Yeonuk Kim

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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, 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, module topics: Evapotranspiration theory and applications [2019 – present]

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 [2024.2 – 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]

Service

Departmental service

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

Journal reviewer

Agricultural and Forest Meteorology; Earth's Future; *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

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: 170 (March 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: 7.

※ 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: 113.

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: 39.

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

Under review and in preparation

1. **Kim, Y.** & Johnson, M. S. Deciphering the role of evapotranspiration in declining relative humidity trends over land. Preprint available at *EarthArXiv*. preprint doi: 10.31223/X5XM5W. Submitted.

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

3. **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 (90% complete).

Presentation and posters (underlined = mentored by Kim)

1. **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)

2. 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)

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

4. **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)

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

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

7. **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)

8. **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)

9. **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)

10. 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)

11. 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)

12. **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)

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: Advanced user of R, Google Earth Engine, Matlab, Python
2. Field instrumentation:
    - Eddy covariance system (field management and data processing)
    - Soil and meteorological sensors (soil thermometers, soil moisture tensiometers, net radiometer etc.)