Bhavna Arora

Energy Geosciences Division
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Research Interests: Understanding the influence of heterogeneities in the subsurface, reactive transport modeling, hot spots and hot moments analysis, and scaling of biogeochemical parameters/ properties.

Education

2006 - 2012	Ph.D., Water Management & Hydrologic Sciences Texas A&M University, College Station, TX Advisors: Dr. Binayak P. Mohanty and Dr. Jennifer T. McGuire
2001 - 2006	M. Tech., Water Resources Development & Management B.Tech. (Hons), Agricultural & Food Engineering Minor, Mathematics & Computing Indian Institute of Technology (IIT), Kharagpur, India Advisor: Dr. Rabindra K. Panda

Professional Positions

2012 - Present	Postdoctoral Fellow, Lawrence Berkeley National Laboratory
2006 - 2012	Research & Teaching Assistant, Texas A&M University
2004 - 2004	Water Quality Intern, Jumbo International
2003 - 2003	Software Development Intern, Indian Agricultural Research Institute

Honors and Awards

2015-Present	Principal Investigator, Laboratory Directed Research and Development (LDRD) Grant, Lawrence Berkeley National Laboratory ($195,000). Colloaborators: Sergi Molins (Co-PI), David Trebotich, Jonathan Ajo-Franklin and Carl Steefel
2014	AAAS/Science Program for Excellence in Science Membership Award, American Association for the Advancement of Science
2012	Biological & Agricultural Engineering Graduate Scholarship, Texas A&M University
2011	Bill and Rita Stout International Graduate Student Achievement Award, Texas A&M University
2010	Outstanding Student Paper Award, AGU Fall Meeting
2010	Graduate Student Research and Presentation Grant, Texas A&M University ($500)
2010-2011	Regents' Scholarship, Texas A&M University

2009-2010	TWRI Mills Scholarship, Texas Water Resources Institute ($1,500)
2009	Graduate Student Council Travel Grant, Texas A&M University ($500)
2006	Institute Silver Medalist, IIT Kharagpur
2006	A. A. Hakim Memorial Endowment Prize, IIT Kharagpur
2003	Vinod Gupta Leadership award, IIT Kharagpur

Peer-Reviewed Publications

1. **Arora, B.**, D. Dwivedi, S. S. Hubbard, C. I. Steefel, and K. H. Williams (2016), Identifying geochemical hot moments and their controls on a contaminated river floodplain system using wavelet and entropy approaches, *Accepted pending minor reviews*, Environmental Modelling & Software.
2. **Arora, B.**, Y. Cheng, E. King, N. Bouskill, and E. Brodie (2016), *Chapter 4.8: Modeling microbial energetics and community dynamics,* in the Handbook of Metal-Microbe Interactions and Bioremediation, S. Das and H. R. Dash (eds.), *In press, CRC Press.*
3. **Arora, B.**, D. Dwivedi, N. F. Spycher, and C. I. Steefel, On modeling CO_2 dynamics in a flood plain aquifer, *Accepted*, *Procedia Earth and Planetary Science.*
4. Dwivedi, D., C. I. Steefel, **B. Arora**, and G. Bisht, Impact of intra-meander hyporheic flow on nitrogen cycling, *Accepted*, *Procedia Earth and Planetary Science.*
5. Dwivedi, D., B. Dafflon, **B. Arora,** H. M. Wainwright, and S. Finsterle (2016), *Chapter 21: Spatial analysis and geostatistical methods*, in the Handbook on Applied Hydrology, V. P. Singh (ed.), *In press, McGraw-Hill.*
6. **Arora, B.**, and B. P. Mohanty, Influence of spatial heterogeneity and hydrological perturbations on redox dynamics: A column study, *Accepted*, *Procedia Earth and Planetary Science.*
7. **Arora, B.**, N. F. Spycher, C. I. Steefel, S. Molins, M. Bill, M. E. Conrad, W. Dong, B. Faybishenko, T. K. Tokunaga, J. Wan, K.H. Williams and S. B. Yabusaki (2016), Influence of Hydrological, Biogeochemical and Temperature Transients on Subsurface Carbon Fluxes in a Flood Plain Environment, *Biogeochemistry,* DOI: 10.1007/s10533-016-0186-8.
8. Dwivedi, D., **B. Arora**, S. Molins, and C. I. Steefel (2015), *Chapter 19 (Section IV): Benchmarking Reactive Transport Codes for Subsurface Environmental Problems*, in Groundwater Assessment, Modeling, and Management, D. Thangarajan and V. P. Singh (eds.), CRC Taylor and Francis Group.
9. Mayer, K. U., P. Alt-Epping, D. Jacques, **B. Arora,** and C. I. Steefel (2015), Benchmark problems for reactive transport modeling of the generation and attenuation of acid rock drainage, *Computational Geosciences*, DOI: 10.1007/s10596-015-9476-9.
10. **Arora, B.**, B. P. Mohanty, and J. T. McGuire (2015), An integrated Markov chain Monte Carlo algorithm for upscaling hydrological and geochemical parameters from column to field scale, *Science of the Total Environment, 512-513*, 428-443, DOI:10.1016/j.scitotenv.2015.01.048.
11. Steefel, C. I., C. A. J. Appelo, **B. Arora**, D. Jacques, T. Kalbacher, O. Kolditz, V. Lagneau, P. C. Lichtner, K. U. Mayer, J. C. L. Meussen, S. Molins, D. Moulton, H. Shao, J. Simunek, N. Spycher, S. B. Yabusaki, and G. T. Yeh (2015), Reactive transport codes for subsurface environmental simulation, *Computational Geosciences,* DOI:10.1007/s10596-014-9443-x.

12. **Arora, B.**, S. S. Sengör, N. F. Spycher, and C. I. Steefel (2015), A reactive transport benchmark on heavy metal cycling in lake sediments, *Computational Geosciences*, DOI: 10.1007/s10596-014-9445-8.
13. **Arora, B.**, B. P. Mohanty, J. T. McGuire, and I. M. Cozzarelli (2013), Temporal dynamics of biogeochemical processes at the Norman Landfill site, *Water Resources Research*, *49*, 1-18, doi: 10.1002/wrcr.20484.
14. **Arora, B.**, B. P. Mohanty, and J. T. McGuire (2012), Uncertainty in dual permeability model parameters for structured soils, *Water Resources Research*, *48*, W01524, doi: 10.1029/2011WR010500.
15. **Arora, B.**, B. P. Mohanty, and J. T. McGuire (2011), Inverse estimation of parameters for multidomain flow models in soil columns with different macropore densities, *Water Resources Research*, 47, W04512, doi: 10.1029/2010WR009451. (**Note:** *This publication was a featured article in EOS, Transactions of the American Geophysical Union*)

Other Publications

1. Wainwright, H. M., B. Faybishenko, S. Molins, J. A. Davis, **B. Arora**, G. Pau, J. Johnson, G. Flach, M. Denham, C. Eddy-Dilek, D. Moulton, K. Lipnikov, C. W. Gable, T. A. Miller, E. Baker, V. Freedman and M. Freshley (2016), Effective Long-term Monitoring Strategies by Integrating Reactive Transport Models and In situ Geochemical Measurements, *16162*.
2. **Arora, B.**, D. Dwivedi, N. F. Spycher, and C. I. Steefel (2015), Modeling carbon fluxes from a biogeochemical hotspot in a floodplain aquifer, *Proceedings of the TOUGH Symposium*, Berkeley, CA, pp. 456-463.
3. Wainwright, H. M., S. Molins, J. A. Davis, **B. Arora**, B. Faybishenko, H. Krishnan, S. S. Hubbard, G. Flach, M. Denham, C. Eddy-Dilek, D. Moulton, K. Lipnikov, C. W. Gable, T. A. Miller, and M. Freshley (2015), Using ASCEM modeling and visualization to optimize remediation strategies at F-Area Savannah River site, SC, *Proceedings of MODFLOW and More 2015*, Colorado.
4. Flach, G., H. M. Wainwright, S. Molins, J. A. Davis, **B. Arora**, B. Faybishenko, H. Krishnan, S. S. Hubbard, M. Denham, C. Eddy-Dilek, D. Moulton, K. Lipnikov, C. W. Gable, T. A. Miller, and M. Freshley (2015), Using ASCEM modeling and visualization to inform stakeholders of contaminant plume evolution and remediation efficacy at F-Basin Savannah River, SC-*15156*, No. SRNL-STI-2015-00027.

Selected Conference Abstracts

1. **Arora, B.**, E. L. King, N. F. Spycher, C. I. Steefel, and M. E. Conrad (2016), Genome-informed reactive transport simulations of CO_2 and carbon isotope dynamics in a flood plain aquifer, Goldschmidt Conference, Yokohama, June 26 – July 1, 2016.
2. **Arora, B.** (2016), Modeling the impact of biogeochemical hotspots and hot moments on carbon fluxes from a flood plain site: Implications for the River Ganges cleanup, IIT Kanpur, Jan. 12, 2016 (***Invited***).
3. Dwivedi, D., **B. Arora,** N. F. Spycher, and C. I. Steefel (2016), Flood Plain Modeling:

Hydrological, Biogeochemical, and Microbial Controls on Carbon and Nitrogen Fluxes, 2016 Environmental System Science (PI) Meeting, Potomac, Apr. 26-27, 2016.

4. Yabusaki, S., M. J. Wilkins, Y. Fang, K. H. Williams, **B. Arora**, J. Bargar, H. Beller, N. J. Bouskill, E. L. Brodie, J. N. Christensen, M. S. Conrad, R. E. Danczak, E. King, N. F. Spycher, C. I. Steefel, T. Tokunaga, R. Versteeg, S. R. Waichler, and H. M. Wainwright (2016), Rifle Floodplain Water Table Dynamics: Biogeochemical Cycling and Uranium Mobility, 2016 Environmental System Science (PI) Meeting, Potomac, Apr. 26-27, 2016.
5. **Arora, B.**, N. F. Spycher, C. I. Steefel, E. King, and M. E. Conrad (2015), Modeling the impact of biogeochemical hotspots and hot moments on subsurface carbon fluxes from a flood plain site, AGU Fall Meeting, San Francisco, Dec. 14-18, 2015.
6. Dwivedi, D., C. I. Steefel, **B. Arora**, G. Bisht, and K. H. Williams (2015), The role of hyporheic zones in cycling of carbon and nitrogen, AGU Fall Meeting, San Francisco, Dec. 14-18, 2015.
7. **Arora, B.**, M. E. Conrad, N. F. Spycher, and C. I. Steefel (2015), Modeling CO_2 and carbon isotope dynamics in a floodplain aquifer, Goldschmidt Conference, Prague, August 16–21, 2015.
8. Dwivedi, D., C. I. Steefel, **B. Arora**, and G. Bisht (2015), Impact of hyporheic zone on biogeochemical cycling of carbon, Goldschmidt Conference, Prague, Aug. 16–21, 2015.
9. **Arora, B.**, D. Dwivedi, S. S. Hubbard, C. I. Steefel, and K. H. Williams (2015), Towards improved characterization of geochemical hot moments: A combined wavelet-entropy approach, SIAM Conference on Mathematical and Computational Issues in the Geosciences, Stanford, June 29 – July 2, 2015.
10. Yabusaki, S., **B. Arora**, N. F. Spycher, E. King, C. Steefel, and E. Brodie (2015), GEWaSC modeling of the Rifle floodplain aquifer: Hydrological, biogeochemical, and microbial controls on carbon, nitrogen, and oxygen fluxes, 2015 Environmental System Science (PI) Meeting, Potomac, Apr. 28-29, 2015.
11. **Arora, B.**, N. F. Spycher, S. Molins, and C. I. Steefel (2014), Modeling the biogeochemical response of a flood plain aquifer impacted by seasonal temperature and water table variations, AGU Fall Meeting, San Francisco, Dec. 15-19, 2014.
12. Conrad, M., **B. Arora**, K. H. Williams, M. Bill, N. F. Spycher, C. I. Steefel, T. K. Tokunaga and S. S. Hubbard (2014), Using concentrations and isotopic compositions of CO_2 to distinguish microbial production of CO_2 in unsaturated zone sediments in hydrogeochemical models, AGU Fall Meeting, San Francisco, Dec. 15-19, 2014.
13. Druhan, J., **B. Arora**, Y. Cheng, and C. I. Steefel (2014), Carbon isotope partitioning in natural and labeled systems: A reactive transport modeling benchmarking study, Subsurface Environmental Simulation Benchmarking Workshop IV, Château de Cadarache, Oct. 6-8, 2014.
14. Yabusaki, S., Y. Fang, **B. Arora**, N. Spycher, and H. Wainwright (2014), Benchmark problem for field-scale variably-saturated flow and biogeochemical reactive transport, Subsurface Environmental Simulation Benchmarking Workshop IV, Château de Cadarache, Oct. 6-8, 2014.
15. Wainwright, H. M., S. Molins, J. Davis, **B. Arora**, B. Faybishenko, S. S. Hubbard, G. Flach, M. Denham, C. Eddy-Dilek, D. Moulton, K. Lipnikov, C. Gable, T. A. Miller, and M. Freshley (2014), Optimizing monitoring and remediation strategies at the Savannah River

site F-Area, using the advanced simulation capability for environmental management (ASCEM), Complex Soil Systems Conference, Berkeley, September 3-5, 2014.

Service and Synergistic Activities

Peer Reviewer for the Following Journals:

Reviewed manuscripts for *Computational Geosciences*, *Environmental Chemistry, Environmental Modelling and Software*, *Journal of Environmental Quality, Journal of Hydrology, Science of the Total Environment*, *Stochastic Environmental Research and Risk Assessment*, *Vadose Zone Journal, Water, Air, & Soil Pollution*, and *Water Resources Research*.

Professional Affiliations:

American Geophysical Union
Geological Society of America
Alpha Epsilon
Phi Kappa Phi

Other Contributions:

- Department Representative, Distinguished Scientist Seminar Series committee, Earth Sciences Division, Lawrence Berkeley National Laboratory, 2015-Present
- Working Group Member, Diversity and Inclusion Council, Earth and Environmental Sciences Area, Sept. 2015-Present.
- Session Chair, Characterizing Spatial and Temporal Variability of Hydrological and Biogeochemical Processes across Scales, AGU Fall Meeting, 2014, 2015 & 2016. Co-conveners: Haruko Wainwright (LBNL) and Susan Hubbard (LBNL).
- Community Outreach Volunteer, Earth and Environmental Sciences Area Exhibitor Booth, AGU Fall Meeting, Dec. 14-18, 2015.
- Education and Outreach Volunteer, Lawrence Berkeley National Laboratory, 41st Annual Solano Avenue Stroll, Sept. 13, 2015.
- Breakout Session Coordinator, Upscaling constructs: approaches to identify, interrogate and model functional zones and associated biogeochemical reactive transport across the genome, plot, floodplain, watershed and basin scales, SFA 2.0 Retreat, Oct. 22-24, 2014.
- Session Co-Chair, Soil organic matter dynamics in the Anthropocene, AGU Fall Meeting, Dec. 9-13, 2013. Co-conveners: Kate Lajtha (Oregon State University), Dipankar Dwivedi (LBNL), and William Riley (LBNL).