

CURRICULUM VITAE

Robert Ladwig

Postdoctoral Research Fellow

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(a) Research interests

Aquatic Ecosystem Modeling, Physical Limnology, Theoretical Ecology, Water Resources Management, Computational Fluid Dynamics, Machine Learning, Causal Inference

(b) Research & professional experience

- 2019 – present Postdoctoral Research Fellow, Center for Limnology, University of Wisconsin-Madison, USA
- *aquatic ecosystem modeling of lakes*
- *development of scientific open-source software for lake modeling*
- *team leader water quality modeling*
- 2017 Visiting Researcher, Hydraulic and Env. Engineering, Saitama University, JPN
- *artificial destratification to mitigate harmful algal bloom formation*
- 2015 – 2019 Research Assistant, Biogeochemistry, Leibniz Institute of Freshwater Ecology and Inland Fisheries Berlin, DE
- *climate change impact on urban lake management*
- 2015 Research Assistant, Chair of Hydrology, Technische Universität Dresden, DE
- *analysis of groundwater management scenarios in coastal aquifers*

(c) Education

Technische Universität Berlin	Berlin, DE	Civil Engineering/ Limnology	PhD <i>magna cum laude</i> , 2019
Technische Universität Dresden	Dresden, DE	Hydrology	M.Sc. 1.5, 2015
Friedrich-Schiller University Jena	Jena, DE	Biogeosciences	B.Sc. 1.7, 2012

(d) Publications

Published journal articles

1. K. Atkins, T. Shannon, M. Meyer, I. Oleksy, N. Framsted, D. Gurung, and R. Ladwig, Integrating periphyton and surface water-groundwater methods to understand lake ecosystem processes, [Limnology & Oceanography Methods](#) (2021).
2. M. Meyer*, R. Ladwig*, J. Mesman*, I. Oleksy*, C. Barbosa, K. Cawley, A. Cramer, J. Feldbauer, P. Tran, J. Zwart, G. López Moreira, M. Shikhani, D. Gurung, R. Hensley, E. Matta, R. McClure, Sánchez-López N. Petzoldt, T., K. Soetaert, M.M. Thomas, and S. Topp, The AEMON-J "Hacking Limnology" Workshop Series and Virtual Summit: Incorporating Data Science Open Science in Aquatic Research, [Limnology & Oceanography Bulletin \(-\)](#) (2021), *co-first authors.
3. R. Ladwig, L. Rock, and H. Dugan, Impact of salinization on lake stratification and spring mixing, [Limnology & Oceanography Letters](#) (2021).
4. T.N. Moore*, J. Mesman*, R. Ladwig*, J. Feldbauer*, F. Olsson, R. Pilla, J. Venkiteswaran, A. Delany, T. Shatwell, K. Rose, H. Dugan, and J. Read, LakeEnsemblR: An R package

that facilitates ensemble modelling of lakes, [Environmental Modelling and Software](#) **105101** (2021), *co-first authors.

5. R.I. Woolway, S. Sharma, G.A. Weyhenmeyer, M. Golub, D. Mercado-Bettín, M. Perroud, V. Stepanenko, Z. Tan, L. Grant, R. Ladwig, J. Mesman, T.N. Moore, T. Shatwell, I. Vanderkelen, J.A. Austin, C.L. DeGasperi, M. Dokulil, S. La Fuente, E.B. Mackay, S.G. Schladow, S. Watanabe, R. Marcé, D.C. Pierson, W. Thiery, and E. Jennings, Phenological shifts in lake stratification under climate change, [Nature Communications](#) **12** (2021).
6. R. Ladwig, P. Hanson, H. Dugan, C. Cayelan, Y. Zhang, L. Shu, C. Duffy, and K. Cobourn, Lake thermal structure drives inter-annual variability in summer anoxia dynamics in a eutrophic lake over 37 years, [Hydrology and Earth System Sciences](#) **25**, 1009–1032 (2021).
7. C.C. Barbosa, M.C. Calijuri, A.C. Albe dos Santos, R. Ladwig, L.F.A de Oliveira, and A.C. Sarmiento, Future projections of water level and thermal regime changes of a multipurpose subtropical reservoir (Sao Paulo, Brazil), [Science of the Total Environment](#) **770**, 144741 (2021).
8. M. Meyer*, R. Ladwig*, H. Dugan, A. Anderson, A. Bah, B. Boehrer, L. Borre, R. Chapina, C. Doyle, E. Favot, G. Flaim, P. Forsberg, P. Hanson, B. Ibelings, P. Isles, F.-P. Lin, D. Lofton, T. Moore, S. Peel, J. Petes, D. Pierson, L. de Senerpont Domis, J. Schloss, M. Shikhani, A. Smagula, J. Stockwell, P. Thomas, R.Q. Thomas, T. Tietjen, and K. Weathers, Virtual growing pains: Initial lessons learned from organizing virtual workshops, [Limnology & Oceanography Bulletin \(-\)](#) (2021), *co-first authors.
9. M. Hupfer, S. Jordan, C. Herzog, C. Ebeling, R. Ladwig, M. Rothe, and J. Lewandowski, Chironomid larvae enhance phosphorus burial in lake sediments: Insights from long-term and short-term experiments, [Science of the Total Environment](#) **663**, 254–264 (2019).
10. R. Ladwig, E. Furusato, G. Kirillin, R. Hinkelmann, and M. Hupfer, Climate change demands adaptive management of urban lakes: Model-based assessment of management scenarios for Lake Tegel (Berlin, Germany), [Water](#) **10**(2), 186 (2018).
11. R. Ladwig, L. Heinrich, G. Singer, and M. Hupfer, Sediment core data reconstruct the management history and usage of a heavily modified urban lake in Berlin, Germany, [Environ Sci Pollut Res.](#) **24**, 25166–25178 (2017).

Submitted and under review

12. R. Ladwig, A.P. Appling, A. Delany, H. Dugan, L. Gao, N. Lottig, J. Stachelek, and P. Hanson, Long-term change in metabolism phenology across North Temperate Lakes, [Limnology & Oceanography](#) .
13. M. Golub, W. Thiery, R. Marce, D. Pierson, I. Vanderkelen, D. Mercado, R.I. Woolway, L. Grant, E. Jennings, J. Schewe, F. Zhao, K. Frieler, M. Mengel, V.Y. Bogomolov, D. Bouffard, R.-M. Couture, A.V. Debolskiy, B. Droppers, G. Gal, M. Guo, A.B.G. Janssen, G. Kirillin, R. Ladwig, M. Magee, T. Moore, M. Perroud, S. Piccolroaz, L. Raaman Vinaa, M. Schmid, T. Shatweel, V.M. Stepanenko, Z. Tan, H. Yao, R. Adrian, M. Allan, O. Anneville, L. Arvola, K. Atkins, L. Boegman, C. Carey, K. Christianson, E. de Eyto, C. DeGasperi, M. Grechushnikova, J. Hejzlar, K. Joehnk, I.D. Jones, A. Laas, E.B. Mackay, I. Mammarella, H. Markensten, C. McBride, D. Özkundakci, M. Potes, K. Rinke, D. Robertson, J. Rusak, R. Salgado, L. van den Linden, P. Verburg, D. Wain, N.K. Ward, S. Wollrab, and G. Zdorovenova, A framework for ensemble modelling of climate change impacts on lakes worldwide: the ISIMIP Lake Sector, Geoscientific Model Development .

14. D. Robertson, B. Siebers, R. Ladwig, D. Hamilton, P. Reneau, C. McDonald, S. Prellwitz, and R. Lathrop, Response in water quality of Green Lake, Wisconsin, to changes in phosphorus loading with special emphasis on metalimnetic oxygen minima and total phosphorus concentrations, U.S. Geological Survey Scientific Investigations Report .
15. J. Feldbauer, T.N. Moore, J. Mesman, R. Ladwig, T. Berendonk, H. Zündorf, and T. Petzoldt, Ensemble of models show coherent response of a reservoir's stratification and ice cover to climate warming, *Aquatic Sciences* .

Other publications

16. Adapting the water management to mitigate the impact of multiple stressors on an urban lake: Case study Lake Tegel, Germany, *PhD thesis*, Technische Universität Berlin, Berlin, Germany, 25.02.2019

(e) Selected software products

2020 – 2021	LakeEnsemblR	Package to facilitate ensemble hydrodynamic modeling
2019 – now	glmtools	Tool suite to interact with the General Lake Model
2020 – now	ODEM	Two-layer lake oxygen model for metabolism studies
2019 – now	thermod	Lake model that simulates heat and food web dynamics
2018 – now	Model Library	Wiki for aquatic ecosystem models
2019 – now	GLM Workshop	Collection of lake modeling teaching material
2021 – now	Lake EFI	Ecological forecasting of temperature and oxygen
2021 – now	Python Lake Modeling	Collection of lake modeling scripts

(f) Invited talks

1. Exploring the metabolism phenology of lakes: numerical and data-driven modeling of in-lake dissolved oxygen dynamics, Invited oral presentation, *GRIL Midis-Aquatiques seminar at Université du Québec à Montréal*, 24.09.2021
2. What is driving oxygen depletion dynamics in lakes (and reservoirs, probably) over different time-scales?, Invited oral presentation, *Hydrobiological seminar at TU Dresden*, 17.12.2020
3. What is driving oxygen depletion in lakes? Process-based modeling of long-term lake oxygen dynamics, Invited oral presentation, *CEREO/WRC seminar at Washington State University*, 04.11.2020
4. What is driving the death zone of Lake Mendota?, Invited oral presentation, *Wisconsin Ecology 22nd Annual Fall Symposium*, Madison, USA, 15.10.2019

(g) Presentations

5. From data to dead zones: using hybridized models and machine learning to predict regional lake anoxia, Poster presentation, *2nd Workshop on Knowledge Guided Machine Learning (KGML)*, Virtual Workshop, 09.-11.08.2021
6. Long-term dynamics and coherence of metabolism of North-Temperate lakes: a Bayesian modeling study , Oral presentation, *35th SIL Congress*, Virtual conference, 22.-27.08.2021
7. Stratification and heat budget drive inter-annual variability of summer hypolimnetic anoxia in an eutrophic lake, Oral presentation, *ASLO Aquatic Sciences Meeting*, Virtual conference, 22.-27.06.2021
8. Coupling Bayesian modeling of lake oxygen dynamics with machine learning to advance aquatic ecosystem understanding, Poster presentation, *AGU Fall Meeting 2020*, Virtual conference, 01.-17.12.2020

9. Two-layer Bayesian Dissolved Oxygen Model for Ecological Process Discovery, Poster presentation, *GLEON 21.5 All Hands' Meeting*, Virtual conference, 19.-22.10.2020
10. LakeEnsemblR: An R package that facilitates ensemble modelling of lakes, Poster presentation, *GLEON 21.5 All Hands' Meeting*, Virtual conference, 19.-22.10.2020
11. Ecological knowledge guides machine learning: (i) process-guided phosphorus modeling, (ii) Bayesian modeling of lake oxygen dynamics, Oral presentation, *Workshop on Knowledge Guided Machine Learning (KGML)*, Virtual Workshop, 18.- 19.08.2020
12. LakeEnsemblR: An R package that facilitates 1D ensemble modeling of lakes, Oral presentation, *Incorporating Data Science and Open Science Techniques in Aquatic Research*, Virtual Summit, 23.-24.07.2020
13. New Features to the Trinity of GLM R-packages: glmtools, GLM3r and GRAPLEr, Poster presentation, *GLEON 21 All Hands' Meeting*, Huntsville, Canada, 04.-08.11.2019
14. Simulating oxythermal habitats of fish in surrogate lake ecosystems, Oral presentation, *4th Science in the Northwoods Conference*, Woodruff, USA, 09.11.2019
15. Simulation of water exchange times for contaminant risk assessment in an urban lake using a depth-averaged 2D model, Conference paper, *E-proceedings of the 38th IAHR World Congress*, Panama City, Panama, 01.-06.09.2019
16. How can we adapt urban lake management in times of climate change?, Invited oral presentation, *9th Water Research Horizon Conference*, Dresden, Germany, 03.-04.07.2018
17. From 1D to 2D: Impact of extreme weather events and climate change on the heavily stressed urban Lake Tegel in Berlin, Germany, Poster presentation, *EGU General Assembly*, Vienna, Austria, 09.-13.04.2018
18. Model-based assessment of urban water management strategies for a shallow dimictic lake, Poster presentation, *ELR2017NAGOA and ICLÉE 8th Conference*, Nagoya, Japan, 22.-25.09.2017
19. Lake on life support: Evaluating urban lake management measures by using a coupled 1D-modeling approach, Oral presentation, *EGU General Assembly*, Vienna, Austria, 23.-28.04.2017
20. Abschlussbericht: Sedimentuntersuchungen am Tegeler See, Report, *on behalf of Berlin Senate Department for the Environment, Transport and Climate Protection*, Berlin, Germany, 2016
21. Qualitative Beurteilung von Bewirtschaftungsmaßnahmen im Sediment eines urbanen Sees mittels multivariater Statistik, Oral presentation (in German), *DGL Tagung Wien*, Vienna, Austria, 26.-30.09.2016
22. Urban Water Interfaces: Interfaces in Urban Surface Waters, Oral presentation, *6th German-Russian Week of the Young Researcher*, Moscow, Russia, 12.-16.09.2016

(h) Teaching and facilitation

- Lecture about "Mathematical modeling and analysis of ecosystems" in Zoology 400 at UW-Madison, Madison, USA, 29.11.2021, 14 students
- Co-Instructor "Zoology 955: Seminar-Limnology - An introduction to lake modeling" at UW-Madison, Madison, USA, in 2019. Full-semester graduate student course, 11 students
- Organizer/Lecturer of "[Process-based aquatic ecosystem modeling](#)". 29.09.2021, Virtual GLEON 2021 All Hands' Meeting
- Organizer of the [2nd Virtual Summit: Incorporating Data Science and Open Science in Aquatic Research \(DSOS\)](#), host of the data-intensive models session. 22.-23.07.2021, 2nd DSOS Sum-

mit, on average 90 participants per day

- Organizer of the four-day [1st Virtual AEMON-J "Hacking Limnology" Workshop Series](#) covering remote sensing, big (ecological) data, machine learning and numerical modeling. 13.-16.07.2021, 1st Virtual AEMON-J Workshop Series, on average 80 participants per day
- Organizer/Lecturer of "[Aquatic Ecosystem Modeling \(PCLake and GLM-AED2\)](#)". 22.08.2021, 35th SIL Congress
- Lecturer of "[GLM-AED2 lake modeling workshop](#)". 05.11.2020, CEREO seminar at Washington State University
- Organizer/Lecturer of "[Process-based lake modeling in R using GLM \(General Lake Model\)](#)". 14.10.2020, Virtual GLEON 21.5 All Hands' Meeting
- Co-Lecturer of "[Ensemble lake modelling with LakeEnsembIR](#)". 15.10.2020, Virtual GLEON 21.5 All Hands' Meeting
- Co-Lecturer of "[GLM Workshop](#)". 06.05.2020, Smart and Connected Communities and FCR Carbon Team - All-Hands Meeting
- Co-Organizer/Lecturer of "[Introduction to running, visualizing, and calibrating the General Lake Model \(GLM\)](#)". 04.-08.11.2019, GLEON 21 All Hands' Meeting, Huntsville, Canada,
- Guest lecture about "Modeling of surface water systems" in the graduate course *Water Resource and Environmental Engineering 2017* at Saitama University, Saitama, Japan

(i) University pedagogical education

- INTEGSCI660: Research Mentor Training Practicum at UW-Madison, Madison, USA, in spring semester 2020-2021. Weekly 1-hour seminar for ten weeks. Course description: Seminar participants will work with a community of peers to develop and improve their mentoring skills. By the end of the seminar, participants should be able to clearly articulate a personal mentoring philosophy to anyone inside or outside their discipline, and have multiple strategies for dealing with mentoring challenges.

(j) Mentoring

Atefeh Hosseini	Graduate, University of Kansas	Prediction of harmful algal blooms
Austin Delany	Graduate, UW-Madison	Modeling of lake nutrient cycling
Carolina Barbosa	Graduate, University of São Paulo	Drinking water reservoir management
Aryan Adhlakha	Undergraduate, UW-Madison	Stochastic modeling of phytoplankton
Lynette Gao	Undergraduate, UW-Madison	Lake anoxia modeling
Simon Heimann	Graduate, Osnabrück University	Temperature and oxygen modeling
Lena Heinrich	Graduate, TU Berlin	Sediment biogeochemistry

(k) Project collaborations

2019 – now	ABI Development (NSF)	Modeling tools for limnological community
2019 – now	KGML (NSF)	Knowledge-guided machine learning
2019 – now	Collaborative Research (NSF)	Oxygen availability for carbon cycling
2019 – now	U.S. Geological Survey	Modeling of Green Lake, Wisconsin
2019 – now	ISIMIP	Climate-impact modeling, contact for GLM
2019 – now	CNH Lakes (NSF)	Human-Lake relationships
2015 – 2019	Urban Water Interfaces (DFG)	Urban hydrology
2018 – now	AEMON-J	Grass-roots modeling network for ECRs
2018	ISEO (CARIPO)	Meromixis in Lake Iseo
2017	Yamagusuku Pond	Artificial reservoir destratification

(l) Reviewer

US National Science Foundation, Journal of Limnology, Freshwater Biology, PNAS, Ecological Modelling, JGR Biogeosciences, Limnology and Oceanography, Hydrology and Earth System Sciences, Environmental Modelling & Software, Environmental Pollution, Inland Waters, Ecological Informatics, Limnologica, Heliyon, Water

(m) Society memberships

- Global Lake Ecological Observatory Network (GLEON): modeling working group moderator
- International Society of Limnology (SIL)
- Association for the Sciences of Limnology and Oceanography (ASLO)
- German Society for Limnology (DGL)

(n) Service

- Since 2020: modeling working group moderator at GLEON
- Since 2020: co-chair of the Social Committee at Hasler Laboratory of Limnology
- Since 2019: member of the international GLM management committee
- UW-Madison Postdoctoral Research Symposium 2019 Planning Committee
- Since June 2019: part of the UW-Madison University Apartments Assembly, Vice Chair of Communications and Newsletters

(o) Outreach

- Interview on anoxia in Lake Mendota with Spectrum News 1 (TV News, April 7, 2021)
- Interview on anoxia in Lake Mendota with News 3 Now from Channel 3000 (TV News, March 20, 2021)
- Interview on anoxia in Lake Mendota with WORT Community Radio 89.9 FM (Local News, March 17, 2021)
- Interview on lake turnover and anoxia for the Clean Lakes Alliance

(p) Computing

Programming

R (7 years)
MATLAB (9 years)
Python (4 years)
C, Fortran90 (basics)

Modeling

Lake: GLM, GOTM, Simstrat, FLake
CFD: open TELEMAC, HEC-RAS
Groundwater: OpenGeoSys, MODFLOW
Water quality: AED, PHREEQC

Misc.

Container (i.e., Docker)
HPC (HLRN, HTCondor)
GIS (ArcGIS, QGIS)
ParaView
Graphics (Inkscape, Illustrator)
Unix