Zhen Wu

Contact: Program in Atmospheres, Oceans, and Climate
Departemt of Earth, Atmospheric, and Planetary Sciences
Massachusetts Institute of Technology
Office #54-1515, 77 Massachusetts Avenue, Cambridge, MA, 02139, USA
Email: zhenwu@mit.edu
Website: zhenwu.info

Research Interests

I seek to understand the interactions between the global cycles of climatically important elements and microbial activities in aquatic ecosystems (both ocean and lakes). To this end, I use idealized ecological theory, numerical models and the analysis of observed data.

Professional Appointments

- **Postdoctoral Associate** 2018 - Present
  Massachusetts Institute of Technology *Cambridge, MA*
    - **Advisor**: Prof. Michael J. Follows

Education

- **Peking University** China
  Ph.D. in Environmental Sciences *2013 – 2018*
- **Peking University** China
  B.Sc. in Environmental Sciences *2009 – 2013*

Awards & Honors

- **Merit Student, Peking University**: 2017
- **Presidential Scholarship, Peking University**: 2017
- **Award for Scientific Research, Peking University**: 2015

Publications

Peer Reviewed Papers

[1] **Z. Wu** and G. Forget. "PlanktonIndividuals.jl: A GPU supported individual-based phytoplankton life cycle model." In: *Journal of Open Source Software* 7.73 (2022), p. 4207. DOI: doi.org/10.21105/joss.04207. URL: https://doi.org/10.21105/joss.04207.

[2] **Z. Wu**, J. Li, Y. Sun, J. Penuelas, J. Huang, J. Sardans, Q. Jiang, J. Finlay, G. L. Britten, M. J. Follows, W. Gao, B. Qin, J. Ni, S. Huo, and Y. Liu*. "Imbalance of global nutrient cycles exacerbated by the greater retention of phosphorus over nitrogen in lakes." In: *Nature Geoscience* 15 (2022). DOI: doi.org/10.1038/s41561-022-00958-7.

[3] **Z. Wu#**, D. Aharonovich#, D. Roth-Rosenberg, O. Weissberg, T. Luzzatto-Knaan, A. Vogts, L. Zoccarato, F. Eigemann, H.-P. Grossart, M. Voss, M. J. Follows*, and D. Sher*. "Single-cell measurements and modelling reveal substantial organic carbon acquisition by Prochlorococcus." In: *Nature Microbiology* (2022). DOI: doi.org/10.1038/s41564-022-01250-5.

[4] **Z. Wu***, S. Dutkiewicz, O. Jahn, D. Sher, A. White, and M. J. Follows. "Modeling Photosynthesis and Exudation in Subtropical Oceans." In: *Global Biogeochemical Cycles* 35.9 (2021), e2021GB006941. DOI: 10.1029/2021GB006941.

[5] **Z. Wu**, R. Zou, Q. Jiang, J. J. Elser, L. Zhao, R. Ye, and Y. Liu*. "What maintains seasonal nitrogen limitation in hyper-eutrophic Lake Dianchi? Insights from stoichiometric three-dimensional numerical modeling." In: *Aquatic Sciences* 82.4 (2020), pp. 1–12. DOI: 10.1007/s00027-020-00744-w.

[6] R. Zou#, **Z. Wu#**, L. Zhao, J. J. Elser, Y. Yu, Y. Chen, and Y. Liu*. "Seasonal algal blooms support sediment release of phosphorus via positive feedback in a eutrophic lake: Insights from a nutrient flux tracking modeling." In: *Ecological Modelling* 416 (2020), p. 108881. DOI: 10.1016/j.ecolmodel.2019. 108881.

[7] **Z. Wu**, Y. Liu*, Z. Liang, S. Wu, and H. Guo. "Internal cycling, not external loading, decides the nutrient limitation in eutrophic lake: A dynamic model with temporal Bayesian hierarchical inference." In: *Water Research* 116 (2017), pp. 231–240. DOI: 10.1016/j.watres.2017.03.039.

[8] J. P. Mattern#, K. Glauninger#, G. L. Britten, J. R. Casey, S. Hyun, **Z. Wu**, E. V. Armbrust, Z. Harchaoui, and F. Ribalet*. "A Bayesian approach to modeling phytoplankton population dynamics from size distribution time series." In: *PLOS Computational Biology* 18.1 (2022), e1009733. DOI: 10.1371/journal.pcbi.1009733.

[9] M. Wang, X. Xu, **Z. Wu**, X. Zhang, P. Sun, Y. Wen, Z. Wang, X. Lu, W. Zhang, X. Wang, and Y. Tong. "Seasonal pattern of nutrient limitation in a eutrophic lake and quantitative analysis of the impacts from internal nutrient cycling." In: *Environmental science & technology* 53.23 (2019), pp. 13675–13686. DOI: 10.1021/acs.est.9b04266.

[10] S. Wu, **Z. Wu**, Z. Liang, Y. Liu*, and Y. Wang. "Denitrification and the controlling factors in Yunnan Plateau Lakes (China): exploring the role of enhanced internal nitrogen cycling by algal blooms." In: *Journal of Environmental Sciences* 76 (2019), pp. 349–358. DOI: 10.1016/j.jes.2018.05.028.

[11] F. Dong, Y. Liu*, **Z. Wu**, Y. Chen, and H. Guo. "Identification of watershed priority management areas under water quality constraints: a simulation-optimization approach with ideal load reduction." In: *Journal of Hydrology* 562 (2018), pp. 577–588. DOI: 10.1016/j.jhydrol.2018.05.033.

[12] B. Li, J. Chen, **Z. Wu**, S. Wu, S. Xie*, and Y. Liu*. "Seasonal and spatial dynamics of denitrification rate and denitrifier community in constructed wetland treating polluted river water." In: *International Biodeterioration & Biodegradation* 126 (2018), pp. 143–151. DOI: 10.1016/j.ibiod.2017.10.008.

[13] B. Li, Y. Yang, J. Chen, **Z. Wu**, Y. Liu, and S. Xie*. "Nitrifying activity and ammonia-oxidizing microorganisms in a constructed wetland treating polluted surface water." In: *Science of the Total Environment* 628 (2018), pp. 310–318. DOI: 10.1016/j.scitotenv.2018.02.041.

[14] B. Li, H. Chen, N. Li, **Z. Wu**, Z. Wen, S. Xie*, and Y. Liu*. "Spatio-temporal shifts in the archaeal community of a constructed wetland treating river water." In: *Science of the Total Environment* 605 (2017), pp. 269–275. DOI: 10.1016/j.scitotenv.2017.06.221.

[15] G. Mao, L. Chen, Y. Yang, **Z. Wu**, T. Tong, Y. Liu, and S. Xie*. "Vertical profiles of water and sediment denitrifiers in two plateau freshwater lakes." In: *Applied microbiology and biotechnology* 101.8 (2017), pp. 3361–3370. DOI: 10.1007/s00253-016-8022-6.

[16] Y. Chen, Y. Dai, Y. Wang, **Z. Wu**, S. Xie*, and Y. Liu*. "Distribution of bacterial communities across plateau freshwater lake and upslope soils." In: *Journal of Environmental Sciences* 43 (2016), pp. 61–69. DOI: 10.1016/j.jes.2015.08.012.

[17] Y. Dai, Y. Yang, **Z. Wu**, Q. Feng, S. Xie*, and Y. Liu*. "Spatiotemporal variation of planktonic and sediment bacterial assemblages in two plateau freshwater lakes at different trophic status." In: *Applied Microbiology and Biotechnology* 100.9 (2016), pp. 4161–4175. DOI: 10.1007/s00253-015-7253-2.

[18] Y. Yang, Y. Dai, **Z. Wu**, S. Xie, and Y. Liu. "Temporal and spatial dynamics of archaeal communities in two freshwater lakes at different trophic status." In: *Frontiers in microbiology* 7 (2016), p. 451. DOI: 10.3389/fmicb.2016.00451.

[19] Y. Yang, N. Li, Q. Zhao, M. Yang, **Z. Wu**, S. Xie*, and Y. Liu*. "Ammonia-oxidizing archaea and bacteria in water columns and sediments of a highly eutrophic plateau freshwater lake." In: *Environmental Science and Pollution Research* 23.15 (2016), pp. 15358–15369. DOI: 10.1007/s11356-016-6707-0.

[20] Y. Dai, **Z. Wu**, S. Xie*, and Y. Liu*. "Methanotrophic community abundance and composition in plateau soils with different plant species and plantation ways." In: *Applied microbiology and biotechnology* 99.21 (2015), pp. 9237–9244. DOI: 10.1007/s00253-015-6782-z.

[21] Y. Dai, **Z. Wu**, Q. Zhou, Q. Zhao, N. Li, S. Xie*, and Y. Liu*. "Activity, abundance and structure of ammonia-oxidizing microorganisms in plateau soils." In: *Research in microbiology* 166.8 (2015), pp. 655–663. DOI: 10.1016/j.resmic.2015.07.012.

[22] J. Zhang, Y. Dai, Y. Wang, **Z. Wu**, S. Xie*, and Y. Liu*. "Distribution of ammonia-oxidizing archaea and bacteria in plateau soils across different land use types." In: *Applied microbiology and biotechnology* 99.16 (2015), pp. 6899–6909. DOI: 10.1007/s00253-015-6625-y.

Talks & Presentations

[1] Z. Wu, D. Sher, O. Weissberg, and M. J. Follows. "Evaluating the implications of mixotrophy in Prochlorococcus using an Individual-based Modeling approach." In: ASLO Aquatic Sciences Meeting. Online, 2021.

[2] Z. Wu, M. J. Follows, and S. Dutkiewicz. "Modeling photosynthesis and exudation of DOM in subtropical oceans." In: Ocean Sciences Meeting. San Diego, USA, 2020.

Teaching

Workshops & Short Courses

- **Modeling Marine Ecosystems At Multiple Scales Using Julia**   Jul, 2021
  JuliaCon, Online

Academic Service

Review

Earth Future, Ecological Indicators, Ecological Modelling, Journal of Hydrology, Journal of Open Source Software, Water Research