

Feng Tao, Ph.D.

Postdoctoral Associate

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EDUCATION

Tsinghua University, Department of Earth System Science	<i>Beijing, China</i>
• Ph.D. in Global Change Ecology	Sept. 2018 - Jun. 2023
Max Planck Institute for Biogeochemistry, Department Biogeochemical Integration	<i>Jena, Germany</i>
• Joint Ph.D. student in Global Change Ecology	Sep. 2021 - Dec. 2022
Sun Yat-sen University, School of Environmental Science and Engineering	<i>Guangzhou, China</i>
• B.Sc. in Environmental Science, with Honors GPA: 4.3/5.0 Rank: 1/63	Aug. 2014 - Jun. 2018
The University of Hong Kong, Faculty of Science	<i>Hong Kong SAR, China</i>
• Exchange Program GPA: 3.76/4.3	Sept. 2016 - Dec. 2016

ACADEMIC APPOINTMENTS

Cornell University	<i>Ithaca, United States</i>
Postdoctoral Associate advised by Prof. Benjamin Z. Houlton, Schmidt AI4Science Postdoc	Sept. 2023 - present
• AI for scalable enhanced rock weathering to remove carbon dioxide	
Tsinghua University	<i>Beijing, China</i>
Research Assistant of Profs. Yiqi Luo (at NAU/Cornell) & Xiaomeng Huang (at Tsinghua)	Aug. 2018 - Jun. 2023
• Soil carbon cycle study with data assimilation and deep learning	
Max Planck Institute for Biogeochemistry	<i>Jena, Germany</i>
Joint Ph.D. student advised by Profs. Markus Reichstein & Marion Schrumpf	Sept. 2021 - Dec. 2022
• Global soil carbon sink using multi-source soil carbon ($^{12}\text{C}/^{14}\text{C}$) data	
Food and Agriculture Organization of the United Nations	<i>Rome, Italy</i>
Visiting Fellow of Global Soil Partnership	Jul. 2019 - Nov. 2019
• Global soil organic carbon sequestration potential mapping	
Northern Arizona University	<i>Flagstaff, United States</i>
Visiting Undergraduate at Prof. Yiqi Luo's lab Data assimilation	Dec. 2017 - May 2018
University of British Columbia	<i>Vancouver, Canada</i>
Research Assistant of Dr. Heather Trajano Microbial Fuel Cells (MFC)	Jun. 2017 - Sept. 2017
Sun Yat-sen University	<i>Guangzhou, China</i>
Research Assistant of Dr. Haiping Luo Bio-electrochemical system	Dec. 2016 - Dec. 2017

AWARDS & SCHOLARSHIPS

Schmidt AI in Science Postdoc Fellowships at Cornell University	2023
27th "Xueshu Xinxu" (Ten Outstanding Postgraduates in Research) of Tsinghua University	2023
Honors PhD of Tsinghua University	2023
Outstanding PhD Thesis of Tsinghua University	2023
Early Career ISMC (International Soil Modelling Consortium) Presentation Award	2021
Chinese Government Scholarship, as visiting PhD student, funded by China Scholarship Council	2020
International Organization Internship, funded by China Scholarship Council	2019
Honors Graduate of Sun Yat-sen University	2018
Outstanding Bachelor Thesis of Sun Yat-sen University	2018
Third Class Scholarship of Sun Yat-sen University	2017
Mitacs Globalink Research Internship Award, funded by Mitacs of Canada and China Scholarship Council	2017
Fung Scholarship (HKU), funded by Victor and William Fung Foundation Limited	2017
First Class Scholarship of Sun Yat-sen University	2016

China National Scholarship , awarded by Ministry of Education of P. R. China	2016
First Class Scholarship of Sun Yat-sen University	2015
China National Scholarship , awarded by Ministry of Education of P. R. China	2015

FIRST AUTHORED PUBLICATIONS

5. **Tao, F.**, Y. Huang, B. A. Hungate, S. Manzoni, S. D. Frey, M. W. I. Schmidt, M. Reichstein, N. Carvalhais, P. Ciais, L. Jiang, J. Lehmann, Y.-P. Wang, B. Z. Houlton, B. Ahrens, U. Mishra, G. Hugelius, T. D. Hocking, X. Lu, Z. Shi, K. Viatkin, R. Vargas, Y. Yigini, C. Omuto, A. A. Malik, G. Peralta, R. Cuevas-Corona, L. E. D. Paolo, I. Luotto, C. Liao, Y.-S. Liang, V. S. Saynes, X. Huang, and Y. Luo. 2023. Microbial carbon use efficiency promotes global soil carbon storage. *Nature* 618, 981–985.
4. [Book Chapter] **Tao, F.** (2022). Practice 10, Deep learning to optimize parametrization of CLM5. In Y. Luo & B. Smith (Eds.), *Land Carbon Cycle Modeling: Matrix Approach, Data Assimilation, and Ecological Forecasting*: Taylor and Francis.
3. [Book Chapter] **Tao, F.**, & Luo, Y. (2022). PROcess-guided deep learning and DATA-driven modelling (PRODA). In Y. Luo & B. Smith (Eds.), *Land Carbon Cycle Modeling: Matrix Approach, Data Assimilation, and Ecological Forecasting*: Taylor and Francis.
2. [Book Chapter] **Tao, F.** (2022). Bayesian statistics and Markov chain Monte Carlo method in data assimilation. In Y. Luo & B. Smith (Eds.), *Land Carbon Cycle Modeling: Matrix Approach, Data Assimilation, and Ecological Forecasting*: Taylor and Francis.
1. **Tao, F.**, Zhou, Z., Huang, Y., Li, Q., Lu, X., Ma, S., Huang, X., Liang, Y., Hugelius, G., Jiang, L., Doughty, R., Ren, Z. & Luo, Y. 2020. Deep learning optimizes data-driven representation of soil organic carbon in Earth system model over the conterminous United States, *Frontiers in Big Data*.

CO-AUTHORED PUBLICATIONS

8. Ma, S., Jiang, L., Wilson, R.M., Chanton, J., Niu, S., Iversen, C.M., Malhotra, A., Jiang, J., Huang, Y., Lu, X., Shi, Z., **Tao, F.**, Liang, J., Ricciuto, D.M., Hanson, P.J. and Luo, Y., 2023. Thermal acclimation of plant photosynthesis and autotrophic respiration in a northern peatland. *Environmental Research: Climate*.
7. Hou, E., Ma, S., Huang, Y., Zhou, Y., Kim, H.S., López-Blanco, E., Jiang, L., Xia, J., **Tao, F.**, Williams, C. and Williams, M., 2023. Across-model spread and shrinking in predicting peatland carbon dynamics under global change. *Global Change Biology*.
6. Liao, C., Huang, W., Wells, J., Zhao, R., Allen, K., Hou, E., Huang, X., Qiu, H., **Tao, F.**, Jiang, L. and Aguilos, M., 2022. Microbe-iron interactions control lignin decomposition in soil. *Soil Biology and Biochemistry*, 173, p.108803.
5. Luo, Y., Huang, Y., Sierra, C. A., Xia, J., Ahlström, A., Chen, Y., Hararuk, O., Hou, E., Jiang, L., Liao, C., Lu, X., Shi, Z., Smith, B., **Tao, F.** & Wang, Y.-P. 2022. Matrix Approach to Land Carbon Cycle Modeling. *Journal of Advances in Modeling Earth Systems*, 14, e2022MS003008.
4. Liao, C., Chen, Y., Wang, J., Liang, Y., Huang, Y., Lin, Z., Lu, X., Huang, Y., **Tao, F.**, Lombardozzi, D. and Arneeth, A., 2022. Disentangling land model uncertainty via Matrix-based Ensemble Model Inter-comparison Platform (MEMIP). *Ecological Processes*, 11(1), pp.1-16.
3. Zhang, Z., Zhang, H., Cui, Z., **Tao, F.**, Chen, Z., Chang, Y., Magliulo, V., Wohlfahrt, G. and Zhao, D., 2021. Global consistency in response of terrestrial ecosystem respiration to temperature. *Agricultural and Forest Meteorology*, 308, p.108576.
2. Zhang, Z., Wang, W., Qi, J., Zhang, H., **Tao, F.** and Zhang, R., 2018. Priming effects of soil organic matter decomposition with addition of different carbon substrates. *Journal of Soils and Sediments*, pp.1-8.
1. Zhang, Z., Zhang, R., Zhou, Y., Cescatti, A., Wohlfahrt, G., Sun, M., Zhang, H., Qi, J., Zhu, J., Magliulo, V. and **Tao, F.**, 2018. A temperature threshold to identify the driving climate forces of the respiratory process in terrestrial ecosystems. *European Journal of Soil Biology*, 89, pp.1-8.

PRESENTATIONS

15. **Tao, F.**, Ahrens, B., Yang, H., Schrumpf, M., Carvalhais, N., Reichstein, M., Huang, X. and Luo, Y., 2022. Historical fate of global soil organic carbon in the past century. **2022 AGU Fall Meeting**. 12 - 16 December 2022, Chicago, USA, Talk.
14. **Tao, F.** and Luo, Y., Quantifying soil carbon sequestration by multi-source constraints. **2022 EGU Meeting**, 23 - 27 May 2022, Vienna, Austria, Talk (highlighted)
13. **Tao, F.** & Luo, Y., *Using Multi-source Constraints to Quantify Soil Carbon Sequestration*. **2021 AGU Fall Meeting**, 13 - 17 December 2021, Virtual, Poster
12. **Tao, F.**, Huang, Y., Hungate, B., Lu, X., Hocking, T. D., Mishra, U., Hugelius, G., Huang, X., Luo, Y., *PROcess-guided deep learning and DATA-driven modelling (PRODA) to uncover key patterns and mechanisms in global soil carbon cycle* at OOS 25: Using Machine Learning to Quantify and Improve Earth System Predictions, **2021 ESA Annual Meeting**, 2 - 6 August 2021, Virtual, Talk
11. **Tao, F.** and Luo, Y., *PROcess-guided deep learning and DATA-driven modelling (PRODA) uncovers key mechanisms underlying global soil carbon storage*, **2021 3rd ISMC Conference**, 18 - 22 May 2021, Virtual, Invited Talk, Highlights Talk
10. **Tao, F.** and Luo, Y., *Big data-driven modelling in CLM5 reveals microbial carbon use efficiency as the key mechanism underlying global soil organic carbon storage*, **2021 NCAR CESM Land Model and Biogeochemistry Working Group Meeting**, 23 - 25 February 2021, Virtual, Talk
9. **Tao, F.**, Huang, X., Mishra, U., Hugelius, G. & Luo, Y., *Big data-driven modelling reveals key mechanisms underlying soil organic carbon stabilization*. **2020 AGU Fall Meeting**, 1 - 17 December 2020, Virtual, Talk
8. **Tao, F.**, Huang & Luo, Y., *Deep learning and constrained modelling from big data jointly reveal key mechanisms in soil organic carbon stabilization* at Symposium SYMP7: Combining Deep Learning and Process-Based Modeling to Advance Ecological Forecasting. **2020 ESA Annual Meeting**, 3 - 6 August 2020, Virtual, Invited Talk
7. **Tao, F.** *Improving representation of soil organic carbon: process-guided data driven deep learning modeling*. **3rd Training Course on New Advances in Land Carbon Cycle Modeling**, 21 - 30 July 2020, Virtual meeting hosted by Northern Arizona University, Flagstaff, Arizona, USA. Talk.
6. **Tao, F.**, Zhou, Z., Huang, Y., Li, Q., Lu, X., Ma, S., Huang, X., Liang, Y., Hugelius, G., Jiang, L., Doughty, R., Ren, Z. & Luo, Y., *Deep learning optimizes data-driven representation of soil organic carbon in Earth system model over the conterminous United States*. **2019 AGU Fall Meeting**, 9 - 13 December 2019, San Francisco, USA. Poster
5. **Tao, F.**, *Soil organic carbon sequestration potential: process-oriented model approach*. **5th Working Session of the International Network of Soil Information Institutions (INSII)**, 21 - 23 October 2019, FAO Headquarters, Rome, Italy. Oral report on behalf of Global Soil Partnership (GSP) secretariat of FAO.
4. **Tao, F.**, *Improving representation of soil organic carbon: Data assimilation with big-data (WoSIS) and big-model (CLM5)*. **2nd Training Course on New Advances in Land Carbon Cycle Modeling**, 13 - 24 May 2019, Northern Arizona University, Flagstaff, Arizona, USA. Talk.
3. **Tao, F.**, Luo, Y., Zhou, Z., Huang, Y., *Big-data-big-model fusion to improve prediction of global soil carbon dynamics with Earth System Model*. **2018 AGU Fall Meeting**, 10 - 14 December 2018, Washington, D.C., USA. Poster
2. **Tao, F.**, Luo, Y., Zhou, Z., Huang, Y., *Big-data-big-model fusion to improve prediction of global soil carbon dynamics with Earth System Model*. **The Fifth Conference on Earth System Science**, 1 - 4 July 2018, Shanghai, China. Poster.
1. **Tao, F.**, Luo, Y., Zhou, Z., Huang, Y., *Big-data-big-model fusion to improve prediction of global soil carbon dynamics with Earth System Model*. **The 5th China Global Change Graduate Forum and Tsinghua University 522th Doctoral Forum**, 30 - 31 June 2018, Wuxi, China. Talk.

TEACHING EXPERIENCE

Lecturer and Instructor, <i>Training Course on New Advances in Land Carbon Cycle Modeling</i> , Northern Arizona University, Flagstaff, Arizona, USA (2019 - 2022), and Cornell University, Ithaca, New York, USA (2022 - present)	2019 - present Two weeks' training
Guest Lecturer, <i>Ecological Modelling</i> , Tsinghua University, Beijing, China	2021 - 2022

REVIEW SERVICES

Review papers for Global Change Biology (GCB), GCB-Bioenergy, New Phytologist, Journal of Advances in Modeling Earth Systems (JAMES), Scientific Data, Ecological Processes

ADDITIONAL INFORMATION

Languages	Mandarin (Native), English (IELTS 7.0), German (Basic)
Programming	Proficient at MATLAB, R and Python. Familiar with Fortran (MPI)
Laboratory Skills	Laboratory skills in chemical and biological analysis. e.g. HPLC, XRD, SEM, etc.