Kara D. Lamb

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Columbia University
Learning the Earth with Artificial Intelligence and Physics (LEAP) Center
Department of Earth and Environmental Engineering
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RESEARCH INTERESTS

Atmospheric Chemistry and Physics
Aerosol and Cloud Physics
Wildfire Air Quality & Climate Effects
Scientific Machine Learning
Physics-Informed Machine Learning

In situ Atmospheric Observations
Anthropogenic Climate Impacts
Data-driven Parameterizations
Reduced Order Modeling

ACADEMIC APPOINTMENTS

Associate Research Scientist   **Mar. 2020 — current**
Columbia University   New York, NY

     Mentor: Pierre Gentine

Research Scientist II   **Jan 2019 — Feb. 2020**
Research Scientist I   **Jan. 2016 — Jan. 2019**
Cooperative Institute for Research in the Environmental Sciences/NOAA Chemical Sciences Division   Boulder, CO

     Mentor: Joshua P. Schwarz

EDUCATION & TRAINING

Ph.D., **University of Chicago,** Physics   **2015**
    Advisor: Elisabeth J. Moyer
    Thesis: In Situ Isotopic Water as a Tracer of Cold Cloud Microphysics

M.S., **University of Chicago,** Physics   **2008**
    Advisor: Cheng Chin
    Topic: Atomic, Molecular, and Optical Physics

B.S., **University of Illinois Urbana-Champaign,** Physics   **2007**
    Summa Cum Laude, with highest distinction in the curriculuum

AWARDS & HONORS

NASA Group Achievement Award, AToM Campaign 2019
Finalist, Flame Challenge, "What is Climate?", Alan Alda Center for Science Communication 2018
NASA Group Achievement Award, KORUS-AQ Campaign 2017
NOAA Earth System Research Laboratory Gold Star Award for Scientific Outreach 2016
Winstein Travel Award, University of Chicago, Department of Physics 2014
NSF Graduate Research Fellowship 2009
National Defense Science and Engineering Graduate (NDSEG) Fellowship 2009
Robert G. Sachs Summer Fellowship, University of Chicago, Department of Physics 2007
Maria Goeppert-Mayer Fellowship, University of Chicago, Department of Physics 2007
Outstanding Senior Award, UIUC Campus Honors Program 2007
Laura B. Eisenstein Award, UIUC Department of Physics 2007
Commonwealth Edison/Beryl Bristow Award, UIUC Department of Physics 2005

GRANTS

Department of Energy, Atmospheric Systems Research Program (**PI: Lamb**) .... Aug. 2022 - July 2025
Internal RFP, NSF Center for Learning the Earth with Artificial Intelligence and Physics (**PI: Lamb**) .... Jan. 2025 - Jan. 2026
Internal RFP, NSF Center for Learning the Earth with Artificial Intelligence and Physics (**PI: Lamb**) .... Jan. 2023 - Jan. 2025
Zegar Family Foundation Grant (**Co-PI's: Lamb & Gentine**) .... Aug. 2023 - July 2026
NASA Digital Twins for Climate Science: Challenges and Potential Paths Forward (**PI: Schmidt**) .... Sept. 2023 - Aug. 2026

MANUSCRIPTS IN PREPARATION

[1] **K.D. Lamb**, P. Gentine. Exploring phase transitions and dynamical processes in tropical moist convection using machine learning. In prep.

[2] J. Will, A. Jenney, **K.D. Lamb**, M.S. Pritchard, C. Kaul, P-L Ma, K. Pressel, J. Shpund, M van Lier Walqui, S. Mandt. Understanding and Visualizing Droplet Distributions in Simulations of Shallow Clouds with Variational Autoencoders. In prep.

[3] **K.D. Lamb**, J. Harrington, J. Mikhaeil, et al. Reducing structural uncertainty in depositional ice growth models using neural ordinary differential equations. In prep.

[4] J. Mikhaeil, **K.D. Lamb**[†], J. Harrington, M. van Lier Walqui, et al. ([†] as mentor). Re-evaluating cloud chamber constraints on depositional ice growth in cirrus clouds– Part 2: A Bayesian workflow for cloud chamber observations. In prep.

PUBLICATIONS

[1] **K.D. Lamb**, M. van Lier Walqui, S. Santos, H. Morrison. Reduced order modeling for linearized representations of microphysical process rates. Under review, *Journal of Advances in Modeling Earth Systems*. [Preprint].

[2] **K.D. Lamb**, P. Gentine. Zero-Shot Learning of Aerosol Optical Properties Using Graph Neural Networks. *Scientific Reports*, 13, 18777, 2023.

[3] S. Shamekh, **K.D. Lamb**, Y. Huang, P. Gentine. Implicit Learning of Convective Organization Explains Precipitation Stochasticity. *Proceedings of the National Academy of Sciences*, 120 (20) e2216158120, 2023.

[4] J.M Katich, E. Apel, I. Bourgeois, C. Brock, T.P. Bui, P. Campuzano-Jost, R. Commane, B. Daube, M. Dollner, M. Fromm, K.D. Froyd, A.J. Hills, R.S. Hornbrook, J. Jimenez, A. Kupc, **K.D. Lamb**, K. McKain, F. Moore, D.M. Murphy, B.A. Nault, J. Peischl, D.A. Peterson, E.A. Ray, K.H. Rosenlof, T. Ryerson, G.P. Schill, J.C. Schroder, B. Weinzierl, C. Thompson, C.J. Williamson, S. Wofsy, P. Yu, J.P. Schwarz. Pyrocumulonimbus significantly impact average stratospheric aerosol composition. *Science*, 379, 6634, 2023.

[5] **K.D. Lamb**, J. Harrington, B.W. Clouser, E.J. Moyer, L. Sarkozy, V. Ebert, O. Möhler, and H. Saathoff. Re-evaluating cloud chamber constraints on depositional ice growth in cirrus clouds– Part 1: Model description and sensitivity tests. *Atmos. Chem. Phys.*, 23, 6043-6064, 2023.

[6] A. E. Perring, B. Mediavilla, D. Wilbanks, J. Churnside, R. Marchbanks, **K.D. Lamb**, R-S. Gao. Airborne Bioaerosol Observations Imply a Strong Terrestrial Source in the Summertime Arctic. *Journal of Geophysical Research: Atmospheres*, doi: 10.1029/2023JD039165, 2023.

[7] M. Liu, H. Matsui, D.S. Hamilton, **K.D. Lamb**, S.D. Rathod, J.P. Schwarz, N.M. Mahowald. The under-appreciated role of anthropogenic sources in atmospheric soluble iron flux to the Southern Ocean. *npj Climate and Atmospheric Science*, 5, 28, 2022.

[8] C.C. Womack, K.M. Manfred, N.L. Wagner, G. Adler, A. Franchin, **K.D. Lamb**, A.M. Middlebrook, J.P. Schwarz, C.A. Brock, S.S. Brown, R.A. Washenfelder. Complex refractive indices in the ultraviolet and visible spectral region for highly absorbing non-spherical biomass burning aerosol. *Atmospheric Chemistry and Physics*, 21, 7235?7252, 2021.

[9] Y. Choi, Y.S. Ghim, M. Segal-Rozenhaimer, J. Redemann, S.E. LeBlanc, Y. Lee, T. Lee, T. Park, J.P. Schwarz, **K.D. Lamb**, C.J. Flynn, R.J. Johnson, and A.E. Perring. Temporal and spatial variations of aerosol optical properties over the Korean peninsula during KORUS-AQ. *Atmospheric Environment*, 118301, ISSN 1352-2310, 2021.

[10] **K.D. Lamb**, H. Matsui, J. Katich, A.P. Perring, J.R. Spackman, B. Weinzerl, M. Dollner, and J.P.Schwarz. Global-scale constraints on light-absorbing anthropogenic iron oxide aerosols. *npj Climate and Atmospheric Science* 4, 15, 2021.

[11] C. Cho, J.P. Schwarz, A.E. Perring, **K.D. Lamb**, Y. Kondo, J.U. Park, D.H. Park, K. Shim, J.S. Park, R.J. Park, M. Lee, C.K. Song, S.W. Kim. Light-absorption enhancement of black carbon in the Asian outflow: Airborne SP2 observations during KORUS-AQ. *Science of the Total Environment*, Jun 15, 2021.

[12] C.E. Jordan, J.H.Crawford, A.J.Beyersdorf, T.F.Eck, H.S.Halliday, B.A. Nault, L.-S. Chang, R. Park,G. Lee,H. Kim, S. Cho, H.J.Shin, J.H.Lee, J. Jung, D.S.Kim, M. Lee, T. Lee, A. Whitehall, J. Szykman, M.K.Schueneman, P. Campuzano-Jost, J.L.Jimenez, J.P.DiGangi, G.S.Diskin, B.E.Anderson, R.H.Moore, L.D.Ziemba, M.A.Fenn, J.W.Hair, R.E.Kuehn, R.E.Holz, G. Chen, K. Travis, M. Shook, D.A.Peterson, **K.D.Lamb**, J.P.Schwarz. Investigation of Factors Controlling PM2.5 Variability across the South Korean peninsula during KORUS-AQ. *Elementa: Science of the Anthropocene* 8, 2020.

[13] L. Sarkozy, B. Clouser, **K.D. Lamb**, E.J. Stutz, H. Saathoff, O. Möhler, S. Wagner, V. Ebert, .B. Kühnreich, and E. Moyer. The Lab Chicago Water Isotope Spectrometer: a tunable diode laser spectrometer for chamber-based measurements of water vapor isotopic evolution during cirrus formation. *Review of Scientific Instruments*, 91, 4, 2020.

[14] P.E.Saide, M. Gao, Z. Lu, D. Goldberg, D.G.Streets, J.-H.Woo, A. Beyersdorf, C. Corr, K.L. Thornhill, B. Anderson, J.W. Hair, A.R. Nehrir, G.S. Diskin, J.L. Jimenez, B.A. Nault, P. Campuzano-Jost, J. Dibb, E. Heim, **K.D. Lamb**, J.P. Schwarz, A.E. Perring, J. Kim, M. Choi, B. Holben, G. Pfister, A. Hodzic, G.R. Carmichael, L. Emmons, J.H. Crawford. Understanding and improving model representation of aerosol optical properties for a Chinese haze event measured during KORUS-AQ. *Atmospheric Chemistry and Physics Discussion*, 20, 11, 6455-6478, 2020.

[15] B. Clouser, **K.D. Lamb**, L. Sarkozy, A. Nisenoff, J. Habig, V. Ebert, H. Saathoff, O. Möhler, and E. Moyer. No anomalous supersaturation in ultracold cirrus laboratory experiments. *Atmospheric Chemistry and Physics*, 20, 1089-1103, 2020.

[16] **K.D. Lamb**. Classification of iron oxide aerosols with a single particle soot photometer using supervised machine learning. *Atmospheric Measurement Techniques*, 12, 3885-3906, 2019.

[17] G. Adler, N. Wagner, **K.D. Lamb**, K. Manfred, J. Schwarz, A. Franchin, A. Middlebrook, R. Washenfelder, C. Womak, R. Yokelson, and D. Murphy. Evidence in biomass burning smoke for light-absorbing aerosol with properties intermediate between black and brown carbon. *Aerosol Science and Technology*, p. 976-989, 2019.

[18] H. Li, **K.D. Lamb**, J. Schwarz, V. Selimovic, R. Yokelson, G. McMeeking, and A. May. Inter-comparison of black carbon measurement methods for simulated open biomass burning emissions. *Atmospheric Environment*, Vol. 206, p.156-169, 2019.

[19] B. Nault, P. Campuzano-Jost, D. Day, J. Schroder, B. Anderson, A. Beyersdorf, D. Blake, W. Brune, Y. Choi, C. Corr, J. de Gouw, J. Dibb, J. DiGangi, G. Diskin, A. Fried, L.G. Huey, M. Kim, C. Knote, **K.D. Lamb**, T. Lee, T. Park, S. Pusede, E. Scheuer, K. Thornhill, J.-H. Woo, and J. Jimenez. Secondary organic aerosol production from local emissions dominates the organic aerosol budget over Seoul, South Korea, during KORUS-AQ. *Atmospheric Chemistry and Physics*, 18(24):17769-17800, 2018.

[20] **K.D. Lamb**, A. Perring, B. Samset, D. Peterson, S. Davis, B. Anderson,A. Beyersdorf, D. Blake, P. Campuzano-Jost, C. Corr, G. Diskin, Y. Kondo, N. Moteki, B. Nault, J. Oh, M. Park, S. Pudede, I. Simpson, K. Thornhill, A. Wisthaler, and J. Schwarz. Estimating Source Region Influences on Black Carbon Abundance, Microphysics, and Radiative Effect Observed Over South Korea. *Journal of Geophysical Research: Atmospheres*, 123(23): 13527-13548, 2018.

[21] K.M. Manfred, R.A. Washenfelder, N.L. Wagner, G. Adler, F. Erdesz, C.C. Womack, **K.D. Lamb**, J.P. Schwarz, A. Franchin, and V. Selimovic. Investigating biomass burning aerosol morphology using a laser imaging nephelometer. *Atmospheric Chemistry and Physics*, 18(3):1879–1894, 2018.

[22] **K.D. Lamb**, B.W. Clouser, M. Bolot, L. Sarkozy, V. Ebert, H. Saathoff, O. Möhler, and E.J. Moyer. Laboratory measurements of HDO/H2O isotopic fractionation during ice deposition in simulated cirrus clouds. *Proceedings of the National Academy of Sciences*, 114(22):5612–5617, 2017.

[23] **K.D. Lamb**, C.C. Gerry, Q. Su, and R. Grobe. Unitary and nonunitary approaches in quantum field theory. *Physical Review A*, 75(1):013425, 2007.

[24] **K.D. Lamb**, S. Menon, Q. Su, and R. Grobe. Non-perturbative retrieval of the scattering strength in one-dimensional media. *Physical Review E*, 74(6):061903, 2006.

MACHINE LEARNING WORKSHOP PAPERS

[1] K. Liao, J. Buch, **K.D. Lamb**[†], P. Gentine ([†] as mentor). Simulating the Air Quality Impacts of Prescribed Fires Using a Graph Neural Network-Based PM2.5 Forecasting System. In *Tackling Climate Change with AI Workshop* (Spotlight Talk). 2023 Conference on Neural Information Processing Systems.

[2] J. Will, A. Jenney, **K.D. Lamb**, M.S. Pritchard, C. Kaul, P-L Ma, K. Pressel, J. Shpund, M van Lier Walqui, S. Mandt. Understanding and Visualizing Droplet Distributions in Simulations of Shallow Clouds with Variational Autoencoders. In *Machine Learning and the Physical Sciences Workshop* 2023 Conference on Neural Information Processing Systems.

[3] E. Diaz Salas-Porras, K. Tazi, A. Braude, D. Okoh, **K.D. Lamb**[†], D. Watson-Parris, P. Harder, N. Meinert ([†] as mentor). "Identifying the origins of Pyrocumulonimbus (PyroCb) events using an Invariance Causal Prediction framework." In *Workshop on Causality for Real-world Impact*. 2022 Conference on Neural Information Processing Systems.

[4] K. Tazi, E. Diaz Salas-Porras, A. Braude, D. Okoh, **K.D. Lamb**[†], D. Watson-Parris, P. Harder, N. Meinert ([†] as mentor). "Pyrocast: a Machine Learning Pipeline to Forecast Pyrocumulonimbus (PyroCb) clouds." In *Tackling Climate Change with AI Workshop*. 2022 Conference on Neural Information Processing Systems.

[5] **K.D. Lamb**. "A deep learning approach for classifying black carbon aerosol morphology." In *Tackling Climate Change with AI Workshop* 2019 Conference on Neural Information Processing Systems, Vancouver, BC, Dec. 2019.

[6] **K.D. Lamb***, G. Malhotra*, A. Vlontzos*, E. Wagstaff*, A.G. Baydin, A. Bhiwandiwalla, Y. Gal, A. Kalaitzis, A. Reina and A. Bhatt (*equal contributions). "Prediction of GNSS Phase Scintillations: A Machine Learning Approach." In *Machine Learning and the Physical Sciences Workshop* 2019 Conference on Neural Information Processing Systems, Vancouver, BC, Dec. 2019.

[7] **K.D. Lamb***, G. Malhotra*, A. Vlontzos*, E. Wagstaff*, A.G. Baydin, A. Bhiwandiwalla, Y. Gal, A. Kalaitzis, A. Reina and A. Bhatt (*equal contributions) "Correlation of Auroral Dynamics and GNSS Scintillation with an Auto-encoder." In *Machine Learning and the Physical Sciences Workshop* 2019 Conference on Neural Information Processing Systems, Vancouver, BC, Dec. 2019.

ORAL PRESENTATIONS

[1] **K.D. Lamb**, P. Gentine. "Zero-Shot Learning of Aerosol Optical Properties with Graph Neural Networks." Invited Talk, EGU General Assembly 2024. Vienna, Austria, April 2024.

[2] **K.D. Lamb**, J. Mikhaeil, J.Y. Harrington. "Learning Constraints on Depositional Ice Growth Models from Cloud Chamber Experiments with Neural Ordinary Differential Equations." AMS Annual Meeting. Baltimore, MD, January 2024.

[3] **K.D. Lamb**, P. Gentine. "Exploring Phase Transitions and Dynamical Processes in Tropical Moist Convection using Machine Learning." AMS Annual Meeting. Baltimore, MD, January 2024.

[4] **K.D. Lamb**, P. Gentine. "Exploring Phase Transitions and Dynamical Processes in Tropical Moist Convection using Machine Learning." Invited Talk, AGU Fall Meeting 2023. San Francisco, CA, December 2023.

[5] **K.D. Lamb**, M. van Lier Walqui, S. Santos, H. Morrison. "Reduced Order Modeling to Reduce Structural Uncertainty in Representing Cloud Microphysical Process Rates." AGU Fall Meeting 2023. San Francisco, CA, December 2023.

[6] **K.D. Lamb**, M. van Lier Walqui, S. Santos, H. Morrison. "Reducing Structural Uncertainty in Cloud Microphysical Models." Invited Talk, in SIAM Mini-Symposium: Understanding cloud physics using stochastic, dynamical, and data-driven modeling. Amsterdam, Netherlands, March 2023.

[7] **K.D. Lamb**, M. van Lier Walqui, S. Santos, H. Morrison. "Unsupervised Learning of Cloud Microphysical Process Rates." In 2023 Joint Atmospheric Radiation Measurement (ARM) User Facility/Atmospheric System Research (ASR) Principal Investigators Meeting. Rockville, MD, August 2023.

[8] **K.D. Lamb**, P. Gentine. "Zero-Shot Learning of Aerosol Optical Properties with Graph Neural Networks." In NOAA AI Workshop 2021. Virtual, Sept. 2021.

[9] **K.D. Lamb**, G. Malhotra, A. Vlontzos, E. Wagstaff, A.G. Baydin, A. Bhiwandiwalla, Y. Gal, A. Kalaitzis, A. Reina and A. Bhatt. "Correlation of Auroral Dynamics and GNSS Scintillation with an Autoencoder." In *2nd AI and Data Science Workshop for Earth and Space Sciences*. NASA JPL (Virtual), Feb. 2021.

[10] **K.D. Lamb**. "Classification of iron oxide aerosols with a single particle soot photometer using supervised machine learning." In FASCINATE Conference on the Frontiers of Atmospheric Science and Chemistry. Boulder, CO, Sept. 2019.

[11] **K.D. Lamb**, Perring, Katich, J., Thatcher, M., Froyd, K., A.E., Spackman, R., Weinzerl, B., and Schwarz, J.P. "Constraints on Anthropogenic Iron Oxide Aerosols on a Global Scale." In 15th AMS Conference on Atmospheric Radiation. Vancouver, BC, July 2018.

[12] **K.D. Lamb**, Perring, A.E., Ahn, J. and Schwarz, J.P. "HD-SP2 Measurements of Black Carbon Containing Aerosols in South Korea during KORUS-AQ." In AGU Fall Meeting Abstracts. San Francisco, CA, Dec. 2016.

[13] **K.D. Lamb**, Clouser, B., Sarkozy, L., Stutz, E., Wagner, E., Ebert, V., Kerstel, E., Saathoff, H., Möhler, O., and Moyer, E. "Implications of the IsoCloud campaigns at the AIDA Cloud Chamber for Ice Growth in Cold Cirrus." In 14th AMS Conference on Cloud Physics. Boston, MA, July, 2015. *Runner up, Outstanding student presenter.*

Poster Presentations

[1] **K.D. Lamb**, J. Mikhaeil, J. Harrington, M. van Lier Walqui. "Cloud chamber constraints on depositional ice growth models." AGU Fall Meeting 2023. San Francisco, CA, December 2023.

[2] **K.D. Lamb**, J. Ko, J. M. Mikhaeil, J. Harrington, M. van Lier Walqui. "Data-driven approaches to constraining depositional ice growth models in cirrus clouds." In 2023 Joint Atmospheric Radiation Measurement (ARM) User Facility/Atmospheric System Research (ASR) Principal Investigators Meeting. Aug. 2023.

[3] **K.D. Lamb**, M. van Lier Walqui, S. Santos, H. Morrison. "Unsupervised learning of microphysical process rates using generative machine learning models." In AGU Fall Meeting. Dec. 2022.

[4] **K.D. Lamb**, J. Harrington, M. van Lier Walqui. "Re-evaluating cloud chamber constraints on depositional ice growth in cirrus clouds." In 2022 Joint Atmospheric Radiation Measurement (ARM) User Facility/Atmospheric System Research (ASR) Principal Investigators Meeting. Oct. 2022.

[5] **K.D. Lamb**, P. Gentine "Zero Shot Learning of Aerosol Optical Properties with Graph Neural Networks. " In AGU Fall Meeting. 13-17 Dec., 2021.

[6] **K.D. Lamb**, P. Gentine "Predicting the Optical Properties of Arbitrarily Shaped Black Carbon Aerosols with Graph Neural Networks. " In EGU General Assembly 2021. Virtural, 19-30 Apr., 2021.

[7] **K.D. Lamb**, Perring, A.E., Nault, B., Campuzano-Jost, P., Jimenez, J-L., Weinheimer, A., Blake, D., Anderson, B., and Schwarz, J.P. "Strong black carbon absorption enhancement attributed to secondary organic aerosol formation in Seoul." In Cooperative Institute for Research in the Environmental Sciences Rendezvous 2019. Boulder, CO, May 2019.

[8] **K.D. Lamb**, Harrington, J.Y., Clouser, B., Ebert, V., Möhler, O., Saathoff, H. and Moyer, E.J. "Do Surface Kinetics Play a Role in Depositional Ice Growth in Cirrus Clouds?" In AGU Fall Meeting Abstracts. Washington, D.C., Dec. 2018.

[9] **K.D. Lamb**, Perring, A.E., Beyersdorf, A., Anderson, B., Flynn, C., Segal-Rozenhaimer, M., Redemann, J., Samset, B., Holben, B., and Schwarz, J.P. "Black Carbon's Contribution to Aerosol Absorption Optical Depth in South Korea." In NOAA ESRL Global Monitoring Annual Conference. Boulder, CO, May 2018.

[10] **K.D. Lamb**, Perring, A.E., Beyersdorf, A.J., Anderson, B.E., Segal-Rosenhaimer, M., Redemann, J., Holben, B.N. and Schwarz, J.P. "Black Carbon's Contribution to Aerosol Absorption Optical Depth in South Korea." In AGU Fall Meeting Abstracts. New Orleans, LA, Dec. 2017.

[11] **K.D. Lamb**, McMeeking, G., Li, H., May, A., and Schwarz, J.P. "Volatility of materials internally mixed with black carbon from biomass burning." In NOAA ESRL Global Monitoring Annual Conference. Boulder, CO, May 2017.

[12] **K.D. Lamb**, Perring, A.E., and Schwarz, J.P. "Measurements of black carbon containing aerosols in South Korea during KORUS-AQ." In International Global Atmospheric Chemistry Project 2016 Science Conference. Breckenridge, CO, Sept. 2016.

[13] **K.D. Lamb**, Clouser, B., Sarkozy, L., Wagner, S., Ebert, V., Kerstel, E., Saathoff, H., Möhler, O. and Moyer, E. "Implications of the ISOCLOUD campaigns at the AIDA Cloud Chamber for ice growth in cold cirrus." In EGU General Assembly Conference Abstracts (Vol. 17). Vienna, Austria, April 2015.

[14] **K.D. Lamb**, Clouser, B., Sarkozy, L., Stutz, E., Kühnreich, B., Landsberg, J., Habig, J., Hiranuma, N., Wagner, S., Ebert, V., Kerstel, E., Möhler, O., Saathoff, H., and Moyer, E. "Investigations into Anomalous Supersaturation in Cold Cirrus at the AIDA Cloud Chamber during the ISOCLOUD Campaigns." In AGU Fall Meeting Abstracts. San Francisco, CA, Dec. 2013.

[15] **K.D. Lamb**, Clouser, B., Sarkozy, L., Stutz, E., Kühnreich, B., Landsberg, J., Habig, J., Hiranuma, N., Wagner, S., Ebert, V. and Kerstel, E., Möhler, O., Saathoff, H., and Moyer, E. "Direct Measurements of Isotopic Fractionation Factors of Water Vapor over Ice for Temperatures Below 235 K." In Goldschmidt Conference 2013. Florence, Italy, Aug. 2013.

[16] **K.D. Lamb**, Aho, S., Bolot, M., Wienhold, F., Peter, T., Legras, B. and Moyer, E.J. "Isotopic signatures as a tracer of cold cloud microphysical processes." In AGU Fall Meeting Abstracts. San Francisco, CA, Dec. 2012.

[17] **K.D. Lamb**, Sharma, A., Scherpelz, P., Brickman Soderberg, K.A., Gemelke, N. and Chin, C. "Progress Towards Scalable Quantum Manipulation using Two Atomic Species in Independent Optical Lattices." In APS Prairie Section Meeting Abstracts. Nov. 2009.

[18] **K.D. Lamb**, Sharma, A., Scherpelz, P., Brickman Soderberg, K.A., Gemelke, N. and Chin, C. "Experimental Progress Towards Scalable Quantum Computing using Dual Atomic Species in Independent Optical Lattices." In Midwest Cold Atom Workshop. Nov. 2008.

Seminars & Workshops

[1] Colloquium, Dept. of Meteorology, Pennsylvania State University, State College, PA, January 2024.

[2] Seminar, NASA GISS, New York, NY, October 2023.

[3] Seminar, Clima Group, California Institute of Technology, Pasadena, CA, September 2023.

[4] Seminar, Atmospheric Science Department, University of Illinois Urbana Champaign, Champaign, IL, September 2023.

[5] Earth Science Colloquium, Lamont-Doherty Earth Observatory. Palisades, NY, April 2023.

[6] Seminar, Department of Geophysics, Cambridge University. Cambridge, UK, September 2022.

[7] Seminar, Department of Atmospheric Sciences, University of Miami. Miami, FL, April 2022.

[8] Seminar, Department of Earth and Planetary Sciences, University of California, Berkeley. Berkeley, CA, April 2022.

[9] Seminar, Department of Earth, Atmospheric, and Planetary Sciences, Purdue University. West Lafayette, IN, March 2022.

[10] Seminar, Earth and Planetary Systems Science Group, University of Tokyo. Tokyo, Japan, Feb. 2017.

[11] Seminar, Aerosol Group, NOAA ESRL Chemical Sciences Division. Boulder, CO, Nov. 2015.

[12] Seminar, Commissiat à l'Énergie Atomique. Gif-sur-Yvette, France, April 2015.

[13] Workshop on Mathematical Modeling, Northeastern Illinois University. Chicago, IL, May 2015.

[14] Seminar for Metrology Group, Physicalisch-Technische Bundesanstalt. Braunchweig, Germany, April 2012.

Science Team Meeting Presentations

[1] **K.D. Lamb**, J. Ko, T. Eidhammer, H. Morrison, J.Y. Harrington, M.van Lier Walqui. "Machine Learning Enhanced Unified Ice Microphysics Scheme Development". CESM Atmospheric Working Group Meeting. Boulder, CO, Feb. 2024.

[2] **K.D. Lamb**, J. Ko, J. Mikhaeil, J.Y. Harrington, M.van Lier Walqui. "Reducing Structural Uncertainty in Ice Growth Models using Neural Ordinary Differential Equations". NSF LEAP STC Annual Meeting. New York, NY, Oct. 2023.

[3] **K.D. Lamb**, M.van Lier Walqui, J.Y. Harrington, H. Morrison, A. Gettelman. "Unification of Observations via Learning Algorithms for Robust Models of Ice Microphysics". NSF LEAP STC Annual Meeting. New York, NY, Jan. 2023.

[4] **K.D. Lamb** "A Graph Neural Network Approach for Modeling Aerosol Optical Properties". USMILE Collaboration Meeting. Virtual, Oct. 2020.

[5] **K.D. Lamb**, Matsui, H., Fahey, D., Katich, J., Perring, A., Spackman, R., Thatcher, M., Weinzerl, B., and Schwarz, J.P. "Global-scale constraints on light-absorbing anthropogenic combustion iron oxide aerosols". ATOM Science Team Meeting. Boulder, CO, Nov. 2019.

[6] **K.D. Lamb**, Katich, J., Matsui, H., Perring, A., Spackman, R., Thatcher, M., Weinzerl, B., and Schwarz, J.P. "Expanding the role of the SP2: in situ measurements of atmospheric iron oxide concentrations". ATOM Science Team Meeting. Boulder, CO, Nov. 2018.

[7] **K.D. Lamb**, Perring, A.E., Nault, B., Campuzano-Jost, P., Jimenez, J.-L., Weinheimer, A., Blake, D., Anderson, B.E., Beyersdorf, A., Corr, C.A., Thornhill, K., and Schwarz, J.P. "Internally mixed black carbon as a tracer of SOA production in the Seoul Metropolitan Area." NASA KORUS-AQ Science Team Meeting. Irvine, CA, Aug. 2018.

[8] **K.D. Lamb**, Adler, G., Cappa, C., Franchin, A., Li, H., Manfred, K., May, A., McMeeking, G., Middlebrook, A., Selimovic, V., Wagner, N., Washenfelder, R., Womack, C., Yokelson, B., and Schwarz, J.P. "Constraints on black carbon optics from biomass burning." NOAA Firelab Science Team Meeting. Boulder, CO, Nov. 2017.

[9] **K.D. Lamb**, Perring, A.E., Oh, J., Ahn, J-Y., Diskin, G., Wisthaler, A., Wennberg, P., Yang, M., and Schwarz, J.P. "HD-SP2 measurements of black carbon containing aerosols on the NASA DC-8 during KORUS-AQ." KORUS-AQ Science Team Meeting. Seongwipo, S. Korea, March 2017.

[10] **K.D. Lamb**, Bolot, M., Clouser, B., Sarkozy, L., Wagner, S., Ebert, V., Kerstel, E., Saathoff, H., Möhler, O., and Moyer, E. "Isotopic Fractionation in small ice crystals growing from vapor in the AIDA cloud chamber." UChicago/ Laboratoire Meterologique Dynamique Cirrus Cloud Workshop. Chicago, IL, Sept. 2014.

[11] **K.D. Lamb**, Clouser, B., Sarkozy, L., Stutz, E., Wagner, E., Ebert, V., Kerstel, E., Saathoff, H., Möhler, O., and Moyer, E. "Cloud Chamber Studies of Isotopic Fractionation and Ice Growth in Cold Cirrus Clouds." IsoCloud Science Team Meeting. Karlsruhe, Germany, January 2013.

Teaching Experience

Instructor/Organizer	AMS AI Short Course, Winter 2024	**American Meteorological Society**
Guest Lecturer	Chemistry of Climate (UN3031), Fall 2023	**Columbia University**
Guest Lecturer	Intro to Atmospheric Chemistry (GU4924), Spring 2023	**Columbia University**
Guest Lecturer	Atmospheric Aerosols (CHEN E4600), Spring 2023	**Columbia University**
Teaching Assistant	Global Warming (PHSC 13400), Spring 2015	**University of Chicago**
Teaching Assistant	Electricity & Magnetism (PHYS 132), Winter 2014	**University of Chicago**
Teaching Assistant	Waves, Heat, & Optics (PHYS 133), Spring 2013	**University of Chicago**
Organizer	Physics Pedagogy Graduate Seminar, 2013 - 2014	**University of Chicago**
Teaching Assistant	Mechanics & Heat (PHYS 101), Spring 2006	**University of Illinois Urbana-Champaign**

Research Projects & Field Campaigns

Frontier Development Laboratory Europe   **June 2022 — Aug. 2022**
- Faculty (Aerosol Team), 8 week research sprint on applying AI/Causal methods to forecast pyrocumulonimbus.

NASA Frontier Development Laboratory   **June 2019 — Aug. 2019**
- Researcher (GNSS Forecasting Team), 8 week research sprint to apply AI/ML to space and earth science research.

NOAA FIREX Firelab Study   **Oct. 2016 — Nov. 2016**
- Laboratory study to characterize the optical properties of biomass burning aerosols at the USDA Fire Sciences Laboratory

NASA/NIER Korean-United States Air Quality Study (KORUS-AQ)   **May 2016 — June 2016**
- 6 week air quality study sampling over the S. Korean peninsula. Operated instruments on NASA DC-8 aircraft during 20 research flights.

AQUAVIT-2 Campaign   **April 2013**
- Cloud chamber instrument inter-comparison campaign to compare field and aircraft instruments used to measure atmospheric water vapor.

IsoCloud 1-4 Campaign   **April 2012 — March 2013**
- Cloud chamber study on isotopic fractionation of water vapor in cold cirrus clouds.

Service & Outreach

Session Chair	Co-Chair, AI for Statistical Parameterization of Unresolved Processes in ESM, AMS Annual Meeting, Baltimore, MD, 2024
	Program Committee, Climate, Weather & Earth Sciences, PASC2024 Conference, Zurich, Switzerland, 2024
	Convener, Data-driven parameterization development, DOE ARM/ASR PI meeting, Rockville, MD, 2023
	Co-Convener, Cirrus in the Upper Troposphere/Lower Stratosphere, AGU Fall Meeting, Chicago, IL 2022
	Co-Chair, AMS Conference on Atmospheric Radiation, Vancouver, BC, 2018
Committees	AMS Artificial Intelligence Applications to Environmental Science STAC Committee, 2023-2026
Organizer	Monthly Atmospheric Composition/Chemistry Meetup, Columbia/LDEO, 2023-present
	Bi-weekly Climate-Machine Learning Journal Club, LEAP/Columbia, 2021-2023
	Organizer, Cirrus Cloud Workshop, University of Chicago/LMD Paris, 2014
Editorial	Associate Editor, *Journal of Atmospheric Science*, 2023 - 2024
Grant/Fellowship Reviewer	Climate Change AI Innovation Grants Reviewer, 2021
	National Science Foundation Reviewer, 2018 - 2023
	US Department of Energy Grant Reviewer, 2020
	National Defense Science and Engineering Graduate Fellowship Evaluation Panel, Geosciences, 2017-2020
	NASA Citizen Science Earth Systems Atmospheric Sciences Panel, Washington DC, 2016
Peer Review (ML conf.)	ICLR Climate Change AI Workshop, Neurips AI4Earth Workshop, ICLR AI for Earth and Space Science Workshop
Peer Review (Journals)	*Journal of Geophysical Research: Atmospheres*, *Environmental Science and Technology*, *Atmospheric Pollution Research*, *Atmospheric Environment*, *Atmospheric Chemistry and Physics*, *Journal of Advances in Modeling Earth Systems*, *Physical Review Letters*, *Environmental Data Science*, *Artificial Intelligence for the Earth Systems*, *Aerosol Science and Technology*
Judge	Senior Physics Division Assistant Captain, Colorado State Science and Engineering Fair, Fort Collins, CO, 2017
	AGU Conference Outstanding Student Poster Awards, 2016-2017
Speaker	PeoriaCorps Career Series, 2022
	Presenter, NASA Frontier Development Lab 2019 Showcase, Google Cloud HQ, Mountainview CA, 2019
	Invited speaker, Society of Catholic Scientists National Conference, Washington, DC, 2018
	Colorado Science Day, Colorado State Capitol, Denver, CO, 2018
	National Honors Society Induction, Osan Air Force Base High School, Pyongtaek, S. Korea, 2016
Mentor	Mentor, Neurips Tackling Climate Change with AI Workshop, 2021
	Mentor, ICML Tackling Climate Change with AI Workshop, 2020
	Earth Explorers Program (STEM program for 7th and 8th graders), Boulder, CO, 2017
	STEM mentor, Girls Do Hack, Adler Planetarium, Chicago, IL, 2015
	STEM mentor, Next Gen 2013 Conference, Museum of Science and Industry, Chicago, IL 2013-2014
	IMPACT peer mentor, University of Chicago, 2012-2013
Science Advisor	Instrument to Instrument Translation/NASA Multi-domain Reusable AI Tools (Trillium), 2023-2024

Media & Press

How AI could power the climate breakthroughs the world needs. [Link], CNN, November, 2023.

Towering Wildfire Clouds Are Affecting the Stratosphere, and the Climate. [Link], State of the Planet, February, 2023.

Can Climate Models Aid Adaptation Efforts with Help from A.I.? [Link] Sustain What? Webcast, December 2022.

How Studying the Clouds Can Improve Climate Models. [Link], State of the Planet, November, 2022.

DOE Awards $14 Million to Improve Climate Change Predictions. [Link] DOE ARM News, November, 2022.

Human-made iron inputs to the Southern Ocean ten times higher than previously estimated. [Link] EurekaAlert! AAAS, May, 2022.

New spectrometer measures water vapor isotopic evolution in cirrus clouds [Link] AIP SciLight, 2020.

NASA flies low over South Korea to measure polluted air. [Link] CNN, June 2016.

On board NASA's flying lab over South Korea. [Link] CNN, June 2016.

References

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