

Junyi Liang, Ph.D.

*Environmental Sciences Division
Oak Ridge National Laboratory
1 Bethel Valley Road
Oak Ridge, TN 37830, USA*

*Tel: (865) 576 7199
E-mail: liangj@ornl.gov; jliangyixian@gmail.com
Web: <https://www.ornl.gov/staff-profile/junyi-liang>*

Research Interests

- Vegetation-microbe interactions
- Offsite environmental impacts of managed systems and related three-dimensional modeling
- Responses and feedbacks of ecosystems to climate change and disturbances
- Data-driven modeling and data-model integration
- Impacts of extreme events and disturbances on ecosystem structure and function
- Terrestrial-aquatic interactions
- Integration of advanced computational technologies (e.g., artificial intelligence) and ecological research

Education

Ph.D., Ecology and Evolutionary Biology, University of Oklahoma, 2016.

Thesis: Responses of terrestrial biogeochemical cycles to global change: syntheses and data-model integration

Advisor: Dr. Yiqi Luo

Dissertation committee: Drs. Heather McCarthy, Lara Souza, Ying Wang, Xiangming Xiao

M.S., Ecology, Institute of Botany, Chinese Academy of Sciences, 2012.

Thesis: Responses of plant and soil carbon and nitrogen contents to global change in a temperate steppe in Inner Mongolia, China

Advisor: Dr. Shiqiang Wan

B.S., Agronomy, China Agricultural University, 2009

Professional Experience

2017 – : Postdoctoral Research Associate, Oak Ridge National Laboratory

2013 – 2016: Research Assistant, University of Oklahoma

Teaching

Fall 2015: *Ecological Modeling* (Teaching Assistant)

Technical Skills

- **Programming languages:** Fortran, MATLAB, NCL, Python, R, SAS
- **Modeling experience**
 - Model development, evaluation, selection and emulation
 - Model-data integration
 - Community Earth System Model (CESM1.2)
 - Coupled Model Intercomparison Project, Phase 5 (CMIP5)
 - Terrestrial ECOSystem (TECO) model
 - Energy Exascale Earth System Model (E3SM)
 - Microbial ENzyme decomposition (MEND) model
- **Field/lab experience**
 - Field manipulative experiments establishing and maintenance
 - Plant community composition
 - Greenhouse gases fluxes at the leaf and ecosystem levels
 - Remote sensing
 - Agilent 7890A GC, Diviner2000™, Li-cor 6400, Li-cor 8100, MSFS-TDR100, Vario MACRO cube, Vario TOC cube, Smartchem200

Participated Projects

US DOE. Oak Ridge National Laboratory's Terrestrial Ecosystem Science — Scientific Focus Area (Task 5: soil carbon)

US DOE. Effects of warming the deep soil and permafrost on ecosystem carbon balance in Alaskan tundra: a coupled measurement and modeling approach (modeling and data-model integration part).

US DOE. From structure to functions: Metagenomics-enabled predictive understanding of soil microbial feedbacks to climate change (modeling and data-model integration part).

NSF of China. Effects of changed carbon input on soil carbon dynamics in a temperate steppe of Northern China (field experiment).

Publications

Book Chapter

Jiang, L., J. Jiang, **J. Liang**, K. R. Wilcox, S. L. Collins, A. K. Knapp, W. T. Pockman, M. D. Smith, Y. Luo. 2016. Frontiers of Ecosystem Modeling and Large-scale Experiments. In A. Chabbi & H. W. Loescher (Eds). *Terrestrial Ecosystem Research Infrastructures*. CRC Press.

Journal Articles

2018

Liang, J., G. Wang, D.M. Ricciuto, L. Gu, P.J. Hanson, J.D. Wood, M.A. Mayes. 2018. Evaluating the E3SM Land Model at a temperate forest site using flux and soil water

measurements. *Geoscientific Model Development Discussion* <https://doi.org/10.5194/gmd-2018-34> (Preprint and under review by *Geoscientific Model Development*).

- Liang, J.**, Z. Zhou, C. Huo, Z. Shi, J. R. Cole, L. Huang, K. T. Konstantinidis, X. Li, B. Liu, Z. Luo, C. R. Penton, E. A. G. Schuur, J. M. Tiedje, Y. P. Wang, L. Wu, J. Xia, J. Zhou, Y. Luo. 2018. More replenishment than priming loss of soil organic carbon with additional carbon input. *Nature Communications* 9, 3175.
- Liang, J.**, J. Xia, Z. Shi, L. Jiang, S. Ma, X. Lu, M. Mauritz, S. M. Natali, E. Pegoraro, C. R. Penton, C. Plaza, V. G. Salmon, G. Celis, J. R. Cole, K. T. Konstantinidis, J. M. Tiedje, J. Zhou, E. A. G. Schuur, Y. Luo. 2018. Biotic responses buffer warming-induced soil organic carbon loss in arctic tundra. *Global Change Biology*: <https://doi.org/10.1111/gcb.14325>.
- Liu, W., S. Chen, **J. Liang**, X. Qin, S. Kang, J. Ren, D. Qin. 2018. The effect of decreasing permafrost stability on ecosystem carbon in the northeastern margin of the Qinghai–Tibet Plateau. *Scientific Reports* 8, 4172.
- Du, L., N. Mickle, Z. Zou, Y. Huang, Z. Shi, L. Jiang, H. R. McCarthy, **J. Liang**, Y. Luo. 2018. Global patterns of extreme drought-induced loss in land primary production: Identify ecological extremes from rain-use efficiency. *Science of the Total Environment* 628-629: 611-620.
- Zhou, S., **J. Liang**, X. Lu, Q. Li, L. Jiang, Y. Zhang, C. R. Schwalm, J. B. Fisher, J. Tjiputra, S. Sitch, A. Ahlström, D. N. Huntzinger, Y. Huang, G. Wang, and Y. Luo. 2018. Sources of uncertainty in modeled land carbon storage within and across three MIPs: Diagnosis with three new techniques. *Journal of Climate* 31: 2833-2851.

2017

- Jiang, L., Z. Shi, J. Xia, **J. Liang**, X. Lu, Y. Wang, and Y. Luo. 2017. Transient Traceability Analysis of Land Carbon Storage Dynamics: Procedures and Its Application to Two Forest Ecosystems. *Journal of Advances in Modeling Earth Systems* 9: 2822-2835.
- Feng, W., **J. Liang**, L. E. Hale, C. G. Jung, J. Chen, J. Zhou, M. Xu, M. Yuan, L. Wu, R. Bracho, E. Pegoraro, E. A. G. Schuur, and Y. Luo. 2017. Enhanced decomposition of stable soil organic carbon and microbial catabolic potentials by long-term field warming. *Global Change Biology* 23:4765-4776.
- Wilcox, K. R., Z. Shi, L. A. Gherardi, N. P. Lemoine, S. E. Koerner, D. L. Hoover, E. Bork, K. M. Byrne, J. Cahill, S. L. Collins, S. Evans, A. K. Gilgen, P. Holub, L. Jiang, A. K. Knapp, D. LeCain, **J. Liang**, P. Garcia-Palacios, J. Penuelas, W. T. Pockman, M. D. Smith, S. Sun, S. R. White, L. Yahdjian, K. Zhu, and Y. Q. Luo. 2017. Asymmetric responses of primary productivity to precipitation extremes: A synthesis of grassland precipitation manipulation experiments. *Global Change Biology* 23:4376-4385.
- Xia, J., A. D. McGuire, D. Lawrence, E. Burke, G. Chen, X. Chen, C. Delire, C. Koven, A. MacDougall, S. Peng, A. Rinke, K. Saito, W. Zhang, R. Alkama, T. J. Bohn, P. Ciais, B. Decharme, I. Gouttevin, T. Hajima, D. J. Hayes, K. Huang, D. Ji, G. Krinner, D. P. Lettenmaier, P. A. Miller, J. C. Moore, B. Smith, T. Sueyoshi, Z. Shi, L. Yan, **J. Liang**, L. Jiang, Q. Zhang, and Y. Luo. 2017. Terrestrial ecosystem model performance in simulating productivity and its vulnerability to climate change in the northern permafrost region. *Journal of Geophysical Research: Biogeosciences* 122:430-446.
- Luo, Y., Z. Shi, X. Lu, J. Xia, **J. Liang**, J. Jiang, Y. Wang, M. J. Smith, L. Jiang, A. Ahlström, B. Chen, O. Hararuk, A. Hastings, F. Hoffman, B. Medlyn, S. Niu, M. Rasmussen, K. Todd-

Brown, and Y. P. Wang. 2017. Transient dynamics of terrestrial carbon storage: mathematical foundation and its applications. *Biogeosciences* 14:145-161.

Chen, J., Y. Luo, J. Xia, K. R. Wilcox, J. Cao, X. Zhou, L. Jiang, S. Niu, K. Y. Estera, R. Huang, F. Wu, T. Hu, **J. Liang**, Z. Shi, J. Guo, and R.-W. Wang. 2017. Warming Effects on Ecosystem Carbon Fluxes Are Modulated by Plant Functional Types. *Ecosystems* 20: 515-526.

2016

Xu, X., Z. Shi, D. Li, A. Rey, H. H. Ruan, J. M. Craine, **J. Liang**, J. Zhou, and Y. Luo. 2016. Soil properties control decomposition of soil organic carbon: Results from data-assimilation analysis. *Geoderma* 262:235-242.

Shi, Z., X. Xu, L. Souza, K. Wilcox, L. F. Jiang, **J. Liang**, J. Y. Xia, P. Garcia-Palacios, and Y. Q. Luo. 2016. Dual mechanisms regulate ecosystem stability under decade-long warming and hay harvest. *Nature Communications* 7:11973.

Luo, Y., A. Ahlström, S. D. Allison, N. H. Batjes, V. Brovkin, N. Carvalhais, A. Chappell, P. Ciais, E. A. Davidson, A. Finzi, K. Georgiou, B. Guenet, O. Hararuk, J. W. Harden, Y. He, F. Hopkins, L. Jiang, C. Koven, R. B. Jackson, C. D. Jones, M. J. Lara, **J. Liang**, A. D. McGuire, W. Parton, C. Peng, J. T. Randerson, A. Salazar, C. A. Sierra, M. J. Smith, H. Tian, K. E. O. Todd-Brown, M. Torn, K. J. van Groenigen, Y. P. Wang, T. O. West, Y. Wei, W. R. Wieder, J. Xia, X. Xu, X. Xu, and T. Zhou. 2016. Toward more realistic projections of soil carbon dynamics by Earth system models. *Global Biogeochemical Cycles* 30:40-56.

Liang, J., X. Qi, L. Souza, and Y. Luo. 2016. Processes regulating progressive nitrogen limitation under elevated carbon dioxide: a meta-analysis. *Biogeosciences* 13: 2689-2699.

Hu, J., J. Zhou, G. Zhou, Y. Luo, X. Xu, P. Li, and **J. Liang**. 2016. Improving Estimations of Spatial Distribution of Soil Respiration Using the Bayesian Maximum Entropy Algorithm and Soil Temperature as Auxiliary Data. *Plos One* 11:e0146589.

Feng, W., Z. Shi, J. Jiang, J. Xia, **J. Liang**, J. Zhou, and Y. Luo. 2016. Methodological uncertainty in estimating carbon turnover times of soil fractions. *Soil Biology and Biochemistry* 100:118-124.

Chen, L. Y., **J. Liang**, S. Q. Qin, L. Liu, K. Fang, Y. P. Xu, J. Z. Ding, F. Li, Y. Q. Luo, and Y. H. Yang. 2016. Determinants of carbon release from the active layer and permafrost deposits on the Tibetan Plateau. *Nature Communications* 7:13046.

2015

Xu, Y., J. Zhang, S. B. Franklin, **J. Liang**, P. Ding, Y. Luo, Z. Lu, D. Bao, and M. Jiang. 2015. Improving allometry models to estimate the above-and belowground biomass of subtropical forest, China. *Ecosphere* 6:art289.

Shi, Z., X. Xu, O. Hararuk, L. Jiang, J. Xia, **J. Liang**, D. Li, and Y. Luo. 2015. Experimental warming altered rates of carbon processes, allocation, and carbon storage in a tallgrass prairie. *Ecosphere* 6:art210.

Shi, Z., R. Sherry, X. Xu, O. Hararuk, L. Souza, L. Jiang, J. Xia, **J. Liang**, and Y. Luo. 2015. Evidence for long-term shift in plant community composition under decadal experimental warming. *Journal of Ecology* 103:1131-1140.

Liang, J., J. Xia, L. Liu, and S. Wan. 2015. Testing for temperature acclimation of plant carbon exchange: a comment on 'Global patterns of the responses of leaf-level photosynthesis and

respiration in terrestrial plants to experimental warming' by Liang et al. Response. *Journal of Plant Ecology* 8:335-335.

- Liang, J.**, D. Li, Z. Shi, J. M. Tiedje, J. Zhou, E. A. G. Schuur, K. T. Konstantinidis, and Y. Luo. 2015. Methods for estimating temperature sensitivity of soil organic matter based on incubation data: A comparative evaluation. *Soil Biology & Biochemistry* 80:127-135.
- Chen, J., Y. Luo, J. Xia, L. Jiang, X. Zhou, M. Lu, **J. Liang**, Z. Shi, S. Shelton, and J. Cao. 2015. Stronger warming effects on microbial abundances in colder regions. *Scientific Reports* 5:18032.

2013

- Liang, J.**, J. Xia, L. Liu, and S. Wan. 2013. Global patterns of the responses of leaf-level photosynthesis and respiration in terrestrial plants to experimental warming. *Journal of Plant Ecology* 6:437-447.

Conference Presentations

Oral Presentations

- Liang, J.**, E. A. G. Schuur, Y. Luo. **2016**. Biology buffers warming-induced SOC loss. AGU Fall Meeting, Dec 15th - 19th, 2016, San Francisco, California, USA.
- Liang, J.**, L. Jiang, Z. Shi, J. Xia, Y. Wang, Y. Luo. **2015**. A new method to diagnose the uncertainty of terrestrial carbon dynamics in Earth system models. 100th ESA Annual meeting, Aug 9th - 14th, 2015, Baltimore, Maryland, USA.
- Liang, J.**, C. Huo, Z. Shi, J. R. Cole, K. T. Konstantinidis, C. R. Penton, E. A. G. Schuur, J. M. Tiedje, L. Wu, J. Zhou, Y. Luo. **2015**. How labile carbon input affects soil carbon storage? Soil Carbon Workshop, May 13 – 15, 2015, Northern Arizona University, Flagstaff, USA.
- Liang, J.**, S. Wan. **2011**. Dynamic patterns of soil respiration in a temperate steppe: components, temperature sensitivity and the regulations. Dec 3rd, 2011, Kaifeng, Henan, China.

Posters

- Liang, J.**, S. Singh, S. Jagadamma, D. M. Ricciuto, L. Gu, P. J. Hanson, J. D. Wood, C. W. Schadt, G. Wang, M. A. Mayes. **2018**. Asymmetric responses of microbial respiration to extreme drought and wetting. ESA annual meeting, August 5th – 10th, 2018, New Orleans, Louisville, USA.
- Liang, J.**, S. Singh, S. Jagadamma, D. M. Ricciuto, L. Gu, P. J. Hanson, J. D. Wood, C. W. Schadt, G. Wang, M. A. Mayes. **2018**. Nonlinear Response of Soil Microbial Respiration to Moisture Variations. ESS PI meeting, May 1st – 2nd, 2018, Washington D. C., USA.
- Liang, J.**, G. Wang, D. M. Ricciuto, L. Gu, P. J. Hanson, J. D. Wood, M. A. Mayes. **2017**. Representation of site-specific soil water potentials improves modeling of soil respiration. AGU Fall Meeting, Dec 11th - 16th, 2017, New Orleans, Louisiana, USA.
- Liang, J.**, K. Todd-Brown, D. Li, Z. Shi, H. Yin, L. Wu, J.M. Tiedje, J. Zhou, E.A.G. Schuur, K.T. Konstantinidis, Y. Luo. **2015**. Methods for estimating temperature sensitivity of soil organic matter based on incubation data. In the DOE Genomics: GTL Awardee Workshop. 2015. Tyson's Corner, Virginia, USA.

- Liang, J.,** C. Huo, Z. Shi, J. Xia, Y. Luo. **2014.** Increase in recalcitrant carbon: a positive balance between stabilization and priming effect. AGU Fall Meeting, Dec 15th – 19th, 2014, San Francisco, California, USA.
- Liang, J.,** X. Qi, Y. Luo. **2014.** Carbon dioxide enrichment does not reduce soil nitrogen availability. 99th ESA Annual meeting, Aug 10th - 15th, 2014, Sacramento, California, USA.
- Liang, J.,** D. Li, Z. Shi, J.M. Tiedje, J. Zhou, E.A.G. Schuur, K.T. Konstantinidis, Y. Luo. **2014.** Methods for estimating temperature sensitivity of soil organic matter based on incubation data: A comparative evaluation. RCN FORECAST Workshop, Jun 11th - 14th, 2014, Breckenridge, Colorado, USA.
- Liang, J.,** D. Li, Y. Luo. **2013.** Methods of estimating temperature sensitivity from soil incubation data. 98th ESA Annual meeting, Aug 4th - 9th, 2013, Minneapolis, Minnesota, USA.

Service and Outreach

Journal referee: Cold Regions Science and Technology, Ecology Letters, Global Change Biology, Journal of Plant Ecology, Plant & Soil, PLOS ONE, Scientific Reports

Student training: Numerical modeling, Data assimilation