Kara D. Lamb

RESEARCH SCIENTIST · ATMOSPHERIC CHEMISTRY AND PHYSICS

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Education

University of Chicago — *Chicago, IL*
PH.D., PHYSICS — *2015*
- Atmospheric Physics. (Advisor: E. Moyer)
- Thesis: *In-situ isotopic water vapor measurements as a tracer of cold cloud microphysics*

University of Chicago — *Chicago, IL*
M.S., PHYSICS — *2008*
- Atomic, Molecular, and Optical Physics. (Advisor: C. Chin)

University of Illinois, Urbana-Champaign — *Champaign, IL*
B.S., PHYSICS — *2007*
- *Summa Cum Laude* with highest distinction in the curriculuum
- Minors: French and Mathematics
- Phi Beta Kappa

Research Interests

Aerosol and cloud microphysics, *In situ* atmospheric observations, Anthropogenic influences on climate, Instrument development, Scientific machine learning.

Research Experience

Columbia University — *New York, N.Y.*
ASSOCIATE RESEARCH SCIENTIST, DEPARTMENT OF EARTH AND ENVIRONMENTAL ENGINEERING — *2020 - present*
Developed graph neural network method for zero-shot learning of aerosol optical properties and submitted paper on this approach. Prepared grant applications on machine learning methods for aerosol and cloud microphysics. Led bi-weekly hybrid-physics machine learning journal club with researchers from Columbia, NYU, and Princeton GFDL. Presented at conferences and collaboration meetings. Current research focuses on using machine learning to parameterize cloud microphysical processes and to post-process Global Storm Resolving Models to investigate the impact of sub-grid-scale cloud organization on precipitation extremes in climate models

Columbia University — *New York, N.Y.*
AFFILIATE, DATA SCIENCE INSTITUTE — *2022 - present*

Cooperative Institute for Research in the Environmental Sciences — *Boulder, CO*
RESEARCH SCIENTIST II, ATMOSPHERIC COMPOSITION AND CHEMICAL PROCESSES, NOAA CHEMICAL SCIENCES DIVISION — *2019 - 2020*
Pioneered applications of machine learning to laser-induced incandescent aerosol detection, resulting in 3 publications and a workshop paper. Improved classification of iron oxide aerosols using supervised machine learning by reducing false positives from 37% to <3%. Produced first global data set to quantify anthropogenic combustion iron oxide aerosol climate impacts from 102 research flights during the NASA AToM and NCAR HIPPO campaigns

Cooperative Institute for Research in the Environmental Sciences — *Boulder, CO*
RESEARCH SCIENTIST I, ATMOSPHERIC COMPOSITION AND CHEMICAL PROCESSES, NOAA CHEMICAL SCIENCES DIVISION — *2016 - 2019*
Operated the NOAA Single Particle Soot Photometer Instrument during aircraft field campaigns and laboratory studies to characterize atmospheric aerosols. Participated in NASA KORUS-AQ aircraft field deployment and NOAA Firelab laboratory study, leading final data preparation and scientific analysis of black carbon aerosol observations. Published research on direct climate forcing of black carbon in East Asia. Mentored summer intern on development of novel technique to detect anthropogenic iron oxide combustion aerosols. Presented at 9 conferences and 10 papers published in peer-reviewed journals.

University of Chicago
GRADUATE RESEARCH ASSISTANT, EXPERIMENTAL ATMOSPHERIC PHYSICS

Chicago, IL
2011 - 2015

Designed, constructed, and validated tunable diode laser absorption spectrometer (Chicago Water Isotope Spectrometer) for isotopic water vapor measurements. Participated in 5 laboratory studies at the AIDA Aerosol and Cloud Chamber (Karlsruhe, Germany) and led final data analysis following campaigns. Developed novel modeling scheme to parameterize isotopic fractionation factors of water vapor at lowest observed temperatures. Adapted bin microphysical model with parameterization for surface kinetic effects to cloud chamber experiments. Resulted in 6 conference presentations and 4 publications.

University of Chicago
GRADUATE RESEARCH ASSISTANT, EXPERIMENTAL ATOMIC, MOLECULAR, AND OPTICAL PHYSICS

Chicago, IL
2008 - 2010

Collaborated with team to construct experimental set-up for quantum computation experiment using dual species ultra-cold atoms. Designed, aligned, and validated magneto-optical trap and dipole laser trap for simultaneous evaporative cooling of Lithium and Cesium atoms. Presented results at 2 conferences and wrote paper on laser injection locking for physics Ph.D. candidacy requirement.

Illinois State University
UNDERGRADUATE RESEARCH ASSISTANT, THEORETICAL ATOMIC, MOLECULAR, AND OPTICAL PHYSICS

Bloomington, IL

2005 - 2006

Used analytical techniques and computational modeling to evaluate scattering inverse problem for opaque media. Resulted in 2 publications.

Honors, Awards, & Fellowships

2019   **NASA Group Achievement Award** ATOM
2019   **Travel Award** Neurips Climate Change.AI workshop
2018   **Finalist, Flame Challenge, "What is Climate?"** Alan Alda Center for Science Communication
2017   **NASA Group Achievement Award** KORUS-AQ
2016   **Gold Star Award for scientific outreach** NOAA Earth System Research Laboratory
2014   **Winstein Travel Award** University of Chicago, Department of Physics
2009   **National Defense Science and Engineering Graduate Fellowship** Department of Defense
2009   **National Science Foundation Graduate Research Fellowship** National Science Foundation
2007   **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
2005   **Commonwealth Edison/Beryl Bristow Award** UIUC Department of Physics

Research Projects and Field Campaigns

Frontier Development Lab Europe
AEROSOL TEAM - DOMAIN LEAD MENTOR

Remote
June-August, 2022

Mentored team of Ph.D. students and postdocs for 8 week research sprint to apply AI/Machine Learning techniques to develop data set and use machine learning/causal methods to improve forecasting of Pyrocumuluniumbus events using reanalysis data sets and high-resolution geostationary satellite images. Received "Steely-eyed Operator" award for leading team.

NASA Frontier Development Lab
GNSS FORECASTING TEAM - DOMAIN SCIENCE RESEARCHER

Mountain View, CA
June-August, 2019

Participated as researcher during 8 week research sprint to apply AI/Machine Learning techniques to space and earth science research. Developed state-of-the art machine learning model to predict high latitude global navigation satellite system (GNSS) ionospheric scintillation events 1 hour in advance. Received "Unexpected Discovery" award for feature extraction on aurora images associated with scintillations.

NOAA FIREX Firelab Study
NOAA SINGLE PARTICLE SOOT PHOTOMETER

Missoula, MT
Oct.-Nov. 2016

Operated NOAA SP2 during laboratory study to characterize the optical properties of biomass burning aerosols at the USDA Fire Sciences Laboratory.

NASA/NIER Korean U.S. Air Quality Study (KORUS-AQ)   *Pyongtaek, South Korea*
NOAA HUMIDIFIED DUAL SINGLE PARTICLE SOOT PHOTOMETER   *May-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   *Karlsruhe, Germany*
CHICAGO WATER ISOTOPE SPECTROMETER, AIDA AEROSOL AND CLOUD CHAMBER   *April 2013*
Operated Chi-WIS during AQUAVIT-2, an instrument inter-comparison campaign to compare field and aircraft instruments used to measure atmospheric water vapor.

IsoCloud 1-4 Campaigns   *Karlsruhe, Germany*
CHICAGO WATER ISOTOPE SPECTROMETER, AIDA AEROSOL AND CLOUD CHAMBER   *April 2012-March 2013*
Cloud chamber study on isotopic fractionation of water vapor in cold cirrus clouds. Operated Chi-WIS during 4 experimental campaigns.

Teaching Experience

University of Chicago   *Chicago, IL*
TEACHING ASSISTANT   *2012-15*
Courses: Global Warming; Electricity and Magnetism; Waves, Heat, and Optics. Delivered lectures for discussion section and acted as tutor for laboratory sections. Graded homework assignments and exams and held office hours. Enrollments ranged from 20-30 students.

University of Chicago   *Chicago, IL*
PHYSICS PEDAGOGY GRADUATE SEMINAR   *2013-14*
Co-organized 2 quarter long graduate seminar on physics teaching at the undergraduate level. Invited speakers from Chicago-area colleges and universities. Discussed teaching methodologies, diversity and inclusion issues, and development of appropriate curriculum.

University of Illinois Urbana-Champaign   *Champaign, IL*
TEACHING ASSISTANT   *2006*
Courses: Mechanics and Heat. Delivered lectures for discussion section and administered quizzes and exams. Graded homework assignments and held office hours. Enrollments ranged from 20-30 students.

Mentoring Experience

2022	**Domain Lead Mentor, Frontier Development Lab Europe, Aerosols Team**	
2022	**Mentor, REU program**	
2021	**Mentor, Neurips Tackling Climate Change with AI Workshop**	
2020	**Mentor, ICML Tackling Climate Change with AI Workshop**	
2017	**Mentor, STAR Fellows Program Intern** Summer internship program for teachers	*Boulder, CO*
2012-13	**IMPACT peer mentor for international graduate student** University of Chicago	*Chicago, IL*

Science Outreach

2019	**Presenter, NASA Frontier Development Lab 2019 Showcase** Google Cloud HQ	*MountainView, CA*
2018	**Invited speaker, Society of Catholic Scientists** National Conference	*Washington, D.C.*
2018	**Colorado Science Day** Colorado State Capitol	*Denver, CO*
2017	**Senior Physics Division Assistant Captain** Colorado State Science and Engineering Fair	*Fort Collins, CO*
2017	**Earth Explorers Program (STEM program for 7th and 8th graders)** Participating Scientist	*Boulder, CO*
2016	**Guest speaker, National Honors Society Induction** Osan Air Force Base High School	*Pyongtaek, S. Korea*
2015	**STEM mentor, Girls Do Hack** Adler Planetarium	*Chicago, IL*
2013	**STEM mentor, Next Gen 2013 Conference** Museum of Science and Industry	*Chicago, IL*

Service

2022	**Session Co-Convener, AGU Fall Meeting** Cirrus in the Tropical Upper Troposphere and Lower Stratosphere	*Chicago, IL*
2021-22	**Hybrid Physics-ML Journal Club** Organizer, Columbia University	
2020-22	**Referee** ICLR Climate Change AI Workshop, Neurips AI4Earth Workshop, ICLR AI for Earth and Space Science Workshop	
2021	**Climate Change AI Innovation Grants** Reviewer	
2018-21	**National Science Foundation** Reviewer	
2020	**US Department of Energy** Reviewer	
2017-20	**National Defense Science and Engineering Graduate Fellowship Evaluation Panel** Geosciences	
2017-22	**Referee** 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	
2018	**Session Co-Chair** AMS Conference on Atmospheric Radiation	*Vancouver, BC*
2016-17	**AGU Conference Outstanding Student Poster Awards** Judge	
2016	**NASA Citizen Science Earth Systems Atmospheric Sciences Panel** Reviewer	*Washington, D.C.*
2014	**Organizer, Cirrus Cloud Workshop** University of Chicago/Laboratoire de Mètéorologie Dynamique	*Chicago, IL*

Research Funding

Current

Department of Energy
ATMOSPHERIC SYSTEM RESEARCH PROGRAM
- "Connecting Laboratory Experiments and *In Situ* Observations of Depositional Ice Growth"
- PI: Kara D. Lamb
- Co-I's: Jerry Y. Harrington (Penn. State), Marcus van Lier Walqui (Columbia)
- Award Period: 8/1/2022 – 7/31/2025

Columbia University NSF Center for Learning Earth with Artificial Intelligence (LEAP)
INTERNAL RFP
- "Unification of Laboratory and Observational Data Via Learning Algorithms for Robust Models of Ice Microphysics"
- PI's: Marcus van Lier-Walqui, Kara D. Lamb
- Co-I's: Hugh Morrison (NCAR), Andrew Gettelman (NCAR)
- Award Period: 3/1/2022 - 3/1/2024

Organizations/Memberships

American Geophysical Union, American Meteorological Society, European Geophysical Union

Publications

In Preparation

[1] **K.D. Lamb**, M. van Lier Walqui, S. Santos, H. Morrison. Unsupervised learning of microphysical process rates using generative machine learning models. In preparation.

[2] **K.D. Lamb**, M van Lier Walqui, J. Harrington, et al. Re-evaluating cloud chamber constraints on depositional ice growth in cirrus clouds– Part 2: Bayesian parameter constraints on depositional ice growth. In preparation.

Under Review

[3] **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. Under review, *Atmos. Chem. Phys. Discuss.*, https://acp.copernicus.org/preprints/acp-2022-733, 2022

[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 the stratospheric aerosol budget. In revision.

[5] S. Shamekh, **K.D. Lamb**, Y. Huang, P. Gentine. Implicit Learning of Convective Organization Explains Precipitation Stochasticity. In revision. https://www.essoar.org/doi/abs/10.1002/essoar.10512517.1

[6] **K.D. Lamb**, P. Gentine. Zero-Shot Learning of Aerosol Optical Properties Using Graph Neural Networks. Under Review. https://arxiv.org/abs/2107.10197

PUBLISHED

[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, https://www.nature.com/articles/s41612-022-00250-w, 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, https://acp.copernicus.org/articles/21/7235/2021/, 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, https://www.sciencedirect.com/science/article/pii/S1352231021001199, 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, https://www.nature.com/articles/s41612-021-00171-0, 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;773:145531. https://www.sciencedirect.com/science/article/pii/S0048969721005994, 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. https://online.ucpress.edu/elementa/article/doi/10.1525/elementa.424/112774/Investigation-of-factors-controlling-PM2-5

[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. https://aip.scitation.org/doi/10.1063/1.5139244

[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, https://acp.copernicus.org/articles/20/6455/2020/, 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, https://acp.copernicus.org/articles/20/1089/2020/, 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, https://amt.copernicus.org/articles/12/3885/2019/, 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, https://www.tandfonline.com/doi/full/10.1080/02786826.2019.1617832, 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, https://www.sciencedirect.com/science/article/pii/S1352231019301724, 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, https://acp.copernicus.org/articles/18/17769/2018/, 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, https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2018JD029257, 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, https://acp.copernicus.org/articles/18/1879/2018/, 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, https://www.pnas.org/doi/10.1073/pnas.1618374114, 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, https://journals.aps.org/pra/abstract/10.1103/PhysRevA.75.013425, 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, https://journals.aps.org/pre/pdf/10.1103/PhysRevE.74.061903, 2006.

Conference Activities

MACHINE LEARNING WORKSHOP PAPERS

[1] 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." Accepted, Workshop on Causality for Real-world Impact. 2022 Conference on Neural Information Processing Systems. https://arxiv.org/abs/2211.08883

[2] 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." Accepted, Tackling Climate Change with AI Workshop. 2022 Conference on Neural Information Processing Systems. https://arxiv.org/abs/2211.13052

[3] **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 Autoencoder." In 2nd AI and Data Science Workshop for Earth and Space Sciences. NASA JPL (Virtual), Feb. 2021.

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

[5] **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." Accepted, Machine Learning and the Physical Sciences Workshop 2019 Conference on Neural Information Processing Systems, Vancouver, BC, Dec. 2019. https://arxiv.org/abs/1910.01570

[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) "Correlation of Auroral Dynamics and GNSS Scintillation with an Auto-encoder." Accepted, Machine Learning and the Physical Sciences Workshop 2019 Conference on Neural Information Processing Systems, Vancouver, BC, Dec. 2019. https://arxiv.org/abs/1910.03085

CONTRIBUTED/INVITED TALKS

[7] **K.D. Lamb**, M. van Lier Walqui, S. Santos, H. Morrison. "Unsupervised Learning of Cloud Microphysical Process Rates." In SIAM Mini-Symposium: Understanding cloud physics using stochastic, dynamical, and data-driven modeling. Amsterdam, Netherlands, March 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**. "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.

[10] **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.

[11] **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.

[12] **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.*

CONTRIBUTED POSTER PRESENTATIONS

[13] **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.

[14] **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.

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

[16] **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.

[17] **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.

[18] **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.

[19] **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.

[20] **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.

[21] **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.

[22] **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.

[23] **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.

[24] **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.

[25] **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.

[26] **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.

[27] **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.

[28] **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.

Invited Seminars and Workshops

[29] **K.D. Lamb** Seminar, Department of Geophysics, Cambridge University. Cambridge, UK, September 2022.

[30] **K.D. Lamb** Seminar, Department of Atmospheric Sciences, University of Miami. Miami, FL, April 2022.

[31] **K.D. Lamb** Seminar, Department of Earth and Planetary Sciences, University of California, Berkeley. Berkeley, CA, April 2022.

[32] **K.D. Lamb** Seminar, Department of Earth, Atmospheric, and Planetary Sciences, Purdue University. West Lafayette, IN, March 2022.

[33] **K.D. Lamb**, Perring, A.E., Oh, J., Ahn, J-Y., Diskin, G., Wisthaler, A., Wennberg, P., Yang, M., and Schwarz, J.P. Seminar for Earth and Planetary Systems Science Group, University of Tokyo. Tokyo, Japan, Feb. 2017.

[34] **K.D. Lamb**, Bolot, M., Clouser, B., Sarkozy, L., Habig, J., Hiranuma, N., Saathoff, H., Möhler, O., Kühnreich, B., Wagner, S., Ebert, V., Landsberg, J., Kerstel, E., and Moyer, E. Seminar for Aerosol group meeting, NOAA ESRL Chemical Sciences Division. Boulder, CO, Nov. 2015.

[35] **K.D. Lamb**, Bolot, M., Clouser, B., Sarkozy, L., Habig, J., Hiranuma, N., Saathoff, H., Möhler, O., Kühnreich, B., Wagner, S., Ebert, V., Landsberg, J., Kerstel, E., and Moyer, E. Seminar, Commissiat à l'Énergie Atomique. Gif-sur-Yvette, France, April 2015.

[36] **K.D. Lamb**, Bolot, M., Clouser, B., Sarkozy, L., Wagner, S., Ebert, V., Kerstel, E., Saathoff, H., Möhler, O., and Moyer, E. Workshop on Mathematical Modeling, Northeastern Illinois University. Chicago, IL, May 2015.

[37] **K.D. Lamb**, Sarkozy, L., Clouser, B., Stutz, E., and Moyer, E. Seminar for Metrology Group, Physickalisch-Technische Bundesanstalt. Braunchweig, Germany, April 2012.

Science Team Meeting Presentations

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

[39] **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.

[40] **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.

[41] **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.

[42] **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.

[43] **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.

[44] **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.

[45] **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.

Data Sets

[46] A. Braude, E. Diaz, D. Okoh, K. Tazi, P. Harder, **K.D. Lamb**, N. Meinert, D. Parris-Watson. PyroCast: Machine Learning Pipeline for pyrocumulonimbus (pyroCb) forecasting. Space ML: Pyrocast. http://spaceml.org

[47] **K.D. Lamb**, J.P. Schwarz, and J.M. Katich. ATom: Light-Absorbing Metallic Aerosols, Single Particle Soot Photometer, 2016-2018. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/1828

[48] **K.D. Lamb**, G. Malhortra, A. Vlontzos, E. Wagstaff, A. Bhatt, G. Baydin, B. Lewis. Aurora Imagery Machine Learning Dataset. Space ML: Enhanced Predictability of GNSS Disturbances. http://spaceml.org

[49] J.P. Schwarz and **K.D. Lamb**. Fire Influence on Regional and Global Environments Experiment (FIREX) Firelab, Single Particle Soot Photometer, 2016. NOAA Chemical Sciences Laboratory FIREX Firelab. https://csl.noaa.gov/projects/firex/firelab/

[50] J.P. Schwarz, A.E. Perring, **K.D. Lamb**. KORUS-AQ: NOAA Humidified Dual Single Particle Soot Photometer, 2016. NASA Airborne Science Data for Atmospheric Composition. https://www-air.larc.nasa.gov/cgi-bin/ArcView/korusaq