Stanford



Mark Zoback

Benjamin M. Page Professor in Earth Sciences, Emeritus

Geophysics

Curriculum Vitae available Online

Bio

BIO

Dr. Mark D. Zoback is the Benjamin M. Page Professor of Geophysics, Emeritus at Stanford University, where he was also the Director of the Stanford Natural Gas Initiative and Co-Director of the Stanford Center for Induced and Triggered Seismicity and the Stanford Center for Carbon Storage and a Senior Fellow in the Precourt Institute for Energy. Dr. Zoback conducts research on in situ stress, fault mechanics, and reservoir geomechanics with an emphasis on shale gas, tight gas and tight oil production as well as CO2 sequestration. Dr. Zoback served on the Secretary of Energy Subcommittee on shale gas development and the National Academy of Engineering Committee that investigated the Deepwater Horizon accident. He is the author of two textbooks and the author/co-author of approximately 400 technical papers. His most recent book, Unconventional Reservoir Geomechanics, was written with Arjun Kohli, and published in 2019 by Cambridge University Press. His online course, Reservoir Geomechanics, has been taken by over 30,000 people around the world. Dr. Zoback has received a number of awards and honors including election to the U.S. National Academy of Engineering in 2011, he was awarded an Einstein Chair Professorship of the Chinese Academy of Sciences in 2013 and received the Robert R. Berg Outstanding Research Award of the AAPG in 2015. He was the 2020 chair of the Society of Petroleum Engineers Technical Committee on Carbon Capture, Utilization and Storage and 2021 Honorary Lecturer for the Society of Exploration Geophysicists. In 2023, he was selected as a Hagler Distinguished Lecturer at Texas A&M University. In 2024, he was awarded the Rolf Emmermann medal of the German Research Centre for Geosciences and the Maurice Ewing medal, the highest award of the Society of Exploration Geophysicists.

ACADEMIC APPOINTMENTS

- Emeritus Faculty, Acad Council, Geophysics

ADMINISTRATIVE APPOINTMENTS

- Professor, Geophysics, Stanford University, (1984-2021)
- Chair, Faculty Senate, (2015-2016)
- Director, Stanford Natural Gas Initiative, (2014-2021)
- Senior Fellow, Precourt Institute for Energy, Stanford University, (2012- present)
- Chairman, Department of Geophysics, Stanford University, (1991-1997)
- Chief Branch of Tectonophysics,, U.S. Geological Survey, (1981-1984)
- Geophysicist U.S. Geological Survey, U.S. Geological Survey, (1976-1984)
- Postdoctoral Fellowship, Research Associate National Research Council, (1975-1976)
- Research Associate, National Research Council Postdoctoral Fellowship, (1975-1976)
- Visiting Scientist, Rhur University, Bochum, Germany, (1975-1975)

- Geophysicist, U.S. Geological Survey, (1973-1975)
- Research Assistant, Stanford University, (1971-1973)
- Geophysicist, Amoco Production, (1969-1971)

HONORS AND AWARDS

- 2025-2026 Alumni of the Year Award, College of Science, University of Arizona (2025)
- Maurice Ewing Medal, Society of Exploration Geophysicists (2024)
- Rolf Emmermann Medal, German Research Centre for Geosciences (2024)
- Distinguished Lecturer, Hagler Institute for Advanced Study, Texas A&M University (2023)
- Best Paper Award 2022 Unconventional Resource and Technology Conference, Soc. Petrol. Eng., Amer. Assoc. Petrol. Geol. and Soc of Explor. Geophys. (2022)
- A.I. Levorsen Award (with Jens Lund Snee), Amer. Assoc. Petrol. Geologists (2019)
- Best Paper Award 2018 (with Jens Lundstern) in The Leading Edge, Society of Exploration Geophysics (2019)
- Outstanding Contribution to the Public Understanding of the Geosciences, American Geosciences Institute (2016)
- Robert J. Berg Award for Outstanding Research, American Association of Petroleum Geologists (2015)
- Einstein Chair Professor, Chinese Academy of Sciences (2013)
- Louis Neel Medal, European Geosciences Union (2013)
- Honorary Member, Society of Exploration Geophysics (2012)
- Elected Fellow, American Rock Mechanics Association (2011)
- Elected Member, National Academy of Engineering (2011)
- Walter H. Bucher Medal, American Geophysical Union (2008)
- Emil Wiechert Medal, German Geophysical Society (2006)
- New Zealand Geophysics Prize for 2006 (with John Townend), New Zealand Geophysics (2006)
- Named Benjamin M. Page Professor of Earth Sciences, Stanford University (2005)
- Best of What's New 2004, Popular Science (EarthScope's San Andreas Fault Observatory at Depth), Popular Science (2004)
- School of Earth Sciences Excellence in Teaching Award, Stanford University (2004)
- Elected Honorary Fellow, European Union of Geosciences (1999)
- Outstanding Alumni Award, University of Arizona Department of Geosciences, University of Arizona (1999)
- Elected Fellow, American Geophysical Union (1998)
- Kenneth Cuthbertson Award for Exceptional Contributions to Stanford University, Stanford University (1998)
- University Fellow, Stanford University (1998)
- Senior Research Scientist Award, Alexander Von Humboldt Stiftung (1989)
- Elected Fellow, American Association for the Advancement of Science (1985)
- Elected Fellow, Geological Society of America (1984)
- National Research Council Post-Doctoral Fellowship, National Research Council (1975)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Distinguished Lecturer, Hagler Institute for Advanced Study, Texas A&M University (2023 - present)
- Organizing Committee, SPE Workshop: Geomechanics Applications in Unconventional Reservoir Development (2023 - 2023)
- Geoscience Advisory Board, University of Arizona (2021 - present)
- Chair, Society of Petroleum Engineers Technical Committee on Carbon Capture, Utilization and Storage (2021 - 2021)

- Honorary Lecturer, Soc. Explor. Geophysicists (2021 - 2021)
- Visiting Professor, ETH, Zurich, Switzerland (2018 - 2018)
- Visiting Professor, Victoria University, Wellington, NZ (2017 - 2017)
- Special Meeting Participant, Ministry of Environment, Bogota, Colombia (2014 - 2014)
- Member, Canadian Academy of Science Committee on Shale Gas Development (2012 - 2013)
- President, American Rock Mechanics Association (2011 - 2013)
- Member, Secretary of Energy Committee on Shale Gas Development (2011 - 2012)
- Earth Science Chair, Program Advisory Committee, DUSEL Program (2010 - 2013)
- SUES Breadth Requirement Review Committee, Stanford University (2010 - 2012)
- Faculty Senate Steering Committee, Stanford University (2010 - 2011)
- Member, NAE Committee Investigating Deepwater Horizon Accident (2010 - 2011)
- Member, NAE Committee on Deepwater Horizon Accident (2010 - 2011)
- Invited Speaker, EUG (2010 - 2010)
- Invited Speaker, Univ. S. Carolina (2010 - 2010)
- Review Committee, Netherlands Earth Science (2010 - 2010)
- Board of Directors, American Rock Mechanics Association (2009 - 2015)
- Board of Directors, Research Partnership for Secure Energy for America (2009 - 2012)
- Faculty Senate, Stanford University (2009 - 2011)
- University Fact Finder, Reappointment Appeal, Stanford University (2009 - 2010)
- Advisory Board, Department of Geosciences, University of Arizona (2008 - 2008)
- Chair, Scientific Earthquake Studies Advisory Group of USGS (2007 - 2011)
- Chair, Science of Earthquake Studies Advisory Committee (USGS) (2007 - 2011)
- Geoscience Department Advisory Board, University of Arizona (2007 - 2011)
- Review Committee, IODP (2006 - 2007)
- University Capital Planning Group, Stanford University (2004 - 2008)
- Member University Advisory Board, Stanford University (2003 - 2004)
- EarthScope Facilities Executive Committee/EarthScope Management Team, EarthScope (2002 - 2008)
- Chair, Planning and Policy Board, Stanford University (2002 - 2004)
- Chair, Subcommittee on University Awards, Stanford University (2002 - 2003)
- Science Director, Western Resources Project (2001 - 2005)
- Provost's Committee on Recreational use of the Dish, Stanford University (2001 - 2004)
- Earth Systems Review Committee, Stanford University (2001 - 2002)
- Provost's Task Force on College Rankings, Stanford University (2001 - 2001)
- Member, Begleitende Kommission, Heidelberg Academy of Science, World Stress Map Project (2000 - 2007)
- Member, DOSECC Board of Directors (2000 - 2006)
- General Counsel Evaluation Panel, Stanford University (2000 - 2000)
- Provost Search Committee, Stanford University (2000 - 2000)
- Chair, Science Advisory Group, International Continental Drilling Program (1999 - 2006)
- Chair, Science Advisory Group, ICDP (1999 - 2006)

- Chair, Faculty Senate, Stanford University (1999 - 2000)
- Member, Stanford Communications Council, Stanford University (1999 - 2000)
- Member, Society of Petroleum Engineers (1998 - present)
- Member, American Association of Petroleum Geologists (1998 - present)
- Committee on Committees, Stanford University (1997 - 1998)
- Coordinator, SME, Earth Sciences Track, Stanford University (1996 - 2000)
- Chair, Committee of 15, Stanford University (1996 - 1998)
- Member, Earth Systems Steering Committee, Stanford University (1995 - 1998)
- Chair, Department of Geophysics, Stanford University (1991 - 1997)
- President, Tectonophysics Section, AGU (1988 - 1989)
- Member, American Association for the Advancement of Science (1984 - present)
- Member, Geological Society of America (1983 - present)
- Member, Seismological Society of America (1982 - present)
- Member, American Geophysical Union (1973 - present)

PROFESSIONAL EDUCATION

- Ph.D, Stanford University , Geophysics (1975)
- M.S., Stanford University , Geophysics (1973)
- B.S., University of Arizona , Geophysics (1969)

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Research

I conduct research on in situ stress, fault mechanics, and reservoir geomechanics with an emphasis on shale gas, tight gas and tight oil production, the feasibility of long-term geologic storage of CO2 and the occurrence of induced and triggered earthquakes. I was one of the principal investigators of the SAFOD project in which a scientific research well was successfully drilled through the San Andreas Fault at seismogenic depth. I am the author of a textbook entitled Reservoir Geomechanics published in 2007 by Cambridge University Press, now in its sixth printing. I served on the National Academy of Energy committee investigating the Deepwater Horizon accident and the Secretary of Energy's committee on shale gas development and environmental protection. I currently serve on a Canadian Council of Academies panel investigating the same topic.

Teaching

I teach both undergraduate and graduate students. Reservoir Geomechanics is a graduate class for students in the departments of Geophysics, GES, and ERE, and Tectonophysics, a graduate class for students principally in Geophysics and GES. I co-teach a Freshman class entitled Sustainability and Collapse with Professor Ursula Heise of the English Department. I also help lead two graduate seminars each week and frequently attend and participate in other seminars.

Professional Activities

Member, Canadian Council of Academies Committee on Shale Gas Development (2012-2013); Member, Secretary of Energy Committee on Shale Gas Development (2011-2012); Member, NAE Committee Investigating Deepwater Horizon Accident (2010-2011); President, American Rock Mechanics Association (2011-2013); Member of Board of RPSEA (2010-); Chair, Scientific Earthquake Studies Advisory Group of USGS (2007-2011); Advisory

Board, Department of Geosciences, University of Arizona (2008-2013); Chair, Stanford Faculty Senate (1999-2000); Chair, Department of Geophysics (1991-97); Chair, Science Advisory Group, ICDP (1999-2006); President, Tectonophysics Section, AGU (1988-89)

Teaching

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Sarah Sausan

Publications

PUBLICATIONS

- **Development of continuous estimates of the least principal stress with depth for application to multi-stage hydraulic fracturing** *GEOMECHANICS AND GEOPHYSICS FOR GEO-ENERGY AND GEO-RESOURCES*
  Zoback, M. D., Singh, A.
  2026; 12 (1)
- **Implications of earthquakes triggered by massive injection of produced water in saline aquifers for large-scale geologic storage of CO₂** *INTERNATIONAL JOURNAL OF GREENHOUSE GAS CONTROL*
  Zoback, M. D., Hennings, P.
  2025; 146
- **Reply to "Comment on 'Estimating the Maximum Magnitude of Induced Earthquakes in the Groningen Gas Field, the Netherlands' by Julian J. Bommer, Jan van Elk, and Mark D. Zoback" by Charles Vlek** *BULLETIN OF THE SEISMOLOGICAL SOCIETY OF AMERICA*
  Bommer, J. J., van Elk, J., Zoback, M. D.
  2025; 115 (2): 715-720
- **Estimating the Maximum Magnitude of Induced Earthquakes in the Groningen Gas Field, the Netherlands** *BULLETIN OF THE SEISMOLOGICAL SOCIETY OF AMERICA*
  Bommer, J. J., van Elk, J., Zoback, M. D.
  2024; 114 (6): 2804-2822
- **Criteria and workflow for selecting saline formations for carbon storage** *INTERNATIONAL JOURNAL OF GREENHOUSE GAS CONTROL*
  Callas, C., Davis, J., Saltzer, S. D., Hashemi, S. S., Wen, G., Gold, P. O., Zoback, M. D., Benson, S. M., Kovscek, A. R.
  2024; 135
- **A Methodology for Fueling Mobility Markets with Hydrogen from Natural Gas plus Carbon Capture and Sequestration** *INTERNATIONAL JOURNAL OF GREENHOUSE GAS CONTROL*
  Okoroafor, E. R., Bracci, J., Boness, N. L., Saltzer, S. D., Shrimali, G., Hennessy, E. M., Kim, T., Seamon, A., Benson, S. M., Zoback, M. D., Kovscek, A. R.
  2024; 133
- **In situ stress state in the petroliferous Barmer Basin, northwestern India: A new geomechanical approach** *AAPG BULLETIN*
  Mishra, P., Karthikeyan, G., Dash, S., Konar, S., Bora, A. K., Kuila, U., Mukhopadhyay, D. K., Zoback, M. D.
  2023; 107 (10): 1639-1667
- **Meeting the challenges of large-scale carbon storage and hydrogen production.** *Proceedings of the National Academy of Sciences of the United States of America*
  Zoback, M., Smit, D.
  2023; 120 (11): e2202397120
- **Author Correction: Multiscale variations of the crustal stress field throughout North America.** *Nature communications*
  Lundstern, J. E., Zoback, M. D.
  2023; 14 (1): 1232
- **Shear-Wave Anisotropy Measurements in the Crust from Receiver Functions: An Interplay of Lower and Upper Crustal Anisotropy** *GEOSCIENCES*
  McCormack, K. L., Zoback, M. D., Frederiksen, A. W., Dvory, N. Z.

2023; 13 (3)

- **Determination of the crustal friction and state of stress in deep boreholes using hydrologic indicators** *ROCK MECHANICS BULLETIN*
  Zhang, S., Ma, X., Zoback, M.
  2023; 2 (1)
- **Criteria and workflow for selecting depleted hydrocarbon reservoirs for carbon storage** *APPLIED ENERGY*
  Callas, C., Saltzer, S. D., Davis, J., Hashemi, S. S., Kovscek, A. R., Okoroafor, E. R., Wen, G., Zoback, M. D., Benson, S. M.
  2022; 324
- **Long-term permeability evolution of shale seal rocks with argon and scCO(2)** *JOURNAL OF NATURAL GAS SCIENCE AND ENGINEERING*
  Karnali-Asl, A., Kovscek, A. R., Zoback, M. D.
  2022; 104
- **Predicting variations of the least principal stress with depth: Application to unconventional oil and gas reservoirs using a log-based viscoelastic stress relaxation model** *GEOPHYSICS*
  Singh, A., Zoback, M. D.
  2022; 87 (3): MR105-MR116
- **State of stress in areas of active unconventional oil and gas development in North America** *AAPG BULLETIN*
  Snee, J., Zoback, M. D.
  2022; 106 (2): 355-385
- **Stratigraphically Controlled Stress Variations at the Hydraulic Fracture Test Site-1 in the Midland Basin, TX** *ENERGIES*
  Kohli, A., Zoback, M.
  2021; 14 (24)
- **A case study of vertical hydraulic fracture growth, stress variations with depth and shear stimulation in the Niobrara Shale and Codell Sand, Denver-Julesburg Basin, Colorado** *INTERPRETATION-A JOURNAL OF SUBSURFACE CHARACTERIZATION*
  McCormack, K. L., Zoback, M. D., Kuang, W.
  2021; 9 (4): SG59-SG69
- **Prior oil and gas production can limit the occurrence of injection-induced seismicity: A case study in the Delaware Basin of western Texas and southeastern New Mexico, USA** *GEOLOGY*
  Dvory, N. Z., Zoback, M. D.
  2021; 49 (10): 1198-1203
- **Permeability Evolution of Fractures in Shale in the Presence of Supercritical CO2** *JOURNAL OF GEOPHYSICAL RESEARCH-SOLID EARTH*
  Hashemi, S. S., Zoback, M. D.
  2021; 126 (8)
- **Close Observation of Hydraulic Fracturing at EGS Collab Experiment 1: Fracture Trajectory, Microseismic Interpretations, and the Role of Natural Fractures** *JOURNAL OF GEOPHYSICAL RESEARCH-SOLID EARTH*
  Fu, P., Schoenball, M., Ajo-Franklin, J. B., Chai, C., Maceira, M., Morris, J. P., Wu, H., Knox, H., Schwering, P. C., White, M. D., Burghardt, J. A., Strickland, C. E., Johnson, et al
  2021
- **Effects of Supercritical CO2 on Matrix Permeability of Unconventional Formations** *Energies*
  Kamali-Asl, A., Zoback, M. D., Kohli, A. H.
  2021; 14 (4)
- **Predicting Lithology-Controlled Stress Variations in the Woodford Shale from Well Log Data via Viscoplastic Relaxation** *SPE JOURNAL*
  Ma, X., Zoback, M. D.
  2020; 25 (5): 2534–46
- **A viscoplastic model of creep in shale** *GEOPHYSICS*
  Haghighat, E., Rassouli, F. S., Zoback, M. D., Juanes, R.
  2020; 85 (3): MR155–MR166
- **Multiscale variations of the crustal stress field throughout North America.** *Nature communications*
  Lund Snee, J. E., Zoback, M. D.

2020; 11 (1): 1951

- **The relation between stimulated shear fractures and production in the Barnett Shale: Implications for unconventional oil and gas reservoirs** *GEOPHYSICS*
  Hakso, A., Zoback, M.
  2019; 84 (6): B461–B469

- **Injection-Induced Seismicity and Fault-Slip Potential in the Fort Worth Basin, Texas** *BULLETIN OF THE SEISMOLOGICAL SOCIETY OF AMERICA*
  Hennings, P. H., Snee, J., Osmond, J. L., DeShon, H. R., Dommisse, R., Horne, E., Lemons, C., Zoback, M. D.
  2019; 109 (5): 1615–34

- **The World Stress Map database release 2016: Crustal stress pattern across scales** *TECTONOPHYSICS*
  Heidbach, O., Rajabi, M., Cui, X., Fuchs, K., Mueller, B., Reinecker, J., Reiter, K., Tingay, M., Wenzel, F., Xie, F., Ziegler, M. O., Zoback, M., Zoback, et al
  2018; 744: 484–98

- **Physics-based forecasting of man-made earthquake hazards in Oklahoma and Kansas.** *Nature communications*
  Langenbruch, C., Weingarten, M., Zoback, M. D.
  2018; 9 (1): 3946

- **Comparison of Short-Term and Long-Term Creep Experiments in Shales and Carbonates from Unconventional Gas Reservoirs** *ROCK MECHANICS AND ROCK ENGINEERING*
  Rassouli, F. S., Zoback, M. D.
  2018; 51 (7): 1995–2014

- **Static and Dynamic Response of Bakken Cores to Cyclic Hydrostatic Loading** *ROCK MECHANICS AND ROCK ENGINEERING*
  Ma, X., Zoback, M. D.
  2018; 51 (6): 1943–53

- **Fully Dynamic Spontaneous Rupture Due to Quasi-Static Pore Pressure and Poroelastic Effects: An Implicit Nonlinear Computational Model of Fluid-Induced Seismic Events** *Fully Dynamic Spontaneous Rupture Due to Quasi-Static Pore Pressure and Poroelastic Effects: An Implicit Nonlinear Computational Model of Fluid-Induced Seismic Events*
  Jin, L., Zoback, M. D.
  2018

- **The relation between stimulated shear fractures and production in the Barnett shale: Implications for unconventional oil and gas reservoirs** *The relation between stimulated shear fractures and production in the Barnett shale: Implications for unconventional oil and gas reservoirs*
  Hakso, A., Zoback, M. D.
  2018

- **Predicted and observed shear on pre-existing faults during hydraulic fracture stimulation** *Predicted and observed shear on pre-existing faults during hydraulic fracture stimulation*
  Zoback, M. D., Lund Snee, J. E.
  2018

- **Monitoring of cyclic steam stimulation by inversion of surface tilt measurements** *Monitoring of cyclic steam stimulation by inversion of surface tilt measurements*
  Maharramov, M., Zoback, M. D.
  2018

- **Microseismic evidence for horizontal hydraulic fractures in the Marcellus Shale, southeastern West Virginia** *Microseismic evidence for horizontal hydraulic fractures in the Marcellus Shale, southeastern West Virginia*
  Allali, A., Zoback, M. D.
  2018

- **Modeling Induced Seismicity: Inter-Seismic Quasi-Static Triggering in A Discretely Fractured Poroelastic Medium** *Modeling Induced Seismicity: Inter-Seismic Quasi-Static Triggering in A Discretely Fractured Poroelastic Medium*
  Jin, L., Zoback, M. D.
  2018

- **Permeability Evolution of Slowly Slipping Faults in Shale Reservoirs** *GEOPHYSICAL RESEARCH LETTERS*
  Wu, W., Reece, J. S., Gensterblum, Y., Zoback, M. D.
  2017; 44 (22): 11368–75
- **Lithology-controlled stress variations and pad-scale faults: A case study of hydraulic fracturing in the Woodford Shale, Oklahoma** *GEOPHYSICS*
  Ma, X., Zoback, M. D.
  2017; 82 (6): ID35–ID44
- **Response to Comment on "How will induced seismicity in Oklahoma respond to decreased saltwater injection rates?"** *Science advances*
  Langenbruch, C., Zoback, M. D.
  2017; 3 (8): eaao2277
- **Laboratory experiments simulating poroelastic stress changes associated with depletion and injection in low-porosity sedimentary rocks** *JOURNAL OF GEOPHYSICAL RESEARCH-SOLID EARTH*
  Ma, X., Zoback, M. D.
  2017; 122 (4): 2478-2503
- **In Situ Stress and Active Faulting in Oklahoma** *BULLETIN OF THE SEISMOLOGICAL SOCIETY OF AMERICA*
  Alt, R. C., Zoback, M. D.
  2017; 107 (1): 216-228
- **Fully Coupled Nonlinear Fluid Flow and Poroelasticity in Arbitrarily Fractured Porous Media: A Hybrid-Dimensional Computational Model.** *Journal of Geophysical Research: Solid Earth.*
  Jin , L., Zoback , M. D.
  2017
- **Utilizing a viscoplastic stress relaxation model to study vertical hydraulic fracture propagation in the Permian Basin** *Utilizing a viscoplastic stress relaxation model to study vertical hydraulic fracture propagation in the Permian Basin*
  Xu, S., Rassouli, F. S., Zoback, M. D.
  2017
- **Utilizing multiplets as an independent assessment of relative microseismic location uncertainty** *Utilizing multiplets as an independent assessment of relative microseismic location uncertainty*
  Hakso, A., Zoback, M. D.
  2017
- **Response to Comment on “How will induced seismicity in Oklahoma respond to decreased saltwater injection rates** *Science Advances*
  Langenbruch, C., Zoback, M. D.
  2017: eaao2277
- **Estimating geomechanical parameters from microseismic plane focal mechanisms recorded during multistage hydraulic fracturing** *GEOPHYSICS*
  Kuang, W., Zoback, M., Zhang, J.
  2017; 82 (1): KS1-KS11
- **The impacts of effective stress and CO2 sorption on the matrix permeability of shale reservoir rocks** *The impacts of effective stress and CO2 sorption on the matrix permeability of shale reservoir rocks*
  Zoback, M. D., Wu, W., Kohli, A. H.
  2017: 179-186
- **Lithology-controlled stress variations and pad-scale faults: a case study of hydraulic fracturing in the Woodford Shale, Oklahoma** *Lithology-controlled stress variations and pad-scale faults: a case study of hydraulic fracturing in the Woodford Shale, Oklahoma*
  Zoback, M. D., Ma, X.
  2017: ID-33-ID44
- **How will induced seismicity in Oklahoma respond to decreased saltwater injection rates?** *Science advances*
  Langenbruch, C., Zoback, M. D.
  2016; 2 (11)

- **Effects of rock mineralogy and pore structure on stress-dependent permeability of shale samples.** *Philosophical transactions. Series A, Mathematical, physical, and engineering sciences*
  Al Ismail, M. I., Zoback, M. D.
  2016; 374 (2078)
- **State of stress in Texas: Implications for induced seismicity** *GEOPHYSICAL RESEARCH LETTERS*
  Snee, J. L., Zoback, M. D.
  2016; 43 (19): 10208-10214
- **Viscoplastic Deformation of the Bakken and Adjacent Formations and Its Relation to Hydraulic Fracture Growth** *ROCK MECHANICS AND ROCK ENGINEERING*
  Yang, Y., Zoback, M.
  2016; 49 (2): 689-698
- **Optimization of a CO2 storage project based on thermal, geomechanical and induced fracturing effects** *JOURNAL OF PETROLEUM SCIENCE AND ENGINEERING*
  Goodarzi, S., Settari, A., Zoback, M. D., Keith, D. W.
  2015; 134: 49-59
- **To prevent earthquake triggering, pressure changes due to CO2 injection need to be limited.** *Proceedings of the National Academy of Sciences of the United States of America*
  Zoback, M. D., Gorelick, S. M.
  2015; 112 (33): E4510
- **Characterizing and Responding to Seismic Risk Associated with Earthquakes Potentially Triggered by Fluid Disposal and Hydraulic Fracturing** *SEISMOLOGICAL RESEARCH LETTERS*
  Walters, R. J., Zoback, M. D., Baker, J. W., Beroza, G. C.
  2015; 86 (4): 1110-1118
- **Oklahoma's recent earthquakes and saltwater disposal.** *Science advances*
  Walsh, F. R., Zoback, M. D.
  2015; 1 (5)
- **(submitted) Oklahoma's Recent Earthquakes and Saltwater Disposal** *Science Advances*
  Walsh, F. R., Zoback, M. D.
  2015
- **Viscous relaxation model for predicting least principal stress magnitudes in sedimentary rocks** *JOURNAL OF PETROLEUM SCIENCE AND ENGINEERING*
  Sone, H., Zoback, M. D.
  2014; 124: 416-431
- **The Stress State of the Northwest Geysers, California Geothermal Field, and Implications for Fault-Controlled Fluid Flow** *BULLETIN OF THE SEISMOLOGICAL SOCIETY OF AMERICA*
  Boyle, K., Zoback, M.
  2014; 104 (5): 2303-2312
- **A scaling law to characterize fault-damage zones at reservoir depths** *AAPG BULLETIN*
  Johri, M., Zoback, M. D., Hennings, P.
  2014; 98 (10): 2057-2079
- **The role of preexisting fractures and faults during multistage hydraulic fracturing in the Bakken Formation** *INTERPRETATION-A JOURNAL OF SUBSURFACE CHARACTERIZATION*
  Yang, Y., Zoback, M. D.
  2014; 2 (3): SG25-SG39
- **Time-dependent deformation of shale gas reservoir rocks and its long-termeffect on the in situ state of stress** *INTERNATIONAL JOURNAL OF ROCK MECHANICS AND MINING SCIENCES*
  Sone, H., Zoback, M. D.
  2014; 69: 120-132

- **Time-dependent subsidence associated with drainage-induced compaction in Gulf of Mexico shales bounding a severely depleted gas reservoir** *AAPG BULLETIN*
  Chang, C., Mallman, E., Zoback, M.
  2014; 98 (6): 1145-1159
- **Experimental investigation of matrix permeability of gas shales** *AAPG BULLETIN*
  Heller, R., Vermylen, J., Zoback, M.
  2014; 98 (5): 975-995
- **Predicting fault damage zones by modeling dynamic rupture propagation and comparison with field observations** *JOURNAL OF GEOPHYSICAL RESEARCH-SOLID EARTH*
  Johri, M., Dunham, E. M., Zoback, M. D., Fang, Z.
  2014; 119 (2): 1251-1272
- **The Effect of CO2 Adsorption on Permeability Anisotropy in the Eagle Ford Shale** *Unconventional Resources Technology Conferece*
  Al Ismail, S., Hol, S., Reece, J. S., Zoback, M. D.
  2014
- **Viscoplastic Deformation of Shale Gas Reservoir Rocks and Its Long-Term Effect on the In-Situ State of Stress** *International Journal Rock Mechanics*
  Sone, H., Zoback, M. D.
  2014: 120-132
- **Adsorption of Methane and Carbon Dioxide on Gas Shale and Pure Mineral Samples** *The Journal of Unconventional Oil and Gas Res.*
  Heller, R., Zoback, M. D.
  2014: 14-24
- **Opportunities and Challenges of Shale Gas Development** *The Bridge*
  Arent, D., Zoback, M. D.
  2014: 16-23
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