Yeonuk Kim

Institute for Resources, Environment and Sustainability

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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 (main advisor), 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:	Mandatory military service [2011.3 – 2013.3]

Professional experience

Postdoctoral Research fellow, UBC (PI: Mark Johnson)	[2022.12 – present]
• 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, Guest lecture topic: Evapotranspiration theory and applications	[2019 – 2023]
Teaching Assistant. ENVR 420: Ecohydrology of Watersheds and Water Systems	[2018]
Teaching Assistant. LFS 250: Land, Food and Community 1	[2017 – 2018]

Service and mentoring experience

IRES Departmental committee on Decolonization, Equity, Diversity, and Inclusion	[2023.10 – present]
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]

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

Excellent Degree Thesis Award. College of Agriculture and Life Science, SNU	[2017]
Graduate with *Cum laude*	[2016]
Grand Prize (Award by President of SNU). SNU Undergraduate Research Program, SNU	[2015]
Evergreen Scholarship. SNU Evergreen Scholarship Foundation	[2015]
Agricultural Engineering Scholarship. Alumni Association 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 interests

Hydrometeorology, Hydroclimatology, Micrometeorology, Biometeorology, Hydrology

Detail topics: land-atmosphere interactions, evapotranspiration, satellite remote sensing, eddy covariance, machine learning applications, hydroclimatic extremes, and climate change adaptation and mitigation

Research projects

Current 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]

Previous projects

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

Google Scholar H-index: 4, Google Scholar total citations: 163 (Feb. 14, 2024)

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: 1.

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: 3.

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: 5.

    ※ 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: 104.

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: 42.

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

In preparation

1. **Kim, Y.** & Johnson, M. S. Deciphering the role of evapotranspiration in declining relative humidity trends over land. (in preparation, 95% complete)

2. **Kim, Y.**, García, M., Black, T. A. & Johnson, M. S. A hybrid approach for evapotranspiration estimation integrating a resistance-free physical model and machine learning. (in preparation, 80% complete)

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

Presentation and posters (underlined = mentored by Kim)

1. **Kim, Y.** & Johnson, M. S. (2023) Changes in atmospheric state reveal long-term changes in evapotranspiration. *The 2023 AGU Fall Meeting*. San Francisco, California, USA (Poster)

2. **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)

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

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

5. **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)

6. **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)

7. **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)

8. 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)

9. 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)

10. **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)

Forthcoming

1. **Kim, Y.**, García, M., Black, T. A. & Johnson, M. S. A hybrid approach for evapotranspiration estimation integrating a resistance-free physical model and machine learning. *Accepted for presentation at the AGU Chapman Conference on Remote Sensing and the Water Cycle.*

2. Chignell, S. M., **Kim, Y.** & Johnson, M. S. Water 'tower', 'sponge', or 'pump'? Remote sensing-based ecohydrogeological characterization and perceptual model of the Bale Mountains, Ethiopia. *Accepted for presentation at the AGU Chapman Conference on Remote Sensing and the Water Cycle.*

Journal referee

Agricultural and Forest Meteorology; Earth's Future; *Hydrology and Earth System Sciences*; *Journal of Hydrology*; *Remote Sensing of Environment*

Other professional development

Visiting PhD student. Dr. Monica García's group at Department of Environmental Engineering, Technical University of Denmark (DTU), funded by Mitacs	[2019 Summer]
Invited workshop participant. 2019 AmeriFlux Early Career Workshop, Boulder, CO, USA	[2019]
Workshop participant. CLM (Community Land Model) / CTSM (Community Terrestrial Systems Model) tutorial, National Center for Atmospheric Research (NCAR) Mesa Lab, Boulder, CO, USA	[2019]
TA development program of LFS 250 course, UBC	[2017 – 2018]
Workshop participant. The International Workshop on Agromet and GIS Applications for Agricultural Decision Making (AgMP, WMO), Jeju, South Korea	[2016]

Relevant skills

1. Computing skills: R, Google Earth Engine (JavaScript), Matlab, Python
2. Experimental facilities: Eddy covariance system (field management and data processing)