Rishi Parashar

Curriculum Vitae

Division of Hydrologic Sciences
Desert Research Institute
2215 Raggio Parkway, Reno, NV 89512
Tel: 775-673-7496; Fax: 775-673-7363
rishi@dri.edu
https://www.dri.edu/directory/rishi-parashar/

Research Interests

Computational Subsurface Hydrology: Discrete fracture network (DFN) models, anomalous transport in porous media, upscaling for flow and transport, inverse modeling

Hydro-bio-chemical Systems: Reactive transport models, microbial motility, biofilm growth, biogeochemical reactions, geochemical evolution of groundwater

Thermo-Hydro-Mechanical Interactions: Enhanced geothermal systems (EGS), induced seismicity

Academic Employment

7/16 -present **Associate Research Professor**, Division of Hydrologic Sciences, Desert Research Institute

6/10 – 6/16 **Assistant Research Professor**, Division of Hydrologic Sciences, Desert Research Institute

Other Academic Affiliations

Faculty, Graduate Program in Hydrologic Sciences (GPHS), University of Nevada – Reno

Adjunct Faculty, Department of Geological Sciences and Engineering, University of Nevada - Reno

Education

6/08 – 5/10 **Postdoctoral Research Associate**, Division of Hydrologic Sciences, Desert Research Institute, Reno

Supervisor: Donald "Matt" Reeves

8/03 – 5/08 **Ph.D. in Civil Engineering**, Purdue University, West Lafayette

Advisor: John. H. Cushman, Dept. of Mathematics and Dept. of Earth, Atmospheric, and Planetary Sciences

Dissertation Title: A Levy motion model of microbial dynamics in a pore: Numerical and Theoretical Results

8/01 – 5/03 **M.S. in Civil Engineering**, Purdue University, West Lafayette

Advisor: Rao S. Govindaraju, Dept. of Civil Engineering

Thesis Title: Moment analysis for some solute transport models in porous media

9/97 – 6/01 **B.Tech in Civil Engineering**, Indian Institute of Technology, Roorkee

Awards & Honors

2021 **Mid-Career Advancement Award**, National Science Foundation

2015 **Peter B. Wagner Medal of Excellence**, for DRI scholars in the early stages of career development

1999 **Summer Undergraduate Research Award**, Indian Institute of Technology, Roorkee

Refereed Publications (* advisees)

1 Parashar, R., H. V. Pham, and D. M. Reeves (2022). Impact of Regional Stress on Flow and Transport Through Interconnected Network of Faults in Pahute Mesa, Nevada National Security Site, under sponsor's review for submission to *Engineering Geology*

2 *Perez, L. J., Parashar, R., Plymale, A., and Scheibe, T. D. (2022). Contributions of biofilm-induced flow heterogeneities to solute retention and anomalous transport features in porous media, *Water Research, 209, 117896, 10.1016/j.watres.2021.117896*

3 *Dechdacho, P., *Perez, L. J., Hershey, R., Parashar, R. (2021). The influence of compost on arsenic removal from contaminated groundwater in granitic aquifers, *Journal of Nevada Water Resources Association, 42-54, 10.22542/jnwra/2021/1/2*

4 *Perez, L. J., A. Puyguiraud, J. J. Hindalgo, J. Jimenez-Martinez, R. Parashar, and M. Dentz (2021). Upscaling mixing-controlled reactions in unsaturated porous media, *Transport in Porous Media*, doi: 10.1007/s11242-021-01710-2

5 Akara, M. E., Reeves, D. M., Parashar, R. (2021). Impact of Horizontal Spatial Clustering in Two-Dimensional Fracture Networks on Solute Transport, *Journal of Hydrology*, 603 (Part C), 127055, doi: 10.1016/j.jhydrol.2021.127055

6 Chabani, A., Trullenque, G., Parashar, R., Pomart, A., Attali, R., Sass, I. (2021). Modelling of Fractured Granitic Geothermal Reservoirs: Use of Deterministic and stochastic methods in Discrete Fracture Networks and a Coupled Processes Modeling Framework, *Proceedings World Geothermal Congress: Reykjavik, Iceland*, 10.5281/zenodo.5614479

7 *Perez, L. J., Bhattacharjee, T., Datta, S. S., Parashar, R., Sund, N. L. (2021). Impact of confined geometries on hopping and trapping of motile bacteria in porous media, *Physical Review E*, 103 (1), 012611

8 *Sund, N. L., Parashar, R., *Pham, H. V. (2021). Upscaling of transport through discrete fracture networks via random walk: A comparison of models, *Physical Review E*, 103 (6), 062116

9 *Pham, H. V., Parashar, R., *Sund, N. L., Pohlmann, K. F. (2021). A Method to Represent a Well in a Three-dimensional Discrete Fracture Network Model, *Groundwater*, 10.1111/gwat.13030

10 *Pham, H. V., Parashar, R., *Sund, N. L., Pohlmann, K. F. (2021). Determination of fracture apertures via calibration of three-dimensional discrete-fracture-network models: application to Pahute Mesa, Nevada National Security Site, USA, *Hydrogeology Journal*, 10.1007/s10040-020-02254-3

11 *Fan, Z., Parashar, R., Jin, Z. (2020). Impact of convective cooling on pore pressure and stresses around a borehole subjected to a constant flux: Implications for hydraulic tests in an enhanced geothermal system reservoir, *Interpretation*, 8 (2), 10.1190/INT-2019-0180.1

12 Akara, M. E., Reeves, D. M., Parashar, R. (2020). Enhancing fracture-network characterization and discrete-fracture-network simulation with high-resolution surveys using unmanned aerial vehicles, *Hydrogeology Journal*, 10.1007/s10040-020-02178-y

13 *Fan, Z., Parashar, R. (2020). Transient flow to a finite-radius well with wellbore storage and skin effect in a poroelastic confined aquifer, *Advances in Water Resources*, 10.1016/j.advwatres.2020.103604

14 Hershey, R. L., Parashar, R., Cooper, C. A., Heintz, K. M., *Pham, H. V., Lyles, B. F. (2020). Evaluation of Timber Mountain Recharge and Groundwater Flow in Relation to Pahute Mesa-Oasis Valley Flow System, U.S. Department of Energy, *Environmental Management Nevada Program*, DOE/NV/0003590-56

15 *Fan, Z., Parashar, R. (2019). Analytical solutions for a wellbore subjected to a non-isothermal fluid flux: Implications for optimizing injection rates, fracture reactivation, and EGS hydraulic stimulation, *Rock Mechanics and Rock Engineering*, doi: 10.1007/s00603-019-01867-9

16 *Yang, X., Parashar, R., *Sund, N. L., Plymale, A., Scheibe, T., Hu, D., Kelly, R. (2019). On Modeling Ensemble Transport of Metal Reducing Motile Bacteria, *Scientific Reports*, doi: 10.1038/s41598-019-51271-0

17 Parashar, R., *Pham, H. V., *Sund, N. L. (2019). Development of Upscaling Techniques and Construction of Calibrated Models for Fractured Rocks Using Discrete Fracture Network Approaches, U.S. Department of Energy, *Environmental Management Nevada Program,* DOE/NV/0003590-43

18 Sund, N. L., Porta, G., Bolster, D., Parashar, R. (2017). A Lagrangian transport Eulerian reaction spatial (LATERS) Markov model for prediction of effective bimolecular reactive transport, *Water Resources Research*, 53, (11), 9040-9058
19 Thomas, J. M., Pohll, G. M., Chapman, J. B., Pohlmann, K. F., Parashar, R., Rybarski, S. C., Hershey, R. L., Fereday, W. H. (2017). Hydraulic fracturing in the upper Humboldt River basin, Nevada, USA. 15th Water-Rock Interaction International Symposium, WRI-15, *Procedia Earth and Planetary Science*, 17, 189-192, doi: 10.1016/j.proeps.2016.12.065
20 Trullenque, G., Parashar, R., Delcourt, C., Collet, L., Villard, P., Potel, S. (2017). Properties of a pair of fracture networks produced by triaxial deformation experiments: Insights on fluid flow using discrete fracture network models, *Hydrogeology Journal*, 25, (3), 813-827, doi: 10.1007/s10040-017-1551-y
21 Parashar, R., Reeves, D. M. (2017). Ground Water Sustainability in Fractured Rock Aquifers, Eds. Ojha, C., Surampalli, R. Y., Bardossy, A., Zhang, T. C., Kao, C., In *Sustainable Water Resources Management*, 439-464, doi: 10.1061/9780784414767 American Society of Civil Engineers (ASCE)
22 Reeves, D. M., R. Parashar, K. Pohlmann, C. Russell, and J. Chapman (2014). Development and calibration of dual-permeability flow models with discontinuous fault networks, *Vadose Zone Journal*, 13(8), 1-23, doi:10.2136/vzj2013.10.0183.
23 Reeves, D. M., R. Parashar, G. Pohll, and R. Carroll (2013). The use of discrete fracture network simulations in the design of horizontal hillslope drainage networks in fractured rocks*, Engineering Geology*, 163, 132-143, doi: 10.1016/j.enggeo.2013.05.013.
24 Parashar, R. and D. M. Reeves (2012). On iterative techniques for solving flow in large two-dimensional discrete fracture networks, *Journal of Computational and Applied Mathematics*, 236(18), 4712-4724.
25 Reeves, D. M., R. Parashar, and Y. Zhang (2012). Hydrogeologic characterization of fractured rock masses intended for disposal of radioactive waste, In: *Radioactive Waste*, Ed. R. A. Rahman, InTech Publishing, ISBN 978-953-51-0551-0.
26 Reeves, D.M., G. Pohll, B. Lyles, J. Faulds, J. Louie, B. Ehni, C. Kratt, C. Cooper, R. Parashar, S. Pullammanappallil, and D. Noel (2012). Geothermal resource characterization and evaluation at Astor Pass, Nevada, *Geothermal Resources Council Transactions*, 36, 1371-1376.
27 Cooper, C.A., J.M. Thomas, B.F. Lyles, D.M. Reeves, G.M. Pohll, and R. Parashar (2012). A preliminary geochemical description of the geothermal reservoir at Astor Pass, Northern Pyramid Lake, Nevada, *Geothermal Resources Council Transactions*, 36, 37-40.
28 Klimczak, C., R. A. Schultz, R. Parashar, and D. M. Reeves (2010). Cubic law with aperture-length correlation: implications for network scale fluid flow, Hydrogeology Journal, 18(4), 851-862, doi: 10.1007/s10040-009-0572-6
29 Parashar, R., D. O'Malley, and J. H. Cushman (2008). Mean first-passage time for superdiffusion in a slit pore with sticky boundaries, *Physical Review E*, 78(5), 052101.
30 Parashar, R. and J. H. Cushman (2008). Scaling the fractional advective-dispersive equation for numerical evaluation of microbial dynamics in confined geometries with sticky boundaries*, Journal of Computational Physics*, 227(13), 6598-6611.
31 Parashar, R. and J. H. Cushman (2007). Finite size Lyapunov exponent for Levy processes, *Physical Review E,* 76(1), 017201.
32 Parashar, R., R. S. Govindaraju, and M. M. Hantush (2007). Temporal moment analysis for volatile organic compounds in dual-porosity media: Loss fractions and effective parameters, *Journal of Environmental Engineering*-ASCE, 133(9), 879-890.
33 Parashar, R. and R. S. Govindaraju (2006). Evaluation of effective parameters for volatile organic compounds in porous media with mobile air phase, *Transport in Porous Media*, 63(2), 349-362.
34 Parashar, R. and R. S. Govindaraju (2006). Moment analysis for compounds undergoing sequential chain reactions with first-order decay, *Stochastic Environmental Research and Risk Assessment*, 20(1-2), 95-105.

Unrefereed Reports and Conference Papers

1 Perez, L. J., Hershey, R. L., Parashar, R. (2020). Geochemical evolution of the groundwater at the Reno-Stead Water Reclamation Facility, Truckee Meadows Water Authority Report
2 Parashar, R., Pham, H. V., Reeves, D. M. (2018). Investigation of primary flow paths in Western Pahute Pesa using models accounting for the influence of regional stress on fault permeability, U.S. Department of Energy, *Environmental Management Nevada Program,* DOE/NV/0003590-24
3 Fan, Z., Parashar, R. (2018). Effect of Coupled Porothermoelastic Stress on Shear Stimulation of Enhanced Geothermal Systems, Proceedings, 43rd Workshop on Geothermal Reservoir Engineering: Stanford, CA, February 12, 2018-February 14, 2018
4 Reeves, D. M., Smith, K. D., Parashar, R., Collins, C., Heintz, K. M. (2017). Investigating the Influence of Regional Stress on Fault and Fracture Permeability at Pahute Mesa, Nevada National Security Site, U.S. *Department of Energy, Environmental Management Nevada Program*
5 Reeves, D. M., and R. Parashar (2015). Generalized responses of fractured rock aquifers to anthropogenic and climatic perturbations. Proceedings of American Institute of Professional Geologists, Anchorage, AK, September 19-22.
6 Reeves, D. M., R. Parashar, G. Pohll, and R. Carroll (2014). Use of DFN concepts in understanding hillslope drainage in fractured rock, International Discrete Fracture Network Engineering Conference, DFNE2014-277, Vancouver, Canada, October 19-22.
7 Reeves, D.M., R. Parashar, K. Pohlmann, E. M. LaBolle, Y. Zhang, C. Russell, and J. Chapman (2014). Radionuclide containment properties of fractured and faulted volcanic tuff units at the T-Tunnel complex Rainer Mesa, Nevada National Security Site, Proceedings of Waste Management 2014 Symposia, Phoenix, Arizona, March 2-6.
8 Pohll, G. M., Carroll, R. W., Reeves, D. M., Parashar, R., Muhunthan, B., Thyiyagarjah, S., Badger, T., Lowell, S., Willoughby, K. (2013). Design Guidelines for Horizontal Drains Used for Slope Stabilization: Washington State Department of Transportation Report, WA-RD 787.1
9 Reeves, D.M., R. Parashar, K. Pohlmann, C. Russell, and J. Chapman (2013). Development and calibration of dual-permeability models in complex hydrogeologic settings: An example from the T-Tunnel Complex, Rainier Mesa, Nevada National Security Site, Proceedings of MODFLOW and MORE 2013: Translating Science into Practice.
10 Benato, S., D.M. Reeves, R. Parashar, N. Davatzes, S. Hickman, D. Elsworth, P. Spielman and J. Taron (2013). Computational investigation of hydro-mechanical effects on transmissivity evolution during the initial injection phase at Ormat Desert Peak EGS Project, NV, Thirty-Eight Workshop on Geothermal Reservoir Engineering, Stanford University, Stanford, California, SGP-TR-198.
11 Reeves, D.M., R. Parashar, K. Pohlmann, E. LaBolle, Y. Zhang, C. Russell, and J. Chapman (2011). Predictions of long-term radionuclide transport at Rainier Mesa, Nevada National Security Site, American Chemistry Society National Meeting, Denver, CO, Aug 28 – Sep 1.
12 Reeves, D. M., R. Parashar, and G. Pohll (2011). A numerical investigation of soil-bedrock interface flow impedance, MODFLOW and More 2011: Integrated Hydrologic Modeling, Golden, CO, Jun 5-8.
13 Parashar, R., and D. M. Reeves (2011). Computation of flow and transport in fracture networks on a continuum grid, MODFLOW and More 2011: Integrated Hydrologic Modeling, Golden, CO, Jun 5-8.
14 Parashar, R. and R. S. Govindaraju (2003). Moment analysis of fate and transport of volatile pollutants in porous media, ASCE-EWRI, Philadelphia, PA, Jun 23-26.

Funding History

As the project **PI**; total funding for **11 projects** = **$3,276,753**

As a **Co-PI** in the project; total funding for **15 projects** = **$1,626,757**

As a **Senior Personnel** participating in the project; total funding for **3 projects** = **$1,904,804**

Total **in-kind support** received for **3 projects** = **$42,000** (approx.)

2009-2013 **Senior Personnel**, Rainier Mesa sub-CAU modeling of T-Tunnel complex and ponds

Funding Agency: U.S. Department of Energy, UGTA-NNSS; Amount: ~ $900,000

Collaborators: Matt Reeves (PI)

2010 **Co-PI**, How do length-aperture correlations influence flow and transport characteristics of fractured rock masses?

Funding Agency: Division of Hydrologic Sciences IR&D (DRI), Amount: $16,221

Collaborators: Matt Reeves (PI)

2011-2013 **Senior Personnel**, Design guidelines for horizontal drains used for slope stabilization

Funding Agency: Washington Department of Transportation; Amount: $220,000

Collaborators: Greg Pohll (PI), Matt Reeves, Rosemary Carroll

2012 **PI**, Review of the Truckee Canal Seepage Loss Investigation Report

Funding Agency: City of Fernley, Amount: $1,150

2013-2015 **Senior Personnel**, Assessment of contaminant migration potential from hydraulic fracturing in the Upper Humboldt River Basin, Nevada

Funding Agency: Noble Energy Inc; Amount: $784,804

Collaborators: Greg Pohll (PI), Jim Thomas, Matt Reeves, Ron Hershey

2014-2019 **PI**, Discrete fracture network modeling for estimation of radionuclide migration at the Western Pahute Mesa – Nevada National Security Site

Funding Agency: U.S. Department of Energy, UGTA-NNSS; Amount: ~ $1,300,000

2015 **PI**, Studying motility pattern of Geobacter for improved understanding of their role in immobilization of some metals

Funding Agency: Environmental Molecular Sciences Laboratory (Pacific Northwest National Lab); Amount: ~ $10,000 in-kind support

Collaborators: Tim Scheibe - PNNL

2015 **PI**, Evaluation of Rainier Mesa revised CM, HFM, and PER comments for additional A&E

Funding Agency: U.S. Department of Energy, UGTA-NNSS; Amount: $20,852

2015-2017 **PI**, The role of microbial motility and electron capacitance in immobilization of some metals

Funding Agency: Maki Endowment (DRI); Amount: $103,111

2015-2017 **Co-PI**, Pahute Mesa fault stress-permeability relations

Funding Agency: U.S. Department of Energy, UGTA-NNSS; Amount: $75,139

Collaborators: Matt Reeves (PI), Ken Smith - UNR

2016 **PI**, Characterizing motion and adhesion dynamics of motile microbes for improved prediction of metal bioremediation

Funding Agency: Environmental Molecular Sciences Laboratory (Pacific Northwest National Lab); Amount: $21,249 in-kind support

Collaborators: Tim Scheibe - PNNL

2016-2018 **PI**, Impact of stress induced fault permeabilities on flow and transport pathways in Western Pahute Mesa

Funding Agency: U.S. Department of Energy, UGTA-NNSS; Amount: $77,029

Collaborators: Matt Reeves – Western Michigan

2018 **PI**, Computing Influence of Faults on Stresses at a Horizontal Tunnel Using Hydro-Mechanical Models

Funding Agency: Barrick Gold Corporation; Amount: $19,992

Collaborators: Zhiqiang Fan

2018-2019 **PI**, Modeling anti-cancer drug transport and distribution for effective treatment of solid tumors
Funding Agency: Innovation Research Program (DRI); Amount: $33,608

Collaborators: Subhash Verma - UNR, Nicole Sund

2018-2019 **Co-PI**, Combining 3D printing technology, laboratory experiments, and numerical simulators to investigate the effect of dead-end fractures and intersections on transport in fractured rock samples

Funding Agency: Institute Project Assignment (DRI); Amount: $13,673

Collaborators: Hai Pham (PI)

2018-2020 **Co-PI**, Evaluation of Recharge and Groundwater Flow Paths at Timber Mountain

Funding Agency: U.S. Department of Energy, UGTA-NNSS; Amount: $165,716

Collaborators: Ron Hershey (PI), Clay Cooper

2018-2022 **PI**, Experimental and modeling studies of transport and retention of motile microbes in pore networks for improved prediction of metal bioremediation

Funding Agency: U.S. Department of Energy – Office of Science; Amount: $545,838

Collaborators: Tim Scheibe - PNNL

2019-2020 **Co-PI**, Hydraulic fracturing induced fault reactivation and groundwater contamination

Funding Agency: Institute Project Assignment (DRI); Amount: $11,390

Collaborators: Zhiqiang Fan (PI)

2019-2020 **Co-PI**, Reactive transport in porous media: Numerical and experimental study of mixing-limited bimolecular reaction kinetics

Funding Agency: Institute Project Assignment (DRI); Amount: $13, 225

Collaborators: Lazaro Perez (PI)

2019-2020 **Co-PI**, Modeling Geochemical Evolution of Groundwater at the Reno-Stead Site

Funding Agency: Truckee Meadows Water Authority; Amount: $18,151

Collaborators: Lazaro Perez (PI)

2020 **PI**, Transport and Retention of Motile Microbes in Pore-Networks

Funding Agency: Environmental Molecular Sciences Laboratory (Pacific Northwest National Lab); Amount: $10,000 in-kind support

Collaborators: Tim Scheibe - PNNL

2020 **Co-PI**, Geochemical characterization of the Reno-Stead site and its implications for groundwater evolution

Funding Agency: Truckee Meadows Water Authority; Amount: $36,351

Collaborators: Lazaro Perez (PI)

2020-2021 **Co-PI**, Development and evaluation of iron-based strategies for arsenic removal in contaminated groundwater

Funding Agency: United States Geological Survey - NIWR; Amount: $119,946

Collaborators: Lazaro Perez (PI), Ron Hershey

2020-2021 **Co-PI**, Tortuosity characterization in artificial porous media via machine learning to quantify solute transport in a Berea sandstone

Funding Agency: Institute Project Assignment (DRI); Amount: $15,433

Collaborators: Lazaro Peres (PI), George Bebis - UNR

2020-2024 **Co-PI**, Assessing risk of transport and uptake of antibiotic resistance and RNA silencing transgenes in soils via integrated experimental data and modeling

Funding Agency: U.S. Department of Agriculture - NIFA; Amount: $499,513 (DRI portion - $140,365)

Collaborators: Courtney Gardner – Washington State Univ (PI), Tim Ginn - WSU

2021-2022 **Co-PI**, Geochemical Characterization of American Flat Aquifer

Funding Agency: Truckee Meadows Water Authority; Amount: $113,876

Collaborators: Lazaro Perez (PI), Ron Hershey

2021-2022 **Co-PI**, Geochemical Characterization of Warm Springs Aquifer

Funding Agency: Truckee Meadows Water Authority; Amount: $199,827

Collaborators: Lazaro Perez (PI), Ron Hershey

2021-2022 **Co-PI**, Analysis of Biological Growth and Clogging Mechanisms at the American Flat Site

Funding Agency: Truckee Meadows Water Authority; Amount: $78,296

Collaborators: Lazaro Perez (PI), Dani Or, Duane Moser

2021-2022 **Co-PI**, Regional-Scale Assessment of CO_2 Geological Storage in Sedimentary Basin Geothermal Reservoirs of Nevada (*part of larger project*: Carbon Utilization and Storage Partnership (CUSP) for the Western USA)

Funding Agency: U.S. Department of Energy - NETL; Amount: $250,000

Collaborators: Steve Bacon (PI), Richard Jasoni, Jay Arnone, Jonathan Ogland-Hand – Carbon Solutions (CS), Jeff Bennett – CS, Richard Middleton – CS

2021-2024 **PI**, MCA: Enhancing discrete fracture network modeling using evolutionary and quantum computing to expand opportunities of convergence research

Funding Agency: National Science Foundation; Amount: $399,904

Collaborators: George Bebis – UNR, Jeffrey Hyman – LANL, Dan O'Malley - LANL

2021-2023 **PI**, Well Field Assessment and Optimization for Sustainable use of Groundwater in the Gardnerville Ranchos Area

Funding Agency: Gardnerville Ranchos General Improvement District; Amount: $275,269

Collaborators: Dan Saftner

2022-2024 **PI**, Use of viral and genetic marker surrogates to assess transport of human enteric viruses in water reclamation systems

Funding Agency: United States Geological Survey - WRRI; Amount: $500,000

Collaborators: Krishna Pagilla – UNR, Subhash Verma - UNR

Conference Oral and Poster Presentations

1 Dechdacho, P., Perez, L. J., Hershey, R. L., Parashar, R. (2021). The Influence of an Iron Metal-Organic Framework Material on Arsenic Sorption in Groundwater: Column Experiments and Simulations, AGU Fall Meeting: New Orleans, LA, December 13, 2021-December 17, 2021

2 Perez, L. J., Bebis, G., McKenna, S., Parashar, R. (2021). Estimating solute transport in heterogeneous porous media via machine learning, AGU Fall Meeting: New Orleans, LA, December 13, 2021-December 17, 2021

3 Parashar, R., Perez, L. J., Plymale, A., Scheibe, T. D. (2021). Heterogeneous Flow Field in Presence of Biofilms and its Impact on Solute Transport and Retention, AGU Fall Meeting: New Orleans, LA, December 13, 2021-December 17, 2021

4 Berghouse, M. J., Perez, L. J., Plymale, A., Parashar, R., Scheibe, T. D. (2021). Impacts of flow on transport of motile microbes in synthetic porous media, AGU Fall Meeting: New Orleans, LA, December 13, 2021-December 17, 2021

5 Perez, L. J., Puyguiraud, A., Hidalgo, J. J., Jiménez-Martínez, J., Parashar, R., Dentz, M. (2021). Upscaling mixing-controlled reactions in unsaturated porous media, AGU Fall Meeting: New Orleans, LA, December 13, 2021-December 17, 2021

6 Dechdacho, P., Hershey, R. L., Perez, L. J., Parashar, R (2021). The influence of compost on arsenic removal from contaminated groundwater in granitic aquifers, UCOWR/NIWR Annual Water Resources Conference, June 8, 2021-June 11, 2021

7 Perez, L. J., Sund, N. L., Parashar, R., Plymale, A., Hu, D., Scheibe, T. D. (2020). Influence of pore geometry on motility and trapping of metal reducing bacteria, 22nd European Geosciences Union General Assembly: Online, May 4, 2020-May 8, 2020

8 Sund, N. L., Perez, L. J., Parashar, R., Plymale, A., Scheibe, T. D. (2020). The Effect of Pore Geometry on Upscaled Models of Transport of Motile Bacteria, American Geophysical Union Fall Meeting 2020: Online, December 1, 2020-December 17, 2020

9 Perez, L. J., Bhattacharjee, T., Datta, S., Parashar, R., Sund, N. L. (2020). Modeling migration of motile bacteria in confined porous media, American Geophysical Union Fall Meeting 2020: Online, December 1, 2020-December 17, 2020

10 Parashar, R., Fan, Z. (2020). Impact of Formation Permeability and Pumping Well Properties on Hydraulic Drawdown in Poroelastic Confined Aquifers, American Geophysical Union Fall Meeting 2020: Online, December 1, 2020-December 17, 2020

11 Akara, M. E., Reeves, D. M., Parashar, R. (2020). Prevalence of Fracture Spatial Clustering and Implications for Solute Transport, American Geophysical Union Fall Meeting 2020: Online, December 1, 2020-December 17, 2020

12 Akara, M. E., Reeves, D. M., Parashar, R. (2020). Improving fracture network characterization and discrete fracture network flow simulations using unmanned aerial vehicles, GSA Annual Meeting: Online, October 26, 2020-October 30, 2020

13 Perez, L. J., Puyguiraud, A., Hidalgo, J. J., Jimenez-Martinez, J., Parashar, R., Dentz, M. (2020). Impact of Flow Heterogeneities on Mixing-Controlled Reactions Using Pore-Scale Modeling and Experimental Data, Computational Methods in Water Resources (CMWR): Online, December 14, 2020-December 17, 2020

14 Perez, L. J., Puyguiraud, A., Hidalgo, J. J., Jimenez-Martinez, J., Parashar, R., Dentz, M. (2020). Upscaling mixing-controlled reactions in unsaturated porous media, Computational Methods in Water Resources Conference, December 14, 2020-December 17, 2020

15 Fan, Z., Parashar, R. (2019). Poroelastic effect on transient flow to a pumping well with storage and finite thickness skin, AGU Fall Meeting: San Francisco, CA, December 9, 2019-December 13, 2019
16 Hershey, R. L., Parashar, R., Pham, H. V., Lyles, B. F., Cooper, C. A., Heintz, K. M. (2019). Evaluation of Timber Mountain Recharge and Groundwater Flow in Relation to Pahute Mesa Groundwater Flow, UGTA Technical Information Exchange, August 29, 2019
17 Parashar, R., Pham, H. V., Reeves, D. M. (2019). Impact of Regional Stress on Large-scale Flow Path Configurations in Western Pahute Mesa, UGTA Technical Information Exchange, August 29, 2019
18 Parashar, R., Pham, H. V., Sund, N. L. (2019). Determination of Fracture Apertures via Calibration of Discrete Fracture Network Models, AGU Fall Meeting: San Francisco, CA, December 9, 2019-December 13, 2019
19 Pham, H. V., Parashar, R., Sund, N. L. (2019). Fracture Apertures in Lava-flow Aquifers Computed via Flow and Transport Calibration of Discrete Fracture Network Models, UGTA Technical Information Exchange: Las Vegas, August 29, 2019
20 Reeves, D., Parashar, R., Labolle, E. M., Zhang, Y., Pohlmann, K. F., Russell, C. E., Chapman, J. B. (2019). Integrated Use of Data and Numerical Models for Site Conceptual Model Development In Complex Hydrogeologic Systems, 2019 NGWA Conference on Fractured Rock and Groundwater: Burlington, VT, September 23, 2019-September 24, 2019
21 Sund, N. L., Parashar, R., Pham, H. V. (2019). Upscaling of Transport in Fracture Networks via Random Walk Based Methods, UGTA Technical Information Exchange: Las Vegas, August 29, 2019
22 Sund, N. L., Perez Jorge, L., Parashar, R., Plymale, A., Hu, D., Scheibe, T. (2019). Species and Scale Dependence of Bacterial Motion Dynamics, AGU Fall Meeting: San Francisco, CA, December 9, 2019-December 13, 2019
23 Reeves, D. M., Parashar, R., Pham, H. V., Sund, N. L. (2018). Network Connectivity in Complex, Three-Dimensional Fracture Networks, Interpore 10th Annual Meeting and Jubilee: New Orleans, LA, May 14, 2018-May 17, 2018
24 Pham, H. V., Parashar, R., Sund, N. L., Pohlmann, K. F. (2018). Data-driven 3-D DFN model development for simulating fracture flow in Pahute Mesa, Nevada National Security Site, 2018 Devils Hole Workshop: Beatty, NV, May 2, 2018-May 4, 2018
25 Reeves, D. M., Parashar, R., Pham, H. V., Smith, K. D. (2018). Investigating Fault Interconnectivity and Stress Controls on Regional-Scale Fluid Flow at Pahute Mesa, Nevada National Security Site, Geological Society of America, North-Central Section Meeting: Ames, IA, April 16, 2018-April 17, 2018
26 Fan, Z., Parashar, R. (2018). Poroelastic response of a stationary fracture subjected to a constant fluid flux, Interpore 10th Annual Meeting and Jubilee: New Orleans, LA, May 14, 2018-May 17, 2018
27 Reeves, D. M., Pham, H. V., Sund, N. L., Parashar, R. (2018). Defining network connectivity in complex, three-dimensional fracture networks, GSA Annual Meeting: Indianapolis, November 4, 2018-November 7, 2018
28 Fan, Z., Parashar, R. (2018). Coupled hydromechanical modeling to investigate effect of faults on stresses at a horizontal tunnel, NWRA Fall Symposium: Reno, September 25, 2018-September 26, 2018
29 Fan, Z., Parashar, R. (2018). An analytical solution for constant rate fluid injection into thermoporoelastic rocks with applications to hydraulic stimulation of enhanced geothermal systems, NWRA Fall Symposium: Reno, September 25, 2018-September 26, 2018
30 Fan, Z., Parashar, R. (2018). An integrated assessment of induced seismicity potential associated with enhanced geothermal systems, AGU Fall Meeting: Washington D.C., December 10, 2018-December 14, 2018
31 Parashar, R., Reeves, D. M. (2018). Determination of Well Capture Zones in Fractured Rock Systems Using Discrete Fracture Network Modeling Approach, AGU Fall Meeting: Washington D.C., December 10, 2018-December 14, 2018
32 Parashar, R., Reeves, D. M. (2017). Generalized Responses of Fractured Rock Aquifers to Pumping and Episodic Recharge, 277-280, Modflow & More 2017: Modeling for Sustainability and Adaptation: Golden, CO, May 21, 2017-May 24, 2017

33 Sund, N. L., Parashar, R., Pham, H. V. (2017). Particle Decision Making Processes in Fractured Media: The War Between Models, 9th International Conference on Porous Media & Annual Meeting 2017: Rotterdam, Netherlands, May 8, 2017
34 Sund, N. L., Porta, G., Bolster, D., Parashar, R. (2017). A Lagrangian transport Eulerian reaction spatial (LATERS) Markov model for prediction of effective bimolecular reactive transport, 9th International Conference on Porous Media & Annual Meeting 2017: Rotterdam, Netherlands, May 8, 2017
35 Pham, H. V., Parashar, R., Sund, N. L., Pohlmann, K. F. (2017). Three-dimensional DFN Model Development and Calibration: A Case Study for Pahute Mesa, Nevada National Security Site, AGU Fall Meeting: New Orleans, LA, December 11, 2017-December 15, 2017
36 Sund, N. L., Yang, X., Parashar, R., Plymale, A., Hu, D., Kelly, R., Scheibe, T. (2017). Species and Scale Dependence of Bacterial Motion Dynamics, AGU Fall Meeting: New Orleans, LA, December 11, 2017-December 15, 2017
37 Parashar, R., Reeves, D. M. (2016). Non-Fickian Migration of Inert Particles on Stochastic Fracture Networks, 8th International Conference on Porous Media & Annual Meeting: Cincinnati, OH, May 9, 2016-May 12, 2016
38 Parashar, R., Sund, N. L., Yang, X., Plymale, A., Hu, D., Kelly, R., Scheibe, T., Frederick, J. M. (2016). Study of transport characteristics of motile microorganisms using micro-scale devices, AGU Fall Meeting: San Francisco, CA, December 12, 2016-December 16, 2016
39 Pham, H. V., Parashar, R., Sund, N. L., Pohlmann, K. F. (2016). Transport Behavior in Fractured Rock Under Conceptual and Parametric Uncertainty, AGU Fall Meeting: San Francisco, CA, December 12, 2016-December 16, 2016
40 Reeves, D. M., Smith, K. D., Parashar, R., Collins, C. M., Heintz, K. M. (2016). Determining the potential role of regional stress on preferential flow and transport at Pahute Mesa, Nevada National Security Site, AGU Fall Meeting: San Francisco, CA, December 12, 2016-December 16, 2016
41 Sund, N. L., Parashar, R., Pham, H. V. (2016). Particle Decision Making Processes in Fractured Media: The Battle Between Models, AGU Fall Meeting: San Francisco, CA, December 12, 2016-December 16, 2016
42 Parashar, R., and D. M. Reeves (2016). Non-Fickian migration of inert particles on stochastic fracture networks, InterPore 2016, Cincinnati, May 9-12.
43 Parashar, R., and D. M. Reeves (2016). Construction of a continuous time random walk model by using discrete fracture network ensemble statistics, Computational Methods in Water Resources (CMWR), Toronto, Canada, Jun 20-24.
44 Parashar, R., and D. M. Reeves (2015). Study of Drawdown Characteristics of Fracture Rock Aquifers Using Discrete Fracture Network Modeling Tools, American Geophysical Union Fall Meeting, San Francisco, CA, Dec 14-18.
45 Pickman, L.H., R. Parashar, and D. M. Reeves (2015). Use of Discrete Fracture Network Statistics for Construction of Two-Dimensional Continuous Time Random Walk Model, American Geophysical Union Fall Meeting, San Francisco, CA, Dec 14-18.
46 Parashar, R. and D.M. Reeves (2014). Numerical investigation on dispersive characteristics of fracture networks, American Geophysical Union Fall Meeting, San Francisco, CA, Dec 15-19.
47 Pickman, L. H., R. Parashar, and D.M. Reeves (2014). Use of CTRW for prediction of radionuclide migration in fractured tuff, American Geophysical Union Fall Meeting, San Francisco, CA, Dec 15-19.
48 Zhang, Y., R. Parashar, K. F. Pohlmann, and J. B. Chapman (2014). Non-Fickian transport in fractured media, American Geophysical Union Fall Meeting, San Francisco, CA, Dec 15-19.
49 Parashar, R., D. M. Reeves, Y. Zhang, L. H. Pickman, K. F. Pohlmann, C. E. Russell, and J. B. Chapman (2014). Western Pahute Mesa Discrete Fracture Network Modeling and Upscaling, DOE UGTA TIE Workshop, Jul 16.
50 Zhang, Y., K. F. Pohlmann, J. B. Chapman, C. E. Russell, and R. Parashar (2014). Capturing anomalous dynamics of conservative and reactive contaminant transport in fractured media from centimeter scales to kilometer scales, DOE UGTA TIE Workshop, Jul 16.

51 Parashar, R. and D.M. Reeves (2013). Particle pair separation statistics for two-dimensional fracture networks, American Geophysical Union Fall Meeting, San Francisco, CA, Dec 9-13.
52 Benato, S., D.M. Reeves, R. Parashar, N. Davatzes, S. Hickman, D. Elsworth, P. Spielman and J. Taron (2013). Computational investigation of hydro-mechanical effects on transmissivity evolution during the initial injection phase at Ormat Desert Peak EGS Project, NV, Oral Presentation at European Geothermal Energy Congress (EGEC), Pisa, Italy, June 3-7.
53 Benato, S., D.M. Reeves, R. Parashar, N. Davatzes, S. Hickman, D. Elsworth, P. Spielman and J. Taron (2013). Computational investigation of hydro-mechanical effects on transmissivity evolution during the initial injection phase at Ormat Desert Peak EGS Project, NV, Oral and Poster Presentation at Geothermal Engineering Integrated Mitigation of Induced Seismicity (GEISER), Naples, Italy, May 30-31.
54 Benato, S., D.M. Reeves, R. Parashar, N. Davatzes, S. Hickman, D. Elsworth, P. Spielman and J. Taron (2013). Computational investigation of hydro-mechanical effects on transmissivity evolution during the initial injection phase at Ormat Desert Peak EGS Project, NV, Poster at International Conference on Enhanced Geothermal Systems (ICEGS), Potsdam, Germany, May 27.
55 Benato, S., D.M. Reeves, R. Parashar, N. Davatzes, S. Hickman, D. Elsworth, P. Spielman and J. Taron (2013). Computational investigation of hydro-mechanical effects on transmissivity evolution during the initial injection phase at Ormat Desert Peak EGS Project, NV, Poster at Rignergia, Aosta, Italy, April 24-28.
56 Benato, S., D.M. Reeves, R. Parashar, N. Davatzes, S. Hickman, D. Elsworth, P. Spielman and J. Taron (2013). Computational investigation of hydro-mechanical effects on transmissivity evolution during the initial injection phase at Ormat Desert Peak EGS Project, NV, Poster at SMU Geothermal Conference, Dallas, TX, March 12-14.
57 Parashar, R. and D.M. Reeves (2012). Comparative performance of various Krylov subspace iterative methods for computation of flow in discrete fracture networks, 4th International Conference on Porous Media and Annual Meeting of the International Society for Porous Media, Purdue University, West Lafayette, IN, May 14-16.
58 Reeves, D.M., G. Pohll, B. Lyles, J. Louie, C. Kratt, J. Faulds, B. Ehni, D. Siler, S. Pullammanappallil, C. Cooper and R. Parashar (2012). Geophysical and hydrogeological characterization of the Astor Pass geothermal field, Nevada, United States/New Zealand Joint Geothermal Workshop, Rotorua, New Zealand, Apr 16-20.
59 Reeves, D.M. and R. Parashar (2012). Characterization and numerical representation of fracture networks for fluid flow, heat and solute transport, United States/New Zealand Joint Geothermal Workshop, Rotorua, New Zealand, Apr 16-20.
60 Reeves, D.M., R. Parashar, K. Pohlmann, Y. Zhang, E.M. LaBolle, C. Russell, and J. Chapman (2011). Threshold behavior in deep vadose zone fluid flow and radionuclide transport behavior at Rainier Mesa, Nevada, American Geophysical Union Fall Meeting, San Francisco, CA, Dec 5-9.
61 Reeves, D.M., J. Huntington, S. Rajagopal, G. Pohll, Y. Zhang, and R. Parashar (2011). Integrated ground water -- surface water modeling of Martis Valley for assessment of climate change impacts on basin-scale water resources, Nevada Water Resources Association Truckee River Symposium, Reno, NV, Sep 28.
62 Parashar, R. (2011). Computation of flow and transport in large and sparse fracture networks, SIAM Conference on Mathematical and Computational Issues in the Geosciences, Long Beach, CA, Mar 21-24.
63 Parashar, R., and D. M. Reeves (2010). Deep vadose zone flow and transport behavior at T-tunnel complex, Rainier Mesa, Nevada National Security Site, American Geophysical Union Fall Meeting, San Francisco, CA, Dec 13-17.
64 Parashar, R., and D. M. Reeves (2009). Mapping and upscaling techniques for efficient simulation of flow and transport on a two-dimensional fracture continuum, American Geophysical Union Fall Meeting, San Francisco, CA, Dec 14-18.
65 Reeves, D. M., and R. Parashar (2009). Flow and transport characteristics of fracture networks with length-aperture correlations, American Geophysical Union Fall Meeting, San Francisco, CA, Dec 14-18.
66 Klimczak, C., R. A. Schultz, R. Parashar, and D. M. Reeves (2008). The cubic law re-evaluated: Quintic law for joint sets, American Geophysical Union Fall Meeting, San Francisco, CA, Dec 15-19.

67 Reeves, D. M., and R. Parashar (2008). Upscaling fracture properties in support of dual-permeability simulations, American Geophysical Union Fall Meeting, San Francisco, CA, Dec 15-19.
68 Parashar, R., and J. H. Cushman (2008). Microbial dynamics in a slit-pore with sticky boundaries, American Geophysical Union Fall Meeting, San Francisco, CA, Dec 15-19.
69 Cushman, J. H., M. Park, and R. Parashar (2008). Renormalizing the chaotic dynamics of motile particles in fractal porous media, International Conference in Statistical Physics, Kolymbari, Chania, Greece, Jul 14-18.

Invited Talks

1 Transport and Retention of Motile Microbes in Pore Networks, Porous Media Seminar Series, Washington State University – Pullman, December 3, 2021
2 Modeling the transport of tracers, heat, and microbes in the subsurface, Graduate Program in Hydrologic Sciences Colloquium, University of Nevada – Reno, February 5, 2021
3 Hydrogeology, geomechanics, and geochemical modeling approaches relevant to mining, Nevada Mining Association, Environmental Committee meeting, June 11, 2020
4 Integration of thermal-hydro-mechanical coupling and fracture/fault mechanics with applications in geomechanics, Ormat Technologies, Reno, January 13, 2020
5 Constraining aperture values by calibrating a discrete fracture network model to tracer test data, dfnWorkShop: Santa Fe, New Mexico, September 24, 2019
6 Discrete fracture network modeling in subsurface hydrology: numerical complexities and applications, Civil Engineering Seminar Series, University of Nevada - Reno, September 25, 2014
7 Super-Fickian diffusion of motile microbes in confined geometries, Civil Engineering Spring Seminar Series, Northwestern University, Chicago, April 16, 2010
8 Dynamics of Motile Microbes, Stochastic Transport and Emergent Scaling in Earth-Surface Processes Meeting, Incline Village, NV, November 4, 2009

Highlighted Research

- Calculating “Run and Tumble” Behavior of Bacteria in Groundwater, Science Highlights, Biological and Environmental Research (BER), U. S. Department of Energy, 2021, https://science.osti.gov/ber/Highlights/2021/BER-2021-03-b
- Mathematical modeling for tumor treatment, Annual Report & Research Highlights, Desert Research Institute, 2018-2019, https://www.dri.edu/wp-content/uploads/DRI-Annual-Report-2018.pdf

Classes Taught

Fall – 2011, 2016, 2021 **GEOL/NRES 414/614 Hydrologic Fluid Dynamics**, University of Nevada - Reno

Students and Postdocs Advised

Luke Pickman **M.S.** (2015), Thesis Title: Development of a continuous time random walk model for fractured media - site characterization and comparison with discrete fracture network method

Xueke Yang **M.S.** (2017), Thesis Title: Dynamics of motile microbes and model development
Recipient of George Burke Maxey Fellowship (2016)

Hai Pham **Postdoc** (2016-2020) co-advised with Karl Pohlmann, Research: Development and application of discrete fracture network models

Nicole Sund **Postdoc** (2016-2019), Research: Upscaling of transport in fracture networks, trajectory analysis of motile microbes

Zhiqiang Fan	**Postdoc** (2017-2020), Research: Thermo-Hydro-Mechanical models, EGS and induced seismicity
Lazaro Perez	**Postdoc** (2019-2021), Research: Bacterial transport and biofilm dynamics, transport, and uptake of transgenes in porous media
Marc Berghouse	**Ph.D.** (expected – 2024), Dissertation Title: TBD *Recipient of George Burke Maxey Fellowship (2021)*

Graduate Student Committees

Ben Bardet (UNR, M.S., Hydrogeology, 2022 – expected)

Porraket Dechdacho (UNR, M.S., Hydrogeology, 2022 – expected)

Institutional and Professional Services

Coordinator of DHS Science Hour (2010-2012)

Faculty hiring committees (2011, 2018)

Member, International Advisory Committee for the Conference on sustainable Water Resources Management and Climate Change Adaptation – Durgapur, India (2011)

Member, National level pore-scale modeling challenge and workshop – PNNL (2011)

George Burke Maxey Fellowship committee (2012, 2014)

Convener, session on discrete fracture network modeling at AGU Fall Meeting (2015)

Postdoc hiring committees (2015, 2016, 2017, 2019, 2021)

Division of Hydrologic Sciences (DHS) promotion committee (2019-present)

University of Nevada – Reno, GPHS Executive Committee (2021-present)

Reviewer: Journal of Hazardous, Toxic, and Radioactive Waste, Hydrogeology Journal, Journal of Hydrology, Water Resources Research, Journal of Hydrologic Engineering, International Journal of Rock Mechanics and Mining Sciences, ASCE book chapters, Transport in Porous Media, Advances in Water Resources, Computers and Geosciences, Mathematical Geosciences, Geophysical Research Letters, Journal of Geophysical Research – Solid Earth, National Science Foundation, Water, Energies, Peer J, Processes, Applied Physics Letters