe, New Mexico
- 02/2007 “Confidence Building in CCS: The Role of Industrial Analogues,” Carbon Sequestration Workshop, RITE, Tokyo, Japan.
- 02/2007 “Monitoring Carbon Dioxide Sequestration in Deep Geological Formations for Inventory Verification and Carbon Credits,” University of Calgary, Alberta, Canada
- 11/2006 “Carbon Dioxide Capture and Storage: A Role For Fossil Fuels in a CO₂ Constrained Future,” Climate Change Institute briefing for State Legislators, Wingspread Center, Racine, WI.
- 10/2006 “A U.S. Roadmap for Carbon Sequestration: Focus on CO₂ Storage.” Petrobras Workshop on Carbon Sequestration, Rio de Janeiro, Brazil
- 09/2006 “Pilot Testing of CO₂ Sequestration in California,” California Energy Commission, 3rd Annual Conference on Climate Change Research, Sacramento, CA
- 09/2006 “Monitoring Carbon Dioxide Sequestration in Deep Geological Formations for Inventory Verification and Carbon Credits”, keynote address at the 2006 SPE Annual Technical Conference and Exhibition held in San Antonio Texas, Sept. 24-27
- 07/2006 “Multiphase Flow of CO₂ and Brine: From the Pore to Field Scale,” Gordon Conference, New Hampshire
- 06/2006 “The Challenge of Gaining Public Acceptance for Geological Storage of Carbon Dioxide”, keynote address at the 8th International Conference on Greenhouse Gas Control Technologies, Trondheim, Norway
- 05/2006 “Geological Sequestration of Carbon Dioxide,” Environmental Defense Board of Directors meeting, New York, New York
- 05/2006 “Overview of Carbon Dioxide Capture and Storage, Oregon State University, Corvallis, OR
- 04/2006 “Monitoring Geological Storage Projects for Leakage,” presented to the Working Group on Carbon Sequestration, London Convention, London, U.K.
- 02/2006 “Siting and Monitoring CO₂ storage Projects,” World Resources Institute, Washington DC
- 02/2006 “Role of CO₂ Capture and Storage in Decarbonizing the U.S. Energy Mix,” AAAS Symposium on Decarbonization of the U.S. Energy Mix, St. Louis, Missouri
- 02/2006 “Monitoring Geological Storage Projects”, Montana State University, Bozeman, MT

01/2006 “Issues Related to Deployment of CO₂ Storage in Geological Formations,” Groundwater Protection Council, Austin Texas

Courses Taught

Energy 153/253	Carbon Capture and Storage	Fall 2008-2020
Energy 104	Technologies in the Greenhouse	Spring, 2008
Energy 104	Sustainable Energy for 9 Billion	Spring 2010-2020
Energy 201	Laboratory Measurements for Multiphase Flow in Rocks (with Post-Docs)	Winter 2011, 2012, 2014, 2015, 2018
Energy 204	Universal Energy Access by 2030	Spring, 2018
Energy 301	Energy Seminar	Fall, Winter Spring 2009-2014
Energy 199	Senior Thesis for ERE Majors	2013-2015

Past and Current Graduate Students and Post-Doctoral Fellows (Current Shown in Italics)

M.S. and Ph.D Students			
Name	Degree	Thesis/Dissertation	Post- Graduation Employment
Ethan Chabora	MS, Energy Resources Engineering 2007-2009	Utility of Above-Zone Pressure Measurements in Monitoring Geologically Stored Carbon Dioxide	Schlumberger
Michael Krause	MS, Energy Resources Engineering 2007-2009	Modeling Sub-Core Scale Permeability in Sandstone for Use in Studying Multiphase Flow of CO ₂ and Brine in Core Flooding Experiments	Continued in Ph.D program at Stanford
Ariel Esposito	MS, Energy Resources Engineering 2008-2010	Remediation of Possible Leakage from Geological CO ₂ Storage Reservoirs into Groundwater Aquifers	National Renewable Energy Laboratory
Boxiao Li	MS, Energy Resources Engineering 2009-2011	Including Fine-Scale Capillary Heterogeneity in Modeling Multiphase Flow of CO ₂ and Brine in Reservoir Cores	Continued in Ph.D program at Stanford
Karim Farhat	MS, Energy Resources Engineering 2009-2011	CO ₂ Interim Storage as a Tool for CO ₂ Market Development: A Comprehensive Technical Assessment	Continued in Ph.D program at Stanford
Israel Reyna	MS, Petroleum Engineering 2009-2011	Simulation Study of Cap Rock Performance in Saline Aquifers	Schlumberger
Christin Strandli	MS, Petroleum Engineering 2009-2011	The Utility of Multilevel Pressure Measurements in Monitoring Geologically Stored Carbon Dioxide	Continued in Ph.D program at Stanford
Lin Zuo	MS, Energy Resources Engineering 2009-2011	An Experimental Study of CO ₂ Exsolution and Relative Permeability Measurements During CO ₂ Saturated Water Depressurization	Continued in Ph.D program at Stanford
Whitney Sargent	MS, Petroleum Engineering 2010-2012	Characterization of the Sequestration Potential in the Powder River Basin, Wyoming	Chevron
Chia-Wei Kuo	Ph.D, Energy Resources Engineering 2007-2012	Effect of Flowrate, Heterogeneity, and Capillarity on Multiphase Flow of CO ₂ and Brine	Post-Doctoral Fellow, National Taiwan University
Michael Krause	Ph.D, Energy Resources Engineering 2009-2012	The Influence of Capillary Heterogeneity on CO ₂ Migration in Porous Media	Tiandi Energy, Houston
Boxiao Li	Ph.D, Petroleum Engineering 2011-2014	Including Small Scale Heterogeneity of Sedimentary Rocks in Large Scale Modeling of CO ₂ Sequestration	Chevron

Christin Strandli	Ph.D, Petroleum Engineering 2011-2015	Use of Multilevel Pressure Data for Monitoring Plume and Brine Migration at Geological Storage Sites	Equinor
Lin Zuo	Ph.D, Energy Resources Engineering 2011-2014	Observation and Simulation of Carbon Dioxide Exsolution from Carbonated Water and its Applications	Chevron
Da Huo	Ph.D, Petroleum Engineering 2011-2015	Observation and Simulation of Multiphase Flow of CO ₂ and Brine in Fractured Rocks	Energy Equity Associate, FBR
Michael Delgado	MS, Management Science and Engineering 2012-2014	Incorporation of Technology Advances in Integrated Assessment Models	E3, San Francisco
Thomas Aird	M.S. Energy Resources Engineering 2012-2014	Contingency Planning and Intervention Methods for Leakage Through Seals	Nuclear Regulatory Commission, Maryland
Chris Zahasky	M.S. Energy Resources Engineering 2012-2014	Simulation of Multi-Phase Flow of CO ₂ and Brine Through Fractured Seals	Ph.D. Program, Stanford University
Dylan Moriarty	M.S. Energy Resources Engineering 2012-2014	Leak Detection and Quantification Using Real-Time CO ₂ (C12/C13) Measurements on a Mobile Platform	Sandia
Jacques de Chalendar	M.S. Energy Resources Engineering 2014-2016	Stability of Residually Trapped CO ₂	Ph.D. program, Stanford
Yao Yao	M.S. Energy Resources Engineering, 2014-2016	Coursework only MS.	China
Scott Mclaughlin	M.S. Energy Resources Engineering 2014-2016	Influence of Exsolution on Oil Recovery	Chevron
Sophie Trastour	M.S. Energy Resources Engineering 2015-2017	Impact of Capillary Heterogeneity on Carbon Dioxide Injection	Kappa Engineering, Houston, TX
Daniel Hatchell	M.S. Energy Resources Engineering 2015-2017	Gravity-Assisted Immiscible CO ₂ for Enhanced Oil Recovery and Storage	Ph.D. UT Austin, TX
Chris Zahasky	Ph.D. Energy Resources Engineering	Use of PET Imaging for Studying Multiphase Flow in Rocks and Fractures	Post-Doctoral Fellow, Imperial College

	2014-2018		Faculty position, University of Wisconsin, Madison
Cindy Ni	Ph.D. Energy Resources Engineering 2015-2020	Influence of Small Scale Heterogeneity on Residual Gas Trapping	UT Austin, Post-doc
<i>Yaxin Li</i>	<i>Ph.D. Energy Resources Engineering 2016-</i>	<i>Large-Scale, Long Term Fate of Residually Trapped CO₂</i>	
Jacques de Chalendar	Ph.D. Energy Resources Engineering 2016-2020	Optimization of Electric Heating and Thermal Storage for Providing Electric Grid Services	Total
EJ Baik	MS Energy Resources Engineering 2016-2018	Assessment of Near-Term Bioenergy & CCS (BECCS) Potential in the U.S.	Ph.D. in Energy Resources Engineering, Stanford University
Folasade Ayoola	MS Energy Resources Engineering 2017-2020	Disposal of CO ₂ Dissolved in Reinjectd Production Water	PhD at in ERE, Stanford
<i>Sudatta Ray</i>	<i>Ph.D. E-IPER, 2016-</i>	<i>Interdependence of Water and Energy Policy on Improving Lives of Small Holder Farmers in India</i>	
Austin Park	MS Energy Resources Engineering 2017-2019	Emission Intensity of Generators in the WECC Electrical Grid	Gridmatic
<i>EJ Baik</i>	<i>Ph.D. Energy Resource Engineering 2018-</i>	<i>Analysis of Options for Carbon Neutral Power Grid in California</i>	
<i>Gege Wen</i>	<i>Ph.D. Energy Resource Engineering 2018-</i>	<i>Machine Learning for Predicting the Performance of CO₂ Storage Projects</i>	
<i>Nora Hennessey</i>	<i>Ph.D. Energy Resource Engineering 2019-</i>	<i>Environmental Equity Issues and the Energy Transition</i>	
Clothilde Venereau	MS Energy Resources Engineering 2019-2020	Assessing the Impact of Residential Buildings Heating Electrification on. Future Electric Loads and Grid. Capacity Requirements in California	
<i>Justin Bracci</i>	<i>MS Energy Resources Engineering 2020-</i>	<i>Technoeconomic Assessment of Hydrogen for Heavy Duty Transport in California</i>	

<i>Catherine Hay</i>	<i>Ph.D. Energy Resource Engineering 2020-</i>	<i>CO₂ Storage in the Gulf of Mexico</i>	
<i>Jihan Zhuang</i>	<i>Ph.D. Material Science and Engineering 2020-</i>	<i>Evaluation of Second-Life Batteries</i>	
Post Doctoral Fellows			
		Research Topics	Employment
Jean-Christophe Perrin	Post-Doctoral Fellow 2007-2009	Core-flooding experiments with CO ₂ and brine Role of sub-core scale heterogeneity on CO ₂ saturation distributions	Professor, University of Nancy, France
Sam Krevor	Post-Doctoral Fellow 2009-2011	Relative permeability measurements in CO ₂ brine systems Leakage detection and characterization using a novel surface monitoring system	Senior Lecturer (Associate Prof.), Imperial College, London, U.K.
Ronny Pini	Post-Doctoral Fellow 2010-2013	Development of a new method for in situ capillary pressure measurements for CO ₂ /brine systems Direct quantification of capillary heterogeneity in rocks	Senior Lecturer (Associate Prof.), Imperial College, London
Charlie Barnhart	Post-Doctoral Fellow 2010-2014	Analysis of Technological, Economic and Resource Constraints on Large Scale Energy Storage	Assistant Prof. Western Washington University
Michael Dale	Post-Doctoral Fellow 2011-2014	The Importance of High Energy-Return on Investment for Modern Energy Systems	Assistant Prof. Clemson University
Matt Pellow	Post-Doctoral Fellow 2015-2017	Net energy analysis of hydrogen as an energy storage system	EPRI, Palo Alto, CA
Ferdinand Hingirl	Post-Doctoral Fellow 2011-2015	Core-Scale Investigations of CO ₂ Reactions with Basalt Tuff	Ambyint, Swiss Federal Institute of Technology, Switzerland
Charlotte Garing	Post-Doctoral Fellow 2014-2018	Stability of Residually Trapped CO ₂	Assistant Prof., University of Georgia
Merixell Gran	Post-Doctoral Fellow 2015-2018	Multiphase Flow in Fractured Basalt	Amphos21, Barcelona, Spain
David Cameron	Post-Doctoral Fellow 2015-2018	Inversion of Pressure Data for Monitoring CO ₂ Migration and Leakage	Netflix, California
Simon Davidsson Kurland	Post-Doctoral Fellow 2017-2018	Net Energy Analysis of Solar PV with Battery Storage	Uppsala University

<i>Michael Machala</i>	<i>Post-Doctoral Fellow 2017-</i>	<i>Enhancing Incomes of Marginal Farmers in Rural India with Food Drying, Cold Storage and Market Data</i>	
<i>Maartje Boon</i>	<i>Post-Doctoral Fellow 2017-</i>	<i>Upscaling Parameters for Multiphase Flow in Heterogeneous Systems</i>	
<i>Takeshi Kurotori</i>	<i>Post-Doctoral Fellow 2020-</i>	<i>Use of Micro-PET Imaging for Studying Fracture Flow in Rocks</i>	
<i>Aqsa Naeem</i>	<i>Post-Doctoral Fellow</i>	<i>Clean Electricity Development Planning for Pakistan</i>	

Publications

Refereed Journal Article

*students and post-doctoral fellows

123. *Wen, G., Tang, M., & **Benson, S. M.** (2020). Multiphase flow prediction with deep neural network. *International Journal of Greenhouse Gas Control*, in press.
122. *Kurotori, T., *Zahasky, C., **Benson, S. M.**, & Pini, R. (2020). Description of Chemical Transport in Laboratory Rock Cores Using the Continuous Random Walk Formalism. *Water Resources Research*, 56(9), e2020WR027511.
121. *Ni, H., & **Benson, S. M.** (2020). Using Unsupervised Machine Learning to Characterize Capillary Flow and Residual Trapping. *Water Resources Research*, 56(8), e2020WR027473.
120. Kurotori, T., *Zahasky, C., **Benson, S. M.**, & Pini, R. (2020). Description of Chemical Transport in Laboratory Rock Cores Using the Continuous Random Walk Formalism. *Water Resources Research*, 56(9), e2020WR027511.
119. Romano, C. R., *Zahasky, C., *Garing, C., Minto, J. M., **Benson, S. M.**, Shipton, Z. K., & Lunn, R. J. (2020). Subcore scale fluid flow behavior in a sandstone with cataclastic deformation bands. *Water Resources Research*, 56(4), e2019WR026715.
118. *Li, Y., Garing, C., & **Benson, S. M.** (2020). A continuum-scale representation of Ostwald ripening in heterogeneous porous media. *Journal of Fluid Mechanics*, 889.
117. *Ni, H., & **Benson, S. M.** (2020). Using Unsupervised Machine Learning to Characterize Capillary Flow and Residual Trapping. *Water Resources Research*, 56(8), e2020WR027473.
116. Romano, C. R., *Zahasky, C., *Garing, C., Minto, J. M., **Benson, S. M.**, Shipton, Z. K., & Lunn, R. J. (2020). Subcore scale fluid flow behavior in a sandstone with cataclastic deformation bands. *Water Resources Research*, 56(4), e2019WR026715.
115. *de Chalendar, J. A., Taggart, J., & **Benson, S. M.** (2019). Tracking emissions in the US electricity system. *Proceedings of the National Academy of Sciences*, 116(51), 25497-25502.
114. Kelemen, P., **Benson, S. M.**, Pilorgé, H., Psarras, P., & Wilcox, J. (2019). An overview of the status and challenges of CO₂ storage in minerals and geological formations. *Frontiers in Climate*, 1, 9.
113. *Wen, G., & **Benson, S. M.** (2019). CO₂ plume migration and dissolution in layered reservoirs. *International Journal of Greenhouse Gas Control*, 87, 66-79.
112. Levi, P. J., Kurland, S. D., Carbajales-Dale, M., Weyant, J. P., Brandt, A. R., & **Benson, S. M.** (2019). Macro-Energy Systems: Toward a New Discipline. *Joule*, 3(10), 2282-2286.
111. Kurotori, T., *Zahasky, C., Hejazi, S. A. H., Shah, S. M., **Benson, S. M.**, & Pini, R. (2019). Measuring, imaging and modelling solute transport in a microporous limestone. *Chemical Engineering Science*, 196, 366-383.
110. *de Chalendar, J. A., & **Benson, S. M.** (2019). Why 100% renewable energy is not enough. *Joule*, 3(6), 1389-1393.
109. *Kurland, S. D., & **Benson, S.** (2019). The energetic implications of introducing lithium-ion batteries to distributed photovoltaic systems. *Sustainable Energy & Fuels*.
108. *Ni, H., *Boon, M., *Garing, C., and **Benson, S.M.** (2019). Predicting CO₂ Residual Trapping Ability Based on Experimental Petrophysical Properties for Different Sandstone Types. *International Journal of Greenhouse Gas Control*, in press.
107. *Zahasky, C., Kurotori, T., Pini, R., & **Benson, S. M.** (2019). Positron Emission Tomography in Water Resources and Subsurface Energy Resources Engineering Research. *Advances in Water Resources*.
106. *de Chalendar, J.A. and **Benson, S.M.** (2019). City-scale decarbonization experiments with integrated energy systems, *Energy & Environmental Science*.
105. *Garing, C., and **Benson, S.M.** (2019). CO₂ wettability of sandstones: addressing conflicting capillary behaviors, *Geophysical Research Letters*.

104. *de Chalendar, J.A., *Garing, C., and **Benson, S.M.** (2018). Pore-scale modelling of Ostwald ripening, JA de Chalendar, C Garing, SM Benson. *Journal of Fluid Mechanics* 835, 363-392.
103. *Zahasky, C., and **Benson S.M.** (2018). Micro-positron emission tomography for measuring sub-core scale single and multiphase transport parameters in porous media, *Advances in Water Resources* 115, 1-16.
102. **Benson, S. M.**, & Deutch, J. (2018). Advancing Enhanced Oil Recovery as a Sequestration Asset. *Joule*, 2(8), 1386-1389.
101. Vasco, D. W., Pride, S. R., *Zahasky, C., & **Benson, S. M.** (2018). Calculating trajectories associated with solute transport in a heterogeneous medium. *Water Resources Research*, 54(9), 6890-6908.
100. *Zahasky, C., Thomas, D., Matter, J., Maher, K., & **Benson, S. M.** (2018). Multimodal imaging and stochastic percolation simulation for improved quantification of effective porosity and surface area in vesicular basalt. *Advances in Water Resources*, 121, 235-244.
99. Davis, S. J., Lewis, N. S., Shaner, M., Aggarwal, S., Arent, D., Azevedo, I. L., **Benson, S.M.** ... & Clack, C. T. (2018). Net-zero emissions energy systems. *Science*, 360(6396), eaas9793.
98. Kurotori, T., *Zahasky, C., Hejazi, S. A. H., Shah, S. M., **Benson, S. M.**, & Pini, R. (2018). Measuring, imaging and modelling solute transport in a microporous limestone. *Chemical Engineering Science*.
97. Rasmusson, K., Rasmusson, M., Tsang, Y., **Benson, S.**, *Hingerl, F., Fagerlund, F., & Niemi, A. (2018). Residual trapping of carbon dioxide during geological storage—Insight gained through a pore-network modeling approach. *International Journal of Greenhouse Gas Control*, 74, 62-78.
96. Turner, P. A., Mach, K. J., Lobell, D. B., **Benson, S. M.**, *Baik, E., Sanchez, D. L., & Field, C. B. (2018). The global overlap of bioenergy and carbon sequestration potential. *Climatic Change*, 1-10.
95. *Baik, E., Sanchez, D. L., Turner, P. A., Mach, K. J., Field, C. B., & **Benson, S. M.** (2018). Geospatial analysis of near-term potential for carbon-negative bioenergy in the United States. *Proceedings of the National Academy of Sciences*, 115(13), 3290-3295.
94. *Garing, C., *de Chalendar, J. A., Voltolini, M., Ajo-Franklin, J. B., & **Benson, S. M.** (2017). Pore-scale capillary pressure analysis using multi-scale X-ray micromotography. *Advances in Water Resources*, 104, 223-241.
93. *Pini, R., & **Benson, S. M.** (2017). Capillary pressure heterogeneity and hysteresis for the supercritical CO₂/water system in a sandstone. *Advances in Water Resources*, 108, 277-292.
92. Minto, J. M., *Hingerl, F. F., **Benson, S. M.**, & Lunn, R. J. (2017). X-ray CT and multiphase flow characterization of a 'bio-grouted' sandstone core: The effect of dissolution on seal longevity. *International Journal of Greenhouse Gas Control*, 64, 152-162.
91. *Felgenhauer, M. F., *Pellow, M. A., **Benson, S. M.**, & Hamacher, T. (2016). Economic and Environmental Prospects of Battery and Fuel Cell Vehicles for the Energy Transition in German Communities. *Energy Procedia*, 99, 380-391.
90. *Felgenhauer, M. F., Pellow, M. A., **Benson, S. M.**, & Hamacher, T. (2016). Evaluating co-benefits of battery and fuel cell vehicles in a community in California. *Energy*, 114, 360-368.
89. *Cameron, D. A., Durlflosky, L. J., & Benson, S. M. (2016). Use of above-zone pressure data to locate and quantify leaks during carbon storage operations. *International Journal of Greenhouse Gas Control*, 52, 32-43.
88. *Pini, R., Vandehey, N. T., Druhan, J., O'Neil, J. P., & **Benson, S. M.** (2016). Quantifying solute spreading and mixing in reservoir rocks using 3-D PET imaging. *Journal of Fluid Mechanics*, 796, 558-587.
87. *Zuo, L., Ajo-Franklin, J. B., Voltolini, M., Geller, J. T., & Benson, S. M. (2017). Pore-scale multiphase flow modeling and imaging of CO₂ exsolution in Sandstone. *Journal of Petroleum Science and Engineering*, 155, 63-77.
86. *Farhat, K., & **Benson, S. M.** (2016). Translating risk assessment to contingency planning for CO₂ geologic storage: A methodological framework. *International Journal of Greenhouse Gas Control*, 52, 410-431.

85. *Zahasky, C., & **Benson, S. M.** (2016). Evaluation of hydraulic controls for leakage intervention in carbon storage reservoirs. *International Journal of Greenhouse Gas Control*, 47, 86-100.
84. *Huo, D., Pini, R., & **Benson, S. M.** (2016). A calibration-free approach for measuring fracture aperture distributions using X-ray computed tomography. *Geosphere*, 12(2), 558-571.
83. Niemi, A., Bensabat, J., Shtivelman, V., Edlmann, K., Gouze, P., Luquot, L., *Hingerl, F., **Benson, S.M.**,... & Liang, T. (2016). Heletz experimental site overview, characterization and data analysis for CO₂ injection and geological storage. *International Journal of Greenhouse Gas Control*, 48, 3-23.
82. *Hingerl, F. F., Yang, F., *Pini, R., Xiao, X., Toney, M. F., Liu, Y., & **Benson, S. M.** (2016). Characterization of heterogeneity in the Heletz sandstone from core to pore scale and quantification of its impact on multi-phase flow. *International Journal of Greenhouse Gas Control*, 48, 69-83.
81. *Huo, D., & **Benson, S. M.** (2016). Experimental investigation of stress-dependency of relative permeability in rock fractures. *Transport in Porous Media*, 113(3), 567-590.
80. Kling, T., *Huo, D., Schwarz, J. O., Enzmann, F., **Benson, S.**, & Blum, P. (2016). Simulating stress-dependent fluid flow in a fractured core sample using real-time X-ray CT data. *Solid Earth*, 7(4), 1109-1124.
79. *Pellow, M. A., Emmott, C. J., Barnhart, C. J., & Benson, S. M. (2015). Hydrogen or batteries for grid storage? A net energy analysis. *Energy & Environmental Science*, 8(7), 1938-1952.
78. Yang, F., *Hingerl, F. F., Xiao, X., Liu, Y., Wu, Z., **Benson, S. M.**, & Toney, M. F. (2015). Extraction of pore-morphology and capillary pressure curves of porous media from synchrotron-based tomography data. *Scientific reports*, 5.
77. *Li, B., & **Benson, S. M.** (2015). Influence of small-scale heterogeneity on upward CO₂ plume migration in storage aquifers. *Advances in Water Resources*, 83, 389-404.
76. Yang, F., *Hingerl, F. F., Xiao, X., Liu, Y., Wu, Z., **Benson, S. M.**, & Toney, M. F. (2015). Extraction of pore-morphology and capillary pressure curves of porous media from synchrotron-based tomography data. *Scientific reports*, 5, 10635.
75. *Kuo, C. W., & Benson, S. M. (2015). Numerical and analytical study of effects of small scale heterogeneity on CO₂/brine multiphase flow system in horizontal corefloods. *Advances in Water Resources*, 79, 1-17.
74. Yang, Y., Yang, F., *Hingerl, F. F., Xiao, X., Liu, Y., Wu, Z., **Benson, S. M.** & Pianetta, P. (2015). Registration of the rotation axis in X-ray tomography. *Journal of synchrotron radiation*, 22(2), 452-457.
73. **Benson, S. M.** (2014). Negative-emissions insurance. *Science*, 344(6191), 1431-1431.
72. **Benson, S. M.**, & Friedmann, S. J. (2014). Spring Issue of The Bridge on Emerging Issues in Earth Resources Engineering.
71. Bazilian, M., Brandt, A. R., Billman, L., Heath, G., Logan, J., Mann, M., & **Benson, S. M.** (2014). Ensuring benefits from North American shale gas development: Towards a research agenda. *Journal of Unconventional Oil and Gas Resources*, 7, 71-74.
70. *Carbajales-Dale, M., *Barnhart, C. J., Brandt, A. R., & **Benson, S. M.** (2014). A better currency for investing in a sustainable future. *Nature Climate Change*, 4(7), 524-527.
69. *Carbajales-Dale, M., *Barnhart, C. J., & **Benson, S. M.** (2014). Can we afford storage? A dynamic net energy analysis of renewable electricity generation supported by energy storage. *Energy & Environmental Science*, 7(5), 1538-1544.
68. Ruprecht, C., *Pini, R., Falta, R., **Benson, S.**, & Murdoch, L. (2014). Hysteretic trapping and relative permeability of CO₂ in sandstone at reservoir conditions. *International Journal of Greenhouse Gas Control*, 27, 15-27.
67. De Coninck, H., & **Benson, S. M.** (2014). Carbon Dioxide Capture and Storage: Issues and Prospects. *Annual Review of Environment and Resources*, 39, 243-270.
66. *Zuo, L., & Benson, S. M. (2014). Process-dependent residual trapping of CO₂ in sandstone. *Geophysical Research Letters*, 41(8), 2820-2826.

65. *Pini, R., & Benson, S. M. (2013). Characterization and scaling of mesoscale heterogeneities in sandstones. *Geophysical Research Letters*, 40(15), 3903-3908.
64. Falta, R. W., *Zuo, L., & **Benson, S. M.** (2013). Migration of exsolved CO₂ following depressurization of saturated brines. *Greenhouse Gases: Science and Technology*, 3(6), 503-515.
63. *Barnhart, C. J., *Dale, M., Brandt, A. R., & **Benson, S. M.** (2013). The energetic implications of curtailing versus storing solar-and wind-generated electricity. *Energy & Environmental Science*, 6(10), 2804-2810.
62. *Li, B., Tchelepi, H. A., & Benson, S. M. (2013). Influence of capillary-pressure models on CO₂ solubility trapping. *Advances in water resources*, 62, 488-498.
61. *Pini, R., & **Benson, S. M.** (2013). Simultaneous determination of capillary pressure and relative permeability curves from core-flooding experiments with various fluid pairs. *Water Resources Research*, 49(6), 3516-3530.
60. *Strandli, C. W., & **Benson, S. M.** (2013). Identifying diagnostics for reservoir structure and CO₂ plume migration from multilevel pressure measurements. *Water Resources Research*, 49(6), 3462-3475.
59. *Barnhart, C. J., & Benson, S. M. (2013). On the importance of reducing the energetic and material demands of electrical energy storage. *Energy & Environmental Science*, 6(4), 1083-1092.
58. *Krause, M., *Krevor, S., & **Benson, S. M.** (2013). A procedure for the accurate determination of sub-core scale permeability distributions with error quantification. *Transport in porous media*, 98(3), 565-588.
57. *Carbajales-Dale, M., & **Benson, S. M.** (2013). The energy balance of the photovoltaic (PV) industry—Is the PV industry a net energy provider. *Environmental Science and Technology*, 47(7), 3482-3489.
56. *Kuo, C. W., & **Benson, S. M.** (2013). Analytical study of effects of flow rate, capillarity, and gravity on CO₂/brine multiphase-flow system in horizontal corefloods. *SPE Journal*, 18(04), 708-720.
55. *Farhat, K., & **Benson, S. M.** (2013). A technical assessment of CO₂ Interim Storage in deep saline aquifers. *International Journal of Greenhouse Gas Control*, 15, 200-212.
54. Jordan, P. D., & **Benson, S. M.** (2013). Worker safety in a mature carbon capture and storage industry in the United States based upon analog industry experience. *International Journal of Greenhouse Gas Control*, 14, 291-303.
53. *Zuo, L., Zhang, C., Falta, R. W., & **Benson, S. M.** (2013). Micromodel investigations of CO₂ exsolution from carbonated water in sedimentary rocks. *Advances in water resources*, 53, 188-197.
52. * Esposito, A., & **Benson, S. M.** (2012). Evaluation and development of options for remediation of CO₂ leakage into groundwater aquifers from geologic carbon storage. *International Journal of Greenhouse Gas Control*, 7, 62-73.
51. * Krevor, S. C., *Pini, R., *Zuo, L., & **Benson, S. M.** (2012). Relative permeability and trapping of CO₂ and water in sandstone rocks at reservoir conditions. *Water resources research*, 48(2).
50. * Pini, R., *Krevor, S. C., & **Benson, S. M.** (2012). Capillary pressure and heterogeneity for the CO₂/water system in sandstone rocks at reservoir conditions. *Advances in Water Resources*, 38, 48-59.
49. * Krevor, S. C., *Pini, R., *Li, B., & **Benson, S. M.** (2011). Capillary heterogeneity trapping of CO₂ in a sandstone rock at reservoir conditions. *Geophysical Research Letters*, 38(15).
48. * Krevor, S. C., Ide, T., **Benson, S. M.**, & Orr Jr, F. M. (2011). Real-time tracking of CO₂ injected into a subsurface coal fire through high-frequency measurements of the ¹³CO₂ signature. *Environmental science & technology*, 45(9), 4179-4186.
47. * Zuo, L., *Krevor, S., Falta, R. W., & **Benson, S. M.** (2012). An experimental study of CO₂ exsolution and relative permeability measurements during CO₂ saturated water depressurization. *Transport in porous media*, 91(2), 459-478.
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