# 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** 2009/09-2013/07
**Northwest A&F University, China**
College of Forestry

*Awards & Honors*

| | |
|---|---|
| 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 |

*Grants*

| | |
|---|---|
| PI, CUHK Seed Funding Support for Thesis Research | 2019 |
| PI, CUHK Interdisciplinary Research Seed Funding | 2017 |

*Publications (*corresponding author)*

**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.***, 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. *Earth's Future*. 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. **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**.

6. 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**.

7. 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**.

8. 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**.

9. 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**.

10. 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**.

11. 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**.

12. 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**.

13. 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**.

14. 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**.

15. 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**.

16. **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**.

17. 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**.

18. 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**.

19. 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. *Bioresource Technology*, *357*, 127312. doi: **10.1016/j.biortech.2022.127312**.

20. **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**.

21. 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**.

22. **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**.

23. **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**.

24. **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**.

25. **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 Gapfilling. 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