Toby Maxwell, PhD
Post-Doctoral Scholar
Soil-Plant-Atmosphere Interactions Lab, University of Oregon
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Education

Ph.D. Agricultural and Environmental Chemistry, University of California, Davis, 2018
Advisor: William Horwath, Department of land, air, and water resources
Dissertation Title: Advancing Molecular to Regional Understanding of Carbon-Water Relations in Managed and Natural Systems Across California

B.S. Chemistry, State University of New York at Geneseo, 2011
Bachelor of Science in Chemistry, Magna Cum Laude

Professional Experience

Post-Doctoral Scholar, Soil-plant-atmosphere interactions lab, Institute of Ecology and Evolution, Department of Biology, University of Oregon, 2018-present

Graduate Student Researcher, Biogeochemistry and nutrient cycling lab, Department of land, air, and water resources, University of California, Davis. 2012-2018

Research and Teaching Intern, Department of Chemistry/Department of Geology, State University of New York at Geneseo, 2011

Research Intern, NSF Research Experience for Undergraduates, Environmental Chemistry lab, State University of New York, New Paltz. 2010

Research Intern, NSF Research Experience for Undergraduates, Environmental Organic Chemistry Lab, University of Rochester, 2009

Teaching Experience

Student Mentor, Soils/Biogeochemistry & Hydrologic Sciences graduate groups, Department of land, air, and water resources, University of California, Davis, 2014-2016.
Taught, set up, and managed lab, field work, and statistical analysis for masters students in our lab.

Student Mentor. GAAAP: Graduate Academic Achievement and Advocacy Program, University of California, Davis, 2016
Advised undergraduate students in career development through this program designed to empower and retain historically underrepresented students.

Lecturer/Organizer, Stable isotopes in Environmental Science, Department of land, air, and water resources, University of California, Davis, Fall, 2015.
Organized course, arranged for visiting speakers, lecturer. Lecture title: Integrating carbon-water relations using multielemental and compound specific isotopic measurements

Teaching Assistant, Science and Society 5, Forests in Society, Department of land, air, and water resources, University of California, Davis, Spring 2014, 2015, 2016
Led 3x1 hour discussions including field-based labs, discussions, citizen science, and presentation skills workshops. Gave in class lectures, wrote and graded tests and quizzes, held office hours.

Teaching Assistant for CHEM 324, Principles of Physical Chemistry, Department of Chemistry, State University of New York at Geneseo, Spring, 2010.
Held office hours to assist with problem sets, graded tests.

Teaching Assistant for CHEM 313, Lab Techniques in Organic Chemistry, Department of Chemistry, State University of New York at Geneseo, Fall, 2010
Assisted students with lab techniques, instrumentation, data interpretation, and writing reports.

Lab Assistant for CHEM 119, Introductory Chemistry Lab, Department of Chemistry, State University of New York at Geneseo, Fall, 2009
Set up basic titrations and reactions, held office hours to develop understanding of the principles of lab techniques and report writing skills.

Peer Reviewed Publications

1. **Maxwell, T.M.,** Silva, L.C.R. & Horwath, W.R. (2018). Integrating effects of species composition and soil properties to predict shifts in montane forest carbon–water relations. Proc. Natl. Acad. Sci. 201718864. doi:10.1073/PNAS.1718864115.
2. **Maxwell T.M.**, Silva L.C.R., Horwath W.R. (2018) Predictable oxygen isotope exchange between plant lipids and environmental water: implications for ecosystem water balance reconstruction. *J. Geophys. Res Biogeosciences*. doi:10.1029/2018JG004553.
3. Jerszurki, D. Couvreur, V., **Maxwell, T.M.**, Silva, L.C.R., Matsumoto, N., Shackel, K., de Souza, J.L.M., Hopmans, J. (2017). Impact of root growth and hydraulic conductance on canopy carbon-water relations of young walnut trees (Juglans regia L.) under drought. Sci. Hortic. (Amsterdam). 226. doi:10.1016/j.scienta.2017.08.051
4. **Maxwell, T.M.**, Silva, L.C.R. & Horwath, W.R. (2014). Using multielemental isotopic analysis to decipher drought impacts and adaptive management in ancient agricultural systems. *Proc. Natl. Acad. Sci.* 2–3.

In review

Liles, G.C., **Maxwell T.M.**, Silva L.C.R, Zhang, J, Horwath WRH (*In review*) Two decades of experimental manipulation reveal mechanisms for enhanced growth potential of Ponderosa Pine plantations across climate gradients. *J. Geophys. Res Biogeosciences.*

Submitted

Broz, A., Retallack, G.J., **Maxwell T.M.**, Silva, L.C.R. (*Submitted*) Paleoproxy for vapor pressure deficit (VPD) from fossil cellulose and pedogenic carbonate. *Geology*

In preparation

1. ***Maxwell T. M.**, Silva L.C.R. (In preparation)* Towards a more interdisciplinary science of ecosystems. *For submission to Trends in Plant Science*

2. **Maxwell T.M.,** Silva LCR, Horwath WRH (*In preparation*) Observed and projected climate change impacts on productivity and efficiency of common wheat (Triticum aestivum L.) across California: A case study in production from 1981 to 2070. *For submission to Science Advances.*

Technical Reports

Culman, S.W., Haden, V.R., **Maxwell, T.M.**, Waterhouse, H., and William Horwath. (2014). Greenhouse Gas Mitigation Opportunities in California Agriculture: Review of California Cropland Emissions and Mitigation Potential. NI GGMOCA R 3. Durham, NC: Duke University.

Invited Talks

Maxwell, T.M. Using stable isotopes to investigate forest carbon-water relations. *UC Davis Stable Isotope Seminar, 5, Nov. 2018.*

Presentations

1. **Maxwell, T.M.**, Silva, L.C.R., Horwath, W.R. (2017), Dynamic and inertial controls on forest carbon-water relations. Abstract PP31D-2311, *Oral presentation at 2017 Fall Meeting, AGU, New Orleans, LA, Dec. 11-15.*
2. **Maxwell, T.M.**, Silva, L.C.R., Horwath, W.R. (2016), Predictable oxygen isotope exchange of plant lipids improves our ability to understand hydrologic shifts and partition evapotranspiration across scales. Abstract PP31D-2311, *presented at 2016 Fall Meeting, AGU, San Francisco, Calif., Dec. 12-16.*
3. **Maxwell, T.M.**, Silva, L.C.R., Horwath, W.R. (2016), Soil Properties Drive Carbon-Water Relations Across a Climate Gradient in Sierra Nevada Forests. Abstract 60315, *Oral Presentation at 2016 Annual Meeting, ESA, Ft. Lauderdale, FL, Aug. 7-12.*
4. **Maxwell, T.M.**, Silva, L.C.R., Horwath, W.R. (2015), Soil Properties Drive Changes in Water Use Efficiency Across a Climatic Gradient. Abstract 68367, *presented at 2015 Fall Meeting, AGU, San Francisco, Calif., Dec. 14-18.*
5. **Maxwell, T.M.**, Silva, L.C.R., Horwath, W.R. (2014), Expanding lipid proxies to the next dimension: Developing methods for the measurement of oxygen isotopes in plant waxes, Abstract 30432, *Oral presentation at 2014 Fall Meeting, AGU, San Francisco, Calif., Dec. 15-19.*
6. **Maxwell, T.M.**, Silva, L.C.R., Horwath, W.R. (2014), Quantifying Water Balance Carbon Storage Relationships Using Oxygen Isotope Ratios of Plant Lipids, Abstract 3782, *Poster at 2014 Annual Goldschimidt Conference, Sacramento, Calif., Jun. 9-13.*
7. **Maxwell, T.M.**, Silva, L.C.R., Pedroso, G., Doane, T.A., Mukome, F.N.D., and Horwath, W.R. (2014), Quantifying Water Balance-Carbon Storage Relationships

Using Oxygen Isotope Ratios of Plant Lipids, Poster 27, *presented at 2014 Soil's Role in Restoring Ecosystem Services Conference, Soil Science Society of America, Sacramento, Calif., Mar. 7-9.*

Current Projects

The climate paradox: mapping resilience and vulnerability of montane forests
Project members: Toby Maxwell, Lucas Silva
This project seeks to develop an index representing sensitivity of growth rates over space and time by linking plant physiology through dendrochronology to landscape ecology, and soil biogeochemistry.

Probing for the role of fungal networks in nutrient transfer of novel plant communities across the Pacific Northwest
Project members: Toby Maxwell, Barbara Bomfim, Kaye Shek, Krista McGuire, Lucas Silva
This project will develop an understanding of the shifting role of fungal networks to provide nutrients under experimentally induced climate change scenarios in a series of prairies across the PNW.

Connecting carbon and oxygen isotope ratios from plant cellulose to soil carbonates to improve understanding of past and future climates
Project members: Adrian Broz, Gregory Retallack, Toby Maxwell, Lucas Silva
I am helping advise UO graduate student Adrian Broz to link cellulose and soil carbonate isotope ratios to vapor pressure deficit, characterizing eco-hydrologic responses environmental change.

Laboratory and Technical Experience

R
Extensive experience with efficient data management of large datasets, multivariate linear modeling, non-linear and process-based models, time series analysis, structural equation modeling, multi-model inference. Experience handling both balanced experimental and unbalanced observational datasets.

Isotope Biogeochemistry
I am an expert in stable isotope biogeochemistry and have run experiments observing shifts in natural abundance over environmental gradients, and additionally probing with enriched isotopes both as dissolved soil amendments (N), and via gaseous uptake (CO_2). Further, I built a cryogenic leaf water extraction system allowing for isotopic analysis of leaf, stem, and soil water hydrogen and oxygen isotope values to measure functional root architecture.

GIS
I am experienced in working with spatial data, including both descriptive and predictive techniques to help determine appropriate interpolation methods in R. A basic knowledge of ArcGIS allows me to perform basic tasks including mapping, merges, calculations, and integration of satellite data.

Analytical Chemistry
Extensive experience troubleshooting methodology and working with GC/MS and HPLC data, significant experience maintaining and troubleshooting instrument software and hardware. Also familiar with extraction, purification, and derivatization procedures for many compound classes from soil and plant material.

Organic Chemistry

Extensive experience with organic separations and purifications. I am comfortable working with volatile, flammable, and toxic chemicals. I have extensive experience with flash column chromatography, extraction from complex matrices, and method calibration.

Trainings and Courses

University of Utah Summer Course in Stable Isotope Ecology and Biogeochemistry, June 2014
This competitively applied for course is a multi-instructor lecture and lab short course offered to graduate students concerning the application of stable isotopes to environmental and ecological studies.

Graduate Coursework: GEO200: Quantitative Geography, ETX 220/L Analysis of Toxicants, SSC 205 Field Studies of Soils in California Ecosystems, SSC 208 Plant Soil Interrelations, PLS 205 Experimental Design and Analysis, PLS 206 Multivariate Statistical Modeling, SSC 202 Environmental Soil Chemistry, CHE 226 Transition Metal Chemistry, SSC 120 Soil Genesis and Classification, SSC 111 Soil Microbiology, SSC 109 Soil Physics

Undergraduate Coursework: CHEM 340/L Modern Analytical Chemistry, CHEM 313 Lab Techniques in Organic Chemistry, CHEM 330/L Inorganic Chemistry, CHEM 302/304/L Biochemistry, CHEM 211/213/L Organic Chemistry, CHEM 320/322 Physical Chemistry, GEO 200 Environmental Geology

Honors/Awards

National Geographic Exploration and Research, 2018 - $5000, award #:EC-422R-18
Jastro Shields Research Award, 2015 - $3000
William and Linda Sullivan Graduate Research Fellowship, 2014 - $1240
Gamma Sigma Epsilon National Chemistry Honor Society

Peer Review Contributions/Service

I have worked as a referee for the following journals
Nature Scientific Reports
Global Change Biology
Journal of Geophysical Research: Biogeosciences
Plant and Soil
PLOS-ONE

Professional Memberships

Ecological Society of America
American Geophysical Union
Soil Science Society of America

Extracurricular

Volunteer, Pacific Crest Trail Association, Winter 2016-Spring 2018
I wrote scientific blog posts and aid in office work for the Pacific Crest Trail association. See link below.

http://www.pcta.org/2016/desert-survives-keys-natures-success-californias-vibrant-desertscape-38536/

Mentor at Center for Land Based Learning SLEWS program, Spring 2013-2017
I assisted middle and high school programs from rural communities to create compost buckets, harvest crops and understand the study of soil as a resource. We participate in ecological restoration projects at reclaimed wilderness sites through organizations partnered with the Center.