VIVIENNE HELEN PAYNE

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Vivienne Payne is the Project Scientist for the Orbiting Carbon Observatory 2 (OCO-2) and the Deputy Project Scientist for OCO-3. She currently serves as co-lead for the NASA Sounder Science Discipline Team and leads the Tropospheric Composition Group in the JPL Earth Science Section. Her research interests lie in remote sensing of the troposphere and ways in which satellite measurements can advance understanding of the Earth system.

Education

2001-2006 **University of Oxford, DPhil**
"Retrieval of Water Vapor and Methane from the MIPAS Satellite Instrument"

1996-2001 **University of Edinburgh, MPhys (Physics) First Class Honours**

Professional Experience

2012-present Research Scientist, Jet Propulsion Laboratory, California Institute of Technology
2022-present **Project Scientist,** Orbiting Carbon Observatory 2 (OCO-2)
2023-present **Deputy Project Scientist,** Orbiting Carbon Observatory 3 (OCO-3)
2019-present **Composition lead,** Atmospheric Infrared Sounder (AIRS)
2014-present **Group Supervisor**, Tropospheric Composition, Earth Science Section
2013-2021 OCO-2/OCO-3 Absorption Coefficient (ABSCO) team lead

2009-2012 **Staff Scientist,** Atmospheric and Environmental Research (AER)
2006-2008 **Senior Research Associate,** AER

2005 **Research Associate,** University of Colorado, Boulder

Service and Outside Activities

- **Co-lead, NASA Sounder Science Discipline Team,** 2021-present (competitively selected)
- **Associate Editor**, IEEE Trans. Geosci. Remote Sens., 2012-2020
- Reviewer for Journals: ***J. Geophys. Res., IEEE Trans. Geosci. Remote Sens***, ***J. Quant. Spec. Radiat. Transfer, Atmos. Meas. Tech.***, ***Atmos. Chem. Phys., J. Appl. Met. Clim., Radio Science***
- Reviewer for Grant Agencies: NASA, DoE, NSF, NOW (Netherlands Science Council), NERC (National Environmental Research Council)
- Reviewer for Conferences: International Geoscience and Remote Sensing Symposium (IGARSS)

Mentoring activities

- Mentor in JPL Mentoring Program, 2018/2019
- Peer mentoring at JPL, 2021-2023

Supervision of postdoctoral researchers and students at JPL

- Mukesh Rai, Postdoctoral Research Associate (2023-present)
- Madison Shogrin, Undergraduate intern (2019/2020)
- Ninos Hermis, Graduate intern (2016-2018)
- Wayana Dolan, Undergraduate intern (2015-2016)
- Hilke Oetjen, Postdoctoral Research Associate (2012-2014)

Mentorship of external postdoctoral researchers and students associated with ROSES projects

- Madison Shogrin, Graduate student, Colorado State University (2020-present)
- Joshua Shutter, Postdoctoral Research Associate, University of Minnesota (2021-present)
- Jared Brewer, Postdoctoral Research Associate, University of Minnesota (2022-present)
- Julieta Juncosa Calahorrano, Graduate student, Colorado State University (2019-present)
- Juliet Zhu, Postdoctoral Research Associate, Colorado State University (2014-2017)

Funded proposals

NASA proposals funded as PI

- Sounder Discipline Team co-lead, Science of Terra, Aqua, Suomi-NPP and JPSS. (2021-2024)
- Impacts of fires on photochemistry: A new long-term record of peroxyacetyl nitrate (PAN) from AIRS, Science of Terra, Aqua, Suomi-NPP and JPSS. (2021-2024)
- New constraints on the impacts of fires on air quality and the nitrogen cycle from CrIS observations of PAN, Science of Terra, Aqua and Suomi-NPP. (2018-2021)
- Inter-calibration of microwave Sensors: Water vapor sounding channels and window channels over land, Precipitation Measurement Mission Science Team (2012-2015)
- Verification of spectroscopic input to the OCO-2 forward model and related error characterization, Orbiting Carbon Observatory 2 Science Team (2011-2014)
- Maintaining high quality spectroscopy for the Community Radiative Transfer Model (Enhancing Capability of Computational Earth System Models and NASA Data for Operation and Assessment), (2011-2014)
- Constraints on high-latitude regional methane fluxes through integration of satellite, aircraft and ground-based observations with models, Atmospheric Composition: Modeling and Analysis (2010-2013)
- Inter-calibration of microwave sensors for TRMM and GPM using a well-validated radiative transfer code, Precipitation Measurement Mission Science Team (2010-2013)

NASA proposals funded as Co-I

- Linking Airborne and Spaceborne Remote Sensing to Quantify Fire VOCs. PI: Dylan Millet, University of Minnesota (2023-2026)
- Development and Analysis of new VOC retrievals from the CrIS sensors. PI: Dylan Millet, University of Minnesota (2021-2024)
- Follow the photochemistry: Harnessing new observations of PAN to learn how changes in emissions are impacting the global atmosphere, Aura Science Team. PI: Emily Fischer, Colorado State University (2020-2023)
- Isoprene Emissions and OH Recycling: New Constraints from Combined Space-Based Measurements of Isoprene, Formaldehyde, and NO2, Aura Science Team. PI: Dylan Millet, University of Minnesota (2020-2023)
- Isoprene Measurements from Space: New Global Constraints on Emissions and Photochemistry from Synthesis of CrIS and OMI Data, Atmospheric Composition, Modeling and Analysis Program. PI: Dylan Millet, University of Minnesota (2017-2020)
- Decadal Record of Lower Tropospheric Methane from Satellite Measurements of Total Column and Free-Tropospheric Methane Concentrations, Atmospheric Composition, Modeling and Analysis Program. PI: John Worden, JPL (2017-2020)
- Refined Atmosphere Data Products from CrIS and ATMS, Suomi-NPP Science Team. PI: Jean-Luc Moncet, AER. (2014-2017)
- Fresh constraints on the global ozone budget through the analysis of new peroxyacetyl nitrate (PAN) observations from TES, Aura Science Team, PI: Emily Fischer, Colorado State University. (2013-2016)
- Use of GOSAT, TES and suborbital observations to constrain North American methane emissions in the Carbon Monitoring System, PI: Daniel Jacob, Harvard University. (2012-2014)

- New TES retrievals of Pollutants and Trace Gases for Air Quality and Tropospheric Chemistry Studies, PI: Mark Shephard, AER (2007-2010)

Other funded proposals

- Co-I on Analysis of Climate-Relevant Gas Absorption Properties from AWARE and Other ARM Spectral Measurements, DoE Atmospheric System Research Program. PI: Eli Mlawer, AER (2017-2020)
- PI on AIRS CO2 algorithm maintenance project (2019-present)

Teaching and outreach

2022	Instructor, NASA Applied Remote Sensing Training Program ("Measuring Atmospheric Carbon Dioxide from Space in Support of Climate Related Studies")
2022-present	Associate Faculty, Colorado State University
2017-2022	Instructor, NASA/JPL/KISS Center for Climate Sciences Summer School, Pasadena, CA
2021	Guest lecturer, "Environmental Analytical Chemistry", Illinois Institute of Technology
2017-2018	Guest lecturer, "Interpreting Satellite Observations of Atmospheric Composition", Colorado State University
2015	Speaker, "Jobs of the Future" symposium, California Lutheran University
2012-2019	Volunteer and Hyperwall presenter at JPL Open House annual public event
2004	Instructor, ESA/ESRIN Summer School, Frascati, Italy

Awards and Fellowships

Individual

2022	JPL Voyager Award, "For excellence in leadership of the development of OCO-2's latest science data retrieval algorithm known as "B11".
2020	Hans Liebe Lecturer in microwave spectroscopy as applied to remote sensing
2019	JPL Explorer Award, for Outstanding Technical Accomplishment (Development of satellite retrievals of peroxyacetyl nitrate)
2010	AER Employee of the Year.
2005	Rupert Ford Fund Fellowship (administered by the Royal Meteorological Society)
2001-2004	National Environmental Research Council Fellowship for graduate study
1996-1997	Margaret Campbell Scott Entrance Bursary to study undergraduate physics

Team

2022	JPL Team Award, "For successful transition of leadership for the OCO missions".
2021	JPL Team Award, "For exceptional support of group members during COVID."
2021	JPL Team Award, "For successful completion of an instrument study contributing to plans for the next generation of NOAA infrared observations from geostationary orbit."
2021	JPL Team Award, "For exceptional execution of all TES instrument closeout tasks following a highly successful 16-year science mission on the NASA Aura satellite."
2020	NASA Group Achievement Award for low-latency satellite processing during FIREX-AQ
2020	JPL Team Award, for successful delivery of high-quality Level 2 from the OCO-2 mission
2018	JPL Team Award, for successful completion of Aura-TES science mission
2017	JPL Team Award, for supporting mission teams in the Earth Science Senior Review process
2017	JPL Team Award, for help in the development of the JPL Earth Science strategic plan
2017	JPL Team Award, for outstanding review of Earth Venture suborbital science proposals
2016	NASA Group Achievement Award for the OCO-2 Science Algorithm Team
2016	JPL Team Award, for implementing the baseline OCO-2 data processing algorithms
2015	JPL Team Award, for essential contributions to the success of the OCO-2 mission
2015	NASA Group Achievement Award for the Global Precipitation Measurement Mission
2015	JPL Team Award for Earth Science Senior Review proposal support

2014 NASA Group Achievement Award for the Aura Tropospheric Emission Spectrometer (TES)
2012, 2014 JPL Team Awards, for contributions to the launch and operations of OCO-2

Invited Talks

May 2022, AIRS 20th Anniversary / NASA Sounder Science Team Meeting (hybrid)
"Atmospheric composition from hyperspectral infrared sounders: Past, present and future"

July 2020, Hans Liebe Lecture, Radio Science conference, Montreal, Canada (virtual)
"Evaluating microwave spectroscopy using ground-based radiometers"

May 2020, Planetary Boundary Layer Incubation workshop, Washington DC (virtual)
"Passive remote sensing of the planetary boundary layer from the infrared"

November 2018, Cal State Los Angeles, Department of Geosciences and Environment seminar
"Spaceborne remote sensing of trace gases in Earth's atmosphere"

September 2018, International Conference on High Resolution Molecular Spectroscopy, Bilbao, Spain
"Spectroscopy for remote sensing of greenhouse gases: Recent progress and outstanding challenges"

June 2018, High Resolution Transmission molecular absorption (HITRAN) conference, Cambridge, MA
"Spectroscopy for remote sensing of tropospheric composition: Perspectives from Aura-TES and OCO-2"

February 2017, Colorado State University, Department of Atmospheric Sciences seminar
"Remote Sensing of tropospheric composition in the thermal infrared"

April 2017, AIRS Science Team Meeting, Pasadena, CA
"Atmospheric composition in the past, present and future: A view from the NASA infrared sounders"

October 2017, University of Oxford, Atmospheric, Oceanic and Planetary Physics seminar
"Looking back, looking forward: Long-term records of atmospheric composition from NASA thermal infrared sounders"

June 2016, Joint Workshop on uncertainties at 183 GHz, Paris, France
"Uncertainties in the spectroscopy of the 183 GHz line"

Refereed Publications

<u>2023</u>

Shogrin, M. J., **Payne, V. H**., Kulawik, S. S., Miyazaki, K., and Fischer, E. V.: Measurement Report: Spatiotemporal variability of peroxy acyl nitrates (PANs) over Mexico City from TES and CrIS satellite measurements, Atmos. Chem. Phys., https://doi.org/10.5194/acp-2022-582, 2023.

Taylor, T. E., O'Dell, C. W., Baker, D., Bruegge, C., Chang, A., Chapsky, L., Chatterjee, A., Cheng, C., Chevallier, F., Crisp, D., Dang, L., Drouin, B., Eldering, A., Feng, L., Fisher, B., Fu, D., Gunson, M., Haemmerle, V., Keller, G. R., Kiel, M., Kuai, L., Kurosu, T., Lambert, A., Laughner, J., Lee, R., Liu, J., Mandrake, L., Marchetti, Y., McGarragh, G., Merrelli, A., Nelson, R. R., Osterman, G., Oyafuso, F., Palmer, P. I., **Payne, V. H.**, Rosenberg, R., Somkuti, P., Spiers, G., To, C., Wennberg, P. O., Yu, S., and Zong, J.: Evaluating the consistency between OCO-2 and OCO-3 XCO_2 estimates derived from the NASA ACOS version 10 retrieval algorithm, Atmos. Meas. Tech. Discuss. [preprint], https://doi.org/10.5194/amt-2022-329, in review, 2023.

Cady-Pereira, K. E., Guo, X., Wang, R., Leytem, A., Calkins, C., Berry, E., Sun, K., Müller, M., Wisthaler, A., **Payne, V. H**., Shephard, M. W., Zondlo, M. A., and Kantchev, V. H.: Validation of NH_3 observations from AIRS and CrIS against aircraft measurements from DISCOVER-AQ and a surface network in the Magic Valley, Atmos. Meas. Tech. Discuss. [preprint], https://doi.org/10.5194/amt-2022-336, in review, 2023.

2022

Payne, V. H., Kulawik, S. S., Fischer, E. V., Brewer, J. F., Huey, L. G., Miyazaki, K., Worden, J. R., Bowman, K. W., Hintsa, E. J., Moore, F., Elkins, J. W., and Juncosa Calahorrano, J.: Satellite measurements of peroxyacetyl nitrate from the Cross-Track Infrared Sounder: Comparison with ATom aircraft measurements, Atmos. Meas. Tech., https://doi.org/10.5194/amt-2021-353, 2022

Worden, H. M., Francis, G. L., Kulawik, S. S., Bowman, K. W., Cady-Pereira, K., Fu, D., Hegarty, J. D., Kantchev, V., Luo, M., **Payne, V. H**., Worden, J. R., Commane, R., and McKain, K.: TROPESS/CrIS carbon monoxide profile validation with NOAA GML and ATom in situ aircraft observations, Atmos. Meas. Tech., 15, 5383–5398, https://doi.org/10.5194/amt-15-5383-2022, 2022

Shi, M., J. R. Worden, A. Bailey, D. Noone, C. Risi, R. Fu, S. Worden, R. Herman, **V. H. Payne**, T. S. Pagano, K. W. Bowman, A. A. Bloom, S. Saatchi, J. Liu, and J. B. Fisher, Amazonian terrestrial water balance inferred from satellite-observed water vapor isotopes. Accepted to *Nature. Comm*., April 2022

Natraj, V., Luo, M., Blavier, J.-F., **Payne, V. H**., Posselt, D. J., Sander, S. P., Zeng, Z.-C., Neu, J. L., Tremblay, D., Wu, L., Roman, J. A., Wu, Y.-H., and Dorsky, L. I.: Simulated Multispectral Temperature and Atmospheric Composition Retrievals for the JPL GEO-IR Sounder, Atmos. Meas. Tech., 15, 1251–1267, https://doi.org/10.5194/amt-15-1251-2022, 2022

Wells, K. C., Millet, D. B., **Payne, V. H**., Vigouroux, C., Aquino, C. A. B., de Maziere, M., de Gouw, J. A., Graus, M., Kurosu, T., Warneke, C. and Wisthaler, A: Next-generation isoprene measurements from space: Detecting daily variability at high resolution. *J. Geophys. Res. Atmospheres*, *127*, e2021JD036181. https://doi. org/10.1029/2021JD036181

Hegarty, J. D., Cady-Pereira, K. E., **Payne, V. H**., Kulawik, S. S., Worden, J. R., Kantchev, V., Worden, H. M., McKain, K., Pittman, J. V., Commane, R., Daube Jr., B. C., and Kort, E. A.: Validation and Error Estimation of AIRS MUSES CO Profiles with HIPPO, ATom and NOAA GML Aircraft Observations, Atmos. Meas. Tech. 5, 205–223, 2022, https://doi.org/10.5194/amt-15-205-2022

2021

Juncosa Calahorrano, J., **Payne, V. H**., Kulawik, S. S., Flocke, F., Campos, T., and Fischer, E. V.: Evolution of PAN in wildfire smoke plumes detected by the Cross-Track Infrared Sounder (CrIS) over the western US during summer 2018, Geophys. Res. Lett., 48 (23), e 2021GL093405, 10.1029/2021GL093405

Kulawik, S. S., J. R. Worden, **V. H. Payne**, D. Fu, S. C. Wofsy, C. Sweeney, B. C. Daube Jr., A. Lipton, I. Polonsky, Y. He, K. E. Cady-Pereira, E. J. Dlugokencky, D. J. Jacob and Y. Yin: Evaluation of single-footprint AIRS CH_4 profile retrieval uncertainties using aircraft profile measurements, *Atmos. Meas. Tech*. 14, 335–354, https://doi.org/10.5194/amt-14-335-2021, 2021.

Buchholz, R. R., H. M. Worden, M. Park, G. Francis, M. N. Deeter, D. P. Edwards, L. K. Emmons, B. Gaubert, J. Gille, S. Martinez-Alonso, W. Tang, R. Kumar, J. R. Drummond, C. Clerbaux, M. George, P-F. Coheur, D. Hurtmans, K. W. Bowman, M. Luo, **V. H. Payne**, J. R. Worden, M. Chin, R. C. Levy, J. Warner, Z. Wei, S. S. Kulawik: Air pollution trends measured from Terra: CO and AOD over industrial, fire-prone and background regions, *Remote Sensing of Environment*, vol. 256, 112275, https://doi.org/10.1016/j.rse.2020.112275, 2021

2020

Wells, K. C., D. B. Millet, **V. H. Payne**, N. J. Deventer, J. A. de Gouw, M. Graus, C. Warneke, A. Wisthaler and J. D. Fuentes: Global measurements of isoprene from space: Constraints on emissions and atmospheric oxidation, *Nature*, 585, 225-233, 2020

Payne, V. H., B. J. Drouin, F. Oyafuso, L. Kuai, B. M. Fisher, K. Sung, D. Nemchick, T. Crawford, M. Smyth, D. Crisp, E. Adkins, J. T. Hodges, D. A. Long, E. J. Mlawer, A. Merrelli, E. Lunny and C. W. O'Dell, Absorption Coefficient (ABSCO) Tables for the Orbiting Carbon Observatories: Version 5.1. *Journal of*

Quantitative Spectroscopy and Radiative Transfer, 255, 107217, https://doi.org/10.1016/j.jqsrt.2020.107217, 2020.

Hobbs, J., B. J. Drouin, F. Oyafuso, **V. H. Payne**, M. R. Gunson, J. McDuffie, E. J. Mlawer: Spectroscopy uncertainty impacts on OCO-2/3 retrievals of XCO2, Journal of Quantitative Spectroscopy and Radiative Transfer, 257, 107630, https://doi.org/10.1016/j.jqsrt.2020.107360

Herman, R. L., J. R. Worden, D. Noone, D. Henze, K. W. Bowman, D. Fu, S. S. Kulawik and **V. H. Payne**, Comparison of optimal estimation HDO/H_2O retrievals from AIRS with ORACLES measurements, *Atmos. Meas. Tech*., 13, 1825–1834, https://doi.org/10.5194/amt-13-1825-2020, 2020.

von Clarmann, T., Degenstein, D. A., Livesey, N. J., Bender, S., Braverman, A., Butz, A., Compernolle, S., Damadeo, R., Dueck, S., Eriksson, P., Funke, B., Johnson, M. C., Kasai, Y., Keppens, A., Kleinert, A., Kramarova, N. A., Laeng, A., **Payne, V. H**., Rozanov, A., Sato, T. O., Schneider, M., Sheese, P., Sofieva, V., Stiller, G. P., von Savigny, C., and Zawada, D.: Estimating and Reporting Uncertainties in Remotely Sensed Atmospheric Composition and Temperature, *Atmos. Meas. Tech*., 13, 4393–4436, https://doi.org/10.5194/amt-13-4393-2020, 2020.

Miyazaki, K., Bowman, K., Sekiya, T., Eskes, H., Boersma, F., Worden, H., Livesey, N., **Payne, V. H**., Sudo, K., Kanaya, Y., Takigawa, M., and Ogochi, K.: An updated tropospheric chemistry reanalysis and emission estimates, TCR-2, for 2005–2018, *Earth Syst. Sci. Data*, https://doi.org/10.5194/essd-12-2223-2020

2019

Fu, D., Millet, D. B., Wells, K., **Payne, V. H**., Yu, S., Guenther, A. and Eldering, A.: Direct measurements of isoprene from infrared satellite observations, Nature Communications, 10, Article number 3811 (2019) https://doi.org/10.1038/s41467-019-11835-0.

Sung, K., E. Wishnow, T. Crawford, D. Nemchick, B. J. Drouin, S. Yu, **V. H. Payne** and J. Jiang, FT-IR measurements of O2 collision-induced absorption in the 565-700 nm region using a high pressure gas absorption cell, J. Quant. Spectrosc. Radiat. Transfer, 235, 232-243, 2019

Shi, H., Z. Jiang, B. Zhao, Z. Li, Y. Chen, Y. Gu, J. H. Jiang, M. Lee, K-N. Liou, J. L. Neu, **V. H. Payne**, H. Su, Y. Wang, M. Witek and J. Worden: Modeling study of the air quality impact of record-breaking Southern California wildfires in December 2017. J. Geophys. Res: Atmos., 124, doi:10.1029/2019JD030472, 2019.

Mlawer, E. J., D. D. Turner, S. N. Paine, L. Palchetti, G. Bianchini, **V. H. Payne**, K. E. Cady-Pereira, R. L. Pernak, M. Alvarado, D. Gombos, J. S. Delamere, M. G. Mlynczak, J. C. Mast, Analysis of water vapor absorption in the far-infrared and sub-millimeter regions using surface radiometric measurements from extremely dry locations, J. Geophys. Res. Atmos., doi:10.1029/2018JD029508, 2019.

Worden, J. R., S. S. Kulawik, D. Fu, **V. H. Payne**, A. E. Lipton, I. Polonsky, Y. He, K. Cady-Pereira, J-L. Moncet, R. L. Herman, F. W. Irion and K. W. Bowman, Characterization and Evaluation of AIRS-based estimates of the deuterium content of water vapor, *Atmos. Meas. Tech.*, 2, 2331-2339, https://doi.org/10.5194/amt-12-2331-2019, 2019.

2018

Fischer, E. V., L. Zhu, L., **V. H. Payne,** J. R. Worden, Z. Jiang, S. S. Kulawik, S. Brey, A. Hecobian, D. Gombos, K. Cady-Pereira and F. Flocke: The Contribution of Fires to TES Observations of Free Tropospheric PAN over North America in July, *Atmos. Chem. Phys.,* 18, 5639-5653, https://doi.org/10.5194/acp-2017-1025

O'Dell, C. W., Eldering, A., Wennberg, P. O., Crisp, D., Gunson, M. R., Fisher, B., Frankenberg, C., Kiel, M., Lindqvist, H., Mandrake, L., Merrelli, A., Natraj, V., Nelson, R. R., Osterman, G. B., **Payne, V. H.,** Taylor, T. R., Wunch, D., Drouin, B. J., Oyafuso, F., Chang, A., McDuffie, J., Smyth, M., Baker, D. F., Basu, S., Chevallier, F., Crowell, S. M. R., Feng, L., Palmer, P. I., Dubey, M., García, O. E., Griffith, D. W. T., Hase, F., Iraci, L. T., Kivi, R., Morino, I., Notholt, J., Ohyama, H., Petri, C., Roehl, C. M., Sha, M. K., Strong, K., Sussmann, R., Te, Y., Uchino, O., and Velazco, V. A.: Improved Retrievals of Carbon Dioxide from the Orbiting Carbon Observatory-2 with the version 8 ACOS algorithm, *Atmos. Meas. Tech*., https://doi.org/10.5194/amt-2018-257, 2018.

2017

K. E. Cady-Pereira, **V. H. Payne**, J. L. Neu, K. W. Bowman, K. Miyazaki, E.A. Marais, S. S. Kulawik, Z. A. Tzompa-Sosa, J. D. Hegarty, Seasonal and Spatial Changes in Trace Gases over Megacities from AURA TES Observations, *Atmos. Chem. Phys*., 17, 9379-9398, https://doi.org/10.5194/acp-17-9379-2017, 2017

V. H. Payne*,* J. L., Neu*,* and H. M., Worden*,* Satellite observations for understanding the drivers of variability and trends in tropospheric ozone*,* J. Geophys. Res. Atmos.*,* 122, doi:10.1002/2017JD026737, 2017

V. H. Payne, E. V. Fischer, J. R. Worden, Z. Jiang, L. Zhu, T. P. Kurosu, S. S. Kulawik: Spatial variability in tropospheric peroxyacetyl nitrate in the tropics from infrared satellite observations in 2005 and 2006, *Atmos. Chem. Phys*., 17, 6341-6351, doi:10.5194/acp-17-6341-2017, 2017.

F. Oyafuso, **V. H. Payne,** B. J. Drouin, V. M. Devi, D. C. Benner, K. Sung, I.E. Gordon, R. Kochanov, Y. Tan, D. Crisp, E. J. Mlawer and A. Guillaume, High-accuracy absorption coefficients for the OCO-2 mission: Validation of updated carbon dioxide cross-sections using atmospheric spectra, *J. Quant. Spectrosc. Radiat. Transfer*, doi:10.1016/j.jqsrt.2017.06.12

M. Huang, G. R. Carmichael, R. B. Pierce, D. S. Jo, R. J. Park, J. Flemming, L. K. Emmons, K. W. Bowman, D. K. Henze, Y. Davila, K. Sudo, J. E. Jonson, M. T. Lund, G. Janssens-Maenhout, F. J. Dentener, T. J. Keating, H. Oetjen, and **V. H. Payne**: Impact of Intercontinental Pollution Transport on North American Ozone Air Pollution: An HTAP Phase II Multi-model Study, *Atmos. Chem. Phys*., 17, 5721-5750, https://doi.org/10.5194/acp-17-5721-2017, 2017

S. S. Kulawik, C. O'Dell, **V. H. Payne**, L. Kuai, H. Worden, C. Sweeney, S. C. Biraud, L. Iraci, E. Yates, T. Tanaka, Lower-tropospheric CO_2 from near-infrared ACOS-GOSAT observations, *Atmos. Chem. Phys*., 17, 5407-5438, https://doi.org/10.5194/acp-17-5407-2017, 2017

L. Zhu, E. V. Fischer, **V. H. Payne**, T. W. Walker, J. R. Worden, Z. Jiang and S. S. Kulawik, PAN in the eastern Pacific free troposphere: A satellite view of the sources, seasonality, internannual variability and timeline for trend detection, J. Geophys. Res, doi:10.1002/2016JD025868, 2017

A. Eldering, C. O'Dell, P. Wennberg, D. Crisp, M. Gunson, C. Viatte, C. Avis, A. Braverman, R. Castano, A. Chang, L. Chapsky, C. Cheng, B. Connor, L. Dang, G. Doran, B. Fisher, C. Frankenberg, D. Fu, R. Granat, J. Hobbs, R. Lee, L. Mandrake, J. McDuffie, C. Miller, V. Myers, V. Natraj, D. O'Brien, G. Osterman, F. Oyafuso, **V. Payne**, H. Pollock, I. Polonsky, C. Roehl, R. Rosenberg, F. Schwandner, M. Smyth, V. Tang, T. Taylor, C. To, D. Wunch, and J. Yoshimizu, The Orbiting Carbon Observatory-2: First 18 months of Science Data Products, *Atmos. Meas. Tech*., 10, 549–563, doi:10.5194/amt-2016-247, 2017

B. J. Drouin, D. C. Benner, L. R. Brown, M. Cich, T. Crawford, V. M. Devi, A. Guillaume, J. T. Hodges, E. J. Mlawer, D. Robichaud, F. Oyafuso, **V. H. Payne**, K. Sung, E. Wishnow and S. Yu, Multispectrum analysis of the oxygen A-band, *J. Quant. Spectrosc. Radiat. Transfer*, doi:10.1016/j.jqsrt.2016.03.037, 2017

2016

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