MEIYUN LIN

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Summary of Scientific achievements to date

Exposure to high concentrations of ground-level ozone harms human and plant health. It can cause breathing difficulty, coughing, and asthma attacks, and can reduce crop yields. Dr. Meiyun Lin works at the intersection of land-ocean-atmosphere, climate, air quality, and human activities, integrating information across scientific disciplines, to understand ozone air pollution and related tracers from global to urban scales. She develops and applies Earth system models, in conjunction with multi-platform observations, to support targeted needs in regional air quality management. Lin authored 51 papers in the peer-reviewed literature, including 15 first-authored, highly-cited publications. Notably, three of Lin's first-authored papers were published in the prestigious *Nature*-branded Journals, which have an acceptance rate of just 10%.

Her novel applications of models and observations have contributed significantly to the science of air quality-climate interactions, our understanding of ozone pollution, the role of global climate change and Earth system feedbacks on air pollution extremes, and the role of large-scale modes of oceanic and atmospheric circulation patterns on pollution transport with implications for developing seasonal air quality prediction. Prediction could allow improved public education to reduce health effects as well as enable air quality planners to make informed decisions about resource management and our changing environment.

Cited by multiple expert testimonies in the U.S. House public hearings, Lin's work has influenced the setting of U.S. National Ozone Air Quality Standards in 2015 and 2020. She was frequently invited to deliver featured talks at national and international conferences, including the AAAS annual meeting, the American Geophysical Union fall meetings, the Atmospheric Chemistry Mechanism Conference, NASA Science Team Meetings, the Global Chemistry-Climate Model Initiative, and atmospheric seminars at Massachusetts Institute of Technology and Harvard University. Lin's research also received broad publicity in media outlets, demonstrating her outreach and public communication skills.

Education

Ph.D. 09/2007, Department of Civil Engineering, University of Tokyo, Japan
M.E. 07/2004, Department of Environmental Engineering, Dalian University of Technology, China
B. E. 07/2001, Department of Environmental Science and Engineering, Sichuan University, China

Employment History

Research Physical Scientist, NOAA Geophysical Fluid Dynamics Laboratory

Duration: 09/27/2021-present

Research Scholar, Princeton University, Program in Atmospheric and Oceanic Sciences

Duration: 07/01/2016-9/26/2021

Duties and accomplishments:

- Supervising postdocs and undergraduate interns in the AOS Visiting Scientist Program;
- Conducting air quality research, with a focus on air quality extremes and their connections with global climate change, drought and Earth system feedbacks;
- Utilizing air quality prediction and/or projection research tools, including GFDL's chemistry-climate models (AM4/AM3), land models (LM3/LM4), NOAA-sponsored field campaign data and other satellite and ground-based observational datasets;
- Conducting Earth system model research, such as quantifying the impacts of drought-stressed vegetation on ozone pollution extremes and fine particulate pollution associated with fires using GFDL Earth system models;
- Developing models of atmospheric chemistry for air quality research. Particularly, Lin is leading the development of a variable-resolution atmospheric chemistry-climate model with regional grid refinements (12x12 km^2) over North America for an improved representation of U.S. air quality extremes. She also contributed to the development of interactive dry deposition schemes in GFDL dynamic vegetation land models.
- Authored 26 papers in the peer-reviewed literature, including three first-authored, highly-cited papers. Notably, Lin et al. (2020) was published in the prestigious Journal *Nature Climate Change*. Lin et al. (2017) was covered by 56 news outlets, ranked in the top 5% of all research outputs scored by Altmetric, received the award of highly-cited papers by the Web of Science, and has received 200+ citations to date on Google Scholar.

Associate Research Scholar, Princeton University, Program in Atmospheric & Oceanic Sciences

Duration: 06/01/2010-06/30/2016

Duties and accomplishments:

- Conducting air quality research, with a focus on background ozone trends, extremes, and large-scale transport;
- Utilizing air quality prediction and/or projection research tools, including GFDL's chemistry-climate models and NOAA-sponsored field campaign data;
- Conducting Earth system model research, such as using GFDL models to identify the connections of regional air quality with large-scale modes of oceanic and atmospheric variability;
- Conducting process-oriented evaluation of GFDL chemistry-climate models and assisting with developing models of atmospheric chemistry for air quality research;
- Authored 18 papers in the peer-reviewed literature, including 5 first-authored, highly-cited publications. Notably, the pioneering work of Lin et al. (2012a, 2012b) using GFDL's high-resolution chemistry-climate models have received over 450 citations in the peer-reviewed literature. Lin et al. (2012a) was selected for the American Geophysical Union Editors' Highlight and featured in Nature News and Science Now in Science Magazine. Lin et al. (Nature Geoscience, 2014) and Lin et al. (*Nature* Communications, 2015) has received over 300 citations. These papers have influenced the setting of U.S. National Ambient Ozone Air Quality Standards in 2015 and 2020.

Postdoctoral Scientist, University of Wisconsin-Madison, Center for Sustainability and the Global Environment

Duration: 03/08/2008 – 05/31/2010

Duties and accomplishments:

- Conducting research on ozone air quality;
- Participating UN Task Force on Hemispheric Transport of Air Pollution;
- Utilizing air quality prediction and/or projection research tools, such as regional-scale air quality models WRF-Chem and CMAQ;
- Developing models of atmospheric chemistry for air quality research, such as building the interface for importing global model chemical boundary conditions for regional air quality modelling;
- Published 4 first-authored papers in the peer-reviewed literature.

Postdoctoral Scientist, University of Tokyo, Center for Climate System Research, Japan

Duration: 10/01/2007 – 02/28/2008

Duties and accomplishments:

- Conducting research on atmospheric chemistry and acid deposition in Asia;
- Utilizing atmospheric composition prediction and/or projection research tools;
- Assisting with developing models of atmospheric chemistry for air quality research, such as building an emission processing interface for the application of CMAQ in Asia.

Funded External Awards

- **Meiyun Lin** (PI). "Characterizing daily-to-yearly variability in sources of ozone in the Las Vegas area". Clark County, Nevada, total budget: $142, 605 (4/1/2017-12/1/2018)
- Lesley Ott (PI), Bryan Duncan (Co-I), **Meiyun Lin** (Co-I), Anne Thompson (Co-I), Yasuko Yoshida (Co-I), J. Eric Nielsen (Co-I). "Statistics for stratospheric influence on surface GHGs during NASA's North American field campaign: A study with aircraft & satellite data and high-resolution global *models*". NASA, Total budget: $416,964, *Princeton sub-award (PI Meiyun Lin): $101,451* (7/1/2014-6/30/2017)
- Owen Cooper (PI) and **Meiyun Lin** (Co-PI). "Exploring emission versus climate drivers of tropospheric ozone variability and trends over northern mid-latitudes from space", NASA Atmospheric Composition, Total budget: $233,529, *Princeton sub-award (PI Meiyun Lin): $141,722* (3/1/2014-2/29/2016)
- Chris Emery, William Koshak, and **Meiyun Lin**, "Investigation of Global Modeling and Lightning NO_x Emissions as Sources of Regional Background Ozone in Texas", State of Texas, Total budget: $145,712, Princeton sub-award (PI Meiyun Lin): $9,810 (10/1/2012-9/30/2013)

Media Reports and Research Highlights

- March 2021, Lin and her postdoc advisee Xie interviewed for their latest article, "*Tripling of western US particulate pollution from wildfires in a warming climate*", published in PNAS".

- April 2020, Lin's article, "Vegetation feedbacks during drought exacerbate ozone air pollution extremes in Europe", Published in Nature Climate Change and featured in multiple media outlets (https://www.nature.com/articles/s41558-020-0743-y/metrics)
- March, 2017. Lin's article, published in *Atmos. Chem. Phys.*, featured in Princeton News, NOAA Research, E&E News, National Public Radio, Southern California Public Radio (SCPR), The Weather Channel, and many other public media outlets.
- May 12, 2015. *Nature Communications* published Lin's work that identifies a link between La Niña and western US deep stratospheric ozone intrusions. The paper was highlighted in NOAA Research and multiple media outlets including *Environment & Energy News*.
- January 26, 2014. *Nature Geoscience* published Lin's work that solves the mystery of Hawaiian ozone changes since the 1970s. The paper was featured in *Nature's News & Views*, *Princeton Journal Watch*, and multiple media outlets.
- June 12, 2013. *The U.S. House Subcommittee on Environment Hearing*. *Lin MY et al* [2012b], on stratospheric intrusions and the challenges for the western states to achieve more stringent ozone standards, was cited by multiple expert testimonies.
- January 1, 2013. *Lin MY et al*. [2012a] ranked *JGR's top 1 most cited paper* for all 2753 articles published in 2012.
- December, 2012. *NOAA's top research accomplishments of 2012* included *Lin MY et al.* [2012a].
- *March 6, 2012. New York Times Greenblog.* Meiyun Lin interviewed on Asian pollution and western U.S. ozone air quality.
- March 5, 2012. *NOAA Research*. Meiyun Lin interviewed on Asian pollution and western U.S. ozone air quality.
- *March 5, 2012. Nature News*. Meiyun Lin interviewed on using NASA satellites to forecast Asian pollution events over the western U.S.
- *March 1, 2012. Science* Magazine *ScienceShot*. Richard A. Kerr, a senior reporter, wrote about *Lin et al* [2012a] on imported Asian pollution.
- February 17, 2012. *Lin MY et al* [2012a] selected as *AGU Editors' highlight*.

Engagement in Community Research Activities

- Contributing Author, IGAC/Tropospheric Ozone Assessment Report (2015-present)
- PI for GFDL-AM3 model, IGAC/Chemistry-Climate Model Initiative (2013-present)
- PI for GFDL-AM3 model, Hemispheric Transport of Air Pollution Phase 2 (Contributing to AeroCom) (2011-present)
- Member/Co-Investigator, NASA Air Quality Applied Sciences Team (2011-2016)
- Contributor, U.S. EPA Integrated Science Assessment (ISA) for Ozone and Related Photochemical Oxidants 2013 (2011-2013)
- Section Co-Chair, American Geophysical Union (AGU) Fall Meeting 2011: Impacts of baseline ozone and particulate matter on surface air quality (2011)
- Reviewers for *J. Geophys. Res., Geophys. Res. Lett., Atmos. Chem. Phys., Environ. Res. Lett., Atmos. Environ., Atmosphere, Environ. Sci. & Tech, Science of The Total Environment*

Peer-reviewed Publications (51)

(**underline** indicates high-profile, first-authored papers, * indicates postdoc advisee)

1. Xie Y.*, **Lin M**., Bertrand Decharme, Christine Delire, Larry W. Horowitz, David M. Lawrence, Fang Li, Roland Séférian. *Tripling of western US particulate pollution from wildfires in a warming climate*. Proceedings of the National Academy of Sciences (PNAS), in press, March 2022.
2. Langford, A. O., Senff, C. J., Alvarez II, R. J., Aikin, K. C., Baidar, S., Bonin, T. A., Brewer, W. A., Brioude, J., Brown, S. S., Burley, J. D., Caputi, D. J., Conley, S. A., Cullis, P. D., Decker, Z. C. J., Evan, S., Kirgis, G., **Lin, M.**, Pagowski, M., Peischl, J., Petropavlovskikh, I., Pierce, R. B., Ryerson, T. B., Sandberg, S. P., Sterling, C. W., Weickmann, A. W., and Zhang, L.: *The Fires, Asian, and Stratospheric Transport-Las Vegas Ozone Study (FAST-LVOS)*, Atmos. Chem. Phys., https://doi.org/10.5194/acp-2021-690, 2022.
3. DeLang, Marissa; Becker, Jacob; Chang, Kai-Lan; Serre, Marc; Cooper, Owen; Schultz, Martin; Schröder, Sabine; Lu, Xiao; Zhang, Lin; Deushi, Makoto; Josse, Beatrice; Keller, Christoph; Lamarque, Jean-Francois; **Lin, Meiyun**; Liu, Junhua; Marecal, Virginie; Strode, Sarah; Sudo, Kengo; Tilmes, Simone ; Zhang, Li; Cleland, Stephanie; Collins, Elyssa; Brauer, Michael; West, J. Jason. *Mapping yearly fine resolution global surface ozone through the Bayesian Maximum Entropy data fusion of observations and model output for 1990–2017*. Environmental Science & Technology, es-2020-077425.R2, in press, 2020
4. **Lin, Meiyun**, Larry W Horowitz, Yuanyu Xie, Fabien Paulot, Sergey Malyshev, Elena Shevliakova et al., ***Vegetation feedbacks during drought exacerbate ozone air pollution extremes in Europe***. **Nature Climate Change**, 10, 444–451, 2020.
5. Yuanyu Xie*, **Meiyun Lin**, and Larry W. Horowitz. *Summer PM2.5 pollution extremes caused by wildfires over the western United States during 2017-2018*, Geophysical Research Letter, 47, https://doi. org/10.1029/2020GL089429, 2020.
6. A.T. Archibald, J. L. Neu, Y. Elshorbany, O. R. Cooper, P.J. Young, H. Akiyoshi, R.A. Cox, M. Coyle, R. Derwent, M. Deushi, A. Finco, G.J. Frost, I. E. Galbally, G. Gerosa, C. Granier, P.T. Griffiths, R. Hossaini, L. Hu, P.Jöckel, B. Josse, **M.Y. Lin** et al.: Tropospheric Ozone Assessment Report: Critical review of changes in the tropospheric ozone burden and budget from 1960-2100, *Elementa: Science of the Anthropocene,* 8(1), https://doi.org/10.1525/elementa.2020.034, *2020*
7. Larry W. Horowitz, Vaishali Naik, Fabien Paulot, Paul A. Ginoux, John P. Dunne, Jingqiu Mao, Jordan Schnell, Xi Chen, Jian He, **M.Y. Lin**, Pu Lin, Sergey Malyshev, David Paynter, Elena Shevliakova, Ming Zhao. *The GFDL Global Atmospheric Chemistry-Climate Model AM4.1: Model Description and Simulation Characteristics.* Journal of Advances in Modelling Earth Systems, 12, e2019MS002032. https://doi.org/ 10.1029/2019MS002032, 2020.
8. **Lin, Meiyun**, Sergey Malyshev, Elena Shevliakova, Fabien Paulot, Larry W Horowitz S Fares, T N Mikkelsen, and L Zhang: *Sensitivity of ozone dry deposition to ecosystem-atmosphere interactions: A critical appraisal of observations and simulations***.** Global Biogeochemical Cycles, 33(10), doi:10.1029/2018GB006157, 2019
9. Zhang, Li*, **Meiyun Lin**, A Langford, et al.: *Characterizing sources of high surface ozone events in the southwestern U.S. with intensive field measurements and two global models. Atmospheric Chemistry and Physics*, 20, 10379–10400, doi:10.5194/acp-20-10379-2020, 2020.
10. Chang, Kai-Lan, O Cooper, J J West, M L Serre, M G Schultz, and Meiyun Lin, et al., March 2019: *A new method (M3Fusion-v1) for combining observations and multiple model output for*

an improved estimate of the global surface ozone distribution. *Geoscientific Model Development*, 12(3), DOI:10.5194/gmd-12-955-2019.

11. Tarasick, D W., I Galbally, O Cooper, M G Schultz, G Ancellet, T Leblanc, T J Wallington, J R Ziemke, Xiong Liu, M Steinbacher, J Staehelin, C Vigouroux, J W Hannigan, O Garcia, G Foret, P Zanis, E C Weatherhead, I Petropavlovskikh, H Worden, M Osman, Jane Liu, Kai-Lan Chang, A Gaudel, and Meiyun Lin et al.: *Tropospheric Ozone Assessment Report: Tropospheric ozone from 1877 to 2016, observed levels, trends and uncertainties. Elementa: Science of the Anthropocene*, **7**, 39, doi:10.1525/elementa.376, 2019
12. D. Jaffe, O. Cooper, A. Fiore, B. Henderson, G. Tonneson, T.R. Russell, D. Henze, A. Langford, **M.Y. Lin**, T. Moore (2018)**.** *Scientific assessment of background ozone over the U.S.: Implications for air quality management.* Elem Sci Anth., doi: 10.1525/elementa.309
13. Dhomse, S., Kinnison, D., Chipperfield, M. P., Cionni, I., Hegglin, M., Abraham, N. L., Akiyoshi, H., Archibald, A. T., Bednarz, E. M., Bekki, S., Braesicke, P., Butchart, N., Dameris, M., Deushi, M., Frith, S., Hardiman, S. C., Hassler, B., Horowitz, L. W., Hu, R.-M., Jöckel, P., Josse, B., Kirner, O., Kremser, S., Langematz, U., Lewis, J., Marchand, M., **Lin, M.Y.**, Mancini, E., Marécal, V., Michou, M., Morgenstern, O., O'Connor, F. M., Oman, L., Pitari, G., Plummer, D. A., Pyle, J. A., Revell, L. E., Rozanov, E., Schofield, R., Stenke, A., Stone, K., Sudo, K., Tilmes, S., Visioni, D., Yamashita, Y., and Zeng, G.: *Estimates of Ozone Return Dates from Chemistry-Climate Model Initiative Simulations*, Atmos. Chem. Phys. 18, 8409-8438, https://doi.org/10.5194/acp-18-8409-2018, 2018.
14. Young PJ, Naik V, Fiore AM, Gaudel A, Guo J, **Lin MY**, et al. *Tropospheric Ozone Assessment Report: Assessment of global-scale model performance for global and regional ozone distributions, variability, and trends.* Elem Sci Anth. 2018;6(1):10. DOI: http://doi.org/10.1525/elementa.265
15. Jonson, J E., M Schulz, L K Emmons, J Flemming, D K Henze, K Sudo, M Tronstad Lund, and **M.Y. Lin**, et al., in press**:** *The effects of intercontinental emission sources on European air pollution levels.* Atmos. Chem. Phys., 18, 13655-13672, https://doi.org/10.5194/acp-18-13655-2018, 2018
16. Liang, C-K, J J West, R A Silva, H Bian, M Chin, F Dentener, Y Davila, L K Emmons, G Folberth, J Flemming, D K Henze, U Im, J E Jonson, T Kucsera, T J Keating, M Tronstad Lund, A Lenzen, and **M.Y. Lin**, et al.: *HTAP2 multi-model estimates of premature human mortality due to intercontinental transport of air pollution.* Atmos. Chem. Phys., 18, 10497-10520, https://doi.org/10.5194/acp-18-10497-2018, 2018.
17. Turnock, S, O Wild, F Dentener, Y Davila, L K Emmons, J Flemming, G Folberth, D K Henze, J E Jonson, T J Keating, S Kengo, and **M.Y. Lin**, et al.: *The Impact of Future Emission Policies on Tropospheric Ozone using a Parameterized Approach.* Atmos. Chem. Phys., 18, 8953-8978, https://doi.org/10.5194/acp-18-8953-2018, 2018.
18. Xu, W, X Xu, and **M.Y. Lin,** et al., January 2018: *Long-term trends of surface ozone and its influencing factors at the Mt. Waliguan GAW station, China, Part 2: The role of anthropogenic emissions and climate variability.* Atmospheric Chemistry and Physics, 18(2)**,** DOI:10.5194/acp-18-773-2018.
19. Hogrefe, C., Liu, P., Pouliot, G., Mathur, R., Roselle, S., Flemming, J., Lin, M.Y., and Park, R. J.: *Impacts of Different Characterizations of Large-Scale Background on Simulated Regional-Scale Ozone Over the Continental United States*, Atmos. Chem. Phys., 18, 3839-3864, https://doi.org/10.5194/acp-18-3839-2018, 2018

20. Doherty, R, C Orbe, G Zeng, M J Prather, D A Plummer, and **M.Y. Lin**, et al., November 2017: *Multi-model Impacts of Climate Change on Pollution Transport from Global Emission Source Regions.* Atmos. Chem. Phys., 17(23), doi:10.5194/acp-17-14219-2017.
21. Naik, Vaishali, Larry W Horowitz, M Daniel Schwarzkopf, and **M.Y. Lin**, September 2017: *Impact of Volcanic Aerosols on Stratospheric Ozone Recovery.* Journal of Geophysical Research, 122 (17), DOI:10.1002/2016JD025808.
22. **Lin, M.Y.**, W. Horowitz, R. Payton, A.M. Fiore, G. Tonnesen (2017). ***US surface ozone trends and extremes over 1980-2014: Quantifying the roles of rising Asian emissions, domestic controls, wildfires, and climate.*** **Atmos. Chem. Phys.,** 17 (4), doi:10.5194/acp-17-2943-2017 **(Cited by 200+ times on Google Scholar).**
23. M. Leonard, I. Petropavlovskikh, **Lin, M.Y.,** A. Mcclure-Begley, B. J. Johnson, S. J. Oltmans, D. Tarasick (2017). *An assessment of 10-year NOAA aircraft-based tropospheric ozone climatology in Colorado.* Atmos. Environ., 158 (2017), 116-127, doi:10.1016/j.atmosenv.2017.03.013.
24. Shen, Zhaoyi; Yi Ming; Larry W. Horowitz; V. Ramaswamy; **Lin, M.Y.** (2017). *On the Seasonality of Arctic Haze*. J. of Climate, 30 (12), 4429-4441.
25. Peng, Wei; Yuan, Jia-Hai; Zhao, Yu; **Lin, M.Y.**; Zhang, Qiang; Victor, David; Mauzerall, Denise (2017). *Air Quality and Climate Benefits of Long-distance Electricity Transmission in China.* Environ. Res. Lett., 12 (6), 064012, DOI:10.1088/1748-9326/aa67ba.
26. Langford, A.O., R.J. Alvarez II, J. Brioude, R. Fine, M. Gustin, J.S. Holloway, **Lin, M.Y.**, R.D. Marchbanks, R.B. Pierce, S.P. Sandberg, C.J. Senff, A.M. Weickmann, E.J. Williams (2017), *Entrainment of stratospheric air and Asian pollution by the convective boundary layer in the Southwestern U.S.*, J. Geophys. Res., 122 (2), doi:10.1002/2016JD025987.
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45. **Lin, M.Y.,** A. M. Fiore, L. W. Horowitz, O. R. R. Cooper, V. Naik, J. S. Holloway, B. J. J. Johnson, A. M. Middlebrook, S. J. J. Oltmans, I. B. Pollack, T. B. Ryerson, J. Warner, C. Wiedinmyer, J. Wilson, and B. Wyman (2012a). ***Transport of Asian ozone pollution into surface air over the western United States in spring*, J. Geophys. Res.,** 117 (D21), doi:10.1029/2011JD016961 **(AGU Editors' Highlight; Cited by 200+ times)**.
46. **Lin, M.Y**., T. Holloway, G. R. Carmichael., A. M. Fiore (2010), *Quantifying pollution inflow and outflow over East Asia in spring with regional and global models*. Atmos. Chem. Phys., 10, 4221-4239
47. **Lin, M.Y.**, T. Holloway, T. Oki, D.G. Streets, and A. Richter (2009), *Multi-scale model analysis of boundary layer ozone over East Asia*. Atmos. Chem. Phys**.**, 9, 3277-3301
48. **Lin, M.Y.**, T. Oki, M. Bengtsson, S. Kanae, T. Holloway, D.G. Streets (2008), *Long-range transport of acidifying substances in East Asia Part I: Model evaluation and sensitivity studies*. **Atmos. Environ.** 42 (24), 5939-5955, doi:10.1016/j.atmosenv.2008.04.008
49. **Lin, M.Y.**, T. Oki, M. Bengtsson, S. Kanae, T. Holloway, D.G. Streets (2008), *Long-range transport of acidifying substances in East Asia Part II: Source-receptor relationships*. Atmos. Environ. 42 (24), 5956-5967, doi:10.1016/j.atmosenv.2008.03.039
50. **Lin, M.Y.**, T. Oki, and M. Bengtsson. *Long-range Transport and Transformations of Acidifying Substances over East Asia in Spring Time*. Annual Journal of Hydraulic Engineering, JSCE, Vol.51, 91-96, 2007
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Book Chapters and Reports (2)

Characterizing daily-to-yearly variability in sources of ozone in the Las Vegas area. Project report for The Clark County Department of Air Quality, Nevada, *submitted in fulfillment of the Memorandum of Agreement No. 604279 between Clark County, Nevada and Princeton University*

UN Task Force on Hemispheric Transport of Air Pollution (2010). **Meiyun Lin** served as a contributing author to *Chapter 4: "Global and Regional Modeling". In: Hemispheric Transport of Air Pollution 2010 (HTAP 2010) - Part A Ozone and Particulate Matter*, pp. 135-198, UNECE Air Pollution Studies No. 17 (ISSN 1014-4625), www.htap.org

Presentations

Dec 2021, **AGU Press Conference**: Wildfire in changing climate (YouTube)

Dec 2021, **AGU Fall Meeting 2021** (A44E-03): A variable-resolution global chemistry-climate model for research at the nexus of US climate and air quality extremes.

Dec 2021, **AGU Fall Meeting 2021** (A32G-03): Ozone and particulate air pollution trends and extremes in China from 2000 to 2021: Quantifying the roles of regional emission controls, heterogenous chemistry, meteorology, and vegetation feedbacks.

Sep 2021, **International Global Atmospheric Chemistry 2021 Conference**: Vegetation feedbacks during drought exacerbate ozone air pollution extremes in Europe.

Nov 2020, **Atmospheric Chemistry Mechanism (ACM) 2020 Conference**: How do vegetation feedbacks exacerbate ozone air pollution extremes in Europe, North America, and Asia? (**Invited**)

Nov 2020, **Atmospheric Chemistry Mechanism (ACM) Conference**: Summer $PM_{2.5}$ pollution extremes caused by wildfires during 2017-2018 (Contributed).

May 2020, **EGU General Assembly**, Vegetation feedbacks during drought exacerbate ozone air pollution extremes in Europe.

Dec 2019, **AGU Fall Meeting 2019:** European ozone pollution extremes exacerbated by land-biosphere feedbacks in a drying climate.

Dec 2019, **AGU Fall Meeting 2019:** Sensitivity of ozone dry deposition to ecosystem-atmosphere interactions: A critical appraisal of observations and simulations

Nov 2019, **NOAA CPO ESSM workshop:** Land-biosphere feedbacks exacerbate climate penalty on air pollution extremes

Oct 2019, **GFDL External Lab Review:** Land-biosphere feedbacks on air quality

Feb 17, 2019, **AAAS Annual Meeting – Science Transcending Boundaries**, **Washington DC**. Global dimensions of local air quality **(Invited)**

May 21, 2018: **The National Academy of Sciences, Engineering, and Medicine, Board on Atmospheric Sciences and Climate:** Interannual variability in sources of U.S. background ozone and their connections with climate **(Invited)**

Feb 22, 2018, **NOAA Climate Program Office Director Visit to GFDL:** *Heat waves, drought, and air quality.*

Feb 12, 2018, **NOAA OAR's Director of Weather and Air Quality John Cortina's Visit to GFDL**: *Atmospheric chemistry and connection to Earth system modeling.*

Dec 14, 2017, **AGU Fall Meeting, New Orleans:** U.S. surface ozone extremes and trends over 1980-2015: Quantifying the roles of rising Asian emissions, wildfires, biosphere-atmosphere couplings, and climate.

Nov 2, 2017, **Fall 2017 GFDL Science Symposium:** Tropospheric Chemistry and Air Quality.

Aug 18, 2017, **Congressional Staff Visit to GFDL**: Air Quality and Climate.

July 27, 2017, **NOAA OAR Formulation and Congressional Analysis Division Brief:** Linking climate variability to surface ozone extremes and trends.

Apr 25, 2017, **Presentation to Environmental Defense Fund:** Global Dimensions to U.S. Ozone Pollution: Implications for Air Quality Policy

Mar 28, 2017. **Background Ozone Scientific Assessment Workshop, Denver, Colorado**: Processes controlling U.S. background ozone extremes and trends.

Oct 31, 2016, **University of Toronto Noble Seminar Series**: *Linking climate variability to surface ozone trends and extremes* (***Invited***)

Sep 30, 2016, Poster presentation at International Global Atmospheric Chemistry (IGAC) Project 2016 Science Conference

Apr-11, 2016, **MIT Atmospheric Science Seminar:** *Climate versus emission drivers of ozone pollution trends and extremes* (***Invited***)

Apr-8, 2016, **Harvard University Atmospheric Science Seminar**: *The roles of climate variability on U.S. surface ozone trends and extremes* ***(Invited)***

Oct-7, 2015**, IGAC/SPARC Chemistry Climate Model Initiative Workshop, Italy**: ***The Role of Climate, the Stratosphere, and Emissions on US Surface O_3 Trends and Extremes*** (***Invited***)

Sep-18, 2015**, CARB/UC Davis Meteorology And Climate - Modeling for Air Quality (MAC-MAQ) Conference**: *Detecting changes in US background ozone means and extremes amidst climate variability* (***Invited***)

Aug-20, 2015, **Western States Air Resources Council**. Key drivers of western US surface ozone means and extremes: Climate variability, stratospheric intrusions, and Asian pollution **(Invited seminar)**

May-11, 2015, **HTAP: Modeling Air Quality from the Global to Local Scales, NCAR**: Establishing process-oriented constrains on global models for ozone source attribution: Lessons from GFDL AM3

May-13, 2015, **Western Regional Air Partnership (WRAP), NCAR**: Key drivers of western US surface ozone variability over recent decades: Stratospheric intrusions, Asian pollution, and Climate variability (***Invited***)

Apr-21, 2015, ***NASA AIRS Science Team Meeting, JPL, Pasadena***: Challenges in quantifying sources and variability of lower tropospheric ozone over western N. America: Perspectives from satellites and models (***Invited***)

Apr-1, 2015, ***Yosemite Transboundary Ozone Pollution Conference:*** Quantifying Asian influence on Western U.S. surface ozone exceedances and long-term trends (***Invited***)

Feb-19, 2015, ***CENRS Air Quality Research Subcommittee***: Key drivers of Western U.S. surface ozone variability over recent decades: Stratospheric intrusions, Asian pollution, and climate ***(Invited)***

Dec-15, 2014, ***American Geophysical Union Fall Meeting***: Key drivers of Western U.S. surface ozone variability from 1980-2050: From extreme events to background trends ***(Invited)***

Dec-19, 2014, ***American Geophysical Union Fall Meeting***: Role of climate variability on tropospheric ozone ***(Invited)***

June 2014, ***NASA Air Quality Applied Sciences Team (AQAST) Meeting***, Harvard University: Year-to-year variability in Western U.S. high-ozone events tied to stratospheric influence: Implications for seasonal prediction to aid regional air quality planning.

May 2014, IGAC/SPARC **Chemistry-Climate Model Initiative Workshop**, Lancaster, UK: Role of climate variability on tropospheric ozone variability and trends (***Invited***)

Dec 2013, **UN Task Force on Hemispheric Transport of Air Pollution (HTAP)**, San Francisco. Influence of decadal climate variability on hemispheric pollution transport.

Aug 2013, ***Hiram "Chip" Levy Symposium,*** Princeton: Footprints of decadal climate variability in ozone at Manna Loa Observatory

July 2013, **Western Regional Air Partnership (WRAP)**-*Western Air Quality Modeling Workshop*, Boulder: Asian and stratospheric influences on Western U.S. ozone variability and trends ***(Invited)***

Dec 2012, **American Geophysical Union (AGU) Fall Meeting 2012**, San Francisco: Developing space-based indicators of stratospheric influence on Western U.S. high surface ozone events

Nov 2012, ***NASA Sounder Science Team Meeting***, Maryland: Predicting Western U.S. high surface ozone events from Asian pollution and stratospheric intrusions: Exploration of AIRS Data ***(Invited)***

Oct 2012, ***Western States Air Resources Council (WESTAR)***-*Western Ozone Transport* Workshop, Nevada: Daily to decadal variability in sources of springtime surface ozone events over the western United States: stratospheric intrusions, Asian pollution, and fires ***(Invited)***

Oct 2012, ***NASA Aura Science Team Meeting***, Pasadena: Identifying and forecasting deep stratospheric ozone intrusions over the western United States from space ***(Invited)***

June 2012, ***NASA Air Quality Applied Sciences Team (AQAST) Meeting***, Wisconsin: Strong stratospheric influence on springtime surface high-O3 events over the western United States in spring: Not-so-rare events?

May 2012, ***California's South Coast Air Quality Management District (SCAQMD)***, Ontario: Global sources of local ozone pollution in Southern California ***(Invited)***

May 2012, ***NOAA Earth System Research Laboratory***, Chemical Science Division, Boulder: Background ozone over the United States in 1980-2010: origin, extremes, and long-term changes ***(Invited)***

Feb 2012, ***UN Task Force on Hemispheric Transport of Air Pollution (TF HTAP)***-*2011-2015 Work Plan Meeting, Pasadena*: Transport of Asian ozone pollution into surface air over the western United States in spring

Dec 2011, ***American Geophysical Union (AGU) Fall Meeting 2011***, San Francisco: Variability and changes in tropospheric ozone over the western United States (1980-2010): Exploring the roles of stratosphere-to-troposphere transport and El Nino-Southern Oscillation

Nov 2011, ***NASA AQAST Meeting, EPA Research Triangle Park***: Estimating background ozone and its specific components over the United States to support NAAQS-setting, implementation, and attainment planning,

Nov 2011, ***NASA AQAST Meeting, EPA Research Triangle Park***: Model Intercomparison of background ozone to inform NAAQS setting and implementation

Oct. 2011, ***NOAA Geophysical Fluid Dynamics Laboratory Science Symposium***, Princeton: Stratospheric impacts on ground-level ozone air quality over the western United States.

July 2011, ***NOAA Senior Research Council***, Princeton: Asian and stratospheric impacts on tropospheric ozone over western North America: means, extremes and the role of ENSO ***(Invited)***

Apr 2011, ***International Workshop on Tropospheric Ozone Changes,*** Toulouse, France: Trends and variability of tropospheric ozone at northern mid-latitudes in 1980-2010: Exploring the role of emissions, ENSO and STE

Dec 2010, **AGU Fall Meeting 2010**, San Francisco: Impacts of Asian emissions on ozone air quality over the western United States

Oct. 2009, **University of Tokyo**, **Institute of Industrial Science**, Japan: Connections between air pollution and the hydrological cycle

Oct. 2009, **Hong Kong Polytechnic University**, Hong Kong, China: Multi-scale model analysis of air pollution in Asia

Oct. 2009, **Acid Deposition Monitoring Network in East Asia (EANET)** - Regional Scientific Workshop, Japan: Multi-scale model analysis of EANET Data (***Invited***)

June 2009, **United Nations TF HTAP** - Linkages between regional and global modeling, air quality and climate change, Paris, France: Quantifying pollution inflow and outflow over East Asia through coupling regional and global models

Feb 2009, **International Institute for Applied Systems Analysis (IIASA)**, **Austria** - 11th workshop for Model Inter-Comparison Study for Asia: Inter-comparison of two regional atmospheric chemistry models (WRF-Chem and CMAQ) for East Asia

Nov 2008, **University of Wisconsin-Madison, Center for Climate Research** -Climate, People, and Environment Program Seminar: What controls the seasonality of boundary layer ozone in Asia?

Oct 2008, **United Nations TF HTAP**, **Vietnam**: Regional impacts of hemispheric air pollution transport

Feb 2008, **International Institute for Applied Systems Analysis (IIASA), Austria** -10th workshop for Model Inter-Comparison Study for Asia: Evaluating gaseous pollutants and source-receptor relationships for reactive nitrogen deposition in East Asia (***Invited***)