Yeonuk Kim, PhD

Division of Hydrologic Sciences, Desert Research Institute (DRI)

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Education

Ph.D. in Resources, Environment and Sustainability, **University of British Columbia (UBC)** [2017 - 2022]

- Dissertation: *Interactions between the land surface and the near-surface atmosphere: implications for evaporative demand and evapotranspiration under a changing climate.* doi: 10.14288/1.0422489
- Committee: Mark Johnson (advisor), T. Andrew Black, Sara Knox, Monica Garcia, Paulo Brando

BSc. in Rural Systems Engineering (*Cum laude*), **Seoul National University (SNU)** [2009 - 2016]

- Thesis: *Interannual variations in methane emission from an irrigated rice paddy caused by rainfall during the aeration period.*
- Advisor: Joon Kim

Professional experience

Postdoctoral Research Fellow, DRI [2025.01 – present]

Technical team member, The OpenET consortium [2025.01 – present]

Postdoctoral Research Fellow, UBC [2023 – 2024]

- Note: formal parental leaves [2023.6 – 2023.8]

Visiting Researcher, Technical University of Denmark (DTU) [2019 Spring]

Graduate Research Assistant, UBC [2017 – 2022]

Research Associate, National Center for Agro-Meteorology [2016 Fall]

Undergraduate Research Assistant, National Center for Agro-Meteorology and SNU [2014 – 2015]

Teaching experiences

Module developer and delivery. ENVR 420: Ecohydrology of Watersheds and Water Systems, UBC [2019 – 2024]

Teaching Assistant. ENVR 420: Ecohydrology of Watersheds and Water Systems, UBC [2018]

Teaching Assistant. LFS 250: Land, Food and Community 1, UBC [2017 – 2018]

Mentoring experience

Supervisory committee of a MSc student (Ming Cao) in UBC [2024]

- Cao, M. (2024). *Soil matters: evaluating soil water dynamics and soil greenhouse gas emissions under climate-smart agriculture.* doi: 10.14288/1.0445215

Mentor of Research Experience program (REX) for UBC undergraduate students [2022 – 2023]

Mentor of a graduate student project. CPSC 532L: Artificial Intelligence for Social Impact, UBC [2020]

Service

Departmental committee on Decolonization, Equity, Diversity, and Inclusion, UBC [2023 – 2024]

Journal reviewer: *Agricultural and Forest Meteorology; Earth's Future*; *Global Change Biology; Geophysical Research Letter, Hydrology and Earth System Sciences*; *Journal of Hydrology*; *Remote Sensing of Environment*

Research interests

ecohydrology, micrometeorology, hydroclimatology, land-atmosphere interactions, evapotranspiration, satellite remote sensing, eddy covariance, machine learning, climate change adaptation and mitigation

Honors and awards

Graduate program

Freda Pagani Award for Outstanding PhD Thesis. UBC [2024]
EGU Highlight Paper Selection, European Geosciences Union (EGU) [2021]
• Lead author of an article, selected as a EGU Highlight (doi: 10.5194/hess-25-5175-2021).
President's Academic Excellence Initiative PhD Award. UBC [2020 – 2022]
Four Years Doctoral Fellowships. UBC [2018 – 2022]
International Tuition Award. UBC [2017 – 2022]
Faculty of Science Graduate Award. UBC [2017 – 2018]
Mitacs Globalink research Award. (Internship in DTU) [2019]
Award by President of K-Water. An idea contest for sustainable water management in South Korea [2018]

Undergraduate program

Outstanding Degree Thesis Award (Award by Dean). College of Agriculture and Life Science, SNU [2017]
Grand Prize (Award by Minister of Culture, Sports and Tourism). An essay contest for a rural tourism [2017]
Grand Prize (Award by President of SNU). SNU Undergraduate Research Program, SNU [2015]
Evergreen Scholarship. SNU Evergreen Scholarship Foundation [2015]
Agricultural Engineering Scholarship. SNU Alumni Associations of Agricultural Engineering [2014 – 2015]
Merit Based Scholarship (Scholarship of Superior Academic Performance). SNU [2011, 2014 – 2015]
National Scholarship for Science and Engineering. Korea Student Aid Foundation [2009]

Research projects

Current projects

Investigating the mutual influence of terrestrial evapotranspiration and humidity trends in the Southwestern United States, *Maki Postdoctoral Fellowship at the Desert Research Institute* [2025 - present]

Previous projects

Future carbon storage and greenhouse gas emissions at Burns Bog under different management and climate scenarios, *Metro Vancouver*. Postdoctoral Researcher [2024]

Improving Estimates of Evapotranspiration and Land Surface Relative Humidity Using Satellite-Derived Soil Moisture and Vegetation Optical Depth from SMAP-SMOS and Land Surface Temperature from Sentinel-3, C$ 250,000 from *Canadian Space Agency*. **Co-Investigator** on project and **Co-author** of grant proposal [2021 – 2024]

Agricultural Water Innovation in the Tropics (AgWIT) project funded by the EU Joint Call for the Water Joint Programming Initiative 2016, *Natural Sciences and Engineering Research Council of Canada.* Graduate Research Assistant [2017 – 2020]

Constructing the foundation of core technologies for custom-made agricultural & forest meteorological services, *Korea Meteorological Administration.* Research Associate [2016]

Constructing the terrestrial ecosystem carbon database for the Carbon-Tracker-Asia improvement, *Korea Meteorological Administration.* Undergraduate Research Assistant [2015]

Development of time series database for CO_2 fluxes and investigation of ecosystem carbon dynamics, *Korea Meteorological Administration.* Undergraduate Research Assistant [2014 – 2015]

Publications

1. **Kim, Y.** & Johnson, M. S. (2025). Deciphering the role of evapotranspiration in declining relative humidity trends over land. *Communications Earth & Environment*. 6 (1), 105. doi: 10.1038/s43247-025-02076-9

2. Chignell**,** S. M., **Kim, Y.** & Johnson, M. S. (2025). Remote sensing-based ecohydrogeological characterisation and perceptual model of the Bale Mountains, Ethiopia. *Hydrological Processes*. 39 (2), e70006. doi: 10.1002/hyp.70006

3. **Kim, Y.**, García, M., Black, T. A. & Johnson, M. S. (2023). Assessing the complementary role of surface flux equilibrium (SFE) theory and maximum entropy production (MEP) principle in the estimation of actual evapotranspiration. *Journal of Advances in Modeling Earth Systems.* 15 (7). e2022MS003224. doi: 10.1029/2022MS003224

4. **Kim, Y.**, García, M., & Johnson, M. S. (2023). Land-atmosphere coupling constrains increases to potential evaporation in a warming climate: Implications at local and global scales. *Earth's Future.* 11 (2). doi: 10.1029/2022EF002886

5. **Kim, Y.**, Morillas, L., Garcia, M., Weber, U., Black, T. A. & Johnson, M. S. (2021). Relative humidity gradients as a key constraint on terrestrial water and energy fluxes. *Hydrology and Earth System Sciences.* 25 (9), 5175-5191. doi: 10.5194/hess-25-5175-2021

6. **Kim, Y.**, Johnson, M. S., Knox, S., Black, T. A., Dalmagro, H. J., Kang, M., Kim, J. & Baldocchi, D. (2020). Gap-filling approaches for eddy covariance methane flux: a comparison of three machine learning algorithms and a traditional method with and without principal component analysis. *Global Change Biology.* 26 (3), 1499-1518. doi:10.1111/gcb.14845.

7. **Kim, Y.**, Talucder, M. S. A., Kang, M., Shim, K. -M., Kang, N. & Kim, J. (2016). Interannual variations in methane emission from an irrigated rice paddy caused by rainfall during the aeration period. *Agriculture, Ecosystems & Environment.* 223, 67-75. doi: 10.1016/j.agee.2016.02.032

Korean journal

8. Choi, S.W., Kim, H., **Kim, Y.**, Kang, M. & Kim, J. (2016). Estimation and mapping of methane emission from rice paddies in Gyunggi-do using the modified water management scaling factor. *Korean Journal of Agricultural and Forest Meteorology*. 18(4), 320-326

Under review & In preparation

1. **Kim, Y.**, García, M., Black, T. A. & Johnson, M. S. A Physically-constrained Evapotranspiration Models with Machine Learning Parameterization Outperform Pure Machine Learning: Critical Role of Domain Knowledge. Under review in *Agricultural and Forest Meteorology*.

2. Johnson, M., Lauren, L & **Kim, Y**. Tropical forest ecohydrology (a book chapter in Handbook of Terrestrial Ecohydrology). In preparation

3. Riba, A., Garica, M., Tarquis, A. M., Oyonarte, C., Domingo, F., Liu, J., Johnson, M. S., **Kim, Y.**, & Wang, S. Optimizing the revisit frequency of remotely sensed observations for continuous estimation of ecosystem evapotranspiration and productivity. In preparation

4. June, S., **Kim, Y.**, Knox, S., Johnson, M. & Merkins, M. Projecting future carbon storage and greenhouse gas emissions at Burns Bog Ameriflux Sites (working title). In preparation

5. **Kim, Y.**, Black, T. A, Jassal, P. & Johnson, M. Partitioning of evapotranspiration in rapidly changing conditions (working title). In preparation

Presentation and posters (underlined = mentored by Kim)

1. Riba, A., García, M., Tarquis, A. M., Oyonarte, C., Domingo, F., Liu, J., Johnson, M. S., **Kim, Y.** & Wang, S. (2025) Optimizing the revisiting frequency of remotely sensed thermal observations for continuous estimation of ecosystem evapotranspiration and productivity using Bayesian inference. *The EGU General Assembly 2025.* Vienna, Austria (Poster)

2. **Kim, Y.** & Johnson, M. S. (2024) Integrating emerging equilibrium theory into satellite-based evapotranspiration (ET) estimation for enhanced temporal upscaling. *2024 Ameriflux Annual Meeting*. Berkeley, CA, USA (Poster)

3. **Kim, Y.**, García, M., Black, T. A. & Johnson, M. S. (2024) A hybrid approach for evapotranspiration estimation integrating a resistance-free physical model and machine learning. *The AGU Chapman Conference on Remote Sensing and the Water Cycle.* Honolulu, Hawaii, USA (Poster)

4. Chignell, S. M., **Kim, Y.** & Johnson, M. S. (2024) Water 'tower', 'sponge', or 'pump'? Remote sensing-based ecohydrogeological characterization and perceptual model of the Bale Mountains, Ethiopia. *The AGU Chapman Conference on Remote Sensing and the Water Cycle.* Honolulu, Hawaii, USA (Poster)

5. **Kim, Y.** & Johnson, M. S. (2023) Changes in atmospheric state reveal long-term changes in evapotranspiration. *AGU23.* San Francisco, California, USA (Poster)

6. **Kim, Y.** & Johnson, M. S. (2023). Satellite observations-derived inputs for hybrid evapotranspiration models: towards physically sound integration of machine learning approaches. *2023 SMAP Canada Workshop.* Montreal, Canada (Invited)

7. Ren, Y., Nambiar, R. & **Kim, Y.** (2023). Alternative aridity index for dryland expansion prediction model. *2023 Multidisciplinary Undergrad Research Conference.* Vancouver, Canada (Poster)

8. **Kim, Y.** (2022). Improving Estimates of Evapotranspiration Using Satellite-Derived Soil Moisture. *Canadian Space Agency.* online (Invited)

9. **Kim, Y.** & Johnson, M. S. (2022). The sensitivity of evaporation to soil moisture: the role of relative humidity gradient. *2022 SMAP Canada Workshop.* online (Invited)

10. **Kim, Y.**, Johnson, M. S., Knox, S., Black, T. A., Dalmagro, H. J., Kang, M., Kim, J., Ryu, Y., Baldocchi, D. (2019). CH4 flux gap-filling approaches for eddy covariance data: a comparison of three machine learning algorithms and marginal distribution sampling method with and without principal component analysis*. 2019 EGU General Assembly.* Vienna, Austria (Poster)

11. **Kim, Y.** & Johnson, M. S. (2017). Spectral entropy as a mean to quantify water stress history for natural vegetation and irrigated agriculture in a water-stressed tropical environment. *2017 AGU Fall Meeting.* New Orleans, Louisiana, USA (Poster)

12. Johnson, M. S., Lathuilliere, M. J., Morillas, L., Dalmagro, H. J., D'Acunha, B., **Kim, Y.**, Suarez, A. & Couto, E. G. (2017). Carbon and water fluxes and footprints in tropical agricultural systems under rainfed and irrigated conditions. *2017 AGU Fall Meeting*. New Orleans, Louisiana, USA (invited)

13. Choi, S.W., Kang, M., Indrawati, Y.M., Kim, H., **Kim, Y.** & Kim, J. (2016). Carbon footprint estimation using long-term flux measurement in Haenam, Korea: Implication for climate-smart agriculture. *EcoSummit 2016*. Le Corum, Montpellier, France (Poster)

14. **Kim, Y.**, Talucder, M. S. A., Kang, M., Kang, N., Shim, K. -M. & Kim, J. (2015). Changes in methane emission from rice paddy triggered by rainfall during the mid-season Drainage (in Korean). *The 2015 Korean Meteorological Society Fall Conf.* Jeju, Korea (Oral)