

LISA R. WELP
(Updated Feb 2024)

Earth, Atmospheric, and Planetary Sciences
Purdue University
550 Stadium Mall Drive
West Lafayette, IN 47907

lwelp@purdue.edu
<http://www.eaps.purdue.edu/research/lwelp/>
Phone: (765) 496-6896

EDUCATION

California Institute of Technology, Pasadena, CA

Ph.D., Environmental Science and Engineering, Advisor: James Randerson 2006

M.S., Environmental Science and Engineering 2002

Indiana University, Bloomington, IN

B.S., Chemistry with High Honors and Geology Minor 2000

PROFESSIONAL APPOINTMENTS

Associate Professor, Earth, Atmospheric, and Planetary Sciences, Purdue University 2021 – present

Assistant Professor, Earth, Atmospheric, and Planetary Sciences, Purdue University 2015 – 2021

Assistant Project Scientist, Scripps Institution of Oceanography, UCSD 2012 – 2014

Postdoctoral Scholar, Scripps Institution of Oceanography, UCSD 2008 – 2012

Postdoctoral Research Associate & Lecturer, Yale University 2006 – 2008

Graduate Research Associate, California Institute of Technology 2000 – 2006

RESEARCH INTERESTS

Understanding the exchange of water and carbon between the Earth's surface and the atmosphere is critically important for understanding feedbacks in the Earth's climate system. My research leverages natural stable isotope tracers to answer fundamental questions in the following areas of focus: hydroclimatology, cloud processes and aerosol impacts, nutrient transport in the critical zone, sensitivity of the carbon cycle in a changing climate, and plant water use efficiency.

AWARDS & FELLOWSHIPS

- Purdue Faculty Insights Forum Fellow 2021-2022
- Purdue College of Science graduate student mentoring award 2020
- Purdue Seeds for Success Award in recognition of obtaining an over \$1 million external sponsored grant, Arequipa NEXUS Institute for Food, Energy, Water and the Environment 2019
- Great Lakes Chief Scientist Training Cruise Award: ship time and travel expenses 2016
- BASIN young investigator travel grant: conference and lodging expenses 2011
- Outstanding poster contribution at the International Carbon Dioxide Conference 2009
- EPA Science to Achieve Results (STAR) Fellowship: tuition and stipend 2001 – 2004
- BASIN student travel grants: conference and lodging expenses 2002 – 2004
- Caltech Institute Fellowship: tuition and stipend 2000 – 2001

MEMBERSHIPS

American Geophysical Union (AGU), Association for Women in Science (AWIS), Earth Science Women's Network (ESWN), Biosphere-Atmosphere Stable Isotope Network (BASIN), Purdue Women in Science Program (WISP)

GRANTS

Current Research Support

1. 11/23-10/24: *RAPID: Measuring the isotopic fingerprint of the South American summer monsoon during a strong El Niño, 2023-2024*, \$138,645, NSF, Welp (PI) with Greg Michalski (Co-PI)
2. 09/23-08/26: *Using water stable isotopes to quantify the roles of entrainment, drizzle, and aerosols in determining marine stratocumulus properties*, \$925,487, DOE, Welp (PI) with Patrick Chuang (Co-PI)
3. 09/22-08/25: *Hydraulic redistribution in forests: Spatial and temporal drivers of variation, and consequences for climate feedbacks*, \$911,307, DOE, Welp (Co-I) with Elin Jacobs (PI)
4. 07/20-06/25: *Network Cluster CINet: Critical interface network in intensively managed landscapes*, \$450,000, NSF, Welp (Co-I) with Tim Filley (Co-PI)

Completed Research Support

1. 05/23-10/23: *The 2023 Southern California Interactions of Low cloud and Land Aerosol (SCILLA) aircraft field experiment*, \$23,705, UCSC subcontract, Office of Naval Research, Welp (Co-I)
2. 01/19-12/21: *Estimating relative inputs of glacial melt-water, groundwater, and irrigation runoff in rivers of Arequipa, Peru*, \$602,079, UNSA NEXUS, Welp (PI), Frisbee (Co-PI)
3. 01/19-12/21: *Determining the sources of particulate air pollution in Arequipa, Peru*, \$528,264, UNSA NEXUS, Michalski (PI), Welp (Co-PI)
4. 08/20-05/21: *Girls Engaging in Online Science, Technology, Engineering, and Mathematics (Geo STEM)*, \$17,500, Halliburton, Welp (Co-I) with Steve Smith (PI)
5. 07/18-07/19: *Investigations of water vapor exchange between Lake Michigan and the atmosphere*, \$7,000, PCCRC Seed Grant, Welp (PI) with Paul Shepson (Co-I) and Mike Baldwin (Co-I)
6. 03/18-02/19: *Estimating watershed residence times in artificially-drained landscapes and relation to nutrient concentrations*, \$15,000, Indiana Water Resources Research Center, Welp (PI)
7. 09/17-09/18: *Helping Teachers and Hosting the Midwest Student Research Symposium*, \$20,000, Halliburton Foundation, Steve Smith (PI), Welp (Co-PI)
8. 12/15-08/16: *How has the declining number of oak trees in Indiana affected forest water use efficiency?* \$7,000, PCCRC Seed Grant, Welp (PI) with Kim Novick (Co-PI, IU) and Rick Meilan (Co-I, Purdue)
9. 02/11-02/14: *Recent trends and physiological constraints on northern extra-tropical ecosystems from atmospheric and satellite data*, \$588,787, NASA, Welp (Science PI) with Ralph Keeling (PI, SIO).

STUDENTS AND POSTDOCS SUPERVISED

Postdoc, in progress

Dr. Nimya Sunil, 2024 –

Postdocs, completed

Dr. Elizabeth Olson, 2019 – 2022

Currently Postdoctoral Researcher, Union College, Schenectady, NY

Dr. Odiney Alvarez-Campos, 2019 – 2020

Currently Environmental Compliance Advisor in the Development, Democracy, and Innovation (DDI) Bureau at USAID, Washington DC

Dr. Kento Magara-Gomez, 2019 – 2020

Currently Associate Professor, Environmental Engineering Department, Universidad Pontificia Bolivariana – Seccional Bucaramanga, Santander, Columbia

Graduate Students, in progress

Mr Ian Frantal, EAPS, MS started fall 2021

Co-advised with Tim Filley

Ms. Alexandra Meyer, EAPS, PhD started fall 2016

Indiana Space Grant award, 2021
EAPS graduate student EXPO outstanding poster award, 2019
EAPS Gerald Krockover K-12 outreach award, 2018
NSF GRFP Graduate Student Fellowship, 2017-2019
Purdue Doctoral Fellowship, 2016-2017

Graduate Students, completed

- Mr. Derrick Slick, EAPS, MS 2023
Currently an Environmental Specialist with the Navajo Nation Environmental Protection Agency's Public Water Systems Supervision Program
Co-advised with Ken Ridgway
NSF GRFP Graduate Student Fellowship, 2018-2020
- Mr. Spencer Willems, EAPS, MS 2021
Previously Tippecanoe County Drainage Coordinator, Currently Project Scientist at Tetra Tech
- Ms. Youmi Oh, EAPS, PhD 2020
Currently NRC Postdoctoral Fellow at NOAA ESRL Global Monitoring Division
Co-advised with Qianlai Zhuang
EAPS Outstanding Graduate Student award, 2020
EAPS graduate student EXPO outstanding talk award, 2020
EAPS Henry Silver graduate award for environmental geoscience, 2018
NASA NESSF Graduate Student Fellowship, 2017-2019
Andrews Purdue Graduate Fellowship, 2016-2017
Purdue PCCRC Graduate Fellowship, 2016-2017
- Ms. Olivia Salmon, Chemistry, PhD 2018
Currently Air Policy Analyst at the Wisconsin Department of Natural Resources
Co-advised with Paul Shepson
Bisland Dissertation Fellowship, 2017-2018
Purdue PCCRC graduate fellowship, 2014
- Ms. Apurupa Gorthi, EAPS/ESE, MS 2017
Currently Program Associate, International Forum for Environment, Sustainability & Technology
Previously Research Associate, Council of Energy, Environment and Water, New Delhi, India

Visting Scholars

Yongbo Hu, PhD student, Nanjing University of Information Science and Technology, China
Zhong-hua He, PhD student, Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences, China

Service on MS/PhD committees

**ESE = Ecological Science and Engineering Interdisciplinary Graduate Program*

**FNR = Forestry and Natural Resources*

**GDSP = Geodata Science Program within EAPS*

- Emily Appel, EAPS PhD, in progress (Bryant group)
Obijianya Christian Chimezie, EAPS MS, in progress (Michalski group)
Ye Yuan, EAPS PhD, in progress (Zhuang group)
Asmita Gautam, Agronomy PhD, in progress (Armstrong group)
Mingyang Guo, EAPS PhD, 2022 (Zhuang group)
Yonghuai Huang, EAPS GDSP MS, 2021 (Tung group)
Ilayda Kelley, Chemistry PhD, changed programs (Michalski group)
Ben Li, EAPS PhD, 2020 (Michalski group)
Lucia Zuniga, EAPS/ESE MS, 2020 (Filley group)
Maria del Rosario Uribe, FNR/ESE PhD, 2020 (Dukes group)

Ben Wilkins, Chemistry PhD, 2019 (Michalski group)

Sirui Wang, EAPS PhD, 2019 (Zhuang group)

Peng Zhu, EAPS PhD, 2018 (Zhuang group)

Undergraduate Students

Ms. Trinity Turvey, EAPS, Planetary Sciences, 2024

Mr. Ben Carpenter, EAPS, Planetary Sciences, 2023

Ms. Meghan Brown, EAPS, Environmental Geoscience, 2023-2024

Mr. Yulei Yang, EAPS, Environmental Geoscience, 2022-2023

Ms. Bethany Kettleborough, Chemistry, Biochemistry, 2022-2024

Ms. Adriana Brown, EAPS, Env. Geoscience, 2021-2022 NGRREC intern (PhD student at Univ. of Michigan)

Ms. Laura Rubio, EAPS, Environmental Geoscience, 2022

Mr. Bode Hoover, Physics, 2021 (PhD student at Indiana Univ. SPEA)

Ms. Weihan Xu, Chemistry, 2020

Mr. Jonathan DeGraw, EAPS Atmospheric Science, 2022 (MS student at Univ. of Oklahoma)

Mr. Jake Fekete, BS EAPS Geology and Geophysics, 2019 DURi program (PhD student and Univ. of Arkansas)

Ms. Emma Beck, Statistics, 2018 SURF program

Ms. Erin O'Connor, EAPS, 2020

Mr. Josh Allen, Computer and Info. Tech., Purdue Polytechnic Institute, 2021

Mr. Jared Foeppel, EAPS Environmental Geoscience, 2021 (MS student at George Washington Univ.)

Ms. Katrina Poling, EAPS, 2019

Mr. Gaurav Mittal, BS Chemical Engineering 2017

Ms. Mona Logan Eders, BS Chemistry 2017 (MS in Chemistry at Ball State)

Mr. Bradley McGinnley, BS EAPS 2016

TEACHING EXPERIENCE & TRAINING

Primary instructor at Purdue

- EAPS 125: Environmental Science and Conservation
- EAPS 315: Biogeochemistry
- EAPS 327: Climate, Science and Society
- EAPS 591: Stable Isotopes in Biogeochemistry
- HONR 399: The Wabash, Honors research course

Other

- CURE-Purdue Professional Development Program - Designed a course-based undergraduate research experience (CURE) Summer 2021
- Faculty Fellow, Instruction Matters Purdue Academic Course Transformation (IMPACT) Fall 2015
- Completed training in 'Effective Peer Instruction with Clickers', Center for the Integration of Research, Teaching and Learning, UCSD Summer 2014
- Co-instructor for 'Controversies at the interface of carbon and climate' at SIO/UCSD Spring 2013
- Completed training in 'Advanced Topics in Science Teaching', Yale University Spring 2008
- Lecturer at Yale University, 'A biological perspective of global change' Fall 2007

PROFESSIONAL LEADERSHIP, SERVICE, & SYNERGISTIC ACTIVITIES

- Water Research Community Co-lead, Purdue Institute for a Sustainable Future 2022 -
- AMS Board on Atmospheric Biogeosciences 2021 -

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- National Ecological Observatory Network (NEON) Technical Working Group for Atmospheric Isotopes 2018 -
- Session co-chair at the AGU Fall 2022 meeting, *Characterizing and Managing Hydrobiogeochemical Processes at Critical Interfaces in Critical Zones* 2022
- AGU Biogeosciences Awards Selection Committee 2018 - 2020
- Referee for 27 different journals: Agricultural & Forest Meteorology, Atmospheric Chemistry and Physics, Atmospheric Measurement Techniques, Biogeosciences, Climate Dynamics, Geochimica et Cosmochimica Acta, Geophysical Research Letters, Global Biogeochemical Cycles, Global Change Biology, Hydrology and Earth System Sciences, Journal of Crop Improvement, Journal of Geophysical Research-Atmospheres, Journal of Geophysical Research-Biogeosciences, Journal of Hydrometeorology, Nature, Nature Communications, Nature Geoscience, Nature Scientific Data, New Phytologist, Plant, Cell & Environment, PLoS ONE, Proceedings of the National Academy of Sciences, Rapid Communications in Mass Spectrometry, Remote Sensing, Science, Tree Physiology, and Water Resources Research
- Panelist reviewer for: NASA/DOE (2016), NSF (2015), NOAA (2010)
- Ad-hoc mail reviewer for: NSF AGS (2020), The Netherlands Organization for Scientific Research (2017), NSF Atmospheric Chemistry (2017), NSF DEB (2016), Swiss NSF (2016, 2017), US-Israel Binational Science Foundation (2015)
- Workshop participant, *Becoming an Effective Leader*, Torrey Pines Training Consortium 2014
- Session co-chair and OSPA liaison at the AGU Fall 2012 meeting, *Stable-Isotope Tracers in the Atmosphere: Insights into Chemical, Physical, and Biological Cycling* 2012
- Participant at NSF-sponsored *MacroSystems Biology PI Meeting* 2012
- Workshop participant, *Women in Science and Technology Conference*, La Jolla, CA 2011
- Workshop participant, Atmospheric Science Collaborations and Enriching Networks (ASCENT), NSF-sponsored, Steamboat Springs, CO 2009
- Session co-chair at the AGU Fall 2008 meeting, *Isotope Tracers of Biosphere-Atmosphere Interactions: Advances in Measurements, Theory and Analysis* 2008
- Workshop participant, FORWARD to Professorship, NSF-sponsored, Washington, DC 2008
- Session co-chair at the AGU Fall 2006 meeting, *Using Stable Isotopes to Quantify Terrestrial Carbon Cycle Processes at Multiple Spatial and Temporal Scales* 2006
- Coordinator for the GNIP sampling station in Cherskii, Siberia 2004 – 2007
- Student participant at the *Novel Approaches to Carbon Management: Separation, Capture, Sequestration, and Conversion to Useful Products* NAS Workshop 2003
- Co-organized Caltech's Environmental Science & Engineering fall seminar series 2002
- Attended the SIRFER Stable Isotope Ecology summer course, Salt Lake City, UT 2001

OUTREACH & PUBLIC SERVICE

- Invited presentation to student members of the Purdue Climate Action Collective (PCAC), 2024
- College of Science Women in Science Program (WISP) guest speaker: *Adopting a Sustainable Lifestyle*, 2023
- Interviewed by the Purdue Exponent (student newspaper) for article on boreal wildfires and smoke transport to Indiana, summer 2023
- Neighbor Nights presenter, National Great Rivers Research & Education Center, spring 2022
- Wabash Sampling Blitz collection station coordinator and volunteer, spring 2015, fall 2016, spring 2018, spring 2019, fall 2019
- Interviewed by the Purdue Exponent (student newspaper) for article on climate change, spring 2022
- *Superheroes of Science* podcast guest, fall 2019
- GLOBE Midwest Student Research Symposium presenter and poster judge, summer 2017

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- Science mentor to Jefferson High School student, 2017-2018
- Earth Science Passport Day at Imagination Station volunteer, fall 2016
- UCSD Founder's Day SIO booth planning, fall 2014
- Science fair mentor to Marshall Middle School student, fall 2013
- Career Day speaker, Forest Park High School, fall 2013
- Contributing author to the Keeling Curve 400 ppm website
- Volunteer judge for the National Ocean Science Bowl competition, Mar 3, 2012, La Jolla, CA
- Guest lecture at Escondido Charter High School, Nov 2011, Escondido, CA
- Volunteer judge for the National Ocean Science Bowl competition, Feb 26, 2011, La Jolla, CA
- Guest lecture at Escondido Charter High School, Oct 2010, Escondido, CA
- Volunteer judge for Odyssey of the Mind creative problem solving competition (IN, CA, CT)
- Concord Square Homeowners Association Board of Directors, 2012-2014

DEPARTMENT AND UNIVERSITY SERVICE

- Co-lead of the Water Research Community, Purdue Institute for a Sustainable Future, 2022-24
- EAPS Faculty Search Committee, Department Head, 2024
- EAPS Faculty Search Chair, Terrestrial climate, 2022-23
- EAPS Faculty Search Co-chair, Cloud microphysics, aerosols, or chemical interactions, 2021-22
- Faculty Senate temporary replacement for member on sabbatical, 2021
- EAPS Ad Hoc Faculty Search Committee in Data Science and Climate, 2020
- EAPS Strategic Planning Committee, 2018 - 2019
- ESE Graduate Committee, 2017 - 2019
- EAPS Graduate Committee, 2016 - present
- EAPS Safety Committee, 2016 - present
- EAPS Faculty Search Committee, Geochronology, 2017-18
- CoS Grade Appeals Committee, 2017 - 2019

BROADENING PARTICIPATION IN SCIENCE SERVICE

- Tri-Alpha, first generation college student honor society, founding faculty advisor, 2021-23
- Purdue Emerging Leaders Science Scholars, faculty mentor, 2021, 2023, 2024
- Purdue SAFE ZONE training, 2021
- Purdue Horizons faculty mentor for first-generation college students, 2016, 2019, 2022
- CoS Undergraduate Women in Science Program (WISP) guest panelist: *Establishing relationships with your professors*, 2017, 2019
- CoS Undergraduate Research Club guest panelist, 2017
- Boiler Gold Rush faculty mentor, 2017

INVITED TALKS

- AGU Fall Meeting – Session title: Stable isotopes of atmospheric greenhouse gases improve understanding of climate change feedbacks Dec 2023
- Arava Institute for Environmental Studies, Ketura Israel – Food security and the nexus to water-energy in the face of climate change workshop (*Canceled due to war*) Oct 2023
- University of New Mexico – Earth and Planetary Sciences Apr 2022
- Ball State University – Environment, Geology, and Natural Resources Mar 2021
- University of Michigan – Institute for Global Change Biology Oct 2020

- Pacific Northwest National Labs – E3SM Couple Biogeochemistry webinar May 2020
- Purdue University – Department of Botany Feb 2020
- AGU Fall Meeting – Session title: The Resilience and Vulnerability of Arctic and Boreal Ecosystems to Climate Change Dec 2019
- Brown University – Earth, Environmental, and Planetary Sciences Sep 2019
- University of Illinois, Chicago – Earth and Environmental Sciences Oct 2017
- International Boreal Forest Research Association (IBFRA) *meeting canceled* 2017
- AGU Fall Meeting – Session title: Changes in Arctic Carbon Cycle Dynamics: Drivers for Increasing Seasonal Cycle Amplitude in Atmospheric CO₂ Concentrations? Dec 2014
- University of California Irvine – Earth System Science Oct 2014
- Purdue University – Earth, Atmospheric and Planetary Sciences Mar 2014
- University of Kansas – Department of Geography Jan 2014
- Indiana University – School of Public and Environmental Affairs Jan 2013
- San Diego State University – Department of Biology Jan 2013
- University of Southern California – Earth Sciences Department Oct 2012
- UCLA – Department of Atmospheric and Oceanic Sciences Jan 2012
- AGU Fall Meeting – Session title: Partitioning Evaporation, Transpiration and Deep Percolation in Vegetated Catchments Dec 2011
- Columbia University – Lamont-Doherty Earth Observatory May 2009
- Boston University – Department of Geography and Environment Feb 2009
- University of Vermont – The Rubenstein School of Environment Mar 2008
- University of North Carolina, Chapel Hill – Department of Geological Sciences Feb 2008
- Washington State University – School of Earth and Environmental Sciences Jan 2008

PEER REVIEWED PUBLICATIONS

35 publications, total citations ~ 3,123, h-index 20

*Denotes advised student, primary advisor or co-advisor; #denotes advised student, thesis committee mentor; +denotes visiting international student, host advisor, ^Pdenotes postdoc.

36. *Meyer, A.L., **L.R. Welp** (2023) Water vapor stable isotope memory effects of common tubing materials. *Atmospheric Measurement Techniques Discussions*, [preprint, in review], <https://doi.org/10.5194/amt-2023-56>.
35. Kumar, P., A. Anders, E. Bauer, N.E. Blair, M. Cain, A. Dere, J. Druhan, T. Filley, C. Giannopoulos, A. E. Goodwell, D. Grimley, D. Karwan, L.L. Keefer, J. Kim, L. Marini, M. Muste, A.N.T. Papanicolaou, B.L. Rhoads, L. Constanza Hernandez Rodriguez, S. Roque-Malo, S. Schaeffer, A. Stumpf, A. Ward, **L. Welp**, C. G. Wilson, Q. Yan, S. Zhou (2023) Emergent role of critical interfaces in the dynamics of intensively managed landscapes. *Earth-Science Reviews*, 244, 104543, <https://doi.org/10.1016/j.earscirev.2023.104543>.
34. **Welp, L.R.**, E.J. Olson, A. Larrea Valdivia, J. Reyes Larico, E. Palma Arhuire, L. Morales Paredes, J. DeGraw, G. Michalski, (2022) Reinterpreting precipitation stable water isotope variability in the Andean Western Cordillera due to sub-seasonal moisture source changes and sub-cloud evaporation. *Geophysical Research Letters*, e2022GL099876, <https://doi.org/10.1029/2022GL099876>.
33. Michalski, G., A.E. Larrea Valdivia, E. Olson, **L. Welp**, H. Fang, K. Magara-Gomez, L. Morales Paredes, J. Reyes Larico, and J. Li. (2022) Identifying NO_x sources in Arequipa, Peru using nitrogen isotopes in particulate nitrate. *Frontiers in Environmental Science* 10, 916738, <https://doi.org/10.3389/fenvs.2022.916738>.
32. *Oh, Y., Q. Zhuang, **L.R. Welp**, L. Liu, S. Basu, E.J. Dlugokencky, L. Bruhwiler, J.B. Miller, S.E. Michel, S. Schwietzke, P. Tans, P. Ciais, and J.P. Chanton (2022) Improved global wetland carbon

isotopic signatures support post-2006 microbial methane emission increase, *Communications Earth and Environment*, 3, 159, <https://doi.org/10.1038/s43247-022-00488-5>.

31. ⁺Hu, Y., W. Xiao, J. Wang, **L.R. Welp**, C. Xie, H. Chu & X. Lee (2022) Quantifying the contribution of evaporation from Lake Taihu to precipitation with an isotope-based method, *Isotopes in Environmental and Health Studies*, 58:3, 258-276, <http://doi.org/10.1080/10256016.2022.2056599>.
30. ^PAlvarez-Campos, **L.R. Welp**, O., E.J. Olson, M.D. Frisbee, S.A. Zuñiga, J.D. Rodríguez, W.R. Roque Quispe, C.I. Salazar Mamani, M.R. Arenas Carrión, J.M. Jara, A. Ccancapa-Cartagena, and C.T. Jafvert (2022) Evidence for high-elevation salar recharge and interbasin groundwater flow in the Western Cordillera of the Peruvian Andes, *Hydrology and Earth System Sciences*, 26, 483-503, <https://doi.org/10.5194/hess-26-483-2022>.
29. Ccancapa-Cartagena, A., B. Paredes, C. Vera, F.D. Chavez-Gonzales, E.J. Olson, **L.R. Welp**, N.N. Zyaykina, T.R. Filley, D.M. Warsinger, C.T. Jafvert (2021) Occurrence and probabilistic health risk assessment (PRA) of dissolved metals in surface water sources in Southern Peru, *Environmental Advances*, 5, 100102, 2666-7657, <https://doi.org/10.1016/j.envadv.2021.100102>.
28. ^POlson, E, G. Michalski, **L. Welp**, A. Larrea Valdivia, J. Reyes Larico, J. Salcedo Peña, H. Fang, K. Magara Gomez, J. Li (2021) Mineral dust and fossil fuel combustion dominate sources of aerosol sulfate in urban Peru identified by sulfur stable isotopes and water-soluble ions, *Atmospheric Environment*, 260, 118482, <https://doi.org/10.1016/j.atmosenv.2021.118482>.
27. [#]Li, J., G. Michalski, E.J. Olson, **L.R. Welp**, A.E. Larrea Valdivia, J. Reyes Larico, F. Alejo Zapata, and L. Morales Paredes (2021) Geochemical characterization and heavy metal sources in PM10 in Arequipa, Peru, *Atmosphere*, 12, 641, <https://doi.org/10.3390/atmos12050641>.
26. ⁺Hu, Y., W. Xiao, Z. Wei, **L.R. Welp**, X. Wen, and X. Lee (2021) Determining the isotopic composition of surface water vapor flux from high-frequency observations using flux-gradient and Keeling methods, *Earth and Space Science*, 7, e2020EA001304, doi: 10.1029/2020EA001304.
25. ^{*}Oh, Y., Q. Zhuang, L. Liu, **L.R. Welp**, M.C.Y. Lau, T.C. Onstott, D. Medvigy, L. Bruhwiler, E.J. Dlugokencky, G. Hugelius, L. D'Imperio, and B. Elberling (2020) Reduced net methane emissions due to microbial methane oxidation in a warmer Arctic, *Nature Climate Change*, doi: 10.1038/s41558-020-0734-z.
24. ⁺He, Z., L. Lei, Z.C. Zeng, M. Sheng, **L.R. Welp** (2020) Evidence of carbon uptake associated with vegetation greening trends in eastern China, *Remote Sensing*, 12, 718, doi:10.3390/rs12040718.
23. ⁺He, Z., L. Lei, Y. Zhang, M. Sheng, C. Wu, L. Li, Z. Zeng, and **L.R. Welp** (2020) Spatio-temporal mapping of multi-satellite observed column atmospheric CO₂ using precision-weighted kriging method, *Remote Sensing*, 12, 576, doi:10.3390/rs12030576.
22. ^{*}Salmon, O.E., **L.R. Welp**, M. Baldwin, K. Hajny, B.H. Stirm, and P.B. Shepson (2019) Vertical profile observations of water vapor deuterium excess in the lower troposphere, *Atmospheric Chemistry and Physics*, 19 (17), 11525-11543, doi: 10.5194/acp-19-11525-2019.
21. ^{*}Gorthi, A., J. Volenec, and **L.R. Welp** (2019) Stomatal response in soybean during drought improves leaf and field-scale water use efficiencies, *Agriculture and Forest Meteorology*, 276-277, 107629, doi:10.1016/j.agroformet.2019.107629.
20. [#]Zhu, P., Q. Zhuang, **L.R. Welp**, P. Ciais, M. Heimann, B. Peng, W. Li, C. Bernacchi, C. Roedenbeck, and T.F. Keenan (2019) Recent warming has resulted in smaller gains in net carbon uptake in northern high latitudes, *Journal of Climate*, doi:10.1175/JCLI-D-18-0653.1.
19. ⁺He, Z., L. Lei, **L.R. Welp**, Z.C. Zeng, N. Bie, and L. Liu (2018) Detection of spatiotemporal extreme changes in atmospheric CO₂ concentration based on satellite observations, *Remote Sensing*, 10(6), 839, doi:10.3390/rs10060839.
18. Keeling, R.F., H.D. Graven, **L.R. Welp**, L. Resplandy, J. Bi, S.C. Piper, Y. Sun, A. Bollenbacher, and H.A.J. Meijer (2017) Atmospheric evidence for a global secular increase in carbon isotopic discrimination of land photosynthesis, *Proceedings of the National Academy of Sciences*, 114(39), 10361-10366, doi:10.1073/pnas.1619240114.

17. #Zhu, P., Q. Zhuang, P. Ciais, **L. Welp**, W. Li, and Q. Xin (2017) Elevated atmospheric CO₂ negatively impacts photosynthesis through radiative forcing and physiology-mediated climate feedback, *Geophysical Research Letters*, 44(4), 1956-1963, doi:10.1002/2016GL071733.
16. Trugman, A.T., N.J. Fenton, Y. Bergeron, X. Xu, **L.R. Welp**, and D. Medvigy (2016) Climate, soil organic layer, and nitrogen jointly drive forest development after fire in the North American boreal zone, *Journal of Advances in Modeling Earth Systems*, 8(3), 1180-1209, doi:10.1002/2015MS000576.
15. **Welp, L.R.**, P.K. Patra, C. Rodenbeck, R.R. Nemani, J. Bi, S.C. Piper, and R.F. Keeling (2016) Increasing summer net CO₂ uptake in high northern ecosystems inferred from atmospheric inversions and comparisons to remote-sensing NDVI, *Atmospheric Chemistry and Physics*, 16, 9047-9066, doi:10.5194/acp-16-9047-2016.
14. Griffis, T.J., J.D. Wood, J.M. Baker, X. Lee, K. Xiao, Z. Chen, **L.R. Welp**, N.M. Schultz, G. Gorski, M. Chen, J. Nieber (2016) Investigating the source, transport, and isotope composition of water vapor in the planetary boundary layer, *Atmospheric Chemistry and Physics*, 16, 5139-5157, doi:10.5194/acp-16-5139-2016.
13. Graven, H.D., R.F. Keeling, S.C. Piper, P.K. Patra, B.B. Stephens, S.C. Wofsy, **L.R. Welp**, C. Sweeney, P.P. Tans, J.J. Kelley, B.C. Daube, E.A. Kort, G.W. Santoni, and J.D. Bent (2013) Enhanced seasonal exchange of CO₂ by northern ecosystems since 1960, *Science*, 341 (6150), 1085-1089, doi:10.1126/science.1239207.
12. **Welp, L.R.**, R.F. Keeling, R.F. Weiss, W. Paplawsky, and S. Heckman (2013) Design and performance of a Nafion dryer for continuous operation at CO₂ and CH₄ air monitoring sites, *Atmospheric Measurement Techniques*, 6(5), 1217-1226, doi:10.5194/amt-6-1217-2013.
11. Huang, S., H. Liu, D. Dahal, S. Jin, **L.R. Welp**, J. Liu, S. Liu (2013) Modeling spatially explicit fire impact on gross primary production in Interior Alaska using satellite images coupled with eddy covariance, *Remote Sensing of Environment*, 135, 178-188, doi:10.1016/j.rse.2013.04.003.
10. **Welp, L.R.**, X. Lee, T.J. Griffis, X. Wen, W. Xiao, S. Li, X. Sun, Z. Hu, M. Val Martin, and J. Huang, (2012) A meta-analysis of water vapor deuterium-excess in the mid-latitude atmospheric surface layer, *Global Biogeochemical Cycles*, 26, GB3021, doi:10.1029/2011GB004246.
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PUBLICATIONS UNDER REVIEW AND IN-PREP

41. Welp, L.R., *Y. Oh, T. Griffis, Z. Yu (*invited submission to the Treatise on Geochemistry*) Isotopes of modern atmospheric greenhouse gases: Improving understanding of climate change feedbacks.
40. Liu, Z., B. Rogers, G. Keppel-Aleks, M. Helbig, A. Ballantyne, J.S. Kimball, A. Chatterjee, A. Foster, A. Kaushik, A. Virkkala, A. Burrell, C. Schwalm, C. Sweeney, E.A.G. Schurr, J. Dean, J. Watts, J.E. Kim, J.A. Wang, L. Hu, **L.R. Welp**, L. Berner, M. Maruritz, M. Farina, M. Mack, N.C. Parazoo, N. Madani, R. Keeling, R. Commane, S. Goetz, S. Piao, S.M. Natali, W. Wang, W. Buermann, W. Walker, X. Lin, W. Wang, Y. Jin (*submitted to Nature Reviews Earth & Environment*) Enhanced seasonal amplitude of atmospheric CO₂ in northern high latitudes: trends, mechanisms, and environmental drivers.
39. ^POlson, E.J., **L.R. Welp**, M.D. Frisbee, S.A. Zúñiga Medina, O. Alvarez-Campos, W.R. Roque Quispe, C.I. Salazar Mamani, M.R. Arenas Carrion, J. Diaz Rodriguez, J. Jara, A. Ccancapa-Cartagena, and Chad T. Jafvert (*submitted to Journal of Hydrological Science*) Spatially-heterogeneous glacial meltwater recharge in drainages surrounding the rapidly-ablating Coropuna ice cap, Peruvian Andes.
38. *Willem, S., A. Meyer, and **L. Welp** (*submitted to Frontiers in Water*) Stream water nitrate concentrations vary with tile drain area, antecedent moisture, and qualitative watershed travel times inferred from stable water isotopes across a midwestern agricultural landscape.
37. [#]Wilkins, B. P., D.K. Woo, P. Kumar, D.A. Keefer, L.L. Keefer, M. Fisher, J. Li, T. Hodson, **L.R. Welp**, G. Michalski (*submitted to Water Resources Research*) Quantification of field-scale denitrification by stable isotope analysis of nitrate and water from tile drain discharge.
36. *Oh, Y., **L.R. Welp**, K. Yi, M.C. Benson, K.A. Novick, Q. Zhuang, and D. Lombardozzi (*submitted to New Phytologist*) Carbon allocation affects seasonal leaf carbon isotopic signatures and inferred water use efficiency of temperate deciduous trees.

BOOK CHAPTER

Hayes, Daniel J., Butman, David E., Domke, Grant M., Fisher, Joshua B., Neigh, Christopher S. R., and **Welp, Lisa R.** “Boreal Forests.” In *Balancing Greenhouse Gas Budgets*, 450. Elsevier, 2022.

MEETING ABSTRACTS

*Denotes advised student or postdoc lead author.

- Witte, M., R. Bahreini, A. Bucholtz, P.Y. Chuang, D. Collins, A.R. Metcalf, **L.R. Welp**, M. Han, M.D. Leandro, A.B. MacDonald, B. Ries, S. Bollinger, and D. Wang (Dec 2023) In situ sampling of aerosol-cloud interactions during the Southern California Interactions of Low cloud and Land Aerosol (SCILLA) airborne experiment, Fall Meeting of the American Geophysical Union, San Francisco, CA.
- Welp, L.R.**, Y. Oh, T. Griffis, Z. Yu (Dec 2023) Stable isotopes of atmospheric greenhouse gases improve understanding of climate change feedbacks, Fall Meeting of the American Geophysical Union, San Francisco, CA. (Invited)
- Paudel, I., **L.R. Welp**, D.F. Jacobs, S.M. Landhäusser, J.S. Dukes (Aug 2023) Reduced sensitivity of carbon and water exchange to soil moisture in temperate trees exposed to chronic throughfall removal. Ecological Society of America Meeting, Portland, Oregon.

- Welp, L.R.**, G. Michalski, A. Brown (Dec 2022) Do reactive interfaces cause low nitrate concentrations in agricultural tile drainage water at the beginning of storm hydrographs? Fall Meeting of the American Geophysical Union, Chicago, IL.
- *Frantal, I., T.R. Filley, A.L. Dere, **L.R. Welp**, Z.S. Brecheisen, and M. Jimenez-Castaneda (Dec 2022) Investigating deep soil CO₂ production in restored prairie ecosystems, Fall Meeting of the American Geophysical Union, Chicago, IL.
- Michalski, G., A. Larrea Valdivia, J. Reyes, E.J. Olson, **L.R. Welp**, F. Van Winkle (Dec 2022) The influence of vulcanism, sea salt, DMS and dust on marine stratocumulus cloud chemistry in southern Peru based on ion and sulfate isotope analysis, Fall Meeting of the American Geophysical Union, Chicago, IL.
- *Olson, E.J., G. Michalski, **L.R. Welp**, M.D. Frisbee, A. Larrea Valdivia, J. Reyes Larrico, and K. Magara Gomez (Dec 2021) Isotopic evidence for fog-fed groundwater recharge near *lomas* forests along the arid Atacama-Sechura coastal desert, Fall Meeting of the American Geophysical Union, New Orleans, LA.
- Dean, J., L. Birch, A. Burrell, S. Connon, S. Goetz, R. Keeling, G. Keppel-Aleks, R. Massey, K. Savage, C. Shwalm, **L. Welp**, B. Rogers (Dec 2021) Assessing the influence of changing vegetation distributions on increasing seasonal CO₂ exchange in high latitudes, Fall Meeting of the American Geophysical Union, New Orleans, L.A.
- *Olson, E.J., **L.R. Welp**, M.D. Frisbee, O. Alvarez-Campos, S.A. Zúñiga Medina, W.R. Roque Quispe, C.I. Salazar Mamani, M.R. Arenas Carrion, and J. Diaz Rodriguez (Dec 2020) Tracing the impact of glacial retreat on the hydrology of the Andean Nevado Coropuna glacier and adjacent drainages, Fall Meeting of the American Geophysical Union.
- *Alvarez-Campos, O., E.J. Olson, M.D. Frisbee, **L.R. Welp**, S.A. Zúñiga Medina, W.R. Roque Quispe, C.I. Salazar Mamani, M.R. Arenas Carrion, and J. Diaz Rodriguez (Oct 2020) Identifying groundwater recharge zones in western cordillera of the central Andes of southern Peru, Geological Society of America Annual Meeting.
- *Alvarez-Campos, O., E. Olson, M. Frisbee, W. Roque Quispe, M. Arenas Carrion, C. Salazar Mamani, S. Zuniga Medina, J. Jara Gonzalez, **L. Welp** (Dec 2019) Investigating the source of springs in Arequipa, Peru, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA.
- Reyes, J., E. Olson, K. Magara Gomez, G. Michalski, J. Li, J. Salcedo Pena, A. Larrea Valdivia, A. Eilas Mamani, **L. Welp** (Dec 2019) Geochemical characteristics and origins of trace metals in PM10 at urban and rural sites in Arequipa, Peru, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA.
- Larrea Valdivia, A., J. Reyes, A. Elias Mamani, J. Salcedo Pena, G. Michalski, K. Magara Gomez, E. Olson, **L. Welp** (Dec 2019) Mass and ion characterization of particulate matter in Arequipa, Peru, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA.
- Michalski, G., A. Larrea Valdivia, A. Eilas Mamani, J. Salcedo Pena, J. Reyes, J. Li, E. Olson, K. Magara Gomez, **L. Welp** (Dec 2019) Nitrogen and oxygen isotopes in aerosol nitrate collected in Arequipa, Peru, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA.
- *Olson, E, G. Michalski, **L. Welp**, A. Larrea Valdivia, J. Reyes, A. Eilas Mamani, J. Salcedo Pena, K. Magara Gomez, J. Li, Y. Palma Arhiure (Dec 2019) Sulfur isotope constraints on PM2.5 sulfate aerosol sources in Arequipa, Peru, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA.
- *Oh, Y., Q. Zhuang, L. Liu, **L. Welp**, X. Lan, S. Basu, E. Dlugokencky, L. Bruhwiler, J. Miller, S. Englund Michel, S. Schwietzke (Dec 2019) Process-based mapping of global wetland carbon isotopic signatures of methane, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA.
- Welp, L.**, L. Calle, H. Graven, B. Poulter (Dec 2019) Drivers of high latitude atmospheric CO₂ seasonal cycle and amplitude: considering the role of plant functional types, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA. (Invited Talk)
- Zhuang, Q., Y. Oh, L. Liu, **L. Welp**, M. Lau, T. Onstott, D. Medvigy, L. Bruhwiler, E. Dlugokencky, F. Hugelius, B. Elderling (Dec 2019) The role of microbial dynamics of methanogens and high affinity

- methaotrophs in current and future net land methane emissions in the Arctic, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA. (Talk)
- *Willem, S., A. Meyer, S. Stannis, E. Beck, J. Allen, and **L. Welp** (Dec 2019) Relating relative watershed residence times and nutrient concentrations in artificially-drained landscapes using stable isotope variability, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA. (Talk)
- Welp, L.**, E. Olson, J. DeGraw, A. Larrea Valdivia, J. Reyes Larico, G. Michalski (Dec 2019) Studying atmospheric moisture transport in southern Peru during the weak 2019 El Nino using isotopes of daily precipitation, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA. (Talk)
- *Meyer, A., **L. Welp**, T. Jayarathne, O. Salmon, B. Stirm, M. Baldwin, P. Shepson (Dec 2019) Using Evaporation stable water isotopologues to determine Great Lakes influence on atmospheric moisture, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA.
- Welp, L.R.**, (Oct 2019) Vertical profile observations of water vapor deuterium excess in the lower troposphere, US CLIVAR Water Isotopes and Climate Workshop, Boulder, CO. (Talk)
- *Meyer, A., **L. Welp**, T. Jayarathne, O. Salmon, B. Stirm, M. Baldwin, P. Shepson (Oct 2019) Using Evaporation stable water isotopologues to determine Great Lakes influence on atmospheric moisture, US CLIVAR Water Isotopes and Climate Workshop, Boulder, CO.
- *Olson, E., **L. Welp**, J. DeGraw, A. Larrea Valdivia, J. Reyes Larico, G. Michalski (Oct 2019) Stable isotope variations in monsoon precipitation related to atmospheric moisture transport in southern Peru, US CLIVAR Water Isotopes and Climate Workshop, Boulder, CO.
- *Meyer, A. and **L. Welp** (June 2019) Relating relative watershed residence times and nutrient concentrations in artificially-drained landscapes using stable isotope variability, 40th Annual Indiana Water Resources Association Symposium, Syracuse, Indiana.
- Welp, L.** (May 2019) Relating estimated watershed residence times and nutrient concentrations in artificially-drained landscapes using stable isotope variability, International Atomic Energy Agency Isotope Hydrology Symposium, Vienna, Austria. (Talk)
- Wilkins, B.P., D.K. Woo, P. Kumar, D.A. Keefer, L.L. Keefer, M. Fisher, J. Li, T.O. Hodson, **L.R. Welp**, and G. Michalski (Dec 2018) Quantification of field-scale denitrification by stable isotope analysis of nitrate and water from tile drain runoff, Proceedings of the Fall Meeting of the American Geophysical Union, Washington, D.C.
- *He, Z., **L.R. Welp**, L. Lei, and Z.C. Zeng (Dec 2018) Satellite-observed carbon sink with local greening in China, Proceedings of the Fall Meeting of the American Geophysical Union, Washington, D.C.
- *Oh, Y. Q. Zhuang, L. Liu, **L.R. Welp**, M. Lau, T.C. Onstott, D. Medvigy, L. D'Imerio, B. Elberling, S. Schwietzke (Dec 2018) High affinity methanotrophs are an important overlooked methane sink the pan-Arctic and global methane budgets, Proceedings of the Fall Meeting of the American Geophysical Union, Washington, D.C.
- Chernysheva, L. G. Michalski, Y. Cheng, A. Meyer, and **L.R. Welp** (Dec 2018) Event-scale variations in water isotopes: What do they tell us? Proceedings of the Fall Meeting of the American Geophysical Union, Washington, D.C.
- Welp, L.**, Meyer A, Griffis T, Feng X & Posmentier E (Aug 2018) In-situ observations of water vapor isotopes in near surface air over Lakes Superior and Michigan, Goldschmidt, Boston, MA.
- *Oh, Y., K. Yi, M. Benson, K. Novick, **L. Welp** (Apr 2018) Species-specific seasonal stable carbon isotope variation in temperate deciduous leaves and implications for carbon allocation phenology and water use efficiency estimates, European Geophysical Union, Vienna, Austria.
- Welp, L.R.**, L. Calle, H. Graven, B. Poulter (Dec 2017) Investigating the role of evergreen and deciduous forests in the increasing atmospheric CO₂ seasonal amplitude, Proceedings of the Fall Meeting of the American Geophysical Union, New Orleans, LA. (Talk)
- *Salmon, O.E., **L.R. Welp**, P.B. Shepson, B.H. Stirm (Dec 2017) Airborne observations of water vapor deuterium excess in the mid-latitude lower troposphere, Proceedings of the Fall Meeting of the American Geophysical Union, New Orleans, LA. (Talk)

- *Meyer, A., **L. Welp** (Dec 2017) Estimating spring condensation on the Great Lakes, Proceedings of the Fall Meeting of the American Geophysical Union, New Orleans, LA.
- Welp, L.R.**, A. Meyer, and T.J. Griffis (Feb 2017) In-situ observations of water vapor isotopes in near surface air over Lakes Superior and Michigan, Integrated Carbon and Water for Ecological Biogeochemical Synthesis (ICWEBS) workshop, Stevenson, WA. (Talk)
- *Meyer, A. and **L.R. Welp** (Feb 2017) Testing the water isotope effect of tubing materials and conditions, Integrated Carbon and Water for Ecological Biogeochemical Synthesis (ICWEBS) workshop, Stevenson, WA.
- Welp, L.R.**, A. Meyer, and T.J. Griffis (Dec 2016) In-situ observations of water vapor isotopes in near surface air over Lakes Superior and Michigan, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA.
- *Oh, Y., **L. Welp**, K. Yi, J.T. Maxwell and K.A. Novick (Dec 2016) Species-specific responses of tree ring and leaf stable isotope signals in isohydric and anisohydric trees to drought, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA.
- Keeling, R.F., H.D. Graven, **L.R. Welp**, L. Resplandy, J. Bi, S.C. Piper, Y. Sun, A. Bollenbacher and H.A.J. Meijer (Dec 2016) Atmospheric evidence for a global secular increase in isotopic discrimination of land photosynthesis, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA. (Talk)
- Zhu, P., Q. Zhuang, D. McGuire, M. Heimann, B. Peng, **L.R. Welp** and C. Bernacchi (Dec 2016) Diminishing warming effects on terrestrial ecosystem net carbon uptake in northern high latitudes, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA. (Talk)
- Thiagarajan, N., B. Passey, **L.R. Welp**, R. Keeling, and J. Eiler (Jun 2016) Seasonal variations in clumped isotope and $\Delta^{17}\text{O}$ of atmospheric CO_2 at La Jolla, CA, Goldschmidt Conference, Yokohama, Japan. (Talk)
- Welp, L.R.**, P.K. Patra*, C. Rodenbeck, R. Nemani, J. Bi, S.C. Piper, R.F. Keeling (Jun 2016) Increasing summer net CO_2 uptake in high northern ecosystems on land, Goldschmidt Conference, Yokohama, Japan. (Poster presented by P. Patra)
- Welp, L.R.**, H. Graven, R. Keeling, and J. Bi (Dec 2015) The impact of boreal deciduous and evergreen forests on atmospheric CO_2 seasonality, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA.
- Trugman, A, N. Fenton, Y. Bergeron, X. Xu, **L.R. Welp**, D. Medvigy (Dec 2015) Modeling forest development after fire disturbance: Climate, soil organic layer, and nitrogen jointly affect forest canopy species and long-term ecosystem carbon accumulation in the North American boreal forest, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA.
- Welp, L.R.**, S. C. Piper, H. Graven, A. Bollenbacher, H.A.J. Meijer, R. Keeling (Jan 2015) Trends in carbon isotope fractionation in atmospheric carbon dioxide constrain water use efficiency of northern ecosystems from the 1980s to 2010, North American Carbon Program Meeting, Washington, D.C.
- Welp, L.R.**, T. Lueker, J. Kim, P. Salameh, S. Walker, R.F. Keeling, R.F. Weiss, C. Sloop, W. Callahan, D. Bixler, and A. Long (Dec 2014) Long-term calibration strategy for the Earth Networks CO_2 and CH_4 sensor network in urban and background sites using the Picarro CRDS gas analyzer, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA.
- Lai, C-T., J.P. Rambo, **L.R. Welp**, K. Bible, and D.Y. Hollinger (Dec 2014) Comparing stable water isotope variation in atmospheric moisture observed over coastal water and forests, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA.
- Graven, H.D., R.F. Keeling, S.C. Piper, P.K. Patra, B.B. Stephens, S.C. Wofsy, **L.R. Welp**, C. Sweeney, P.P. Tans, J.J. Kelley, B.C. Daube, E.A. Kort, G. Santoni, J.D. Bent, R. Thomas, and I.C. Prentice (Dec 2014) Enhanced seasonal exchange of CO_2 by northern ecosystems – Observations and models, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA.
- Welp, L.R.**, S.C. Piper, H.D. Graven, A. Bollenbacher, H.A.J. Meijer, and R.F. Keeling (Dec 2013) Trends in carbon isotope fractionation in atmospheric carbon dioxide constrain water use efficiency of northern

ecosystems from the 1980s to 2010, Fall Meeting of the American Geophysical Union, San Francisco, CA. (Talk)

- Welp, L.R.**, H.D. Graven, S.C. Piper, and R.F. Keeling (Oct 2013) Increasing seasonal CO₂ exchange in high northern latitudes, International Boreal Forest Association Meeting, Edmonton, Canada. (Talk)
- Welp, L.R.**, H.D. Graven, P. Patra, R. Nemani, S.C. Piper, and R.F. Keeling (Jun 2013) Increasing seasonal CO₂ exchange in high northern latitudes, International Carbon Dioxide Conference, Beijing, China.
- Welp, L.R.**, H.D. Graven, P. Patra, R. Nemani, S.C. Piper, and R.F. Keeling (Apr 2013) Increasing seasonal land-atmosphere CO₂ exchange as a results of unidentified large-scale changes in Arctic and boreal ecosystems, NASA Terrestrial Ecology Science Team Meeting, La Jolla, CA.
- Graven, H.D., S. Piper, P.K. Patra, C. Sweeney, **L.R. Welp**, B.B. Stephens, S.C. Wofsy, and R.F. Keeling (Dec 2012) Large-scale increase in the seasonal cycle of CO₂ in the Northern Hemisphere since 1960, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA.
- Keeling R.F., **L.R. Welp**, H. Graven, and S.C. Piper (Apr 2012) Constraints on land biospheric carbon cycling based on measurements of atmospheric CO₂ and its isotopic composition, DOE TES PI Meeting, Washington D.C.
- Welp L.R.**, X. Lee, T. Griffis, X. Wen, W. Xiao, S. Li, X. Sun, and Z. Hu (Dec 2011) A meta-analysis of deuterium-excess in water vapor in the atmospheric surface layer in mid-latitudes, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA. (Invited Talk)
- Welp, L.R.**, P. K. Patra, R. F. Keeling, R. R. Nemani, and S. C. Piper (Dec 2011) Long-term trends in Arctic and Boreal CO₂ uptake from 1986 to 2007 inferred from a time dependent inversion compared with satellite NDVI observations to identify likely regions of change, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA.
- Piper, S.C., R.F. Keeling, P.K. Patra, **L.R. Welp** (Dec 2011) Analysis of Trends in the Seasonal Cycle of Atmospheric CO₂ in the Northern Hemisphere from 1958 to 2010, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA.
- Welp, L.R.**, P. K. Patra, R. F. Keeling, R. R. Nemani, and S. C. Piper (Oct 2011) Trends in annual and seasonal high northern latitude CO₂ fluxes from 1986 to 2007 inferred from a time dependent inversion compared with satellite NDVI observations to identify likely regions of change, NASA Carbon Cycle & Ecosystems Joint Science Workshop, Alexandria, VA. (Speed Talk and Poster)
- Welp, L.R.**, R.F. Keeling, H.A.J. Meijer, A. Bollenbacher, S.C. Piper, K. Yoshimura, R.J. Francey, C.E. Allison and M. Wahlen (May 2011) The isotopic composition of oxygen in atmospheric CO₂ and El Niño: a new constraint of global productivity, NOAA ESRL Global Monitoring Division (GMD) Annual Conference, Boulder, CO. (Talk)
- Welp, L.R.**, W. Paplawsky, R.F. Keeling, R.F. Weiss and S. Heckman (May 2011) A low-maintenance drying system for ambient air greenhouse gas monitoring, NOAA ESRL Global Monitoring Annual Conference, Boulder, CO.
- Welp, L.R.**, X. Lee, T.J. Griffis, X. Wen, S. Li, X. Sun and Z. Hu (Mar 2011) A meta-analysis of high-frequency deuterium-excess of water vapor measured at six stations. Proceedings of the BASIN meeting “The Roles of Stable Isotopes in Water Cycle Research”, Keystone, CO. (Talk)
- Welp, L.R.**, R.F. Keeling, H.A.J. Meijer, A. Bollenbacher, S.C. Piper, K. Yoshimura, R.J. Francey, C.E. Allison and M. Wahlen (Dec 2010) The isotopic composition of oxygen in atmospheric CO₂ and El Niño: a new constraint of global productivity, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA. (Talk)
- Welp, L.R.**, R.F. Keeling, H.A.J. Meijer, A.F. Bollenbacher, S.C. Piper and M. Wahlen (Oct 2009) The role of ENSO in interannual variability of oxygen isotope ratios of CO₂ from three decades of the global Scripps Institution of Oceanography (SIO) flask network. Proceedings of the International Carbon Dioxide Conference, Jena, Germany. (Outstanding Poster Award)
- Welp, L.R.** and X. Lee (Dec 2008) Variability in the hourly deuterium excess of water vapor near the ground, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA. (Talk)

- Welp, L.R.**, X. Lee, T.J. Griffis, K. Kim, K. Billmark and J. Baker (Dec 2007) Oxygen isotopes of water in evapotranspiration and at the sites of leaf evaporation in a soybean canopy, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA. (Talk)
- Welp, L.R.**, J.W. White, J.T. Randerson, P.P. Tans, C.J. Still, B.H. Vaughn, D.C. Noone, N.H. Buenning and W.J. Riley (Dec 2006) A decreasing seasonal cycle amplitude of $\delta^{18}\text{O}\text{-CO}_2$ as a metric of high latitude temperatures increases, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA. (Talk)
- Welp, L.R.**, X. Lee, T.J. Griffis, K. Kim, T. Bavin, K. Billmark and J. Baker (Dec 2006) Simultaneous Diurnal measurements of stable isotopes of water vapor and CO_2 exchange above a soybean ecosystem using high frequency laser spectroscopy, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA.
- Still, C., D. Noone, N. Buenning, J. Randerson, **L. Welp**, J. White, B. Vaughan and W. Riley (Dec 2006) What controls the global value of oxygen-18 in atmospheric CO_2 ?, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA.
- Welp, L.R.**, J.T. Randerson and H. Liu (Dec 2005) The sensitivity of carbon fluxes to spring warming and summer drought depends on plant functional type in boreal forest ecosystems, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA.
- Welp, L.R.**, J.T. Randerson, G.M. Zimova, A.I. Davydova, S.P. Davydov and S.A. Zimov (Dec 2004) Using stable isotopes to partition seasonal precipitation inputs in the Kolyma River: Implications for basin-scale water use, Proceedings of the Fall Meeting of the American Geophysical Union, San Francisco, CA.
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