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### DEGREES:

June, 1994 Ph.D. in Physical Chemistry, Harvard University, Cambridge, MA

June, 1985 B.A. in Chemistry, Oberlin College, Oberlin, OH.

### PROFESSIONAL APPOINTMENTS:

2014 – Director, Linde Center for Global Environmental Science, Caltech.

2008 – 2011 Director, Linde Center for Global Environmental Science, Caltech.

2005 Visiting Prof., Dept. of Chem., University of Otago, New Zealand

2005 – 2006 Secretary of the Atmospheric Sciences Section, American Geophysical Union.

2004 – R. Stanton Avery Professor of Atmospheric Chemistry and Environmental Science and Engineering, California Institute of Technology.

2001 – 2004 Professor of Atmospheric Chemistry and Environmental Science and Engineering, California Institute of Technology.

1998 – 2001 Associate Professor of Atmospheric Chemistry and Environmental Engineering Science, California Institute of Technology.

1994 – 1997 Postdoctoral Research Fellow, Department of Chemistry, Harvard University.

### HONORS AND AWARDS:

2013 Fellow, American Geophysical Union

2002 MacArthur Fellow

1999 – 2003 Presidential Early Career Award for Scientists and Engineers (PECASE)

1992 – 1993 Hughes Corp., Graduate Fellowship.

1986 – 1988 National Science Foundation Graduate Fellowship.

### LARGE PROJECTS:

2000 – Founding science team member Orbiting Carbon Observatory (OCO, OCO-2)

2002 – Chair, Total Carbon Column Observing Network (TCCON)

2010 – 2012 PI, Mars Atmospheric Trace Molecule Occultation Spectrometer (MATMOS)

## PUBLICATIONS:

1. Lee, L, Teng, AP, Wennberg, PO, Crouse, JD, Cohen, RC, “On Rates and Mechanisms of OH and O<sub>3</sub> Reactions with Isoprene-Derived Hydroxy Nitrates”, *J. Phys. Chem. A*, 118, 1622, 2014.
2. Bates, KH, Crouse, JD, St Clair, JM, Bennett, NB, Nguyen, TB, Seinfeld, JH, Stoltz, BM, Wennberg, PO, “Gas Phase Production and Loss of Isoprene Epoxydiols”, *J. Phys. Chem. A*, 118, 1237, 2014.
3. Rex, M, Wohltmann, I, Ridder, T, Lehmann, R, Rosenlof, K, Wennberg, P, Weisenstein, D, Notholt, J, Kruger, K, Mohr, V, Tegtmeier, S, “A tropical West Pacific OH minimum and implications for stratospheric composition”, *Atmos. Chem. Phys.*, 14, 4827-4841, 2014.
4. Gentner, DR, Ford, TB, Guha, A, Boulanger, K, Brioude, J, Angevine, WM, de Gouw, JA, Warneke, C, Gilman, JB, Ryerson, TB, Peischl, J, Meinardi, S, Blake, DR, Atlas, E, Lonneman, WA, Kleindienst, TE, Beaver, MR, St Clair, JM, Wennberg, PO, VandenBoer, TC, Markovic, MZ, Murphy, JG, Harley, RA, Goldstein, AH, “Emissions of organic carbon and methane from petroleum and dairy operations in California's San Joaquin Valley”, *Atmos. Chem. Phys.*, 14, 4955-4978, 2014.
5. St Clair, JM, Spencer, KM, Beaver, MR, Crouse, JD, Paulot, F, Wennberg, PO, “Quantification of hydroxyacetone and glycolaldehyde using chemical ionization mass spectrometry”, *Atmos. Chem. Phys.*, 14, 4251-4262, 2014.
6. Galli, A, Guerlet, S, Butz, A, Aben, I, Suto, H, Kuze, A, Deutscher, NM, Notholt, J, Wunch, D, Wennberg, PO, Griffith, DWT, Hasekamp, O, Landgraf, J, “The impact of spectral resolution on satellite retrieval accuracy of CO<sub>2</sub> and CH<sub>4</sub>”, *Atmos. Meas. Tech.*, 7, 1105-1119, 2014.
7. Pusede, SE, Gentner, DR, Wooldridge, PJ, Browne, EC, Rollins, AW, Min, KE, Russell, AR, Thomas, J, Zhang, L, Brune, WH, Henry, SB, DiGangi, JP, Keutsch, FN, Harrold, SA, Thornton, JA, Beaver, MR, St Clair, JM, Wennberg, PO, Sanders, J, Ren, X, VandenBoer, TC, Markovic, MZ, Guha, A, Weber, R, Goldstein, AH, Cohen, RC, “On the temperature dependence of organic reactivity, nitrogen oxides, ozone production, and the impact of emission controls in San Joaquin Valley, California”, *Atmos. Meas. Tech.*, 14, 3373-3395, 2014.
8. Nguyen, TB, Coggon, MM, Bates, KH, Zhang, X, Schwantes, RH, Schilling, KA, Loza, CL, Flagan, RC, Wennberg, PO, Seinfeld, JH, “Organic aerosol formation from the reactive uptake of isoprene epoxydiols (IEPOX) onto non-acidified inorganic seeds”, *Atmos. Chem. Phys.*, 14, 3497-3510, 2014.
9. Deng, F, Jones, DBA, Henze, DK, Bousserez, N, Bowman, KW, Fisher, JB, Nassar, R, O'Dell, C, Wunch, D, Wennberg, PO, Kort, EA, Wofsy, SC, Blumenstock, T, Deutscher, NM, Griffith, DWT, Hase, F, Heikkinen, P, Sherlock, V, Strong, K, Sussmann, R, Warneke, T, “Inferring regional sources and sinks of atmospheric CO<sub>2</sub> from GOSAT XCO<sub>2</sub> data”, *Atmos. Chem. Phys.*, 14, 3703-3727, 2014.
10. Crouse, JD, Nielsen, LB, Jorgensen, S, Kjaergaard, HG, Wennberg, PO, “Autoxidation of Organic Compounds in the Atmosphere”, *J. Phys. Chem. Lett.*, 7, 3513-3520, 2013.
11. Mao, JQ, Paulot, F, Jacob, DJ, Cohen, RC, Crouse, JD, Wennberg, PO, Keller, CA, Hudman, RC, Barkley, MP, Horowitz, LW, “Ozone and organic nitrates over the eastern United States: Sensitivity to isoprene chemistry”, *J. Geophys. Res.*, 118, 11256-11268, 2013.
12. Worton, DR, Surratt, JD, LaFranchi, BW, Chan, AWH, Zhao, YL, Weber, RJ, Park, JH, Gilman, JB, de Gouw, J, Park, C, Schade, G, Beaver, M, St Clair, JM, Crouse, J, Wennberg,

- P, Wolfe, GM, Harrold, S, Thornton, JA, Farmer, DK, Docherty, KS, Cubison, MJ, Jimenez, JL, Frossard, AA, Russell, LM, Kristensen, K, Glasius, M, Mao, JQ, Ren, XR, Brune, W, Browne, EC, Pusede, SE, Cohen, RC, Seinfeld, JH, Goldstein, AH, "Observational Insights into Aerosol Formation from Isoprene", *Env. Sci. Tech.*, 47, 11403-11413, 2013.
13. Kjaergaard, HG, Kurten, T, Nielsen, LB, Jorgensen, S, Wennberg, PO, "Criegee Intermediates React with Ozone", *J. Phys. Chem. Lett.*, 4, 2525-2529, 2013.
  14. Keppel-Aleks, G, Randerson, JT, Lindsay, K, Stephens, BB, Keith Moore, J, Doney, SC, Thornton, PE, Mahowald, NM, Hoffman, FM, Sweeney, C, Tans, PP, Wennberg, PO, Wofsy, SC, "Atmospheric Carbon Dioxide Variability in the Community Earth System Model: Evaluation and Transient Dynamics during the Twentieth and Twenty-First Centuries", *J. Climate*, 26, 4447-4475, 2013.
  15. Oshchepkov, S, Bril, A, Yokota, T, Wennberg, PO, Deutscher, NM, Wunch, D, Toon, GC, Yoshida, Y, O'Dell, CW, Crisp, D, Miller, CE, Frankenberg, C, Butz, A, Aben, I, Guerlet, S, Hasekamp, O, Boesch, H, Cogan, A, Parker, R, Griffith, D, Macatangay, R, Notholt, J, Sussmann, R, Rettinger, M, Sherlock, V, Robinson, J, Kyro, E, Heikkinen, P, Feist, DG, Morino, I, Kadyrov, N, Belikov, D, Maksyutov, S, Matsunaga, T, Uchino, O, Watanabe, H, "Effects of atmospheric light scattering on spectroscopic observations of greenhouse gases from space. Part 2: Algorithm intercomparison in the GOSAT data processing for CO<sub>2</sub> retrievals over TCCON sites", *J. Geophys. Res.*, 118, 1493-1512, 2013.
  16. Hase, F, Drouin, BJ, Roehl, CM, Toon, GC, Wennberg, PO, Wunch, D, Blumenstock, T, Desmet, F, Feist, DG, Heikkinen, P, De Maziere, M, Rettinger, M, Robinson, J, Schneider, M, Sherlock, V, Sussmann, R, Te, Y, Warneke, T, Weinzierl, C, "Calibration of sealed HCl cells used for TCCON instrumental line shape monitoring", *Atmos. Meas. Tech.*, 6, 3527-3537, 2013.
  17. Mandrake, L, Frankenberg, C, O'Dell, CW, Osterman, G, Wennberg, P, Wunch, D, "Semi-autonomous sounding selection for OCO-2", *Atmos. Meas. Tech.*, 6, 2851-2864, 2013.
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  20. Xie, Y, Paulot, F, Carter, WPL, Nolte, CG, Luecken, DJ, Hutzell, WT, Wennberg, PO, Cohen, RC, Pinder, RW, "Understanding the impact of recent advances in isoprene photooxidation on simulations of regional air quality", *Atmos. Chem. Phys.*, 13, 8439-8455, 2013.
  21. Yoshida, Y, Kikuchi, N, Morino, I, Uchino, O, Oshchepkov, S, Bril, A, Saeki, T, Schutgens, N, Toon, GC, Wunch, D, Roehl, CM, Wennberg, PO, Griffith, DWT, Deutscher, NM, Warneke, T, Notholt, J, Robinson, J, Sherlock, V, Connor, B, Rettinger, M, Sussmann, R, Ahonen, P, Heikkinen, P, Kyro, E, Mendonca, J, Strong, K, Hase, F, Dohe, S, Yokota, T, "Improvement of the retrieval algorithm for GOSAT SWIR XCO<sub>2</sub> and XCH<sub>4</sub> and their validation using TCCON data", *Atmos. Meas. Tech.*, 6, 1533-1547, 2013.
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23. Keppel-Aleks, G, Wennberg, PO, O'Dell, CW, Wunch, D, "Towards constraints on fossil fuel emissions from total column carbon dioxide", *Atmos. Chem. Phys.*, 13, 4349-4357, 2013.
24. Browne, EC, Min, KE, Wooldridge, PJ, Apel, E, Blake, DR, Brune, WH, Cantrell, CA, Cubison, MJ, Diskin, GS, Jimenez, JL, Weinheimer, AJ, Wennberg, PO, Wisthaler, A, Cohen, RC, "Observations of total RONO<sub>2</sub> over the boreal forest: NO<sub>x</sub> sinks and HNO<sub>3</sub> sources", *Atmos. Chem. Phys.*, 13, 4543-4563, 2013.
25. Frankenberg, C, Wunch, D, Toon, G, Risi, C, Scheepmaker, R, Lee, JE, Wennberg, P, Worden, J, "Water vapor isotopologue retrievals from high-resolution GOSAT shortwave infrared spectra", *Atmos. Meas. Tech.*, 6, 263-274, 2013.
26. Belikov, DA, Maksyutov, S, Sherlock, V, Aoki, S, Deutscher, NM, Dohe, S, Griffith, D, Kyro, E, Morino, I, Nakazawa, T, Notholt, J, Rettinger, M, Schneider, M, Sussmann, R, Toon, GC, Wennberg, PO, Wunch, D, "Simulations of column-averaged CO<sub>2</sub> and CH<sub>4</sub> using the NIES TM with a hybrid sigma-isentropic (sigma-theta) vertical coordinate", *Atmos. Chem. Phys.*, 13, 1713-1732, 2013.
27. Kwan, AJ, Chan, AWH, Ng, NL, Kjaergaard, HG, Seinfeld, JH, Wennberg, PO, "Peroxy radical chemistry and OH radical production during the NO<sub>3</sub>-initiated oxidation of isoprene" *Atmos. Chem. Phys.*, 12, 7499-7515, 2012.
28. Wennberg, PO, Mui, W, Wunch, D, Kort, EA, Blake, DR, Atlas, EL, Santoni, GW, Wofsy, SC, Diskin, GS, Jeong, S, Fischer, ML, "On the sources of methane to the Los Angeles atmosphere", *Environ. Sci. Technol.*, 46, 9282-9289, 2012.
29. Olson, JR, Crawford, JH, Brune, W, Mao, J, Ren, X, Fried, A, Anderson, B, Apel, E, Beaver, M, Blake, D, Chen, G, Crouse, J, Dibb, J, Diskin, G, Hall, SR, Huey, JG, Knapp, D, Richter, D, Riemer, D, St. Clair, J, Ullmann, K, Walega, J, Weibring, P, Weinheimer, A, Wennberg, P, Wisthaler, A, "An analysis of fast photochemistry over high northern latitudes during spring and summer using in-situ observations from ARCTAS and TOPSE", *Atmos. Chem. Phys.*, 12, 6799-6825, 2012.
30. Eddingsaas, NC, Loza, CL, Yee, LD, Chan, M, Schilling, KA, Chhabra, PS, Seinfeld, JH, Wennberg, PO, "α-pinene photooxidation under controlled chemical conditions – Part 2: SOA yield and composition in low- and high-NO<sub>x</sub> environments", *Atmos. Chem. Phys.*, 12, 7413-7427, 2012.
31. Eddingsaas, NC, Loza, CL, Yee, LD, Seinfeld, JH, Wennberg, PO "α-pinene photooxidation under controlled chemical conditions – Part 1: Gas-phase composition in low- and high-NO<sub>x</sub> environments", *Atmos. Chem. Phys.*, 12, 6489-6504, 2012.
32. Oshchepkov, S, Bril, A, Yokota, T, Morino, I, Yoshida, Y, Matsunaga, T, Belikov, D, Wunch, D, Wennberg, P, Toon, G, O'Dell, C, Butz, A, Guerlet, S, Cogan, A, Boesch, H, Eguchi, N, Deutscher, N, Griffith, D, Macatangay, R, Notholt, J, Sussmann, R, Rettinger, M, Sherlock, V, Robinson, J, Kyro, E, Heikkinen, P, Feist, DG, Nagahama, T, Kadygrov, N, Maksyutov, S, Uchino, O, Watanabe, H, "Effects of atmospheric light scattering on spectroscopic observations of greenhouse gases from space: Validation of PPDF-based CO<sub>2</sub> retrievals from GOSAT", *J. Geophys. Res.*, 117, D12305, 2012.
33. Crouse, JD, Knap, HC, Ornsø, KB, Jørgensen, S, Paulot, F, Kjaergaard, HG, Wennberg, PO, "Atmospheric Fate of methacrolein. 1. Peroxy radical isomerization following addition of OH and O<sub>2</sub>", *J. Phys. Chem.*, 116, 5756-5762, 2012.
34. Kjaergaard, HG, Knap, HC, Ornsø, KB, Jørgensen, S, Crouse, JD, Paulot, F, Wennberg, PO, "Atmospheric fate of methacrolein. 2. Formation of lactone and implications for organic aerosol production", *J. Phys. Chem.*, 116, 5763-5768, 2012.

35. Risi, C, Noone, D, Worden, J, Frankenberg, C, Stiller, G, Kiefer, M, Funke, B, Walker, K, Bernath, P, Schneider, M, Wunch, D, Sherlock, V, Deutscher, N, Griffith, D, Wennberg, PO, Strong, K, Smale, D, Mahieu, E, Barthlott, S, Hase, F, Garcia, O, Notholt, J, Warneke, T, Toon, G, Sayres, D, Bony, S, Lee, J, Brown, D, Uemura, R, Sturm, C, "Process-evaluation of tropospheric humidity simulated by general circulation models using water vapor isotopologues: 1. Comparison between models and observations", *J. Geophys. Res.*, 117, D05303, 2012.
36. Beaver, MR, St Clair, JM, Paulot, F, Spencer, KM, Crouse, JD, LaFranchi, BW, Min, KE, Pusede, SE, Wooldridge, PJ, Schade, GW, Park, C, Cohen, RC, Wennberg, PO, "Importance of biogenic precursors to the budget of organic nitrates: observations of multifunctional organic nitrates by CIMS and TD-LIF during BEARPEX 2009", *Atmos. Chem. Phys.*, 12, 5773-5785, 2012.
37. Galli, A, Butz, A, Scheepmaker, RA, Hasekamp, O, Landgraf, J, Tol, P, Wunch, D, Deutscher, NM, Toon, GC, Wennberg, PO, Griffith, DWT, Aben, I, "CH<sub>4</sub>, CO, and H<sub>2</sub>O spectroscopy for the Sentinel-5 Precursor mission: an assessment with the Total Carbon Column Observing Network measurements", *Atm. Meas. Tech.*, 5, 1387-1398, 2012.
38. Crisp, D, Fisher, BM, O'Dell, C, Frankenberg, C, Basilio, R, Bosch, H, Brown, LR, Castano, R, Connor, B, Deutscher, NM, Eldering, A, Griffith, D, Gunson, M, Kuze, A, Mandrake, L, McDuffie, J, Messerschmidt, J, Miller, CE, Morino, I, Natraj, V, Notholt, J, O'Brien, DM, Oyafuso, F, Polonsky, I, Robinson, J, Salawitch, R, Sherlock, V, Smyth, M, Suto, H, Taylor, TE, Thompson, DR, Wennberg, PO, Wunch, D, Yung, YL, "The ACOS CO<sub>2</sub> retrieval algorithm - Part II: Global X-CO<sub>2</sub> data characterization", *Atm. Meas. Tech.*, 5, 687-707, 2012.
39. Wolfe, GM, Crouse, JD, Parrish, JD, St Clair, JM, Beaver, MR, Paulot, F, Yoon, TP, Wennberg, PO, Keutsch, FN, "Photolysis, OH reactivity and ozone reactivity of a proxy for isoprene-derived hydroperoxyenals (HPALDs)", *Phys. Chem. Chem. Phys.*, 14, 7276-7286, 2012.
40. Keppel-Aleks, G, Wennberg, PO, Washenfelder, RA, Wunch, D, Schneider, T, Toon, GC, Andres, RJ, Blavier, J-F, Connor, B, Davis, KJ, Desai, AR, Messerschmidt, J, Notholt, J, Roehl, CM, Sherlock, V, Stephens, BB, Vay, SA, Wofsy, SC, "The imprint of surface fluxes and transport on variations in total column carbon dioxide", *Biogeosciences*, 9, 875-891, 2012.
41. Apel, EC, Olson, JR, Crawford, JH, Hornbrook, RS, Hills, AJ, Cantrell, CA, Emmons, LK, Knapp, DJ, Hall, S, Mauldin, RL, Weinheimer, AJ, Fried, A, Blake, DR, Crouse, JD, St Clair, JM, Wennberg, PO, Diskin, GS, Fuelberg, HE, Wisthaler, A, Mikoviny, T, Brune, W, Riemer, DD, "Impact of the deep convection of isoprene and other reactive trace species on radicals and ozone in the upper troposphere", *Atmos. Chem. Phys.*, 12, 1307-1325, 2012.
42. Paulot, F, Henze, DK, Wennberg, PO, "Impact of the isoprene photochemical cascade on tropical ozone", *Atmos. Chem. Phys.*, 12, 1135-1150, 2012.
43. Schneising, O, Bergamaschi, P, Bovensmann, H, Buchwitz, M, Burrows, JP, Deutscher, NM, Griffith, DWT, Heymann, J, Macatangay, R, Messerschmidt, J, Notholt, J, Rettinger, M, Reuter, M, Sussmann, R, Velazco, VA, Warneke, T, Wennberg, PO, Wunch, D, "Atmospheric greenhouse gases retrieved from SCIAMACHY: comparison to ground-based FTS measurements and model results", *Atmos. Chem. Phys.*, 12, 1527-1540, 2012.
44. O'Dell, CW, Connor, B, Bosch, H, O'Brien, D, Frankenberg, C, Castano, R, Christi, M, Crisp, D, Eldering, A, Fisher, B, Gunson, M, McDuffie, J, Miller, CE, Natraj, V, Oyafuso, F, Polonsky, I, Smyth, M, Taylor, T, Toon, GC, Wennberg, PO, Wunch, D, "The ACOS CO<sub>2</sub>

- retrieval algorithm - Part 1: Description and validation against synthetic observations”, *Atm. Meas. Tech.*, 5, 99-120, 2012.
45. Wespes, C, Emmons, L, Edwards, DP, Hannigan, J, Hurtmans, D, Saunio, M, Coheur, PF, Clerbaux, C, Coffey, MT, Batchelor, RL, Lindenmaier, R, Strong, K, Weinheimer, AJ, Nowak, JB, Ryerson, TB, Crouse, JD, Wennberg, PO, “Analysis of ozone and nitric acid in spring and summer Arctic pollution using aircraft, ground-based, satellite observations and MOZART-4 model: source attribution and partitioning”, *Atmos. Chem. Phys.*, 12, 237-259, 2012.
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- “Multi-scale modeling study of the source contributions to near-surface ozone and sulfur oxides levels over California during the ARCTAS-CARB period”, *Atmos. Chem. Phys.*, 11, 3173-3194, 2011.
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