

Isis Fukai, Curriculum Vitae

Email: ifukai@vols.utk.edu

Knoxville, TN, 37996

Education

- 2019 – present PhD Student, Energy Science and Engineering, University of Tennessee (GPA: 4.0)
2010 – 2013 M.S., Geology, conc. Metamorphic Petrology, Louisiana State University (GPA: 4.0)
2005 – 2009 B.A., Geology, Oberlin College (GPA: 3.6)

Fellowships and Professional Experience

- 2014 – 2019 *Geoscience Researcher*, Battelle, Energy Division, Columbus OH.
2013 – 2014 *Research Fellow*, Oak Ridge Institute for Science and Education, National Energy Technology Laboratory, Pittsburgh, PA.
2013 *Mickey Leland Energy Fellow*, National Energy Technology Laboratory, Pittsburgh, PA.

Research and Project Experience

- 2019 – present *Consortium for Monitoring Technology and Verification* (Director: Dr Sara Pozzi; Co-Principal Investigator: Dr. Terry Hazen; Client: U.S. Dept. of Energy National Nuclear Security Administration) **Role: Graduate Research Assistant.** Evaluation of microbial-geochemical systems in radionuclide-contaminated environments with potential to aid in monitoring of undeclared nuclear fuel cycle activities and proliferation effluent.
- 2019 – 2021 *Protecting and Advancing Water, Environment and Sustainability (PAWES) Engineering Research Center (ERC) Planning Grant* (Principal Investigator: Dr. Terry Hazen; Client: National Science Foundation) **Role: Graduate Research Assistant.** Helped develop and maintain website for the proposed PAWES Engineering Research Center (ERC). Designed and developed outreach video introducing ERC goals, activities, and resources to focus groups from STEM-underrepresented communities.
- 2017 – 2019 *Integrated Mid-Continent Stacked Carbon Storage Hub, Phases I, II* (Principal Investigator: Dr. Andrew Duguid; Client: U.S. Dept. of Energy) **Role: Deputy Principal Investigator and Task Lead.** Aided in the development and oversight of research scope and budget to evaluate the feasibility of commercial CO₂ capture and storage (CCS) for climate change mitigation in the U.S. Mid-Continent region.
- 2016 – 2019 *Mid-Atlantic Offshore CO₂ Storage Resource Assessment* (Principal Investigator: Dr. Neeraj Gupta; Client: U.S. Dept. of Energy) **Role: Deputy Principal Investigator and Task Lead.** Assisted with management of technical scope and task lead in assessment of offshore geologic CO₂ storage for climate change mitigation in the Mid-Atlantic U.S. coastal region.
- 2014 – 2018 *CO₂ Utilization for Enhanced Oil Recovery and Geologic Storage in Ohio, Phases I, II* (Principal Investigator: Dr. Srikanta Mishra; Client: Ohio Coal Development Office) **Role: Task Lead.** Served as technical lead for source-sink analysis, regulatory and policy assessment, discounted cash flow analysis, and performance-cost modeling of power plant CO₂ capture and storage via CO₂-enhanced oil recovery.
- 2014 – 2017 *CO₂ Storage Resource Assessment in Cambrian-Ordovician Formations in Eastern Ohio* (Principal Investigator: Dr. Neeraj Gupta; Client: Ohio Coal Development Office) **Role: Task Co-Lead.** Field supervisor for logging and coring operations; responsible for lithofacies models and petrophysical analysis of geologic formations suitable for long-term containment of anthropogenic CO₂ emissions.
-

Isis Fukai, Curriculum Vitae

Email: ifukai@vols.utk.edu

Knoxville, TN, 37996

Research and Project Experience (cont.)

- 2014 – 2015 *Development of Brine Disposal Framework in the Northern Appalachian Basin* (Principal Investigator: Mr. Joel Sminchak; Client: Research Partnership to Secure Energy for America) **Role: Research Associate.** Helped to develop outreach materials and industry guidance on best practices for safe operation of EPA Underground Injection Control Class II brine disposal wells in the Appalachian basin.
- 2013 – 2014 *Experimental Characterization of CO₂ Storage Mechanisms in Clays and Organic-Rich Shales* (Principal Investigator: Dr. Angela Goodman; U.S. Dept. of Energy) **Role: Post-Master's Research Fellow.** Helped to design and conduct experimental analyses of CO₂ sorption on clay standards and shale samples to evaluate the mechanisms and feasibility of anthropogenic CO₂ storage in methane-bearing shales.
- 2011 – 2013 *Metamorphic and Geochemical Signatures of Calc-Silicate Gneisses from the Sawtooth Mts, ID* (Advisor: Dr. Barbara Dutrow; Louisiana State University) **Role: Graduate Student (MS).** Development and execution of research scope, budget to establish physical and chemical constraints on crustal evolution of the North American Craton.
- 2008 – 2009 *Metamorphic phase equilibria of amphibolites from the Adirondack Mts, New York.* (Advisor: Dr. Frederick Page, Oberlin College) **Role: Undergraduate Student.** Responsible for field characterization and laboratory analysis of equilibrium mineral assemblages to characterize pressure and temperature conditions of amphibolites in the Adirondack Mountains

Student and Professional Society Memberships

- 2020 – present *Senator*, Graduate Student Senate
- Equity and Diversity Committee (2020-2021)
 - Legislative and Steering Committee (2021-2022)
- 2017 – present *Committee Member*, Society of Petroleum Engineers (SPE)
- Carbon Capture Utilization and Storage Technical Section
 - Storage Resources Management System (SRMS)
- 2020 – 2022 *Member*, Bredesen Center Student Advisory Council

Volunteer and Outreach Activities

- 2022 – present *Peer Mentor*, Bredesen Center Peer Mentorship Program
- 2016 – present *Peer-Reviewer*, International Journal of Greenhouse Gas Control, Environmental Science and Technology, Greenhouse Gases: Science and Technology; Journal of CO₂ Utilization
- 2022 *Graduate Participant*, Community Engagement Academy Summer Intensive, June 6-7th; University of Tennessee Office of Community Engagement and Outreach, Knoxville, TN
- 2018 *Presenter and Panelist*, American Association of University Women's (AAUW) Tech Savvy Conference, April 21st, 2018; Gaylord, MI
- 2015 – 2017 *Science Fair Judge*, State and Local Science Fair; Columbus, OH
- 2005 – 2009 *Student Volunteer*, Bonner Program for Community-Engaged Learning, Teaching, and Research, Oberlin College; Oberlin, OH

Isis Fukai, Curriculum Vitae

Email: ifukai@vols.utk.edu

Knoxville, TN, 37996

Academic Awards and Scholarships

- 2012 Southeast Geophysical Society Student Scholarship
- 2011 Geological Society of America Graduate Student Research Grant
- 2011 The New Orleans Geological Society Graduate Student Scholarship
- 2009 High Honors, Oberlin College Geosciences Degree Honors Program
- 2009 Oberlin College Outstanding Geology Senior Award
- 2008 The Rick Black and Robyn Silverblatt-Black Geology Student Research Award

Field Experience

- 2014 – 2019 *Geoscientist*, wireline-logging and coring operations; Appalachian basin, Michigan basin, Nebraska, US
- 2011 *Graduate Research Assistant*, high-resolution sampling and mapping; Sawtooth Mountains, Idaho, US
- 2009 *Undergraduate Participant*, 5-week intensive geologic field methods course, Miami University Geology Field Station; Rocky Mountains, US, Canada

Laboratory Experience

DNA extraction, polymerase chain reaction (PCR), acridine orange direct count, Agilent Bioanalyzer, Qubit fluorometry, NanoDrop spectrophotometry, fluorescence microscopy, polarized light microscopy (petrographic), transmitted light microscopy, scanning-electron microscopy, X-ray diffractometry, X-ray fluorescence spectroscopy, Fourier-Transform infrared spectroscopy, electron-microprobe analysis, inductively-coupled plasma mass spectrometry

Teaching Experience

- 2010 – 2012 *Graduate Teaching Assistant*, Igneous and Metamorphic Petrology, Mineralogy, Physical Geology; Louisiana State University, Baton Rouge, LA
- 2008 – 2009 *Undergraduate Teaching Assistant*, Physical Geology; Oberlin College, Oberlin, OH
- 2005 – 2007 *Academic Tutor*, America Counts, America Reads; Oberlin Public Schools, Oberlin, OH

Software and Computational Experience

Mothur, QIIME, Petra, ArcGIS, GoldenSoftware suite, Perple_X, Thermo-Calc, GoldSim, CO₂-Prophet, IECM, Seisworks, GeoMappApp, Adobe Illustrator, Python programming, Microsoft Office

Select Conference Presentations and Invited Talks

Fukai, I., Hazen, T.C., Ash, K. 2022. *Microbial Signatures for Monitoring Nuclear Proliferation*. DOE-NNSA Defense Nuclear Nonproliferation Research & Development University Program Review Meeting, Ann Arbor, MI, June 9th, 2022.

Fukai, I., Hazen, T.C. 2021. *Evaluation of Microbial Biosensors with Applications in Nuclear Arms Nonproliferation*. World Microbe Forum, virtual, June 20-24th, 2021.

Fukai, I., Hazen, T.C., Duff, M., Dulai, H., Arkin, A., Alm, E. 2020. *Biosensors for Detecting Nuclear Activity in the Environment*. Consortium for Monitoring, Technology, and Verification 2020 Student Virtual Research Symposium, June 11th, 2020.

Select Conference Presentations and Invited Talks (cont.)

Fukai, I., Hazen, T.C., Duff, M., Dulai, H., Arkin, A., Alm, E. 2020. *Evaluating Time Signatures of Nuclear Contamination Recorded in Plants and Microbial Biosensors*. Consortium for Monitoring, Technology, and Verification 2020 Workshop, Ann Arbor MI, March 10-11th, 2020.

Fukai, I., Cumming, L., Gupta, N. *Mid-Atlantic Offshore Carbon Storage Resource Calculations*. Joint Offshore Stakeholder Workshop and Midwest Regional Carbon Sequestration Partnership Annual Partner's Meeting. Annapolis, MD, November 13-15, 2018.

Fukai, I., Gupta, N., Hawkins, J., Haagsma, A., Ravi Ganesh, P., Kelley, M., Conner, A., Main, J., Scharenberg, M., Larsen, G., Raziperchikolaee, S. *Regional CO₂ Storage Resource and Containment Assessment of Cambrian and Ordovician Formations in Eastern Ohio*. 14th International Conference of Greenhouse Gas Control Technologies, Melbourne, Australia. October 21-26, 2018

Fukai, I., and Duguid, A. *Introduction to Carbon Capture Utilization and Storage and the Integrated Midcontinent Stacked Carbon Storage Hub Project*. Geology and Geological Engineering Department Seminar Series, South Dakota School of Mines and Technology, Rapid City, SD. Sept. 28, 2018.

Fukai, I., Glier, J., Mishra, S. *Techno-Economic Analysis of CO₂ Capture and Utilization for Enhanced Oil Recovery and Associated Geological Storage in Ohio's Depleted Oilfields*. 2018 Carbon Capture Utilization and Storage Conference, Nashville, TN. March 19-22, 2018.

Fukai, I., Ravi Ganesh, P., Scharenberg, M., Main, J., Gupta, N. *CO₂ Storage Resource and Reservoir Feasibility Assessment of Deep Saline Cambrian-Ordovician Formations in Eastern Ohio*. Carbon Management Technology Conference, Houston TX. July 17 – 20, 2017.

Fukai, I., Haagsma, A., Scharenberg, M., Ravi Ganesh, P., Main, J. *CO₂ Storage Resource Estimates for Cambrian-Ordovician Formations in Eastern Ohio*. American Association of Petroleum Geologists Eastern Section Annual Meeting, Lexington, KY. September 25 - 27, 2016.

Fukai, I., Dutrow, B.L., Henry, D.J., Mueller, P.A., and Foster, D.A. 2012. *Metamorphic and geochemical signatures within calc-silicate gneisses of the Sawtooth Metamorphic Complex, ID: Implications for western North American crustal evolution*. American Geophysical Union Annual Fall Meeting, San Francisco, CA. December 3rd – 7th, 2012.

Publications

Sylvain Thibeau, S., George Koperina, G., Roland Okwen, R., Thakur, S., Riestenberg, D., Meckel, T., **Fukai, I.**, Whitaker, S., Tucker, O., and Frailey S.M. "Estimating Storable Quantities." *Guidelines for Applications of the CO₂ Storage Resources Management System*, v 1.01. Society of Petroleum Engineers, 2022, pp. 39-61. ISBN 978-1-61399-878-6.

Roueché, J., Johnson, P., **Fukai, I.** "Data Used to Characterize a Geologic Formation for a Storage Project." *Guidelines for Applications of the CO₂ Storage Resources Management System*, v 1.01. Society of Petroleum Engineers, 2022, pp. 64-67. ISBN 978-1-61399-878-6.

Haagsma, A., **Fukai, I.**, Howat, E., Schuetter, J., Conner, A., Grove, B., Mishra, S., Gupta, N. "Well Logging in Fractured Media". *CO₂ Injection in the Network of Carbonate Fractures*. Edited by de Dios, J.C., Mishra, S., Poletto, F., Ramos, A. 1st Edition. Springer International Publishing, 2021, pp. 27-68. <https://link.springer.com/chapter/10.1007/978-3-030-62986-1_2>

Fukai, I., Keister, L., Ganesh P. R., Cumming, L., Fortin, W., Gupta, N. 2020. Carbon dioxide storage resource assessment of Cretaceous- and Jurassic-age sandstones in the Atlantic offshore region of the northeastern United States. *Environmental Geosciences* 27, 25-47.

<<https://doi.org/10.1306/eg.09261919016>>

Publications (cont.)

Fukai, I., Mishra, S., Scharenberg, M., Jimenez, J., Glier, J., and Peterson, R. 2019. Techno-Economic Assessment of Carbon Capture, Utilization and Storage for Coal-Fired Power Generation and CO₂-Enhanced Oil Recovery in the USA: An Ohio Case Study. *Greenhouse Gases: Science and Technology*, 1-19. <<https://doi.org/10.1002/ghg.1930>>

Sanguinito, S., Goodman, A., Tkach, M., Kutchko, B., Culp, J., Natesakhawat, S., Fazio, J., **Fukai, I.**, Crandall, D. 2018. Quantifying Dry Supercritical CO₂-Induced Changes of the Utica Shale. *Fuel*, 226, 54-64. <<https://www.sciencedirect.com/science/article/pii/S0016236118305647>>

Fukai, I., and Dutrow, B. 2017. High-grade calcareous metasediments from the Sawtooth Metamorphic Complex, Idaho, USA: evidence for passive margin strata and polymetamorphism within the Idaho batholith. *International Geology Review* 59, 753-778. <<https://www.tandfonline.com/doi/full/10.1080/00206814.2016.1278564?scroll=top&needAccess=true>>

Fukai, I., Mishra, S., Moody, M. 2016. Economic analysis of CO₂-enhanced oil recovery in Ohio: Implications for carbon capture, utilization, and storage in the Appalachian Basin region. *International Journal of Greenhouse Gas Control* 52, 357 - 377. <<https://www.sciencedirect.com/science/article/pii/S1750583616303760>>

Levin, J., **Fukai, I.**, Soeder, D., Bromhal, G., Dilmore, R., Guthrie, G., Rodosta, T., Sanguinito, S., Frailey, S., Gorecki, C., Peck, W., Goodman, A. 2016. U.S. DOE NETL methodology for estimating the prospective CO₂ storage resource of shales at the national and regional scale. *International Journal of Greenhouse Gas Control* 51, 81-94. <<https://www.sciencedirect.com/science/article/pii/S1750583616302109>>