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Research Interests

- Using remote sensing and in situ data with data-model fusion techniques to advance local and global estimates of net ecosystem CO₂ exchange, gross primary production, respirations, and CH₄ emissions
- Reconciling bottom-up and top-down estimates of regional and global CO₂ and CH₄ budget
- Process representation of natural wetland methane emission (heterotrophic CO₂ and CH₄ respiration, CH₄ oxidation, CH₄ emission pathways, water and energy dynamics) in terrestrial ecosystem models
- Terrestrial carbon cycle in response to climate changes from fine to coarse spatiotemporal scales
- Thermal acclimation representation and quantification in photosynthesis, CO₂ respirations, and methanogenesis, in process-based terrestrial ecosystem models, using data assimilation

Research Experience

May 2023 – Present: Assistant Researcher, Joint Institute for Regional Earth System Science and Engineering (JIFRESSE) between UCLA and NASA's Jet Propulsion Laboratory (JPL)

Feb 2019 - 2023: Postdoctoral scholar in terrestrial carbon-climate feedbacks at the NASA Jet propulsion laboratory, California Institute of Technology.

2017 - 2019: Research Assistant (Dr. Yiqi Luo), Northern Arizona University

2015 - 2017: Research Assistant (Dr. Yiqi Luo), University of Oklahoma

Education

Ph.D. Biological Sciences, December 2019

Center for Ecosystem Science and Society, Department of Biological Sciences, Northern Arizona University (transferred with Dr. Yiqi Luo from the University of Oklahoma in July 2017)

M.S. Plant Physiological Ecology, August 2015

Department of Life Sciences, University of Chinese Academy of Sciences, Beijing, China.

B.S. Biological Sciences, July 2012

Department of Life Sciences, Sichuan Agricultural University, Sichuan, China

Proposals and Projects involved

- CoI: NASA ROSES 2021 Terrestrial Ecology: Arctic-Boreal Vulnerability Experiment – Phase 3 NNH21ZDA001N-TE 'Using CO₂, CH₄ and land-surface observations to resolve the sign and magnitude of northern high latitude carbon-climate feedbacks'. PI: A. Anthony Bloom, Jet Propulsion Lab at Caltech, 0.5 wy for CoI Shuang Ma. (2022-2024). Published work: Northern high-latitude carbon-climate feedback (Ma et al 2023a)
- Participant: NASA ROSES Carbon Climate Interaction, JPL PI Junjie Liu. Satellite constrained spatial

distribution of dominant climatic drivers of the tropical carbon inter-annual variations (Ma et al 2023b, in prep)

- Participant: NASA CMS/IDS Methane. JPL PI John Worden, Anthony Bloom. Constraining bottom-up global CH₄ budgets with emissions inverted from satellite methane concentration data ([Ma et al 2021](#)).
- Participant: Climate Modeling Alliance at Caltech (<https://clima.caltech.edu/>). Caltech PI Tapio Schneider, JPL PI Anthony Bloom. Terrestrial Biosphere Model development in dead organic matter decomposition, and snow processes.
- Participant: DOE Spruce and Peatland Responses Under Changing Environments Project. PI Paul Hanson. NAU PI Yiqi Luo. Adding CH₄ production, oxidation, diffusion, ebullition, and plant-aided transport into a terrestrial biosphere model and constrain model with in situ data ([Ma et al 2017](#); [Ma et al 2022](#)). Quantifying community scale thermal acclimation in photosynthesis, CO₂ and CH₄ respirations. (Ma et al 2023c);

Teaching Experience

2019-2024: Lecturer and group advisor at the 1st-7th ‘New Advances in Land Carbon Cycle Modeling’ Workshop, Cornell University, New York

2018 Fall: Teaching Assistant (Dr. Yiqi Luo, Data Assimilation in Ecological Modeling), Northern Arizona University

2018 Spring: Teaching Assistant (Dr. Emma Lou Benenati, BIO 182), Northern Arizona University

2013 Spring: Teaching Assistant (Dr. Xiaoyong Cui, Applied Stable Isotope Techniques in Plant Physiology), University of Chinese Academy of Sciences

2009: Assistant supervisor for 2009 Biological Sciences freshman (Dr. Meng Xie), Sichuan Agricultural University

First-author peer-reviewed publications

1. **Ma, S.**, Junjie Liu, Anthony Bloom, David Lawrence, et al., Satellite constrained spatial distribution of dominant climatic drivers of the tropical carbon inter-annual variations, 2023, *under review at Science advances*
2. **Ma, S.**, Bloom, A. A., Watts, J. D., Quetin, G. R., Donatella, Z., Euskirchen, E. S., et al. (2023). Resolving the carbon-climate feedback potential of wetland CO₂ and CH₄ fluxes in Alaska. *Global Biogeochemical Cycles*, 37, e2022GB007524. <https://doi.org/10.1029/2022GB007524>
3. **Ma, S.**, Jiang, L., Wilson, R.M., Chanton, J., Niu, S., Iversen, C.M., Malhotra, A., Jiang, J., Huang, Y., Lu, X. and Shi, Z., 2023. Thermal acclimation of plant photosynthesis and autotrophic respiration in a northern peatland. *Environmental Research: Climate*, 2(2), p.025003.
4. **Ma, S.**, Jiang, L., Wilson, R. M., Chanton, J. P., Bridgham, S., Niu, S., Iversen, C. M., Malhotra, A., Jiang, J., Lu, X., Huang, Y., Keller, J., Xu, X., Ricciuto, D. M., Hanson, P. J., and Luo, Y.: Evaluating alternative ebullition models for predicting peatland methane emission and its pathways via data–model fusion, *Biogeosciences*, 19, 2245–2262, <https://doi.org/10.5194/bg-19-2245-2022>, 2022.
5. **Ma, S.**, Worden, J. R., Bloom, A. A., Zhang, Y., Poulter, B., Cusworth, D. H., et al. (2021). Satellite constraints on the latitudinal distribution and temperature sensitivity of wetland methane emissions. *AGU Advances*, 2, e2021AV000408. <https://doi.org/10.1029/2021AV000408>
6. **Ma, S.**, Luo Y., Hoffman F., Ricciuto D., Sierra, C., etc., “Chapter 26: Application of data assimilation to a peatland methane study”, 2021, *Book chapter for ‘New Advances in Land Carbon Cycle Modeling’*.

7. **Ma, S.**, Luo Y., Hoffman F., Ricciuto D., Sierra, C., etc., “Chapter 28: Practice 7 – Data Assimilation at the SPRUCE site”, 2021, *Book chapter for ‘New Advances in Land Carbon Cycle Modeling’*.
8. **Ma, S.**, Jiang, J., Huang, Y., Shi, Z., Wilson, R.M., Ricciuto, D., Sebestyen, S.D., Hanson, P.J. and Luo, Y., 2017. Data-constrained projections of methane fluxes in a northern Minnesota peatland in response to elevated CO₂ and warming. *Journal of Geophysical Research: Biogeosciences*, 122(11), pp.2841-2861.
9. **Ma, S.**, Zhu, X., Zhang, J., Zhang, L., Che, R., Wang, F., Liu, H., Niu, H., Wang, S. and Cui, X., 2015. Warming decreased and grazing increased plant uptake of amino acids in an alpine meadow. *Ecology and Evolution*, 5(18), pp.3995-4005.

Co-author peer-reviewed publications

10. Nesser, H., Jacob, D. J., Maasakkers, J. D., Lorente, A., Chen, Z., Lu, X., Shen, L., Qu, Z., Sulprizio, M. P., Winter, M., **Ma, S.**, Bloom, A. A., Worden, J. R., Stavins, R. N., and Randles, C. A.: High-resolution US methane emissions inferred from an inversion of 2019 TROPOMI satellite data: contributions from individual states, urban areas, and landfills, *Atmos. Chem. Phys.*, 24, 5069–5091, <https://doi.org/10.5194/acp-24-5069-2024>, 2024.
11. Norton, A. J., Bloom, A. A., Parazoo, N. C., Levine, P. A., **Ma, S.**, Braghiere, R. K., and Smallman, T. L.: Improved process representation of leaf phenology significantly shifts climate sensitivity of ecosystem carbon balance, *Biogeosciences*, 20, 2455–2484, <https://doi.org/10.5194/bg-20-2455-2023>, 2023.
12. Worden, J. R., Pandey, S., Zhang, Y., Cusworth, D. H., Qu, Z., Bloom, A. A., et al. (2023). Verifying methane inventories and trends with atmospheric methane data. *AGU Advances*, 4, e2023AV000871. <https://doi.org/10.1029/2023AV000871>
13. Russell Doughty, Yujie Wang, Jennifer Johnson, **Ma, S.**, et al. A novel data-driven global model of photosynthesis using solar-induced chlorophyll fluorescence. *ESS Open Archive*. April 16, 2023. DOI: 10.22541/essoar.168167172.20799710/v1
14. Hou, E., Ma, S., Huang, Y., Zhou, Y., Kim, H.-S., López-Blanco, E., Jiang, L., Xia, J., Tao, F., Williams, C., Williams, M., Ricciuto, D., Hanson, P. J., & Luo, Y. (2023). Across-model spread and shrinking in predicting peatland carbon dynamics under global change. *Global Change Biology*, 29, 2759–2775. <https://doi.org/10.1111/gcb.16643>
15. Worden, J. R., Cusworth, D. H., Qu, Z., Yin, Y., Zhang, Y., Bloom, A. A., Ma, S., Byrne, B. K., Scarpelli, T., Maasakkers, J. D., Crisp, D., Duren, R., and Jacob, D. J.: The 2019 methane budget and uncertainties at 1° resolution and each country through Bayesian integration Of GOSAT total column methane data and a priori inventory estimates, *Atmos. Chem. Phys.*, 22, 6811–6841, <https://doi.org/10.5194/acp-22-6811-2022>, 2022.
16. Baskaran, L., Elder, C., Bloom, A.A., Ma, S., Thompson, D. and Miller, C.E., 2022. Geomorphological patterns of remotely sensed methane hot spots in the Mackenzie Delta, Canada. *Environmental Research Letters*, 17(1), p.015009.
17. Lu, X., Jacob, D. J., Wang, H., Maasakkers, J. D., Zhang, Y., Scarpelli, T. R., Shen, L., Qu, Z., Sulprizio, M. P., Nesser, H., Bloom, A. A., **Ma, S.**, Worden, J. R., Fan, S., Parker, R. J., Boesch, H., Gautam, R., Gordon, D., Moran, M. D., Reuland, F., Villasana, C. A. O., and Andrews, A.: Methane emissions in the United States, Canada, and Mexico: evaluation of national methane emission inventories and 2010–2017 sectoral trends by inverse analysis of in situ (GLOBALVIEWplus CH₄ ObsPack) and satellite (GOSAT) atmospheric observations, *Atmos. Chem. Phys.*, 22, 395–418, <https://doi.org/10.5194/acp-22-395-2022>, 2022.
18. Cusworth, D.H., Bloom, A.A., **Ma, S.** et al. A Bayesian framework for deriving sector-based methane emissions from top-down fluxes. *Commun Earth Environ* 2, 242 (2021). <https://doi.org/10.1038/s43247-021-00312-6>
19. Yang, Y., Bloom, A. A., **Ma, S.**, Levine, P., Norton, A., Parazoo, N. C., Reager, J. T., Worden, J., Quetin, G. R., Smallman, T. L., Williams, M., Xu, L., and Saatchi, S.: CARDAMOM-FluxVal Version 1.0: a

FLUXNET-based Validation System for CARDAMOM Carbon and Water Flux Estimates, *Geosci. Model Dev. Discuss.*, <https://doi.org/10.5194/gmd-2021-190> 2021.

20. Zhang, Y., Jacob, D. J., Lu, X., Maasakkers, J. D., Scarpelli, T. R., Sheng, J.-X., Shen, L., Qu, Z., Sulprizio, M. P., Chang, J., Bloom, A. A., **Ma, S.**, Worden, J., Parker, R. J., and Boesch, H.: Attribution of the accelerating increase in atmospheric methane during 2010–2018 by inverse analysis of GOSAT observations, *Atmos. Chem. Phys.*, 21, 3643–3666, <https://doi.org/10.5194/acp-21-3643-2021>, 2021.
21. Lu, X., Jacob, D. J., Zhang, Y., Maasakkers, J. D., Sulprizio, M. P., Shen, L., Qu, Z., Scarpelli, T. R., Nesser, H., Yantosca, R. M., Sheng, J., Andrews, A., Parker, R. J., Boesch, H., Bloom, A. A., and **Ma, S.**: Global methane budget and trend, 2010–2017: complementarity of inverse analyses using in situ (GLOBALVIEWplus CH4 ObsPack) and satellite (GOSAT) observations, *Atmos. Chem. Phys.*, 21, 4637–4657, <https://doi.org/10.5194/acp-21-4637-2021>, 2021.
22. Tao, F., Zhou, Z., Huang, Y., Li, Q., Lu, X., **Ma, S.**, Huang, X., Liang, Y., Hugelius, G., Jiang, L. and Doughty, R., 2020. Deep learning optimizes data-driven representation of soil organic carbon in Earth system model over the conterminous United States. *Frontiers in Big Data*, 3, p.17.
23. Huang, Y., Stacy, M., Jiang, J., Sundi, N., Ma, S., Saruta, V., Jung, C. G., Shi, Z., Xia, J., Hanson, P. J., Ricciuto, D., and Luo, Y.: Realized ecological forecast through an interactive Ecological Platform for Assimilating Data (EcoPAD, v1.0) into models, *Geosci. Model Dev.*, 12, 1119–1137, <https://doi.org/10.5194/gmd-12-1119-2019>, 2019.
24. Stuble, K.L., **Ma, S.**, Liang, J., Luo, Y., Classen, A.T. and Souza, L., 2019. Long-term impacts of warming drive decomposition and accelerate the turnover of labile, not recalcitrant, carbon. *Ecosphere*, 10(5), p.e02715.
25. Liang, J., Xia, J., Shi, Z., Jiang, L., **Ma, S.**, Lu, X., Mauritz, M., Natali, S.M., Pegoraro, E., Penton, C.R. and Plaza, C., 2018. Biotic responses buffer warming-induced soil organic carbon loss in Arctic tundra. *Global change biology*, 24(10), pp.4946-4959.
26. Jiang, J., Huang, Y., **Ma, S.**, Stacy, M., Shi, Z., Ricciuto, D.M., Hanson, P.J. and Luo, Y., 2018. Forecasting responses of a northern peatland carbon cycle to elevated CO₂ and a gradient of experimental warming. *Journal of Geophysical Research: Biogeosciences*, 123(3), pp.1057-1071.
27. Che, R.X., Wang, F., Wang, Y.F., Deng, Y.C., Zhang, J., **Ma, S.** and Cui, X.Y., 2016. A review on the methods for measuring total microbial activity in soils. *Acta Entomol Sin*, 36, pp.2103-2112.
28. Wu, Y.B., Che, R.X., **Ma, S.**, Deng, Y.C., Zhu, M.J. and Cui, X.Y., 2014. Estimation of root production and turnover in an alpine meadow: Comparison of three measurement methods. *Acta Ecologica Sinica*, 34(13), pp.3529-3537.
29. Xue, J., **Ma, S.**, Deng, X., Li, C., Chen, H. and Wu, Q., 2014. Prokaryotic expression and reverse catalytic activity characterizations of phenylalanine ammonia-lyase gene (FtPAL) from *Fagopyrum tataricum*. *Journal of Agricultural Biotechnology*, 22(1), pp.64-70.

Community Service

2020-2022 Global Change Biology Editorial Advisory Board

Reviewed manuscripts from JGR, JAMES, GCB, LDD, Plos One, EGU Biogeosciences, Nature *npj Clim Atmos Sci*

Awards

DOE SPRUCE Project 2020 Honorary Award in modeling

NAU Graduate Student Government Student Travel Award, NAU, 2019

Endowed Scholarship, Oklahoma Gem and Mineral Society, 2019

ECOSS Travel Awards, NAU, 2017

Student Travel Support, Joint NACP and AmeriFlux Principal Investigators Meeting, Washington DC, March 27-30, 2017

Outstanding Graduation Thesis, Sichuan Agricultural University, 2012

Technical Skills

Computational: Fortran, C, R, Matlab, Python, Julia, GitHub.

Experimental: Metagenomics analysis, high throughput sequencing, DNA/RNA extraction, Polymerase Chain Reaction (PCR) for DNA amplification, chloroform fumigation for microbial carbon qualification, stable isotope labeling

Conference and Seminar Presentations

Shuang Ma, A. Anthony Bloom, Yan Yang, Eren Bilir, Paul A. Levine, Renato K. Braghiere, Nicholas C. Parazoo, John R. Worden, David S. Schimel, Charles E. Miller. Assessing the impact of recent climate change and rising CO₂ on land-atmosphere greenhouse gas exchanges in the ABoVE domain. ABoVE Science Team Meeting 2024

Shuang Ma, A. Anthony Bloom, Jennifer D. Watts, Gregory R. Quetin, Zona Donatella, Eugénie S. Euskirchen, Alexander J. Norton, Yi Yin, Paul A. Levine, Renato Braghiere, Nicholas C. Parazoo, John R. Worden, David S. Schimel, Charles E. Miller. Resolving the carbon-climate feedback potential of high latitude wetland CO₂ and CH₄ exchange -- a Bayesian approach to constrain a biogeochemical model with observations. 2023 Carbon Cycle and Ecosystems Joint Science Workshop

Shuang Ma, Bloom, A.A., Norton, A., Levine, P.A., Doughty, R., Braghiere, R.K. and Liu, J., 2022, December. Satellite constrained spatial distribution of dominant climatic drivers of the tropical carbon inter-annual variations. 2023 Carbon Cycle and Ecosystems Joint Science Workshop

Shuang Ma, A. Anthony Bloom, Jennifer D. Watts, Gregory R. Quetin, Zona Donatella, Eugénie S. Euskirchen, Alexander J. Norton, Yi Yin, Paul A. Levine, Renato K. Braghiere, Nicholas C. Parazoo, John R. Worden, David S. Schimel, Charles E. Miller. Resolving high-latitude ecosystem carbon-climate feedback using joint observational constraints on CO₂ and CH₄ In Fall Meeting 2023. AGU

Shuang Ma, Bloom, A.A., Norton, A., Levine, P.A., Doughty, R., Braghiere, R.K. and Liu, J., 2022, December. Satellite constrained spatial distribution of dominant climatic drivers of the tropical carbon inter-annual variations. In *Fall Meeting 2022*. AGU.

Shuang Ma, A. Anthony Bloom, Jennifer D. Watts, Gregory R. Quetin, Zona Donatella, Eugénie S. Euskirchen, Alexander J. Norton, Yi Yin, Paul A. Levine, Renato Braghiere, Nicholas C. Parazoo, John R. Worden, David S. Schimel, Charles E. Miller. Resolving the carbon-climate feedback potential of high latitude wetland CO₂ and CH₄ exchange -- a Bayesian approach to constrain a biogeochemical model with observations. 'New Directions in Land Data Assimilation' workshop, AIMES (Analysis, Integration, and Modeling of the Earth System), June 13-15. 2022

Shuang Ma, A. Anthony Bloom, Jennifer D. Watts, Gregory R. Quetin, Zona Donatella, Eugénie S. Euskirchen, Alexander J. Norton, Yi Yin, Paul A. Levine, Renato Braghiere, Nicholas C. Parazoo, John R. Worden, David S. Schimel, Charles E. Miller. Resolving the carbon-climate feedback potential of high latitude wetland CO₂ and CH₄ exchange -- a Bayesian approach to constrain a biogeochemical model with observations. Woodwell Climate Research Center Jan 14 2022

Shuang Ma, Bloom, A.A., Quetin, G., Watts, J., Zona, D., Euskirchen, E., Norton, A., Levine, P., Parazoo, N., Yin, Y. and Worden, J., 2021, December. Resolving the carbon-climate feedback potential of high latitude wetland CO₂ and CH₄ exchanges. In *AGU Fall Meeting Abstracts* (Vol. 2021, pp. A11D-11).

Shuang Ma, John R Worden, A. Anthony Bloom, Yuzhong Zhang, Benjamin Poulter, Daniel H. Cusworth, Yi Yin, Sudhanshu Pandey, Joannes D. Maasakkers, Xiao Lu, Lu Shen, Jianxiong Sheng, Christian Frankenberg, Charles E. Miller, Daniel J. Jacob. Satellite constraints on the latitudinal distribution and temperature sensitivity of wetland CH₄ emissions - A Bayesian approach to reconcile bottom-up and top-down estimates, 2021 BP&BSR Tropical wetland CH₄ workshop (<https://bp.bsr.org/>) (Oral presentation)

Shuang Ma, John R Worden, A. Anthony Bloom, Yuzhong Zhang, Benjamin Poulter, Daniel H. Cusworth, Yi Yin, Sudhanshu Pandey, Joannes D. Maasakkers, Xiao Lu, Lu Shen, Jianxiong Sheng, Christian Frankenberg, Charles E. Miller, Daniel J. Jacob. Satellite constraints on the latitudinal distribution and temperature sensitivity of wetland CH₄ emissions, 2021 17th International Workshop on Greenhouse Gas Measurements from Space (IWGGMS). (Poster)

Shuang Ma, John R Worden, A. Anthony Bloom, Yuzhong Zhang, Benjamin Poulter, Daniel H. Cusworth, Yi Yin, Sudhanshu Pandey, Joannes D. Maasakkers, Xiao Lu, Lu Shen, Jianxiong Sheng, Christian Frankenberg, Charles E. Miller, Daniel J. Jacob. Satellite observations constrain ratio of tropical and high-latitude wetland methane emissions and their climate sensitivity. 2020 Annual Meeting of American Geophysical Union. (Poster)

Shuang Ma, A. Anthony Bloom, John Worden, Charles E. Miller, Yiqi Luo, Jeff Chanton, Rachel M. Wilson, Daniel Ricciuto, Paul J. Hanson. Merging models and data across scales to decipher wetland methane processes, latitudinal distribution, and climatic sensitivities. 2020 Carbon Club Seminar, Jet Propulsion Lab, Caltech Institute of Technology. (Oral presentation)

Shuang Ma, Rachel M. Wilson, Jeff Chanton, Scott Brigham, Colleen M. Iversen, Avni Malhotra, Jiang Jiang, Xingjie Lu, Jason Keller, Xiaofeng Xu, Daniel Ricciuto, Paul J. Hanson, Shuli Niu, Yiqi Luo. Data-model fusion of methane and carbon cycle at SPRUCE, implications for experimental designs, and the way forward. 2020 SPRUCE Project Methane workshop. (Oral presentation)

Shuang Ma, Wilson, R., Chanton, J., Niu, S., Brigham, S., Ricciuto, D., Hanson, J., Luo, Y. et al. Linear thermal acclimation in photosynthesis, respirations, and methane production in a northern peatland after 4 years of warming treatments. 2019 Carbon Club Seminar, Jet Propulsion Lab, Caltech Institute of Technology. (Oral presentation)

Shuang Ma, Rachel M. Wilson, Jeff Chanton, Scott Brigham, Colleen M. Iversen, Avni Malhotra, Jiang Jiang, Xingjie Lu, Jason Keller, Xiaofeng Xu, Daniel Ricciuto, Paul J. Hanson, Shuli Niu, Yiqi Luo. Constraining methane emission pathways via model structure selection and parameter estimation with flux and concentration data in a northern peatland. 2019 Annual Meeting of American Geophysical Union. (Poster)

Shuang Ma, Rachel M. Wilson, Jeff Chanton, Scott Brigham, Colleen M. Iversen, Avni Malhotra, Jiang Jiang, Xingjie Lu, Jason Keller, Xiaofeng Xu, Daniel Ricciuto, Paul J. Hanson, Shuli Niu, Yiqi Luo. Data assimilation and ecological forecasting applications on methane simulation at an experiment site. 2019 New Advances in Land Carbon Cycle Modeling workshop, Northern Arizona University. (Oral presentation)

Shuang Ma, Yuanyuan Huang, Jiang Jiang, Mark Stacy, Zheng Shi, Daniel Ricciuto, Paul Hanson, Nilutpal Sundi, Yiqi Luo. Eco-PAD, A smart ecological forecasting system linking models with individual experiments. 2019 New Advances in Land Carbon Cycle Modeling workshop, Northern Arizona University. (Oral presentation)

Shuang Ma, Jiang Jiang, Xingjie Lu, Zhenggang Du, Rachel Wilson, Jeff Chanton, Daniel Ricciuto, Paul Hanson, Yiqi Luo. Combining soil flux and soil gas profiles to constrain CH₄ emission pathways in a Northern peatland – a data-model fusion study 2018 Annual Meeting of American Geophysical Union. (Poster)

Shuang Ma, Rachel Wilson, Jiang Jiang, Yuanyuan Huang, Jeff Chanton, Scott Bridgham, Paul Hanson and Yiqi Luo. Vertical Methane concentration profile and carbon dynamics at the SPRUCE site simulated

by the process based biogeochemical model. 2018 Spruce and Peatland Responses Under Changing Environments (SPRUCE) Project All-Hands Meeting

Shuang Ma, Jiang Jiang, Yuanyuan Huang, Daniel Ricciuto, Paul Hanson, Yiqi Luo, Acclimation of methane production weakens ecosystem response to climate warming in a northern peatland. 2017 Annual Meeting of American Geophysical Union. (Oral presentation)

Shuang Ma, Jiangjiang, Yuanyuan Huang, Daniel Ricciuto, Paul J. Hanson, Yiqi Luo, Data-constrained projections of methane fluxes in Northern Minnesota Peatland in response to elevated CO₂ and warming. 2016 Annual Meeting of American Geophysical Union. (Poster)

Shuang Ma, Jiangjiang, Yiqi Luo. Impacts of seasonal changes in precipitation on carbon sequestration in a tallgrass prairie. 2016 Annual Meeting of Ecological Society of America. (Poster)