

KELVIN H. BATES, PH.D.

Research Scientist II, Cooperative Institute for Research in Environmental Science, University of Colorado
Tropospheric Chemistry group, Chemical Sciences Lab, NOAA
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EDUCATION

- Ph.D. in Chemistry, California Institute of Technology**, Pasadena, CA 2012 - 17
Thesis: "Isoprene Oxidation and Secondary Organic Aerosol Formation Under HO₂-Dominated Conditions"
Faculty mentors: Professors John Seinfeld, Paul Wennberg, and Brian Stoltz
- B.S. in Chemistry and Economics, Davidson College**, Davidson, NC 2008 - 12
Phi Beta Kappa, Summa cum Laude

PROFESSIONAL EXPERIENCE

RESEARCH

- Research Scientist II** 2023 -
Tropospheric Chemistry group, Chemical Sciences Laboratory, NOAA Earth Systems Research Laboratory, Boulder, CO
• Preparing, calibrating, and deploying a suite of aerosol mass spectrometers for the AEROMMA campaign
- Project Scientist** 2022 - 23
& Visiting Research Associate 2020 - 22
with Professor Tran Nguyen at University of California at Davis, Davis, CA
• Coordinated a compilation of nationwide laboratory studies in the Index of Chamber Atmospheric Research
• Studied organic aerosol and organonitrate production from nighttime chemistry of terpenes
• Performed experiments and simulations to quantify organic acid formation and sulfate chemistry in aerosols
- Research Associate** 2020 - 23
& Postdoctoral Fellow 2017 - 20
with Professor Daniel Jacob at Harvard University, Cambridge, MA
• Incorporated detailed isoprene oxidation chemistry into the GEOS-Chem global chemical transport model
• Investigated the effects of gas-phase organic oxidation on global oxidants cycles, aerosols, and trace gases
• Developed a new theoretical framework of odd oxygen for examination of tropospheric ozone budgets
• Led the chemistry subgroup of postdocs and grad students within the Atmos. Chem. Modeling Group
- Postdoctoral Scholar** Summer 2017
& Graduate Research Assistant 2012 - 17
with Professors John Seinfeld, Paul Wennberg, and Brian Stoltz at the California Institute of Technology, Pasadena, CA
• Determined rates and products of reactions in the OH-initiated oxidation of isoprene under low-NO conditions
• Examined factors affecting formation of organic aerosol from isoprene in an environmental chamber
• Synthesized chemical standards of isoprene-derived products for use in chamber experiments and calibrations
• Simulated the effects of isoprene oxidation in the global atmosphere with chemical transport modeling
• Measured aerosol concentration and composition over coastal CA in two aircraft campaigns (2015 & 2016)

TEACHING

Air Pollution	ECI 242	UC Davis	Instructor	Winter 2022
Environmental Fate of Toxicants	ETX 102A	UC Davis	Guest Lecturer	Winter 2021
Fellowship Writing	AGC 298	UC Davis	Guest Lecturer	Fall 2020
Atmospheric Chemistry	Ch/ESE/Ge 171	Caltech	Teaching Assistant	Spring 2015
Organic Chemistry I	Ch 41a	Caltech	Teaching Assistant	Fall 2013

AWARDS AND FELLOWSHIPS

UBC Early Career Invited Lecture Award	University of British Columbia	2021
Climate and Global Change Postdoctoral Fellowship	National Fellowship, NOAA	2017 - 19
Center for the Environment Postdoctoral Fellowship	Harvard University	2017 - 19
Selected to participate in ACCESS XIV	Brookhaven National Lab	Summer 2017
NSF Graduate Research Fellowship	National Fellowship, NSF	2014 - 17
Sharp Fellowship	California Institute of Technology	2012 - 13
David Halbert Howard, Jr. Chemistry Award	Davidson College, Dept. of Chemistry	Spring 2011

ACS Outstanding Scholastic Achievement Award	American Chemical Society, Regional Award	Spring 2011
Goldwater Scholarship Honorable Mention	National Fellowship	Spring 2011
Ernest F. Hollings Undergraduate Scholarship	National Fellowship, NOAA	2010 - 12
POLYED Award for Achievement in Organic Chemistry	Davidson College, Dept. of Chemistry	Spring 2010
Davidson Honor Scholarship	Davidson College	2008 - 12
Presidential Scholar	National Award	Spring 2008

AFFILIATIONS

American Geophysical Union (AGU)	member	2012 -
American Association for Aerosol Research (AAAR)	member	2014 -
American Meteorological Society	member	2018 -
American Chemical Society	member	2019 -

PUBLICATIONS

- Nguyen, T. B., **Bates, K. H.**, Buenconsejo, R., Charan, S. M., Cavanna, E. E., Cocker, D. R., Day, D. A., DeVault, M. P., Donahue, N. H., Finewax, Z., Habib, L. F., Handschy, A. V., Hildebrandt Ruiz, L., Hou, C.-Y. S., Jimenez, J. L., Joo, T., Klodt, A. L., Kong, W., Le, C., Masoud, C. G., Mayernik, M. S., Ng, N. L., Nienhouse, E. J., Nizkorodov, S. A., Orlando, J. J., Post, J. J., Sturm, P. O., Thrasher, B. L., Tyndall, G. S., Seinfeld, J. H., Worley, S. J., Zhang, X., and Ziemann, P. J. Overview of ICARUS – a curated, open access, online repository for atmospheric simulation chamber data. *ACS Earth Space Chem.*, 2023. *In review.*
- Yang, L. H., Jacob, D. J., Colombi, N. K., Zhai, S., **Bates, K. H.**, Shah, V., Beaudry, E., Yantosca, R. M., Lin, H., Brewer, J. F., Chong, H., Travis, K. R., Crawford, J. H., Lamsal, L., Koo, J.-H., and Kim, J. NO₂ vertical profiles over South Korea and their relation to oxidant chemistry: Implications for geostationary satellite retrievals and the observation of NO₂ diurnal variation from space. *Atmos. Chem. Phys.*, 23, 2465–2481, DOI: 10.5194/acp-23-2465-2023, 2023.
- Cope, J. D.‡, **Bates, K. H.**‡, Tran, L. N., Abellar, K. A., and Nguyen, T. B. Sulfur radical formation from the tropospheric irradiation of aqueous sulfate aerosols. *Proc. Nat'l Acad. Sci.*, 119 (36) e2202857119, DOI: 10.1073/pnas.2202857119, 2022. ‡co-first authors
- Choi, J., Henze, D. K., Cao, H., Nowlan, C. R., Abad, G. G., Kwon, H.-A., Lee, H.-M., Oak, Y., Park, R. J., **Bates, K. H.**, Maasakkers, J. D., Wisthaler, A., and Weinheimer, A. J. An inversion framework for optimizing non-methane VOC emissions using remote sensing and airborne observations in Northeast Asia during the KORUS-AQ field campaign. *J. Geophys. Res. – Atmos.*, 127 (7), DOI: 10.1029/2021JD035844, 2022.
- Allen, H. M., **Bates, K. H.**, Crounse, J. D., Kim, M. J., Teng, A. P., Ray, E. A., and Wennberg, P. O. H₂O₂ and CH₃OOH (MHP) in the remote atmosphere: II: Physical and chemical controls. *J. Geophys. Res. – Atmos.*, 127 (6), DOI: 10.1029/2021JD035702, 2022.
- Shen, L., Jacob, D. J., Santillana, M., **Bates, K. H.**, Zhuang, J., and Chen, W. A machine-learning-guided adaptive algorithm to reduce the computational cost of integrating kinetics in global atmospheric chemistry models: application to GEOS-Chem versions 12.0.0 and 12.9.1. *Geosci. Model Dev.*, 15, 1677-1687, DOI: 10.5194/gmd-15-1677-2022, 2022.
- Bates, K. H.**, Burke, G. J. P., Cope, J. D., and Nguyen, T. B. Secondary organic aerosol and organic nitrogen yields from the nitrate radical (NO₃) oxidation of alpha-pinene from various RO₂ fates. *Atmos. Chem. Phys.*, 22, 1467-1482, DOI: 10.5194/acp-22-1467-2022, 2022.
- Dovrou, E., **Bates, K. H.**, Moch, J. M., Mickley, L. J., Jacob, D. J., and Keutsch, F. N. Catalytic role of formaldehyde in particulate matter formation. *Proc. Nat'l Acad. Sci.*, 119 (6), e2113265119; DOI: 10.1073/pnas.2113265119, 2022.
- Bates, K. H.**, Jacob, D. J., Li, K., Ivatt, P. D., Evans, M. J., Yan, Y. and Lin, J. Development and evaluation of a new compact mechanism for aromatic oxidation in atmospheric models. *Atmos. Chem. Phys.*, 21, 18351-18374, DOI: 10.5194/acp-21-18351-2021, 2021.
- Bates, K. H.**, Cope, J. D., and Nguyen, T. B. Gas-phase oxidation rates and products of 1,2-dihydroxy isoprene. *Environ. Sci. Technol.*, 55 (20), 14294-14304, DOI: 10.1021/acs.est.1c04177, 2021.
- Dovrou, E., **Bates, K. H.**, Rivera-Rios, J. C., Cox, J. L., Shutter, J. D., and Keutsch, F. N. Towards a chemical mechanism of the oxidation of aqueous sulfur dioxide via isoprene hydroxyl hydroperoxides (ISOPOOH). *Atmos. Chem. Phys.*, 21, 8999-9008, DOI: 10.5194/acp-21-8999-2021, 2021.

34. Cope, J. D., Abellar, K. A., **Bates, K. H.**, Fu, X., and Nguyen, T. B. Aqueous OH Oxidation of Erythritol and Isoprene's 2-Methyltetrols as Sources of Formic and Acetic Acids in the Atmosphere. *ACS Earth Space Chem.*, 5 (6), 1265-1277. DOI: 10.1021/acsearthspacechem.1c00107, 2021.
33. Kwon, H.-A., Park, R. J., Oak, Y., Nowlan, C. R., Janz, S. J., Kowalewski, M. G., Fried, A., Walega, J., **Bates, K. H.**, Choi, J., Blake, D. R., Wisthaler, A., and Woo, J.-H.. Top-down estimates of anthropogenic VOC emissions in South Korea using formaldehyde vertical measurements from aircraft during the KORUS-AQ campaign. *Elem. Sci. Anth.*, 9 (1). DOI: 10.1525/elementa.2021.00109, 2021.
32. Zhai, S., Jacob, D. J., Wang, X., Liu, Z., Wen, T., Shah, V., Li, K., Moch, J. M., **Bates, K. H.**, Song, S., Shen, L., Zhang, Y., Luo, G., Yu, F., Sun, Y., Wang, L., Qi, M., Tao, J., Gui, K., Xu, H., Zhang, Q., Zhao, T., Wang, Y., Lee, H. C., Choi, H., and Liao, H. Control of particulate nitrate air pollution in China. *Nature Geosci.* Accepted, DOI: 10.1038/s41561-021-00726-z, 2021.
31. **Bates, K. H.**, Jacob, D. J., Wang, S., Hornbrook, R. S., Apel, E. C., Kim, M. J., Millet, D. B., Wells, K. C., Chen, X., Brewer, J. F., Ray, E. A., Commane, R., Diskin, G. S., and Wofsy, S. C. The global budget of atmospheric methanol: new constraints on secondary, oceanic, and terrestrial sources. *J. Geophys. Res. – Atmos.*, 126 (4). DOI: 10.1029/2020JD033439, 2021.
30. Li, K., Jacob, D. J., Liao, H., Qiu, Y., Shen, L., Zhai, S., **Bates, K. H.**, Sulprizio, M. P., Song, S., Lu, X., Zhang, Q., and Zheng, B. Ozone pollution in the North China Plain spreading into the late-winter haze season. *Proc. Nat'l Acad. Sci.*, 118 (10), DOI: 10.1073/pnas.2015797118, 2021.
29. Vasquez, K. T., Crounse, J. D., Schulze, B. C., **Bates, K. H.**, Teng, A. P., Xu, L., and Wennberg, P. O. Rapid hydrolysis of tertiary isoprene nitrate efficiently removes NO_x from the atmosphere. *Proc. Nat'l Acad. Sci.*, 117 (52) 33011-33016. DOI: 10.1073/pnas.2017442117, 2020.
28. Wells, K. C., Millet, D. B., Payne, V. H., Deventer, M. J., **Bates, K. H.**, de Gouw, J. A., Graus, M., Warneke, C., Wisthaler, A., and Fuentes, J. D. Global measurements of isoprene from space: Constraints on emissions and atmospheric oxidation over source regions. *Nature*, 585, 225-233, DOI: 10.1038/s41586-020-2664-3, 2020.
27. Wang, S., Apel, E., Schwantes, R. H., **Bates, K. H.**, Fischer, E., Hornbrook, R., Hills, A., Emmons, L., Tilmes, S., Lamarque, J.-F., Yang, M., Marandino, C., Saltzman, E., de Bruyn, W., Kameyama, S., Tanimoto, H., Omori, Y., Hall, S., Ullmann, K., Ryerson, T., Daube, B., Commane, R., McKain, K., Sweeney, C., Thames, A., Miller, D., Brune, W., Diskin, G., DiCangi, J., and Wofsy, S. Global atmospheric budget of acetone: air-sea exchange and the contribution to the hydroxyl radicals. *J. Geophys. Res. – Atmos.*, 125 (15). DOI: 10.1029/2020JD032553, 2020.
26. Link, M., Nguyen, T. B., **Bates, K. H.**, Müller, J.-F., and Farmer, D. Can isoprene oxidation explain high concentrations of atmospheric formic and acetic acid over forests? *ACS Earth Space Chem.*, 4 (5), 730-740, DOI: 10.1021/acsearthspacechem.0c00010, 2020.
25. Schulze, B. C., Charan, S. M., Kenseth, C. M., Kong, W., **Bates, K. H.**, Williams, W., Metcalf, A. R., Jonsson, H. H., Woods, R., Sorooshian, A., Flagan, R. C., and Seinfeld, J. H. Characterization of aerosol hygroscopicity over the Northeast Pacific Ocean: Impacts on prediction of CCN and stratocumulus cloud droplet number concentrations. *Earth Space Sci.*, 7, e2020EA001098, DOI: 10.1029/2020EA001098, 2020.
24. **Bates, K. H.** and Jacob, D. J. An expanded definition of the odd oxygen family for tropospheric ozone budgets: Implications for ozone lifetime and stratospheric influence. *Geophys. Res. Lett.*, 47, e2019GL084486, DOI: 10.1029/2019GL084486, 2020.
23. Möller, K. H., Kurtén, T., **Bates, K. H.**, Thornton, J. A., and Kjaergaard, H. G. Thermalized epoxide formation in the Atmosphere. *J. Phys. Chem. A*, 123 (49), 10620-10630, DOI: 10.1021/acs.jpca.9b09364, 2019.
22. Dovrou, E., Rivera-Rios, J. C., **Bates, K. H.** and Keutsch, F. N. Sulfate formation via cloud processing from isoprene hydroxyl hydroperoxides (ISOPOOH). *Environ. Sci. Technol.*, 53 (21), 12476-12484, DOI: 10.1021/acs.est.9b04645, 2019.
21. Li, K., Jacob, D. J., Liao, H., Zhu, J., Shah, V., Shen, L., **Bates, K. H.**, Zhang, Q., and Zhai, S. A two-pollutant strategy for improving ozone and particulate air quality in China. *Nature Geosci.* 12, 906-910, DOI: 10.1038/s41561-019-0464-x, 2019.
20. **Bates, K. H.** and Jacob, D. J. A new model mechanism for atmospheric oxidation of isoprene: Global effects on oxidants, nitrogen oxides, organic products, and secondary organic aerosol. *Atmos. Chem. Phys.*, 19, 9613-9640, DOI: 10.5194/acp-19-9613-2019, 2019.
19. Rooney, B., Zhao, R., Wang, Y., **Bates, K. H.**, Pillarisetti, A., Sharma, S., Kundu, S., Bond, T. C., Lam, N., Ozultun, B., Xu, L., Fleming, L. T., Weltman, R., Meinardi, S., Blake, D. R., Nizkorodov, S. A., Edwards, R. D., Yadav, A., Arora, N. K., Smith, K. R., and Seinfeld, J. H. Impacts of household sources on air pollution at village and regional scales in India. *Atmos. Chem. Phys.*, 19, 7719-7742. DOI: 10.5194/acp-19-7719-2019, 2019.
18. Schwantes, R. H., Charan, S. M., **Bates, K. H.**, Huang, Y., Nguyen, T. B., Mai, H., Kong, W., Flagan, R. C., and Seinfeld, J. H. Low-volatility compounds contribute significantly to isoprene sSOA under high-NO conditions. *Atmos. Chem. Phys.*, 19, 7255-7278. DOI: 10.5194/acp-19-7255-2019, 2019.

17. Møller, K. H., **Bates, K. H.**, and Kjaergaard, H. G. The importance of hydrogen shift reactions in atmospheric isoprene oxidation. *J. Phys. Chem. A*, 123 (4), 920-932. DOI: 10.1021/acs.jpca.8b10432, 2019.
16. Li, K., Jacob, D. J., Liao, H., Shen, L., Zhang, Q., and **Bates, K. H.** Anthropogenic drivers of 2013-2017 trends in summer surface ozone in China. *Proc. Nat'l Acad. Sci.*, 116 (2), 422-427, DOI: 10.1073/pnas.1812168116, 2019.
15. Allen, H. M., Teng, A. P., **Bates, K. H.**, Crouse, J. D., Thayer, M., Rivera-Rios, J., Keutsch, F., St. Clair, J. M., and Wennberg, P. O. Kinetics and product yields of the OH driven oxidation of hydroxymethyl hydroperoxide. *J. Phys. Chem. A*, 122 (30), 6292-6302, DOI: 10.1021/acs.jpca.8b04577, 2018.
14. Kalashnikova, O. V., Garay, M. J., Xu, F., **Bates, K. H.**, Kong, S., Kenseth, C., Cappa, C., Siedel, F., Yorks, J., Diner, D. J., Jonsson, H. H., and Seinfeld, J. H. Photopolarimetric sensitivity to black carbon content of wildfire smoke: Results from the 2016 IMPACT-PM field campaign. *J. Geophys. Res. – Atmos.*, 123 (10), 5376-5396, DOI: 10.1029/2017JD028032, 2018.
13. Wennberg, P. O., **Bates, K. H.**, Crouse, J. D., Dodson, L. G., McVay, R. C., Mertens, L. A., Nguyen, T. B., Praske, E., Schwantes, R. H., Smarte, M. D., St. Clair, J. M., Teng, A. P., Zhang, X., and Seinfeld, J. The gas-phase oxidation of isoprene and its first-generation products. *Chem. Rev.*, 118 (7), 3337-3390, DOI: 10.1021/acs.chemrev.7b00439, 2018.
12. Sorooshian, A., MacDonald, A. B., Dadashazar, H., **Bates, K. H.**, Coggon, M. M., Craven, J. S., Crosbie, E., Hersey, S. P., Hodas, N., Lin, J. J., Negrón Marty, A., Maudlin, L. C., Metcalf, A. R., Murphy, S. M., Prabhakar, G., Rissman, T. A., Shingler, T., Varutbangkul, T., Wang, Z., Woods, R. K., Chuang, P. Y., Nenes, A., Jonsson, H. H., Flagan, R. C., and Seinfeld, J. H. A multi-year data set on aerosol-cloud-precipitation-meteorology interactions for marine stratocumulus clouds. *Scientific Data*, 5, 180026, DOI: 10.1038/sdata.2018.26, 2018.
11. **Bates, K. H.**, Nguyen, T. B., Teng, A. P., Crouse, J. D., Kjaergaard, H. G., Stoltz, B. M., Seinfeld, J. H., and Wennberg, P. O. Production and fate of C₄ dihydroxycarbonyl compounds from isoprene oxidation. *J. Phys. Chem. A*, 120 (1), 106-117, DOI: 10.1021/acs.jpca.5b10335, 2016.
10. Wang, Z., Ramirez, M. M., Dadashazar, H., MacDonald, A., Crosbie, E., **Bates, K. H.**, Coggon, M. M., Craven, J. S., Lynch, P., Campbell, J. R., Aghdam, M. A., Woods, R. K., Jonsson, H., Flagan, R. C., Seinfeld, J. H., and Sorooshian, A. Contrasting cloud composition between coupled and decoupled marine boundary layer clouds. *J. Geophys. Res. – Atmos.*, 121 (19), 11679-11691, DOI: 10.1002/2016JD025695, 2016.
9. Nguyen, T. B., Crouse, J. D., Teng, A. P., Coggon, M. M., Schwantes, R. H., **Bates, K. H.**, Zhang, L., Feiner, P., Miller, D. C., Skog, K., Rivera, J., Olson, K., Koss, A., Goldstein, A. H., de Gouw, J., Tyndall, G., Brun, W. H., Keutsch, F. N., Seinfeld, J. H., and Wennberg, P. O. Atmospheric fates of Criegee intermediates in the ozonolysis of isoprene. *Phys. Chem. Chem. Phys.*, 18, 10241-10254, DOI: 10.1039/C6CP00053C, 2016.
8. Liu, Y., Brito, J., Dorris, M., Rivera-Rios, J. C., Seco, R., **Bates, K. H.**, Artaxo, P., Duvoisin, S., Keutsch, F. N., Kim, S., Goldstein, A. H., Guenther, A., Manzi, A.-O., de Souza, R., Springston, S. R., Watson, T. B., McKinney, K. A., and Martin, S. T. Isoprene photochemistry over the Amazon rain forest. *Proc. Nat'l. Acad. Sci.*, 113 (22), 6125-6130, DOI: 10.1073/pnas.1524136113, 2016.
7. Zhang, X., Dalleska, N. F., Huang, D. D., **Bates, K. H.**, Sorooshian, A., Flagan, R. C., and Seinfeld, J. H. Time-resolved molecular characterization of water-soluble organic aerosols by PILS + UPLC/ESI-ToF/MS. *Atmos. Env.*, 130, 180-189. DOI: 10.1016/j.atmosenv.2015.08.049, 2016.
6. St. Clair, J. M., Rivera-Rios, J. C., Crouse, J. D., Knap, H. C., **Bates, K. H.**, Teng, A. P., Jørgensen, S., Kjaergaard, H. G., Keutsch, F. N., and Wennberg, P. O. Kinetics and products for the reaction of the first-generation isoprene hydroxy hydroperoxide (ISOPOOH) with OH. *J. Phys. Chem. A*, 120 (9), 1441-1451. DOI: 10.1021/acs.jpca.5b06532, 2016.
5. Nguyen, T. B., **Bates, K. H.**, Crouse, J. D., Schwantes, R. H., Zhang, X., Kjaergaard, H. G., Surratt, J. D., Lin, P., Laskin, A., Seinfeld, J. H., and Wennberg, P. O. Mechanism of the hydroxyl radical oxidation of methacryloyl peroxyoxynitrate (MPAN) and its pathway toward secondary organic aerosol formation in the atmosphere. *Phys. Chem. Chem. Phys.*, 17, 17914-17926. DOI: 10.1039/C5CP02001H, 2015.
4. Praske, E., Crouse, J. D., **Bates, K. H.**, Kurtén, T., Kjaergaard, H. G., Wennberg, P. O. (2015) Atmospheric fate of methyl vinyl ketone: peroxy radical reactions with NO and HO₂. *J. Phys. Chem. A*, 119 (19), 4562-4572. DOI: 10.1021/jp5107058, 2015.
3. **Bates, K. H.**, Crouse, J. D., St. Clair, J. M., Bennett, N. B., Nguyen, T. B., Seinfeld, J. H., Stoltz, B. M., Wennberg, P. O. Gas phase production and loss of isoprene epoxydiols. *J. Phys. Chem. A*, 118 (7), 1237-1246. DOI: 10.1021/jp4107958, 2014.
2. Nguyen, T. B., Crouse, J. D., Schwantes, R. H., Teng, A. P., **Bates, K. H.**, Zhang, X., St. Clair, J. M., Brune, W. H., Tyndall, G. S., Keutsch, F. N., Seinfeld, J. H., Wennberg, P. O. Overview of the Focused Isoprene eXperiments at California Institute of Technology (FIXCIT): mechanistic chamber studies on the oxidation of biogenic compounds. *Atmos. Chem. Phys.*, 14, 13531-13549. DOI: 10.5194/acp-14-13531-2014, 2014.

1. Nguyen, T. B., Coggon, M. M., **Bates, K. H.**, Zhang, X., Schwantes, R. H., Schilling, K. A., Loza, C. L., Flagan, R. C., Wennberg, P. O., Seinfeld, J. H. Organic aerosol formation from the reactive uptake of isoprene epoxydiols (IEPOX) onto non-acidified inorganic seeds. *Atmos. Chem. Phys.*, 14, 3497-3510. DOI: 10.5194/acp-14-3497-2014, 2014.

PRESENTATIONS AND POSTERS

INVITED TALKS

- 2023 Bates, K. H., Particulate pollution as miniature chemical reactors: balancing the budgets of organic aerosol, reactive nitrogen, and organic acids in the atmosphere. Department of Mechanical Engineering, *University of Colorado*, February, Boulder, CO (virtual).
- 2023 Bates, K. H., Particulate pollution as miniature chemical reactors: balancing the budgets of organic aerosol, reactive nitrogen, and organic acids in the atmosphere. Department of Chemical & Environmental Engineering, *University of Arizona*, February, Tucson, AZ.
- 2023 Bates, K. H., Particulate pollution as miniature chemical reactors: balancing the budgets of organic aerosol, reactive nitrogen, and organic acids in the atmosphere. Department of Chemistry, *University of Copenhagen*, February, Copenhagen, Denmark.
- 2022 Bates, K. H., The nighttime chemistry of terpenes: aerosol & organonitrate formation. Atmospheric Chemistry Colloquium, *Massachusetts Institute of Technology*, November, Cambridge, MA (virtual).
- 2022 Bates, K. H., Remote tropospheric measurements and global atmospheric budgets of methanol and ethanol. Air Quality Chemistry & Physics Seminar Series, *UC Davis*, April, Davis, CA.
- 2021 Bates, K. H., Particulate pollution as miniature chemical reactors: balancing the budgets of organic aerosol, reactive nitrogen, and organic acids in the atmosphere, Program in Atmospheres, Oceans, and Climate Lunchtime Seminar, *Massachusetts Institute of Technology*, November, Cambridge, MA (virtual).
- 2021 Bates, K. H., Atmospheric particles as miniature chemical reactors: rethinking the sources and sinks of organic aerosol. Early Career Invited Lecture in Chemistry, *Univ. British Columbia*, September, Vancouver, BC.
- 2019 Bates, K. H., Global implications of a new model mechanism for atmospheric oxidation of isoprene. *Massachusetts Institute of Technology*, April, Cambridge, MA.
- 2019 Bates, K. H., Redefining odd oxygen: a new budget diagnostic for tropospheric ozone. *National Center for Atmospheric Research*, March, Boulder, CO.
- 2018 Bates, K. H., The influence of isoprene on global atmospheric oxidant budgets. *University of Washington*, April, Seattle, WA.
- 2018 Bates, K. H., Atmospheric isoprene oxidation and smog formation in remote environments. *Kobenhavns Universitet*, March, Copenhagen, Denmark.

CONFERENCE TALKS

- 2022 Bates, K. H., *et al.* Sources and chemistry of ethanol. *International GEOS-Chem Conference*, June, St. Louis, MO.
- 2022 Bates, K. H., *et al.* Organic aerosol photooxidation as a major source of formic and acetic acids to the continental boundary layer. *American Meteorological Society Annual Meeting*, January, Houston, TX (virtual).
- 2021 Bates, K. H., *et al.* Dimer formation and SOA yields from the reaction of α -pinene with NO_3 . *Pacificchem*, December, Honolulu, HI (virtual).
- 2021 Bates, K. H., *et al.* SOA and organic nitrate formation from the reaction of α -pinene with NO_3 under simulated nighttime conditions, *American Association for Aerosol Research*, October, Albuquerque, NM (virtual).
- 2021 Bates, K. H., *et al.* Increased photochemical sinks help balance the SOA budget: experimental evidence and modeling results, *American Association for Aerosol Research*, October, Albuquerque, NM (virtual).
- 2020 Bates, K. H., *et al.* Intercomparison and optimization of aromatic oxidation mechanisms. *Atmospheric Chemical Mechanisms*, November, Davis, CA (virtual).
- 2020 Bates, K. H., *et al.* Organic hydroperoxides and the catalytic role of formaldehyde in atmospheric sulfate formation. *American Chemical Society Fall Meeting*, August, San Francisco, CA (virtual). Invited.
- 2020 Bates, K. H., *et al.* An expanded definition of the odd oxygen family for tropospheric ozone budgets: Implications for ozone lifetime, stratospheric influence, and source tagging. *American Meteorological Society Annual Meeting*, January, Boston, MA. Invited.
- 2019 Bates, K. H., *et al.* Modeling the effects of an updated isoprene oxidation mechanism on organic aerosol, reactive nitrogen, and sulfate budgets. *American Association for Aerosol Research*, October, Portland, OR.

- 2019 Bates, K. H., *et al.* Redefining odd oxygen: a new budget diagnostic for tropospheric ozone. *International GEOS-Chem Conference*, May, Cambridge, MA.
- 2019 Bates, K. H., *et al.* An expanded definition of odd oxygen for improved tropospheric ozone accounting. *American Meteorological Society Annual Meeting*, January, Phoenix, AZ.
- 2017 Bates, K. H., *et al.* Isoprene oxidation mechanisms and secondary organic aerosol formation under HO₂-dominated conditions. *ACCESS XIV*, July, Brookhaven, NY.
- 2017 Bates, K. H., *et al.* Updated isoprene chemistry in GEOS-Chem: mechanisms and impacts. *International GEOS-Chem Conference*, May, Cambridge, MA.
- 2016 Bates, K. H., *et al.* Incorporating recent advances in isoprene photooxidation into GEOS-Chem: Effects on oxidant, NO_x, and VOC budgets. *American Geophysical Union Fall Meeting*, December, San Francisco, CA.
- 2016 Bates, K. H., *et al.* Determinants of isoprene SOA yields from recent comprehensive chamber studies. *American Association for Aerosol Research*, October, Portland, OR.
- 2015 Bates, K. H., *et al.* Secondary organic aerosol yields from isoprene oxidation under low-NO conditions. *American Association for Aerosol Research*, October, Minneapolis, MN.

CONFERENCE POSTERS

- 2020 Bates, K. H., *et al.* The global budget of atmospheric methanol: new constraints on secondary, oceanic, and terrestrial sources. *American Geophysical Union Fall Meeting*, December, San Francisco, CA (virtual).
- 2019 Bates, K. H., *et al.* Combined volatility-based partitioning and reactive-uptake parameterizations of SOA formation in GEOS-Chem: Application to isoprene. *European Aerosol Conference*, August, Gothenburg, Sweden.
- 2019 Bates, K. H., *et al.* An expanded definition of the odd oxygen family for tropospheric ozone budgets. *Gordon Research Conference on Atmospheric Chemistry*, July, Newry, ME.
- 2018 Bates, K. H., *et al.* Modeling the effects of isoprene oxidation and hydrogen shift reactions on HO_x, NO_x, and ozone. *American Geophysical Union Fall Meeting*, December, Washington, DC.
- 2018 Bates, K. H., *et al.* Coupled gas and particle phase modeling of isoprene SOA formation. *American Association for Aerosol Research*, September, St. Louis, MO.
- 2018 Bates, K. H., *et al.* New constraints on budgets of oxidized volatile organic compounds in the remote troposphere. *iCACGP-IGAC*, September, Takamatsu, Kagawa, Japan.
- 2017 Bates, K. H., *et al.* Modeling the formation of secondary organic aerosol precursors from isoprene. *American Association for Aerosol Research*, October, Raleigh, NC.
- 2017 Bates, K. H., *et al.* A new explicit model of isoprene oxidation. *Gordon Research Conference on Atmospheric Chemistry*, August, Newry, ME.
- 2015 Bates, K. H., *et al.* AMS observations over coastal California from the Biological and Oceanic Atmospheric Study (BOAS). *American Geophysical Union Fall Meeting*, December, San Francisco, CA.
- 2015 Bates, K. H., *et al.* Recent revisions to isoprene photochemistry based on Caltech chamber and field data. *International GEOS-Chem Conference*, May, Cambridge, MA.
- 2014 Bates, K. H., *et al.* Photooxidation products of isoprene epoxydiol (IEPOX) and IEPOX-derived secondary organic aerosol. *American Geophysical Union Fall Meeting*, December, San Francisco, CA.
- 2014 Bates, K. H., *et al.* Photooxidation of isoprene epoxydiol (IEPOX)-derived secondary organic aerosol. *American Association for Aerosol Research*, October, Orlando, FL. (student poster competition winner)
- 2013 Bates, K. H., *et al.* Gas-phase production and loss of isoprene epoxydiols. *American Geophysical Union Fall Meeting*, December, San Francisco, CA.
- 2012 Bates, K. H., *et al.* Signature alkane ratios and hydrocarbon emission estimates for western Kern County oilfields. *American Geophysical Union Fall Meeting*, December, San Francisco, CA.

TECHNICAL SKILLS

Computer proficiency: IGOR Pro (data analysis); MatLab, Mathematica, and MathCad (mathematical programming); GEOS-Chem (chemical transport modeling); Spartan (molecular modeling); LaTeX; MS Office; LabVIEW (visual programming interface); IDL, Fortran 77/90, Python, R, html (programming).

Atmospheric chemistry instrumentation: proficient with aerosol mass spectrometry, scanning mobility particle sizer, differential mobility analyzer, condensation particle counter, chemical ionization mass spectrometry; some experience with nephelometer, single particle soot photometer, wideband integrated bioaerosol sampler.

Analytical chemistry instrumentation: proficient with HPLC, NMR spectroscopy, FT-IR and UV/Vis spectroscopy, GC-MS, bomb calorimetry.

Biochemistry: proficient with DNA extraction, RT-PCR, flow cytometry, gel extraction, gel electrophoresis, column chromatography, cell feeding, cell counting, luciferase assays.

Reviewer: *Proc. Nat'l. Acad. Sci., Atmos. Chem. Phys., J. Geophys. Res. - Atmos., ACS Earth & Space Chem., Geosci. Model Dev., Beilstein J. Org. Chem., Atmos. Environ., Environ. Sci. & Technol., Geophys. Res. Lett.*

Languages: fluent in English, proficient in Spanish, conversant in French

ACTIVITIES AND LEADERSHIP

Chemistry subgroup leader, Atmospheric Chemistry Modeling Group, Harvard	2018 - 2022
Coordinator, Atmospheric & Environmental Chemistry Seminar Series, Harvard	2017 - 2019
Resident Associate, Page House, Caltech	2014 - 2017
Communications Officer, Science and Engineering Policy at Caltech (SEPAC)	2015 - 2017
Caltech PRISM (LGBTQ alliance)	
President	2014 - 2015
Treasurer	2013 - 2014 & 2015 - 2016
Extracurricular Players at Caltech (EXPLiCIT; student theater group)	
President	2014 - 2016
Vice President	2013 - 2014
Secretary	2016 - 2017