




## Mark Zoback

Benjamin M. Page Professor in Earth Sciences, Emeritus  
Geophysics

 Curriculum Vitae available Online

### Bio

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#### BIO

Mark Zoback is the Benjamin M. Page Professor of Geophysics and the Director of the Stanford Natural Gas Initiative at Stanford University. He co-directs SCITS Stanford Center for Induced and Triggered Seismicity (SCITS) and the Stanford Center for Carbon Storage (SCCS). Dr. Zoback conducts research on in situ stress, fault mechanics, and reservoir geomechanics. He is the author/co-author of over 300 technical papers, holder of five patents and author of two books. Reservoir Geomechanics, published by Cambridge University Press in 2007 is now its 15th printing. His online course, also entitled Reservoir Geomechanics, has been completed by over 10,000 students around the world. His new book, Unconventional Reservoir Geomechanics, written with Arjun Kohli, is being released by Cambridge Press in April, 2019. Dr. Zoback has received a number of awards and honors, including the 2008 Walter H. Bucher Medal of the American Geophysical Union. In 2011 he was elected to the U.S. National Academy of Engineering and in 2012 was elected to Honorary Membership of the Society of Exploration Geophysics. He was the 2013 recipient of the Louis Néel Medal of the European Geosciences Union and named an Einstein Chair Professor of the Chinese Academy of Sciences. In 2015 he received the Robert R. Berg Outstanding Research Award of the AAPG and in 2016 received the Outstanding Contribution to the Public Understanding of the Geosciences Award from the American Geological Institute.

#### ACADEMIC APPOINTMENTS

- Emeritus (Active) Professor, Geophysics

#### ADMINISTRATIVE APPOINTMENTS

- Professor, Geophysics, Stanford University, (1984- present)
- Chair, Faculty Senate, (2015- present)
- Director, Stanford Natural Gas Initiative, (2014- present)
- 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)
- Chief In-Situ Stress Measurement Project, U.S. Geological Survey, (1976-1980)
- Postdoctoral Fellowship, Research Associate National Research Council, (1975-1976)
- Research Associate, National Research Council Postdoctoral Fellowship, (1975-1976)
- Visiting Scientist, Ruhr 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**

- National Research Council Post-Doctoral Fellowship, National Research Council (1975)
- Elected Fellow, Geological Society of America (1984)
- Elected Fellow, American Association for the Advancement of Science (1985)
- Senior Research Scientist Award, Alexander Von Humboldt Stiftung (1989)
- University Fellow, Stanford University (1998)
- Kenneth Cuthbertson Award for Exceptional Contributions to Stanford University, Stanford University (1998)
- Elected Fellow, American Geophysical Union (1998)
- Elected Honorary Fellow, European Union of Geosciences (1999)
- Outstanding Alumni Award, University of Arizona Department of Geosciences, University of Arizona (1999)
- 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)
- Named Benjamin M. Page Professor of Earth Sciences, Stanford University (2005)
- New Zealand Geophysics Prize for 2006 (with John Townend), New Zealand Geophysics (2006)
- Emil Wiechert Medal, German Geophysical Society (2006)
- Walter H. Bucher Medal, American Geophysical Union (2008)
- Elected Fellow, American Rock Mechanics Association (2011)
- Elected Member, National Academy of Engineering (2011)
- Honorary Member, Society of Exploration Geophysics (2012)
- Louis Neel Medal, European Geosciences Union (2013)
- Einstein Chair Professor, Chinese Academy of Sciences (2013)
- Robert J. Berg Award for Outstanding Research, American Association of Petroleum Geologists (2015)
- Outstanding Contribution to the Public Understanding of the Geosciences, American Geosciences Institute (2016)

## **BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS**

- Invited Speaker, Frontiers of Science, University of Texas Arlington (2016 - 2016)
- Invited Speaker, University of Texas, Dallas, TX (2016 - 2016)
- Invited Speaker, Teale Lecture, University of Connecticut (2016 - 2016)
- Invited Speaker, Geological Sciences, Southern Methodist University, Dallas, TX (2016 - 2016)
- Invited Speaker, University Texas of Austin (2016 - 2016)
- Invited Speaker, Geological Sciences, University of Texas, Dallas, TX (2016 - 2016)
- Invited Speaker, IHS-CERAWeek, Oklahoma City, OK (2016 - 2016)
- Invited Speaker, American Association for the Advancement of Science (2015 - 2015)
- Invited Speaker, University of Texas Austin (2015 - 2015)
- Invited Speaker, EMI/ASCE, Stanford University (2015 - 2015)
- Invited Speaker, Institute of the Americas Conference, La Jolla (2015 - 2015)
- Invited Speaker, Australia Academy of Technology and Science Conference, Sydney, Australia (2015 - 2015)
- Invited Speaker, Nuclear Waste Technical Review Board, Washington, DC (2015 - 2015)

- Invited Speaker, International Energy Agency, Brussels, Belgium (2015 - 2015)
- Invited Speaker, Vail Global Energy Forum (2015 - 2015)
- Invited Speaker, Geological Sciences, UC Berkeley (2015 - 2015)
- Invited Speaker, International Symposium on Induced Seismicity, Davos, Switzerland (2015 - 2015)
- Invited Speaker, Colorado School of Mines, Heiland Lecture (2015 - 2015)
- Invited Speaker, Hubbert Forum, Menlo Park (2015 - 2015)
- Invited Speaker, Society of Petroleum Engineers Distinguished Lecture, Dhahran, Saudi Arabia (2015 - 2015)
- Invited Speaker, NAE Workshop on Shale Gas Development, Washington, DC (2015 - 2015)
- Keynote Speaker, International Society of Rock Mechanics, Montreal (2015 - 2015)
- Invited Speaker, Crough Lecture, Purdue University (2014 - 2014)
- Invited Speaker, AGU (2014 - 2014)
- Invited Speaker, ASME (2014 - 2014)
- Invited Speaker, Sehlin Lecture, University of Minnesota (2014 - 2014)
- Invited Speaker, Chinese Academy of Sciences (2014 - 2014)
- Invited Speaker, Los Alamos National Laboratory, New Mexico (2014 - 2014)
- Invited Speaker, Sandia National Laboratory, New Mexico (2014 - 2014)
- Invited Speaker, SPE/SEG Workshop on Induced and Triggered Seismicity (2014 - 2014)
- Invited Speaker, AAPG (2014 - 2014)
- Invited Speaker, EAGE, Amsterdam (2014 - 2014)
- Invited Speaker, Peking University (2014 - 2014)
- Invited Speaker, Goldschmidt Conference, Sacramento, CA (2014 - 2014)
- Special Meeting Participant, Ministry of Environment, Bogota, Colombia (2014 - 2014)
- Special Meeting Participant, USGS/Oklahoma Geological Survey, Induced Seismicity (2014 - 2014)
- Invited Speaker, National Agency Hydrocarbons, Bogota Colombia (2013 - 2013)
- Invited Speaker, University of Calgary, Canada (2013 - 2013)
- Invited Speaker, British Geophysical Association (2013 - 2013)
- Member, Canadian Academy of Science Committee on Shale Gas Development (2012 - 2013)
- Invited Speaker, American Geophysical Union Meeting (2012 - 2012)
- Invited Speaker, Lawrence Berkeley National Laboratory (2012 - 2012)
- Invited Speaker, Lawrence Livermore National Laboratory (2012 - 2012)
- Invited Speaker, SPE/SEG Workshop on Induced and Triggered Seismicity (2012 - 2012)
- Invited Speaker, USC, Lyman Handy Lecture (2012 - 2012)
- 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 on Deepwater Horizon Accident (2010 - 2011)
- Member, NAE Committee Investigating Deepwater Horizon Accident (2010 - 2011)

- Cuyler Memorial Lecture, University of Texas (2010 - 2010)
- Distinguished Scientist Lecture, Lawrence Berkeley National Lab (2010 - 2010)
- Holmes Lecture, Syracuse University (2010 - 2010)
- Invited Speaker, Unconventional Gas Conference (2010 - 2010)
- Invited Speaker, Univ. S. Carolina (2010 - 2010)
- Invited Speaker, EUG (2010 - 2010)
- Invited Speaker, USGS/GCEP Conference on CO2 Seals (2010 - 2010)
- Invited Speaker, University of Wisconsin (2010 - 2010)
- Invited Speaker, American Geophysical Union (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)
- Invited Speaker, GCEP Annual Meeting (2009 - 2009)
- Invited Speaker, ILP Symposium, Clarmont-Ferrand, France (2009 - 2009)
- Invited Speaker, SPE Shale Forum (2009 - 2009)
- Invited Speaker, Sed. Basin Workshop, Abu Dhabi (2009 - 2009)
- Invited Speaker, ConocoPhillips Workshop on Geomechanics (2009 - 2009)
- Advisory Board, Department of Geosciences, University of Arizona (2008 - 2008)
- Chair, Science of Earthquake Studies Advisory Committee (USGS) (2007 - 2011)
- Chair, Scientific Earthquake Studies Advisory Group of 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, ICDP (1999 - 2006)
- Chair, Science Advisory Group, International Continental Drilling Program (1999 - 2006)

- Chair, Faculty Senate, Stanford University (1999 - 2000)
- Member, Stanford Communications Council, Stanford University (1999 - 2000)
- Member, American Association of Petroleum Geologists (1998 - present)
- Member, Society of Petroleum Engineers (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)

## LINKS

- Stress and Crustal Mechanics Group: <https://pangea.stanford.edu/researchgroups/stress/>

## Research & Scholarship

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### 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 CO<sub>2</sub> 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

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### COURSES

#### 2020-21

- Crustal Mechanics: GEOPHYS 385K (Aut, Win)
- Earthquake Seismology, Deformation, and Stress: GEOPHYS 385L (Aut, Sum)
- Radio Remote Sensing: GEOPHYS 385Z (Sum)
- Reservoir Geomechanics: GEOPHYS 202 (Win)

#### 2019-20

- Crustal Mechanics: GEOPHYS 385K (Aut, Win, Spr, Sum)
- Earthquake Seismology, Deformation, and Stress: GEOPHYS 385L (Aut, Spr, Sum)
- Radio Remote Sensing: GEOPHYS 385Z (Sum)
- Reservoir Geomechanics: GEOPHYS 202 (Win)
- Unconventional Reservoir Geomechanics: GEOPHYS 208 (Spr)

#### 2018-19

- Crustal Mechanics: GEOPHYS 385K (Aut, Spr, Sum)
- Earthquake Seismology, Deformation, and Stress: GEOPHYS 385L (Aut, Spr, Sum)
- Radio Remote Sensing: GEOPHYS 385Z (Sum)
- Reservoir Geomechanics: GEOPHYS 202 (Spr)
- Unconventional Reservoir Geomechanics: GEOPHYS 208 (Win)

#### 2017-18

- Earthquake Seismology, Deformation, and Stress: GEOPHYS 385L (Aut, Spr, Sum)
- Radio Remote Sensing: GEOPHYS 385Z (Sum)

### STANFORD ADVISEES

#### Doctoral Dissertation Reader (AC)

Lainam (Best) Chaipornkaew

#### Postdoctoral Faculty Sponsor

Noam Dvory, Arash Kamali Asl

#### Doctoral Dissertation Advisor (AC)

Ankush Singh

#### Postdoctoral Research Mentor

Noam Dvory

## Publications

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### PUBLICATIONS

- **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

- **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
- **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



- 
- **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
  - **(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-term effect 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., Vermilyen, 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 CO<sub>2</sub> Adsorption on Permeability Anisotropy in the Eagle Ford Shale** *Unconventional Resources Technology Conference*  
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

- **The Role of Preexisting Fractures and Faults During Multi-Stage Hydraulic Fracturing in the Bakken Formation** *Interpretation*  
Yang, Y., Zoback, M. D.  
2014: SG24-SG39
- **Utilizing ant-tracking to identify slowly slipping faults in the Barnett Shale** *Unconventional Resources Technology Conference*  
Farghal, N. S., Zoback, M. D.  
2014
- **Long-period long-duration seismic events during hydraulic stimulation of shale and tight-gas reservoirs - Part 2: Location and mechanisms** *GEOPHYSICS*  
Das, I., Zoback, M. D.  
2013; 78 (6): KS109-KS117
- **Long-period, long-duration seismic events during hydraulic stimulation of shale and tight-gas reservoirs - Part 1: Waveform characteristics** *GEOPHYSICS*  
Das, I., Zoback, M. D.  
2013; 78 (6): KS97-KS108
- **Mechanical properties of shale-gas reservoir rocks - Part 2: Ductile creep, brittle strength, and their relation to the elastic modulus** *GEOPHYSICS*  
Sone, H., Zoback, M. D.  
2013; 78 (5): D390-D399
- **Frictional properties of shale reservoir rocks** *JOURNAL OF GEOPHYSICAL RESEARCH-SOLID EARTH*  
Kohli, A. H., Zoback, M. D.  
2013; 118 (9): 5109-5125
- **Mechanical properties of shale-gas reservoir rocks - Part 1: Static and dynamic elastic properties and anisotropy** *GEOPHYSICS*  
Sone, H., Zoback, M. D.  
2013; 78 (5): D378-D389
- **Experimental Investigation of Matrix Permeability of Gas Shales** *AAPG Bulletin*  
Heller, R., Vermylen, J., Zoback, M. D.  
2013: 975-995
- **An Integrated Geomechanical and Microseismic Study of Multi-Well Hydraulic Fracture Stimulation in the Bakken Formation** *Unconventional Resources Technology Conference*  
Yang, Y., Zoback, M. D., Simon, M., Dohmen, T.  
2013
- **Experimental Investigation of Deformation Mechanisms During Shear-Enhanced Compaction in Poorly Lithified Sandstone and Sand** *Journal Geophys. Res.*  
Skurtveit, E., Torabi, A., Zoback, M. D., Gabrielsen, R. H.  
2013
- **The Evolution of Stimulated Reservoir Volume During Hydraulic Stimulation of Shale Gas Formations** *Unconventional Resources Technology Conference*  
Johri, M., Zoback, M. D.  
2013
- **Response to Juanes et al.: Evidence that earthquake triggering could render long-term carbon storage unsuccessful in many regions, Proc** *Proceedings of the National Academy of Sciences*  
Zoback, M. D., Gorelick, S. M.  
2013; 109
- **Intraplate earthquakes, regional stress and fault mechanics in the Central and Eastern US and Southeastern Canada** *TECTONOPHYSICS*  
Hurd, O., Zoback, M. D.  
2012; 581: 182-192
- **Modeling evolution of the San Andreas Fault system in northern and central California** *GEOCHEMISTRY GEOPHYSICS GEOSYSTEMS*  
Popov, A. A., Sobolev, S. V., Zoback, M. D.  
2012; 13

- **CO<sub>2</sub> sequestration into the Wyodak coal seam of Powder River Basin-Preliminary reservoir characterization and simulation** *INTERNATIONAL JOURNAL OF GREENHOUSE GAS CONTROL*  
Dutta, P., Zoback, M. D.  
2012; 9: 103-116
- **Regional Stress Orientations and Slip Compatibility of Earthquake Focal Planes in the New Madrid Seismic Zone** *SEISMOLOGICAL RESEARCH LETTERS*  
Hurd, O., Zoback, M. D.  
2012; 83 (4): 672-679
- **Earthquake triggering and large-scale geologic storage of carbon dioxide** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*  
Zoback, M. D., Gorelick, S. M.  
2012; 109 (26): 10164-10168
- **The importance of slow slip on faults during hydraulic fracturing of a shale gas reservoirs**  
Zoback, M. D., Kohli, A., Das, I., McClure, M.  
Society of Petroleum Engineers.2012
- **Stimulated Shale Volume Characterization: Multiwell case study from the Horn River Shale** *Society of Petroleum Engineers Annual Technical Conference and Exhibition*  
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