Yeonuk Kim

Desert Research Institute

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Education

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

- Dissertation: Interactions between the land surface and the near-surface atmosphere: implications for evaporative demand and evapotranspiration under a changing climate.
- Advisors: Mark Johnson (supervisor), T. Andrew Black, Sara Knox, Monica Garcia, Paulo Brando
- Note: Master-PhD transfer via fast-track in 2018.9

BSc. in Rural Systems Engineering (Agricultural Civil Engineering), **Seoul National University** [2009 - 2016]

- Thesis: Interannual variations in methane emission from an irrigated rice paddy caused by rainfall during the aeration period.
- Advisors: Joon Kim
- Note: graduate with Excellent Degree Thesis Award and *Cum laude*.

Professional experience

Postdoctoral Research fellow, Desert Research Institute [2025.01 – present]
Postdoctoral Research fellow, University of British Columbia [2023 – 2024]
- Note: formal parental leaves [2023.6 – 2023.8]

Graduate Research Assistant, UBC (PI: Mark Johnson) [2017 – 2022]
Research Associate, National Center for Agro-Meteorology [2016 Fall]
Undergraduate Research Assistant, National Center for Agro-Meteorology [2014 – 2015]

Teaching experiences

Module developer and delivery. ENVR 420: Ecohydrology of Watersheds and Water Systems, module topics: Evapotranspiration theory and applications [2019 – 2024]
Teaching Assistant. ENVR 420: Ecohydrology of Watersheds and Water Systems [2018]
Teaching Assistant. LFS 250: Land, Food and Community 1 [2017 – 2018]

Mentoring experience

Supervisory committee of a MSc student (Ming Cao) in IRES [2024]
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 [2020]

Service

Departmental service

IRES Departmental committee on Decolonization, Equity, Diversity, and Inclusion [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*

Honors and awards

Graduate program

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 internship in Technical University of Denmark (DTU) [2019]
Award by President of K-Water. Idea contest for sustainable water management in South Korea [2018]

Undergraduate program

Grand Prize (Award by President of SNU). SNU Undergraduate Research Program, SNU [2015]
Evergreen Scholarship, and Agricultural Engineering Scholarship. SNU Alumni Associations [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 interests

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

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

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]

Future carbon storage and greenhouse gas emissions at Burns Bog under different management and climate scenarios, *Metro Vancouver*. [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.**, 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. e2022MS003224. doi: 10.1029/2022MS003224

   ※ SCI. 2021 IF=8.469, Rank=8/94 (Meteorology & atmospheric sciences). Time Cited: 3.

2. **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

   ※ SCI. 2021 IF=8.852, Rank=7/202 (Geoscience, multidisciplinary). Time Cited: 7.

3. **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

   ※ SCI. 2021 IF=6.617, Rank=14/202 (Geoscience, multidisciplinary). Time Cited: 12.

   ※ This article was selected as EGU highlights by European Geosciences Union.

4. **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.

   ※ SCI. 2021 IF=13.212, Rank=17/279 (Environmental Sciences). Time Cited: 147.

5. **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

   ※ SCI. 2021 IF=6.576, Rank=5/59 (Agriculture, Multidisciplinary). Time Cited: 41.

Korean journal

6. 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

Accepted and under review

1. Chignell**,** S. M., **Kim, Y.** & Johnson, M. S. Water tower or water pump? Ecohydrogeological characterization and perceptual model of the Bale Mountains, Ethiopia. Accepted (*Hydrological Processes*).

2. **Kim, Y.** & Johnson, M. S. Deciphering the role of evapotranspiration in declining relative humidity trends over land. Under final revision (*Communications Earth & Environment*).

3. **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 first round review in *Agricultural and Forest Meteorology*.

In preparations

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

2. June, S., **Kim, Y.**, Ahongshangbam, J., Johnson, M. & Knox, S. Future Carbon storage and Greenhouse Gas Emissions at Burns Bog (working title).

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

Presentation and posters (underlined = mentored by Kim)

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

2. **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)

3. 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)

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

5. **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)

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

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

8. **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)

9. **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)

10. **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)

11. 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)

12. 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)

13. **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)