# Gregory B. Rieker

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**Provost Endowed Chair Professor, Mechanical Engineering** — **August 2024 – Present**
*University of Colorado Boulder* — *Boulder, Colorado*

**Co-founder and Chief Technology Officer** — **April 2018 – Present**
*LongPath Technologies, Inc. (spin-out from lab)* — *Boulder, Colorado*

**Joint and Courtesy Appointments**
*National Institute of Standards and Technology*
*National Renewable Energy Laboratory*
*Environmental Engineering Program, University of Colorado*

**Expertise:** Optical Diagnostics for Harsh Environments, Lasers, Frequency Combs, Combustion, Design, Energy Systems, Industrial Systems, Atmospheric Systems

## AWARDS (State, National, International)

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|---|---|
| **Colorado Photonics Company of the Year (LongPath)** | **October 2021** |
| **National Academy of Inventors, Senior Member** | **February 2021** |
| **National Academy of Engineering Frontiers in Engineering Symposium** | **February 2021** |
| **Colorado Governor's Award for High-Impact Research** | **October 2019** |
| **Hiroshi Tsuji Early Career Researcher Award** | **April 2019** |
| **US Early Career Combustion Investigator Award** | **March 2019** |
| **Peter Werle Early Career Scientist Award** | **September 2018** |
| **National Science Foundation CAREER Award** | **March 2015** |
| **National Research Council (NRC) Research Associateship** | **March 2012** |

## AWARDS (University of Colorado)

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| **Provost Endowed Chair** | **February 2025** |
| **CEAS Faculty Research Award** | **December 2023** |
| **CU Boulder Provost's Faculty Achievement Award** | **October 2023** |
| **Discovery Learning Apprenticeship Outstanding Mentor** | **August 2022** |
| **Mechanical Engineering Faculty Outstanding Research Award** | **September 2019** |
| **Woodward Outstanding Faculty Award** | **August 2018** |
| **Research and Innovation Faculty Fellowship** | **December 2017** |
| **Vogel Family Faculty Fellowship** | **December 2017** |

## EDUCATION

**Doctor of Philosophy in Mechanical Engineering** — **June 2009**
*Stanford University (Advisor: R. K. Hanson)* — *Stanford, California*
Thesis: Wavelength-Modulation Spectroscopy for Measurements of Gas Temperature and Concentration in Harsh Environments

**Master of Science in Mechanical Engineering** **September 2004**
*Stanford University* *Stanford, California*

**Bachelor of Science in Mechanical Engineering** **December 2002**
*Missouri University of Science and Technology* *Rolla, Missouri*
Summa Cum Laude, Honors Scholar in Engineering

## PRIOR PROFESSIONAL EXPERIENCE

**Associate Professor, Mechanical Engineering** **August 2019 – July 2024**
*University of Colorado Boulder* *Boulder, Colorado*

**Assistant Professor, Mechanical Engineering** **August 2013 – July 2019**
*University of Colorado Boulder* *Boulder, Colorado*

**National Research Council Research Associate** **July 2012 – August 2013**
*National Institute of Standards and Technology (Advisor: N. Newbury)* *Boulder, Colorado*
- Development of frequency comb spectrometers for gas-phase measurements in atmospheric systems

**Co-Founder, Scientist** **2010 – 2012**
*Fluence, LLC* *Newark, California*
- Design and experimental characterization of a compact, high-energy plasma accelerator for medical applications

**Postdoctoral Fellow** **June 2009 – December 2009**
*Stanford University (Advisor: M.A. Cappelli).* *Stanford, California*
- Development of optical emission and solid-state nuclear track diagnostics for particle velocity and contaminant identification in plasma accelerators

## PEER-REVIEWED PUBLICATIONS

*Graduate student in Rieker lab
**Postdoc / Research staff/ Visiting Scholars in Rieker lab

82. I. Gordon, L. Rothman, R. Hargreaves, F. Gomez, T. Bertin, C. Hill, R. Kochanov, Y. Tan, P. Bernath, M. Birk, V. Boudon, A. Campargue, A. Coustenis, B. Drouin, R. Gamache, J. Hodges, D. Jacquemart, E. Mlawer, A. Nikitin, V. Perevalov, M. Rotger, S. Robert, J. Tennyson, G. Toon, H. Tran, V. Tyuterev, M. Adkins, A. Barbe, D. Bailey, K. Bielska, L. Bizzocchi, T. Blake, C. Bowesman, P. Cacciani, P. Čermák, A. Császár, L. Denis, S. Egbert,* O. Egorov, A. Yu. Ermilov, A. Fleisher, H. Fleurbaey, A. Foltynowicz, T. Furtenbacher, M. Germann, E. Guest, J. Harrison, J. Hartmann, A. Hjältén, S. Hu, X. Huang, T. Johnson, H. Jóźwiak, S. Kassi, M. Khan, F. KwabiaTchana, T. Lee, D. Lisak, A. Liu, O. Lyulin, N. Malarich*, L. Manceron, A. Marinina, S. Massie, J. Mascio, E. Medvedev, V. Meshkov, G. Mellau, M. Melosso, S. Mikhailenko, D. Mondelain, H. Müller, M. O'Donnell, A. Owens, A. Perrin, O. Polyansky, P. Raston, Z. Reed, M. Rey, C. Richard, **G. Rieker,** C. Röske, S. Sharpe, E. Starikova, N. Stolarczyk, A. Stolyarov, K. Sung, F. Tamassia, J. Terragni, V. Ushakov, S. Vasilchenko, B. Vispoel, K.

Vodopyanov, G. Wagner, S. Wójtewicz, S. Yurchenko, N. Zobov, "The HITRAN2024 molecular spectroscopic database," Journal of Quantitative Spectroscopy and Radiative Transfer, 109807 (2026) https://doi.org/10.1016/j.jqsrt.2026.109807

81. T. Bertin, I. Gordon, R. Hargreaves, J. Tennyson, S. Yurchenko, K. Kefala, V. Boudon, C. Richard, A. Nikitin, V. Tyuterev, M. Rey, M. Birk, G. Wagner, K. Sung, B. Coy, W. Broussard, G. Toon, A. Rodina, E. Starikova, A. Campargue, Z. Reed, J. Hodges, Y. Tan, N. Malarich*, **G. Rieker**, "The HITRAN2024 methane update," Journal of Quantitative Spectroscopy and Radiative Transfer 349, 109736 (2026). https://doi.org/10.1016/j.jqsrt.2025.109736

80. C. Alden, D. Chipponeri, D. Youngquist, B. Krough, A. Makowiecki, D. Wilson, G. Rieker, "Validation testing of continuous laser methane monitoring at operational oil and gas production facilities," Atmosphere 16, 1409 (2025). https://doi.org/10.3390/atmos16121409

79. A. Hodshire, G. Duggan, D. Zimmerle, A. Santos, T. McArthur, J. Bylsma, C. Alden, D. Youngquist, A. White, **G. Rieker,** "Intermittent emissions from oil and gas operations: implications for detection effectiveness from periodic leak detection surveys," ACS ES&T Air 2, 2776-2785 (2025). https://doi.org/10.1021/acsestair.5c00024

78. T. Furtenbacher, S. Egbert*, K. Sung, S. Coburn**, B. Drouin, **G. Rieker,** A. Csaszar, "Improved assessment of H216O transitions in the region 6600–7500 cm−1," Journal of Quantitative Spectroscopy and Radiative Transfer 334, 109513 (2025). https://doi.org/10.1016/j.jqsrt.2025.109513

77. C. Callahan*, S. Bresler, S. Coburn**, D. Long, **G. Rieker**, "GAAS: GPU accelerated absorption simulator," Journal of Quantitative Spectroscopy and Radiative Transfer 333, 109307 (2025). https://doi.org/10.1016/j.jqsrt.2024.109307

76. D. Yun*, S. C. Egbert*, N. A. Malarich*, R. K. Cole*, J.J. France, J. Liu, K. M. Rice, M. A. Hagenmaier, J. M. Donbar, N. Hoghooghi**, S. C. Coburn**, **G. Rieker,** "Temperature, pressure, velocity, and water vapor mole fraction profiles in a ramjet combustor using dual frequency comb spectroscopy and a high temperature absorption database," Combustion and Flame 273, 113922 (2025). https://doi.org/10.1016/j.combustflame.2024.113922

75. S. Simons-Wellin, S. Sheppard, S. Coburn**, J. Farnsworth, P. Hamlington, **G. Rieker,** **"**Adaptive Mesh Large Eddy Simulations of Transitional Jet Diffusion Flames in Crossflow," International Journal of Heat and Mass Transfer 236, 126307 (2025). https://doi.org/10.1016/j.ijheatmasstransfer.2024.126307

74. P. Chang, N. Hoghooghi**, S. Egbert*, D. Lesko, S. Swartz, J. Biegert, **G. Rieker**, R. Reddy, S. Diddams, "Mid-Infrared Hyperspectral Microscopy with Broadband 1-GHz Dual Frequency Combs," APL Photonics 9, 106111 (2024). https://doi.org/10.1063/5.0225616

73. S. Egbert*, K. Sung, S. Coburn**, B. Drouin, **G. Rieker**, "Water-vapor absorption database using Dual Comb Spectroscopy from 300 to 1300 K Part II: Air-Broadened H2O,

6600 to 7650 cm-1," Journal of Quantitative Spectroscopy and Radiative Transfer 328, 109119 (2024). https://doi.org/10.1016/j.jqsrt.2024.109119

72. C. Callahan*, E. Gatica*, G. Hampson, **G. Rieker**, "Compact, Real-Time Exhaust Gas Recirculation Rate Sensor for Use in Natural Gas Combustion Engine Control," Proceedings of the Combustion Institute 40, 105692 (2024). https://doi.org/10.1016/j.proci.2024.105692

71. S. Coburn**, E. Miller*, N. Harris,* S. Droste, K. Knabe, **G.Rieker, "**Measuring Methane Destruction Efficiency in Gas Flares with Dual Comb Spectroscopy," Proceedings of the Combustion Institute 40, 105533 (2024). https://doi.org/10.1016/j.proci.2024.105533

70. (Cover article) D. Long, M. Cich, C. Mathurin*, A. Heiniger, G. Mathews**, A. Frymire*, **G. Rieker**, "Nanosecond Time-resolved Dual-comb Absorption Spectroscopy," Nature Photonics 18, 127-131 (2024). https://doi.org/10.1038/s41566-023-01316-8

69. (Cover article) N. Hoghooghi**, P. Chang, S. Egbert*, M. Burch, R.A. Shaik, P. Lynch, S. Diddams, **G. Rieker**, "GHz Repetition Rate Mid-Infrared Frequency Comb Spectroscopy of Fast Chemical Reactions," Optica 11, 876-882 (2024). https://doi.org/10.1364/OPTICA.521655

68. M. Walsh, E. Baumann, N. Malarich*, S. Egbert*, R. Cole*, **G. Rieker,** N. Newbury, I. Coddington, K. Cossel, J. Genest, "Pulse interaction induced systematic errors in dual comb spectroscopy," Optics Express 32, 19837-19853 (2024). https://doi.org/10.1364/OE.523623

67. D. Yun*, S. Egbert*, A. Frymire*, S. Coburn**, J. France, K. Rice, J. Donbar, **G, Rieker,** "Single-Beam Velocimetry with Dual Frequency Comb Absorption Spectroscopy," Optics Express 32, 18650-18663 (2024). https://doi.org/10.1364/OE.523451

66. S. Egbert*, K. Sung, S. Coburn**, B. Drouin, **G. Rieker**, "Water-Vapor Absorption Database using Dual Comb Spectroscopy from 300-1300 K Part I: Pure H2O, 6600 to 7650 cm-1," Journal of Quantitative Spectroscopy and Radiative Transfer 318, 108940 (2024). https://doi.org/10.1016/j.jqsrt.2024.108940

65. A. Makowiecki*, S. Coburn**, S. Sheppard, B. Bitterlin*, T. Breda*, A. Dawlatzai*, R. Giannella*, A. Jaros*, C. Kling*, E. Kolb, C. Lapointe, S. Simons-Wellin, H. Michelsen, J. Daily, M. Hannigan, P. Hamlington, J. Farnsworth, **G. Rieker**, "WindCline: Sloping Wind Tunnel for Characterizing Flame Behavior Under Variable Inclines and Wind Conditions," Review of Scientific Instruments 95, 025103 (2024). https://doi.org/10.1063/5.0175784

64. D. Yun*, W. Sabin*, S. Coburn**, N. Hoghooghi**, J. France, M. Hagenmaier, K. Rice, J. Donbar, **G. Rieker**, "Thermometry and velocimetry in a ramjet using dual comb spectroscopy of the $O_2$ A-band," Optics Express 31, 42571- 42580 (2023). https://doi.org/10.1364/OE.507647

63. R. Cole*, H. Tran, N. Hoghooghi**, **G. Rieker**, "Temperature-dependent CO2 Line Mixing Models using Dual Frequency Comb Absorption and Phase Spectroscopy up to 25 bar and 1000 K," Journal of Quantitative Spectroscopy and Radiative Transfer 297, 108488, (2023). https://doi.org/10.1016/j.jqsrt.2023.108488

62. D. Yun*, N. Malarich*, R. Cole*, S. Egbert*, J. France, J. Liu, K. Rice, M. Hagenmaier, J. Donbar, N. Hoghooghi**, S. Coburn**, **G. Rieker**, "Supersonic Combustion Diagnostics with Dual Comb Spectroscopy," Proceedings of the Combustion Institute 39, 1299-1306, (2023). https://doi.org/10.1016/j.proci.2022.07.103

61. D. Yun*, R. Cole*, N. Malarich*, S. Coburn**, N. Hoghooghi**, J. Liu, J. France, M. Hagenmaier, K. Rice, J. Donbar, **G. Rieker**, "Spatially Resolved Mass Flux Measurements with Dual-comb Spectroscopy," Optica 9, 1050-105, (2022). https://doi.org/10.1364/OPTICA.459009

60. N. Hoghooghi**, S. Xing, P. Chang, D. Lesko, A. Lind, **G. Rieker**, S. Diddams, "Broadband 1-GHz Mid-infrared Frequency Comb," Light: Science & Applications 11, 1-7, (2022). https://doi.org/10.1038/s41377-022-00947-w

59. A. Anderson, E. Strong*, S. Coburn**, **G. Rieker**, J. Gopinath, "Orbital Angular Momentum-based Dual-comb Interferometer for Ranging and Rotation Sensing," Optics Express 30, 21195-21210, (2022). https://doi.org/10.1364/OE.457238

58. J. Glusman, C. B. Lapointe, A. S. Makoweicki*, S. Simons-Wellin, **G. Rieker,** J.W. Daily, P. E. Hamlington, "Validation of Computationally Efficient Simulations of Douglas Fir Pyrolysis and Combustion Using Time-Resolved Frequency Comb Laser Measurements," Frontiers in Forests and Global Change 8, (2022). https://doi.org/10.3389/ffgc.2022.758689

57. N. Malarich*, **G. Rieker**, "Resolving nonuniform temperature distributions with single-beam absorption spectroscopy. Part II: Implementation with Broadband Spectra," Journal of Quantitative Spectroscopy and Radiative Transfer 272, 107805 (2021). https://doi.org/10.1016/j.jqsrt.2021.107805

56. C. Lapointe, N.T. Wimer, S. Simons-Wellin, J.F. Glusman, **G.B. Rieker**, P.E. Hamlington, "Efficient Simulations of Propagating Flames and Fire Suppression Optimization Using Adaptive Mesh Refinement," Fluids 6, (2021). https://doi.org/10.3390/fluids6090323

55. N. Malarich*, D. Yun*, K. Sung, S. Egbert*, S. Coburn**, B. Drouin, **G. Rieker**, "Dual frequency comb absorption spectroscopy of CH4 up to 1000 Kelvin from 6770 to 7570 cm-1," Journal of Quantitative Spectroscopy and Radiative Transfer 272, 107812 (2021). https://doi.org/10.1016/j.jqsrt.2021.107812

54. R. Cole*, N. Hoghooghi**; B. Drouin; **G. Rieker**, "High-temperature absorption line shape parameters for CO2 in the 6800-7000 cm-1 region from dual frequency comb measurements up to 1000 K," Journal of Quantitative Spectroscopy and Radiative Transfer 276, 107912 (2021). https://doi.org/10.1016/j.jqsrt.2021.107912

53. A. Rybchuk*, C. Alden**, J. Lindquist, **G. Rieker**, "A Statistical Evaluation of WRF-LES Trace Gas Dispersion Using Project Prairie Grass Measurements," Monthly Weather Review, Vol 149, Issue 5 (2021). https://doi.org/10.1175/MWR-D-20-0233.1

52. R. Cole*, A. Draper*, P. Schroeder*, C. Casby, A. Makowiecki*; S. Coburn**, J. Steinbrenner, N. Hoghooghi**, **G. Rieker**, "Demonstration of a uniform, high-pressure, high-temperature gas cell with a dual frequency comb absorption spectrometer," Journal of Quantitative Spectroscopy, Vol 268, 107640 (2021). https://doi.org/10.1016/j.jqsrt.2021.107640

51. E. Strong*, A. Anderson, M. Brenner, B. Heffernan, N. Hoghooghi**, J. Gopinath, **G. Rieker**, "Angular velocimetry for fluid flows: an optical sensor using structured light and machine learning," Optics Express, Vol. 29, Issue 7, pp. 9960-9980 (2021) https://doi.org/10.1364/OE.417210

50. A.Q. Anderson, E. Strong*, B. Heffernan, M. Siemens, **G. Rieker,** J. Gopinath, "Observation of the rotational Doppler shift with spatially incoherent light," Optics Express 29, 4058-4066 (2021). https://doi.org/10.1354/OE.415580

49. N. Malarich*, **G. Rieker**, "Resolving non-uniform temperature distributions with single-beam absorption spectroscopy. Part I: Theoretical capabilities and limitations," Journal of Quantitative Spectroscopy and Radiative Transfer 260, 107455 (2021). https://doi.org/10.1016/j.jqsrt.2020.107455

48. J. Christopher*, O. Doronina, D. Petrykowski*, T. Hayden*, C. Lapointe, N. Wimer, I. Grooms, **G. Rieker**, P. Hamlington, "Flow Parameter Estimation Using Laser Absorption Spectroscopy and Approximate Bayesian Computation," Experiments in Fluids 62, 43 (2021). https://doi.org/10.1007/s00348-020-03122-2

47. N. Hoghooghi**, R. Cole*, **G. Rieker**, "11-μs Time-resolved, Continuous Dual-Comb Spectroscopy with Spectrally Filtered Mode-locked Frequency Combs," Applied Physics B 127, 1-10 (2021). https://doi.org/10.1007/s00340-020-07552-y

46. A. Makowiecki*, D. Herman, N. Hoghooghi**, E. Strong*, R. Cole*, G. Ycas, F. Giorgetta, C. Lapointe, J. Glusman, J. Daily, P. Hamlington, N. Newbury, I. Coddington, **G. Rieker**, "Mid-Infrared Dual Frequency Comb Spectroscopy for Combustion Analysis from 2.8 to 5 Microns," Proceedings of the Combustion Institute 38, 1627-1635 (2021). https://doi.org/10.1016/j.proci.2020.06.195

45. P. Schroeder*, A. Makowiecki*, M. Kelley, R. Cole*, N. Malarich*, R. Wright**, J. Porter, **G. Rieker**, "Temperature and concentration measurements in a high-pressure gasifier enabled by cepstral analysis of dual frequency comb spectroscopy," Proceedings of the Combustion Institute 38, 1561-1569 (2021). https://doi.org/10.1016/j.proci.2020.06.011

44. C. Alden**, R. Wright**, S. Coburn**, D. Caputi, G. Wendland**, A. Rybchuk*, S. Conley, I. C. Faloona, **G. Rieker**, "Temporal Variability of Emissions Revealed by Continuous, Long-Term Monitoring of an Underground Natural Gas Storage Facility,"

Environmental Science & Technology 54, 14589-14597 (2020). https://doi.org/10.1021/acs.est.0c03175

43. E. Strong*, A. Anderson, J. Gopinath, **G. Rieker**, "Centering a beam of light to the axis of rotation of a planar object," Review of Scientific Instruments 91, 105101 (2020). https://doi.org/10.1063/5.0010160

42. N. Wimer, M. Day, C. Lapointe, A. Makowiecki*, J. Glusman, J. Daily, **G. Rieker**, P. Hamlington, "Numerical Simulations of Buoyancy-Driven Flows Using Adaptive Mesh Refinement: Structure and Dynamics of a Large-Scale Helium Plume," Theoretical and Computational Fluid Dynamics, (2020). https://doi.org/10.1007/s00162-020-00548-6

41. E. Hannah*, W. Swann, J. Ellis, M. Bodine, M. Carter, N. Kuczun, N. Newbury, L. Sinclair, A. Muschinski, **G. Rieker**, "Optical timing jitter due to atmospheric turbulence: comparison of frequency comb measurements to predictions from micrometeorological sensors," Optics Express 28, 25664-27209 (2020). https://doi.org/10.1364/OE.400434

40. C. Goldenstein, G. Matthews, R. Cole*, A. Makowiecki*, **G. Rieker,** "Cepstral Analysis for Baseline-Insensitive Absorption Spectroscopy Using Light Sources with Pronounced Intensity Variations," Applied Optics 59, 7865-7875 (2020). https://doi.org/10.1364/AO.399405

39. A. Makowiecki*, J. Steinbrenner, N. Wimer, J. Glusman, C. LaPointe, P. Hamlington, J. Daily, **G. Rieker**, "Dual frequency comb spectroscopy of solid fuel pyrolysis and combustion: Quantifying the influence of moisture content in Douglas fir," Fire Safety Journal, 103185 (2020). https://doi.org/10.1016/j.firesaf.2020.103185

38. (Top download, August 2020; OSA Spotlight on Optics review) D. Lesko, A. Lind, N. Hoghooghi**, A. Kowligy, H. Timmers, P. Sekhar, B. Rudin, F. Emaury, **G. Rieker**, S. Diddams, "Fully phase-stabilized 1 GHz turnkey frequency comb at 1.56 μm," OSA Continuum 3, 2070-2077 (2020). https://doi.org/10.1364/OSAC.396597

37. A. Makowiecki*, R. Cole*, N. Hoghooghi**, **G. Rieker**, "Pressure Scaling of Measured Absorption Cross-Sections by Modifying the Molecular Free Induction Decay Signal," Journal of Quantitative Spectroscopy and Radiative Transfer 254, 107189 (2020). https://doi.org/10.1016/j.jqsrt.2020.107189

36. A. Anderson, E. F. Strong*, B. M. Heffernan, M. E. Siemens, **G. Rieker**, J. T. Gopinath, "Detection technique effect on rotational Doppler measurements," Optics Letters 45, 2636- 2639 (2020). https://doi.org/10.1364/OL.390425

35. N. Wimer, C. Lapointe, J. Christopher*, S. Nigam, T. Hayden*, A. Upadhye, M. Strobel, **G. Rieker**, P. Hamlington, "Scaling of the Puffing Strouhal Number for Buoyant Jets and Plumes," Journal of Fluid Mechanics 895, A26 (2020). https://doi.org/10.1017/jfm.2020.271

34. C. Lapointe, N. Wimer, J. Glusman, A. Makowiecki*, J. Daily, **G. Rieker**, P. Hamlington, "Efficient Simulation of Turbulent Diffusion Flames in OpenFOAM Using Adaptive

Mesh Refinement," Fire Safety Journal 111, 102934 (2020). https://doi.org/10.1016/j.firesaf.2019.102934

33. T. Hayden*, N. Wimer, C. Lapointe, J. Christopher*, A. Upadhye, M. Strobel, P. Hamlington, and **G. Rieker**, "Characterization of a buoyant jet from a catalytic combustor using wavelength modulation spectroscopy," Combustion Science and Technology 192, 997-1014 (2019). https://doi.org/10.1080/00102202.2019.1604518

32. (Editor's pick) R. Cole*, A. Makowiecki*, N. Hoghooghi**, and **G. Rieker**, "Baseline-free Quantitative Absorption Spectroscopy Based on Cepstral Analysis," Optics Express 27, 37920-37939 (2019). https://doi.org/10.1364/OE.27.037920

31. (Top 15 downloaded frequency comb article in Optica from 2019-2021) N. Hoghooghi**, R. Wright**, A. Makowiecki*, W. Swann, E. Waxman, I. Coddington, and **G. Rieker**, "Coherent broadband cavity-enhanced dual-comb spectroscopy for detection of multiple gas species," Optica 6, 28 (2019). https://doi.org/10.1364/OPTICA.6.000028

30. A. Draper*, R. Cole*, J. Mohr, A. Zdanawicz, A. Marchese, N. Hoghooghi**, and **G. Rieker**, "Broadband Dual Frequency Comb Spectroscopy in a Rapid Compression Machine," Optics Express 27, 10814-10825 (2019). https://doi.org/10.1364/OE.27.010814

29. C. Alden**, S. Coburn**, R. Wright**, E. Baumann, K. Cossel, E. Perez, E. Hoenig, K. Prasad, I. Coddington, and **G. Rieker**, "Single-blind quantification of natural gas leaks from 1 km distance using frequency combs," Environmental Science and Technology 53, 2908-2917 (2019). https://doi.org/10.1021/acs.est.8b06259

28. T. Hayden*, N. Malarich*, D. Petrykowski*, S. Nigam, J. Christopher*, C. LaPointe, N. Wimer, A. Upadhye, M. Strobel, P. Hamlington, and **G. Rieker**, "OH radical measurements in combustion environments using wavelength modulation spectroscopy and dual frequency comb spectroscopy near 1491 nm," Applied Physics B 125, 226 (2019). https://doi.org/10.1007/s00340-019-7341-6

27. T. Hayden*, D. Petrykowski*, A. Sanchez*, S. Nigam, C. Lapointe, J. Christopher*, N. Wimer, A. Upadhye, M. Strobel, P. Hamlington, and **G. Rieker**, "Characterization of OH, $H_2O$, and temperature profiles in industrial flame treatment systems interacting with polymer films," Proceedings of the Combustion Institute 37 (indexed, peer reviewed), 1571-1578 (2019). https://doi.org/10.1016/j.proci.2018.05.058

26. J. Glusman, K. Niemeyer, A. Makowiecki*, N. Wimer, C. Lapointe, **G. Rieker**, P. Hamlington, and J. Daily, "Reduced Gas-Phase Kinetic Models for Burning of Douglas Fir," Frontiers in Mechanical Engineering 5, 40 (2019). https://doi.org/10.3389/fmech.2019.00040

25. (Top 15 highly cited frequency comb articles in Optica) S. Coburn**, C. Alden**, R. Wright**, K. Cossel, G. Truong, E. Baumann, F. Giorgetta, C. Sweeney, N. Newbury, K. Prasad, I. Coddington, and **G. Rieker**, "Regional trace-gas source attribution using a field-deployed dual frequency comb spectrometer," Optica 5, 320 (2018). https://doi.org/10.1364/OPTICA.5.000320

24. J. Christopher*, N. Wimer, C. LaPointe, T. Hayden*, I. Grooms, **G. Rieker**, and P. Hamlington, "Parameter estimation for complex thermal-fluid flows using approximate Bayesian computation," Physical Review Fluids 3, 104602 (2018). https://doi.org/10.1103/PhysRevFluids.3.104602

23. J. Yang*, P. Schroeder*, M. Cich, B. Drouin, F Giorgetta, W.C. Swann, I. Coddington, N. Newbury, and **G. Rieker**, "Speed-dependent Voigt Lineshape Parameter Database from Dual Frequency Comb Measurements up to 1305K. Part II: Argon-broadened $H_2O$ Absorption, 6801-7188 $cm^{-1}$," Journal of Quantitative Spectroscopy and Radiative Transfer 217, 189 (2018). https://doi.org/10.1016/j.jqsrt.2018.02.025

22. P. Schroeder*, M. Cich, J. Yang*, F Giorgetta, W.C. Swann, I. Coddington, N. Newbury, B. Drouin, and **G. Rieker**, "Speed-dependent Voigt Lineshape Parameter Database from Dual Frequency Comb Measurements up to 1305K. Part I: Pure $H_2O$ Absorption, 6801-7188 $cm^{1}$," Journal of Quantitative Spectroscopy and Radiative Transfer 210, 240 (2018). https://doi.org/10.1016/j.jqsrt.2018.02.025

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## SUBMITTED MANUSCRIPTS

*Graduate student in Rieker lab
**Postdoc / Research staff/ Visiting Scholars in Rieker lab

1. S. Simons-Wellin, S. Coburn**, P. Bevington, **G. Rieker**, P. Hamlington, "Adaptive Computational Framework to Infer Flaring Source Conditions from Remotely-Sensed Measurements of Methane Emissions," Environmental Science & Technology, submitted.

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3. P. Chang, R. Ishrak, N, Hoghooghi**, S. Egbert*, **G. Rieker**, S.A. Diddams, R. Reddy, "Dual-Comb Photothermal Microscopy," submitted.

4. D. Long, G. Mathews**, S. Pegahan, A. Ross, S. Coburn**, **G. Rieker**, A. Heiniger, "Mid-infrared dual comb spectroscopy via continuous-wave optical parametric oscillation," submitted.

5. S. Coburn**, C. Alden**, R. Wright**, G. Wendland**, A. Rybchuk*, N. Seitz**, I. Coddington, **G. Rieker**, "Long Distance Methane Emissions Monitoring with Dual Frequency Comb Spectroscopy: blind testing in complex emissions scenarios," submitted.

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11. **G. Rieker**, Sean Coburn**, "System and Method for Differentiating Gas Sources Based on Temperature," U.S. Patent Application No. 63/547,062 filed November 2, 2023.

10. (Patent Family) **G. Rieker**, C. Alden**, R. Wright**, S. Coburn**, "Systems and Methods for Dual Comb Spectroscopy," U.S. Patent No. US 11,686,622; Filed September 16, 2020, Issued June 27, 2023. Also Canadian Patent Application No. 3,093,345.

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*3 plenary, 53 invited, 80 with proceedings*

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196. (Invited) **G. Rieker,** "Frequency Comb Laser Diagnostics and Optical Pyrometry in Wildland Fire Research," *CLEO 2026,* Charlotte, North Carolina, May 2026.

195. G. Gallaher*, G. Mathews**, M. Sippel*, S. Coburn**, **G. Rieker,** "Time-Resolved Mid-Infrared Dual-Comb Spectroscopy of Pyrolysis Products of PMMA, PLA, and Paraffin," *CLEO 2026,* Charlotte, North Carolina, May 2026 (w/ proceedings).

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191. G. Mathews, A. Lalko*, A. Ziola, A. Makowiecki, K. Williamson, D. Day, M. Takeuchi, S. Egbert*, G. Gillespie**, A. Harness, R. Wright, A. Handschy, N. Hoghooghi**, P. Chang, S. Takahama, D. Henze, J. Jimenez, S. Diddams, **G. Rieker**, "Standoff Aerosol Measurements using Mid-Infrared Dual Frequency Comb Absorption Spectroscopy," *AAAR 43rd Annual Conference*, Buffalo, New York, October 2025.

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181. C. Mathurin*, D. Long, G. Mathews**, M. Cich, A. Heiniger, K. Souders, A. Frymire*, P. Hamlington, **G. Rieker**, "High Speed Mass Flux Measurements Using Mid-Infrared Electro-Optic Dual Comb Spectroscopy," *14th U.S. National Combustion Meeting,* Boston, MA, March 2025 (w/ proceedings).

180. A. Frymire*, D. Long, C. Mathurin*, G. Matthews**, S. Coburn**, **G. Rieker**, "High-Speed H2O Gas Thermometry from 300-1200K with Carrier-Multiplexed Electro-Optic Dual-Comb Spectroscopy," *14th U.S. National Combustion Meeting,* Boston, MA, March 2025 (w/ proceedings).

179. L. Shannon, A. Guth, S. Coburn**, P. Bevington, S. Simons-Wellin, C. Hoffman, M. Hannigan, **G. Rieker**, P. Hamlington, J. Farnsworth, "Influence of Ground Slope on Fire Spread Through a Douglas Fir Fuel Array in a Heading Crossflow," *14th U.S. National Combustion Meeting,* Boston, MA, March 2025 (w/ proceedings).

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177. G. Mathews*, S. Egbert*, G. Gillespie**, A. Lalko*, A. Makowiecki, A. Harness, A. Ziola, A. Handschy, D. Day, J. Jimenez, M. Takeuchi, D. Henze, S. Takahama, N. Hoghooghi**, P. Chang, S. Diddams, **G. Rieker**, "SAURON: Standoff Aerosol measUrement Remote Optical Network," *Field Laser Applications in Industry & Research (FLAIR)*, Assisi, Italy, September 2024.

176. C. Mathurin*, D. Long, G. Mathews**, M. Cich, A. Heiniger, K. Souders, A. Frymire*, P. Hamlington, **G. Rieker**, **"**High Speed Velocimetry with Mid-infrared Electro-optic Modulator Dual Comb Spectroscopy," *Field Laser Applications in Industry & Research (FLAIR)*, Assisi, Italy, September 2024.

175. D. Long, M. Cich, C. Mathurin*, A. Heiniger, G. Mathews**, A. Frymire*, **G. Rieker**, "Nanosecond Time-resolved Dual-comb Absorption Spectroscopy," *Field Laser Applications in Industry & Research (FLAIR)*, Assisi, Italy, September 2024.

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173. S. Coburn**, E. Miller*, N. Harris,* S. Droste, K. Knabe, **G. Rieker**, "Measuring Methane Destruction Efficiency in Gas Flares with Dual Comb Spectroscopy," *40th International Symposium on Combustion*, Milan, Italy, July 2024.

172. S. Egbert*, K. Sung, S. Coburn**, B. Drouin, **G. Rieker**, "Water-vapor absorption database using Dual Comb Spectroscopy from 300 to 1300 K: Self- and Air-Broadened $H_2O$, 6600 to 7650 cm-1," *ASA-HITRAN Conference,* Boston, Massachusetts, June 2024.

171. A. Frymire*, D. Yun*, D. Long, S. Coburn**, J. France, J. Donbar, **G. Rieker**, "A Compact Velocimeter for Supersonic Propulsion using Electro-optic Modulator Dual-comb Spectroscopy," *JANNAF Propulsion Meeting*, Oklahoma City, Oklahoma, May 2024.

170. (Invited) **G. Rieker**, "Practical Dual Comb Spectroscopy to Improve Energy Systems: Navigating the Interfaces Between Science, Engineering, and Industry," *13th Advanced Lasers and Photon Sources Conference (ALPS2024) in the framework of the OPTICS & PHOTONICS International Congress 2024 (OPIC2024),* Yokohama, Japan, April 2024.

169. (Invited) S. Coburn**, R. Wright, C. Alden, **G. Rieker**, "Trends in Industrial Methane Monitoring: Benefits of Optical Approaches and Pressure from Non-optical Approaches," *2024 CLEO Technical Conference,* Charlotte, North Carolina, May 2024.

168. (Invited) N. Hoghooghi**, P. Chang, S. Egbert*, M. Burch, R. Shaik, P. Lynch, S. Diddams, **G. Rieker,** "Chemical kinetics study with a GHz mid-infrared dual-comb spectrometer,*" 2024 CLEO Technical Conference,* Charlotte, North Carolina, May 2024 (w/ proceedings).

167. S. Egbert*, D. Yun*, J. France, N. Malarich*, R. Cole*, J. Liu, K. Rice, M. Hagenmaier, N. Hoghooghi**, S. Coburn**, J. Donbar, **G. Rieker**, "Dual Comb Spectroscopy for High-temperature Ramjet Mass Flux Measurements," *JANNAF 52nd Combustion, 40th Airbreathing Propulsion Meeting*, Salt Lake City, Utah, December 2023 (w/ proceedings).

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165. P. Bevington, L. Shannon, S. Simons-Wellin, C. Lapointe, S. Coburn**, **G. Rieker**, J. Farnsworth, and P. Hamlington**,** "Large Eddy Simulation of Turbulent Fire Spread in a Douglas Fir Fuel Array," *2023 Fall Technical Meeting of the Western States Section of The Combustion Institute*, Northridge, CA, October 2023 (w/ proceedings).

164. S. Simons-Wellin, C. Lapointe, S. Coburn**, S. Sheppard, J. Farnsworth, **G. Rieker**, P. Hamlington, "Non-Unity Lewis Number Simulations of a Low Reynolds Number Jet Diffusion Flame in Crossflow," *2023 Fall Technical Meeting of the Western States Section of The Combustion Institute*, Northridge, CA, October 2023 (w/ proceedings).

163. (Plenary) **G. Rieker,** "Practical Dual Comb Spectroscopy: Navigating the Interfaces Between Science, Engineering, and Industry," *Optica Sensing Congress*, Munich, Germany, July 2023.

162. M. Walsh, P. Chang, F. Emaury, **G. Rieker**, N. Newbury, F. Giorgetta, S. Diddams, J. Genest, "Mode-resolved, shot noise limited, dual-comb spectroscopy with independent free running lasers," *Fourier Transform Spectroscopy (FTS)*, *Optica Sensing Congress,* Munich, Germany, July 2023 (w/ proceedings).

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160. (Invited Hot Topic) S. Egbert*, N. Hoghooghi**, P. Chang, A. Lalko*, S. Coburn**, S. Diddams, **G. Rieker**, "Broadband, High-Resolution, Portable Dual Comb Spectrometer From 3-5 μm," *Gordon Research Conference, Laser Diagnostics for Energy and Combustion Science*, Newry, Maine, July 2023.

159. D. Yun*, W. Sabin*, S. Coburn**, N. Hoghooghi**, J. France, M. Hagenmaier, K. Rice, J. Donbar, **G. Rieker**, "O2 A-Band Thermometry and Velocimetry in a Ramjet with Dual Comb Spectroscopy," *Gordon Research Seminar, Laser Diagnostics for Energy and Combustion Science*, Newry, Maine, July 2023.

158. C. Callahan*, D. Long, S. Coburn**, **G. Rieker**, "GPU Accelerated Absorption Simulation (GAAS)," *5th QUADMARTS Workshop*, Estes Park, Colorado, June 2023.

157. S. Egbert*, N. Hoghooghi**, S. Coburn**, K. Sung, B. Drouin, **G. Rieker**, "High-Resolution Near- and Mid-IR Dual Comb Spectroscopy for High-Temperature Database and Field Measurements," *5th QUADMARTS Workshop*, Estes Park, Colorado, June 2023.

156. K. Rozmiarek, T. Jones, I. Overeem,, Y. Oh, B. Vaughn, V. Morris, E. Miller*, **G. Rieker**, C. Brashear, "Working Towards a Better Understanding of Hotspot Methane Emissions from Big Trail Lake, Goldstream Valley, Alaska," *6th European Conference on Permafrost (EUCOP 2023)*, Puigcerdà, Spain, June 2023.

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154. S. Egbert*, S. Coburn**, K. Sung, B. Drouin, **G. Rieker**, "High-Resolution Dual Comb Spectroscopy to Validate High-Temperature H2O Absorption Models," *CLEO: Conference on Lasers and Electro-Optics,* San Jose, CA, May 2023, (w/ proceedings).

153. N. Hoghooghi**, P. Chang, S. Egbert*, M. Burch, P. Lynch, S. Diddams, **G. Rieker**, "Mid-Infrared Dual-Comb Spectroscopy for High-Speed Chemical Kinetics Measurements in a Shock Tube," *CLEO: Conference on Lasers and Electro-Optics,* San Jose, CA, May 2023, (w/ proceedings).

152. (Invited) **G. Rieker**, R. Wright, S. Coburn**, C. Alden, I. Dickinson, "Large-Scale Mitigation of Methane Emissions from Oil and Gas Operations with Dual Frequency Comb Spectroscopy" *CLEO: Conference on Lasers and Electro-Optics,* San Jose, CA, May 2023.

151. P. Chang, N. Hoghooghi**, S. Swartz, D. Lesko, R. Ishark, S. Egbert*, J. Biegert, R. Reddy, **G. Rieker**, S. Diddams, "Mid-Infrared Hyperspectral Microscopy With Broadband 1-GHz Dual-Comb Spectroscopy," *CLEO: Conference on Lasers and Electro-Optics,* San Jose, CA, May 2023, (w/ proceedings).

150. C. Mathurin*, D. Long, G. Mathews**, M. Cich, A. Heiniger, K. Souders, A. Frymire*, P. Hamlington, **G. Rieker**, "High Speed Velocity Measurements with Mid-Infrared Electro-Optic Modulated Dual Comb Spectroscopy" *13th U.S. National Combustion Meeting*, College Station, Texas, 2023, (w/ proceedings).

149. D. Yun*, W. Sabin*, S. Coburn**, N. Hoghooghi**, J. France, M. Hagenmaier, K. Rice, J. Donbar, **G. Rieker**, "Temperature and Velocity in a Ramjet with O2 Dual Comb Spectroscopy" *13th U.S. National Combustion Meeting,* College Station, Texas, 2023, (w/ proceedings).

148. (Invited) N. Hoghooghi**, P. Chang, M. Burch, S. Egbert*, S. Diddams, P. Lynch, **G. Rieker, "**1-GHz MIR dual-comb spectrometer for high-speed chemical kinetics studies," *IEEE Photonics Conference IPC*, Vancouver, Canada, November 2022.

147. (Invited) **G. Rieker**, S. Coburn**, N. Hoghooghi**, "Advancements in Dual Frequency Comb Spectroscopy for Sensing in Harsh and Remote Environments," *Field Laser Applications in Industry & Research (FLAIR)*, Aix les Bains, France, September 2022.

146. N. Hoghooghi**, P. Chang, S. Egbert*, M. Burch, P. Lynch, S. Diddams, **G. Rieker,** "High-speed mid-infrared dual-comb spectrometer based on mode-locked fiber combs," *Field Laser Applications in Industry & Research (FLAIR)*, Aix les Bains, France, September 2022.

145. D. Yun*, R. Cole*, N. Malarich*, S. Egbert*, W. Sabin*, J. France, J. Liu, M. Hagenmaier, K. Rice, J. Donbar, N. Hoghooghi**, S. Coburn**, **G. Rieker, "**Mass Flux Measurements with Dual Frequency Comb Spectroscopy," *Field Laser Applications in Industry & Research (FLAIR)*, Aix les Bains, France, September 2022.

144. R. Cole*, H. Tran, N. Hoghooghi**, **G.Rieker,** "Temperature-dependent CO2 Lin Mixing Models using Dual Frequency Comb Absorption and Phase Spectroscopy up to 25 bar and 1000 K," *ASA-HITRAN Conference,* Reims, France, August 2022.

143. (Invited) **G. Rieker**, "Free Range Frequency combs: mobilizing frequency comb laser technology from hypersonic research to atmospheric sensing," *IEEE Photonics Society Summer Topicals Meeting*, Cabo San Lucas, Mexico, July 2022.

142. D. Yun*, N. Malarich*, R. Cole*, S. Egbert*, J. France, J. Liu, K. Rice, M. Hagenmaier, J. Donbar, N. Hoghooghi**, S. Coburn**, **G. Rieker**, "Hypersonic Combustion

Diagnostics with Dual Comb Spectroscopy," *39th International Symposium on Combustion*, Vancouver, B.C., Canada, July 2022.

141. C. Callahan*, S. Coburn**, **G. Rieker**, "The GPU Accelerated Absorption Simulation (GAAS) Platform," *75th International Symposium on Molecular Spectroscopy,"* Champaign-Urbana, Ill, June 2022.

140. S. Egbert*, P. Chang, S. Diddams, **G. Rieker**, N. Hoghooghi**, "High-Speed, High-Resolution, Broadband Dual-Comb Spectrometer From 3-5 μm," *75th International Symposium on Molecular Spectroscopy,"* Champaign-Urbana, Ill, June 2022.

139. (Invited) **G. Rieker**, "From Rocket Engines to Exoplanets: Dual Frequency Comb Spectroscopy of High Temperature and Pressure Lineshapes in Support of Extreme Environment Diagnostics," *ICSLS (International Conference on Spectral Line Shapes),* Caserta, Italy, June 2022.

138. E. Strong*, S. Coburn**, A. Anderson, R. Cole*, S. Becker, J. Gopinath, **G. Rieker**, "Broadband Spectroscopic Imaging Using Dual Frequency Comb Spectroscopy and Compressive Sensing," *CLEO: Conference on Lasers and Electro-Optics,* San Jose, CA, May 2022, (w/ proceedings).

137. A. Anderson, E. Strong*, S. Coburn**, **G. Rieker**, J. Gopinath**,** "Dual Comb Ranging and Rotation Sensing with Orbital Angular Momentum," *CLEO: Conference on Lasers and Electro-Optics,* San Jose, CA, May 2022, (w/ proceedings).

136. D. Yun*, R.Cole*, N. Malarich*, S. Coburn**, N. Hoghooghi**, J. France, K. Rice, J. Donbar, **G. Rieker,** "Velocity Measurements in a Ground-test Ramjet using Dual Frequency Comb Spectroscopy," *CLEO: Conference on Lasers and Electro-Optics,* San Jose, CA, May 2022, (w/ proceedings).

135. P. Chang, N. Hoghooghi**, S. Egbert*, S. Xing, D. Lesko, A. Lind, **G. Rieker**, S. Diddams, "1 GHz Mid-infrared Dual-comb Spectrometer Spanning More Than 30 THz," *CLEO: Conference on Lasers and Electro-Optics,* San Jose, CA, May 2022, (w/ proceedings).

134. D. Yun*, R. Cole*, N. Malarich*, S. Egbert*, J. France, J. Liu, M. Hagenmaeier, K. Rice, J. Donbar, N. Hoghooghi**, S. Coburn**, **G. Rieker**, "2D Mass Flux Profile of an Oblique Shock Train in a Scramjet Isolator via Dual-Frequency Comb Spectroscopy," *AIAA SciTech Forum and Exposition*, San Diego, CA, January 2022 (w/ proceedings).

133. (Best student paper award) R.Cole*, N. Hoghooghi**, **G. Rieker**, "Improving absorption models for $CO_2$ at high pressure and temperature using dual frequency comb spectroscopy," *2021 OSA Optical Sensors and Sensing Congress*, virtual, July 19-23 2021 (w/ proceedings).

132. (Invited) **G.B. Rieker**, "The Value of Continuous Methane Monitoring Using Dual Frequency Comb Lasers: Success Stories from Long-term Industry Deployments," 2021 OSA Optical Sensors and Sensing Congress, 19-23 July, virtual, 2021 (w/ proceedings).

131. J.F. Glusman, C.B. Lapointe, A.S. Makowiecki, S. Simons-Wellin, **G.B. Rieker**, J.W. Daily, P.E. Hamlington, "Computationally efficient simulations of Douglas Fir pyrolysis and combustion" 12th U.S. National Combustion Meeting, virtual, 2021 (w/ proceedings).

130. N.A. Malarich, **G.B. Rieker**, "Measuring temperature nonuniformity through a diffusion flame with single-beam absorption spectroscopy," *12th U.S. National Combustion Meeting*, virtual, 2021 (w/ proceedings).

129. N. A. Malarich*, D. Yun*, K. Sung, S. C. Egbert*, S. C. Coburn**, B. R Drouin, **G. B. Rieker,** "Examination of Spectroscopic Databases via Dual Frequency Comb Absorption Spectroscopy of $CH_4$ from 6770-7630 $cm^{-1}$ up to 1000 K," *International Symposium on Molecular Spectroscopy,* Champagne-Urbana, June 2021.

128. S.C. Egbert*, N. Malarich*, D. Yun*, K. Sung, S.C. Coburn**, B. R. Drouin, **G.B. Rieker**, "Speed-Dependent Voigt Lineshape Parameter Database Using Dual Frequency Comb Laser Absorption Measurements Of Pure And Air-Broadened H2O From 6656-7540 CM-1 Up To 1100 K," *International Symposium on Molecular Spectroscopy,* Champagne-Urbana, June 2021.

127. R. Cole*, N. Hoghooghi**, **G. B. Rieker**, "Dual Frequency Comb Absorption Spectroscopy of CO2 at High Pressure And Temperature," *International Symposium on Molecular Spectroscopy,* Champagne-Urbana, June 2021.

126. E. Strong*, A. Q. Anderson, B. M. Heffernan, M. P. Brenner, N. Hoghooghi**, J. T. Gopinath, **G. B. Rieker, "**Sensing Angular Velocity with Optical Orbital Angular Momentum and Machine Learning," *OSA Optical Sensors and Sensing Congress,* Vancouver, Canada, July 2021 (w/ proceedings).

125. N. Hoghooghi**, A. Lind, D. Lesko, S. Xing, P.Chang, **G.Rieker**, S. Diddams, "Intra-pulse difference frequency generation spanning 7 to 14 μm with a 1-GHz mode-locked laser comb," *CLEO: Conference on Lasers and Electro-Optics,* May 2021, (w/ proceedings).

124. A. Anderson, E. Strong*, B. Heffernan, M. Siemans, **G. Rieker**, J. Gopinath, "Rotation Measurement Using Spatially Incoherent Light and the Rotational Doppler Shift," *CLEO: Conference on Lasers and Electro-Optics,* May 2021, (w/ proceedings).

123. A. Rybchuk*, C. Alden**, J. Lundquist, **G. Rieker,** "Evaluating the Accuracy of WRF-LES for Natural Gas Monitoring Applications," *101st Annual Meeting of the American Meteorological Society,* January 2021.

122. P. Schroeder*, A. Makowiecki*, M. Kelley, R. Cole*, N. Malarich*, R. Wright**, J. Porter, **G. Rieker**, "Temperature and concentration measurements in a high-pressure gasifier enabled by cepstral analysis of dual frequency comb spectroscopy," *38th International Symposium on Combustion*, Adelaide, Australia, virtual, January 2021.

121. A. Makowiecki, D. Herman, N. Hoghooghi**, E. Strong*, R. Cole*, G. Yeas, F. Giorgetta, C. Lapointe, J. Glusman, J. Daily, P. Hamlington, N. Newbury, I Coddington,

**G. Rieker**, "Mid-Infrared Dual Frequency Comb Spectroscopy for Combustion Analysis from 2.8 to 5 Microns," *38th International Symposium on Combustion*, Adelaide, Australia, virtual, January 2021.

120. (Invited) D. Yun, R. Cole, S. Coburn, K. Rice, J. Donbar, **G. Rieker**, N. Malarich, S. Egbert, N. Hoghooghi, J. France, J. Liu, M. Hagenmaier, "Non-intrusive Measurement of High Speed Flows." *AIAA: SciTech Forum,* virtual, January 2021 (w/ proceedings)

119. D. Yun*, N. Malarich*, R. Cole*, S. Egbert*, S. Coburn**, N. Hoghooghi**, J. France, K. Rice, J. Donbar, **G. Rieker**, "Velocity Measurements in a Ground-test Scramjet using Dual Frequency Comb Spectroscopy," *JANNAF 50th CS/38th APS, 38th EPSS/ 32nd ESHS Joint Subcommittee Meeting,* virtual, December 2020.

118. (Invited) **G.Rieker**, N. Malarich*, D. Yun*, R. Cole*, S. Egbert*, S. Coburn**, N. Hoghooghi**, J. France, K. Rice, J. Donbar, "Dual Frequency Comb Spectroscopy for CFD validation in High speed Combustion," *JANNAF 50th CS/38th APS, 38th EPSS/ 32nd ESHS Joint Subcommittee Meeting,* virtual, December 2020.

117. A. Rybchuk*, C. Alden**, J. Lundquist, G. Rieker, "A Comparison of Trace Gas Dispersion from WRF-LES to Project Prairie Grass," *Rocky Mountain Fluid Mechanics Research Symposium,* August 2020.

116. (Invited) S. Coburn**, C. Alden**, R. Wright**, D. Wilson, G. Wendland, A. Rybchuk*, N. Sietz, D. Doran, I. Coddington, I. Faloona, and G. Rieker, "Continuous Observations of Methane Emissions from Oil and Natural Gas Infrastructure Using a Dual Frequency Comb Based Monitoring System," *OSA Optical Sensors and Sensing/Imaging and Applied Optics Congress*, virtual, June 2020.

115. (Invited) N. Hoghooghi**, A. Makowiecki*, D. Herman, E. Strong*, R. Cole*, G. Ycas, F. Giorgetta, N. Newbury, I. Coddington, **G. Rieker**, "Mid-infrared Dual-comb Spectroscopy for Wildfire Combustion Analysis," *OSA Optical Sensors and Sensing/Imaging and Applied Optics Congress*, virtual, June 2020.

114. E. Hannah*, W. Swann, J. Ellis, M. Bodine, C. Mak, N. Kuczun, N. Newbury. L. Sinclair, A. Muschinski, **G. Rieker**, "Retrieval of the Refractive Index Structure Parameter from Frequency Comb Timing Jitter Data," *2020 OSA Optical Sensors and Sensing Congress*, Vancouver, Canada, June 2020 (w/ proceedings).

113. M. Ruiz-Llata**, **G. Rieker**, "Independent Component Analysis for Spectral Signature Separation in Dual-comb Spectroscopy," *2020 OSA Optical Sensors and Sensing Congress*, Vancouver, Canada, June 2020 (w/ proceedings).

112. E. Hannah*, W. Swann, J. Ellis, M. Bodine, N. Newbury, L. Sinclair, A. Muschinski, **G. Rieker**, **"**Impact of Outdoor Atmospheric Turbulence on Optical Timing Jitter," *CLEO: Conference on Lasers and Electro-Optics,* Orlando Florida, May 2020 (w/ proceedings).

111. E. Strong*, A. Anderson, B. Heffernan, M. Brenner, J. Gopinath, **G. Rieker,** "An angular velocity sensor using machine learning and optical orbital angular momentum,"

*CLEO: Conference on Lasers and Electro-Optics,* Orlando Florida, May 2020 (w/ proceedings).

110. (Invited) A. Makowiecki*, N. Hoghooghi**, D. Herman, E. Strong*, R. Cole*, G. Ycas, F. Giorgetta, N. Newbury, I. Coddington, **G. Rieker**, "Mid-Infrared Dual-Comb Spectroscopy of Biomass Pyrolysis," *CLEO: Conference on Lasers and Electro-Optics,* Orlando, Florida, May 2020 (w/ proceedings).

109. (Invited) **G. Rieker**, "Emission Inventories from Natural Gas Storage Facilities Using Regional Frequency Comb Laser Monitoring and Aircraft Flyovers," *Carbon Capture, Utilization and Storage, and Oil and Gas Technologies Integrated Review Meeting 2019,* Pittsburgh, PA, August 2019.

108. (Invited) **G**. **Rieker**, C. Alden**, S. Coburn**, R. Wright**, N. Seitz, D. Doran, D. Wilson, A. Rybchuk*, G. Wendland*, J. Genest, A. Tourigny-Plante, J.D. Deschenes, I. Coddington, K. Osadetz, "Greenhouse Gas Source Attribution Over Multiple Square Kilometer Regions Using Dual Frequency Comb Lasers," *CAMI Subscribers Meeting 2019*, Calgary, Alberta, Canada, August 2019.

107. (Invited) A. Makowiecki*, R. Cole*, N. Hoghooghi**, G. Rieker, "Baseline Free Absorption Spectroscopy," Gordon Research Conference, Les Diablerets, Switzerland, July 2019.

106. (Invited) A. Makowiecki*, R. Cole*, N. Hoghooghi**, G. Rieker, "Baseline Free Absorption Spectroscopy," Gordon Research Seminar, Les Diablerets, Switzerland, July 2019.

105. D. Yun*, N**.** Malarich*, S. Coburn**, K. Sung, B. Drouin, **G. Rieker**, "Updating High Temperature Methane Absorption Databases Using Dual Comb Spectroscopy Data," *Rocky Mountain Fluid Mechanics Symposium*, Boulder, Colorado, July 2019.

104. C. Alden**, **G**. **Rieker**, S. Coburn**, R. Wright**, N. Seitz, D. Doran, D. Wilson, A. Rybchuk*, G. Wendland*, J. Genest, A. Tourigny-Plante, J.D. Deschenes, I. Coddington, K. Osadetz, "Greenhouse Gas Source Attribution Over Multiple Square Kilometer Regions Using Dual Frequency Comb Lasers," *COSIA/Oil Sands Innovation Summit 2019*, Calgary, Alberta, Canada, June 2019.

103. N. Malarich*, D. Yun*, S. Coburn**, K. Sung, B. Drouin, **G. Rieker**, "High Temperature Methane Absorption With A Dual Frequency Comb Spectrometer," *International Symposium on Molecular Spectroscopy*, Champaign-Urbana, Illinois, June 2019.

102. R. Cole*, A.Makowiecki*, N. Hoghooghi**, **G. Rieker**, "Baseline-free Measurement of Temperature, Pressure, and Concentration from Molecular Free Induction Decay," *International Symposium on Molecular Spectroscopy,* Champaign-Urbana, Illinois, June 2019.

101. (Invited) A. Makowiecki*, R. Cole*, N. Hoghooghi**, **G. Rieker**, "Baseline Free Absorption Spectroscopy," *Gordon Research Conference*, Les Diablerets, Switzerland, July 2019.

100. (Invited) A. Makowiecki*, R. Cole*, N. Hoghooghi**, **G. Rieker**, "Baseline Free Absorption Spectroscopy," *Gordon Research Seminar,* Les Diablerets, Switzerland, July 2019.

99. (Plenary) G. **Rieker**, "Frequency Combs in Combustion," *QUADMARTS*, Nancy, France, May 2019.

98. N. Hoghooghi**, R. Wright**, W. Swann, I. Coddington, and G. **Rieker,** "Broadband Coherent Cavity-Enhanced Dual-Comb Spectroscopy," *Cavity Enhanced Spectroscopy Conference 2019,* Madison, WI, June 2019.

97. (Invited) E. Baumann, E. Mitchell, M. Hoehler, F. Giorgetta, T. Hayden*, G. Rieker, N. Newberry, "Imaging through Flames with Coherent Laser Ranging," *Conference on Lasers and Electro-Optics*, (*CLEO)*, San Jose, California, May 2019.

96. (Postdeadline) R. Cole*, A. Makowiecki*, N. Hoghooghi**, **G.Rieker**, "Baseline-free Quantitative Absorption Spectroscopy,
Based on Molecular Free Induction Decay," *Conference on Lasers and Electro-Optics*, (*CLEO)*, San Jose, California, May 2019 (w/ proceedings).

95. N. Hoghooghi**, R. Cole*, A. Makowiecki*, and **G. Rieker**, "GHz Dual-comb Spectroscopy with 110-μs Time Resolution," *CLEO 2019*, San Jose, CA, May 2019 (w/ proceedings).

94. C. Lapointe, N. Wimer, M. Day, A. Makowiecki*, J. Glusman, J. Daily, **G. Rieker**, P. Hamlington, "The Study of Fire at Small Scales Using Adaptive Mesh Refinement," *17th International Conference on Numerical Combustion*, SIAM, Aachen, Germany, May 2019.

93. (Invited) **G. Rieker**, "Leveraging Lasers for Carbon Reduction," *21st Century Energy Transitions Symposium*, Denver, CO, April 2019.

92. (Plenary) **G. Rieker**, "Frequency Combs in Combustion," *11th US National Combustion Meeting*, Pasadena, CA, March 2019.

91. N. Malarich*, Torrey Hayden*, and **G. Rieker**, "Capturing spatial temperature distributions with broadband single-beam absorption spectroscopy," *11th US National Combustion Meeting*, Pasadena, CA, March 2019 (w/ proceedings).

90. A. Makowiecki*, J.E. Steinbrenner, N.T. Wimer*, C.B. Lapointe, J.F. Glusman, J.W. Daily, P.E. Hamlington, **G. Rieker**, "Comparison of Flame Temperatures to Mass Flux Rates for Wildland Fire Fuels," *11th US National Combustion Meeting*, Pasadena, CA, March 2019 (w/ proceedings).

89. C. Lapointe, N. Wimer, J. Glusman, A. Makowiecki*, J. Daily, **G. Rieker**, and P. Hamlington, "Progress Towards High Fidelity Simulations of Large-Scale Fires," *11th US National Combustion Meeting*, Pasadena, CA, March 2019 (w/ proceedings).

88. (Invited) **G. Rieker**, S. Coburn**, C. Alden**, R. Wright**, S. Conley, I. Faloona, K. Prasad, and I. Coddington, "Multi-facility methane leak detection with a long-distance frequency comb laser system," *EUCI Stakeholder Symposium on Mitigating Methane Emissions*, Los Angeles, CA, March 2019.

87. N. Wimer, M. Day, A. Makowiecki*, J. Glusman, J. Daily, **G. Rieker**, and P. Hamlington, "Low Mach Number AMR Combustion Simulations with PeleLM," Conference on Computational Science and Engineering, SIAM, Spokane, WA, February 2019.

86. A. Draper*, R. Cole*, J. Mohr, A. Zdanawicz, C. Gould, A. Marchese, N. Hoghooghi**, and **G. Rieker**, "Progress Toward Dual Frequency Comb Spectroscopy in a Rapid Compression Machine," *AIAA Science and Technology Exhibition and Forum*, San Diego, CA, January 2019 (w/ proceedings).

85. (Invited) **G. Rieker**, R. Cole*, N. Hoghooghi**, and A. Draper*, "Dual-frequency comb spectroscopy for dynamic, high-pressure combustion systems," *Fourier Transform Spectroscopy*, Singapore, Singapore, November 2018.

84. J. Christopher*, D. Petrykowski*, T. Hayden*, C. Lapointe, N. Wimer, S. Nigam, I. Grooms, P. Hamlington, and **G. Rieker**, "Parameter Estimation using Wavelength Modulation Spectroscopy Temperature Measurements and Approximate Bayesian Computation," *OSA Optics and Photonics for Energy & the Environment (E2)*, Singapore, Singapore, November 2018 (w/ proceedings).

83. R. Cole*, A. Draper*, P. Schroeder*, and **G. Rieker**, "Dual Frequency Comb Absorption Spectroscopy of Extreme Pressure and Temperature Environments," *Field Laser Applications in Industry and Research (FLAIR),* Assisi, Italy, September 2018.

82. C. Alden**, S. Coburn**, R. Wright**, A. Rybchuk*, G. Wendland**, K. Cossel, E. Baumann, K. Prasad, I. Coddington, and **G. Rieker**, "New monitoring and detection methodology for methane emissions from oil and gas," *2nd annual National Enforcement Investigation Center (NEIC) Technical Information Exchange*, Denver, CO, August 2018.

81. I. Coddington, G. Truong, E. Waxman, K. Cossel, P. Schroeder*, R. Wright**, S. Coburn**, C. Alden**, E. Baumann, F. Giorgetta, W. Swann, **G. Rieker**, N.R. Newbury, "Dual-comb spectroscopy for precision green-house gas measurement", *24th International Conference on Optics*, Tokyo, Japan, August 2018.

80. T. Hayden*, D. Petrykowski*, A. Sanchez*, S. Nigam, C. Lapointe, J. Christopher*, N. Wimer, A. Upadhye, M. Strobel, P. Hamlington, and **G. Rieker**, "Characterization of OH, H2O, and temperature profiles in industrial flame treatment systems interacting with polymer films," *37$^{th}$ International Symposium on Combustion*, Dublin, Ireland, July 2018.

79. N. Malarich* and **G. Rieker**, "Theoretical limits of nonuniform temperature retrievals with single-beam absorption spectroscopy," *Laser Applications to Chemical, Security and Environmental Analysis (LACSEA),* Orlando, FL, July 2018 (w/ proceedings).

78. (Invited) **G. Rieker**, S. Coburn**, C. Alden**, R. Wright**, S. Conley, I. Faloona, K. Prasad, and I. Coddington, "Dual Frequency Comb Methane Leak Detection at Operational Oil and Gas Facilities," *73nd International Symposium on Molecular Spectroscopy*, Champaign-Urbana, IL, June 2018.

77. R. Cole*, P. Schroeder*, A. Draper*, M. Cich, B. Drouin, and **G. Rieker**, "Dual Frequency Comb Spectroscopy for Development and Testing of High Pressure, High Temperature Absorption Models," *73nd International Symposium on Molecular Spectroscopy*, Champaign-Urbana, IL, June 2018.

76. E. Waxman, K. Cossel, F. Giorgetta, G. Truong, M. Cermak, W. Swann, D. Hesselius, **G. Rieker**, N. Newbury, I. Coddington, "Dynamic Regional and City Scale Sensing of GHG's using a Dual-comb Spectrometer," *73nd International Symposium on Molecular Spectroscopy*, Champaign-Urbana, IL, June 2018.

75. (Invited) **G. Rieker**, P. Schroeder*, R. Cole*, J. Yang*, A. Draper*, M. Cich, B. Drouin, "Frequency Comb Lasers in High-temperature Spectroscopy: Spectral Database Development to Practical Field Measurements," *15th International HITRAN conference*, Cambridge, MA, June 2018.

74. (Invited) **G. Rieker**, S. Coburn**, C. Alden**, R. Cole*, A. Draper*, P. Schroeder*, R. Wright**, I. Coddington, K. Cossel, E. Baumann, K. Prasad, N. Newbury, "Novel Uses of Stabilized Optical Frequency Combs: from Regional Methane Leak Source Identification to Diagnostics for Extreme Combustion," *IEEE International Frequency Control Symposium*, Squaw Valley, CA, May 2018. (w/ proceedings).

73. (Invited) N. Hoghooghi**, R. Wright**, W. Swann, I. Coddington, N. Newbury, and **G. Rieker**, "Sensitive Detection of Multiple Gas Species using a Cavity Enhanced Dual-Comb Spectrometer," *CLEO 2018*, San Jose, CA, May 2018 (w/ proceedings).

72. S. Coburn**, C. Alden**, R. Wright**, E. Baumann, K. Cossel, N. Newbury, K. Prasad, I. Coddington, and **G. Rieker**, "Quantifying methane emissions among simulated gas wells with a dual-frequency comb spectrometer," *CLEO 2018*, San Jose, CA, May 2018 (w/ proceedings).

71. C. Alden**, S. Coburn**, R. Wright**, E. Baumann, K. Cossel, C. Sweeney, A. Karion, I. Coddington, **G. Rieker**, "Single-blind testing of a regional, continuous monitoring system for finding methane leaks from oil and gas operations," *NOAA/ESRL Laboratory Global Monitoring Annual Conference*, Boulder, CO, May 2018.

70. N. Wimer, A. Makowiecki*, J. Glusman, A. Poludnenko, C. Hoffman, J. Daily, **G. Rieker**, and P. Hamlington, "Direct Numerical Simulation of a Turbulent Helium Plume and Methane Pool Fire," *The Fire Continuum Conference*, Missoula, MT, May 2018.

69. I. Coddington, K. Cossel, E. Waxman, F. Giorgetta, M. Cermak, D. Hesselius, S. Ruben, W. Swann, G. Truong, **G. Rieker**, and N. Newbury, "Regional sensing with an open-path dual comb spectroscopy and a UAS," *SPIE Defense + Security*, Orlando, FL, April 2018. (w/ proceedings).

68. I. Coddington, C. Alden**, E. Baumann, S. Coburn**, K. Cossel, F. Giorgetta, D. Herman, K. Prasad, N. Newbury, **G. Rieker**, E. Waxman, R. Wright**, G. Ycas, "Fiber frequency combs for remote sensing", *SPIE Photonics Europe*, Srasbourg, France, April 2018.

67. P. Schroeder*, M. Cich, J. Yang*, B. Drouin, R. Cole*, A. Draper*, and **G. Rieker**, "Study of High Temperature Absorption Lineshapes using Frequency Comb Lasers," *Western States Section Combustion Institute (WSSCI) Spring Meeting*, Bend, OR, March 2018 (w/ proceedings).

66. J. Glusman, A. Makowiecki*, N. Wimer, K. Niemeyer, **G. Rieker**, P. Hamlington, J. Daily, "A Chemical Kinetic Mechanism Reduction and Pyrolysis Model for Wildland Fire Direct Numerical Simulation," *Western States Section Combustion Institute (WSSCI) Spring Meeting*, Bend, OR, March 2018 (w/ proceedings).

65. N. Wimer, A. Mackowiecki*, J. Glusman, A. Poludnenko, C. Hoffman, J. Daily, **G. Rieker**, and P. Hamlington, "Examination of Wildland Fire Spread at Small Scales Using Direct Numerical Simulations and High-Speed Laser Diagnostics," *American Geophysical Union Fall Meeting*, New Orleans, LA, December 2017.

64. (Invited) S. Coburn**, C. Alden**, R. Wright**, K. Cossel, E. Baumann, F. Giorgetta, G. Truong, N. Newbury, I. Faloona, S. Conley, S. Ghosh, K. Prasad, I. Coddington, and **G. Rieker**, "Quantification of Variable Trace Gas Emissions across Large Regions using a Field-deployed Dual-comb Spectrometer", *OSA Optics and Photonics for Energy & the Environment (E2)*, Boulder, CO, November 2017 (w/ proceedings).

63. (Invited) **G. Rieker**, "Prospects for Laser-Based Sensing in Solar Reactors", *Optics for Solar Energy (SOLAR),* Boulder, CO, November 2017.

62. T. Hayden*, N. Wimer, C. Lapointe, J. Christopher*, S. Nigam, P. Hamlington, **G. Rieker**, "Wavelength Modulation Spectroscopy of OH Radical in an Industrial Flame", *OSA Optics and Photonics for Energy & the Environment (E2),* Boulder, CO, November 2017 (w/ proceedings).

61. A. Makowiecki*, N. Wimer, J. Glusman, A. Poludnenko, C. Hoffman, J. Daily, P. Hamlington, and **G. Rieker**, "Examination of Wildland Fire Spread at Small Scales using Frequency Comb Laser Diagnostics and Direct Numerical Simulations," *7th International Fire Ecology and Management Conference Smoke Management and Modeling*, Orlando, FL, November, 2017.

60. J. Christopher*, N. Wimer, C. Lapointe, T. Hayden*, I. Grooms, **G. Rieker**, P. Hamlington, "A Parameter Estimation for a Pulsating Turbulent Buoyant Jet Using Approximate Bayesian Computation", *70th Annual Meeting of the APS Division of Fluid Dynamics*, Denver, CO, November 2017.

59. N. Wimer, A. Makowiecki*, A. Poludnenko, C. Hoffman, J. Daily, **G. Rieker,** P. Hamlington, "Direct Numerical Simulation of Wildland Fires at Small Scales", *70th Annual Meeting of the APS Division of Fluid Dynamics*, Denver, CO, November 2017.

58. S. Nigam, C. Lapointe, J. Christopher*, N. Wimer, T. Hayden*, **G. Rieker**, P. Hamlington, "Flame Structure and Dynamics for an Array of Pre-mixed Methane-Air Jets," *70th Annual Meeting of the APS Division of Fluid Dynamics*, Denver, CO, November 2017.

57. (Invited) **G. Rieker**, "Tackling the Grand Challenge of Fugitive Methane Emissions from Oil and Gas Production," *21st Century Energy Transition Symposium*, Fort Collins, CO, October 2017.

56. N. Wimer, A. Makowiecki*, A. Poludnenko, C. Hoffman, J. Daily, **G. Rieker,** P. Hamlington, "Direct Numerical Simulation of Wildland Fires at Small Scales", *Western States Section Combustion Institute (WSSCI) Fall Meeting*, Laramie, WY, October 2017 (w/ proceedings).

55. (Invited) **G. Rieker**, "Frequency Combs in Combustion," *Gordon Conference on Laser Diagnostics in Combustion,* Mt. Snow, VT, August 2017.

54. A. Draper*, R. Cole*, P. Schroeder*, **G. Rieker**, "Design and Evaluation of a High-Temperature and High-Pressure Spectroscopic Cell", *Rocky Mountain Fluids Meeting*, Boulder, CO, August 2017.

53. A. Makowiecki*, T. Hayden*, M. Nakles, N. Pilgram, N. MacDonald, W. Hargus, **G. Rieker**, "Wavelength modulation spectroscopy for measurements of temperature and species concentration downstream from a supersonic nozzle," *53rd AIAA/SAE/ASEE Joint Propulsion Conference*, 2017 AIAA Propulsion and Energy Forum and Exposition, Atlanta, GA, July 2017 (w/ proceedings).

52. P. Schroeder*, M. Cich, J. Yang*, B. Drouin, **G. Rieker**, "Multispectral fitting validation of the speed dependent Voigt profile at up to 1300K in water vapor with a dual frequency comb spectrometer", *72nd International Symposium on Molecular Spectroscopy*, Champaign-Urbana, IL, June 2017.

51. T. Hayden*, N. Wimer, C. Lapointe, J. Christopher*, P. Hamlington, **G. Rieker**, "Characterization of the Output from a Catalytic Combustor Using Wavelength Modulation Spectroscopy", *2017 AIAA Aviation and Aeronautics Forum and Exposition (AIAA AVIATION Forum)*, Denver, CO, June 2017 (w/ proceedings).

50. J. Christopher*, C. Lapointe, T. Hayden*, N. Wimer, I. Grooms, **G. Rieker**, P. Hamlington, "Parameter Estimation for a Turbulent Buoyant Jet with Rotating Cylinder Using Approximate Bayesian Computation", *Computational Fluid Dynamics Conference*, Denver, CO, June 2017.

49. C. Lapointe, J. Christopher*, N. Wimer, T. Hayden*, **G. Rieker**, P. Hamlington, "Optimization for Internal Turbulent Compressible Flows Using Adjoints", *2017 AIAA*

*Aviation and Aeronautics Forum and Exposition (AIAA AVIATION Forum)*, Denver, CO, June 2017 (w/ proceedings).

48. N. Wimer, C. Lapointe, T. Hayden*, J. Christopher*, **G. Rieker**, P. Hamlington, "Near- and Far-Field Properties of High-Temperature Turbulent Buoyant Jets", *2017 AIAA Aviation and Aeronautics Forum and Exposition (AIAA AVIATION Forum)*, Denver, CO, June 2017 (w/ proceedings).

47. (Invited) **G. Rieker**, "Methane Leak Detection with Fielded Frequency Comb Lasers," *CLEO 2017,* San Jose, CA, May 2017.

46. N. Malarich*, **G. Rieker**, "Resolving gas temperature distributions with single-beam dual-comb absorption spectroscopy," *CLEO 2017*, San Jose, CA, May 2017 (w/ proceedings).

45. P. Schroeder*, D. Pfotenhauer*, J. Yang*, F. Giorgetta, W. Swann, I. Coddington, N. Newbury, **G. Rieker**, "Comparison of dual frequency comb absorption spectra of air-broadened water vapor up to 1300K with HITRAN Online and HITEMP 2010 Models," *CLEO 2017*, San Jose, CA, May 2017 (w/ proceedings).

44. T. Hayden*, C. Lapointe, N. Wimer, J. Christopher*, P. Hamlington, and **G. Rieker**, "Characterization of a Jet Above a Catalytic Combustor Using Wavelength Modulation Spectroscopy", *10th US National Combustion Meeting*, College Park, MD, April 2017 (w/ proceedings).

43. J. Christopher*, C. Lapointe, N. Wimer, T. Hayden*, I. Grooms, **G. Rieker**, and P. Hamlington, "Parameter Estimation for a Turbulent Buoyant Jet Using Approximate Bayesian Computation," *AIAA Science and Technology Exhibition and Forum*, Grapevine, TX, January 2017 (w/ proceedings).

42. A. Makowiecki*, T. Hayden*, M. Nakles, N. Pilgram, N. MacDonald, W. Hargus, and **G. Rieker**, "Wavelength Modulation Spectroscopy for Measurements of Temperature in a Simulated Thruster Plume," *JANNAF 8$^{th}$ Spacecraft Propulsion Meeting*, Phoenix, AZ, December 2016 (w/ proceedings).

41. T. Hayden* and **G. Rieker**, "Ultra-large amplitude wavelength modulation spectroscopy," *Optics and Photonics for Energy and the Environment (E2)*, Leipzig, Germany, November 2016 (w/ proceedings).

40. P. Schroeder*, J. Yang*, F. Giorgetta, W. Swann, I. Coddington, N. Newbury, and **G. Rieker**, "Dual frequency comb spectroscopy of high temperature water vapor: absorption model development for combustion sensors," *Fourier Transform Spectroscopy*, Leipzig, Germany, November 2016 (w/ proceedings).

39. (Invited) I. Coddington, G. Truong, E. Waxman, K. Cossel, P. Schroeder*, S. Coburn**, R. Wright**, F. Giorgetta, W. Swann, **G. Rieker**, and N. Newbury, "Dual-Comb spectroscopy for GHG quantification," *Optics and Photonics for Energy and the Environment (E2)*, Leipzig, Germany, November 2016 (w/ proceedings).

38. (Invited) E. Baumann, F. Giorgetta, **G. Rieker**, W. Swann, L. Sinclair, I. Coddington, G. Truong, K. Cossel, E. Waxman, and N. Newbury, "Dual Comb Outdoor Spectroscopy for Complex Molecular Response Retrieval." *Fourier Transform Spectroscopy*, Leipzig, Germany, November 2016 (w/ proceedings).

37. (Invited) **G. Rieker**, "Combustion and Environmental Science Applications of Fieldable Frequency Combs," *Field Laser Applications in Industry and Research (FLAIR),* Aix-les-Bains, France, September 2016.

36. N. Wimer, C. Lapointe, T. Hayden*, J. Christopher*, **G. Rieker**, and P. Hamlington, "Effects of Exit Variability on Near-field Statistics for Turbulent Buoyant Jets," *69th Annual Meeting of the APS Division of Fluid Dynamics*, Portland, OR, November 2016.

35. J. Christopher*, N. Wimer, T. Hayden*, C. Lapointe, I. Grooms, **G. Rieker**, and P. Hamlington, "Parameter Estimation for a Turbulent Buoyant Jet Using Approximate Bayesian Computation," *69th Annual Meeting of the APS Division of Fluid Dynamics*, Portland, OR, November 2016.

34. C. Lapointe, N. Wimer, T. Hayden*, J. Christopher*, **G. Rieker**, and P. Hamlington, "Scaling Analysis of Temperature Variability Between a Rotating Cylinder and a Turbulent Buoyant Jet," *69th Annual Meeting of the APS Division of Fluid Dynamics*, Portland, OR, November 2016.

33. P. Schroeder*, R. Wright**, S. Coburn**, B. Sodergren, K. Cossel, S. Droste, G. Truong, E. Baumann, F. Giorgetta, I. Coddington, N. Newbury, and **G. Rieker**, "*Dual Frequency Comb Laser Absorption Spectroscopy in a 16 MW Gas Turbine Exhaust*," 36th International Symposium on Combustion, Seoul, South Korea, July 2016.

32. (Invited) **G. Rieker**, P. Schroeder*, S. Coburn**, C. Alden**, R. Wright**, K. Cossel, G. Truong, E. Baumann, F. Giorgetta, W. Swann, I. Coddington, and N. Newbury "Combustion diagnostics and chemical sensing with frequency comb lasers," Paper LW2G–1, *Laser Applications to Chemical, Security and Environmental Analysis (LACSEA),* Heidelberg, Germany, July 2016.

31. (Invited) **G. Rieker**, "Open-path Dual-comb Spectroscopy for Localizing Fugitive Gas Sources," *Laser Applications to Chemical, Security and Environmental Analysis (LACSEA),* Heidelberg, Germany, July 2016.

30. (Invited) **G. Rieker**, "Localizing Gas Sources with Kilometer-scale Open-path Dual-comb Spectroscopy and High-resolution Transport Modeling," *OSA Incubator on Precision Atmospheric Measurements,* Washington D.C., May 2016.

29. S. Coburn**, C. Alden**, R. Wright**, K. Cossel, G. Truong, E. Baumann, S. Ghosh, K. Prasad, N. Newbury, I. Coddington, and **G. Rieker**, "Dual frequency comb spectroscopy and atmospheric modeling for the detection of methane leaks at oil and gas production sites," *18th Coherent Laser Radar Conference,* Boulder, CO, June 2016.

28. S. Coburn**, R. Wright**, K. Cossel, G. Truong, E. Baumann, I. Coddington, N. Newbury, C. Alden**, S. Ghosh, K. Prasad, and **G. Rieker**, "Methane Detection for Oil

and Gas Production Sites Using Portable Dual-comb Spectrometry," *71st International Symposium on Molecular Spectroscopy,* Champaign-Urbana, IL, June 2016.

27. K. Cossel, E. Waxman, G. Truong, F. Giorgetta, W. Swann, S. Coburn**, R. Wright**, **G. Rieker**, I. Coddington, and N. Newbury, "A portable dual frequency comb spectrometer for atmospheric applications," *71st International Symposium on Molecular Spectroscopy,* Champaign-Urbana, IL, June 2016.

26. (Invited) I. Coddington, G. Truong, E. Waxman, K. Cossel, P. Schroeder*, R. Wright**, S. Coburn**, B. Sodergren, F. Giorgetta, W. Swann, **G. Rieker**, and N. Newbury, "Frequency Comb Measurements Through Turbulent Paths," *CLEO 2016*, San Jose, CA, May 2016 (w/ proceedings).

25. K. Cossel, G. Truong, E. Waxman, E. Baumann, F. Giorgetta, **G. Rieker**, L. Sinclair, W. Swann, I. Coddington, and N. Newbury, "Long-path Atmospheric Measurements Using Dual Frequency Comb Spectroscopy," *American Geophysical Union Fall Meeting,* San Francisco, CA, Dec. 2015.

24. (Invited) **G. Rieker,** F. Giorgetta, W. Swann, P. Schroeder*, J. Kofler, L. Sinclair, E. Baumann, G. Petron, C. Sweeney, P. Tans, I. Coddington, and N. Newbury, "Precision atmospheric trace gas monitoring with frequency comb lasers," *Frontiers in Optics/Laser Science*, San Jose, CA, October 2015.

23. E. Baumann, F. Giorgetta, **G. Rieker**, L. Sinclair, I. Coddington, W. Swann, and N. Newbury, "Dual-comb Spectrometer for Direct Phase Spectroscopy of Greenhouse Gases across an Open Air Path," *Advanced Solid State Lasers*, Berlin, Germany, October 2015 (w/ proceedings).

22. P. Schroeder*, D. Pfotenhauer*, and **G. Rieker**, "Dual Frequency Comb Spectroscopy of High Temperature Water Vapor Absorption," *Rocky Mountain Fluid Mechanics Research Symposium*, Boulder, CO, August 2015.

21. (Invited) I. Coddington, **G. Rieker**, A. Klose, S. Diddams, F. Giorgetta, L. Sinclair, E. Baumann, G. Truong, G. Ycas, W. Swann, N. Newbury, "Dual-comb Spectroscopy in the Open Air," *International Symposium on Molecular Spectroscopy*, Champaign-Urbana, IL, June 2015.

20. F. Giorgetta, **G. Rieker**, L. Sinclair, E. Baumann, I. Coddington, W. C. Swann, and N. R. Newbury, "Phase Spectroscopy of Atmospheric Gases across a 2-km Open-Air Path by Dual-Comb Spectroscopy," *Imaging and Applied Optics 2015*, Arlington, VA, June 2015 (w/ proceedings).

19. **G. Rieker**, F. Giorgetta, W. Swann, L. Sinclair, C. Cromer, E. Baumann, I. Coddington, and N. R. Newbury, "Dual-Frequency Comb Measurements of Atmospheric Absorption: Comparison with HITRAN Database Parameters," *CLEO 2015*, San Jose, CA, May 2015 (w/ proceedings).

18. T. Hayden*, P. Schroeder*, and **G. Rieker**, “Large Amplitude Wavelength Modulation Spectroscopy for Sensitive Measurements of Broad Absorbers,” *CLEO 2015*, San Jose, CA, May 2015 (w/ proceedings).

17. **G. Rieker**, F. Giorgetta, I. Coddington, W. Swann, L. Sinclair, C. Cromer, E. Baumann, A. Zolot, N.R. Newbury, J. Kofler, G. Petron, C. Sweeney, and P. Tans, " Frequency Comb Spectroscopy of $CO_2$, $CH_4$, $H_2O$, and Isotopes Over a 2km Outdoor Path: Concentration Retrievals Using Different Absorption Models," *13th International HITRAN conference,* Cambridge, MA, June 2014.

16. I. Coddington, F. Giorgetta, **G. Rieker**, W. Swann, A. Zolot, L. Sinclair, E. Baumann, C. Cromer N.R. Newbury, “CO2 phase and amplitude spectra measured over 2 km outdoor path with a dual-comb spectrometer,” *Infrared Remote Sensing and Instrumentation XXII*, 921907, September 2014 (w/ proceedings).

15. (Invited) I. Coddington, **G. Rieker**, F. Giorgetta, W.C. Swann, L.C. Sinclair, C. Cromer, E. Baumann, A. Zolot, and N.R. Newbury, “Dual Frequency Comb Spectroscopy for Accurate and Precise Carbon Monitoring over Multi-kilometer Paths,” *PIERS 2014,* Guangzhou, China, August 2014.

14. F. Giorgetta, **G. Rieker**, I. Coddington, W. Swann, A. Zolot, L. Sinclair, E. Baumann, C. Cromer, N. Newbury, “High-Resolution CO2 Phase Spectra Measured over an Open Air Path with a Dual-Comb Spectrometer,” *6th EPS-QEOD Europhoton Conference,* Neuchatel, Switzerland, August 2014 (w/ proceedings).

13. (Invited) N. Newbury, **G. Rieker**, F. Giorgetta, W. Swann, L. Sinclair, E. Baumann, A. Zolot, and I. Coddington, "Dual-Comb Spectroscopy of Greenhouse Gases Over a 2-km Outdoor Path," *Laser Applications to Chemical, Security and Environmental Analysis (LACSEA)*, Seattle, Wa, July 2014.

12. L. Sinclair, I. Coddington, W. Swann, L. Sonderhouse, **G. Rieker**, A. Hati, K. Iwakuni, and N. Newbury, “A frequency comb that maintains optical coherence under significant vibrations,” *CLEO 2014*, San Jose, CA, June 2014 (w/ proceedings).

11. **G. Rieker**, F. Giorgetta, I. Coddington, W.C. Swann, L.C. Sinclair, C. Cromer, E. Baumann, A. Zolot, N.R. Newbury, J. Kofler, G. Petron, C. Sweeney, and P. Tans, "Measurements of $CO_2$, $CH_4$, $H_2O$, and HDO over a 2-km Outdoor Path with Dual-Comb Spectroscopy," A24B-05, *American Geophysical Union Fall Meeting,* San Francisco, CA, Dec. 2013.

10. (Invited) **G. Rieker**, F. Giorgetta, I. Coddington, W. Swann, L. Sinclair, C. Cromer, E. Baumann, A. Zolot, and N. Newbury, "Dual-Comb Spectroscopy of Greenhouse Gases Over a 2-km Outdoor Path," *Optical Instrumentation for Energy and Environmental Applications (E2)*, Tucson, AZ, Nov. 2013.

9. (Invited) I. Coddington, A. Zolot, E. Baumann, F. Giorgetta, **G. Rieker**, J. Nicholson, W. Swann, and N. Newbury, “High-resolution Frequency Comb Molecular Spectroscopy,” *Optical Instrumentation for Energy and Environmental Applications (E2)*, Tucson, AZ, Nov. 2013.

8. E. Baumann, A. Zolot, **G. Rieker**, F. Giorgetta, I. Coddington, W. Swann, K. Knabe, P. Williams, and N. Newbury, "Coherent Comb-based Spectroscopy in the Mid and Near-infrared," *Mid-infrared Coherent Sources (MICS),* Paris, France, Oct. 2013 (w/ proceedings).

7. (Invited) **G. Rieker**, F. Giorgetta, I. Coddington, E. Baumann, A. Zolot, W. Swann, L. Sinclair, C. Cromer, and N. Newbury, "Frequency Comb-based Laser Sensors for Precision Ranging, Spectroscopy and Frequency Transfer," (given by G. Rieker in place of N. Newbury), *Optical Sensors*, Rio Grande, Puerto Rico, July 2013.

6. (Postdeadline) **G. Rieker**, F. Giorgetta, W. Swann, I. Coddington, L. Sinclair, C. Cromer, E. Baumann, A. Zolot, and N. Newbury, "Open-Path Dual-Comb Spectroscopy of Greenhouse Gases," *CLEO 2013*, San Jose, CA, June 2013 (w/ proceedings).

5. N. R. Newbury, A. Zolot, E. Baumann, I. Coddington, F. Giorgetta, **G. Rieker**, W. Swann, "Precision spectroscopy with coherent dual frequency combs", CLEO Europe 2013, Munich, Germany, May 2013.

4. M. Constantin, D. Constantin, J. Perl, P. Keall, F. Poehlmann, **G. Rieker**, M. Cappelli, "Monte Carlo Simulations of Beam Characteristics for a Compact Plasma Proton Accelerator," *52nd AAPM Annual Meeting*, 2010.

3. M. Gruber, C. Carter, M. Ryan, **G. Rieker**, J. Jeffries, R. Hanson, J. Liu, and T. Mathur, "Laser-Based Measurements of OH, Temperature, and Water Vapor Concentration in a Hydrocarbon-Fueled Scramjet," *Proceedings of the 44th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit*, 2008 (w/ proceedings).

2. **G. Rieker**, J. Jeffries, R. Hanson, T. Mathur, C. Carter, and M. Gruber, "Comparison of Wavelength Modulation and Direct Absorption Spectroscopy for Measurements of Gas Temperature in a Scramjet Combustor," *Proceedings of the 5th U.S. National Combustion Meeting*, 2007 (w/ proceedings).

1. **G. Rieker,** J.T.C. Liu, J. Jeffries, R. Hanson, T. Mathur, M. Gruber, and C. Carter, "Diode Laser Sensor for Gas Temperature and H2O Concentration in a Scramjet Combustor Using Wavelength Modulation Spectroscopy," *Proceedings of the 41st AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit*, 2005 (w/ proceedings).

## SEMINARS

79. "Maybe This Will Work? The Long Path to Impact," October 2025, *IMRA Boulder Research Labs, 10th Anniversary Celebration*.

78. "Frequency Combs for Reacting Systems," September 2025, *Princeton University, Department of Chemistry Seminar Series*.

77. “It’s not how many photons you have, it’s how you use them,” August 2025, Keynote for *Q School - Single Photonics Short Course*.

76. “LongPath Large Area Laser Emissions Monitoring Networks,” July 2025, *Rocky Mountain Institute, Landfill Methane Emissions Seminar*.

75. “Ultra-Fast, Ultra-Broad, Ultra-Precise Line-of-Sight Spectroscopy”, June 2025, Session Lead at *Gordon Research Conference on Reacting Systems*.

74. “Energy and environmental system monitoring via laser-based absorption spectroscopy,” June 2025, Lecture Series at *Scottish Universities Summer School in Physics 2025*.

73. “Frequency Combs for Reacting Systems,” April 2025, *University of Georgia, Department of Chemistry Seminar*.

72. “The Long Path to Quantum Technology Commercialization,” April 2025, *US Council on Competitiveness, Competitiveness Conversations*.

71. “Cost Effective Absorption and Emission Sensing,” January 2025, *3M Corporation, Seminar Series*.

70. “Gas Sensing with Frequency Combs,” October 2024, *QEDC Optical Frequency Combs and Their Applications in Quantum Technology*.

69. “Frequency Combs in Combustion and Reacting Systems,” September 2024, *Erlangen Graduate School in Advanced Optical Technologies Combustion Workshop*.

68. “Frequency Comb Applications in Quantum Sensing,” September 2024, *Colorado School of Mines, Quantum Engineering Seminar.*

67. “Frequency Combs Applications in Quantum Sensing,” August 2024, *QEDC Quantum Sensing Technical Advisory Committee.*

66. “Cost Effective Laser Sensors,” June 2024, *Woodward Technical Forum*.

65. “Real-time laser sensors for feedback control of engine systems,” April 2024, *John Deere Global Technical Forum*.

64. “Practical Dual Comb Spectroscopy to Improve Energy Systems: Navigating the Interfaces Between Science, Engineering, and Industry,” April 2024, *Institute for Laser Science Seminar, University of Electro-Communications, Chofu, Japan*.

63. “Working with ARPA-E, Spotlight on Energy Startups,” March 2024, Panelist, *CERA Week*.

62. “The Long Path to LongPath Technologies” March 2024, Keynote, *Destination Startup*.

61. “What is Quantum Sensing?” February 2024, Panelist, *AAAS Annual Meeting*.

60. “Practical Frequency Comb Spectroscopy to Improve Energy Systems,” February 2024, *CSGB Tech Talks, Sandia National Labs*.

59. “How do we grow partnerships between higher education institutions and industry and national labs, and government?” October 2023, Panelist, *University of Colorado Quantum Convening*.

58. “Toward Sharks with Laser Beams on Their Heads,” October 2023, *University of Colorado Mechanical Engineering Seminar*.

57. “Networked Methane Monitoring of Oil and Gas Infrastructure,” September 2023, *Buff Gold Ventures Annual Meeting*.

56. “CU Quantum Technology: from Nobel Prize to commercial climate change mitigation,” August 2023, *University of Colorado Boulder Global Ambassadors Meeting*.

55. “CU Quantum Technology: from Nobel Prize to commercial climate change mitigation,” June 2023, *Board of Regents Meeting, University of Colorado Boulder*.

54. “Methane Mitigation from Oil and Gas Infrastructure,” June 2023, Keynote, *Baker Hughes Energy Summit*.

53. “Mobilizing frequency comb lasers for precision sensing in energy and climate applications,” March 2023, *Pennsylvania State University Mechanical Engineering Seminar Series*.

52. “Scaling Up with SCALEUP,” Main stage panelist, March 2023, *ARPA-E Summit*.

51. “Recent Progress in Frequency Comb-based Diagnostics for Combustion,” February 2023, *Multi-Agency Coordinating Committee for Combustion Meeting*.

50. “You Can’t Improve What You Don’t Measure – Mobilizing frequency comb lasers for precision sensing in energy and climate applications,” February 2023, *Brigham Young University Physics Colloquium*.

49. “Frequency Comb Spectroscopy: from Nobel Prize to Practical Application,” February 2023, *University of Colorado Analytical, Environmental, & Atmospheric Chemistry Division Seminar.*

48. “Strategies for Leveraging Government Funding while Building a Company,” June 2022, *Innosphere Webinar Series*.

47. “Free Range Frequency Combs: mobilizing frequency comb laser technology from hypersonic research to atmospheric sensing,” April 2022, *Texas A&M University, J. Mike Walker ’66 Department of Mechanical Engineering Seminar Series*.

46. “Grazers, Gas and Garbage: The history and future of LongPath monitoring with frequency combs,” March 2022, *Stanford Methane Emissions Technology Alliance Seminar*.

45. “Free-range frequency combs: mobilizing frequency comb laser technology for energy and climate applications from atmospheric sensing to wildland fire research,” February 2022, *University of Colorado Physics Colloquium*.

44. “Have 100,000 lasers, will travel – mobilizing frequency comb laser technology for climate applications from atmospheric sensing to wildland fire research”, December 2021, *Cornell University Atkinson Center for Sustainability*.

43. “Practical Dual Comb Spectroscopy: Lessons Learned at the Interface Between Science, Engineering, and Industry”, September 2021, *University of Colorado Q-SEnSE Convergence Seminar*.

43. “Free Range Frequency Combs: mobilizing frequency comb laser technology from hypersonic research to atmospheric sensing”, November 2021, *KAUST University Seminar*

42. “High precision sensing through the mobilization of frequency comb laser technology for climate applications ranging from atmospheric sensing to wildland fire research,” September 28, 2021, *Cornell University Civil and Environmental Engineering Seminar.*

41. "Optimizing Career Paths in Optics: The Guide for Young Professionals," May 9, 2021, *OSA CLEO Conference,* virtual.

40. “Free Range Frequency Combs: mobilizing frequency comb laser technology from hypersonic research to atmospheric sensing,” January 5, 2021, *Caltech Chemical Physics Seminar,* virtual.

39. “Launching LongPath Technologies: A CU/NIST Tech transfer Success,” January 23, 2020, *NIST Boulder,CO with VTC to Gaithersburg West Square.*

38. “Frequency Comb Laser Diagnostics for Hypersonic Propulsion,” January 16, 2020, Presentation to AFOSR Director and Chief Science Officer Seminar, Boulder, CO.

37. “Low-cost Multi-Sensor Networks for Determining the Location and Size of Renegade Gas Sources”, November 5, 2019, Operational Renegade Gas Working Group, Boulder, CO.

36. “High Temperature Laboratory Spectroscopy in Support of Improved Modeling of Exoplanet Atmospheres,” May 2, 2019, NExSS Working Group Meeting, Santa Cruz, CA.

35. “The Long Road to LongPath Technologies,” April 24, 2019, Innovation After Hours, Boulder, CO.

34. “Advanced Lineshapes in Laser Absorption Diagnostics for Combustion and Propulsion,” April 15, 2019, AFOSR Spectroscopy Workshop, Arlington, VA.

33. “Have 100,000 Lasers, Will Travel – The Path to Frequency Comb Spectroscopy in Combustion,” January 25, 2019, *Air Force Research Laboratory – Wright-Patterson Air Force Base*, Dayton, OH.

32. “Decoding the Stories of Distant Planets,” October 17, 2018, *RIO Faculty Fellow TED-style Talks at the Dairy Performing Arts Center*, Boulder, CO.

31. “Laser Spectroscopy for Combustion and Atmospheric Systems,” October 12, 2018, *National Renewable Energy Laboratory*, Golden, CO.

30. “Have 100,000 lasers, will travel – Frequency comb spectroscopy of atmospheric and combustion systems,” September 28, 2018, *George Washington University*, Washington D.C.

29. “An introduction to the work of the Precision Laser Diagnostics Laboratory at the University of Colorado,” September 10, 2018, *Universite Grenoble Alpes and CNRS-Grenoble*, Grenoble, France.

28. “Spinning Technologies Out of the Laboratory: A Tale of Two Ventures,” July 24, 2018, CU Venture Partners Lunch and Learn, Boulder, CO.

27. “Frequency Comb-based Methane Detection Network,” July 13, 2018, *Operational Renegade Gas Working Group Meeting*, Boulder, CO.

26. “Regional Methane Monitoring with Frequency Combs,” December 21, 2017, *Breakthrough Energy Coalition*, Boulder, CO.

25. “A Different Path to the Professorship,” October 18, 2017, *University of Colorado Advocates Meeting*, Boulder, CO. (short presentation and discussion of entrepreneurial faculty pathways)

24. “Frequency Combs in Combustion,” September 26, 2017, *Zolo Technologies*, Lafayette, CO.

23. “High precision GHG measurement in the open air,” July 11, 2017, *EPA Regional Science Council Seminar*, Denver, CO.

22. “Frequency Comb-based Methane Detection Network,” May 22, 2017, *Operational Renegade Gas Working Group Meeting*, Boulder, CO.

21. “Progress on frequency comb spectroscopy of atmospheric trace gases,” April 18, 2017, *NOAA Global Monitoring Carbon Cycle Group Seminar*, Boulder, CO.

20. “Have 100,000 lasers, will travel – Frequency comb spectroscopy of atmospheric trace gases,” April 10, 2017, *NCAR Atmospheric Chemistry Observations and Modeling Seminar*, Boulder, CO.

19. “A Different Path to the Professorship,” February 1, 2017, *University of Colorado Chancellor’s Cabinet*, Boulder, CO. (short presentation and discussion of entrepreneurial faculty pathways)

18. “Practical Frequency Comb Spectroscopy in Combustion and Atmospheric Research,” January 20, 2017, *California Institute of Technology / Jet Propulsion Laboratory*, Pasadena, CA.

17. “Probing Harsh Environments with Lasers: Sensing in 3M-relevant Combustion Systems,” November 3, 2016, *3M Technical Forum*, St. Paul, MN.

16. “Frequency Comb-based Methane Detection Network,” September 28, 2016, *Methane Monitoring Open Forum*, Fort Collins, CO.

15. “Have 100,000 Lasers, Will Travel – Field Applications of Frequency Combs from Methane Detection to Combustion,” August 17, 2016, *Colorado State University Energy and Environment Seminar*, Fort Collins, CO.

14. “Fire, Lasers, and Saving the World – How Engineering Led Me to the Coolest Job Ever,” July 14, 2016, *BOLD Aspire Summer Bridge Program*, Boulder, CO.

13. “Free Range Frequency Combs: Field Applications of NIST Technology from Methane Detection to Combustion,” March 17, 2016, *NIST Time and Frequency Seminar Series,* Boulder, CO.

12. “Have (100,000) Lasers, Will Travel – Frequency Comb Lasers for Trace Gas Monitoring,” November 16, 2015, *Institute for Artic and Alpine Research Seminar*, Boulder, CO.

11. “Fire, Lasers, and Saving the World – How Engineering Led Me to the Coolest Job Ever,” July 15, 2015, *BOLD Aspire Summer Bridge Program*, Boulder, CO.

10. “Probing Harsh Environments with Lasers: from Field-Deployed Diodes to Frequency Combs,” June 29, 2015, *Air Force Research Laboratories – Edwards AFB*, CA.

9. “Frequency Comb Laser Systems for Continuous, Multi-site Methane Monitoring,” April 7, 2015, *RPSEA First Protocol Development Workshop*, National Oceanic And Atmospheric Administration, Boulder, CO.

8. "Greenhouse Gas Concentration Measurements over a 2-km Outdoor Path using Dual-comb Spectroscopy," January 14, 2014, *Mechanical Engineering Graduate Seminar Series*, University of Colorado-Boulder, Boulder, CO.

7. “Probing Harsh Environments with Lasers: from Field-deployed Diodes to Frequency Combs,” November 15, 2013, *Optical, Electronic, and Quantum Systems Seminar*, University of Colorado-Boulder, Boulder, CO.

6. “Greenhouse Gas Concentration Measurements over a 2-km Outdoor Path using Dual-comb Spectroscopy,” November 7, 2013, *Collaborative for Air Quality Research Seminar*, University of Colorado-Boulder, Boulder, CO.

5. “Oh, The Places Your Laser Beam Will Go – Optical Sensing in Harsh Environments,” October 29, 2013, *Boulder Fluids Seminar*, University of Colorado-Boulder, Boulder, CO.

4. "Intermediate-path Sensing of Greenhouse Gases with Dual Comb Spectroscopy," April 30, 2013, *Carbon Cycle Greenhouse Gases Group Seminar*, National Oceanic and Atmospheric Administration, Boulder, CO.

3. "Frequency comb laser sources and their prospects for practical sensing," Nov. 16, 2012, *Institute for Combustion and Gas Dynamics Seminar Series*, University of Duisburg-Essen, Duisburg-Essen, Germany.

2. "Practical Laser-based Sensors for Harsh Combustion Environments," Sept. 20, 2012, *Mechanical Engineering Graduate Seminar Series*, University of Colorado-Boulder, Boulder, CO.

1. “Innovations in Particle Beam Generation with Plasmas,” Oct. 2010, *Program in Radiation Biology Seminar*, Stanford University, Stanford, CA.

## CONFERENCE PRESENTATIONS (Poster)

*Graduate student in Rieker lab
**Postdoc / Research staff/ Visiting Scholars in Rieker lab

54. K. Rozmiarak, X. Liu, Y. Oh, I. Overeem, E. Miller*, V. Morris, B. Vaughn, N. Hasson, B. Chase, K. Walter Anthony, Q. Zhuang, C. Smallwood, **G. Rieker**, T. Jones, “Observation and Multi-Model Intercomparison of $\delta^{13}C$-$CH_4$ from an Arctic Permafrost Thaw Lake,” *AGU 2025,* New Orleans, December 2025.

53. G. Mathews**, A. Lalko*, C. Huff*, C. Rowe*, K. Williamson, A. Makowiecki, A. Harness, R. Wright, M. Takeuchi, A. Ziola, A. Handschy, D. Day, P. Chang, T. Wu, A. Lind, N. Hoghooghi**, S. Egbert*, G. Gillespie**, H. Beica**, J. Jimenez, S. Takahama, D. Henze, T. Komljenovic, J. Li, J. Bowers, K. Vahala, S. Diddams, G. Rieker, “Compact Mid-infrared Dual Frequency Comb Spectrometers for Aerosol Measurements Outside of the Laboratory,” *Gordon Research Conference, Laser Diagnostics for Energy and Combustion Science*, Les Diablerets, Switzerland, June 2025.

52. K. Rozmiarek, Y. Oh, X. Liu, I. Overeem, E. Miller*, V. Morris, B. H. Vaughn, N. R. Hasson, B.M. Chase, K.M. Walter Anthony, Q. Zhuang, **G. Rieker**, T. R. Jones, “Multi-model Insights into δ13C-CH4 from Arctic Permafrost Thermokarsts,” *EGU General Assembly*, Vienna, Austria, April 2025.

51. E. Miller*, S. Coburn**, K. Rozmiarek, N. Hasson, C. Alden, B. Vaughn, V. Morris, K. Anthony, T. Jones, **G. Rieker**, “Bridging Spatial Scales of Permafrost Methane Flux Measurements with Open-Path Dual Comb Spectroscopy,” *AGU Annual Meeting*, Washington DC, December 2024.

50. C. Callahan*, E. Gatica*, G. Hampson, **G. Rieker**, "Compact, Real-Time Exhaust Gas Recirculation Rate Sensor for Use in Natural Gas Combustion Engine Control," *40th International Symposium on Combustion*, Milan, Italy, July 2024.

49. D. Long, M. Cich, C. Mathurin*, A. Heiniger, G. Mathews**, A. Frymire*, **G. Rieker, "**Nanosecond mid-infrared dual comb spectroscopy", *Frontiers in Optics & Laser Science (FIOLS)*, Tacoma, Washington, October 2023.

48. L. Shannon, A. Makowiecki*, P. Hamlington, **G. Rieker**, J. Farnsworth, "Parting the Flames: Interactions of a Flame Sheet with a Juncture Flow," *APS Gallery of Fluid Motion*, September 2023.

47. S. Egbert*, N. Hoghooghi**, P. Chang, A. Lalko*, S. Coburn**, S. Diddams, **G. Rieker**, "Broadband, High-Resolution, Portable Dual Comb Spectrometer From 3-5 μm," *Gordon Research Conference, Laser Diagnostics for Energy and Combustion Science*, Newry, Maine, July 2023.

46. D. Yun*, W. Sabin*, S. Coburn**, N. Hoghooghi**, J. France, M. Hagenmaier, K. Rice, J. Donbar, **G. Rieker**, "O2 A-Band Thermometry and Velocimetry in a Ramjet with Dual Comb Spectroscopy," *Gordon Research Seminar, Laser Diagnostics for Energy and Combustion Science*, Newry, Maine, July 2023

45. **G. Rieker**, P. Lynch, N. Hoghooghi**, P. Chang, S. Egbert*, S. Diddams, "High-speed, broadband mid-infrared dual comb spectrometer based on mode-locked fiber combs for combustion studies," (Work in Progress Posters), *39th International Symposium on Combustion*, Vancouver, Canada, July 2022.

44. C. Alden**, R. Wright**, S. Coburn**, D. Wilson, N. Seitz, D. Doran, I. Dickinson, **G. Rieker**, "Network-based continuous methane emissions monitoring mitigates gas losses at scale," *American Geophysical Union Fall Meeting*, December 2021.

43. **G. Rieker**, "Laser Technologies to Transform and Improve Our Future", *US Frontiers of Engineering Symposium*, National Academy of Engineering, virtual, February 2021.

42. C. Alden**, G. Gannaway, S. Coburn**, R.Wright**, David Wilson, Nick Seitz, Dan Doran, **G. Rieker**, "Continuous monitoring of methane emissions on 14 Permian basin natural gas production facilities, links to operations and mitigation," *American Geophysical Union Fall Meeting*, virtual, December 2020.

41. A. Anderson, E. Strong*, B. Heffernan, M. Siemens, **G. Rieker**, J. Gopinath, "Detection Strategies for Measuring Rotation with the Rotational Doppler Effect," *CLEO Conference,* virtual, May 2020.

40. C. Alden**, S. Coburn**, R. Wright**, D. Caputi, A. Rybchuk*, G. Wendland**, I. Coddington, S. Conley, I. Faloona, **G. Rieker**, "High time variability of emissions observed at a natural gas storage site," AGU Fall Meeting, San Francisco, CA, December 2019.

39. **G. Rieker**, R. Wright**, C. Alden**, S. Coburn**, N. Seitz**, A. Rybchuk*, G. Wendland**, A. Goldstein, A. Tourigney-Plante, J. Genest, J. Deschenes, I. Coddington, K. Osadetz, "Greenhouse gas source attribution and quantification over multiple square kilometer regions using dual frequency comb lasers," IEA Greenhouse Gas Combined Monitoring and Environmental Research Network Meeting, Calgary, Canada, August 2019.

38. S. Coburn**, C. Alden**, R. Wright**, A. Rybchuk*, G. Wendland*, I. Coddington, **G. Rieker**, "Frequency Comb-based Methane Observation Network," 2019 ARPA-E Energy Innovation Summit, Denver, CO, July 2019 (hosted a demo booth).

37. **G. Rieker**, "Recent Advancements in Frequency Comb Diagnostics for Combustion," *Gordon Research Conference*, Les Diablarets, Switzerland, July 2019.

36. N. Hoghooghi**, R. Cole, **G. Rieker**, "Microsecond Dual-Comb Spectroscopy Using Spectrally Filtered Fiber Mode-locked Lasers," *Gordon Research Conference*, Les Diablarets, Switzerland, July 2019.

35. O. Rybchuk*, C. Alden, **G. Rieker**, ""Modeling Ground- and Aircraft-based Methane Monitoring Systems for Natural Gas Storage Facilities using LPDM-LES," *NOAA GMAC Conference*, Boulder, CO, May 2019.

34. C. Alden**, S. Coburn**, R. Wright**, E. Baumann, K. Cossel, C. Sweeney, A. Karion, K. Prasad, I. Coddington and **G. Rieker**, "Regional, Continuous Methane Leak Detection Using Dual Frequency Comb Lasers and Atmospheric Inversions," *American Geophysical Union Fall Meeting*, Washington D.C., December 2018.

33. N. Wimer, M. Day, A. Makowiecki*, J. Glusman, J. Daily, **G. Rieker**, and P. Hamlington, "Progress Towards Direct Numerical Simulations of Plumes and Pool Fires," 71st Annual meeting, Division of Fluid Dynamics, American Physical Society, Atlanta, GA, November 2018.

32. **G. Rieker**, S. Coburn**, C. Alden**, R. Wright**, N. Hoghooghi**, R. Cole*, P. Schroeder*, N. Malarich*, A. Makowiecki*, A. Rybchuk*, G. Wendland**, M. Cich, B. Drouin, and I. Coddington, "The Expanding Reach of Fielded Dual Frequency Comb Spectrometers: from Kilometer-scale Measurements of Oil & Gas Fields to Model Development for Exoplanet Spectroscopy," *Field Laser Applications in Industry and Research (FLAIR),* Assisi, Italy, September 2018.

31. A. Makowiecki*, J. Steinbrenner, J. Glusman, N. Wimer, J. Daily, P. Hamilington and **G. Rieker**, "Dual Frequency Comb Spectroscopy for the Investigation of Ignition Behaviour of Wildland Fire Fuels," *Field Laser Applications in Industry and Research (FLAIR),* Assisi, Italy, September 2018.

30. N. Hoghooghi**, R. Cole*, and **G. Rieker**, "GHz Frequency Comb Generation Using Spectral Mode Filters for Rapid Dual-comb Spectroscopy," *Field Laser Applications in Industry and Research (FLAIR),* Assisi, Italy, September 2018.

29. N. Wimer, C. Lapointe, M. Day, A. Poludnenko, J. Glusman, A. Makowiecki*, J. Daily, **G. Rieker**, and P. Hamlington, "Progress Towards Direct Numerical Simulations of Fire Using Adaptive Mesh Refinement," *37th International Symposium on Combustion*, Dublin, Ireland, July 2018.

28. A. Makowiecki*, J. Steinbrenner, J. Glusman, N. Wimer, J. Daily, P. Hamlington, and G. Rieker, "Diagnostics Suite for Benchmark Data of Wildland Fire Fuels for Application to Physics-Based Models," *37th International Symposium on Combustion*, Dublin, Ireland, July 2018.

27. J. Glusman, A. Makowiecki*, N. Wimer, K. Niemeyer, G. Rieker, P. Hamlington, and J. Daily, "Experimental Comparison of Small-Scale Biomass Pyrolysis and Reduced Chemical Kinetic Models for Direct Numerical Simulations of Wildland Fires," *37th International Symposium on Combustion*, Dublin, Ireland, July 2018.

26. S. Coburn**, C. Alden**, R. Wright**, K. Cossel, E. Baumann, G. Truong, N. Newbury, K. Prasad, I. Coddington, T. Weaver and **G. Rieker**, "Frequency Comb-based Methane Observation Network," *2018 ARPA-E Energy Innovation Summit*, Washington D.C., March 2018 (hosted a demo booth).

25. C. Alden**, S. Coburn**, R. Wright**, E. Baumann, K. Cossel, C. Sweeney, S. Ghosh, N. Newbury, K. Prasad, I. Coddington and **G. Rieker**, "Continuous time-resolved regional methane leak detection with on-line background estimation using a novel combination of dual frequency comb laser spectroscopy and atmospheric inversions", *American Geophysical Union Fall Meeting*, New Orleans, LA, December 2017.

24. S. Coburn**, C. Alden**, R. Wright**, K. Cossel, E. Baumann, G. Truong, N. Newbury, K. Prasad, I. Coddington, T. Weaver and **G. Rieker**, "Frequency Comb-based Methane Observation Network," *CH4 Connections*, Ft. Collins, CO, December 2017 (hosted a demo booth).

23. S. Coburn**, C. Alden**, R. Wright**, K. Cossel, E. Baumann, G. Truong, N. Newbury, K. Prasad, I. Coddington, T. Weaver and **G. Rieker**, "Regional scale monitoring of methane emissions using sensitive open path laser measurements and an atmospheric inversion technique," *SPARK 2017*, Edmonton, Canada, November 2017.

22. N. Wimer, A. Makowiecki*, J. Glusman, A. Poludnenko, C. Hoffman, J. Daily, G. Rieker, and P. Hamlington, "Examination of Wildfire Spread at Small Scales Using Direct Numerical Simulations and Frequency Comb Laser Diagnostics," *Strategic Environmental Research and Development Program (SERDP) and Environmental Security Technology Certification Program (ESTCP) Symposium*, Washington, D.C., November 2017.

21. R. Cole*, P. Schroeder*, A. Draper*, and **G. Rieker**, "Dual Frequency Comb Absorption Spectroscopy at High Pressures and Temperatures: Toward Model Improvement for Laser Diagnostics in Extreme Environments," *Gordon Research Conference on Laser Diagnostics in Combustion*, Mt. Snow, VT, August 2017.

20. A. Makowiecki*, N. Hoghooghi**, N. Wimer, J. Daily, P. Hamlington, **G Rieker**. "Cavity Enhanced Dual Frequency Comb Spectroscopy for Characterization of Biomass

Pyrolysis." *Gordon Research Conference on Laser Diagnostics in Combustion*, Mt. Snow, VT, August 2017.

19. N. Wimer, A. Makowiecki*, A. Poludnenko, C. Hoffman, J. Daily, **G. Rieker**, and P. Hamlington. "Examination of Wildland Fire Spread at Small Scales Using Direct Numerical Simulations and Frequency Comb Laser Diagnostics," *12th International Symposium on Fire Safety Science,* Lund University, Sweden, June 2017.

18. C. Alden**, S. Coburn**, R. Wright**, S. Ghosh, I. Coddington, C. Sweeney, A. Karion, N. Newbury, K. Prasad, G. Rieker, "Continuous, regional approach to methane source detection and sizing using dual frequency comb laser spectroscopy and atmospheric inversions," *Global Monitoring Annual Conference 2017*, Boulder, Colorado, May 2017.

17. C. Alden**, R. Wright**, K. Prasad, T. Weaver, and **G. Rieker**, "Regional Methane Leak Detection with Frequency Comb Lasers," *2017 ARPA-E Energy Innovation Summit*, Washington D.C., March 2017 (hosted a demo booth).

16. S. Coburn**, R. Wright**, K. Cossel, G. Truong, E. Baumann, I. Coddington, N. Newbury, C. Alden**, S. Ghosh, K. Prasad, and **G. Rieker**, "Portable Dual-comb Spectrometer for Stable Detection of Methane Leaks over Kilometer Scale Paths at Oil and Natural Gas Production Sites," *AGU 2016*, December 2016.

15. C. Alden**, K. Prasad, S. Ghosh, A. Karion, C. Sweeney, S. Coburn**, R. Wright**, K. Cossel, G. Truong, E. Baumann, I. Coddington, N. Newbury, and **G. Rieker**, "A new method for top-down quantification of methane and pollutant emissions from natural gas production," *AGU 2016*, December 2016.

14. A. Makowiecki*, T. Hayden*, M. Nakles, N. Pilgram, N. MacDonald, W. Hargus, and **G. Rieker**, "Wavelength Modulation Spectroscopy in a Supersonic Ammonia Jet," *Colorado Photonics Industry Association Annual Meeting*, November 2016**.**

13. **G. Rieker**, I. Coddington, "Frequency Comb-based Methane Detection Network," *Rice University Natural Gas Industry Day*, October 2016.

12. A. Torres*, P. Schroeder*, D. Pfotenhauer*, and **G. Rieker**, "The Design of a High-Temperature, High-Pressure Spectroscopic Cell," *Discovery Learning Apprenticeship Annual Review*, May 2016.

11. K. Cossel, E. Waxman, G. Truong, **G. Rieker**, F. Giorgetta, W. Swann, I. Coddington, N. Newbury, "A portable dual frequency comb spectrometer for atmospheric applications," *EGU 2016*, April 2016.

10. C. Alden**, K. Prasad, S. Ghosh, A. Karion, C. Sweeney, S. Coburn**, R. Wright**, E. Baumann, G. Truong, K. Cossel, I. Lopez Coto, I. Coddington, **G. Rieker**, "Continuous Monitoring of Pollutant Emissions at Site- to Regional- Scales," *44th Annual Global Monitoring Conference,* March 2016.

9. **G. Rieker**, C. Alden**, S. Coburn**, R. Wright**, K. Prasad, S. Ghosh, I. Coddington, "Frequency Comb-based Methane Detection Network," *2016 ARPA-E Energy Innovation Summit*, February 2016.

8. **G. Rieker**, P. Schroeder*, D. Pfotenhauer*, F. Giorgetta, W. Swann, I. Coddington, N. Newbury, "Transitioning Frequency Comb Laser Diagnostics from the Lab to the Combustor," *Gordon Research Conference on Laser Diagnostics in Combustion*, August 2015.

7. P. Schroeder*, **G. Rieker**, F. Giorgetta, W. Swann, I. Coddington, N. Newbury, "Dual Frequency Comb Spectroscopy of High Temperature Water Vapor Absorption," *Gordon Research Conference on Laser Diagnostics in Combustion*, August 2015.

6. T. Hayden*, **G. Rieker**, "Large Amplitude Wavelength Modulation Spectroscopy for Sensitive Measurements of Broad Absorbers," *Rocky Mountain Fluid Mechanics Research Symposium*, August 2015.

5. P. Schroeder*, **G. Rieker**, "Combining Science and Engineering: Spectroscopy of Water Vapor in a Coal Gasifier Using Frequency Comb Lasers." *CU Energy Frontiers Conference*, March 2015. People's choice award.

4. P. Schroeder*, **G. Rieker**, "Combining Science and Engineering: Spectroscopy of Water Vapor in a Coal Gasifier Using Frequency Comb Lasers." *Colorado Photonics Industry Association Annual Meeting*, November 2014**.** Award for best poster.

3. **G. Rieker**, S. Cauble, F. Poehlmann, and M. Cappelli, "Medical imaging isotope production using a novel compact plasma accelerator," *Center for Biomedical Imaging at Stanford Symposium*, April 2012.

2. M. Constantin, P. Keall, J. Perl, F. Poehlmann, **G. Rieker**, M. Cappelli, "Monte Carlo Simulations of Compact Plasma Accelerators for Proton Radiotherapy," *51st AAPM Annual Meeting*, 2009.

1. **G. Rieker**, J. Jeffries, R. Hanson, T. Mathur, M. Gruber, and C. Carter, "Calibration-Free Wavelength-Modulation Spectroscopy for Measurements of Temperature and $H_2O$ Concentration in Harsh, Non-Uniform Environments," *Gordon Research Conference on Laser Diagnostics in Combustion*, 2007.

## PRESS RELEASES AND MEDIA COVERAGE

Wind Tunnel Research Could Help Predict How Wildfires Spread
https://www.colorado.edu/today/2025/12/05/wind-tunnel-research-could-help-predict-how-wildfires-spread (December 5, 2025)

2025 Boulder Chamber Celebration of Leadership Awards
https://www.boulderchamber.com/2025/03/11/boulder-chamber-announces-finalists-for-2025-celebration-of-leadership-awards/ (March 2025)

LongPath Ditches Up-in-the-Air Tech for Emissions Reduction Closer to Ground https://www.hartenergy.com/exclusives/longpath-ditches-air-tech-emissions-reduction-closer-ground-211406 Hart Energy (December 17, 2024)

LongPath Technologies; $162.4 Million DOE Loan Finalized https://pulse2.com/longpath-technologies-162-4-million-doe-loan-finalized/ Pulse2 (November 4, 2024)

Company receives $162m loan from US government for methane emissions monitoring https://jpt.spe.org/company-receives-162m-loan-from-us-government-for-methane-emissions-monitoring Journal of Petroleum Engineering (November 4, 2024)

LongPath Technologies DOE loan https://www.mrt.com/business/oil/article/longpath-technologies-doe-loan-19879955.php MRT (November 2, 2024)

LongPath's methane monitors set for US-wide deployment https://optics.org/news/15/10/48 (October 30, 2024)

LongPath Technologies finalizes $624m DOE loan to expand methane emissions monitoring network https://www.oilfieldtechnology.com/product-news/28102024/longpath-technologies-finalises-us1624-million-doe-loan-to-expand-methane-emissions-monitoring-network/ (October 28, 2024)

LongPath's methane monitoring technology gets DOE loan guarantee https://www.rigzone.com/news/longpaths_methane_monitoring_technology_gets_1624_mm_doe_loan_guarantee-27-oct-2024-178537-article/ (October 27, 2024)

Spinout LongPath Technologies expands methane detection with $162m DOE loan https://www.colorado.edu/today/2024/10/25/spinout-longpath-technologies-expand-methane-detection-162m-doe-loan CU Boulder Today (October 25, 2024)

Denver area company wins $162.4 million Department of Energy Financing for Methane Emissions https://www.bizjournals.com/denver/news/2024/10/24/longpath-technologies-doe-loan-methane-emissions.html Denver Business Journal (October 24, 2024)

DOE finalizes $162M loan guarantee for monitoring methane leaks https://www.eenews.net/articles/doe-finalizes-162m-loan-guarantee-for-monitoring-methane-leaks/ E & E News by POLITICO (October 24, 2024)

LongPath Technologies Secures DOE Loan to Expand Emissions Monitoring Network https://www.hartenergy.com/exclusives/longpath-technologies-secures-doe-loan-expand-emissions-monitoring-network-210876 Hart Energy (October 23, 2024)

Colorado's LongPath laser methane detection company receives $162 million DOE loan https://denvergazette.com/news/environment/162m-federal-loan-for-laser-methane-detection-system/article_89aebb84-90c4-11ef-9130-473d44b86f9d.html
Denver Gazette - (October 23, 2024)

DOE expands support for tracking and cutting methane https://www.axios.com/2024/10/23/doe-longpath-methane-tracking
AXIOS (October 23, 2024)

CU Boulder, Elevate Quantum partners ready for $127 million regional quantum boost CU Boulder, Elevate Quantum partners ready for $127M regional quantum boost | CU Boulder Today | University of Colorado Boulder (July 2, 2024)

Quantum Industry Partnerships, presentation: US Congressional Representative Yadira Caraveo visit to CU Boulder (July 2024)

CU Boulder researchers are building an eye of sauron whose gaze pierces harmful gasses https://www.kunc.org/news/2024-05-24/cu-boulder-researchers-are-building-an-eye-of-sauron-whose-gaze-pierces-harmful-gasses NPR News (May 2024)

Quantum seed grants awarded to advance industry and university innovation projects in Colorado https://www.colorado.edu/researchinnovation/2024/01/21/quantum-seed-grants-awarded-advance-industry-and-university-innovation-projects-colorado
Research & Innovation Office (January 2024)

Methane Leak is Having a Moment https://www.axios.com/pro/climate-deals/2024/01/08/methane-leak-tech Axios Pro: Climate Deals (January 8, 2024)

LPO Breaking News: Up to $189 Million Conditional Commitment to LongPath to Support U.S. Methane Emissions Monitoring
https://content.govdelivery.com/accounts/USDOELPO/bulletins/3833a5b (January 2024)

New Frequency comb can identify molecules in 20-nanosecond snapshots
**https://physicsworld.com/a/frequency-comb-identifies-molecules-every-20-nanoseconds/**
Physics World (December 2023)

CU Boulder leads $5.9 million marine carbon dioxide removal monitoring effort CU Boulder leads $5.9 million marine carbon dioxide removal monitoring effort | Electrical, Computer & Energy Engineering | University of Colorado Boulder (November 2023)

New Frequency Comb Can Identify Molecules in 20-Nanosecond Snapshots | NIST
NIST News (October 2023)

Q-SEnSE: An NSF Quantum Leap Challenge Institute
https://www.youtube.com/watch?v=KZACoFKmiTs&t=210s (May 2023)

Wired Magazine, The Artic's Permafrost-Obsessed Methane Detectives
https://www.wired.com/story/arctic-permafrost-obsessed-methane-detectives/ (April 6, 2023)

Scaling Up with Scale Up https://www.arpae-summit.com/Press/2023-Summit-Videos%E2%80%8B%E2%80%8B%E2%80%8B%E2%80%8B%E2%80%8B%E2%80%8B%E2%80%8B (March 22, 2023)

New Buff Venture Fund makes landmark investments in CU Boulder startups
https://www.colorado.edu/venturepartners/2023/03/21/internal-news/new-buff-venture-fund-makes-landmark-investments-cu-boulder-startups

Meeting and technology demonstration with U.S. Senator John Hickenlooper, Methane Emissions Technology Evaluation Center (October 25, 2022)

CU Boulder Lasers Go Supersonic, https://www.colorado.edu/engineering/2022/10/13/cu-boulder-lasers-go-supersonic (October 13, 2022)

QEI Collaboration lab opening to foster high-impact research in quantum engineering, https://www.colorado.edu/engineering/2022/10/10/qei-collaboration-lab-opening-foster-high-impact-research-quantum-engineering (October 10, 2022)

Digital Wildcatters Podcast, https://youtu.be/ecWdz25q3Qc (September 12, 2022)

CU Today (June 28, 2022) Colorado's Quantum Revolution: How scientists exploring a universe of tiny things are transforming the state into a new Silicon Valley https://www.colorado.edu/today/2022/quantum-revolution

Daily Camera (June 27, 2022) LongPath Technologies employs lasers to detect oil and gas leaks https://www.dailycamera.com/2022/06/25/a-win-win-for-industry-environment-boulders-longpath-technologies-employs-lasers-to-detect-oil-and-gas-leaks/

CU Boulder Today (June 8, 2022) Methane leaks are a major factor in climate change. One start-up wants to stop them https://colorado.edu/today/2022/06/08/methane-leaks-are-major-factor-climate-change-one-startup-wants-stop-them

Testimony for U.S. House of Representatives Committee on Science, Space and Technology hearing on Detecting and Quantifying Methane Emissions, https://science.house.gov/hearings/detecting-and-quantifying-methane-emissions-from-the-oil-and-gas-sector (June 6, 2022) Additional coverage

ARPA E Energy Innovation Summit, meeting with Secretary of Energy Jennifer Granholm, Denver Colorado (May 25, 2022)

U.S. House of Representatives Committee on Science, Space and Technology in person meeting at NIST (May 4, 2022)

ASEE First Bell (January 2022) CU Boulder Researchers Replicate Exoplanet Climates to Help Look For Life. https://mailview.bulletinmedia.com/mailview.aspx

YouTube Video "Finding Life Outside our Solar System" (December 2021) https://www.youtube.com/watch?v=kjg_RIj-LRc&t=4s

Phys.org (December 2021) https://phys.org/news/2021-12-space-lab-replicate-climates-exoplanets.html

Interesting Engineering (December 2021) https://interestingengineering.com/researchers-replicate-exoplanet-climates-in-lab-to-help-look-for-life

Fuentitech.com (December 2021)
https://fuentitech.com/researchers-replicate-the-climate-of-extraterrestrial-planets-to-help-find-extraterrestrial-life/426667/

NPR Marketplace (November 2021)
https://www.marketplace.org/2021/11/02/stepping-up-the-technology-to-find-methane-leaks/

E&E News: Energy Wire (October 2021)
https://www.eenews.net/articles/the-key-for-epa-rules-inside-the-methane-tech-revolution/

physicsworld Biomedical Devices Research Update (October 2021)
https://physicsworld.com/a/ultrasensitive-frequency-comb-breathalyser-targets-real-time-disease-diagnosis/

CU Engineering Weekly Digest (Oct 23, 2021)
Quantum Engineering Initiative
https://www.colorado.edu/engineering-facultystaff/newsletter/engineering-communications-marketing/oct-23-2021

CU Boulder Today (September 2021) Colorado General Assembly – Joint Technology Committee Presentation
https://www.colorado.edu/today/2021/09/13/philip-makotyn-presents-colorado-general-assemblys-joint-technology-committee

The Insider from Venture Partners at CU Boulder News (March 2021)
https://www.longpathtech.com/news/longpath-wins-5m-in-doe-funding-for-continuous-methane-leak-detection

The Insider from Venture Partners at CU Boulder Emerging Innovations (March 2021)
https://www.colorado.edu/venturepartners/2021/03/23/structured-light-velocimetry-sensing-angular-velocity

CU Boulder Today Feature Story (February 2021)
https://www.colorado.edu/researchinnovation/2021/02/10/faculty-innovators-recognized-national-academy-inventors

Boulder Daily Camera Front Page Story (July 2020)
https://www.dailycamera.com/2020/07/23/cu-boulder-receives-25m-to-study-sciences-grand-challenges/

CU Boulder Today Feature Story (July 2020)
https://www.colorado.edu/today/2020/07/21/new-25-million-center-advance-quantum-science-and-engineering

Venture Partners at CU Boulder Feature Story (June 2020)
https://www.colorado.edu/venturepartners/2020/06/11/inventions-keep-powering-cu-boulder-startup-formation-system-leaps-no-20-global

Forbes News Story (November 2019): https://www.forbes.com/sites/scottcarpenter/2019/11/27/detection-of-methane-leak-from-space-could-herald-a-revolution/#64c23440667c

WINNER: 2019 CO-LABS Governor's Awards for High Impact Research Dual Comb Spectroscopy Methane Detection Technology (October 2019): https://www.youtube.com/watch?v=F7DkKgtQvTM&feature=youtu.be

CUBit Quantum Initiative Stories – Faculty Spotlight (October 2019): https://www.colorado.edu/initiative/cubit/2019/10/30/greg-rieker

Yale Environment 360 Story (October 2019): https://e360.yale.edu/features/methane-detectives-can-a-wave-of-new-technology-slash-natural-gas-leaks

CU Boulder Today Story (October 2019): https://www.colorado.edu/today/2019/10/31/cu-researchers-recognized-3-governors-awards-high-impact-research

CGTNAmerica.com Methane Emissions Story (October 2019): https://www.youtube.com/watch?v=2q9STz1si5Y&feature=youtu.be

Meetings with US Congressman Joe Neguse and NIST directors (2019)

NIST – A Standard Blog – Taking Measure (May 2019): https://www.nist.gov/blogs/taking-measure/long-road-nobelists-invention-longpath-technologies

Colorado Public Radio live interview (2018): https://www.cpr.org/news/story/detecting-methane-leaks-could-turn-into-big-business

9news Colorado story (2018): https://www.9news.com/video/news/scientists-working-to-find-invisible-methane-leaks/73-8134745

CBS news Colorado story (2018): https://denver.cbslocal.com/2018/05/02/colorado-researchers-team-up-on-gas-leak-detecting-technology/

Colorado Public Radio story (2018): http://www.kunc.org/post/how-scientists-are-using-lasers-hunt-leaky-oil-and-gas-equipment

Boulder Weekly story (2018): http://www.boulderweekly.com/boulderganic/enter-boulder-born-laser-methane-comb/

Grand Junction Sentinel story (2018): https://www.gjsentinel.com/news/western_colorado/lasers-developed-at-cu-fight-methane-leaks/article_9d2971aa-4138-11e8-8d84-10604b9f6eda.html

University of Colorado press release (2018): https://www.colorado.edu/mechanical/2018/03/22/detecting-methane-miles-away

Optical Society of America press release (2018): https://www.osa.org/en-us/about_osa/newsroom/news_releases/2018/laser-based_system_offers_continuous_monitoring_of/

Select sites carrying above press releases (2018):

1. Science Daily: https://www.sciencedaily.com/releases/2018/03/180322103259.htm
2. Patch.com (oil and gas industry news): https://patch.com/colorado/boulder/cu-built-laser-based-sensor-detects-methane-leaks-miles-away
3. Physics World: https://physicsworld.com/a/infrared-frequency-combs-detect-gas-leaks/
4. https://www.eurekalert.org/pub_releases/2018-03/nios-md031918.php
5. https://www.rdmag.com/article/2018/03/laser-based-instrument-finds-gas-leaks-distance
6. https://eponline.com/articles/2018/03/26/new-method-shown-for-detecting-methane-leaks.aspx
7. https://www.pddnet.com/news/2018/03/laser-based-sensing-system-can-detect-methane-leaks-miles-away

Reference in story on methane emissions in the US (2018): https://cen.acs.org/articles/96/i16/Overhaul-needed-methane-measurements-National.html

"Regional Methane Leak Detection", Senator Michael Bennet [meeting with U.S. Senator Michael Bennet to describe our work under the ARPA-E MONITOR program], March 14, 2018.

"Regional Methane Leak Detection", Senator Cory Gardner [meeting with U.S. Senator Cory Gardner to describe our work under the ARPA-E MONITOR program], April 17, 2017.

"Dual-Comb Spectroscopy", *Optics and Photonics News* [our work on mobile dual frequency comb spectroscopy highlighted in article by Takuro Ideguchi], January 1, 2017, https://www.osa-opn.org/home/articles/volume_28/january_2017/features/dual-comb_spectroscopy/ .

"CU Boulder team to track methane leaks using lasers" *CU Mechanical Engineering* [press release], January 26, 2017, http://www.colorado.edu/mechanical/2017/01/26/cu-boulder-team-track-methane-leaks-using-lasers.

"CU Engineers Using Lasers to Track Gas Leaks", *KUNC All Things Considered,* [article], and Radio Interview, February 6, 2017, http://www.kunc.org/post/cu-engineers-using-lasers-track-gas-leaks.

"CU Boulder Team Tracks Methane Leaks with Lasers", *Photonics Spectra*, [article], January 31, 2017, https://www.photonics.com/Article.aspx?PID=6&VID=146&IID=931&AID=61644

"Engineers at CU Boulder to track gas leaks using lasers", *BizWest* [article], January 27, 2017, https://bizwest.com/2017/01/27/engineers-cu-boulder-track-gas-leaks-using-lasers/

"New Methane Leak Detector Could Save Oil Industry $30 Billion Per Year", oilprice.com, [article], February 2, 2017, http://oilprice.com/Energy/Energy-General/New-Methane-Leak-Detector-Could-Save-Oil-Industry-30-Billion-Per-Year.html

"CU Boulder-led team lands grant to study gas storage emissions", Daily Camera, [article], January 27, 2017, http://www.dailycamera.com/cu-news/ci_30754199/cu-boulder-led-team-lands-grant-study-gas

"NIST/CU Team Launches 'Comb and Copter' System to Map Atmospheric Gases", NIST [press release], June 23, 2017, https://www.nist.gov/news-events/news/2017/06/nistcu-team-launches-comb-and-copter-system-map-atmospheric-gases

"IRISS Teams Up with NIST and DARPA to Test Nobel Prize-Winning Technology", Grand Challenge Integrated Remote and In Situ Sensing [press release], June 27, 2017, http://www.colorado.edu/iriss/2017/02/10/iriss-uas-reflects-frequency-combs

## CURRENT AND PAST RESEARCH GRANTS

Total as PI: $ 37,833,941
Total as PI or Co-PI: $ 88,616,672
Total Share to Rieker Laboratory: $ 19,360,603

**Powerful Selectivity for Trace Field Detection**
$290,000 Greg Rieker (PI)
- Lawrence Livermore National Laboratory
- 9/1/25 –8/31/27
- 0.25 person-months/year

**Validated Physics-Based Computational Modeling of Firebrand Generation, Properties, and Near-Field Transport**
$1,305,489 Peter Hamlington (PI) ($238,771 Rieker share)
- National Science Foundation
- 01/2026 – 12/2028
- 0.5 person-months/year

**EMBRACE-AGS-Growth: Advancing Temperature-Dependent Methane Absorption Models to Support Next-Generation Remote Sensing**
$399,934 Ryan Cole (PI), ($61,740 – Rieker share)
- National Science Foundation
- 3/1/25 –2/28/29
- 0 person-months/year

**BioComb: Data-driven biomanufacturing using optical frequency combs**
$4,193,580 Greg Rieker (PI, together with Marieke Klijn), ($1,663,163 – Rieker share)
- Schmidt Sciences
- 1/1/25 – 12/31/28
- 1 person-months/year

**Carcinogenic Air Pollutant Monitoring with Dual-comb Spectroscopy**
$50,000 Greg Rieker (PI)
- Colorado OEDIT 2023-2024 Seed Grant
- 1/1/24 – 6/30/25
- 0 person-months/year

**SAURON: Standoff Aerosol measUrement Remote Optical Network**
$18,696,153 Greg Rieker (PI), ($3,635,259 – Rieker share)
- Intelligence Advanced Research Projects Agency
- 1/8/24 – 5/31/27
- 2 person-months/year

**Cutting-Edge Multi-Scale Modeling of High-Temperature Particle-Laden Flows**
$349,187 Peter Hamlington (PI), ($90,852 – Rieker share)
- 3M Company
- 1/1/25 – 12/31/27
- 0 person-months/year

**Phase I SBIR, FLAME: Frequency comb Lasers for the Analysis of Methane Emissions from flares**
$250,000 Stefan Droste (PI), ($79,618 – Rieker share)
- Department of Energy
- 7/1/23 – 6/30/24
- 0 person-months/year

**A Low GHG Advanced SI Engine that can Operate on NG and NG/H2 Blends with Diesel-equivalent Performance for Off-Road Applications**
$2,540,848 Jeffrey Naber (PI) ($151,500 – Rieker share)
- Department of Energy
- 6/1/23 – 8/31/26
- 0.5 person-months/year

**Integrating measurements across platforms to feasibly assess emissions and mitigation of methane and VOCs from landfills**
$1,000,000 Mike Hannigan (PI), ($214,000 – Rieker share)
- Environmental Protection Agency
- 9/1/23 – 8/31/26
- 0 person-months/year

**High-speed frequency comb molecular identifier**
$125,000 Greg Rieker (PI) ($62,500 – Rieker share)
- Colorado OEDIT Advanced Industries Accelerator Grant;
- 3/1/23 – 2/29/24
- 0 person-months/year

**Accurate Multi Parameter Scramjet Diagnostics Using Frequency Comb Lasers**
$1,325,000 Greg Rieker (PI) ($869,482 – Rieker share)
- Air Force Research Laboratories; Jeff Donbar
- 08/12/2020-11/15/2026
- 0.5 person-months/year

**Collaborative Research: NNA Track 1: Yukon River Watershed Communities: Global Impacts and Social Implications**
$2,998,503 Tyler Jones (PI), Greg Rieker (co-PI) ($601,338 – Rieker share)
- National Science Foundation; Angela Turner, (aturner@nsf.gov )
- 09/15/2020– 08/31/2026
- 0.38 person-months/year

**Advancing Frequency Comb Technology for Air Force-relevant Sensing Applications: Pathway to Routine High Accuracy (1%) Measurements in Propulsion and Hypersonic Systems**
$1,230,478 Greg Rieker (PI)
- Air Force Office of Scientific Research; Andy Stickrath
- 09/30/2020 – 09/29/2025
- 1.0 person-months/year

**MRI: Development of a Mobile High-speed Dual Frequency Comb Spectroscopy User Facility**
$1,036,033 Greg Rieker (PI), ($792,578 – Rieker share)
- National Science Foundation; John Daily (702.292.7937, jdaily@nsf.gov )
- 09/01/2020 – 08/31/2024
- 0.5 person-months/year

**QLCI-CI: Enhanced Sensing and Distribution Using Correlated Quantum States**
$30,000,000 Jun Ye (PI), Greg Rieker (co-PI) ($1,043,640 – Rieker share)
- National Science Foundation; NSF Quantum Leap Challenge Institutes Management Team (hwarchall@nsf.gov and ddagenai@nsf.gov )
- 07/01/2020 – 6/30/2026
- 0.5 person-months/year

**Novel Sloping Wind Tunnel Experiments and Adaptive Mesh Simulations of Fine-Scale Combustion for Physics-Based Models of Wildland Fire**
$2,088,770 Peter Hamlington (PI), Greg Rieker (co-PI) ($ 593,917 – Rieker share)
- SERDP; Kurt Preston (Kurt.T.Preston@usace.army.mil)
- 05/01/2020 - 4/29/2026
- 0.5 person-months/year

**Phase 2 - STTR: Mid Infrared Laser Absorption Spectroscopy for Multi-Parameter Rotating Detonation Analysis**
$750,000 Jason Kriesel (PI), Greg Rieker (co-PI) ($150,000 – Rieker share)
- Air Force Research Laboratories; William Hargus, Jr. (William.hargus@us.af.mil )
- 9/01/2020 – 11/30/2023
- 0.0 person-months/year

**CAREER: Frequency Comb-based Diagnostics for Combustion Environments**
$ 510,000. Greg Rieker (PI) ($ 510,000 – Rieker share)
- National Science Foundation; Song-Charng Kong (703.292.8695, skong@nsf.gov)
- 3/1/15 – 2/29/21
- 0.5 person-months/year

**Frequency Comb-Based Remote Methane Observation Network**
$ 2,125,470. Greg Rieker (PI), ($ 980,415 – Rieker share)
- DOE ARPA-E; Joseph King (202.287.1055, Joseph.king@hq.doe.gov)
- 5/1/15 – 5/5/17
- 2.5 person-months/year

**(Plus-Up) Frequency Comb-Based Remote Methane Observation Network**
$ 2,692,143. Greg Rieker (PI), ($ 1,186,117 – Rieker share)
- DOE ARPA-E; Joseph King (202.287.1055, Joseph.king@hq.doe.gov)
- 3/27/18 – 3/30/21
- 2.5 person-months/year

**Emission Inventories from Natural Gas Storage Facilities using Regional Frequency Comb Laser Monitoring and Aircraft Flyovers**
$ 1,323,130. Greg Rieker (PI) ($ 730,885 – Rieker share)

- Department of Energy; Sandra Borek (412.386.4533, Sandra.borek@netl.doe.gov )
- 10/1/16 – 9/30/20
- 0 person-months/year

**Broadband Dual-Comb Spectrometry for Hazardous Material Detection**
$ 1,741,625. Greg Rieker (PI) ($ 1,241,625 – Rieker share)
- DARPA, Anne Fischer (703.526.2831, anne.fischer@darpa.mil)
- 9/1/15 – 9/30/20
- 2.0 person-months/year

**Exoplanets Research Program: Frequency Comb Measurement of Methane and Water to 1300 K**
$ 464,829. Greg Rieker (PI) ($ 276,473 – Rieker share)
- NASA ROSES;
- 1/1/18 – 12/31/21
- 0.5 person-months/year

**Phase and Angular Momentum Spectroscopy with Frequency Comb Lasers**
$ 583,000. Greg Rieker (PI) ($ 583,000 – Rieker share)
- AFOSR; Chiping Li (703.696.8574, chiping.li@us.af.mil)
- 4/1/17 – 12/31/21
- 1.0 person-months/year

**Collaborative Research: High Temperature and Pressure Char Kinetics – Diagnostic development, Gasifier experiments, and Modeling**
$ 310,000. Greg Rieker (PI) ($ 155,000 – Rieker share)
- NSF; Dr. Ray Chen
- 9/1/13 – 8/30/16
- 0.5 person-months/year

**Western Economic Development Atmospheric Methane Monitoring Project**
$ 250,000. Greg Rieker (PI) ($ 108,683 – Rieker share)
- CMC Research Institutes, Inc.;
- 12/4/17 – 3/31/19
- 0 person-months/year

**Regional Methane Leak Detection System**
$ 130,000. Greg Rieker (PI) ($ 130,000 – Rieker share)
- Colorado OEDIT Advanced Industries Accelerator Grant;
- 6/1/18 – 5/31/19
- 0 person-months/year

**Research and Development of Optimized Polymer Film Flame Treatments**
$ 480,000. Greg Rieker/Peter Hamlington (PI) ($ 240,000 – Rieker share)
- 3M Corporation; Mark Strobel (mastrobel1@mmm.com)
- 1/1/15 – present (ongoing)
- 0 person-months/year

**Innovative Seed Grant: Single-beam laser diagnostic to measure fluid vorticity in real-world environments**
$ 50,000. Greg Rieker (PI) ($ 25,000 – Rieker share)
- University of Colorado; Victor Bright
- 7/1/18 – 12/31/19
- 0 person-months/year

**Innovative Seed Grant: Multi-species Trace Gas Analyzer for Atmospheric, Energy, and Medical Applications**
$ 50,000. Greg Rieker (PI) ($ 50,000 – Rieker share)
- University of Colorado; Victor Bright
- 7/1/14 – 12/31/15
- 0 person-months/year

**Wavelength Modulation Spectroscopy for Expanding $NH_3$ Gas Plume**
$ 42,500. Greg Rieker (PI) ($ 42,500 – Rieker share)
- AFRL; Natalia MacDonald
- 6/1/15 – 6/1/16
- 0 person-months/year

**Examination of Wildland Fire Spread at Small Scales Using Direct Numerical Simulations and Frequency Comb Laser Diagnostics**
$ 1,150,000. Peter Hamlington (PI), Greg Rieker (co-PI) ($ 442,000 – Rieker share)
- SERDP; Kurt Preston (Kurt.T.Preston@usace.army.mil)
- 9/1/16 – 8/30/19
- 0.5 person-months/year

**MURI: Stratospheric Turbulence/ Particle Measurements and Models for Air Force Hypersonics**
$ 7,500,000. Brian Argrow (PI), Greg Rieker (co-PI) ($450,702 – Rieker share)
- AFOSR; TBA (TBA)
- 1/1/18 – 12/31/23
- 0.5 person-months/year

## GRADUATE TEACHING

Faculty Course Questionnaires (FCQs) max score 6.0

| | |
|---|---|
| Fall 2013 | **MCEN 5065/5075: Graduate Design** |
| | *18 students, FCQs: 5.4 course overall, 5.2 instructor overall* |
| Spring 2014 | **MCEN 5055: Advanced Product Design** |
| | *26 students, FCQs: 5.3 course overall, 5.8 instructor overall* |
| AY 14-15 | **MCEN 5065/5075: Graduate Design Team Mentorship** |
| | 1 *team of 3 students, no FCQ* |
| AY 15-16 | **MCEN 5065/5075: Graduate Design Team Mentorship** |
| | 2 teams of 3 students, no *FCQ* |
| AY 16-17 | **MCEN 5065/5075: Graduate Design Team Mentorship** |
| | 2 teams of 3 students, no *FCQ* |
| Spring 2015 | **MCEN 5055: Advanced Product Design** |
| | *25 students, FCQs: 5.2 course overall, 5.5 instructor overall* |

Spring 2016 **MCEN 5055: Advanced Product Design**
*18 students, FCQs: 5.4 course overall, 5.8 instructor overall*
Fall 2016 **MCEN 5055: Advanced Product Design**
*27 students, FCQs: 4.7 course overall, 5.4 instructor overall*
Change to Faculty Course Questionnaires (FCQs) max score 5.0
Spring 2022 **MCEN 5055: Advanced Product Design**
*25 students, FCQs: >4.65 across all 16 categories, Average 4.81*
Fall 2022 **MCEN 5055: Advanced Product Design**
*33 students, FCQs: >4.4 across all 16 categories, Average 4.65*
Spring 2023 **(New Course) MCEN 5228: Optical Sensing**
*17 students, FCQs: Average (16 categories) 4.33*
AY 24-25 **MCEN 5065/5075**: **Graduate Design Team Mentorship**
1 team of 4 students.
AY 25-26 **MCEN 5065-5075: Graduate Design Team Mentorship**
1 team of 4 students.

## UNDERGRADUATE TEACHING

Faculty Course Questionnaires (FCQs) max score 6.0
AY 15-16 **MCEN 4045/4085: Undergraduate Senior Design Team Mentorship**
*1 team of 6 students, FCQs: 6.0 course overall, 6.0 instructor overall*
Spring 2017 **MCEN 4228: Thermofluids Laboratory (new course)**
*11 students, FCQs: 4.8 course overall, 5.8 instructor overall*
Fall 2017 **MCEN 3012: Thermodynamics I**
*114 students, FCQs: 5.2 course overall, 5.6 instructor overall*
Spring 2018 **MCEN 4228: Thermofluids Laboratory**
*6 students, FCQs: 6.0 course overall, 5.8 instructor overall*
Fall 2018 **MCEN 3012: Thermodynamics I**
*103 students (2 sections), FCQs: 5.2 course overall, 5.6 instructor overall*
AY 24-25 **MCEN 4045/4085: Undergraduate Senior Design Team Mentorship**
1 team of 9 students.
AY 25-26 **MCEN 4045/4085 Undergraduate Senior Design Team Mentorship**
2 teams of 10 students.
Spring 2026 **MCEN 5228-008 Optical Sensing**

## EDUCATION GRANTS

Total as PI: $ 133,500

**STEM Education Grant: University of Colorado Senior and Graduate Design Projects in Support of NIST Metrology Initiatives**
$ 90,000. Greg Rieker (PI)
- NIST; Paul Hale (303.497.5367, paul.hale@nist.gov)
- 9/1/14 – 8/30/18
- 0 person-months/year

**New Hands-on Upper Level Energy Course: Experimental Thermal-Fluid Systems Capstone**
$ 33,500. Greg Rieker/Julie Steinbrenner (PI)
- CU; EEF Committee (Rotates)
- 6/1/16 – 5/30/19

– 0 person-months/year

**Shell Education Grant for Experimental Thermal-Fluid Systems Capstone**
$ 10,000. Greg Rieker/Julie Steinbrenner (PI)
– CU; Michael Hannigan (michael.hannigan@colorado.edu)
– 6/1/16 – 5/30/17
– 0 person-months/year

## RESEARCH ADVISING

Current

Senior Research Associates
Sean Coburn (2015 – present)
Garrett Mathews (2021 – present)

Research Associate
Carson Teale (2025 – present)

PhD
Carl Mathurin
Augustine Frymire
Alyssa Lalko
Elijah Miller
Carly Rowe
Nicolas Harris
Erick Gatica
Eric Richter
Jonathan Hale
Aidan Hulbert

Masters
Gemma Gallaher

Undergrad
Mari Sippel

Alumni

PhD
Paul Schroeder PhD 2017 (now with General Atomics)
Torrey Hayden PhD 2018 (now with BAE Systems)
Jason Christopher PhD 2018 (co-advised with Hamlington; now with Air Force)
Amanda Makowiecki PhD 2019 (now with LongPath Technologies)
Nathan Malarich PhD 2020 (now with NOAA)
Ryan Cole PhD 2021 (now with Bates College)
Elizabeth Strong PhD 2021(now with Apple)
Alex Rybchuk PhD 2021 (co-advised with Lundquist, now with NREL)
David Yun 2023 (now with Boeing)
Scott Egbert 2024 (now with IMRA)
Charles Callahan 2024 (now with LongPath Technologies)

Research Associate / Postdoc

Nazanin Hoghooghi (2015 – 2023, now with NIST)
Caroline Alden (2015 – 2022, now with LongPath Technologies)
Graeme Gillespie (2023 – 2024, now with Erise law)
Justin Earley (2023 – 2024, now with ASU)
Hermina Beica (2025, now with LightMachinery)

Research Engineers
Robert Wright (2015-2020, now with LongPath)
Griffith Wendland (2018-2019)

MS
Anthony Draper MS 2018 (now with Meta)
Bennett Sodergren MS 2015 (now with Vescent Photonics, Inc.)
Jinyu Yang MS 2017 (now with Notre Dame)
Alan Sanchez MS 2018 (now with Tesla)
Justice Calderon MS 2021 (now with IBM)
Mehrassa Marizad MS 2023 (now with Double Helix)
Colton Huff MS 2025

Undergraduates & BS/MS
Jaylen Hinds (You're @ CU 2014)
Matthew Chamot (DLA 2016-2017)
Brendan Bitterlin (DLA 2017-2018)
Bill Andrew (summer intern 2015)
Bryan Watson (summer intern 2016)
Josh Biggio (summer intern 2017)
Sonya Schuppan (summer intern 2017)
Zak Armacost (summer intern 2018)
Nicolas Seitz (summer intern 2018)
Cesar Galan Gutierrez (part-time staff 2017-2018)
Alexandra Jaros (SPUR, intern 2018-2019)
Robert Giannella (summer intern 2018)
Christopher Kling (DLA 2019-2020)
Cameron Casby (DLA 2019-2020)
Abdul Dalwatzai (intern 2020-2021)
Timothy Breda (DLA 2020-2021)
Sean Bohling (SPUR 2021)
Walter Sabon (DLA 2021-2022)
Alison Kelly (SPUR 2022)
Liam Davis (DLA 2022 – 2023)
Colton Huff (SPUR 2023)
Gemma Gallaher (SPUR 2023)
Marcus Centeno (SPUR 2023)
Mari Sippel (intern 2024-2025)
Stefan Ferla (SPUR 2025)

Visiting Scholars
Marta Ruiz-Llata (University Carlos III Madrid, 2019-2020)

Other

Matt Francisco, MS Thesis Committee 2013
Ricardo Jiminez, PhD Committee (Physics) 2013
Ricardo Piedrahita, Preliminary exam 2014, PhD Committee 2015
Ben Yu, PhD Committee (Physics) 2015
Dan Maser, PhD Comprehensive Exam (Physics) 2015, PhD Committee 2017
Fnu Shikhar, PhD Committee 2015
Kim Urness, PhD Comprehensive Exam 2013, PhD Committee 2014
Colin Towery, PhD Comprehensive Exam 2015, PhD Committee 2017
Bill Tandy, PhD Comprehensive Exam (Aerospace) 2016, PhD Committee 2017
Awad Alquaity, PhD Committee (KAUST) 2016
Nick Wimer, PhD Comprehensive Exam 2017, PhD Committee 2019
Yao Zhai, PhD Comprehensive Exam 2017, PhD Committee 2018
Sid Nigam, MS Committee 2018
Daniel Cole, PhD Committee (Physics) 2018
Holly Leopardi, PhD Comprehensive Exam (Physics) 2018, PhD Committee 2019
Samuel Whitman, PhD Preliminary Exam 2018
Caelan LaPointe, PhD Preliminary Exam 2018, PhD Comprehensive Exam 2019, PhD Committee 2020
Corey Rogers, PhD Preliminary Exam 2018
Stephanie Schwartz, PhD Comprehensive Exam 2019, PhD Committee 2020
Susana Todero, PhD Committee (Physics) 2020
Dan Lesko, PhD Comprehensive Exam (Chemistry) 2020
Meghan Kelleher, PhD Comprehensive Exam 2021, PhD Committee 2023
Yeweu Wu, PhD Committee (Physics) 2021
Mike Meehan, PhD Preliminary Exam 2019, PhD Comprehensive Exam 2021
Zach Decker, PhD Committee 2021
M. Ali Abbas, PhD Committee (Radboud University, Netherlands) 2021
Chaitanya Ghole, PhD Preliminary Exam 2022
Alex Anderson, PhD Committee (Electrical) 2022
Jeff Glusman, PhD Preliminary Exam 2020, PhD Comprehensive Exam 2021, PhD Committee 2022
Alex Lind, PhD Comprehensive Exam (Physics) 2020, PhD Committee 2022
Manoj Kalubovilage, PhD Committee (Physics) 2022
Tin Nguyen, PhD Comprehensive Exam (Physics) 2022
Daniel Herman, PhD Comprehensive Exam (Physics) 2020, PhD Committee 2022
Tim Aiken, PhD Comprehensive Exam (Aerospace) 2022, PhD Committee 2023
James Rundel, PhD Preliminary Exam 2021, PhD Committee 2023
Jatinder Sampathkumar, PhD Preliminary Exam 2020, PhD Comprehensive Exam 2021, PhD Committee 2023
Emily Caldwell, PhD Comprehensive Exam (Electrical) 2022, PhD Committee 2023
Jas Shahanand, PhD Preliminary Exam 2023
Antonio Yervez, MS Committee, 2024
Gary Sutliff, PhD Comprehensive Exam (Aerospace) 2024
Neeraj Prakesh, PhD Comprehensive Exam 2023, PhD Committee 2024
Justin Burau, PhD Comprehensive Exam (Physics) 2023, PhD Committee 2024
Jenny Jiahui, PhD Comprehensive Exam (Physics) 2024
Sam Simons-Wellin, PhD Preliminary Exam 2023, PhD Committee 2025

Colby Francoeur, PhD Comprehensive Exam 2024, PhD Committee 2025
Jan Bartos, PhD Comprehensive Exam 2024, PhD Committee 2025
Nathan Sweet, PhD Preliminary Exam (Chemistry) 2025
Mohammed Sy, PhD Committee 2025, KAUST Saudi Arabia
Peter Tz Shin Chang, PhD Committee 2025
Kai-Ting Ting, PhD Committee 2025
Qizhong Liang, PhD Committee 2025
Laura Shannon, PhD Comprehensive Exam 2025
Leo Bloxham, PhD Preliminary Exam (Chemistry) 2026

## DEPARTMENT SERVICE

| | |
|---|---|
| 2013-2014 | Graduate committee |
| | Graduate visit day (GEARRS) event co-lead |
| | Design track admissions lead |
| 2014-2015 | Graduate committee |
| | Graduate visit day (GEARRS) event co-lead |
| | Design track admissions lead |
| 2015-2016 | Graduate committee |
| | Graduate visit day (GEARRS) event lead |
| | Faculty search committee |
| 2015-2018 | Secured funding for 6 senior and graduate design teams |
| 2016-2017 | External relations committee |
| | Design track admissions lead |
| 2017-2018 | Graduate committee |
| 2018-2019 | External relations committee |
| | Department chair search committee |
| | Quantum Science search committee |
| 2020-2021 | Design Center Colorado Committee |
| 2021-2022 | Faculty Search Committee |
| 2022-2023 | Chair, Research & External Relations Committee, Executive Committee |
| 2023 | Quantum Seed Grant Steering Committee |
| 2023 | Mechanical Engineering Mentor Program |
| 2023 | MCEN 5930 Internship for Credit: advising Murali Anumolu, Yugendran Subramani & Rahul Gondi |
| 2024-2025 | Design Center Colorado Committee |
| 2024 | Guest Lectures - Spring MCEN 5055: Advanced Product Design |
| 2024 | Guest Lectures – Fall MCEN 5055: Advanced Product Design |
| 2024 | Proctor – Thermofluids Preliminary Exams |
| 2025 | Proctor – Thermofluids Preliminary Exams |
| 2025 | Guest Lectures – Fall MCEN 5055: Advanced Product Design |
| 2025-2026 | Quantum Engineering Faculty Search, Chair |

## COLLEGE/CAMPUS SERVICE

| | |
|---|---|
| 2015-2018 | BOLD Center Goldshirt Interviews |

| | |
|---|---|
| 2015, 2016 | BOLD Center Aspire Summer Bridge Presenter |
| 2015, 2016 | Innovative Seed Grant Review Panels |
| 2017-2018 | Water-energy Nexus Innovative Research Thrust Executive Committee |
| 2017-2018 | Quantum Integrated Sensor Systems Innovative Research Thrust Executive Committee |
| 2017-2019 | Organizer and Faculty Lead, Operational Renegade Gas (ORG) Working Group |
| 2018 | Faculty Innovation Ambassador |
| 2018-2020 | Quantum Sensing and Metrology Pillar Lead, CUbit Quantum Initiative |
| 2019-2020 | Development Committee, 3M Master Research Agreement |
| 2019-2023 | CEAS Quantum Engineering Initiative, Director |
| 2022 | CEAS Strategic Planning, Facilitator for Innovation & Entrepreneurship Workshop |
| 2020-present | CUbit Quantum Initiative, Associate Director for Engineering |
| 2023-present | CEAS Quantum Engineering Initiative, Member |
| 2025 | Provost's Faculty Achievement Award Selection Committee |

## NATIONAL/INTERNATIONAL SERVICE

| | |
|---|---|
| 2014 | DOE Basic Energy Sciences Early Career Proposal Review Panel |
| 2015 | NSF Combustion and Fire Systems Proposal Review Panel |
| 2016 | Organizing Committee, OSA *Fourier Transform Spectroscopy* conference |
| 2017 | Local Organizing Committee, OSA *Light and Energy Congress* conference |
| 2017 | Participant, NSF Junior Faculty in Combustion Workshop |
| 2017-2018 | Organizing Committee, OSA *CLEO* conference, Applications and Technology subgroup |
| 2018 | Organizing Committee, OSA *Optics for Energy and Environment* conference |
| 2018 | Organizing Committee, OSA *Laser Applications in Chemical, Security, and Environmental Analysis* conference |
| 2019 | Chair, OSA *CLEO* conference, Applications and Technology subgroup |
| 2015-2018 | Presider/Chair, 9 conference sessions |
| 2018 | European Research Council STG proposal review panel |
| 2018 | EPSRC European proposal review panel |
| 2019 | Participant, NSF Junior Faculty in Combustion Workshop |
| 2019 | Nominee, NAE Frontiers in Engineering Symposium |
| 2019 | Participant and section organizer, AFOSR Fundamental Spectroscopy Workshop |
| 2021 | Organizing Committee, Master in Quantum Technology and Engineering, Universidad Carlos III de Madrid, Spain |
| 2021 | US Sections of the Combustion Institute Early Career Research Award Selection Panel |
| 2022 | Peter Werle Early Career Award Selection Panel, Lead Facilitator |
| 2022 | NSF Combustion and Fire Systems CAREER Award Review Panel |
| 2023 | QUADMARTS Annual Meeting, Host and Organizer |
| 2018-present | NASA NExSS Steering Committee |
| 2020-present | FLAIR Conference Advisory Board |
| 2022-present | QUADMARTS International Collaborative Steering Committee |
| 2025-present | Elevate Quantum Industry Advisory Board |

2025 Applied Photonics Summer School Faculty, Stirling University, Glasgow
2025 Tenure Review, Department of Mechanical Engineering, University of Duisberg-Essen, Germany

## JOURNAL REVIEWER

Optica
Optics Express
Combustion and Flame
Journal of Quantitative Spectroscopy and Radiative Transfer (JQSRT)
Proceedings of the Combustion Institute
Applied Optics
Optics Letters
Applied Physics B
Journal of Molecular Spectroscopy
AIAA Journal
Journal of Applied Remote Sensing
Measurement Science and Technology
Applied Spectroscopy
Optics and Laser Technology
Journal of Physics D
Journal of Energy & Fuels
Nature Communications