325 Broadway R/CSD7
Boulder, CO 80305
(303)-497-4949
jessica.gilman@noaa.gov

Jessica B. Gilman

Curriculum Vitae

EDUCATION

University of Colorado, Boulder, Colorado — **2006**
Ph.D. in Analytical and Atmospheric Chemistry

Ohio State University, Columbus, Ohio — **2001**
B.S. in Chemistry, *cum laude*

RESEARCH EXPERIENCE

Research Associate (Research Scientist II) — **2011 – *present***
Research Associate (Research Scientist I) — **2006 – 2011**
Cooperative Institute for Research in Environmental Science at University of Colorado, Boulder, CO *and* NOAA Earth System Research Laboratory, Chemical Sciences Division
Science Advisor: Dr. Thomas B. Ryerson (NOAA CSD Tropospheric Chemistry Group)
Collaborators: Dr. Brian M. Lerner, Dr. Carsten Warneke, and Dr. Joost A. de Gouw

- Principal investigator of VOC measurements via gas chromatography-mass spectrometry
  - SONGNEX 2015, Shale Oil and Natural Gas Study on NOAA WP-3D aircraft, CO
  - UBWOS 2014, Uintah Basin Winter Ozone Study, Vernal, UT
  - SENEX 2013, Southeast Nexus on NOAA WP-3D aircraft, Smyrna, TN
  - SONNE 2012, Summer Ozone Near Natural gas Emissions, Erie, CO, *Lead Scientist*
  - UBWOS 2012, Uintah Basin Winter Ozone Study, Vernal, UT
  - BioCORN 2011, Biofuel Crops emission of Ozone Precursors Intensive, Fort Collins, CO
  - NACHTT 2011, Nitrogen, Aerosol Composition, and Halogens on a Tall Tower, Erie, CO
  - CalNex 2010, California Nexus of Air Quality and Climate, Pasadena, CA
  - FireLab 2009, Biomass burning emissions from temperate fuels in U.S., Missoula, MT
  - ICEALOT 2008, Int'l Chemistry Exp. in the Arctic Lower Troposphere on *R/V Knorr*
  - BEARPEX 2007, Biosphere Effects on Aerosols and Photochem. Exp., Georgetown, CA
  - TexAQS 2006, Texas Air Quality Study on *R/V Ronald H. Brown*
- Co-developed and deployed new analysis system designed to collect, analyze, and re-condition whole air samples (WAS) using a custom "cryo-mechanical" GC-MS (*ACCBAR*)
- Conducted laboratory measurements in collaboration with NOAA GMD (Dr. S.A. Montzka), Carnegie Mellon Univ. (Dr. A.L. Robinson), and Univ. of Wisconsin (Dr. F.N. Keutsch)
- Expanded analytical capabilities of GC-MS (*TACOH and ACCBAR*) by minimizing and accurately characterizing sampling artifacts inherent to measurement technique
- Increased speed, accuracy, and precision of data reduction
- Mentored undergraduate and graduate students

Graduate Research Assistant — **2001 - 2006**
Department of Chemistry at the University of Colorado, Boulder, CO
Thesis Title: Properties of long-chain organics at the air-aqueous interface as proxies for organically coated atmospheric aerosols
Advisor: Prof. Veronica Vaida

- Instruments utilized: Langmuir-Blodgett trough, GC-MS, ESI-MS, ^{1}H-NMR spectroscopy, and visible absorption spectroscopy
- Implemented derivatization techniques for the identification of oxidized organic products
- Analyzed aerosol field samples collected at Storm Peak, CO via ESI-MS
- Graduate assistant to CU Mass Spectrometry Facility

RESEARCH EXPERIENCE *continued*

Undergraduate Research Assistant **2000 - 2001**

Department of Chemistry at the Ohio State University, Columbus, Ohio

Advisor: Prof. Heather C. Allen

- Measured surface tension of aqueous sulfuric acid solutions
- Learned second harmonic generation (SHG) spectroscopy in order to characterize air-aqueous interface of sulfuric acid solutions

HONORS and AWARDS

Colorado Governor's Award for High-Impact Research **2014**

Member of a team of scientists honored for "Helping the public and policy makers understand the air quality and other atmospheric effects of oil and gas activities in Colorado, Utah, Wyoming, and beyond."

Sewell Fellowship, University of Colorado, Boulder, CO **2005-2006**

Graduate Teaching Excellence Award, University of Colorado, Boulder, CO **2004**

PUBLICATION METRICS

Summary of Publications *as of September 2015*

Total number of publications:	**61**	*Number of first author publications:	**7**
Total number of citations:	**1197**	*Number of publications in progress:*	*10*
Hirsch index:	**23**	Research ID:	E-7751-2010

PEER-REVIEWED PUBLICATIONS

***Biomass burning emissions and potential air quality impacts of volatile organic compounds and other trace gases from temperate fuels common in the United States**. J. B. Gilman, B. M. Lerner, W. C. Kuster, P. D. Goldan, C. Warneke, P. R. Veres, J. M. Roberts, J. A. de Gouw, I. R. Burling and R. J. Yokelson. *Atmospheric Chemistry and Physics Discussions*, 15(15), p21713-21763, doi:10.5194/acpd-15-21713-2015, **2015**.

Real-time measurements of secondary organic aerosol formation and aging from ambient air in an oxidation flow reactor in the Los Angeles area. A. M. Ortega, P. L. Hayes, Z. Peng, B. B. Palm, W. Hu, D. A. Day, R. Li, M. J. Cubison, W. H. Brune, M. Graus, C. Warneke, J. B. Gilman, W. C. Kuster, J. A. de Gouw and J. L. Jimenez. *Atmospheric Chemistry and Physics Discussions*, 15(15), p21907-21958, doi:10.5194/acpd-15-21907-2015, **2015**.

Reactive nitrogen partitioning and its relationship to winter ozone events in Utah. R. J. Wild, P. M. Edwards, T. S. Bates, R. C. Cohen, J. A. de Gouw, W. P. Dubé, J. B. Gilman, J. Holloway, J. Kercher, A. Koss, L. Lee, B. Lerner, R. McLaren, P. K. Quinn, J. M. Roberts, J. Stutz, J. A. Thornton, P. R. Veres, C. Warneke, E. Williams, C. J. Young, B. Yuan and S. S. Brown. *Atmospheric Chemistry and Physics Discussions*, 15(15), p21383-21413, doi:10.5194/acpd-15-21383-2015, **2015**.

Quantifying atmospheric methane emissions from the Haynesville, Fayetteville, and northeastern Marcellus shale gas production regions. J. Peischl, T. B. Ryerson, K. C. Aikin, J. A. de Gouw, J. B. Gilman, J. S. Holloway, B. M. Lerner, R. Nadkarni, J. A. Neuman, J. B. Nowak, M. Trainer, C. Warneke and D. D. Parrish. *Journal of Geophysical Research-Atmospheres*, 5(120), p2119-2139, doi:10.1002/2014jd022697, **2015**.

Airborne flux measurements of methane and volatile organic compounds over the Haynesville and Marcellus shale gas production regions. Y. Bin, L. Kaser, T. Karl, M. Graus, J. Peischl, T. L. Campos, S. Shertz, E. C. Apel, R. S. Hornbrook, A. Hills, J. B. Gilman , B. M. Lerner, C. Warneke, F. M. Flocke, T. B. Ryerson, A. B. Guenther and J. A. de Gouw. *Journal of Geophysical Research: Atmospheres*, 12(120), p6271-89, doi:10.1002/2015jd023242, **2015**.

Atmospheric benzenoid emissions from plants rival those from fossil fuels. P. K. Misztal, C. N. Hewitt, J. Wildt, J. D. Blande, A. S. D. Eller, S. Fares, D. R. Gentner, J. B. Gilman , M. Graus, J. Greenberg, A. B. Guenther, A. Hansel, P. Harley, M. Huang, K. Jardine, T. Karl, L. Kaser, F. N. Keutsch, A. Kiendler-Scharr, E. Kleist, B. M. Lerner, T. Li, J. Mak, A. C. Noelscher, R. Schnitzhofer, V. Sinha, B. Thornton, C. Warneke, F. Wegener, C. Werner, J. Williams, D. R. Worton, N. Yassaa and A. H. Goldstein. *Scientific Reports*, 5:12064, doi:10.1038/srep12064, **2015**.

PEER-REVIEWED PUBLICATIONS
continued

Investigation of secondary formation of formic acid: urban environment vs. oil and gas producing region. B. Yuan, P. R. Veres, C. Warneke, J. M. Roberts, J. B. Gilman, A. Koss, P. M. Edwards, M. Graus, W. C. Kuster, S. M. Li, R. J. Wild, S. S. Brown, W. P. Dube, B. M. Lerner, E. J. Williams, J. E. Johnson, P. K. Quinn, T. S. Bates, B. Lefer, P. L. Hayes, J. L. Jimenez, R. J. Weber, R. Zamora, B. Ervens, D. B. Millet, B. Rappenglueck and J. A. de Gouw. *Atmospheric Chemistry and Physics*, 4(15), p1975-1993, doi:10.5194/acp-15-1975-2015, **2015**.

Photochemical aging of volatile organic compounds associated with oil and natural gas extraction in the Uintah Basin, UT, during a wintertime ozone formation event. A. R. Koss, J. de Gouw, C. Warneke, J. B. Gilman, B. M. Lerner, M. Graus, B. Yuan, P. Edwards, S. S. Brown, R. Wild, J. M. Roberts, T. S. Bates and P. K. Quinn. *Atmospheric Chemistry and Physics*, 10(15), p5727-5741, doi:10.5194/acp-15-5727-2015, **2015**.

Modeling the formation and aging of secondary organic aerosols in Los Angeles during CalNex 2010. P. L. Hayes, A. G. Carlton, K. R. Baker, R. Ahmadov, R. A. Washenfelder, S. Alvarez, B. Rappenglueck, J. B. Gilman, W. C. Kuster, J. A. de Gouw, P. Zotter, A. S. H. Prevot, S. Szidat, T. E. Kleindienst, J. H. Offenberg, P. K. Ma and J. L. Jimenez. *Atmospheric Chemistry and Physics*, 10(15), p5773-5801, doi:10.5194/acp-15-5773-2015, **2015**.

Airborne measurements of the atmospheric emissions from a fuel ethanol refinery. J. A. de Gouw, S. A. McKeen, K. C. Aikin, C. A. Brock, S. S. Brown, J. B. Gilman, M. Graus, T. Hanisco, J. S. Holloway, J. Kaiser, F. N. Keutsch, B. M. Lerner, J. Liao, M. Z. Markovic, A. M. Middlebrook, K. E. Min, J. A. Neuman, J. B. Nowak, J. Peischl, I. B. Pollack, J. M. Roberts, T. B. Ryerson, M. Trainer, P. R. Veres, C. Warneke, A. Welti and G. M. Wolfe. *Journal of Geophysical Research-Atmospheres*, 9(120), p4385-4397, doi:10.1002/2015jd023138, **2015**.

Gas and aerosol carbon in California: comparison of measurements and model predictions in Pasadena and Bakersfield. K. R. Baker, A. G. Carlton, T. E. Kleindienst, J. H. Offenberg, M. R. Beaver, D. R. Gentner, A. H. Goldstein, P. L. Hayes, J. L. Jimenez, J. B. Gilman, J. A. de Gouw, M. C. Woody, H. O. T. Pye, J. T. Kelly, M. Lewandowski, M. Jaoui, P. S. Stevens, W. H. Brune, Y. H. Lin, C. L. Rubitschun and J. D. Surratt. *Atmospheric Chemistry and Physics*, 9(15), p5243-5258, doi:10.5194/acp-15-5243-2015, **2015**.

Intermediate-Volatility Organic Compounds: A Large Source of Secondary Organic Aerosol. Y. Zhao, C. J. Hennigan, A. A. May, D. S. Tkacik, J. A. de Gouw, J. B. Gilman, W. C. Kuster, A. Borbon and A. L. Robinson. *Environmental Science & Technology*, 23(48), p13743-13750, doi:10.1021/es5035188, **2014**.

Volatile organic compound emissions from the oil and natural gas industry in the Uintah Basin, Utah: oil and gas well pad emissions compared to ambient air composition. C. Warneke, F. Geiger, P. M. Edwards, W. Dube, G. Pétron, J. Kofler, A. Zahn, S. S. Brown, M. Graus, J. B. Gilman, B. M. Lerner, J. Peischl, T. B. Ryerson, J. A. de Gouw and J. M. Roberts. *Atmos. Chem. Phys.*, 20(14), p10977-10988, doi:10.5194/acp-14-10977-2014, **2014**.

Conversion of hydroperoxides to carbonyls in field and laboratory instrumentation: Observational bias in diagnosing pristine versus anthropogenically controlled atmospheric chemistry. J. C. Rivera-Rios, T. B. Nguyen, J. D. Crounse, W. Jud, J. M. St Clair, T. Mikoviny, J. B. Gilman, B. M. Lerner, J. B. Kaiser, J. de Gouw, A. Wisthaler, A. Hansel, P. O. Wennberg, J. H. Seinfeld and F. N. Keutsch. *Geophysical Research Letters*, 23(41), p8645-8651, doi:10.1002/2014gl061919, **2014**.

High winter ozone pollution from carbonyl photolysis in an oil and gas basin. P. M. Edwards, S. S. Brown, J. M. Roberts, R. Ahmadov, R. M. Banta, J. A. de Gouw, W. P. Dube, R. A. Field, J. H. Flynn, J. B. Gilman, M. Graus, D. Helmig, A. Koss, A. O. Langford, B. L. Lefer, B. M. Lerner, R. Li, S.-M. Li, S. A. McKeen, S. M. Murphy, D. D. Parrish, C. J. Senff, J. Soltis, J. Stutz, C. Sweeney, C. R. Thompson, M. K. Trainer, C. Tsai, P. R. Veres, R. A. Washenfelder, C. Warneke, R. J. Wild, C. J. Young, B. Yuan and R. Zamora. *Nature*, 7522(514), p351, doi:10.1038/nature13767, **2014**.

PEER-REVIEWED PUBLICATIONS *continued*

A portable and inexpensive method for quantifying ambient intermediate volatility organic compounds. N. C. Bouvier-Brown, E. Carrasco, J. Karz, K. Chang, T. Nguyen, D. Ruiz, V. Okonta, J. B. Gilman, W. C. Kuster and J. A. de Gouw. *Atmospheric Environment*, 94, p126-133, doi:10.1016/j.atmosenv.2014.05.004, **2014**.

The primary and recycling sources of OH during the NACHTT-2011 campaign: HONO as an important OH primary source in the wintertime. S. Kim, T. C. VandenBoer, C. J. Young, T. P. Riedel, J. A. Thornton, B. Swarthout, B. Sive, B. Lerner, J. B. Gilman, C. Warneke, J. M. Roberts, A. Guenther, N. L. Wagner, W. P. Dube, E. Williams and S. S. Brown. *Journal of Geophysical Research-Atmospheres*, 11(119), p6886-6896, doi:10.1002/2013jd019784, **2014**.

Emissions of organic carbon and methane from petroleum and dairy operations in California's San Joaquin Valley. D. R. Gentner, T. B. Ford, A. Guha, K. Boulanger, J. Brioude, W. M. Angevine, J. A. de Gouw, C. Warneke, J. B. Gilman, T. B. Ryerson, J. Peischl, S. Meinardi, D. R. Blake, E. Atlas, W. A. Lonneman, T. E. Kleindienst, M. R. Beaver, J. M. St Clair, P. O. Wennberg, T. C. VandenBoer, M. Z. Markovic, J. G. Murphy, R. A. Harley and A. H. Goldstein. *Atmospheric Chemistry and Physics*, 10(14), p4955-4978, doi:10.5194/acp-14-4955-2014, **2014**.

An MCM modeling study of nitryl chloride ($ClNO_2$) impacts on oxidation, ozone production and nitrogen oxide partitioning in polluted continental outflow. T. P. Riedel, G. M. Wolfe, K. T. Danas, J. B. Gilman, W. C. Kuster, D. M. Bon, A. Vlasenko, S. M. Li, E. J. Williams, B. M. Lerner, P. R. Veres, J. M. Roberts, J. S. Holloway, B. Lefer, S. S. Brown and J. A. Thornton. *Atmospheric Chemistry and Physics*, 8(14), p3789-3800, doi:10.5194/acp-14-3789-2014, **2014**.

Chlorine as a primary radical: evaluation of methods to understand its role in initiation of oxidative cycles. C. J. Young, R. A. Washenfelder, P. M. Edwards, D. D. Parrish, J. B. Gilman, W. C. Kuster, L. H. Mielke, H. D. Osthoff, C. Tsai, O. Pikelnaya, J. Stutz, P. R. Veres, J. M. Roberts, S. Griffith, S. Dusanter, P. S. Stevens, J. Flynn, N. Grossberg, B. Lefer, J. S. Holloway, J. Peischl, T. B. Ryerson, E. L. Atlas, D. R. Blake and S. S. Brown. *Atmospheric Chemistry and Physics*, 7(14), p3427-3440, doi:10.5194/acp-14-3427-2014, **2014**.

Emission factor ratios, SOA mass yields, and the impact of vehicular emissions on SOA formation. J. J. Ensberg, P. L. Hayes, J. L. Jimenez, J. B. Gilman, W. C. Kuster, J. A. de Gouw, J. S. Holloway, T. D. Gordon, S. Jathar, A. L. Robinson and J. H. Seinfeld. *Atmospheric Chemistry and Physics*, 5(14), p2383-2397, doi:10.5194/acp-14-2383-2014, **2014**.

Observational insights into aerosol formation from isoprene. D. R. Worton, J. D. Surratt, B. W. LaFranchi, A. W. H. Chan, Y. Zhao, R. J. Weber, J.-H. Park, J. B. Gilman, J. de Gouw, C. Park, G. Schade, M. Beaver, J. M. St Clair, J. Crounse, P. Wennberg, G. M. Wolfe, S. Harrold, J. A. Thornton, D. K. Farmer, K. S. Docherty, M. J. Cubison, J.-L. Jimenez, A. A. Frossard, L. M. Russell, K. Kristensen, M. Glasius, J. Mao, X. Ren, W. Brune, E. C. Browne, S. E. Pusede, R. C. Cohen, J. H. Seinfeld and A. H. Goldstein. *Environmental Science & Technology*, 20(47), p11403-11413, doi:10.1021/es4011064, **2013**.

Heterogeneous formation of nitryl chloride and its role as a nocturnal NOx reservoir species during CalNex-LA 2010. L. H. Mielke, J. Stutz, C. Tsai, S. C. Hurlock, J. M. Roberts, P. R. Veres, K. D. Froyd, P. L. Hayes, M. J. Cubison, J. L. Jimenez, R. A. Washenfelder, C. J. Young, J. B. Gilman, J. A. de Gouw, J. H. Flynn, N. Grossberg, B. L. Lefer, J. Liu, R. J. Weber and H. D. Osthoff. *Journal of Geophysical Research-Atmospheres*, 18(118), p10638-10652, doi:10.1002/jgrd.50783, **2013**.

Organic aerosol composition and sources in Pasadena, California, during the 2010 CalNex campaign. P. L. Hayes, A. M. Ortega, M. J. Cubison, K. D. Froyd, Y. Zhao, S. S. Cliff, W. W. Hu, D. W. Toohey, J. H. Flynn, B. L. Lefer, N. Grossberg, S. Alvarez, B. Rappenglueck, J. W. Taylor, J. D. Allan, J. S. Holloway, J. B. Gilman, W. C. Kuster, J. A. De Gouw, P. Massoli, X. Zhang, J. Liu, R. J. Weber, A. L. Corrigan, L. M. Russell, G. Isaacman, D. R. Worton, N. M. Kreisberg, A. H. Goldstein, R. Thalman, E. M. Waxman, R. Volkamer, Y. H. Lin, J. D. Surratt, T. E. Kleindienst, J. H. Offenberg, S. Dusanter, S. Griffith, P. S. Stevens, J. Brioude, W. M. Angevine and J. L. Jimenez. *Journal of Geophysical Research-Atmospheres*, 16(118), p9233-9257, doi:10.1002/jgrd.50530, **2013**.

PEER-REVIEWED PUBLICATIONS
continued

Pollutant transport among California regions. W. M. Angevine, J. Brioude, S. McKeen, J. S. Holloway, B. M. Lerner, A. H. Goldstein, A. Guha, A. Andrews, J. B. Nowak, S. Evan, M. L. Fischer, J. B. Gilman and D. Bon. *Journal of Geophysical Research-Atmospheres*, 12(118), p6750-6763, doi:10.1002/jgrd.50490, **2013**.

Detailed chemical characterization of unresolved complex mixtures in atmospheric organics: Insights into emission sources, atmospheric processing, and secondary organic aerosol formation. A. W. H. Chan, G. Isaacman, K. R. Wilson, D. R. Worton, C. R. Ruehl, T. Nah, D. R. Gentner, T. R. Dallmann, T. W. Kirchstetter, R. A. Harley, J. B. Gilman, W. C. Kuster, J. A. deGouw, J. H. Offenberg, T. E. Kleindienst, Y. H. Lin, C. L. Rubitschun, J. D. Surratt, P. L. Hayes, J. L. Jimenez and A. H. Goldstein. *Journal of Geophysical Research-Atmospheres*, 12(118), p6783-6796, doi:10.1002/jgrd.50533, **2013**.

Quantifying sources of methane using light alkanes in the Los Angeles basin, California. J. Peischl, T. B. Ryerson, J. Brioude, K. C. Aikin, A. E. Andrews, E. Atlas, D. Blake, B. C. Daube, J. A. de Gouw, E. Dlugokencky, G. J. Frost, D. R. Gentner, J. B. Gilman, A. H. Goldstein, R. A. Harley, J. S. Holloway, J. Kofler, W. C. Kuster, P. M. Lang, P. C. Novelli, G. W. Santoni, M. Trainer, S. C. Wofsy and D. D. Parrish. *Journal of Geophysical Research-Atmospheres*, 10(118), p4974-4990, doi:10.1002/jgrd.50413, **2013**.

The impact of shipping, agricultural, and urban emissions on single particle chemistry observed aboard the *R/V Atlantis* during CalNex. C. J. Gaston, P. K. Quinn, T. S. Bates, J. B. Gilman, D. M. Bon, W. C. Kuster and K. A. Prather. *Journal of Geophysical Research-Atmospheres*, 10(118), p5003-5017, doi:10.1002/jgrd.50427, **2013**.

Photochemical aging of volatile organic compounds in the Los Angeles basin: Weekday-weekend effect. C. Warneke, J. A. de Gouw, P. M. Edwards, J. S. Holloway, J. B. Gilman, W. C. Kuster, M. Graus, E. Atlas, D. Blake, D. R. Gentner, A. H. Goldstein, R. A. Harley, S. Alvarez, B. Rappenglueck, M. Trainer and D. D. Parrish. *Journal of Geophysical Research-Atmospheres*, 10(118), p5018-5028, doi:10.1002/jgrd.50423, **2013**.

Emission ratios of anthropogenic volatile organic compounds in northern mid-latitude megacities: Observations versus emission inventories in Los Angeles and Paris. A. Borbon, J. B. Gilman, W. C. Kuster, N. Grand, S. Chevaillier, A. Colomb, C. Dolgorouky, V. Gros, M. Lopez, R. Sarda-Esteve, J. Holloway, J. Stutz, H. Petetin, S. McKeen, M. Beekmann, C. Warneke, D. D. Parrish and J. A. de Gouw. *Journal of Geophysical Research-Atmospheres*, 4(118), p2041-2057, doi:10.1002/jgrd.50059, **2013**.

*__Source signature of volatile organic compounds from oil and natural gas operations in Northeastern Colorado__. J. B. Gilman, B. M. Lerner, W. C. Kuster and J. A. de Gouw. *Environmental Science & Technology*, 3(47), p1297-1305, doi:10.1021/es304119a, **2013**. *Listed as "Highly Cited" by ISI*

Volatile organic compound emissions from elephant grass and bamboo cultivars used as potential bioethanol crop. E. Crespo, M. Graus, J. B. Gilman, B. M. Lerner, R. Fall, F. J. M. Harren and C. Warneke. *Atmospheric Environment*, 65, p61-68, doi:10.1016/j.atmosenv.2012.10.009, **2013**.

Brown carbon absorption linked to organic mass tracers in biomass burning particles. D. A. Lack, R. Bahreni, J. M. Langridge, J. B. Gilman and A. M. Middlebrook. *Atmospheric Chemistry and Physics*, 5(13), p2415-2422, doi:10.5194/acp-13-2415-2013, **2013**.

Coupling field and laboratory measurements to estimate the emission factors of identified and unidentified trace gases for prescribed fires. R. J. Yokelson, I. R. Burling, J. B. Gilman, C. Warneke, C. E. Stockwell, J. de Gouw, S. K. Akagi, S. P. Urbanski, P. Veres, J. M. Roberts, W. C. Kuster, J. Reardon, D. W. T. Griffith, T. J. Johnson, S. Hosseini, J. W. Miller, D. R. Cocker, H. Jung and D. R. Weise. *Atmospheric Chemistry and Physics*, 1(13), p89-116, doi:10.5194/acp-13-89-2013, **2013**. *Listed as "Highly Cited" by ISI*

PEER-REVIEWED PUBLICATIONS
continued

The sea breeze/land breeze circulation in Los Angeles and its influence on nitryl chloride production in this region. N. L. Wagner, T. P. Riedel, J. M. Roberts, J. A. Thornton, W. M. Angevine, E. J. Williams, B. M. Lerner, A. Vlasenko, S. M. Li, W. P. Dube, D. J. Coffman, D. M. Bon, J. A. de Gouw, W. C. Kuster, J. B. Gilman and S. S. Brown. *Journal of Geophysical Research-Atmospheres*, 117, doi:D00v2410.1029/2012jd017810, **2012**.

Vertically resolved measurements of nighttime radical reservoirs; in Los Angeles and their contribution to the urban radical budget. C. J. Young, R. A. Washenfelder, J. M. Roberts, L. H. Mielke, H. D. Osthoff, C. Tsai, O. Pikelnaya, J. Stutz, P. R. Veres, A. K. Cochran, T. C. VandenBoer, J. Flynn, N. Grossberg, C. L. Haman, B. Lefer, H. Stark, M. Graus, J. de Gouw, J. B. Gilman, W. C. Kuster and S. S. Brown. *Environmental Science & Technology*, 20(46), p10965-10973, doi:10.1021/es302206a, **2012**.

Increasing atmospheric burden of ethanol in the United States. J. A. de Gouw, J. B. Gilman, A. Borbon, C. Warneke, W. C. Kuster, P. D. Goldan, J. S. Holloway, J. Peischl, T. B. Ryerson, D. D. Parrish, D. R. Gentner, A. H. Goldstein and R. A. Harley. *Geophysical Research Letters*, 39, doi:L1580310.1029/2012gl052109, **2012**.

Gasoline emissions dominate over diesel in formation of secondary organic aerosol mass. R. Bahreini, A. M. Middlebrook, J. A. de Gouw, C. Warneke, M. Trainer, C. A. Brock, H. Stark, S. S. Brown, W. P. Dube, J. B. Gilman, K. Hall, J. S. Holloway, W. C. Kuster, A. E. Perring, A. S. H. Prevot, J. P. Schwarz, J. R. Spackman, S. Szidat, N. L. Wagner, R. J. Weber, P. Zotter and D. D. Parrish. *Geophysical Research Letters*, 39), doi:L0680510.1029/2011gl050718, **2012**.
Listed as "Highly Cited" by ISI

Airborne and ground-based observations of a weekend effect in ozone, precursors, and oxidation products in the California South Coast Air Basin. I. B. Pollack, T. B. Ryerson, M. Trainer, D. D. Parrish, A. E. Andrews, E. L. Atlas, D. R. Blake, S. S. Brown, R. Commane, B. C. Daube, J. A. de Gouw, W. P. Dube, J. Flynn, G. J. Frost, J. B. Gilman, N. Grossberg, J. S. Holloway, J. Kofler, E. A. Kort, W. C. Kuster, P. M. Lang, B. Lefer, R. A. Lueb, J. A. Neuman, J. B. Nowak, P. C. Novelli, J. Peischl, A. E. Perring, J. M. Roberts, G. Santoni, J. P. Schwarz, J. R. Spackman, N. L. Wagner, C. Warneke, R. A. Washenfelder, S. C. Wofsy and B. Xiang. *Journal of Geophysical Research-Atmospheres*, 117), doi:D00v0510.1029/2011jd016772, **2012**.

Modelled and measured concentrations of peroxy radicals and nitrate radical in the US Gulf Coast region during TexAQS 2006. R. Sommariva, T. S. Bates, D. Bon, D. M. Brookes, J. A. de Gouw, J. B. Gilman, S. C. Herndon, W. C. Kuster, B. M. Lerner, P. S. Monks, H. D. Osthoff, A. E. Parker, J. M. Roberts, S. C. Tucker, C. Warneke, E. J. Williams, M. S. Zahniser and S. S. Brown. *Journal of Atmospheric Chemistry*, 4(68), p331-362, doi:10.1007/s10874-012-9224-7, **2011**.

The glyoxal budget and its contribution to organic aerosol for Los Angeles, California, during CalNex 2010. R. A. Washenfelder, C. J. Young, S. S. Brown, W. M. Angevine, E. L. Atlas, D. R. Blake, D. M. Bon, M. J. Cubison, J. A. de Gouw, S. Dusanter, J. Flynn, J. B. Gilman, M. Graus, S. Griffith, N. Grossberg, P. L. Hayes, J. L. Jimenez, W. C. Kuster, B. L. Lefer, I. B. Pollack, T. B. Ryerson, H. Stark, P. S. Stevens and M. K. Trainer. *Journal of Geophysical Research-Atmospheres*, 116, doi:D00v0210.1029/2011jd016314, **2011**.

Evidence of rapid production of organic acids in an urban air mass. P. R. Veres, J. M. Roberts, A. K. Cochran, J. B. Gilman, W. C. Kuster, J. S. Holloway, M. Graus, J. Flynn, B. Lefer, C. Warneke and J. de Gouw. *Geophysical Research Letters*, 38, doi:L1780710.1029/2011gl048420, **2011**.

Volatile organic compound emissions from switchgrass cultivars used as biofuel crops. A. S. D. Eller, K. Sekimoto, J. B. Gilman, W. C. Kuster, J. A. de Gouw, R. K. Monson, M. Graus, E. Crespo, C. Warneke and R. Fall. *Atmospheric Environment*, 19(45), p3333-3337, doi:10.1016/j.atmosenv.2011.03.042, **2011**.

PEER-REVIEWED PUBLICATIONS *continued*

Isocyanic acid in the atmosphere and its possible link to smoke-related health effects. J. M. Roberts, P. R. Veres, A. K. Cochran, C. Warneke, I. R. Burling, R. J. Yokelson, B. Lerner, J. B. Gilman, W. C. Kuster, R. Fall and J. de Gouw. *Proceedings of the National Academy of Sciences of the United States of America*, 22(108), p8966-8971, doi:10.1073/pnas.1103352108, **2011**.

The Chemistry of Atmosphere-Forest Exchange (CAFE) Model - Part 2: Application to BEARPEX-2007 observations. G. M. Wolfe, J. A. Thornton, N. C. Bouvier-Brown, A. H. Goldstein, J. H. Park, M. McKay, D. M. Matross, J. Mao, W. H. Brune, B. W. LaFranchi, E. C. Browne, K. E. Min, P. J. Wooldridge, R. C. Cohen, J. D. Crounse, I. C. Faloona, J. B. Gilman, W. C. Kuster, J. A. de Gouw, A. Huisman and F. N. Keutsch. *Atmospheric Chemistry and Physics*, 3(11), p1269-1294, doi:10.5194/acp-11-1269-2011, **2011**.

Ozone production in remote oceanic and industrial areas derived from ship based measurements of peroxy radicals during TexAQS 2006. R. Sommariva, S. S. Brown, J. M. Roberts, D. M. Brookes, A. E. Parker, P. S. Monks, T. S. Bates, D. Bon, J. A. de Gouw, G. J. Frost, J. B. Gilman, P. D. Goldan, S. C. Herndon, W. C. Kuster, B. M. Lerner, H. D. Osthoff, S. C. Tucker, C. Warneke, E. J. Williams and M. S. Zahniser. *Atmospheric Chemistry and Physics*, 6(11), p2471-2485, doi:10.5194/acp-11-2471-2011, **2011**.

Chemical and physical transformations of organic aerosol from the photo-oxidation of open biomass burning emissions in an environmental chamber. C. J. Hennigan, M. A. Miracolo, G. J. Engelhart, A. A. May, A. A. Presto, T. Lee, A. P. Sullivan, G. R. McMeeking, H. Coe, C. E. Wold, W. M. Hao, J. B. Gilman, W. C. Kuster, J. de Gouw, B. A. Schichtel, J. L. Collett, Jr., S. M. Kreidenweis and A. L. Robinson. *Atmospheric Chemistry and Physics*, 15(11), p7669-7686, doi:10.5194/acp-11-7669-2011, **2011**.

Photochemical modeling of glyoxal at a rural site: observations and analysis from BEARPEX 2007. A. J. Huisman, J. R. Hottle, M. M. Galloway, J. P. DiGangi, K. L. Coens, W. Choi, I. C. Faloona, J. B. Gilman, W. C. Kuster, J. de Gouw, N. C. Bouvier-Brown, A. H. Goldstein, B. W. LaFranchi, R. C. Cohen, G. M. Wolfe, J. A. Thornton, K. S. Docherty, D. K. Farmer, M. J. Cubison, J. L. Jimenez, J. Mao, W. H. Brune and F. N. Keutsch. *Atmospheric Chemistry and Physics*, 17(11), p8883-8897, doi:10.5194/acp-11-8883-2011, **2011**.

Origins and composition of fine atmospheric carbonaceous aerosol in the Sierra Nevada Mountains, California. D. R. Worton, A. H. Goldstein, D. K. Farmer, K. S. Docherty, J. L. Jimenez, J. B. Gilman, W. C. Kuster, J. de Gouw, B. J. Williams, N. M. Kreisberg, S. V. Hering, G. Bench, M. McKay, K. Kristensen, M. Glasius, J. D. Surratt and J. H. Seinfeld. *Atmospheric Chemistry and Physics*, 19(11), p10219-10241, doi:10.5194/acp-11-10219-2011, **2011**.

Airborne formaldehyde measurements using PTR-MS: calibration, humidity dependence, inter-comparison and initial results. C. Warneke, P. Veres, J. S. Holloway, J. Stutz, C. Tsai, S. Alvarez, B. Rappenglueck, F. C. Fehsenfeld, M. Graus, J. B. Gilman and J. A. de Gouw. *Atmospheric Measurement Techniques*, 10(4), p2345-2358, doi:10.5194/amt-4-2345-2011, **2011**.

*__Ozone variability and halogen oxidation within the Arctic and sub-Arctic springtime boundary layer__. J. B. Gilman, J. F. Burkhart, B. M. Lerner, E. J. Williams, W. C. Kuster, P. D. Goldan, P. C. Murphy, C. Warneke, C. Fowler, S. A. Montzka, B. R. Miller, L. Miller, S. J. Oltmans, T. B. Ryerson, O. R. Cooper, A. Stohl and J. A. de Gouw. *Atmospheric Chemistry and Physics*, 21(10), p10223-10236, doi:10.5194/acp-10-10223-2010, **2010**.

Development and validation of a portable gas phase standard generation and calibration system for volatile organic compounds. P. Veres, J. B. Gilman, J. M. Roberts, W. C. Kuster, C. Warneke, I. R. Burling and J. de Gouw. *Atmospheric Measurement Techniques*, 3(3), p683-691, doi:10.5194/amt-3-683-2010, **2010**.

PEER-REVIEWED PUBLICATIONS *continued*

*__Measurements of volatile organic compounds during the 2006 TexAQS/GoMACCS campaign: Industrial influences, regional characteristics, and diurnal dependencies of the OH reactivity__. J. B. Gilman, W. C. Kuster, P. D. Goldan, S. C. Herndon, M. S. Zahniser, S. C. Tucker, W. A. Brewer, B. M. Lerner, E. J. Williams, R. A. Harley, F. C. Fehsenfeld, C. Warneke and J. A. de Gouw. *Journal of Geophysical Research-Atmospheres*, 114, doi:10.1029/2008jd011525, **2009**.

Methyl chavicol: Characterization of its biogenic emission rate, abundance, and oxidation products in the atmosphere. N. C. Bouvier-Brown, A. H. Goldstein, D. R. Worton, D. M. Matross, J. B. Gilman, W. C. Kuster, D. Welsh-Bon, C. Warneke, J. A. de Gouw, T. M. Cahill and R. Holzinger. *Atmospheric Chemistry and Physics*, 6(9), p2061-2074, **2009**.

In-situ ambient quantification of monoterpenes, sesquiterpenes, and related oxygenated compounds during BEARPEX 2007: Implications for gas- and particle-phase chemistry. N. C. Bouvier-Brown, A. H. Goldstein, J. B. Gilman, W. C. Kuster and J. A. de Gouw. *Atmospheric Chemistry and Physics*, 15(9), p5505-5518, **2009**.

Closing the peroxy acetyl nitrate budget: Observations of acyl peroxy nitrates (PAN, PPN, and MPAN) during BEARPEX 2007. B. W. LaFranchi, G. M. Wolfe, J. A. Thornton, S. A. Harrold, E. C. Browne, K. E. Min, P. J. Wooldridge, J. B. Gilman, W. C. Kuster, P. D. Goldan, J. A. de Gouw, M. McKay, A. H. Goldstein, X. Ren, J. Mao and R. C. Cohen. *Atmospheric Chemistry and Physics*, 19(9), p7623-7641, **2009**.

*__Interfacial properties of mixed films of long-chain organics at the air-water interface__. J. B. Gilman, H. Tervahattu and V. Vaida. *Atmospheric Environment*, 34(40), p6606-6614, **2006**.

*__Permeability of acetic acid through organic films at the air-aqueous interface__. J. B. Gilman and V. Vaida. *Journal Of Physical Chemistry A*, 24(110), p7581-7587, **2006**.

*__Selectivity and stability of organic films at the air-aqueous interface__. J. B. Gilman, T. L. Eliason, A. Fast and V. Vaida. *Journal Of Colloid And Interface Science*, 1(280), p234-243, **2004**.

Kinetics and products of the reaction of gas-phase ozone with anthracene adsorbed at the air-aqueous interface. B. T. Mmereki, D. J. Donaldson, J. B. Gilman, T. L. Eliason and V. Vaida. *Atmospheric Environment*, 36(38), p6091-6103, **2004**.

Oxidation of organic films relevant to atmospheric aerosols. T. L. Eliason, J. B. Gilman and V. Vaida. *Atmospheric Environment*, 9(38), p1367-1378, **2004**.

PRESENTATION METRICS

Summary of Presentations *as of September 2015*

Number of invited talks and seminars:	10	Number of guest lectures:	6
Number of contributed talks:	7	Other (data meetings, etc.):	8
Number of poster presentations:	2	**Total number of presentations:**	**33**

INVITED TALKS and SEMINARS

Characterizing the emissions of volatile organic compounds from oil and natural gas operations in several U.S. shale basins. J.B. Gilman *et al*.
- Department of Chemistry Seminar at Hendrix College, Conway, AR, March 2014.
- Department of Atmospheric Science Seminar at Colorado State University, Fort Collins, CO, November 2013.

Regional characteristics and potential atmospheric impacts of volatile organic compounds (VOCs) emitted from oil and natural gas operations in several major shale plays across the United States. J.B. Gilman, B. M. Lerner, M. Dumas, D. Hughes, A. Jaksich, C.D. Hatch, M. Graus, J. Peischl, I. B. Pollack, T. B. Ryerson, J. S. Holloway, M. K. Trainer, K. C. Aikin, C. Warneke and J.A. de Gouw. Oral presentation at the 125th Annual Geological Society of America Meeting, Denver, CO, October 2013.

INVITED TALKS and SEMINARS *continued*

Characterizing emissions and assessing air quality impacts from oil and natural gas operations in Colorado and Utah. J.B. Gilman, B.M. Lerner, C. Warneke, F. Geiger, J.S. Holloway, J. Peischl, T.B. Ryerson, C.J. Young, P.M. Edwards, S.S. Brown, J.M. Roberts, E.J. Williams, D.D. Parrish and J.A. de Gouw. Oral presentation at the 246th American Chemical Society National Meeting, Indianapolis, IN, September 2013.

Source signature of volatile organic compounds associated with oil and natural gas operations in Colorado and Utah. J.B. Gilman, B.M. Lerner, C. Warneke, J.S. Holloway, J. Peischl, T.B. Ryerson, C.J. Young, P.M. Edwards, S.S. Brown, D. E. Wolfe, E.J. Williams and J.A. de Gouw. Oral presentation at the AGU Fall Meeting, San Francisco, CA, December 2012.

Characterizing VOC emissions from fossil fuel production, processing, and combustion. J.B. Gilman *et al*. Air Quality Symposium Honoring James Meagher, Boulder, CO, August 2012.

VOCs associated with oil and natural gas operations in Colorado. J.B. Gilman *et al*. Statement to the Regional Air Quality Council Board Meeting, Denver, CO, June 2012.

VOCs associated with oil and natural gas operations in Colorado and Utah: regional characteristics and potential atmospheric impacts. J.B. Gilman *et al*. NOAA Chemical Sciences Division Seminar, Boulder, CO, May 2012.

Volatile organic compounds (VOCs): impacts on local air quality and regional transport. J.B. Gilman *et al*. Department of Chemistry Seminar at College of Wooster, Wooster, OH, April 2010.

Volatile organic compounds (VOCs): global distribution and impacts on local air quality. J.B. Gilman *et al*. Department of Chemistry Seminar at Hendrix College, Conway, AR, November 2008.

CONFERENCE and MEETING PRESENTATIONS

Primary emissions and secondary formation of volatile organic compounds from natural gas production in several major U.S. shale plays. J.B. Gilman, B.M. Lerner, C. Warneke, M. Graus, R. Lui, A. Koss, B. Yuan, S. Murphy, S. Alvarez, B. Lefer, K.-E. Min, S.S. Brown, J.M. Roberts, H.S. Osthoff, J. Peischl, T.B. Ryerson, and J.A. de Gouw. Oral presentation at the AGU Fall Meeting, San Francisco, CA, December 2014.

Characterizing emissions of volatile organic compounds from oil and natural gas operations in U.S. shale basins. J.B. Gilman, B.M. Lerner, C. Warneke, M. Graus, R. Lui, A. Koss, B. Yuan, S. Murphy, B. Lefer, K.-E. Min, S.S. Brown, J.M. Roberts, H.S. Osthoff, J. Peischl, T.B. Ryerson, and J.A. de Gouw. Oral presentation at the 16th Global Emissions Initiative Conf., Boulder, CO, June 2014.

Characterizing emissions of volatile organic compounds in the Haynesville, Fayetteville, and Marcellus shale regions via aircraft observations during SENEX 2013. J.B. Gilman, B. M. Lerner, M. Dumas, D. Hughes, A. Jaksich, C.D. Hatch, M. Graus, J. Peischl, I. B. Pollack, T. B. Ryerson, J. S. Holloway, M. K. Trainer, K. C. Aikin, C. Warneke and J.A. de Gouw. Poster presentation at the AGU Fall Meeting, San Francisco, CA, December 2013.

Characterizing the chemical evolution of air masses via multi-platform measurements of volatile organic compounds (VOCs) during CalNEX: composition, OH reactivity, and potential SOA formation. J.B. Gilman, W.C. Kuster, D. Bon, C. Warneke, B.M. Lerner, E.J. Williams, J.S. Holloway, I.B. Pollack, T.B. Ryerson, E.L. Atlas, D.R. Blake, S.C. Herndon, M.S. Zahniser, A. Vlasenko, SM. Li, S. Alvarez, B. Rappenglueck, J. Flynn, N. Grossberg, B. Lefer and J.A. de Gouw. Poster presentation at the AGU Fall Meeting, San Francisco, CA, December 2011.

OH reactivity and SOA potential of VOCs and other trace gases measured in controlled laboratory biomass burns. J.B. Gilman, W.C. Kuster, P.D. Goldan, C. Warneke, P. Veres, J.M. Roberts, J.A. de Gouw, I.R. Burling, R.J. Yokelson. Oral presentation at the AGU Fall Meeting, San Francisco, CA, December 2010.

Springtime halogen oxidation determines the variability in surface ozone concentrations throughout the Arctic and sub-Arctic. J.B. Gilman, B.M. Lerner, W.C. Kuster, P.D. Goldan, S.A. Montzka, B.R. Miller, L. Miller, S.J. Oltmans, T.B. Ryerson, J.F. Burkhart, A. Stohl, E.J. Williams, J.A. de Gouw. Oral presentation at the AGU Fall Meeting, San Francisco, CA, December 2009.

PRESENTATIONS *continued*

Volatile Organic Compounds (VOCs) measured in the Arctic aboard the R/V Knorr during ICEALOT 2008: primary sources and evidence of halogen oxidation. J.B. Gilman, W.C. Kuster, P.D. Goldan, B.M. Lerner, E.J. Williams, and J.A. de Gouw. Oral presentation at the AGU Fall Meeting, San Francisco, CA, December 2008.

Volatile organic compounds (VOCs) measured aboard the Ronald H. Brown during TexAQS 2006 and their OH reactivity. J.B. Gilman, W.C. Kuster, P.D. Goldan, S.C. Herndon, M.S. Zahniser, S.C. Tucker, W.A. Brewer, B.M. Lerner, E.J. Williams, H.D. Osthoff, S.S. Brown, C. Warneke and J.A. de Gouw. Oral presentation at the AGU Fall Meeting, San Francisco, CA, December 2007.

Permeability of organic films at the air-water interface. J.B. Gilman, H. Tervahattu, V. Vaida. Oral presentation at the 231st ACS National Meeting, Atlanta, GA, March 2006.

GUEST LECTURES

Volatile organic compounds (VOCs): sources, chemistry, and secondary formation of pollutants. Atmospheric Chemistry (graduate level) at Ohio State University, Columbus, OH, March 2014.

GC-MS instrumentation and application to atmospheric chemistry. Advanced Analytical Chemistry (undergraduate level) at Hendrix College, Conway, AR, March 2014.

Atmospheric Chemistry of Oil and Natural Gas Operations. Atmospheric Chemistry (graduate level) at University of Colorado, Boulder, CO, March 2013.

Sources of volatile organic compounds (VOCs) and their impacts on local air quality. Environmental Chemistry (undergraduate level) at University of Colorado, Boulder, CO, April 2012 and May 2013.

VOCs measured aboard the R/V Brown: results from the 2006 Texas air quality study. Graduate seminar "Organics in the atmosphere" at University of Colorado, Boulder, CO, April 2008

DATA MEETINGS

Oral Presentations:

Uintah Basin Wintertime Ozone Study (UBWOS) Data Meeting, Vernal, UT, June 2014.
Southeast Atmosphere Study (SAS) Data Workshop, Boulder, CO, April 2014.
Uintah Basin Wintertime Ozone Study (UBWOS) Data Meeting, Vernal, UT, June 2012.
California Nexus (CalNex) Data Analysis Workshop, Sacramento, CA, May 2011
R/V Atlantis (CalNex) Data Analysis Workshop, Davis, CA, January 2011
POLARCAT (ICEALOT) Workshop, Durham, NH, June 2009
Biosphere Effects on Aerosols and Photochemistry Experiment (BEARPEX) Science Meeting, Berkeley, CA, February 2008
Principal Findings Data Analysis Workshop (TexAQS II/GoMACCS), Austin, TX, June 2007.

PROFESSIONAL AFFIALIATIONS

Member of American Geophysical Union
Member of American Chemical Society
Member of American Association for the Advancement of Science

PROFESSIONAL ACTIVITIES

CIRES Member Council, Vice-Chair of Council and CSD representative **2010 - 2013**

Conference Activities:

- Covener, chair, and student presentation judge of session "The impacts of energy production and use on air quality and climate" at AGU Fall Meeting, San Francisco, CA, December 2015
- Chair and student presentation judge at AGU Fall Meeting, San Francisco, CA, December 2014
- Student presentation judge at AGU Fall Meeting, San Francisco, CA, December 2013

Reviewer of Manuscripts for: Journal of Geophysical Research-Atmospheres, Environmental Science and Technology, Atmospheric Chemistry and Physics, Atmospheric Environment, Journal of Atmospheric Chemistry, and Journal of Environmental and Physical Health

Reviewer of Proposals for: National Science Foundation

Reviewer of Book Chapter for: *Mass Spectrometry Handbook* (John Wiley & Sons, Inc,)

OUTREACH ACTIVITIES	**CSU Front Range Geoscience Mentor Program,** Mentor and Member	**2015 -- *present***
	Earth Science Women's Network, Member	**2015 -- *present***
	Experiences in Professional Research Organizations and Atmospheric Chemistry at Hendrix, NOAA CSD Organizer and Contributor at Storm Peak Lab, Steamboat, CO	**2015**
	NOAA Hollings Scholar Seminar, Presenter	**2015, 2014, 2012**
	NASA Women in Science Symposium, Demonstration Leader	**2012**
	Earth Explorers, Contributor to middle school science project	**2012**

WEBSITE

http://www.esrl.noaa.gov/csd/staff/jessica.gilman/

MEDIA COVERAGE

Science in Flight (SENEX). CIRES YouTube video interview posted July 2013 available at: https://www.youtube.com/watch?v=ZTh2HQ3dm04

CU-Boulder, NOAA study uncovers oil and gas emission's "chemical signature." J. Aguilar. *Daily Camera*, January 16, 2013 available at: http://www.dailycamera.com/erie-news/ci_22390113/cu-boulder-noaa-study-uncovers-oil-and-gas?source=most_emailed#

Oil and gas wells contribute fuel for ozone pollution. CIRES Press Release, January 14, 2013 available at: http://cires.colorado.edu/news/press/2013/natgas.html

Oil and gas wells contribute to ozone formation? CIRES YouTube video interview posted January 2013 available at: http://youtu.be/enuNY4wLCKU

Colorado to join studies of air quality around oil and gas fields. M. Jaffe. *The Denver Post*, May 6, 2012 available at: http://www.denverpost.com/ci_20553795/undefined?source=infinite