Yongzan Liu

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Professional Experience

Lawrence Berkeley National Laboratory *2021/09 - present*
Postdoctoral Scholar at Energy Geosciences Division

Education

Texas A&M University *2017/09 - 2021/08*
Ph.D. in Petroleum Engineering
Thesis: Hydraulic-Fracture Geometry Characterization Using Low-Frequency Distributed Acoustic Sensing (LF-DAS) Data: Forward Modeling, Inverse Modeling, and Field Applications
Advisors: Dr. Kan Wu and Dr. George Moridis

University of Alberta *2014/09 - 2017/06*
M.S. in Petroleum Engineering
Thesis: Modeling of Recovery and In-Situ Distribution of Fracturing Fluid in Shale Gas Reservoirs Due to Fracture Closure, Proppant Distribution and Gravity Segregation [link]
Advisor: Dr. Juliana Leung

China University of Petroleum (East China) *2010/09 - 2014/06*
B.S. in Petroleum Engineering

Memorial University of Newfoundland *2014/01 - 2014/06*
Undergraduate Visiting Student in Memorial University of Newfoundland, Canada

Research Interests

- **Numerical Modeling**: Computational Geomechanics; Multi-Phase Flow in Fractured Porous Media; Coupled Thermal-Hydraulic-Mechanical Modeling
- **Fracture Monitoring and Characterization**: Fracture Propagation; Distributed Acoustic Sensing (DAS); Distributed Temperature Sensing (DTS); Distributed Strain Sensing (DSS)
- **Fractured Reservoir Characterization**: History Matching; Flowback/Production Data Analysis; Inversion Algorithms

Research Projects

Hydraulic-Fracture Geometry Characterization Using LF-DAS Data *2019/09 - now*
- Developed an efficient 3D geomechanical model based on Displacement Discontinuity Method (DDM)
- Proposed a guideline for fracture-hit detection using LF-DAS data and applied to several field case studies
- Developed an inversion algorithm for quantitative hydraulic-fracture geometry characterization

Coupled Multiphase Flow and Geomechanics Modeling of Fractured Reservoirs *2017/09 - now*
- Developed efficient coupled multiphase flow and geomechanics models for deformable fractured reservoirs
- Fractures modeled explicitly by either Discrete Fracture Model (DFM) with unstructured meshing or Embedded Discrete Fracture Model (EDFM)
- Various fracture constitutive models implemented accounting for proppant embedment, deformation hysteresis, and shear dilation

Coupled Thermal-Hydraulic-Mechanical (THM) Modeling of Geothermal Reservoirs *2017/09 - now*
- Developed a coupled THM model for geothermal reservoirs with shear fractures
- Validated against benchmark problems in the 'Numerical Code Comparison' Project under the direction of DOE's Geothermal Reservoir Engineering Management Program (GREMP)
- Ongoing research includes simulation and evaluation of geothermal reservoir performance

Fracturing Fluid Flowback and In-Situ Distribution in Unconventional Reservoirs *2015/08 - 2018/08*

· Developed comprehensive numerical models that incorporate essentially all the dominant mechanisms controlling fracturing fluid flowback characteristics

· Investigated the impacts of various physical mechanisms on fracturing fluid flowback and in-situ distribution and their subsequent influences on well performance

· Identified flowback signatures under different fracture geometries that help to better utilize flowback data for hydraulic fracture characterization

Publications

Feature Article – research highlighted in JPT

1. Wu, K., **Liu, Y.**, Jin, G., Moridis, G. J. 2021. Fracture Hits and Hydraulic-Fracture Geometry Characterization Using Low-Frequency Distributed Acoustic Sensing Strain Data. *Journal of Petroleum Technology.* **73** (07):39-42. SPE-0721-0039-JPT. [link]

Journal Article – * denotes corresponding author

12. **Liu, Y.**, Jin, G., Wu, K. (accepted). New Insights on Characteristics of Near-Wellbore Fractured Zone from Simulated High-Resolution Distributed Strain Sensing Data. *SPE Reservoir Evaluation & Engineering.* SPE-208587-PA.
11. **Liu, Y.**, Jin, G., Wu, K., Moridis, G. J. (accepted). Quantitative Hydraulic-Fracture Geometry Characterization with LF-DAS Strain Data: Fracture-Height Sensitivity and Field Applications. *SPE Production & Operations.* SPE-204158-PA.
10. **Liu, Y.**, Jin, G., Wu, K., Moridis, G. J. (in press). Hydraulic Fracture Width Inversion Using LF-DAS Strain Data. Part II: Extension for Multifracture and Field Application. *SPE Journal.* SPE-205379-PA. [link]
9. **Liu, Y.**, Wu, K., Jin, G., Moridis, G. J., Kerr, E. et al. 2021. Fracture-Hit Detection Using LF-DAS Signals Measured during Multifracture Propagation in Unconventional Reservoirs. *SPE Reservoir Evaluation & Engineering.* **24** (03): 523-535. SPE-204457-PA. [link]
8. **Liu, Y.**, Jin, G., Wu, K., Moridis, G. J. 2021. Hydraulic Fracture Width Inversion Using LF-DAS Strain Data. Part I: Algorithm and Sensitivity Analysis. **26** (01): 359-371. *SPE Journal.* SPE-204225-PA. [link]
7. **Liu, Y.**, Liu, L., Leung, J. Y., Wu, K., Moridis, G. J. 2021. Coupled Flow/Geomechanics Modeling of Interfracture Water Injection To Enhance Oil Recovery in Tight Reservoirs. *SPE Journal.* **26** (01): 1-21. SPE-199983-PA. [link]
6. **Liu, Y.**, Wu, K., Jin, G., Moridis, G. J. 2020. Rock Deformation and Strain-Rate Characterization during Hydraulic Fracturing Treatments: Insights for Interpretation of Low-Frequency Distributed-Acoustic Sensing Signals. *SPE Journal.* **25** (05): 2251-2264. SPE-202482-PA. [link]
5. **Liu, Y.**, Liu, L., Leung, J. Y., Moridis, G. J. 2020. Sequentially Coupled Flow and Geomechanical Simulation with a Discrete Fracture Model for Analyzing Fracturing Fluid Recovery and Distribution in Fractured Ultra-Low Permeability Gas Reservoirs. *Journal of Petroleum Science and Engineering* **189**: 107042. [link]
4. Liu, L., **Liu, Y.***, Yao, J., Huang, Z. 2020. Mechanistic Study of Cyclic Water Injection to Enhance Oil Recovery in Tight Reservoirs with Fracture Deformation Hysteresis. *Fuel* **271**: 117677. [link]
3. Liu, L., **Liu, Y.***, Yao, J., Huang, Z. 2020. Efficient Coupled Multiphase-Flow and Geomechanics Modeling of Well Performance and Stress Evolution in Shale-Gas Reservoirs Considering Dynamic Fracture Properties. *SPE Journal.* **25** (03): 1523-1542. SPE-200496-PA. [link]
2. **Liu, Y.**, Leung, J. Y., Chalaturnyk, R., Virués,C. J. J. 2019. New Insights on Mechanisms Controlling Fracturing-Fluid Distribution and Their Effects on Well Performance in Shale-Gas Reservoirs. *SPE Production & Operations* **34** (03): 564-585. SPE-185043-PA. [link]
1. **Liu, Y.**, Leung, J. Y., Chalaturnyk, R. 2018. Geomechanical Simulation of Partially Propped Fracture Closure and Its Implication for Water Flowback and Gas Production. *SPE Reservoir Evaluation & Engineering* **21** (02): 273-290. SPE-189454-PA. [link]

Conference Paper – full length

9. **Liu, Y.**, Wu, K., Jin, G., Moridis, G. J. 2021. Quantification of Thermal Effects on Cross-Well Low-Frequency Distributed Acoustic Sensing Measurements. SPE/SEG/AAPG Unconventional Resources Technology Conference, Houston, Texas, US, 26-28 July.
8. **Liu, Y.**, Jin, G., Wu, K., 2021. New Insights on Near-Wellbore Fracture Characteristics from High-Resolution Distributed Strain Sensing Measurements. SPE/SEG/AAPG Unconventional Resources Technology Conference, Houston, Texas, US, 26-28 July.

7. **Liu, Y.**, Jin, G., Wu, K., Moridis, G. J. 2021. Quantitative Hydraulic-Fracture Geometry Characterization with LF-DAS Strain Data: Numerical Analysis and Field Applications. SPE Hydraulic Fracturing Technology Conference and Exhibition, The Woodlands, Texas, USA. 2-4 February. SPE-204158-MS.
6. **Liu, Y.**, Liu, L., Leung, J. Y., Wu, K., Moridis, G. J. 2020. Coupled Flow and Geomechanics Modeling of Inter-Fracture Water Injection to Enhance Oil Recovery in Tight Reservoirs. SPE Canada Unconventional Resources Conference, Virtual, 15-16, September.
5. **Liu, Y.**, Wu, K., Jin, G., Moridis, G. J., Kerr, E. et al. 2020. Strain and Strain-Rate Responses Measured by LF-DAS and Corresponding Features for Fracture-Hit Detection during Multiple-Fracture Propagation in Unconventional Reservoirs. Unconventional Resources Technology Conference, Virtual, 20-22 July.
4. **Liu, Y.** Liu, L., Leung, J. Y., Wu, K., Moridis, G. J. 2020. Numerical Investigation of Water Flowback Characteristics for Unconventional Reservoirs with Complex Fracture Geometries. Unconventional Resources Technology Conference, Virtual, 20-22 July.
3. **Liu, Y.**, Wu, K., Jin, G., Moridis, G. J. 2020. Hydraulic Fracture Modeling of Fracture-Induced Strain Variation Measured by Low-Frequency Distributed Acoustic Sensing (LF-DAS) along Offset Wells. 54^{th} US Rock Mechanics/Geomechanics Symposium, Golden, Colorado, USA (canceled). 28 June-1 July.
2. Liu, L., Huang, Z., Yao., Yuan, D., Wu, Y. S., **Liu, Y.** 2020. An Efficient Coupled Hydro-Mechanical Modeling of Two-Phase Flow in Fractured Vuggy Porous Media. 54^{th} US Rock Mechanics/Geomechanics Symposium, Golden, Colorado, USA (canceled). 28 June-1 July.
1. **Liu, Y.**, Leung, J. Y., Chalaturnyk, R., Virués,C. J. J. 2017. Fracturing Fluid Distribution in Shale Gas Reservoirs Due to Fracture Closure, Proppant Distribution and Gravity Segregation. SPE Canada Unconventional Resources Conference, Calgary, Alberta, Canada. 15-16, February. SPE-185043-MS.

Awards & Certificates

· Winner of First ARMA Graduate Research Competition	*2021/06*
· Third Place Winner of TAMU SPE Student Paper Contest (PhD Division)	*2021/01*
· Nomination for TAMU College of Engineering Outstanding Graduate Student	*2020/10*
· University of Alberta Graduate Research Assistant Fellowship	*2014/09 - 2017/06*
· University of Alberta Travel Award	*2017/02*
· Schlumberger MEPO History Matching Course Completion Certificate	*2015/04*
· Stanford Reservoir Geomechanics Course Completion Certificate	*2014/06*
· Excellent Undergraduate Student Award	*2014/01*
· China University of Petroleum Technology Innovation Awards	*2013/09*
· China National Inspiration Scholarship	*2012/09*

Scholarly Services & Affiliations

Judge/Technical Committee/Session Chair

Judge, SPE Student Paper Contest (PhD Division), 2021/09
Session Developer, 56^{th} US Rock Mechanics/Geomechanics Symposium, 2022/06

Journal Technical Reviewer

International Journal of Rock Mechanics and Mining Sciences
Rock Mechanics and Rock Engineering
Water Resources Research
SPE Journal
SPE Reservoir Evaluation & Engineering
SPE Production & Operations
Journal of Petroleum Science and Engineering
Engineering Computations
ACS Omega

Professional Member

Society of Petroleum Engineer (SPE)
America Rock Mechanics Association (ARMA)

Student Organization

Founder & President, ARMA-TAMU Student Chapter