

Seonkyoo (Sean) Yoon

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Education

Ph.D. Civil and Environmental Engineering, MIT, Cambridge, MA, 2016.

Thesis: Ensemble-based reservoir history matching using hyper-reduced-order models
Advisor: John R. Williams

M.S. Civil and Environmental Engineering, Yonsei University, Seoul, South Korea, 2009.

Thesis: A fully Bayesian approach to generalized maximum likelihood estimator
Advisor: Woncheol Cho

B.S. Civil and Environmental Engineering, Yonsei University, Seoul, South Korea, 2007.

Employment

University of Florida, Gainesville, FL

Assistant Professor, 2024 – Present

University of Minnesota, Twin Cities, MN

Post-doctoral Associate, 2018 – 2023

MIT, Cambridge, MA

Post-doctoral Associate, 2016 – 2018

Graduate Research Assistant, 2011 – 2016

Korea Institute of Construction Technology, South Korea

Post-master Researcher, 2009 – 2010

Yonsei University, Seoul, South Korea

Graduate Research Assistant, 2007 – 2009

Fellowships & Awards

MIT Energy Initiative Research Seed Fund, 2016. \$150,000

Eni-MIT Energy Fellowship, 2013. \$60,000

Schoettler Scholarship, MIT, 2011. \$30,337

Korean Government Scholarship, Ministry of Education, South Korea, 2011–2012. \$62,000

Teaching

University of Florida, Gainesville, FL

Instructor: Groundwater Geology (Geological Sciences)

University of Minnesota, Twin Cities, MN

Guest Lecturer: Fracture Hydrogeology (Earth and Environmental Sciences)

Guest Lecturer: Remediation Technologies (Civil, Environmental, & Geo-Engineering)

MIT, Cambridge, MA

TA: Engineering Computation & Data Science (Civil & Environmental Engineering)

Yonsei University, Seoul, South Korea

TA: Fluid Mechanics (Civil & Environmental Engineering)

Service & Outreach

Reviewer: Geophysical Research Letters, Hydrogeology Journal, International Journal of Greenhouse Gas Control, Journal of Fluid Mechanics, Journal of Geophysical Research - Machine Learning and Computation, Journal of Hydrology, Physical Review Fluids, Stochastic Environmental Research and Risk Assessment, Water Resources Research

Groundwater Model Exhibitor: “Can You Dig It?” Event at Florida Museum of Natural History, 2024

Training Seminar Speaker: Fourth Midwest OpenFOAM User Group Meeting • 2019

Invited Talks

University of Florida, 2023

Elucidating Anomalous Transport in Geological Formations from Microscopic to Field Scales

University of Georgia, 2022

Contaminant Transport in Porous and Fractured Media

Utah State University, 2021

Computational Modeling and Data Integration for Complex Groundwater Systems

Korea Institute of Science and Technology, South Korea, 2017

Data assimilation for characterizing large-scale aquifer systems

Publications

Kim, T., Han, W. S., Yoon, S., Kang, P. K., Shin, J., & Nam, M. J., (2024). Evaluation of the Impact of Transition from Porous to Fractured Rock Media on 3D Field-scale DNAPLs Contamination. *Journal of Hazardous Materials*.

Cao, H., Yoon, S., Xu, Z., Pyrak-Nolte, L., Breciani, E., & Kang, P. K., (2023). Emergence of unstable focused flow induced by variable-density flows in vertical fractures. *Water Resources Research*.

Wang, L., Yoon, S., Zheng, L., Wang, T., Chen, X., & Kang, P. K., (2023). Flux exchange between fracture and matrix dictates late-time tracer tailing. *Journal of Hydrology*.

Yoon, S., Hyman, J. D., Han, W. S., & Kang, P. K., (2023). Effects of dead-end fractures on non-Fickian transport in three-dimensional discrete fracture networks. *Journal of Geophysical Research - Solid Earth*.

Xu, Z., Cao, H., Yoon, S., Kang, P. K., Jun, Y.-S., Kneafsey, T., Sheets, J. M., Cole, D., & Pyrak-Nolte, L., (2023). Gravity-Driven controls on fluid and carbonate precipitation distributions in fractures. *Scientific Reports*.

Lee, W., Yoon, S., & Kang, P. K., (2023). Inertia and diffusion effects on bimolecular reactive transport with fluid-solid reactions in rough fracture flows. *Physical Review Fluids*.

Yoon, S., Lee, S., Zhang, J., Zeng, L., & Kang, P. K., (2023). Inverse estimation of multiple contaminant sources in three-dimensional heterogeneous aquifers with variable-density flows. *Journal of Hydrology*.

Lee, J., Han, W. S., Kang, P. K., Yoon, S., Choung, S., Hwang, J., Shin, J., (2022). Long-term fate and transport of remobilized radiocesium through porous and fractured aquifers below a dam. *Journal of Hydrology*.

Yoon, S., & Kang, P. K., (2021). Mixing-induced bimolecular reactive transport in rough channel flows: Pore-scale simulation and stochastic upscaling. *Transport in Porous Media*.

Yoon, S., Dentz, M., & Kang, P. K., (2021). Optimal fluid stretching for mixing-limited reactions in rough channel flows. *Journal of Fluid Mechanics*, 916, A45

Yoon, S., & Kang, P. K., (2021). Roughness, inertia, and diffusion effects on anomalous transport in rough channel flows. *Physical Review Fluids*, 6, 014502

- Yoon, S., Lee, S., Williams, J. R., & Kang, P. K., (2020). Effects of variable-density flow on the value-of-information of pressure and concentration data for aquifer characterization. *Advances in Water Resources*, 135, 103468
- Yoon, S., Williams, J. R., Juanes, R., & Kang, P. K., (2017). Maximizing the value of pressure data in saline aquifer characterization. *Advances in Water Resources*, 109, 14—28
- Yoon, S., Alghareeb, Z. M., & Williams, J. R., (2016). Hyper-reduced-order models for subsurface flow simulation. *SPE Journal*, 21(06), 2128—2140
- Veneziano, D., & Yoon, S., (2013). Rainfall extremes, excesses, and intensity-duration-frequency curves: A unified asymptotic framework and new nonasymptotic results based on multifractal measures. *Water Resources Research*, 49(7), 4320—4334
- Yoon, S., Cho, W., Heo, J. H., & Kim, C. E., (2010). A full Bayesian approach to generalized maximum likelihood estimation of generalized extreme value distribution. *Stochastic Environmental Research and Risk Assessment*, 24(5), 761—770
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Proceedings & Abstracts

- Cao, H., Yoon, S., Xu, Z., Pyrak-Nolte, L. J., Bresciani, E., & Kang, P. K. (2022, December). Emergence of focused flow and instability in vertical fractures induced by variable-density flows. In *AGU Fall Meeting Abstracts* (Vol. 2022, pp. H52G-02).
- Kim, T., Han, W. S., Yoon, S., Kang, P. K., & Shin, J. (2022, December). A 3D Integrated Model of Porous Media and Fractured Rock for Predicting DNAPLs Transport and Fate. In *AGU Fall Meeting Abstracts* (Vol. 2022, pp. H15A-05).
- Yoon, S., Hyman, J., Han, W. S., & Kang, P. K. (2022, December). Machine Learning-assisted Identification of Structural Properties Controlling Transport in Fracture Networks. In *AGU Fall Meeting Abstracts* (Vol. 2022, pp. H16H-06).
- Kang, P. K., Liu, M., Kwon, B., & Yoon, S. (2022, December). Machine Learning to Predict Effective Reaction Rates in 3D Porous Media from Pore Structural Features. In *AGU Fall Meeting Abstracts* (Vol. 2022, pp. H22K-03).
- Kang, P., Yoon, S., & Lee, W. (2021, December). Upscaling Inertia Effects on Reactive Transport in Rough Fracture Flows. In *AGU Fall Meeting Abstracts* (Vol. 2021, pp. H43E-08).
- Yoon, S., Lee, S., Zhang, J., Zeng, L., & Kang, P. (2021, December). Identification of Multiple Contaminant Sources in Three-dimensional Heterogeneous Aquifers: Effects of Variable-Density Flow and Aquifer Heterogeneity. In *AGU Fall Meeting Abstracts* (Vol. 2021, pp. H44C-07).
- Cao, H., Yoon, S., Xu, Z., Pyrak-Nolte, L., Bresciani, E., & Kang, P. (2021, December). Gravity-driven instability in fracture flows with miscible fluids of different densities. In *AGU Fall Meeting Abstracts* (Vol. 2021, pp. H41C-05).
- Yoon, S., & Kang, P. K. (2020, December). Predicting Anomalous Reactive Transport in Rough Fractures: Pore-scale Simulation and Stochastic Upscaling. In *AGU Fall Meeting Abstracts* (Vol. 2020, pp. H067-02).
- Cao, H., Yoon, S., Xu, Z., Pyrak-Nolte, L. J., & Kang, P. K. (2020, December). Gravity-driven instability in fracture flows with miscible fluids. In *AGU Fall Meeting Abstracts* (Vol. 2020, pp. H060-0013).
- Pyrak-Nolte, L. J., Jiang, L., Mitchell, C. A., Xu, Z., Cao, H., Yoon, S., ... & Yoon, H. (2020, December). Rock-Fluid Interactions: Fracture Formation and Fluid Distributions. In *AGU Fall Meeting Abstracts* (Vol. 2020, pp. MR013-02).
- Lee, W., Yoon, S., & Kang, P. K. (2020, December). Effects of Recirculating Flows on Solute Transport with Solid-Fluid Reactions in Rough Fractures. In *AGU Fall Meeting Abstracts* (Vol. 2020, pp. H088-0007).

- Xu, Z., Cao, H., Yoon, S., Kang, P. K., & Pyrak-Nolte, L. J. (2020, December). Gravity-driven Reactive Miscible Fluid Mixing in a Fracture. In *AGU Fall Meeting Abstracts* (Vol. 2020, pp. NG007-0007).
- Kang, P. K., & Yoon, S. (2019, December). Roughness, Inertia, and Diffusion Effects on Anomalous and Reactive Transport in Rough Fractures. In *AGU Fall Meeting Abstracts* (Vol. 2019, pp. H53D-07).
- Yoon, S., Dentz, M., & Kang, P. K. (2019, December). Optimal Fluid Stretching for Mixing-induced Reaction in Rough Fractures. In *AGU Fall Meeting Abstracts* (Vol. 2019, pp. H33N-2191).
- Lee, W., Yoon, S., & Kang, P. K. (2019, December). Effects of Eddies on Heterogeneous Bimolecular Reactive Transport in Rough Fractures. In *AGU Fall Meeting Abstracts* (Vol. 2019, pp. H33C-03).
- Lee, W., Yoon, S., & Kang, P. K. (2018, December). Mixing and Mass Partitioning at Fracture Intersections: The Effects of Surface Roughness and Flow Rate. In *AGU Fall Meeting Abstracts* (Vol. 2018, pp. H51P-1517).
- Yoon, S., Williams, J. R., Juanes, R., & Kang, P. K. (2017, December). Impact of Variable-Density Flow on the Value-of-Information from Pressure and Concentration Data for Saline Aquifer Characterization. In *AGU Fall Meeting Abstracts* (Vol. 2017, pp. H32A-04).
- Yoon, S., Kang, P., & Williams, J. (2017, April). Variable-density effects on the worth of pressure data for characterizing aquifer permeability. In *EGU General Assembly Conference Abstracts* (p. 10777).
- Yoon, S., Alghareeb, Z. M., & Williams, J. R. (2014, October). Development of reduced-order oil reservoir models using localized deim. In *SPE Annual Technical Conference and Exhibition* (pp. SPE-170741). SPE.