

CHARLES J. PARADIS
University of Wisconsin-Milwaukee
Department of Geosciences
Lapham Hall, Room 348
Milwaukee, WI 53211
paradisc@uwm.edu
<https://sites.uwm.edu/paradisc/>

RESEARCH INTERESTS

- Elucidating sources and pathways of contaminants in natural and built environments
- Enhanced flushing of redox-sensitive metals and radionuclides from groundwater
- Mass discharge of anthropogenic salts from groundwater to surface water
- Field tracer experiments and numerical modeling for characterization of flow and transport

EDUCATION

- Ph.D. Geology, University of Tennessee – Knoxville (2017)
- M.S. Hydrology, University of California – Davis (2013)
- B.A. Geology, University of California – Berkeley (2007)

EMPLOYMENT

- Assistant Professor, Department of Geosciences, UW-Milwaukee (2019 to current)
- Post-doc, Earth Systems Observations, Los Alamos National Lab (2018 to 2019)
- Associate Geologist, Parsons, Boston, MA, Somerset, NJ, and Walnut Creek, CA (2007 to 2013)

RESEARCH ARTICLES

- 21) Sultana, R., M. A. Dangelmayr, C. J. Paradis & R. H. Johnson, 2024. Combining fission-track radiography and scanning electron microscopy to identify uranium host phases. *Environmental Earth Sciences* 83(2) doi:10.1007/s12665-023-11373-5.
- 20) Dangelmayr, M., C. Meurer, A. Tigar, R. H. Johnson & C. Paradis, 2023. Desorption and Co-Dissolution of Uranium-Bearing Solids During Alkalinity-Enhanced Flushing of Contaminated Sediments. *Ground Water Monitoring and Remediation* 43(2):61-76 doi:10.1111/gwmr.12573.
- 19) Johnson, R. H., R. D. Kent, A. D. Tigar, C. D. Richardson, C. J. Paradis & P. W. Reimus, 2023a. Cross-Hole and Vadose-Zone Infiltration Tracer Test Analyses to Determine Aquifer Reactive Transport Parameters at a Former Uranium Mill Site (Grand Junction, Colorado). *Minerals* 13(7) doi:10.3390/min13070947.
- 18) Johnson, R. H., C. J. Paradis, R. D. Kent, A. D. Tigar & P. W. Reimus, 2023b. Single-Well Push-Pull Tracer Test Analyses to Determine Aquifer Reactive Transport Parameters at a Former Uranium Mill Site (Grand Junction, Colorado). *Minerals* 13(2) doi:10.3390/min13020228.
- 17) Paradis, C., N. Van Ee, K. Hoss, C. Meurer, A. Tigar, P. Reimus & R. Johnson, 2022a. Single-Well Injection-Drift Test to Estimate Groundwater Velocity. *Groundwater* 60(4):565-570 doi:10.1111/gwat.13184.
- 16) Paradis, C. J., K. N. Hoss, C. E. Meurer, J. L. Hatami, M. A. Dangelmayr, A. D. Tigar & R. H. Johnson, 2022b. Elucidating mobilization mechanisms of uranium during recharge of river water to contaminated groundwater. *Journal of Contaminant Hydrology* 251 doi:10.1016/j.jconhyd.2022.104076.
- 15) Paradis, C. J., J. I. Miller, J. W. Moon, S. J. Spencer, L. M. Lui, J. D. Van Nostrand, D. L. Ning, A. D. Steen, L. D. McKay, A. P. Arkin, J. Z. Zhou, E. J. Alm & T. C. Hazen, 2022c. Sustained Ability of a Natural Microbial Community to Remove Nitrate from Groundwater. *Groundwater* 60(1):99-111 doi:10.1111/gwat.13132.

RESEARCH ARTICLES

- 14) Passante, E. K., L. E. Dechant, C. J. Paradis & S. L. McLellan, 2022. Halophilic bacteria in a Lake Michigan drainage basin as potential biological indicators of chloride-impacted freshwaters. *Science of the Total Environment* 846 doi:10.1016/j.scitotenv.2022.157458.
- 13) Moon, J. W., C. J. Paradis, D. C. Joyner, F. von Netzer, E. L. Majumder, E. R. Dixon, M. Podar, X. X. Ge, P. J. Walian, H. J. Smith, X. Q. Wu, G. M. Zane, K. F. Walker, M. P. Thorgersen, F. L. Poole, L. M. Lui, B. G. Adams, K. B. De León, S. S. Brewer, D. E. Williams, K. A. Lowe, M. Rodriguez, T. L. Mehlhorn, S. M. Pfiffner, R. Chakraborty, A. P. Arkin, J. D. Wall, M. W. Fields, M. W. W. Adams, D. A. Stahl, D. A. Elias & T. C. Hazen, 2020. Characterization of subsurface media from locations up- and down-gradient of a uranium-contaminated aquifer. *Chemosphere* 255 doi:10.1016/j.chemosphere.2020.126951.
- 12) Paradis, C. J., R. H. Johnson, A. D. Tigar, K. B. Sauer, O. C. Marina & P. W. Reimus, 2020. Field experiments of surface water to groundwater recharge to characterize the mobility of uranium and vanadium at a former mill tailing site. *Journal of Contaminant Hydrology* 229 doi:10.1016/j.jconhyd.2019.103581.
- 11) Buscheck, T., D. Mackay, C. Paradis, R. Schmidt & N. de Sieyes, 2019. Enhancing Microbial Sulfate Reduction of Hydrocarbons in Groundwater Using Permeable Filled Borings. *Ground Water Monitoring and Remediation* 39(3):48-60 doi:10.1111/gwmr.12346.
- 10) Ge, X. X., B. J. Vaccaro, M. P. Thorgersen, F. L. Poole, E. L. Majumder, G. M. Zane, K. B. De León, W. A. Lancaster, J. W. Moon, C. J. Paradis, F. von Netzer, D. A. Stahl, P. D. Adams, A. P. Arkin, J. D. Wall, T. C. Hazen & M. W. W. Adams, 2019. Iron- and aluminium-induced depletion of molybdenum in acidic environments impedes the nitrogen cycle. *Environmental Microbiology* 21(1):152-163 doi:10.1111/1462-2920.14435.
- 9) Paradis, C. J., E. R. Dixon, L. M. Lui, A. P. Arkin, J. C. Parker, J. D. Istok, E. Perfect, L. D. McKay & T. C. Hazen, 2019a. Improved Method for Estimating Reaction Rates During Push-Pull Tests. *Groundwater* 57(2):292-302 doi:10.1111/gwat.12770.
- 8) Paradis, C. J., L. D. McKay, E. Perfect, J. D. Istok & T. C. Hazen, 2019b. Push-pull tests for estimating effective porosity: expanded analytical solution and in situ application (vol 26, pg 381, 2018). *Hydrogeology Journal* 27(1):437-439 doi:10.1007/s10040-018-1879-y.
- 7) Mackay, D., E. Hathaway, N. de Sieyes, H. Zhang, E. Rasa, C. Paradis, R. Schmidt, J. Peng, T. Buscheck & N. Sihota, 2018a. Comparing Natural Source Zone Depletion Pathways at a Fuel Release Site. *Ground Water Monitoring and Remediation* 38(2):24-39 doi:10.1111/gwmr.12278.
- 6) Mackay, D., C. Paradis, T. Buscheck, E. Daniels, E. Hathaway, N. de Sieyes, E. Rasa, R. Schmidt & J. Peng, 2018b. Methods to Estimate Source Zone Depletion of Fuel Releases by Groundwater Flow. *Ground Water Monitoring and Remediation* 38(1):26-41 doi:10.1111/gwmr.12256.
- 5) Paradis, C. J., L. D. McKay, E. Perfect, J. D. Istok & T. C. Hazen, 2018a. Push-pull tests for estimating effective porosity: expanded analytical solution and in situ application. *Hydrogeology Journal* 26(2):381-393 doi:10.1007/s10040-017-1672-3.
- 4) Paradis, C. J., J. W. Moon, D. A. Elias, L. D. McKay & T. C. Hazen, 2018b. In situ decay of polyfluorinated benzoic acids under anaerobic conditions. *Journal of Contaminant Hydrology* 217:8-16 doi:10.1016/j.jconhyd.2018.08.009.
- 3) Paradis, C. J., S. Jagadamma, D. B. Watson, L. D. McKay, T. C. Hazen, M. Park & J. D. Istok, 2016. In situ mobility of uranium in the presence of nitrate following sulfate-reducing conditions. *Journal of Contaminant Hydrology* 187:55-64 doi:10.1016/j.jconhyd.2016.02.002.
- 2) Mahmoudi, N., M. S. Robeson, H. F. Castro, J. L. Fortney, S. M. Techtmann, D. C. Joyner, C. J. Paradis, S. M. Pfiffner & T. C. Hazen, 2015. Microbial community composition and diversity in Caspian Sea sediments. *Fems Microbiology Ecology* 91(1) doi:10.1093/femsec/fiu013.

RESEARCH ARTICLES

- 1) Smith, M. B., A. M. Rocha, C. S. Smillie, S. W. Olesen, C. Paradis, L. Y. Wu, J. H. Campbell, J. L. Fortney, T. L. Mehlhorn, K. A. Lowe, J. E. Earles, J. Phillips, S. M. Techtmann, D. C. Joyner, D. A. Elias, K. L. Bailey, R. A. Hurt, S. P. Preheim, M. C. Sanders, J. Yang, M. A. Mueller, S. Brooks, D. B. Watson, P. Zhang, Z. L. He, E. A. Dubinsky, P. D. Adams, A. P. Arkin, M. W. Fields, J. Z. Zhou, E. J. Alm & T. C. Hazen, 2015. Natural Bacterial Communities Serve as Quantitative Geochemical Biosensors. *Mbio* 6(3) doi:10.1128/mBio.00326-15.

RESEARCH FUNDING

- National Science Foundation, \$349,999 (2022-2025), Collaborative Research: Enhanced Biogeochemical Flushing of Uranium in Groundwater. Award #: 2229869. UW-Milwaukee. Principal Investigator.
- RSI EnTech LLC., Support Contractor to the Department of Energy Office of Legacy Management, \$64,767 (2022-2023), Post-doc and Graduate Student for Groundwater Tracer and Uranium Geochemistry. UW-Milwaukee. Principal Investigator.
- University of Wisconsin Milwaukee Research Foundation Bradley Catalyst Grant, \$50,000 (2021-2022), Mobile Produced Water Recycling and Resource Recovery System. UW-Milwaukee. Principal Investigator.
- University of Wisconsin System Water Resources Institute Groundwater Research & Monitoring Program, \$86,213 (2021-2023), Mass discharge of road salt via groundwater to surface waters in Southeastern Wisconsin. UW-Milwaukee. Principal Investigator.
- National Science Foundation, \$290,907 (2020-2023), GP-GO: LET'S GEO: Learning Ecosystem for Training Student Geoscientists for Employment Opportunities. Award #: 2023212. UW-Milwaukee. Co-Principal Investigator.
- United States Department of Energy Office of Legacy Management, \$268,200 (2019-2022) - Los Alamos National Laboratory Technology Transfer to Legacy Management: Tracer Testing and Isotopic Analyses in Conjunction with Field-based Experiments of Periodic Flooding Events and Subsequent Mobilization of Uranium in Groundwater. Los Alamos National Laboratory. Principal Investigator.

POST-DOCS & GRADUATE STUDENTS

- Rakiba Sultana, Ph.D., Mechanisms That Control the Fate and Transport of Uranium in Groundwater During Experimental River Flooding Events (2025 expected)
- Sophia Norenberg, M.S., Temporal Dynamics of Road Salt Transport to Urban Streams (2025 expected)
- Dr. Martin Dangelmayr, Post-doc, Biogeochemical Flushing of Uranium in Groundwater (2022 to 2023)
- Leah Dechant, M.S., Elucidating Unique Sources and Persistent Hydrologic Pathways of Chloride to Perennial Freshwater Streams: Root River Analog in a Cold-Weather Environment, <https://dc.uwm.edu/etd/3133/>, (2021 to 2023)
- Kendyl Hoss, M.S., In-situ Mobility of Uranium During Direct River Water to Groundwater Recharge Events, <https://dc.uwm.edu/etd/2900/>, (2020 to 2022)
- Cullen Meurer, M.S., Alkalinity-driven Mobilization of Uranium in One-dimensional Flow-through Columns with Natural Sediment and Groundwater, <https://dc.uwm.edu/etd/3042/>, (2020 to 2022)
- Jiyan Hatami, M.S., Sorption of Sodium 2-naphthalene Sulfonate to Organic Carbon in Natural Saturated Porous Media, <https://dc.uwm.edu/etd/3270/>, (2019 to 2021)

TEACHING EXPERIENCE

- Instructor, GEOSCI 463/463G: Physical Hydrogeology, UW-Milwaukee (2019, 2020, 2021, 2022, 2023)
- Instructor, GEOSCI 563: Hydrogeology Field Methods, UW-Milwaukee (2021, 2023)
- Instructor, GEOSCI 730: Groundwater Modeling, UW-Milwaukee (2021, 2023)
- Instructor, GEOSCI 381: Milwaukee's Water: History and Science, UW-Milwaukee (2023)
- Instructor, GEOSCI 106: Environmental Geology, UW-Milwaukee (2020, 2021)
- Instructor, GEOSCI 105: Earth, Air, Fire & Water, UW-Milwaukee (2022)
- Instructor, GEOSCI 102: Historical Geology, UW-Milwaukee (2024)

SELECT PRESENTATIONS

- Paradis, C., Biogeochemical Flushing of Uranium in Groundwater, Invited Seminar by the University of Iowa Department of Earth and Environmental Sciences, September 15, 2023
- Paradis, C., Dechant, L. Tracking Salt: From Winter Roads to Summer Streams, Invited Webinar via YouTube live stream by Wisconsin Salt Wise for Wisconsin Salt Awareness Week, January 24, 2023
- Paradis, C., Dechant, L. Impacts of Residual Road Salt from Groundwater to River Water in Southeastern Wisconsin, Invited oral presentation at Clean Rivers, Clean Lake Symposium at Milwaukee Area Technical College at Mequon Campus, Mequon, Wisconsin, September 8, 2022
- Paradis, C. Single-well Tracer Tests and the Art of Interpreting the Breakthrough Curve. Invited oral (virtual) presentation at UW-Milwaukee Water Technology Accelerator Webinar Series, May 12, 2022
- Paradis, C., Meurer, C., Hatami, J., Hoss, K., Sultana, R., Tigar, A., Johnson, R. Single-well injection-drift test to characterize groundwater velocity and dispersivity. Oral (virtual) presentation at Geological Society of America Joint North-Central/South-Central Section 55th Annual Meeting in virtual, April 19, 2021
- Paradis, C. What I did last summer: simulated flood events at a uranium-contaminated field site. Invited oral (virtual) presentation at UW-Milwaukee Department of Geography in Milwaukee, Wisconsin, USA, November 13, 2020
- Schmidt, A., Meurer, C., Sulikowski, G., Hatami, J., Paradis, C.* The Milwaukee Column: A simple, affordable, and effective apparatus for teaching and research of one-dimensional flow and transport in porous media. Oral presentation at Geological Society of America North-Central Section 54th Annual Meeting in Duluth, Minnesota, USA, May 17, 2020, *presenting author
- Paradis, C. In-situ characterization and remediation of contaminated aquifers. Invited oral presentation at Marquette University in Milwaukee, Wisconsin, USA, November 21, 2019
- Paradis, C., McKay, L. D., Hazen, T. C. Exposure history dependence of microbial mediated substrate transformation in groundwater. Poster presentation at the National Ground Water Association Groundwater Summit in Nashville, Tennessee, USA, December 4, 2017
- Paradis, C., Mahmoudi, N., Jagadamma, S., Driver, D. A., O'Dell, K. B., Schaeffer, S. M., Hazen, T. C. Response of soil respiration and microbial community structure to simulated heavy precipitation and drought in a Lexington silt loam. Poster presentation at the 16th International Symposium of Microbial Ecology in Montreal, Quebec, CA, August 23, 2016
- Paradis, C., Stokes, A., Gilley, B., Feig, A., Atchison, C. The impact of inclusion: A student's perspective of participating in a fully-accessible geoscience field course. Oral presentation at the Earth Educators' Rendezvous in Boulder, Colorado, USA, July 14, 2015
- Paradis, C., Jagadamma, S., Fortney, J., Mehlhorn, T., Parker, J., Watson, D. B., McKay, L. D., Hazen T. C. Simultaneous Push-Pull Tests to Investigate Exposure History Dependence of Electron Donor Biodegradation Rates. Oral presentation at the Annual Geological Society of America Meeting in Vancouver, British Columbia, CA, October 19, 2014
- Paradis, C., Felice, M. L., de Sieyes, N. R., Schmidt, R., Mackay, D. M. Laboratory Assessment of Enhanced Anaerobic Benzene Biodegradation. Oral presentation at the 8th International Association of Hydrological Sciences Groundwater Quality Conference in Gainesville, Florida, USA, April 24, 2013

SELECT PRESENTATIONS

- Paradis, C., Mackay, D. M., Holland, R., Schmidt, R., Mork, E., Rasa, E., Scow, K. M., Buscheck, T. Accelerated Natural Sulfate Reduction to Enhance Biodegradation of Persistent Petroleum Hydrocarbon Plumes. Oral presentation at the Battelle Conference for Chlorinated and Recalcitrant Compounds in Monterey, California, USA, May 21, 2012

SERVICE

- National Oceanic and Atmospheric Administration Sea Grant Proposal Reviewer (2023)
- Technical Advisory Committee Member, Regional Chloride Impact Study, SEWRPC (2023)
- Faculty Search Committee Member, Biology Department, UW-Milwaukee (2023)
- National Science Foundation Grant Proposal Reviewer (2023 to current)
- United States Department of Energy Grant Proposal Reviewer (2023)
- Advisory Committee Member, Conservation and Environmental Science, UW-Milwaukee (2023 to current)
- Field Station Committee Member, UW-Milwaukee (2021 to current)
- Colloquium Committee Chair, Geosciences Department, UW-Milwaukee (2019 to current)
- Session Chair, Field Tracer Studies for Aquifer Characterization, Annual GSA Meeting, Phoenix (2019)
- Peer Reviewer for: Groundwater, Hydrogeology Journal, Journal of Hydrology, Groundwater Monitoring & Remediation, Journal of Contaminant Hydrology, Environmental Processes (2019 to current)

UW-MILWAUKEE DIGITAL COMMONS

Spatial Footprint of Uranium Above Water Table

Author: Jena Choi

Publication: UWM Undergraduate Research Symposium

Date: 04/2023

Assessing Methods for Analyzing Total Dissolved Solids: Looking into Water Samples from the Root River in Racine County, WI

Author: Anna Sniadach

Publication: UWM Undergraduate Research Symposium

Date: 04/2023

The Milwaukee Column: A Simple Column Apparatus for Teaching Groundwater Flow and Contaminant Transport

Author: Dylan Childs

Publication: UWM Undergraduate Research Symposium

Date: 05/2022

Occurrence of Microplastics in the Niagara Dolomite Aquifer

Author: Justin Peschman

Publication: UWM Undergraduate Research Symposium

Date: 05/2022

Purity of On-Campus Road Salts at the University of Wisconsin at Milwaukee

Author: Samuel Sellars

Publication: UWM Undergraduate Research Symposium

Date: 05/2022

UW-MILWAUKEE DIGITAL COMMONS

Lithium Metal Recovery from Permian Basin Produced Water

Author: Matao Casarez

Publication: UWM Undergraduate Research Symposium

Date: 05/2022

The Milwaukee Column: A Simple, Affordable, and Effective Apparatus For Teaching and Research of One-Dimensional Flow and Transport in Porous Media

Author: Dylan Childs

Publication: UWM Undergraduate Research Symposium

Date: 04/2021

Elucidating Unique Sources and Persistent Hydrologic Pathways of Chloride to Perennial Freshwater Streams: Root River Analog in a Cold-Weather Environment

Author: Leah Elizabeth Dechant

Publication: Theses and Dissertations

Date: 05/2023

Mass Transport of Uranium During Recharge of Surface Water to Contaminated Groundwater

Author: Kendyl Nicole Hoss

Publication: Theses and Dissertations

Date: 05/2022

Tackling Chloride Pollution in Southeastern Wisconsin: Halophilic Bacterial Indicators and Policy Alternatives

Author: Elexius Kaitlyn Passante

Publication: Theses and Dissertations

Date: 05/2022

Alkalinity Enhanced Mass Reduction of Uranium Contaminated Sediment

Author: Cullen Edward Meurer

Publication: Theses and Dissertations

Date: 05/2022

Sorption of 2-Naphthalene Sulfonate to Organic Carbon in Natural Saturated Porous Media

Author: Jiyan Hatami

Publication: Theses and Dissertations

Date: 12/2021

Simulating the Effects of Urbanization and Climate Change on Ground Water Recharging Using the Usgs Precipitation and Runoff Modelling System (PRMS)

Author: Kenneth Oanes

Publication: Theses and Dissertations

Date: 05/2020

The Dynamics and Speciation of Arsenic in Drinking Water Wells in Eastern Wisconsin

Author: Evvan Plank

Publication: Theses and Dissertations

Date: 12/2019

DRAFT DOCUMENTS

Computation and Visualization of Groundwater Flow: Seven Classic Cases Using Finite Difference Methods

Author: Charles Paradis

Publication Type: Technical Document

Synopsis: What follows is a demonstration of the finite difference method for computation and visualization of groundwater flow based on seven classic cases from Wang and Anderson (1982). The computational programs are written in Fortran, like Wang and Anderson (1982), but have been updated to exclude the use of obsolescent or deleted features and to include the use of modern programming practices. For example, the programs are written explicitly, as opposed to implicitly, thus avoiding any potentially incorrect compiler specific assumptions regarding the types of declared variables. The program loops are written with a single entry point and a single exit point, thus avoiding the use of go to statements that can potentially lead to confusion and errors. The Fortran programs are also written to include outputs for the visualization utility, Gnuplot, to use as inputs to generate plots of hydraulic head; the visualization programs are written in Gnuplot's scripting language.

Tracer-based Separation of Advection and Dispersion from Breakthrough Curves

Author: Charles Paradis and Rakiba Sultana

Publication Type: Technical Document

Synopsis: The method proposed here can allow for separating advection and dispersion from the breakthrough curve of a reactive solute based on data only, as opposed to model-derived fitting of groundwater velocity and the dispersion coefficient, all while preserving the true concentration, as opposed to the dimensionless relative concentration, of the reactive solute. This relatively straightforward approach allows for a rapid visual separation of advection and dispersion from solute breakthrough curves to help determine if reactive mass transport mechanisms occurred. The method proposed here also includes a quantitative measure of reactivity to help identify what solutes, if any, were subject to reactive mass transport. The quantitative measure of reactivity is based on temporal moments analyses and can also help characterize what type of reactive mass transport mechanisms likely occurred; all without the need to solve the advection-dispersion-reaction equation or transform true concentrations.