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 2016 - 2019
Ph.D., Civil Engineering
Dissertation: *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 2013 - 2016
M.S., Civil Engineering
Thesis: *Effects of Differential Rainfall on the Dynamics of Landscape Evolution*

Johns Hopkins University, Baltimore, Maryland USA 2009 - 2013
B.S., Environmental Engineering
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 2022 - present
NSF EAR Postdoctoral Fellow, Saint Anthony Falls Laboratory
Supervisor: Dr. Andrew Wickert

- Developed a new framework for understanding how river networks reorganize in landscapes containing heterogeneous bedrock lithology using a numerical landscape evolution model
- Utilized remote sensing and created geospatial metrics to identify river network patterns that indicate past drainage reorganization
- Collected sediment samples and used ^{10}Be analysis to estimate catchment-averaged erosion rates to predict long-term landscape evolution in the upper Midwestern US

University of Massachusetts Amherst, Amherst, Massachusetts USA 2019 - 2022
Postdoctoral Associate, Department of Geosciences
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 soil organic carbon redistribution across the Midwestern US over the next century

University of Illinois Urbana-Champaign, Urbana, Illinois USA 2013 - 2019
Graduate Researcher, Department of Civil and Environmental Engineering

- Conducted paired physical basin-experiments and numerical models of landscape evolution and compared their equilibrium properties
- Discovered that numerical models underpredict landscape dynamism and over-preserve signals of initial conditions compared to physical basin-experiments
- Incorporated a lateral river migration sub-model into the numerical models to better predict landscape dynamism and prevent over-preservation of initial conditions, resolving the differences between the physical and numerical models

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

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

Teaching Experience

University of Minnesota Twin Cities, Minneapolis, Minnesota USA Spring 2023
Student, GRAD 8101 **Teaching in Higher Education**

- Class specializing in course design and implementing active learning

University of Minnesota Twin Cities, Minneapolis, Minnesota USA Fall 2022
Guest Lecturer, ESCI 4701 **Geomorphology**

- Taught a week course (lecture and lab) on landscape evolution modeling
- Lecture Materials and Hands-on modeling activity

University of Massachusetts Amherst, Amherst, Massachusetts USA Fall 2019
Teaching Assistant, GEOLOGY 497S **Soil Erosion in Agricultural Landscapes**

- Trained students to collect and analyze agricultural soil samples in Iowa
- Assisted in the design of four different semester-long projects about the effects of agriculture on soil erosion
- Presented research on numerical modeling soil erosion in agricultural landscapes

University of Illinois Urbana-Champaign, Urbana, Illinois USA Spring 2019
Teaching Assistant, CEE 553 **River Morphodynamics**

- Taught a course on the fundamentals of landscape evolution modeling
- Substituted for instructor while he was out of town
- Developed a coding help session for students' semester project

University of Illinois Urbana-Champaign, Urbana, Illinois USA Fall 2017
Teaching Assistant, CEE 451 **Environmental Fluid Mechanics**

- Graded homework and gave student's feedback for improvement
- Held a coding help session for students' semester project

Johns Hopkins University, Baltimore, Maryland USA Spring 2013
Teaching Assistant, EN.570.210 **Intro. to Computation and Mathematical Modeling**

- Prepared weekly sessions to help students with homework and concepts
- Graded and provided feedback on homework, projects, and tests

Research

Research Interests: **Landscape evolution** response to **allogenic** (land-use change, climate change, lithologic variability) and **autogenic** (landsliding, river migration, knickpoint retreat) dynamics

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.* Earth's Future (*accepted pending minor revisions*).

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 (*2022*).
https://doi.org/10.1130/G50667.1

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).

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).

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*

Awards and Fellowships

- **National Science Foundation Earth Sciences Postdoctoral Fellow, $174,000** 2022 - 2024
- **National Science Foundation Graduate Research Fellow, $102,000** 2015- 2019
- **Ben Chie Yen Fellow & Civil and Environmental Engineering Distinguished Fellow** 2013 - 2014
  University of Illinois Urbana-Champaign, **$50,000**
- **Lucien Brush Award for Excellence in Environmental Engineering** 2013
  Johns Hopkins University

Technical Skills and Training

Numerical Modeling Development
River Morphodynamics, Landscape Evolution (example work: SOC-LEM), Soil Dynamics, Sediment Transport

Software and Coding
Python, MATLAB, R, ArcGIS, LaTeX, HEC-RAS, Microsoft Office, FORTRAN, Linux, HTML, JavaScript, ffmpeg, Blender (example work: TopoBlender), 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

- Committee Member, Saint Anthony Falls Laboratory Community-Building Committee 2022 - present
- Computer Builder Volunteer, Free Geek Twin Cities 2022 - present
- Pod Member, Unlearning 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
- Guest Lecturer, Hands-on field trip about rivers and sediment 2019
  Amherst-Pelham Regional High School
- 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

Manuscript Reviewer

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

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