

Haoming Ma, PhD

Research Scientist and Principal Investigator

Hydrogen Energy Research Ctr
School of Energy Resources
University of Wyoming
Laramie, WY 82071

haoming.ma@uwyo.edu
[Google Scholar](#) | [LinkedIn](#)
Homepage: haoming-ma.github.io
[UWyo Faculty/Staff page](#)

EDUCATION

- Ph.D. Department of Chemical & Petroleum Engineering, University of Calgary, Canada, 2023
Dissertation: *Data-driven Carbon Dioxide Enhanced Oil Recovery Models and Their Applications*
Committee: Zhangxin Chen (chair), Sean T. McCoy (co-chair), Joule A. Bergerson, Christopher Clarkson, Steven Bryant, Xiaolong Yin (External)
- M.Sc. Computer Information and Technology, School of Engineering and Applied Science, University of Pennsylvania, Pennsylvania, 2025
- M.Sc. Energy Management and Policy, Department of Energy and Mineral Engineering, Pennsylvania State University, Pennsylvania, 2019
- B. Sc. Energy Engineering, Department of Energy and Mineral Engineering, Pennsylvania State University, Pennsylvania, 2018

PROFESSIONAL APPOINTMENTS

- 2025.03 to Present **Staff Research Scientist and Principal Investigator**, Hydrogen Energy Research Center, School of Energy Resources, University of Wyoming
- 2025.10 to Present **Founding CTO**, StorageN Inc., Laramie, Wyoming
- 2025.03 to Present **Affiliated Researcher**, Center for Energy and Environmental Systems Analysis, University of Texas at Austin
- 2023.11 to 2025.03 **Post-doctoral Fellow**, Energy Emissions Modeling and Data Lab, Hildebrand Department of Petroleum and Geosystems Engineering, University of Texas at Austin
- 2023.09 to 2023.11 **Research Associate**, Reservoir Simulation Group, Department of Chemical & Petroleum Engineering, University of Calgary
- 2022.09 to 2023.05 **Sessional Instructor**, Reservoir Simulation Group, Department of Chemical & Petroleum Engineering, University of Calgary

RESEARCH INTERESTS

My research interest lies in conducting **Geo-Energy System Modeling and Analysis** powered by artificial intelligence and multiscale remote-sensing data (e.g., from satellites to aircraft to ground-based sensors), coupling with techno-economic analysis (TEA) and life cycle assessment (LCA) to enable the industrial-scale deployment of sustainable geo-energy extraction and storage. This interdisciplinary effort informs innovative geo-energy infrastructure, investment decisions and policy frameworks in the global effort to aggressively reduce greenhouse gas emissions in a cost-effective pattern.

I am particularly interested in the following topics:

- Geological CO₂ utilization and sequestration
- Methane emissions across geo-energy supply chains
- Subsurface hydrogen extraction, storage and utilization
- Enhanced geothermal systems

AWARDS

2024	Best Paper Award, Frontiers in Energy
2023	SPE Canadian Educational Foundation General Scholarship, Society of Petroleum Engineers Educational Foundation
2022	Alberta Graduate Excellence Scholarship
2022	Canada First Research Excellence Fund Conference Grant
2022, 2023	Chemical & Petroleum Engineering Graduate Excellence Award, University of Calgary
2020-2022	International Graduate Tuition Award, University of Calgary
2019	Graduate Teaching Assistant Fellowship, Penn State University
2018	Outstanding Graduate Teaching Assistant Award, Penn State University
2016-2018	Leone Family Undergraduate Scholarship, Penn State University
2017	John and Elizabeth Holmes Teas Scholarship, Penn State University

Media Coverage

2024	Estimating emissions potential of decommissioned gas wells from shale samples , Research, Penn State News (April 22, 2024)
2023	Indigenous pathways program makes a difference for Schulich students , UToday, UCalgary News (March 30, 2023)

RESEARCH EXPERIENCE

2025-Present **Staff Research Scientist and Principal Investigator**, Hydrogen Energy Research Center, School of Energy Resources, University of Wyoming

Lead a research program that performs techno-economic and life cycle analyses of innovative hydrogen and alternative fuel technologies, advancing Wyoming's energy-driven economy. Directly involved and secured ~\$28M research grant from U.S. Department of Energy (DOE) Office of Fossil Energy and Carbon Management (FECM) and National Science Foundation (NSF).

2023-2025 **Post-doctoral Fellow**, Energy Emissions Modeling and Data Lab, Hildebrand Department of Petroleum and Geosystems Engineering, University of Texas at Austin

Developed a geospatial measurement-informed life cycle assessment (LCA) framework for global LNG supply chains and blue-hydrogen technologies ([Open-source tool](#)). Contributed to the preparation of \$40M proposals to the U.S. DOE FECM.

2023-2023 **Research Associate**, Reservoir Simulation Group, Department of Chemical & Petroleum Engineering, University of Calgary

2020-2023 **Research Assistant**, Reservoir Simulation Group, Department of Chemical & Petroleum Engineering, University of Calgary

Oversaw research team in reservoir modeling of geological CO₂ sequestration, geothermal energy recovery, and underground hydrogen storage; Developed artificial intelligence-based geosystem analysis tools to quantify trade-offs of CO₂ sequestration techniques; Led 5 research projects; Contributed to grant proposals; Mentored 2 PhD and 1 M.Sc. Funded by Natural Sciences and Engineering Research Council of Canada (NSERC), Canada First Research Excellence Fund (CFREF), and industrial partners.

TEACHING EXPERIENCE

Sole Instructor, University of Calgary

FA2022 Quantitative Engineering Foundations I

W2023 Quantitative Engineering Foundations II

Teaching Assistant, University of Calgary

FA2022 Reservoir Simulation

W2022 Life Cycle Assessment

FA2021 Reservoir Simulation

Teaching Assistant, Penn State University

SP2019	Risk Management in Energy Market
SU2018	Introduction to the Electricity Market
FA2018	Corporate Finance in Energy Market
FA2018	Fluid Mechanics
SP2019	Wind & Hydrology Power System
FA2017	Corporate Finance in Energy Market
FA2017	Fluid Mechanics

RESEARCH CONTRIBUTIONS

Peer-Reviewed Journal Articles (T=19; First-authored/Correspondence = 11)

Note: * denotes corresponding authors, underlined names are mentees

- 2025 [\[J19\]](#) **Ma, H.**, Nabil, S. K., An, K.*, Nishikawa, E., Kibria, M. G., Bergerson, J. A., Chen, Z., McCoy, S. T.*, (2025). One- or two-step processes: which have a lower GHG impact for production of synthetic aviation fuel via indirect CO₂ electrolysis? *Carbon Capture Science & Technology*. 17:100477
- [\[J18\]](#) **Ma, H.**, Lu, Y.*, Kou, Z., Xue, Z.*, Zhang, K., Deng, P., Di, C., Zhu, Y., Wang, H., Chen, Z., (2025). Cybersecurity and Cyber-Attacks in the Growing Natural Gas and Hydrogen Industry: A Systematic Review of Challenges and Opportunities. *Gas Science and Engineering*. 143: 205744.
- [\[J17\]](#) Gao, X., Zhang, K.*, Ji, D., **Ma, H.***, Meng, Y., Jiang, S., Tian, W., Tang, Y., He, L., Liu, C., Lau, H. C., Chen, Z., (2025). A proposed layout of CO₂ capture utilization and storage for coal-fired power plants in China. *Fuel*. 401: 135723.
- [\[J16\]](#) Di, C., Wei, Y., **Ma, H.**, Deng, P., Liu, B., Wang, K., Chen, Z.* (2025). Accelerating geological gas storage simulations: A novel and efficient gases–brine phase-equilibrium calculation algorithm. *Renewable Energy*. 252: 123545
- [\[J15\]](#) Xue, Z., Wei, Z., **Ma, H.**, Sun, Z., Lu, C., Chen, Z.* (2025). Exploring the role of fracture networks in enhanced geothermal systems: Insights from integrated thermal-hydraulic-mechanical-chemical and wellbore dynamics simulations. *Renewable and Sustainable Energy Reviews*. 215: 115636
- [\[J14\]](#) Deng, P., **Ma, H.**, Song, J., Peng, X., Zhu, S., Xue, D., Jiang, L., Chen, Z.*, (2025). Carbon dioxide as cushion gas for large-scale underground hydrogen storage: Mechanisms and implications. *Applied Energy*. 388:125622
- [\[J13\]](#) **Ma, H.***, McCoy, S. T., Chen, Z.*, (2025). Development and comparison of reduced-order models for CO₂-enhanced oil recovery predictions, *Energy*, 320: 135313

- [\[J12\]](#) **Ma, H.***, Yang, Y., Xue, Z., Clarkson, C. R., Chen, Z.*, (2025). Transitioning from emission source to sink: Economic and environmental trade-offs for CO₂-enhanced coalbed methane recovery of Mannville coal Canada, *Science of the Total Environment*, 966: 178721
- 2024 [\[J11\]](#) **Xue, Z., Zhang, Y., Ma, H.***, Lu, Y., Zhang, K., Wei, Y., Wang, M., Wu, W., Chai, M., Sun, Z., Chen, Z.*, (2024). A combined neural network forecasting approach for CO₂ enhanced shale gas recovery. *SPE Journal*, 29 (08): 4459–4470. Paper Number: SPE-219774-PA
- [\[J10\]](#) **Xue, Z., Ma, H.***, Sun, Z., Lu, C., Chen, Z.*, (2024). Technical analysis of a novel economically mixed CO₂-water enhanced geothermal system. *Journal of Cleaner Production*, 448: 141749.
- [\[J9\]](#) **Xue, Z., Ma, H.**, Wei, Y., Wu, W., Sun, Z., Chai, M., Zhang, C., & Chen, Z., (2024). Integrated technological and economic feasibility comparisons of enhanced geothermal systems associated with carbon storage. *Applied Energy*, 359: 122757.
- [\[J8\]](#) Yang, Y., Liu, S.*, **Ma, H.**, (2024). Impact of unrecovered gas reserve on methane emissions from abandoned shale gas wells. *Science of the Total Environment*, 913: 169750.
- 2023 [\[J7\]](#) **Deng, P.**, Chen, Z.*, Peng, X., Wang, J., Zhu, S., **Ma, H.**, Wu, Z., (2023). Optimized lower pressure limit for condensate underground gas storage using a dynamic pseudo-component model. *Energy*, 285: 129505.
- [\[J6\]](#) **Xue, Z.**, Zhang, K., Zhang, C., **Ma, H.**, Chen, Z.*, (2023). Comparative data-driven enhanced geothermal systems forecasting models: a case study of Qiabuqia field in China. *Energy*, 280: 128255.
- [\[J5\]](#) **Xue, Z.**, Yao, S., **Ma, H.**, Zhang, C., Zhang, K., Chen, Z.*, (2023). Thermo-economic optimization of an enhanced geothermal system (EGS) based on machine learning and differential evolution algorithms. *Fuel*, 340: 127569.
- [\[J4\]](#) **Ma, H.**, Sun, Z., Xue, Z., Zhang, C., Chen, Z.*, (2023). A systemic review of hydrogen supply chain in energy transition. *Frontiers in Energy*, 17: 102-122.
- 2022 [\[J3\]](#) **Ma, H.**, Yang, Y.*, **Zhang, Y.**, Li, Z., Zhang, K., Xue, Z., Zhan J., Chen, Z.*, (2022). Optimized schemes of enhanced shale gas recovery by CO₂-N₂ mixtures associated with CO₂ sequestration. *Energy Conversion and Management*, 268: 116062.
- [\[J2\]](#) **Ma, H.**, Yang, Y.*, Chen, Z.*, (2022). Numerical simulation of bitumen recovery via supercritical water injection with in-situ upgrading. *Fuel*, 313: 122708.
- 2021 [\[J1\]](#) **Ma, H.**, Chen, S., Xue, D., Chen, Y., Chen, Z.*, (2021). Outlook for the Coal Industry and New Coal Production Technologies. *Advances in Geo-Energy Research*, 5(2): 119-120.

Conference Proceedings (T=18)

- 2025 [C18] Ravikumar A. P., **Ma, H.**, Zhu Y., Long W., Masnadi M., Heath G., Balcombe P., Satellite Data Reveal Global Super-Emitting Liquefied Natural Gas Supply Chains, *American Geophysical Union Annual Meeting (AGU25)*, New Orleans, LA USA, December 15-19
- [C17] **Ma, H.**, Holubynak E., Modeling cost and emissions of natural hydrogen production, *American Geophysical Union Annual Meeting (AGU25)*, New Orleans, LA USA, December 15-19
- [C16] **Ma, H.**, Super-emitting Liquefied Natural Gas Supply Chains, *EEMDL Annual Event 2025*, Austin, TX, USA, October 21-23
- [C15] **Ma, H.**, Zhu Y., Long W., Masnadi M., Heath G., Balcombe P., Ravikumar A. P., Measurement-informed, geospatial, life cycle greenhouse gas emissions of global liquefied natural gas supply chains, *ACS Spring 2025*, San Diego, CA, USA, March 23-27.
- 2024 [C14] Xue, Z., **Ma, H.**, Chen, Z., Combining Geothermal Energy Recovery and Carbon Sequestration in EGS Using Different Working Fluids, *American Geophysical Union Annual Meeting (AGU24)*, Washington, D.C., USA, December 9-13
- [C13] **Ma, H.**, Xue, Z., Yang, Y., Chen, Z., System Assessment of CO₂-Enhanced Coalbed Methane Production in Mannville Canada, *American Geophysical Union Annual Meeting (AGU24)*, Washington, D.C., USA, December 9-13
- [C12] **Ma, H.**, Tullos, E., Lyon, D., Gupta, S., Ravikumar, A. P., Discrepancy in Intermittency Accounting Methods of Methane Emissions from Aerial-Based Surveys of Oil and Gas Facilities, *American Geophysical Union Annual Meeting (AGU24)*, Washington, D.C., USA, December 9-13
- [C11] **Ma, H.**, Xue, Z., Yang, Y., Chen, Z., Environmental Cost of large-scale underground hydrogen storage in Saline Aquifers, *American Geophysical Union Annual Meeting (AGU24)*, Washington, D.C., USA, December 9-13
- [C10] **Ma, H.**, Zhu, Y., Long, W., Masnadi, M., Heath, G., Balcombe, P. Ravikumar, A. P., Measurement-informed, Geospatial, Life-cycle Greenhouse Gas emissions of Global Liquefied Natural Gas Supply Chains. *Energy Emissions Modeling & Data Lab 2024 Annual Event*, Austin, USA, October 22-23
- [C9] **Ma, H.**, Chen, Z., & McCoy, S. T. Motivating CO₂-Enhanced Oil Recovery to Geologic Carbon Storage by Integrating Techno-Economic and Life-Cycle Assessments. *17th International Conference on Greenhouse Gas Control Technologies (GHGT-17)*, Calgary, Canada, October 20-24
- [C8] **Ma, H.**, An, K., Nabil, S. K., Kibria, M. G., & McCoy, S. T. Uncertainty Analysis on CO₂-Ethanol-Synthetic Aviation Fuel Pathways. *17th International Conference on Greenhouse Gas Control Technologies (GHGT-17)*, Calgary, Canada, October 20-24

- [C7] Xue, Z., **Ma, H.**, Chen, Z., Integration of geothermal energy recovery and carbon sequestration of an EGS by CO₂-water mixtures, *SPE Western Regional Meeting*, Palo Alto, CA, USA, April 16-18
- 2023 [C6] **Ma, H.**, Yang, Y., Xue, Z., Chen, Z., Techno-economic feasibility of CO₂ storage associated with enhanced coalbed methane production: a case study of Manville coal. *Canadian Chemical Engineering Conference (CSCHE 2023)*, Calgary, Alberta, Canada, October 29 – November 1
- [C5] Song, Y., Song, Z., Meng, Y., **Ma, H.**, Chen, Z., Zhang, Y., Zhang, L., Feng, D. Effect of CO₂ dissolution on fluid flow and phase behavior in oil-water systems in shale reservoirs. URTEC-3860690-MS. *SPE/AAPG/SEG Unconventional Resources Technology Conference (URTeC)*, Denver, CO, USA, June 13-15
- [C4] **Ma, H.**, Yang, Y., Xue, Z., Chen, Z.*, Comparative machine learning frameworks for forecasting CO₂/CH₄ competitive adsorption ratio in shale. SPE-212994-MS, *SPE Western Regional Meeting*, Anchorage, AK, USA, May 22-25
- [C3] Xue, Z., **Ma, H.**, Chen, Z.*, Numerical investigation of energy production from an enhanced geothermal system associated with CO₂ geological sequestration. SPE-213041-MS, *SPE Western Regional Meeting*, Anchorage, AK, USA, May 22-25
- 2022 [C2] **Ma, H.**, McCoy, S. T.*, Chen, Z.*, Economic and engineering co-optimization of CO₂ storage and oil recovery, *16th Greenhouse Gas Control Technologies Conference (GHGT-16)*, Lyon, France, October 23-27
- [C1] Liu, H.*, Cui, L., Liu, Z., Zhou, C., Yao, M., **Ma, H.**, Liu, Q. Using machine learning method to optimize well stimulation design in heterogeneous naturally fractured tight reservoirs. SPE-208971-MS, *SPE Canadian Energy Technology Conference*, Calgary, Alberta, Canada, March 16-17

Preprints & In-Progress (T=11)

- [W11] Di, C., Tian, F., Zhao, L., Deng, P., **Ma, H.**, Liu, B., Peng, L., Chen, Z.*, Cooling Effects on Capillary Sealing in CO₂-Plume Geothermal Systems: Capillary Pressure Modeling and Leakage Assessment (in Revision, *Environmental Science & Technology*)
- [W10] Gupta, S., Tullos, E., Lyon, D., **Ma, H.**, Ravikumar, A. P.*, Evaluating Practical Detection Limits for Aerial Methane Technologies Using Large Scale Field Measurements (under review, *Environmental Science & Technology*, [ChemRxiv preprint](#))
- [W9] **Ma, H.**, Zhu, Y., Long, W., Masnadi, M. S., Heath, G. A., Balcombe, P., George, F., Roman-White, S., Ravikumar, A. P.*, Probabilistic, Measurement-Informed Greenhouse Gas Emissions from Global Liquefied Natural Gas Supply Chains Reveal Wide Country-Level Variation (under review, *Science*, [ChemRxiv preprint](#))
- [W8] Long, W., Jing, L., Liu, Z., Jabber, M., Chen, Z., Moya, D., Ren, B., **Ma, H.**, Littlefield, J., Ramadan, F., Qahtani, A., Guan, D., Bi, X., Bergerson, J. A., Ravikumar, A. P., Houjeiri, H.,

- Masnadi, M. S.*, Global carbon intensity of LNG value chain amid intensifying energy security and climate trade-offs (under review, *Nature*, [Preprint](#))
- [W7] Xue, Z., Bi, J., **Ma, H.**, Sun, Z., Chen, Z.*, A Robust Physics-Constrained Neural Operator Framework for Efficient Geothermal Resource Development (under review, *Nature Communications*)
- [W6] **Ma, H.***, Yang, Y., Zhai, H., Nye, C., Holubnyak, E., Long, W., Ravikumar, A. P., Masnadi, M. S., Chen, Z., Holistic System Analysis Reveals Business Model Gaps for Enabling Large-Scale Underground Hydrogen Storage, (to be submitted to *Nature Energy*, March 2026)
- [W5] Long, W., **Ma, H.***, Ravikumar, A. P., Masnadi, M. S., Geopolitical Tensions in Middle East Can Drive-up Global Greenhouse Gas Emissions of the Oil and Gas Trading Market, (to be submitted to *ES&T Letter*, March 2026)
- [W4] **Ma, H.**, McCoy, S. T.*, Chen, Z.*, Economic and environmental trade-offs of CO₂ enhanced oil recovery associated with carbon sequestration: an integrated techno-economic and life-cycle assessment framework of Weyburn oilfield, (to be submitted to *Environmental Science & Technology*, June 2026).
- [W3] **Ma, H.**, Tullos, E., Lyon, D., Gupta, S., Ravikumar, A. P.*, Reconciling the Impact of Intermittency of Aerial-based Methane Measurement Surveys, (to be submitted to *Environmental Science & Technology* June 2026)
- [W2] Buckhold, S., **Ma, H.***, Holubnyak, E.*, Geospatial Cost and Emission Analysis of Electro-Sustainable Aviation Fuel (eSAF) by Fischer-Tropsch in Wyoming, (in progress)
- [W1] Cincotta, R. E., **Ma, H.***, Holubnyak, E.*, Harmonized Techno-Environmental Assessment of Hydrogen Production via Methane Pyrolysis (in progress)

Invited Talks

- 2022 Unconventional Resources Research Seminar Series, China University of Petroleum (East China), Virtual, November 23.
- 2022 CO₂ Capture and Utilization Workshop, jointly University of Calgary and University of Toronto, October 13.
- 2022 Multi-group research seminars, jointly ETH Zürich, University of Pennsylvania, Delft University of Technology, and University of Calgary, Virtual, August 15.

LEADERSHIP AND PROFESSIONAL SERVICE

Technical Committees

- 2025 – Board of Directors, Research and Development Section, *Society of Petroleum Engineers*
- 2025 – Board of Directors, Methane Technical Section, *Society of Petroleum Engineers*

- 2026 Disciplinary of Energy Management, *SPE Annual Technical Conference and Exhibition (ATCE)*, Houston, USA, October 21–23, 2026.
- 2025 Disciplinary of Energy Management, *SPE Annual Technical Conference and Exhibition (ATCE)*, Houston, USA, October 20–22, 2025.

Conference Session Chairs

- 2025 **Ma, H.**, Long, W., Ravikumar, A. P., Masnadi, M. S., Advances in Translating Measured Methane Emissions into Greenhouse Gas Inventories for the Oil and Gas Supply Chains, *AGU Annual Meeting (AGU25)*, New Orleans, LA, USA, December 15-19.
- Ma, H.**, Biniwale, S., Risk Management and Sustainable Solutions in Energy Sector: Bridging Technology, Business, and Resilience, *SPE Annual Technical Conference and Exhibition (ATCE)*, Houston, USA, October 22.
- 2024 **Ma, H.**, Ravikumar, A., Sherwin, E., Johnson, M., Advances in Methane Emissions Reconciliation and Uncertainty Estimation Across Oil and Gas Supply Chains, *AGU Annual Meeting (AGU24)*, Washington D.C., USA, December 9-13.
- Liu, S., Neil, C., **Ma, H.**, Principles of Geologic Storage: Geochemical Interactions, Geomechanics, Hydrodynamics, and Caprock Integrity, *AGU Annual Meeting (AGU24)*, Washington D.C., USA, December 9-13.

To Academia

- Reviewer, Journals (~150 to date): *Nature Communications, Renewable & Sustainable Energy Reviews, Applied Energy, Energy Conversion and Management, Energy, Energy Strategy Reviews, Energy Reports, Geoenery Science and Engineering; International Journal of Greenhouse Gas Control*
- Guest Editor, Special Issue on “Geologic Hydrogen Resources: Sustainable Production, Utilization, and Storage for a Net-Zero Economy”, *RSC Environmental Science: Advances*, 2025
- Guest Editor, Special Issue on “Gas Geo-storage and Unconventional Energy Sources Recovery”, *International Journal of Coal Science & Technology*, 2024

To University

- Mentor, International Student Mentorship Program, University of Calgary, 2023
- Sponsor Representative, CPE Grad Student Association, University of Calgary, 2021-2022
- Vice-President, Chinese Association of EMS College, Penn State University, 2017-2018

To Community

- Judge, 2024 SPE Student Chapter Awards 2024
- Associate Director, Chinese-Canada Petroleum Society, 2023-2024

Co-Chairperson, SPE North America Students Symposium, 2023

Team Lead, SPE Calgary Section Growth & Development Group, 2022-2023

Volunteer, Startup Village Competition for 2023 ATCE, 2023

CERTIFICATES

University Teaching and Learning, Taylor Institute, University of Calgary, 2022

IBM Artificial Intelligence Engineering, Coursera, 2021

PROFESSIONAL ASSOCIATIONS

Society of Petroleum Engineers (SPE)

American Chemical Society (ACS)

American Geophysical Union (AGU)