

Yi Fang

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EDUCATION

2013-2017 **Doctor of Philosophy** in Energy and Mineral Engineering (GPA: 4.0/4.0)
Institute The Pennsylvania State University, University Park
Supervisor Prof. Derek Elsworth
2011-2013 **Master of Science** in Geology (GPA: 3.8/4.0)
Institute The California State University, Long Beach
Supervisor Prof. Gregory J. Holk
2007-2011 **Bachelor of Engineering** in Civil Engineering
Institute China University of Geosciences, Wuhan

PROFESSIONAL APPOINTMENTS

2017-Present *Postdoctoral Fellow*
Institute Institute for Geophysics, The University of Texas at Austin
Supervisor Prof. Peter B. Flemings

WORK EXPERIENCE

2016, 2017 *Summer Geomechanics Intern* in Production Technology Team
Company Aramco Services Company-Houston Research Center

RESEARCH EXPERIENCE

2013-2017 *Research Assistant*
Institute The Pennsylvania State University, Energy Institute, G3 Center
Department of Energy and Mineral Engineering
2011-2013 *Research Assistant*
Institute The California State University, Long Beach, The Institute for Integrated
Research in Materials, Environments and Society

TEACHING EXPERIENCE

Institute Penn State, Department of Energy and Mineral Engineering
Spring 2017 *Teaching Assistant*, Production Process Engineering (PNG480)
Spring 2017 *Teaching Assistant*, Petroleum Engineering Design (PNG475)
Spring 2016 *Teaching Assistant*, Computational Reservoir Geomechanics (EGEE520)
Spring 2015 *Co-Instructor*, Contaminant Hydrogeology (EnvSE408)
Institute Cal State Long Beach, Department of Geological Sciences
Spring 2013 *Teaching Associate*, Physical Geology Laboratory (GEOL102)

AWARDS & HONORS

- Sep 2018 2018 SPE Outstanding Technical Editor Award
- Jun 2018 Elected Future Leader, American Rock Mechanics Association
- Jun 2018 Outstanding Reviewer (Journal of Petroleum Science and Engineering)
- May 2018 Prize for Best Paper (GeoShanghai International Conference)
- Oct 2017 2017 SPE Outstanding Technical Editor Award
- Sep 2017 Outstanding Reviewer (International Journal of Greenhouse Gas Control)
- Mar 2017 SedHeat Student Scholarship
- Aug 2016 Outstanding Reviewer (Journal of Petroleum Science and Engineering)
- Jan 2016 Outstanding Reviewer (Journal of Natural Gas Science and Engineering)
- Jul 2014 Member, Sigma Xi
- Apr 2013 Member, The Honor Society of Phi Kappa Phi
- Mar 2013 Recipient, Geological Society of America Student Travel Grant
- 2012-2013 Recipient, Geological Society of America Student Research Grant
- 2011-2013 Carl W. Johnson-Bert Conrey Graduate Fellowship, CSULB
- 2011 Academician Scholarship of Chinese Academy of Sciences, CUG
- 2010 Petrochina Jilin Oilfield Outstanding Student Scholarship
- 2009 Outstanding Academic Records, CUG
- 2008-2011 People's Scholarship, CUG

JOURNAL PUBLICATIONS (*Corresponding author)

- [12] **Fang, Y***, D. Elsworth, T. Ishibashi, and F. Zhang. 2018. Permeability evolution and frictional stability of fabricated fractures with specified roughness, *Journal of Geophysical Research, Solid Earth*, doi: 10.1029/2018JB016215
- [11] Jia, Y*, Y. Lu, J. Tang, **Y. Fang**, B. Xia, and Z. Ge. 2018. Mechanical-Chemical-Mineralogical Controls on Permeability Evolution of Shale Fractures. *Geofluids*, vol. 2018, Article ID 7801843, 18 pages, DOI: 10.1155/2018/7801843
- [10] **Fang, Y***, D. Elsworth, C. Wang, Y. Jia. 2018. Mineralogical controls on frictional strength, stability, and shear permeability evolution of fractures. *Journal of Geophysical Research, Solid Earth*, 123, 3549-3563, doi: 10.1029/2017JB015338
- [9] Jia, Y*, Y. Lu, D. Elsworth, **Y. Fang**, and J. Tang. 2018. Surface Characteristics and Permeability Enhancement of Shale Fractures due to Water and Supercritical Carbon Dioxide Fracturing. *Journal of Petroleum Science and Engineering*. Doi: 10.1016/j.petrol.2018.02.018
- [8] Im, K*, D. Elsworth, and **Y. Fang**. 2017. The Influence of Pre-slip healing on the evolution of permeability on fractures and faults. *Geophysical Research Letter*. 45, 166-175, Doi: 10.1002/2017GL076216
- [7] **Fang, Y***, D. Elsworth, and T.T. Cladouhos. 2018. Reservoir Permeability Mapping using MEQ Data. *Geothermics*. Vol. 72, p. 83-100
- [6] Zhang, F., **Y. Fang***, D. Elsworth, C. Wang, and X. Yang. 2017. Evolution of Friction and Permeability in a Propped Fracture under Shearing. *Geofluids*, vol. 2017, Article ID 206347, 13 pages, doi: 10.1155/2017/2063747
- [5] Wang*, C., D. Elsworth, and **Y. Fang**. 2017. Influence of weakening minerals on ensemble strength and slip stability of faults, *Journal of Geophysical Research, Solid Earth*, 122, 7090-7110, doi:10.1002/2016JB013687
- [4] **Fang, Y.**, C. Wang, D. Elsworth*, and T. Ishibashi. 2017. Seismicity-permeability coupling in the behavior of gas shale, CO2 storage and deep geothermal energy. *Geomechanics and Geophysics for Geo-Energy and Geo-Resources*. V. 3, No. 2, p.

- 189-198.
- [3] **Fang, Y***, D. Elsworth, C. Wang, T. Ishibashi, and J.P. Fitts. 2017. Frictional Stability-Permeability Relationships for Fractures in Shales. *Journal of Geophysical Research, Solid Earth*. V. 122, No. 3, p. 1760-1776.
 - [2] **Fang, Y***, S.M. den Hartog, D. Elsworth, C. Marone, and T.T. Cladouhos. 2015. Anomalous Distribution of MEQs in Geothermal Reservoir: Mechanisms and Implications. *Geothermics*. Vol. 63, p. 62-73.
 - [1] Li, Y*, D.Z. Tang, **Y. Fang**, H. Xu, and Y.J. Meng. 2013. Distribution of Stable Carbon Isotope in Coalbed Methane from the East Margin of Ordos Basin: *Science China Earth Sciences*. V. 57, No. 8, p. 1741-1748.

CONFERENCE PROCEEDING PAPERS

- [17] **Fang, Y.** and Y. Han. 2018. Micromechanical Modeling of Multi-Cluster Hydraulic Fracturing in Horizontal Well. Unconventional Resources Technology Conference. Houston, TX. July 23-25.
- [16] Zhang, F., **Y. Fang**, D. Elsworth, and C. Wang. 2018. Co-evolution of Friction and Permeability in a Propped Fracture under Constant Shear and Implication to Induced Seismicity. 52nd U.S. Rock Mechanics/Geomechanics Symposium, Seattle, WA.
- [15] Elsworth, D., K. Im, **Y. Fang**, T. Ishibashi, and C. Wang. 2018. Induced Seismicity and Permeability Evolution in Gas Shales, CO₂ Storage, and Deep Geothermal Energy. In book: Proceedings of GeoShanghai 2018 International Conference: Multi-physics Processes in Soil Mechanics and Advances in Geotechnical Testing
- [14] An, M., F. Zhang, L. Zhang, and **Y. Fang**. 2018. Effects of Normal Stress and Clay Content on the Frictional Properties of Reservoir Rocks under Fully Saturated Conditions. In book: Proceedings of GeoShanghai 2018 International Conference: Rock Mechanics and Rock Engineering
- [13] Wang, C., D. Elsworth, **Y. Fang**, K. Liu and Y. Jia. 2017. Weakening Effects of Microstructural Tribological Films in CO₂-Altered Reservoirs and Caprocks. 51st US Rock Mechanics/Geomechanics Symposium, San Francisco, CA.
- [12] Jia, Y., Y. Lu, D. Elsworth, **Y. Fang**, C. Wang and J. Wang. 2017. Hydro-mechanical-chemical effects on permeability evolution of fractures in Longmaxi shale. 51st US Rock Mechanics/Geomechanics Symposium. San Francisco, CA.
- [11] **Fang, Y.**, D. Elsworth, C. Wang, and Y. Jia. 2017. Can Mineralogical Composition Predict Frictional Strength, Stability and Shear Permeability Evolution of Fractures. 51st U.S. Rock Mechanics/Geomechanics Symposium.
- [10] Im, K., D. Elsworth, and **Y. Fang**. 2017. Shear-Induced Permeability Enhancement. ISRM Specialized Conference. YSRM2017 & 5th NDRM. May 11-13, 2017, Jeju, Korea.
- [9] Han, Y., **Y. Fang**, D.P. San-Roman-Alerigi, S. Batarseh. 2017. Numerical Modeling of Thermal-Mechanical Interaction Process in High Power Electromagnetic Heating of Rocks. SPE Middle East Oil & Gas Show and Conference. Manama, Kingdom of Bahrain, March 6-9, 2017 (SPE-183836).
- [8] **Fang, Y.**, C. Wang, D. Elsworth, and T. Ishibashi. Seismicity-Permeability Coupling to Illustrate the Behavior of Gas Shales, CO₂ Storage and Deep Geothermal Energy. International Conference on Geomechanics, Geo-energy and Geo-resources. Melbourne, Australia, September 28-29, 2016.
- [7] Ishibashi, T., H. Asanuma, **Y. Fang**, C. Wang, and D. Elsworth. 2016. Exploring the Link between Permeability and Strength Evolution during Fracture Shearing. 50th U.S. Rock Mechanics/Geomechanics Symposium, Houston, TX.
- [6] **Fang, Y.**, Wang, C., Elsworth, D., and Ishibashi, T. 2016. Friction-Permeability Relationships for Reservoir Caprocks. In *50th US Rock Mechanics/Geomechanics Symposium*.

- [5] Elsworth, D., **Y. Fang**, Q. Gan, K. J. Im, T. Ishibashi, and Y. Guglielmi. "Induced seismicity in the development of EGS—benefits and drawbacks." In *Rock Dynamics: From Research to Engineering: Proceedings of the 2nd International Conference on Rock Dynamics and Applications*, p. 13. CRC Press, 2016.
- [4] **Fang, Y.**, D. Elsworth, and T.T. Cladouhos. 2015. Estimating in-situ Permeability of Stimulated EGS Reservoirs Using MEQ Moment Magnitude: an Analysis of Newberry MEQ Data. Stanford Geothermal Workshop 40th Annual, Stanford, January 26-28, 2015.
- [3] **Fang, Y.**, D. Elsworth, and T.T. Cladouhos. 2015. Mapping Permeability Tensor Using In-Situ MEQ data. 49th U.S. Rock Mechanics/Geomechanics Symposium, San Francisco, CA.
- [2] Im, K., D. Elsworth, and **Y. Fang**. 2015. Asymptotic Analysis of Thermal Stimulation of Geothermal Reservoirs. Stanford Geothermal Workshop 40th Annual, Stanford, January 26-28, 2015.
- [1] **Fang, Y.**, D. Elsworth, and T.T. Cladouhos. 2014. Bimodal Depth Distribution of MEQs in the Newberry Geothermal Reservoir. 48th U.S. Rock Mechanics/Geomechanics Symposium, Minneapolis, MN

CONFERENCE PROCEEDING ABSTRACTS

- [8] **Fang, Y.**, P.B. Flemings, S.C. Phillips, H. Daigle, J. O'Connell, P.J. Polito. 2018. Permeability, compression behavior, and lateral stress ratio of hydrate-bearing siltstone from UT-GOM2-1 pressure core (GC 955-northern Gulf of Mexico): Initial Results. American Geophysical Union Fall Meeting in Washington D.C. December 10-14, 2018.
- [7] **Fang, Y.**, P.B. Flemings, H. Daigle, J. O'Connell, P. Polito. Measure Permeability of Natural Hydrate-bearing Sediments Using K0 Permeameter. 2018 Gordon Research Conference on Gas Hydrate, Galveston, TX. Feb 24 – Mar 02, 2018
- [6] Spokas, K., **Y. Fang**, J.P. Fitts, C.A. Peters, and D. Elsworth. Collapse of chemically altered porous surface decreases fracture permeability, frictional strength and stability. InterPore 10th Annual Meeting and Jubilee, New Orleans, May 14-17, 2018
- [5] Spokas, K., **Y. Fang**, D. Elsworth, J.P. Fitts, and C.A. Peters. Formation of a porous altered layer on fracture surface due to reactive fluids and its effects on fracture friction and permeability. Goldschmidt2017 in Paris, August 13-18, 2017
- [4] Wang, C., D. Elsworth, Z. Li, K. Liu, **Y. Fang**, and Y. Jia. Weakening Effects of Low-Friction Microstructural Films in CO₂ Altered Reservoir Rocks and Caprocks: Joint 52nd Northeastern Annual Section/51st North-Central Annual Section Meeting
- [3] Ishibashi, T., H. Asanuma, **Y. Fang**, and D. Elsworth. Fracture permeability evolution during shearing: the role of shear-induced dilation. American Geophysical Union Fall Meeting in San Francisco, December 14-18, 2015 (Poster Presentation)
- [2] **Fang, Y.**, D. Elsworth, C. Marone, S.M. den Hartog, and T.T. Cladouhos. The Missing Intermediate-Depth MEQs in the Newberry Geothermal Reservoir Stimulation: the Role of Frictional Instability. American Geophysical Union Fall Meeting in San Francisco, December 15-19, 2014 (Poster Presentation).
- [1] **Fang, Y.** and G. Holk. 2013. A Stable Isotope Study of Fluid-Rock Interaction in the San Gabriel Fault Zone and its Relationship to Seismic Process: Geological Society of America Abstracts with Programs, Vol. 45, No. 6, p. 74 (Poster Presentation).

TECHNICAL REPORTS

- [2] Elsworth, D., Izadi, G., Gan, Q., **Fang, Y.**, Taron, J. and Sonnenthal, E., 2015. *THMC Modeling of EGS Reservoirs--Continuum through Discontinuum Representations. Capturing Reservoir Stimulation, Evolution and Induced Seismicity* (No. DOE-PSU--

0002761-1). Pennsylvania State Univ., State College, PA (United States).

- [1] White, M.D., R. Podgorney, S.M. Kelkar, M.W. McClure, G. Danko, A. Ghassemi, P. Fu, D. Bahrami, C. Barbier, Q. Cheng, K.K. Chiu, C. Detournay, D. Elsworth, **Y. Fang**, J.K. Furtney, Q. Gan, Q. Gao, B. Guo, Y. Hao, R.N. Horne, K. Huang, K. Im, J. Norbeck, J. Rutqvist, M.R. Safari, V. Sesetty, E. Sonnenthal, Q. Tao., S.K. White, Y. Wong, and Y. Xia, *Benchmark Problems of the Geothermal Technologies Office Code Comparison Study*. United States.

WORKSHOP PARTICIPATION

- [3] OSU GOM2 Workshop. Columbus, Ohio, 24-25, September, 2018.
[2] Unlocking the Energy Elephant: A SedHeat Workshop. Salt Lake City, Utah. 1-4, March, 2017.
[1] ARMA/AAPG SedHeat Workshop on Successful Engineering of Sedimentary Geothermal Systems, Houston, TX, 24-25 June, 2016

INVITED TALK/SEMINAR

- Apr 2017 National Energy Technology Laboratory, Morgantown, WV, USA
Dec 2017 Dept. Geotechnical Engineering, Tongji University, Shanghai, China

PROFESSIONAL SERVICES

Journal Article Reviewer

- [14] Geophysical Research Letters (AGU)
[13] Journal of Geophysical Research, Solid Earth (AGU)
[12] Water Resources Research (AGU)
[11] Journal of Hydrology (Elsevier)
[10] Society of Petroleum Engineer Journal (SPEJ)
[9] Geofluids (Hindawi)
[8] International Journal of Greenhouse Gas Control (Elsevier)
[7] Journal of Petroleum Science and Engineering (Elsevier)
[6] Journal of Unconventional Oil and Gas Resources (Elsevier)
[5] Journal of Natural Gas Science and Engineering (Elsevier)
[4] Fuel (Elsevier)
[3] Journal of Rock Mechanics and Geotechnical Engineering (Elsevier)
[2] Tunnelling and Underground Space Technology (Elsevier)
[1] Journal of CO2 Utilization (Elsevier)

Conferences Services

- [5] Session developer/Chair for ARMA 2019
[4] Co-convener of 2018 American Geophysical Union Fall Meeting (Session ID: 45398)
[3] Member of Technical Committee for ARMA 2018
[2] Served as a reviewer for ARMA 2015-2018
[1] Student Volunteer, GSA Annual Meeting, Charlotte, NC, USA, 2012

PROFESSIONAL MEMBERSHIP

- 2012-Present Member of American Geophysical Union
2012-Present Member of Geological Society of America
2013-Present Member of American Rock Mechanics Association
2013-Present Student Member of Society of Petroleum Engineers
2014-Present Student Member of Geothermal Resources Council

2017-Present Member of International Society for Rock Mechanics