

Jiangong Liu

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Areas of Expertise

Ecosystem Ecology
Land-Atmosphere Interaction
Wetland Biogeochemistry

Research Interests

Ecosystem Adaptation to Climate Change
Ecosystem Response to Climate Extremes
Nature-based Climate Solutions
Terrestrial Carbon Cycle Modeling
Explainable AI & causally-inferenced AI

Research Experience

Postdoctoral Research Scientist, Columbia University 2022/05-present
Department of Earth & Environmental Engineering
Advisor: Dr. Pierre Gentine
Topic: *Causality-guided Explainable AI of Ecophysiology*

Postdoctoral Researcher, Seoul National University 2020/06-2022/04
Institute of Agriculture and Life Sciences
Advisor: Dr. Youngryel Ryu
Topic: *Eco-evolutionary Optimality of Plant Acclimation*

Visiting Scholar, University of California, Berkeley 2019/01-2019/07
Department of Environmental Science, Policy & Management
Advisor: Dr. Dennis Baldocchi
Topic: *Wetland Methane Fluxes:
Multiscale, Nonlinearity, Asynchrony and Causality*

Research Assistant
The Chinese University of Hong Kong 2016/01-2017/01
Department of Geography & Resource Management
Advisor: Dr. Derrick Y.F. Lai

Education

Ph.D. in Physical Geography
The Chinese University of Hong Kong 2016/01-2020/12
Department of Geography & Resource Management,
Advisor: Dr. Derrick Y.F. Lai
Thesis: *Biosphere-atmosphere Carbon Exchange in a
Subtropical Mangrove Wetland in Hong Kong*

M.S. in Global Change Ecology 2013/09-2015/07
Northwest A&F University, China
College of Forestry
Advisor: Dr. Changhui Peng
Thesis: *Spatiotemporal Variations of Natural Wetland
Methane Emissions over China under Climate Change*

B.S. in Forestry
Northwest A&F University, China
 College of Forestry

2009/09-2013/07

<i>Awards & Honors</i>	FLUXNET Secondment Award	2024
	Second Class Award, ChinaFlux & Licor Outstanding Papers	2024
	IOP Trusted Reviewer	2023
	Best Oral Presentation, Annual Eastern Regional	
	Dynamic Global Vegetation Modeling Conference	2023
	First Class Award, ChinaFlux Outstanding Papers	2020
	Best Oral Presentation, AsiaFlux Workshop	2019
	AsiaFlux Workshop Scholarship	2019
	Best Poster Award, Hong Kong Geography Day	2018
	Global Scholarship for Research Excellence	2018
<i>Grants</i>	PI, CUHK Seed Funding Support for Thesis Research	2019
	PI, CUHK Interdisciplinary Research Seed Funding	2017

Publications
 (*corresponding author)

Preprint & *in press*

1. **Liu, J.***, Wang, Q., Zhan, W., Lian, X., & Gentine, P. When and where soil dryness matters to ecosystem photosynthesis. *Nature Plants*. *in press*. preprint: **10.21203/rs.3.rs-5147541/v1**.
2. **Liu, J.**, Neogi, S., & Lai, D. Y. F. Ecosystem-scale carbon dioxide, methane and water fluxes from a freshwater fishpond: temporal variability, drivers, and implications for nature-based climate solutions. *in press*. *in press*.
3. Lian, X., **Liu, J.**, Kornhuber, K., & Gentine, P. Rossby waves as large-scale natural experiments of ecosystem response to compound climatic stressors. *Nature Geoscience*. *in press*.
4. Giardina, F., **Liu, J.***, Seneviratne, S., Stocker, B., & Gentine, P. Groundwater rivals aridity in determining global photosynthesis. *3rd-round revision for Nature Communications*. preprint: **10.21203/rs.3.rs-3793488/v1**.
5. Huang, Y., Lian, X., Skulovich, O., **Liu, J.**, Shamekh, S., & Gentine, P. Large and increasing soil moisture impact on Western European heatwaves. preprint: **10.22541/au.173161581.17902240/v1**.

Book Chapter

1. **Liu, J.**, Schäfer, K.V.R., & Lai, D. Y. F. (2022). Biosphere-Atmosphere Exchange of CO₂ and CH₄ in Mangrove Forests and Salt Marshes. Book chapter for “*Carbon Mineralization in Coastal Wetlands*” edited by Lee, J., Marchand, C., Ouyang X., & Lai, D. Y. F. *Elsevier*. doi: **10.1016/B978-0-12-819220-7.00009-1**.

Journal

1. **Liu, J.***, Ryu, Y., Luo, X., Dechant, B., Keenan, T., Gentine, P., Li, B., Li, X., Prentice, C. I., Stocker, B., & Harrison, S. Evidence for widespread thermal acclimation of canopy photosynthesis. (2024). *Nature Plants*. doi: **10.1038/s41477-024-01846-1**.

2. Hao, Y., Mao, J., Bachmann, C., Hoffman, F., Koren, G., Chen, H., Tian, H., **Liu, J.**, *et al.* Soil moisture controls over carbon sequestration and greenhouse gas emissions: a review. (2025). *npj Climate and Atmospheric Science*, 8, 16. doi: **10.1038/s41612-024-00888-8**.
3. Jeong, S., Ryu, Y., Li, X., Dechant, B., **Liu, J.**, Kong, J., Choi, W., Fang, J., Lian, X., & Gentine, P. GEOSIF: A continental-scale sub-daily reconstructed solar-induced fluorescence derived from OCO-3 and GK-2A over Eastern Asia and Oceania. (2024). *Remote Sensing of Environment*, 311, 114284. doi: **10.1016/j.rse.2024.114284**.
4. Guo, R., Chi, J., **Liu, J.**, Luo, Y., Shekhar, A., Mo, L., & Liu, G. Atmospheric water demand constrains net ecosystem production in subtropical mangrove forests. (2024). *Journal of Hydrology*, 630, 130651. doi: **10.1016/j.jhydrol.2024.130651**.
5. Qiu, R., Han, G., Li, X., Xiao, J., **Liu, J.**, Wang, S., Li, S., & Gong, W. Contrasting responses of relationship between solar-induced fluorescence and gross primary production to drought across aridity gradients. (2024). *Remote Sensing of Environment*, 302, 113984. doi: **10.1016/j.rse.2023.113984**.
6. Tang, Y., Li, T., Yang, X., Chao, Q., Wang, C., Lai, D. Y. F., **Liu, J.**, Zhu, X., Zhao, X., Fan, X., Zhang, Y., Hu, Q., & Qin, Z. (2023). Mango-GPP: A process-based model for simulating gross primary productivity of mangrove ecosystems. *Journal of Advances in Modeling Earth Systems*, 15, e2023MS003714. doi: **10.1029/2023MS003714**.
7. Li, X., Ryu, Y., Xiao, J., Dechant, B., **Liu, J.**, Li, B., Jeong, S., & Gentine, P. (2023). New-generation geostationary satellite reveals widespread midday depression in dryland photosynthesis during the 2020 western U.S. heatwave. *Science Advances*, 9(31), eadi0775. doi: **10.1126/sciadv.adi0775**.
8. Nathaniel, J., **Liu, J.**, & Gentine, P. (2023). MetaFlux: Meta-learning global carbon fluxes from sparse spatiotemporal observations. *Scientific Data*, 10(1), 440. doi: **10.1038/s41597-023-02349-y**.
9. Li, B., Ryu, Y., Jiang, C., Dechant, B., **Liu, J.**, Yan, Y., & Li, X. BESSv2.0: A satellite-based and coupled-process model for quantifying long-term global land-atmosphere fluxes. (2023). *Remote Sensing of Environment*, 295, 113696. doi: **10.1016/j.rse.2023.113696**.
10. Qu, S., **Liu, J.**, Li, B., Zhao, L., Li, X., Zhang, Z., Yuan, M., & Lin, A. Unveiling the driver behind China's greening trend: urban vs. rural areas. (2023). *Environmental Research Letters*, 18, 084027. doi: **10.1088/1748-9326/ace83d**.
11. Qu, S., Ryu, Y., **Liu, J.**, & Wang, J. (2023). Greening rate in North Korea doubles South Korea. *Environmental Research Letters*, 18, 084020. doi: **10.1088/1748-9326/acdaad**.
12. **Liu, J.**, Valach, A., Baldocchi, D., & Lai, D. Y. F. (2022). Biophysical controls of ecosystem-Scale methane fluxes from a subtropical estuarine mangrove: multiscale, nonlinearity, asynchrony and causality. *Global Biogeochemical Cycles*, 36, e2021GB007179. doi: **10.1029/2021GB007179**.

13. Kong, J., Ryu, Y., **Liu, J.**, Dechant, B., Shortt, R., Rey-Sanchez, C., Szutu, D., Verfaillie, J., Houborg, R., & Baldocchi, D. (2022). Matching high resolution satellite data and flux tower footprints improves their agreement in photosynthesis estimates. *Agricultural and Forest Meteorology*, 316, 108878. doi: **10.1016/j.agrformet.2022.108878**.
14. Zhan, W., Lian, X., **Liu, J.**, & Gentine, P. (2022). Inappropriateness of space-for-time and variability-for-time approaches to infer future dryland productivity changes. *Frontiers in Environmental Science*, 10, 1010269. doi: **10.3389/fenvs.2022.1010269**.
15. Zhou, T., **Liu, J.**, Lie, Z., & Lai, D. Y. F. (2022). Effects of applying different carbon substrates on nutrient removal and greenhouse gas emissions by constructed wetlands treating carbon-depleted hydroponic wastewater. *Biore-source Technology*, 357, 127312. doi: **10.1016/j.biortech.2022.127312**.
16. **Liu, J.**, Zhou, Y., Valach, A., Shortt, R., Kasak, K., Rey-Sanchez, C., Hemes, K. S., Baldocchi, D., & Lai, D. Y. F. (2020). Methane emissions reduce the radiative cooling effect of a subtropical estuarine mangrove wetland by half. *Global Change Biology*, 26(9), 4998–5016. doi: **10.1111/gcb.15247**.
17. Kasak, K., Valach, A. C., Rey-Sanchez, C., Kill, K., Shortt, R., **Liu, J.**, Dronova, I., Mander, Szutu, D., Verfaillie, J., & Baldocchi, D. D. (2020). Experimental harvesting of wetland plants to evaluate trade-offs between reducing methane emissions and removing nutrients accumulated to the biomass in constructed wetlands. *Science of the Total Environment*, 715, 136960. doi: **10.1016/j.scitotenv.2020.136960**.
18. **Liu, J.**, & Lai, D. Y. F. (2019). Subtropical mangrove wetland is a stronger carbon dioxide sink in the dry than wet seasons. *Agricultural and Forest Meteorology*, 278, 107644. doi: **10.1016/j.agrformet.2019.107644**.
19. **Liu, J.**, Hartmann, S. C., Keppler, F., & Lai, D. Y. F. (2019). Simultaneous abiotic production of greenhouse gases (CO₂, CH₄, and N₂O) in subtropical soils. *Journal of Geophysical Research: Biogeosciences*, 124(7), 1977–1987. doi: **10.1029/2019JG005154**.
20. **Liu, J.**, Chen, H., Zhu, Q., Shen, Y., Wang, X., Wang, M., & Peng, C. (2015). A novel pathway of direct methane production and emission by eukaryotes including plants, animals and fungi: An overview. *Atmospheric Environment*, 115, 26–35. doi: **10.1016/j.atmosenv.2015.05.019**.
21. **Liu, J.**, Zhu, Q., Yang, Y., Luo, Y., & Peng, C. (2015). Spatiotemporal patterns of natural wetland methane emissions over China under climate change. (in Chinese). *Chinese Journal of Applied Ecology*, 26(11), 3467–3474. PMID: **26915204**.

Tools

1. Irvin, J., Zhou, Y., Lu, F., Liu, V., Zhou, S., McNicol, G., & **Liu, J.** (2021). FluxGapfill: A Python Interface for Machine-learning Driven Methane Gap-filling. Version 0.2.0. Zenodo. doi: **10.5281/zenodo.5515761**.

Teaching

Teaching Assistant
The Chinese University of Hong Kong

2016/01-2019/12

Courses:

GRMD2001 Non-local Field Trip (Tai Wan)	2016 Summer
GRMD4203 Ecosystem Restoration and Management	2017,2018 Spring
UGEB2240 Natural Wonders of the World	2017,2019 Fall
GRMD3205 Geomorphology	2018 Fall
UGEB2222 Natural Hazards	2018 Fall

Services

Leader, FLUXNET-Early Career Scientist Network
Member, FLUXNET CH₄ and N₂O processing committee
Member, AmeriFlux-Diversity, Equity and Inclusion Committee
Guest editor, Frontiers in Forests and Global Change
Journal Reviewer: National Science Review, Global Change Biology, Remote Sensing of Environment, Agricultural and Forest Meteorology, Environmental Research Letters, Journal of Geophysical Research: Biogeosciences, Earth's Future, Biogeosciences, Limnology and Oceanography Letters, Frontiers in Forests and Global Change, Environmental Research Communications