Sam Silva, Ph.D.

Assistant Professor
University of Southern California
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PROFESSIONAL APPOINTMENTS

Assistant Professor   Jan 2022-Present
Department of Earth Sciences
Department of Civil and Environmental Engineering
Department of Population and Public Health Sciences
University of Southern California, Los Angeles, CA

Research Scientist   2021
Pacific Northwest National Laboratory, Richland, WA

Linus Pauling Distinguished Postdoctoral Fellow   2019-2021
Pacific Northwest National Laboratory, Richland, WA

EDUCATION

Ph.D. Environmental Engineering and Computation
Massachusetts Institute of Technology, Cambridge, MA   2019

M.S. Atmospheric Sciences
University of Arizona, Tucson, AZ   2014

B.S. Physics
University of Arizona, Tucson, AZ   2013

PUBLICATIONS

Group members/mentees are listed in **bold**.
⊕Undergraduate Student Mentee
†Graduate Student Mentee

Submitted and Under Review

Ziming, L., †**Sturm, P. O.**, Bharadwaj, S., **Silva, S. J.**, and Tegmark, M. (Submitted) Discovering New Interpretable Conservation Laws as Sparse Invariants.

Azzouz, M, Hasan, Z, Rahman, Md. M., Gauderman, W. J., Lorenzo, M, Lurmann, F. W., Eckel, S. P., Palinkas, L., Johnston, J., Hurlburt, M., **Silva, S. J.**, †**Schlaerth, H.**, Ko, J, Ban-Weiss, G, McConnell, R, Stockfelt, L, Garcia, E. (Submitted) Does socioeconomic and environmental burden affect vulnerability to extreme air pollution and heat? - A case-crossover study of mortality in California

Silva, S. J., and Keller, C. A. (Under Review) Limitations of XAI methods for process-level understanding in the atmospheric sciences

Yu, S., Pritchard, M., Ma, P.-L., Singh, B., **Silva, S. J.** (Under Review) Two-step hyperparameter optimization method: Accelerating hyperparameter search by using a fraction of a training dataset

Lyman, K., Krishnamoorthy, B., **Silva, S. J.**, Halappanavar, M., Kalyanaraman, A., Keller, C., and Barber, V. (Submitted) Persistent Cycles in Dynamic Directed Bipartite Graphs: An Application in Atmospheric Chemistry

†**Schlaerth, H. L.**, **Silva, S. J.**, Li, Y., Li, D. (Under Review) Albedo as a competing warming effect of urban greening

John, S. G., Pasquier, B, Holzer, M, **Silva, S. J.**, (Under review) Biogeochemical fluxes of nickel in the global oceans inferred from a diagnostic model

Peplinski, M., Dilkina, B., **Silva, S. J.**, Ban-Weiss, G., Sanders, K. T. (Under Review). A machine learning framework to estimate residential electricity demand based on smart meter electricity, climate, building characteristics, and socioeconomic datasets

Peer-Reviewed

25. †**Schlaerth, H. L.**, **Silva, S. J.**, Li, Y. (2023). Characterizing ozone sensitivity to urban greening in Los Angeles under current day and future anthropogenic emissions scenarios, *JGR: Atmospheres*, September 11, 2023, e2023JD039199. https://doi.org/10.1029/2023JD039199.

24. Clifton, O. E., Schwede, D., Hogrefe, C., Bash, J. O., Bland, S., Cheung, P., Coyle, M., Emberson, L., Flemming, J., Fredj, E., Galmarini, S., Ganzeveld, L., Gazetas, O., Goded, I., Holmes, C., D., Horváth, L., Huijnen, V., Li, Q., Makar, P. A., Mammarella, I., Manca, G., Munger, J. W., Pérez-Camanyo, J. L., Pleim, J., Ran, L., San Jose, R., **Silva, S. J.**, Staebler, R., Sun, S., Tai, A. P. K., Tas, E., Vesala, T., Weidinger, T., Wu, Z., and Zhang, L. (Accepted, 2023) A single-point modeling approach for the intercomparison and evaluation of ozone dry deposition across chemical transport models (Activity 2 of AQMEII4) *Atmos. Chem. Phys.*, 23, 9911–9961, 2023, https://doi.org/10.5194/acp-23-9911-2023.

23. ⊕**Yik, W.**, **Silva, S. J.**, Geiss, A., Watson-Parris, D. (2023). Exploring Randomly Wired Neural Networks for Climate Model Emulation *AIES*, no. 4 (October 2023): 220088. https://doi.org/10.1175/AIES-D-22-0088.1

22. Palinkas, L. A., De Leon, J., Yu, K., Salinas, E., Fernandez, C., Johnston, J, Rahman, M., Md., **Silva, S. J.**, Hurlburt, M., McConnell, R. S., Garcia, E. (2023). Adaptation resources and responses to wildfire smoke and other forms of air pollution in low-income urban settings: A mixed-methods study, *IJERP* 20, no. 7 (April 4, 2023): 5393. https://doi.org/10.3390/ijerph20075393.

21. **Silva, S. J.**, Burrows, S. M., Calvin, K., Cameron-Smith, P. J., Shi, X., Zhou, T. (2023). Contrasting the biophysical and radiative effects of rising CO_2 concentrations on ozone dry deposition fluxes, *JGR: Atmospheres*, 128, no. 6 (March 27, 2023): e2022JD037668. https://doi.org/10.1029/2022JD037668.

20. Rahman, Md Mostafijur, Lorenzo, M, Ban-Weiss, G, Hasan, Z, Azzouz, M, Eckel, S. P., Conti, D. V., Lurmann, F. W., **Schlaerth, H.**†, Johnston, J, Ko, J, Palinkas, L, Hurlburt, M, **Silva, S. J.**, W Gauderman, W. J., McConnell, R, and Garcia, E., (2023) Ambient temperature and air pollution associations with suicide and homicide mortality in

California: A Statewide Case-Crossover Study, *STOTEN*, 874 (May 2023): 162462. https://doi.org/10.1016/j.scitotenv.2023.162462

19. Palinkas, L. A., Hurlburt, M. S., Fernandez, C., De Leon, J., Yu, K., Salinas, E., Garcia, E. Johnston, J., Rahman, M. M., **Silva, S. J.**, McConnell, R. S. (2022). Vulnerable, Resilient, or Both? A Qualitative Study of Adaptation Resources and Behaviors to Heat Waves and Health Outcomes of Low-Income Residents of Urban Heat Islands *IJERPH*, https://doi.org/10.3390/ijerph191711090

18. Geiss, A., **Silva, S. J.**, and Hardin, J. (2022) Downscaling Atmospheric Chemistry Simulations with Physically Consistent Deep Learning, *Geosci. Model Dev.*, March 23, 2022. https://doi.org/10.5194/gmd-2022-76.

17. Rahman, Md Mostafijur, McConnell, R., **Schlaerth, H.**, Ko, J., **Silva, S. J.**, Lurmann, F. W., Palinkas, L., Johnston, J., Hurlburt, M., Yin, H., Ban-Weiss, G and Garcia, E. (2022) The Effects of Co-Exposure to Extremes of Heat and Particulate Air Pollution on Mortality in California: Implications for Climate Change. *American Journal of Respiratory and Critical Care Medicine*, June 21, 2022, rccm.202204-0657OC. https://doi.org/10.1164/rccm.202204-0657OC

16. **Silva, S. J.,** Keller, C. A, and Hardin, J. (2022) Using an Explainable Machine Learning Approach to Characterize Earth System Model Errors: Application of SHAP Analysis to Modeling Lightning Flash Occurrence. *JAMES*, 14, e2021MS002881. https://doi.org/10.1029/2021MS002881

15. Galmarini, S., Makar, P., Clifton, O. E., Hogrefe, C., Bash, J. O., Bellasio, R., Bianconi, R., Bieser, J., Butler, T., Ducker, J., Flemming, J., Hodzic, A., Holmes, C. D., Kioutsioukis, I., Kranenburg, R., Lupascu, A., Perez-Camanyo, J. L., Pleim, J., Ryu, Y.-H., San Jose, R., Schwede, D., **Silva, S. J.**, and Wolke, R. (2021) Technical note: AQMEII4 Activity 1: evaluation of wet and dry deposition schemes as an integral part of regional-scale air quality models. *Atmos. Chem. Phys.*, 21, 15663–15697, https://doi.org/10.5194/acp-21-15663-2021

14. **Silva, S. J.,** Ma, P.-L., Hardin, J. C., and Rothenberg, D. (2021) Physically Regularized Machine Learning Emulators of Aerosol Activation. *Geosci. Model Dev.* 14, no. 5 (May 28, 2021): 3067–77. https://doi.org/10.5194/gmd-14-3067-2021

13. **Silva, S. J.**, Burrows S. M., Evans M. J., and Halappanavar M. (2021) A Graph Theoretical Intercomparison of Atmospheric Chemical Mechanisms. *Geophys. Res. Lett.* 48, e2020GL090481. https://doi.org/10.1029/2020GL090481

12. **Silva, S. J.**, Ridley, D. A., and Heald, C. L. (2020). Exploring the constraints on simulated aerosol sources and transport across the North Atlantic with island-based sun photometers. *Earth and Space Science*, 7, e2020EA001392. https://doi.org/10.1029/2020EA001392

11. **Silva, S. J.**, Heald, C. L., and Guenther, A. B. (2020) Development of a Reduced Complexity Plant Canopy Physics Surrogate Model for use in Chemical Transport Models: A Case Study with GEOS-Chem v12.3.0, *Geosci. Model Dev*. 13, no. 6 (June 3, 2020): 2569–85. https://doi.org/10.5194/gmd-13-2569-2020

10.   Clifton, O. E., Fiore, A. M. , Massman, W. J., Baublitz, C. B., Coyle, M., Emberson, L., Fares, S., Farmer, D. K., Gentine, P., Gerosa, G., Guenther, A. B., Helmig, D., Lombardozzi, D. L., Munger, J. W., Patton, E. G., Pusede, S. E., Schwede, D. B., **Silva, S. J.**, Sörgel, M., Steiner, A. L., and Tai, A. P. K., (2020) Dry deposition of ozone over land: processes, measurements and modeling, *Reviews of Geophysics*, 58, e2019RG000670. https://doi.org/10.1029/2019RG000670

9.   Wong, A. Y. H., Geddes, J.A., Tai, A.P.K., and **Silva, S. J.** (2019) Importance of Dry Deposition Parameterization Choice in Global Simulations of Surface Ozone, *Atmos. Chem. Phys.*, 19, no. 22: 14365–85. https://doi.org/10.5194/acp-19-14365-2019.

8.   **Silva, S. J.**, Heald, C. L., Ravela, S., Mammarella, I., and Munger, J.W. (2019). A Deep Learning Parameterization for Ozone Dry Deposition Velocities. *Geophys. Res. Lett*, 46. https://doi.org/ 10.1029/2018GL081049

7.   **Silva, S. J.**, Heald, C. L., and Li, M. (2018). Space-Based Constraints on Terrestrial Glyoxal Production. *JGR: Atmospheres*, 123, 13, 583–13, 594. https://doi.org/10.1029/2018JD029311

6.   **Silva, S. J.**, Barbieri, L. K., and Thomer, A. K. (2018). Observing Vegetation Phenology through Social Media. *PLOS ONE* 13, no. 5 (May 10, 2018): e0197325. doi:10.1371/journal.pone.0197325.

5.   **Silva, S. J.** and Heald, C. L. (2018). Investigating dry deposition of ozone to vegetation. *JGR: Atmospheres*, 123, 559–573. doi:10.1002/2017JD027278

4.   **Silva, S. J.** and Arellano, A. F. (2017). Characterizing Regional-Scale Combustion Using Satellite Retrievals of CO, NO_2 and CO_2. *Remote Sensing* 2017, 9, 744, doi:10.3390/rs9070744

3.   **Silva, S. J.**, Heald, C. L., Geddes, J. A., Austin, K. G., Kasibhatla, P. S., and Marlier, M. E. (2016). Impacts of current and projected oil palm plantation expansion on air quality over Southeast Asia, *Atmos. Chem. Phys.*, 16, 10621-10635, doi:10.5194/acp-16-10621- 2016

2.   Geddes J.A., Heald C. L., **Silva, S. J.**, and Martin R. V. (2016). Land cover change impacts on atmospheric chemistry: simulating large-scale tree mortality in the United States. *Atmos. Chem. Phys.* 16, 2323-2340, doi:10.5194/acp-16-2323-2016

1.   **Silva, S. J.**, Arellano, A. F., and Worden, H. (2013). Toward anthropogenic combustion emission constraints from space-based analysis of urban CO_2/CO sensitivity, *Geophys. Res. Lett.*, 40, doi:10.1002/grl.50954.

PRESENTATIONS

Invited Seminars

2023   University of Arizona, HAS/Statistics & Data Sciences
2023   University of Virginia, School of Data Science
2023   Columbia University, LEAP NSF STC Journal Series
2022   Harvard University, Atmospheric & Environmental Chemistry Seminar Series
2022   University of Illinois Urbana-Champaign, Department of Atmospheric Sciences

2022 University of Southern California, Information Sciences Institute
2022 University of Southern California, Department of Civil & Environmental Engineering
2022 CityAir/University of Arizona, Department of Applied Mathematics
2021 City University of Hong Kong, School of Energy & Environment
2021 University of Southern California, Department of Earth Sciences
2021 University of Michigan, Department of Climate & Space Sciences and Engineering
2021 University of Arizona, Department of Chemical & Environmental Engineering
2021 Yale University, Department of Chemical & Environmental Engineering
2021 NASA Global Modeling and Assimilation Office
2020 University of Virginia, Department of Environmental Sciences
2020 Purdue University, Department of Earth, Atmospheric, & Planetary Sciences
2020 University of Arizona, Department of Hydrology & Atmospheric Sciences
2020 Reed College, Department of Chemistry
2019 NASA Langley Research Center
2019 Pacific Northwest National Laboratory

Conference Presentations († = Invited)

2023 Atmospheric Chemistry GRC, Newry, ME, *Poster Presentation*
2023 AMS Annual Meeting, Virtual, *Oral Presentation*
2022 AGU Fall Meeting, Virtual, *Oral Presentation*
2022 Atmospheric Chemical Mechanisms Conference, Davis, CA, *Poster Presentation*
2022 ACTIVATE Science Team Meeting, Tucson, AZ, *Oral Presentation*
2021 AGU Fall Meeting, Virtual, *Poster Presentation*
2021† International Aerosol Modeling Algorithms Conference, Virtual, *Oral Presentation*
2021 16th IGAC Science Conference, Virtual, *Poster Presentation*
2021 PNNL TechFest, Virtual, *Oral Presentation*
2021 Physics Informed Machine Learning Workshop@PNNL, Virtual, *Oral Presentation*
2020 AGU Fall Meeting, Virtual, *Poster Presentation*
2020 Atmospheric Chemical Mechanisms Conference, Virtual, *Oral Presentation*
2020† MIT Earth Systems and Signals Group, Virtual, *Oral Presentation*
2020 DOE ESMD/E3SM PI Meeting, Virtual, *Oral Presentation*
2020 DOE ARM/ASR Machine Learning Workshop, Virtual, *Oral Presentation*
2020 PNNL POGO Research Symposium, Richland, WA, *Poster Presentation*
2019 AGU Fall Meeting, San Francisco, CA, *Poster Presentation*
2019† MAC-MAQ, UC Davis, Davis, CA, *Oral Presentation*
2019 Atmospheric Chemistry GRC, Newry, ME, *Poster Presentation*
2019 Atmospheric Chemistry Colloquium for Emerging Senior Scientists (ACCESS) XV, Brookhaven National Laboratory, Upton, NY, *Oral Presentation*
2019 9th International GEOS-Chem Conference, Cambridge, MA, *Poster Presentation*
2018 AGU Fall Meeting, Washington DC, *Poster Presentation*
2018 iCACGP/IGAC, Takamatsu, Japan, *Poster Presentation*
2017 Ozone Dry Deposition Workshop, LDEO, Palisades, NY, *Oral Presentation*
2017 8th International GEOS-Chem Conference, Cambridge, MA, *Oral Presentation*
2016 AGU Fall Meeting, San Francisco, CA., *Poster Presentation*
2015 AGU Fall Meeting, San Francisco, CA., *Poster Presentation*
2015 7th International GEOS-Chem Meeting, Cambridge, MA., *Poster Presentation*

2014 IWGGMS 10, Noordwijk, The Netherlands, *Oral Presentation*
2013 IWGGMS 9, Yokohama, Japan, *Oral Presentation*
2013 AGU Fall Meeting, San Francisco, CA., *Poster Presentation*
2012 AGU Fall Meeting, San Francisco, CA., *Oral Presentation*
2012 Honors College Research Symposium, University of Arizona, *Poster Presentation*

AWARDS & HONORS

NASA Group Achievement Award for ACTIVATE mission	2023
USC Wrigley Institute Faculty Innovation Award	2022
Linus Pauling Distinguished Postdoctoral Fellowship	2019-2021
Best Doctoral Thesis: MIT Civil and Environmental Engineering	2020
Invited Participant: Atmospheric Chemistry Colloquium for Emerging Senior Scientists (ACCESS) XV	2019
NASA Earth and Space Sciences Fellowship	2016-2019
John Hennessy OGE Fellowship (MIT)	2018
Earth Science Information Partners Seed Grant	2017
Earth Science Information Partners (ESIP) Student Fellow	2016
Poster Award – 7th International GEOS-Chem Meeting	2015
University of Arizona College of Science Graduate Student Award for Research	2014
University of Arizona College of Science Galileo Circle Scholarship	2013
NASA SpaceGrant (University of Arizona)	2011
University of Arizona Honors Research Grant	2011
University of Arizona Wildcat Excellence Award	2009

INSTITUTIONAL SERVICE

University of Southern California:

Earth Sciences Graduate Admission Committee	2021-present
Earth Sciences Computer Committee	2022-present
Earth Sciences Merit Review Committee	2022-present
Faculty Advisor for Sigma Gamma Epsilon	2023-present
Earth Science Undergraduate Honor Society	
Earth Sciences Faculty Search Committee	2023-2024
Civil and Environmental Engineering Faculty Search Committee	2022-2023

Pacific Northwest National Laboratory:

Earth and Biological Science Directorate Diversity and Inclusion Council	2020-2021
Earth and Biological Science Directorate Strategy Workshops on Data Driven Discovery using AI/ML	2021
Reading Groups Organized:	
Machine Learning for Earth Science	2021
Young Scientist Paper Discussion Group	2020
Staff Interview Panelist:	
Atmospheric Science and Global Change Division Director	2021
Earth System Modeling Group Lead	2021
Machine Learning and Climate Science Staff Scientist	2021

PROFESSIONAL ACTIVITIES

UCAR University Representative – USC   2023-present

California Air Resources Board: Research Screening Committee   2023-Present

Society for Advancement of Chicanos/Hispanics and Native Americans in Science
  Distinguished Awards Task Force   2022-2023
  National Diversity in Stem Conference – Applicant Review   2022-2023
  Reviewed: Travel Scholarship, Research Presentations, & Session Proposals

Steering Group: Air Quality Model Evaluation International Initiative 4   2017-2022

DOE Artificial Intelligence for Earth System Predictability (AI4ESP)
  Workshop Session Co-Chair – Aerosols and Clouds   2021

Careers Panelist: El Día del Agua y la Atmósfera   2021
  Dept. of Hydrology and Atmospheric Sciences, The University of Arizona

National Science Olympiad: Meteorology/Climate Rules Review   2021

Proposal Reviewer: NSF, NOAA, DOE, NASA, DOE/PNNL Visiting Faculty Program, Climate Change A.I. Innovation Grants, Israeli Science Foundation (ISF), US Army Corps of Engineers

Journal Referee: ACS Earth and Space Chemistry, Aerosol Science & Technology, Atmosphere, Atmospheric Chemistry and Physics, Environmental Science & Technology, Geophysical Research Letters, Geoscientific Model Development, Global Biogeochemical Cycles, Journal of Advances in Model Earth Systems, Journal of Applied Meteorology and Climatology, Journal of Geophysical Research: Atmospheres, Journal of Open Source Software, Science Advances

Academic Conference Activities
International Aerosol Modeling Algorithms (IAMA): Technical Program Committee   2023
ICLR Climate Change AI Workshop Program Committee: Tackling Climate Change   2023
  with Machine Learning
NeurIPS Climate Change AI Workshop paper review   2022-2023

Conference Sessions Organized
AMS Annual Meeting: A.I. in Weather and Climate Modeling: Bridging the Gap
  Between Theoretical Advances and Production Use   2022
AGU Fall Meeting: A.I. in Weather and Climate Modeling: From Theoretical
  Advances to Operational Use   2021
AMS Annual Meeting: Machine-Learning Applications for Atmospheric Chemistry   2021
AGU Fall Meeting: Biosphere-Atmosphere Interactions and Atmospheric Chemistry   2020
AGU Fall Meeting: Biosphere-Atmosphere Interactions and Atmospheric Chemistry   2019
9th International GEOS-Chem Conference: Machine Learning and GEOS-Chem   2019

Professional Organization Membership
  American Geophysical Union
  American Meteorological Society
  Society of Hispanic Professional Engineers
  Society for Advancement of Chicanos/Hispanics and Native Americans in Science

ADVISING & MENTORSHIP

University of Southern California:

PhD Advising

Hannah Schlaerth, Civil and Environmental Engineering	2022-2023
Kayley Butler, Civil and Environmental Engineering	2022-present
Obin Sturm, Earth Sciences	2022-present
Brian Schlaff, Earth Sciences	2023-present
Daniel Getter, Earth Sciences	2023-present

Master's Student Advising

Sahithi Nandyala, Applied Data Science	2022-present

Undergraduate Researchers

William Yik, Computer Science and Mathematics*	2022-present
*Undergraduate at Harvey Mudd College	
Kyla Gordon*, Environmental Studies and Earth Sciences	2022-present
*Awarded USC URAP funding	
Katherine Mottola*, Earth Sciences	2023-present
*Sp 2023 Direct Research Units, F 2023 Thesis Units	
Emy Li, Applied Mathematics and Economics	2023-present
Anthony Guzman*, Earth Sciences and Data Science	2023-present
*Awarded USC ESRAP funding	
Lucas Valliere, Earth Sciences and Data Science	2023-present
Kaylena Pham, Civil and Environmental Engineering	2023-present

PhD Thesis Committee Member

Jason Ezra Williams, Physics	2023
Joseph Ko, Civil and Environmental Engineering	2022
Yun Li, Civil and Environmental Engineering	2022
Stepp Mayes, Civil and Environmental Engineering	2023

PhD Exam Committee Member

Diego Aguilera, Civil and Environmental Engineering	2022
Screening Exam	
Joseph Ko, Civil and Environmental Engineering	2022
Qualifying Exam	
Vahid Farahani, Civil and Environmental Engineering	2022
Qualifying Exam	
Alexander James, Earth Sciences	2022
Qualifying Exam	
McKenna Peplinski, Civil and Environmental Engineering	2022
Qualifying Exam	

Pacific Northwest National Laboratory:

Student Mentor: DOE Computational Science Graduate Fellowship	2021
Earth Science Mentor Match: Mentor	2020

Massachusetts Institute of Technology:

Undergraduate Research Mentor	2019

TEACHING

GESM 150 – Pollution and the Planet   Fall 2023

GEOL/PM 599 – Data Science Methods for Climate Change and Health Research
    Co-taught with faculty in the Keck School of Medicine   Sp 2023

GEOL 515 – Introduction to Atmospheric Science   Sp 2023

USC Sustainability Across the Curriculum Initiative Faculty Development
    Workshop: Invited Speaker & Participant   2023

USC Sustainability Across the Curriculum Initiative Teaching Grant
    $10,000 in funds to support course development   2023

National Association of Geoscience Teachers Workshop for Early Career
    Geoscience Faculty: Participant   2022

Invited Guest Lecture: The University of Arizona   2020, 2022
    Course: Data Assimilation

PNNL Teacher-Scientist Program Development   2021

Teaching Certificate: MIT Teaching and Learning Laboratory   2018

MIT edX: Curriculum Development   2016
    Developed randomized problem/solution sets for a large (> 1000 student)
    Massive Open Online Course

Teaching Assistant: Remote Sensing   2013
    The University of Arizona, for senior undergraduate and early graduate students