# Kunxiaojia (Tammy) Yuan

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**PROFESSIONAL EXPERIENCES**

| | |
|---|---|
| **University of Houston**, Assistant Professor | 2025.9-present |
| **Lawrence Berkeley National Lab**, Postdoc | 2022.1-2025.8 |
| **University of Wisconsin-Madison**, Visiting scholar | 2021.10-2022.1 |
| **Google X**, AI Researcher (Intern) | 2019.10-2020.2 |
| **Lawrence Berkeley National Lab**, Affiliate researcher | 2018.10-2021.9 |

**EDUCATION**

**Wuhan University** 2021
**Ph.D.** in Geographic Information Sciences

**Wuhan University** 2016
**B.Eng.** in Remote Sensing

**RESEARCH INTEREST**

Land-atmosphere interactions; Wetland ecology; Wildfire modeling; Coastal resiliency; Interpretable AI; Causal inference; Remote sensing; Earth system modeling

**PUBLICATIONS**

[1] Li, F., Zhu, Q., **Yuan, K.,** Fluet-Chouinard, E., Zhang, X., Wang, J., Knox, S., You, H., Chen, M., Li, M., Stern, R., Hoyt, A., McNicol, G., Riley, W., Peng, S., Poulter, B., Malhotra, A., Cooley, S., Zhang, Z., Hong, S., Chen, Z., Zhu, Z., Raymond, P., Ciais, P., Jackson, R. The underappreciated importance of small wetlands in global methane emissions, ***Nature Climate Change***, in press.

[2] Cias, P., [39 coauthors incl. **Yuan, K**.] Why methane surged in the atmosphere during the early 2020s, ***Science***, 391, no. 6785 (2026): eadx8262.

[3] **Chen, S**.*, **Yuan, K**., Li, F., Zhu, Q., & Zhuang, Q. (2025). Hysteretic temperature sensitivity in wetland CH4 emission modeling. ***Agricultural and Forest Meteorology***, *372*, 110704. (* indicates students supervised)

[4] Brereton, A., Mekonnen, Z., Arora, B., Riley, W., **Yuan, K.**, Xu, Y., Zhang, Y., Zhu, Q., Anthony, T., Paytan, A., Development of a Model Framework for Terrestrial Carbon Flux Prediction: the Regional Carbon and Climate Analytics Tool (RCCAT) Applied to Non-tidal Wetlands, ***Geoscientific Model Development***, 18 (21), pp.8157-8173.

[5] Li, F., Zhu, Q., **Yuan, K.,** Huang, H., Radeloff, V.C., Chen, M. (2025). Exacerbating risk in human-ignited large fires over western US due to lower flammability thresholds and greenhouse gas emissions, ***PNAS Nexus***, 4.2: pgaf012.

[6] **Yuan, K.**, Li, F., McNicol, G., Chen, M., Hoyt, A., Knox, S., Riley, W. J., Jackson, R., and Zhu, Q (2024). Two decades of Boreal-Arctic wetland methane emissions modulated by warming and vegetation activity, ***Nature Climate Change***, 14, 282–288.

**PUBLICATIONS CONT'D**

[7] Zhu, Q., Jacob, D.J., **Yuan, K.,** Li, F., Runkle, B., Chen, M., Bloom, A., Poulter, B., East, J.D., Riley, W.J., McNicol, G., Worden, J., Frankenberg, C., Halabisky, M. (2025). Advancements and opportunities to improve bottom-up estimates of global wetland methane emissions, ***Environmental Research Letters***, 20, p023001.

[8] Yang, S., Tang, J., Li, Z., **Yuan, K.**, Wu, Q., Chang, K., Hodgkins, S., Wilson, R., Zhu, Q., Grant, R., Riley, W.J., Saleska, S., Rich, V., Varner, R. (2025). Unraveling the depth-dependent causal dynamics of methanogenesis and methanotrophy in a high-latitude fen peatland, ***Environmental Research Letters***, under review.

[9] Zhu, Q., **Yuan, K.**, Li, F., Riley, W.J., Hoyt, A., Jackson, R., McNicol, G., Chen, M., Knox, S., Briner, O., Beerling, D., Gedney, N., Hopcroft, P., Ito, A., Jain, A., Jensen, K., Kleinen, T., Li, T., Liu, X., McDonald, K., Melton, J., Miller, P., Muller, J., Peng, C.,Poulter, B., Qin, Z., Peng, S., Tian, H., Xu, X., Yao, Y., Yi, X., Zhang, Z., Zhang, W., Zhu, Q., Zhuang, Q. (2024), Critical needs to close monitoring gaps in pan-tropical wetland CH4 emissions, ***Environmental Research Letters,*** 19(11), 114046.

[10] Li, F., Zhu, Q., **Yuan, K.**, Ji, F., Paul, A., Lee, P., Radeloff, V.C., Chen, M., (2024). Projecting Large Fires in the Western US with an Interpretable and Accurate Hybrid Machine Learning Method. ***Earth's Future***, 12, e2024EF004588.

[11] McNicol et al. [59 coauthors incl. **Yuan, K**.] (2023) Upscaling Wetland Methane Emissions From the FLUXNET-CH4 Eddy Covariance Network (UpCH4 v1.0): Model Development, Network Assessment, and Budget Comparison, ***AGU Advances*****,** 4(5), e2023AV000956.

[12] Li, F., Hao, D., Zhu, Q., **Yuan, K.**, Braghiere, R., He, L., Luo, X., Wei, S., Riley, W. J., Zeng, Y., Chen, M. (2023). Vegetation clumping modulates global photosynthesis through adjusting canopy light environment. ***Global Change Biology***, 00, 1-16.

[13] Li, F., Hao, D., Zhu, Q., **Yuan, K.,** Braghiere, R., He, L., Luo, X., Wei, S., Riley, W., Zeng, Y., and Chen, M. (2023). Global impacts of vegetation clumping on regulating land surface heat fluxes, ***Agricultural and Forest Meteorology***, 345 (2024): 109820

[14] **Yuan, K.**, Zhu, Q., Li, F., Riley, W. J., Torn, M., Chu, H., McNicol, G., Chen, M., Knox, S., Delwiche, K., Wu, H., Baldocchi, D., Ma, H., Desai, A. R., Chen, J., Sachs, T., Ueyama, M., Sonnentag, O., Helbig, M., Tuittila, E., Jurasinski G., Koebsch F., Campbell, D., Schmid, H. P., Lohila., A., Goeckede, M., Nilsson M. B., Friborg, T., Jansen J., Zona, D., Euskirchen E., Ward E., Bohrer G., Jin, Z., Liu, L., Iwata H., Goodrich, J., and Jackson, R. (2022). Causality guided machine learning model on wetland $CH_4$ emissions across global wetlands. ***Agricultural and Forest Meteorology***, 324, 109115.

[15] **Yuan, K.**, Zhu, Q., Riley, W. J., Li, F., and Wu, H. (2022). Understanding and reducing the uncertainties of land surface energy flux partitioning within CMIP6 land models. ***Agricultural and Forest Meteorology***, 319, 108920.

[16] Li, F., Zhu, Q., Riley, W., Zhao, L., Xu, L., **Yuan, K**., Chen M., Wu, H., Gui, Z., Gong, J., and Randerson, J. (2022). AttentionFire_v1.0: interpretable machine learning fire model for burned area predictions over tropics. ***Geoscientific Model Development***, 16(3), pp.869-884.

**PUBLICATIONS CONT'D**

[17] Li, F., Zhu, Q., Riley, W. J., **Yuan, K.**, Wu, H., and Gui, Z. (2022). Wetter California projected by CMIP6 models with observational constraints under a high GHG emission scenario. ***Earth's Future***, 10(4), e2022EF002694.

[18] Zhu, Q., Li, F., Riley, W., Xu, L., Zhao, L., **Yuan, K.**, Wu, H., Gong, J., and Randerson, J. (2022). Building a machine learning surrogate model for wildfire activities within a global Earth system model. ***Geoscientific Model Development***, 15(5), 1899-1911.

[19] **Yuan, K.**, Zhu, Q., Zheng, S., Zhao, L., Chen, M., Riley, W.J., Cai, X., Ma, H., Li, F., Wu, H. and Chen, L., (2021). Deforestation reshapes land-surface energy-flux partitioning. ***Environmental Research Letters***, 16(2), p.024014.

[20] Li, F., Gui, Z., Zhang, Z., Peng, D., Tian, S., **Yuan, K.**, Sun, Y., Wu, H., Gong, J. and Lei, Y., (2020). A hierarchical temporal attention-based LSTM encoder-decoder model for individual mobility prediction. ***Neurocomputing,*** *403*, pp.153-166.

[21] **Yuan, K.**, Cheng, X., Gui, Z., Li, F. and Wu, H., (2019). A quad-tree-based fast and adaptive Kernel Density Estimation algorithm for heat-map generation. ***International Journal of Geographical Information Science***, 33(12), pp.2455-2476.

[22] **Wang, S.*** and **Yuan, K.,** (2019), July. Spatiotemporal analysis and prediction of crime events in Atlanta using deep learning. *IEEE 4th International Conference on Image, Vision and Computing (ICIVC)* (pp. 346-350). IEEE. (* indicates students)

***Book chapter:***

[23] Li, F., & **Yuan, K**. (2026). Wildfires. *Data-Driven Earth Observation for Disaster Management* (pp. 503-514). Elsevier.

[24] **Yuan, K**. (2026). Methane Feedbacks on Climate. *Encyclopedia of Climate System Science*. Elsevier. In press.

***Published datasets:***

[25] **Yuan, K**., Li, F., Chen, M., Hoyt, A., Knox, S.H., Riley, W., Jackson, R. and Zhu, Q., (2024). Boreal Arctic Wetland Methane Emissions, 2002-2021. ORNL DAAC, Oak Ridge, Tennessee, USA. https://daac.ornl.gov/cgi-bin/dsviewer.pl?ds_id=2351

[26] McNicol, G.et al. [59 coauthors incl. **Yuan, K**.], (2023). Global Wetland Methane Emissions derived from FLUXNET and the UpCH$_4$ Model, 2001-2018. ORNL DAAC, Oak Ridge, Tennessee, USA. https://daac.ornl.gov/cgi-bin/dsviewer.pl?ds_id=2253

**PATENT**

· Predicting climate conditions based on teleconnections. US Patent 11, 243,332, 2022.

· A heatmap generation method and system considering spatial density differences. Patent # CN112417233B. 2022

**INVITED TALKS**

[1] ***AGU Fall Meeting***. **Yuan, K**., Zhu, Q., Li, F., and Riley, W. J., (2025) Data-driven upscaling of global wetland methane emissions.

**INVITED TALKS CONT'D**

[2] ***AI4CH4 workshop***. **Yuan, K.**, (2025). Causal-ML and its application in wetland methane upscaling.

[3] ***Stanford University.*** **Yuan, K.,** (2024) How Causal Inference and Machine Learning Advance Understanding and Modeling Wetland $CH_4$ Emissions.

[4] ***AmeriFlux-Remote Sensing and Upscaling workshop.*** **Yuan, K.,** Li, F., Zhu, Q., and Riley W.J., (2024) Wetland $CH_4$ Emissions Upscaling by Causality Guided Machine Learning: from Regional to Global Scale.

[5] ***AGU Meeting***. **Yuan, K.,** Li, F., Zhu, Q., Chen, M., McNicol, G., and Riley W.J., (2024) Understanding and modeling wetland $CH_4$ emissions at multiple scales using multi-sourced observations.

[6] ***DOE-RUBISCO Biogeochemistry Science Friday Webinar***. **Yuan, K.,** (2024) Two Decades of Boreal-Arctic Wetland Methane Emissions Modulated by Warming and Vegetation Activity.

[7] ***Earth AI seminar - Lawrence Berkeley National Lab***. **Yuan, K.,** (2024) How Causal Inference and AI Advance Understanding and Modeling Wetland $CH_4$ Emissions.

[8] ***University of Wisconsin-Madison***. **Yuan, K.,** (2024) How Causal Inference Advances Scientific Discovery in Earth System Science.

[9] ***EESA Research Highlight Seminar - Lawrence Berkeley National Lab***. **Yuan, K.,** (2024) How Causal Inference and Machine Learning Advance Scientific Discovery: Wetland $CH_4$ Emission as an Example.

[10] ***University of Texas at Dallas***. **Yuan, K.,** (2024) Global wetland methane emissions: mechanisms, climate feedback and climate mitigation.

[11] ***AGU Fall Meeting.*** **Yuan, K.,** Zhu, Q., Chen, M., McNicol, G., Riley, W.J., Knox, S. and Hoyt, A. (2022) Upscaling Wetland Methane Emissions with a Causality Guided Machine Learning Model.

[12] ***University of Wisconsin-Madison.*** **Yuan, K.,** (2021) Causal Inference and its application in earth system science.

[13] ***Wuhan University.*** **Yuan, K.,** (2020) Causal Inference Theory and Applications.

**HONORS & SCHOLARSHIPS**

· Lawrence Berkeley National Lab Recognition of Excellence Award (1,500$), 2024
· Province-Level Outstanding Undergraduate Thesis (top 2%), 2016
· University-Level Outstanding Undergraduate (top 2%), 2016
· Third prize, nationwide Super-Map GIS development competition (top 2%), 2016
· Second Prize, Mathematical Modeling Competition in Central China. (top 3%), 2015
· Excellent student leader, and merit student at Wuhan University, 2013-2015
· Yongling Chen Science and technology Innovation scholarship, 2015
· Outstanding student leader, Wuhan University, 2015

**TEACHING**

**Instructor,** *University of Houston,* 2026 Spring
GEOL 4397/6397 Land Atmosphere Interactions: From Soil to Sky

**Instructor,** *University of Houston,* 2027 Spring (Scheduled)
GEOL 1302/1102 Introduction to Global Climate Change

**Guest lecture***, University of Wisconsin-Madison* 2024 Spring
ECOL711 Multivariate Analysis of Ecological and Community Data
How Causal Inference Advances Scientific Discovery in Earth System Science

**Guest lecture***, University of Wisconsin-Madison* 2023 Spring
ECOL711 Multivariate Analysis of Ecological and Community Data
Causal Inference and its application in analyzing and modelling GHG emissions

**Teaching assistant***, Wuhan University* 2017 Spring
Principles & Applications of Remote Sensing

**Teaching assistant***, Wuhan University* 2017 Spring
Advanced Geographic Information Technology

**SERVICE**

***Editorship & Review:***

**Reviewer:**

Proposals: NASA Postdoctoral Program (NPP)
Conferences: *ICLR* (top-tier conference in AI and machine learning).
Journal papers: reviewed 40+ papers in 28 journals, e.g., *Nature Communications, Global Change Biology, Agricultural and Forest Meteorology, Communications Earth & Environment, Earth System Science Data, Environmental Research Letters, Journal of Geophysical Research-Atmospheres, Journal of Geophysical Research-Machine Learning and Computation, International Journal of Digital Earth, International Journal of Geographical Information Science, Atmospheric Environment, Environmental Research Communications, Environmental Research: Climate, Remote Sensing*.

**Guest Editor:**

· Geomatics, Natural Hazards and Risk
· Remote Sensing

***Professional Service:***

**Workshop organizer**:

· Bridging the Gap-Flux Data Meets Land Surface Models, 2025
· AmeriFlux Early Career Networking Workshop, 2024

**Conference Session Convenor/Chair**:

· AGU B51P & B52D: *Warming-Induced Emissions: Integrating Models and Observations to Advance Understanding of Greenhouse Gas Fluxes of Natural Systems and Climate Feedbacks*, 2025
· EGU AS5/BG9: *Machine learning for Carbon Cycle Research*, 2025
· AGU B41M & B43D: *The Global Methane Budget and Advancing Understanding of Wetland Greenhouse Gas Emissions*, 2024

**Committee member**:

· FLUXNET-Early Career Scientist Network, 2024-present