Jeffrey S. Kwang (He/Him/His)

Contact Information

Email: jeffskwang@gmail.com
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Education

University of Illinois Urbana-Champaign, Urbana, Illinois USA
Ph.D., Civil Engineering, 2019
Dissertation Title: *Overcoming Unrealistic Behavior of Landscape Evolution Models Attributed to the Stream Power Incision Model: Scale Invariance and Ultra-sensitivity to Initial Conditions*
Advisor: Dr. Gary Parker

University of Illinois Urbana-Champaign, Urbana, Illinois USA
M.S., Civil Engineering, 2016
Thesis Title: *Effects of Differential Rainfall on the Dynamics of Landscape Evolution*

Johns Hopkins University, Baltimore, Maryland USA
B.S., Environmental Engineering, 2013
Capstone Design Project: *River Morphodynamic Modeling after the Removal of Bloede Dam on the Patapsco River*

Professional Appointments

University of Minnesota Twin Cities, Minneapolis, Minnesota USA
NSF EAR Postdoctoral Fellow, Saint Anthony Falls Laboratory, (February 2022 to Present)
Supervisor: Dr. Andrew Wickert

- Designed numerical morphodynamic experiments to study river network reorganization in previously glaciated regions
- Collected sediment samples ^{10}Be anlysis to estimate catchment-averaged erosion rates to predict long-term landscape evolution in the upper Midwest United States

University of Massachusetts Amherst, Amherst, Massachusetts USA
Postdoctoral Associate, Department of Geosciences, (August 2019 to January 2022)
Supervisor: Dr. Isaac Larsen

- Developed a 3-dimensional numerical model that simulates the redistribution of soil and organic carbon in agricultural landscapes
- Supervised 8 undergraduate students and developed a workflow for soil analysis
- Forecasted high spatiotemporal resolution landscape evolution and carbon transport across the US cornbelt region over the next century

University of Illinois Urbana-Champaign, Urbana, Illinois USA
Graduate Researcher, Department of Civil and Environmental Engineering, (August 2013 to July 2019)

- Discovered that numerical landscape evolution models underpredict landscape dynamism and over-preserve signals of initial conditions compared to physical basin experiments
- Incoporated a lateral river migration sub-model, a mechanism observed in basin experiments, into the numerical models to better predict landscape dynamism and prevent over-preservation of initial conditions

University of Minnesota Twin Cities, Minneapolis, Minnesota USA
Undergraduate Researcher, Saint Anthony Falls Laboratory, (Summer 2012)

- Conducted flume studies on the role of large woody debris in riverine sediment transport and presented results at the Geologic Society of American 2012 annual meeting

Awards and Fellowships

- **National Science Foundation Earth Sciences Postdoctoral Fellow**, (2022-2024), **$174,000**
- **National Science Foundation Graduate Research Fellow**, (2015 - 2019), **$102,000**
- **Ben Chie Yen Fellow & Civil and Environmental Engineering Distinguished Fellow**, University of Illinois Urbana-Champaign, (2013 - 2014), **$75,000**
- **Lucien Brush Award for Excellence in Environmental Engineering**, Johns Hopkins University, (2013)

Papers in Preparation

Kwang, J. S., Wickert A.D. & Larsen, I. J. Extreme memory of lithologic variability in numerical landscape evolution models.

Papers

Kwang, J. S., Thaler, E. A.& Larsen, I. J. *The Future of Soils in the Midwestern United States*. (*in review*).

Quarrier, C. L. , **Kwang, J. S.**, Quirk, B. J., Thaler, E. A. & Larsen, I. J. *Pre-agricultural soil erosion rates in the midwestern U.S.* Geology (*accepted*).

Moodie, A. J., Carlson, B., Foreman, B.Z., **Kwang, J. S.**, Naito, K.& Nittrouer, J. A. *SedEdu: software organizing sediment-related educational modules.* Journal of Open Source Education (2022).
https://doi.org/10.21105/jose.00129

Thaler, E. A., **Kwang, J. S.**, Quirk, B. J., Quarrier, C. L. & Larsen, I. J. *Rates of historical anthropogenic soil erosion in the Midwestern United States.* Earth's Future (2022).
https://doi.org/10.1029/2021EF002396

Kwang, J. S., Thaler, E. A., Quirk, B. J., Quarrier, C. L. & Larsen, I. J. *A landscape evolution modeling approach for predicting three-dimensional soil organic carbon redistribution in agricultural landscapes.* Journal of Geophysical Research: Biogeosciences (2022).
https://doi.org/10.1029/2021JG006616

Yan, Q., Wainwright, H., Dafflon, B., Uhlemann, S., Steefel, C. I., Falco, N., **Kwang, J. S.**, & Hubbard, S. S. *A hybrid data–model approach to map soil thickness in mountain hillslopes*. Earth Surface Dynamics 9, 1347-1361 (2021).
https://doi.org/10.5194/esurf-9-1347-2021

Kwang, J. S., Langston, A. L. & Parker, G. *The role of lateral erosion in the evolution of non-dendritic drainage networks to dendricity and the persistence of dynamic networks*. Proceedings of the National Academy of Sciences of the United States of America 118, e2015770118 (2021).
https://doi.org/10.1073/pnas.2015770118

Zhang, L., Li, T., Wang, G., **Kwang, J. S.**, Nittrouer, J. A., Fu, X. & Parker, G. *How canyons evolve by incision into bedrock: Rainbow Canyon, Death Valley National Park, United States*. Proceedings of the National Academy of Sciences of the United States of America 117, 14730–14737 (2020).
https://doi.org/10.1073/pnas.1911040117

Kwang, J. S. & Parker, G. *Extreme Memory of Initial Conditions in Numerical Landscape Evolution Models*. Geophysical Research Letters 46, 6563–6573 (2019).
https://doi.org/10.1029/2019GL083305

Zhang, L., Stark, S., Schumer, R., **Kwang, J. S.**, Li, T., Fu, X., Wang, G. & Parker, G. *The Advective-Diffusive Morphodynamics of Mixed Bedrock-Alluvial Rivers Subjected to Spatiotemporally Varying Sediment Supply*. Journal of Geophysical Research: Earth Surface 123, 1731–1755 (2018).
https://doi.org/10.1029/2017JF004431

Kwang, J. S. & Parker, G. *Landscape evolution models using the stream power incision model show unrealistic behavior when m/n equals 0.5*. Earth Surface Dynamics 5, 807–820 (2017).
https://doi.org/10.5194/esurf-5-807-2017

Theses

Kwang, J. S. *Overcoming Unrealistic Behavior of Landscape Evolution Models Attributed to the Stream Power Incision Model: Scale Invariance and Ultra-sensitivity to Initial Conditions*. Ph.D. Dissertation, University of Illinois at Urbana-Champaign, Urbana, Illinois USA (2019).

Kwang, J. S. *Effects of Differential Rainfall on the Dynamics of Landscape Evolution*. M.S. Thesis, University of Illinois at Urbana-Champaign, Urbana, Illinois USA (2016).

Conference Proceedings

Kwang, J. S., Wickert, A. D. & Larsen, I. J. *Drainage network reorganization in landscapes buried by glacial deposits*. American Geophysical Union Fall Meeting (2022). ***Invited*** *Poster Presentation*

Gasparini, N. M., Roth, D. L., Madoff, R., Mukherjee U., Callahan, R. P., Mahon, R., Sklar, L. S., Gagliardi, J., Lehnigk, K., Luna, L., Merritts, D., **Kwang, J. S.**, Del Vecchio, J., Sun, X., Koppes, M. N., McDowell, C., Straub, K. M. & Hassenruck-Gudipati, H. J. *Lessons learned from the AGU EPSP URGE pod on how to structure an equitable, inclusive, and safe committee space*. American Geophysical Union Fall Meeting (2021). *Poster Presentation*

Del Vecchio, J., Hassenruck-Gudipati, H.J. , Roth, D.L., Merritts, D., Hill, K.M., Sun, X., **Kwang, J. S.**, Koppes, M.N., Mahon, R., Maddoff, R., Gasparini, N.M., Lehnigk, K., McDowell, C., Callahan, R.P., Mukherjee, U., Sklar, L.S., Gagliardi, J., Luna, L.& Straub, K.M.*URGE Pod Outcomes for the AGU EPSP Section*. American Geophysical Union Fall Meeting (2021). *Poster Presentation*

Kwang, J. S., Thaler, E. A. & Larsen, I. J. *Forecasting soil loss across the US Corn Belt*. American Geophysical Union Fall Meeting (2021). *Poster Presentation*

Quarrier, C. L., Larsen, I. J., Quirk, B. J., Thaler, E. A. & **Kwang, J. K**. *Quantifying Natural Soil Erosion Rates in Agricultural Landscapes of the Midwestern U.S. to Promote Sustainable Soil Management*. American Geophysical Union Fall Meeting (2021). *Poster Presentation*

Kwang, J. S., Thaler, E. A. & Larsen, I. J. *Predicting anthropogenic soil organic carbon redistribution in the Midwestern United States*. American Geophysical Union Fall Meeting (2020). *Poster Presentation*

Quirk B. J., David S. R., Thaler, E. A., **Kwang, J. S.** & Larsen, I. J. *Using cosmogenic ^{10}Be in detrital quartz to quantify erosion rates in the Des Moines Lobe region of Iowa*. American Geophysical Union Fall Meeting (2020). *Poster Presentation*

Thaler, E. A, **Kwang, J. S.** & Larsen, I. J. *Quantifying the magnitude of historical anthropogenic soil loss in the Midwestern United States*. American Geophysical Union Fall Meeting (2020). *Poster Presentation*

Kwang, J. S., Langston, A. L. & Parker, G. *Steady state behavior and initial condition signal shredding in landscape evolution models incorporating lateral incision*. American Geophysical Union Fall Meeting (2019). *Oral Presentation*

Kwang, J. S. & Parker, G. *Ultra-sensitivity of numerical landscape evolution models to their initial conditions*. American Geophysical Union Fall Meeting (2018). *Poster Presentation*

Kwang, J. S. & Parker, G. *Do Landscapes have good memories?* Community Surface Dynamics Modeling System, Coupling of Tectonic and Surface Processes Workshop (2018).

Kwang, J. S. & Parker, G. *Interactions between landslides and landscape evolution using a sediment flux-dependent bedrock incision model incorporating bed macro-roughness*. American Geophysical Union Fall Meeting (2017). *Oral Presentation*

Kwang, J. S. & Parker, G. *Landscape evolution using a sediment flux-dependent bedrock incision model incorporating bedrock macro-roughness*. American Geophysical Union Fall Meeting (2016). *Poster Presentation*

Kwang, J. S. & Parker, G. *Scale Invariance in Landscape Evolution Models*. American Geophysical Union Fall Meeting (2014). *Poster Presentation*

Kwang, J. S. & Hill, K,.M. *Effects of spacing between engineered log jams on flow, scour, and depositional patterns*, Geological Society of America Annual Meeting (2012). *Poster Presentation*

Presentations

Kwang, J. S. *Modeling landscape evolution from small to big spatiotemporal scales: bedrock mountains and agricultural fields*. Professional Seminar. University of Massachusetts Amherst, Amherst, Massachusetts USA (2021).

Kwang, J. S. *Ultra-sensitivity of Numerical Landscape Evolution Models to their Initial Conditions*. Ven Te Chow Hydrosystems Seminar. University of Illinois at Urbana-Champaign, Urbana, Illinois USA (2018).

Kwang, J. S. *Dynamic River Networks in Landscape Evolution Models*. Ven Te Chow Hydrosystems Seminar. University of Illinois at Urbana-Champaign, Urbana, Illinois USA (2016).

Teching Experience

Introduction to Computation and Mathematical Modeling, Undegraduate-level course
Teaching Assistant, Johns Hopkins University (Spring 2013)

Environmental Fluid Mechanics, Graduate-level course
Teaching Assistant, University of Illinois at Urbana-Champaign (Fall 2017)

River Morphodynamics, Graduate-level course
Teaching Assistant, University of Illinois at Urbana-Champaign (Spring 2019)

Soil Erosion in Agricultural Landscapes, Upper Undergraduate-level course
Guest Lecturer and Teaching Assistant, University of Massachusetts (Fall 2019)

Geomorphology, Upper Undergraduate-level course
Guest Lecturer, University of Minnesota Twin Cities (Fall 2022)

Technical Skills and Training

Numerical Modeling Development
River Morphodynamics, Landscape Evolution, Soil Dynamics, Sediment Transport

Software and Coding
Python, MATLAB, R, ArcGIS, LaTeX, HEC-RAS, Microsoft Office, FORTRAN, Linux, HTML, JavaScript, ffmpeg, Blender, Fusion 360

Laboratory
Sediment transport flume experiments, spectroscopy, sediment grain size analysis, laser scanning

Field Geology
Soil coring, field surveying, RTK-GPS, stream-cross sections and profiles, sediment sampling, total station

Bystander Intervention Training
Workshop held by the American Geophysical Union, Hydrology Section Student Subcommittee

Service

- Computer Builder Volunteer, Free Geek Twin Cities, (2022 -)
- Pod Member, Unlearing Racism in Geoscience (URGE), American Geophysical Union, Earth and Planetary Surface Processes, (2021)
- Food Sorter, Food Bank of Western Massachusetts, (2021)
- Workshop Developer, Eureka! at the University of Massachusetts Amherst, (2020 - 2021)
- Big Brother, Big Brothers Big Sisters of America of Central Illinois, (2014 - 2019)

- Exhibitor, Engineering Open House at University of Illinois Urbana-Champaign, (2014 - 2019)
- River Cleanup Volunteer, Boneyard Creek Community Day (2014-2019)

Memberships

- American Geophysical Union
- Tau Beta Pi
- Geological Society of America
- Community Surface Dynamics Modeling System
- Geo-Hydro Discussion Group - article featured in AGU connect
- Asian Americans and Pacific Islanders in Geosciences

Manuscript Reviewer

Earth Surface Dynamics, Geology, Geomorphology, Geophysical Research Letters, Geoscientific Model Development, Journal of Geophysical Research: Earth Surface, Water Resources Research