

**Dr. Robert R. Nelson**  
Postdoctoral Researcher  
Jet Propulsion Laboratory, California Institute of Technology  
4800 Oak Grove Drive, m/s: 233-300, Pasadena, CA 91109, USA  
(763) 354-8411, Robert.R.Nelson@jpl.nasa.gov

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## RELEVANT EXPERIENCE

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Robert is a postdoctoral researcher in the JPL Tropospheric Composition group and on the Orbiting Carbon Observatory (OCO-2/3) and Multi-angle Imaging SpectroRadiometer (MISR) Science Teams. He spent his graduate career investigating ways to improve the accuracy and precision of near-infrared carbon dioxide retrievals from space-based instruments, with a focus on the impact of clouds and aerosols. His research objectives include improving atmospheric gas and aerosol retrieval algorithms, detecting and quantifying small-scale greenhouse gas sources, and developing novel products from space-based measurements.

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## EDUCATION

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| • <b>Ph.D.</b> , Atmospheric Science (Colorado State University, Fort Collins, CO) | 4.00 GPA | 2019 |
| • <b>M.S.</b> , Atmospheric Science (Colorado State University, Fort Collins, CO)  | 3.98 GPA | 2015 |
| • <b>B.S.</b> , Meteorology (Iowa State University, Ames, IA)                      | 3.92 GPA | 2012 |

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## RESEARCH AND PROFESSIONAL EXPERIENCE

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| <b>Postdoctoral Researcher, Jet Propulsion Laboratory</b>   | 2019-Present  |
| • Contributing to the development of the OCO-2 and OCO-3 carbon dioxide retrieval algorithms and MISR aerosol retrieval algorithm. Working under the guidance of Dr. Annmarie Eldering.               |               |
| <b>Graduate Research Assistant, Colorado State University</b>   | 2012–2019     |
| • Worked under Dr. Christopher O’Dell on the development and improvement of carbon dioxide retrieval algorithms. Took Ph.D. level courses, primarily on radiative transfer and remote sensing topics. |               |
| <b>American Meteorological Society Local Chapter Treasurer &amp; Webmaster</b>  | 2014–2016     |
| • Various responsibilities as an elected officer of FORT Collins Atmospheric Scientists (FORTCAST).   |               |
| <b>Senior Thesis, Iowa State University</b>   | Fall 2011     |
| • Analyzed the presence of the Madden-Julian Oscillation in the Iowa State University Global Climate Model using a variety of analytic techniques.  |               |
| <b>Research Intern, University of Oklahoma</b>  | Summer 2011   |
| • Compared cloud climatologies from MODIS imagery to mesoscale models to assess systematic differences in cloudiness.   |               |
| <b>American Meteorological Society Student Chapter President, Iowa State University</b>   | May 2011–2012 |
| • Led our chapter of the AMS through the 2011-2012 academic year. Responsibilities included organizing educational outreach, fundraising, and promoting both our local and the national AMS chapters. |               |
| <b>Research Intern, University of Michigan</b>  | Summer 2010   |
| • Researched synoptic and mesoscale influences on mercury wet deposition.   |               |

**Honors Mentor Program, Iowa State University**

Fall 2008

- Created self-organizing maps from North American Regional Climate Change Assessment Program (NARCCAP) data.

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**TECHNICAL EXPERTISE**

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- Python, Git, LaTeX, Unix, Adobe Photoshop, Microsoft Office, some experience with IDL, MATLAB, FORTRAN, and NCL

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**RECOGNITION**

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- JPL Team Award (OCO-2, OCO-3) 2020
- JPL Voyager Award (OCO-2, OCO-3) 2019
- American Meteorological Society Graduate Fellowship Recipient 2012–2013
- Phi Beta Kappa Honors Society, Iowa State University 2011–2012
- Ernest F. Hollings Scholar, NOAA 2010–2012
- University Honors Program, Iowa State University 2008–2012

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**SELECT PRESENTATIONS**

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- *“OCO-3 Snapshot Area Mapping Mode: Early Results”*, EGU General Assembly, Virtual 2020
- *“Exploring Improvements to the Aerosol Parameterization in the OCO-2  $X_{CO_2}$  Retrieval Algorithm”*, AGU Fall Meeting, Washington D.C., USA 2018
- *“Using GEOS-5 Aerosols to Inform the OCO-2  $CO_2$  Retrieval”*, IWGGMS, FMI, Helsinki, Finland 2017
- *“A Comparison of Aerosol Measurements from OCO-2 and MODIS”*, AGU Fall Meeting, San Francisco, CA, USA 2016
- *“Total Column Water Vapor from OCO-2”*, IWGGMS, Kyoto University, Kyoto, Japan 2016
- *“A Comparison of Cloud and Aerosol Measurements from OCO-2 and CALIPSO”*, AGU Fall Meeting, San Francisco, CA, USA 2015
- *“Aerosol First Guess Sensitivity in the ACOS  $X_{CO_2}$  Retrieval Algorithm”*, AGU Fall Meeting, San Francisco, CA, USA 2014
- *“The Potential of Clear Sky Carbon Dioxide Satellite Retrievals”*, IWGGMS, ESA-ESTEC, Noordwijk, Netherlands 2014
- *“Comparison of High Resolution Cloud Climatologies From MODIS Imagery and Mesoscale Models”*, AMS Annual Meeting, New Orleans, LA, USA 2012
- *“The MJO Impact on Global Precipitation: A Comparison Study between ISU GCM and Observation”*, Iowa State University Senior Thesis Symposium, Ames, IA, USA 2011

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**TEACHING**

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**Colorado State University Atmospheric Radiation Teaching Assistant**

Spring 2015

- Assisted Dr. Chris O’Dell in teaching Atmospheric Radiation by grading assignments, creating homework and test questions and modules, and helping students succeed.

**Colorado State University Programming Teaching Assistant**

Spring 2014

- Assisted students with programming problems in multiple languages including MATLAB, IDL, Python, FORTRAN, and NCL.

**Iowa State University Freshman Honors Program Leader**

Fall 2009

- Led a diverse group of students toward completing common goals. Learned how to effectively prepare syllabi, manage class time, and successfully motivate students.

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**SELECT PUBLICATIONS**

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**Nelson, R. R.**, Eldering, A., Kulawik, S. S., O'Dell, C.: Reduced OCO-2 XCO<sub>2</sub> errors from the retrieval of additional temperature and water vapor parameters, in prep., 2021.

Nassar, R., Mastrogiacomo, J.-P., Bateman-Hemphill, W., McCracken, C., MacDonald, C., Hill, T., O'Dell, C., Kiel, M., **Nelson, R.**, Pavlick, R., Eldering, A., Crisp, D.: Space-based detection of CO<sub>2</sub> emission reductions due to COVID-19 at Europe's largest fossil fuel power plant, *Geophys. Res. Lett.*, in review, 2021.

**Nelson, R. R.**, Eldering, A., Crisp, D., Merrelli, A. J., O'Dell, C. W.: Retrieved wind speed from the Orbiting Carbon Observatory-2, *Atmos. Meas. Tech.*, doi:10.5194/amt-13-6889-2020, 2020.

Johnson, M. S., Schwandner, F. M., Potter, C. S., Nguyen, H. M., Bell, E., **Nelson, R. R.**, Philip, S., O'Dell, C. W.: Carbon dioxide emissions during the 2018 Kilauea volcano eruption estimated using OCO-2 satellite retrievals, *Geophys. Res. Lett.*, in press, doi:10.1029/2020GL090507, 2020.

Taylor, T. E., Eldering, A., Merrelli, A., Kiel, M., Somkuti, P., Cheng C., Rosenberg, R., Fisher, B., Crisp, D., Basilio, R., Bennett, M., Cervantes, D., Chang, A., Dang, L., Frankenberg, C., Haemmerle, V. R., Keller, G. R., Kurosu, T., Laughner, J. L., Lee, R., Marchetti, Y., **Nelson, R. R.**, O'Dell, C. W., Osterman, G., Pavlick, R., Roehl, C., Schneider, R., Spiers, G., To, C., Wells, C., Wennberg, P. O., Yelamanchili, A., Yu, S.: OCO-3 early mission operations and initial (vEarly) XCO<sub>2</sub> and SIF retrievals, *Remote Sens. Environ.*, doi:10.1016/j.rse.2020.112032, 2020.

Sanghavi, S., **Nelson, R.**, Frankenberg, C., Gunson, M.: Aerosols in OCO-2/GOSAT retrievals of XCO<sub>2</sub>: an information content and error analysis, *Remote Sens. Environ.*, doi:10.1016/j.rse.2020.112053, 2020.

Kulawik, S. S., O'Dell, C., **Nelson, R. R.**, and Taylor, T. E.: Validation of OCO-2 error analysis using simulated retrievals, *Atmos. Meas. Tech.*, doi:10.5194/amt-2018-368, 2019.

**Nelson, R. R.**: Aerosol parameterizations in space-based near-infrared retrievals of carbon dioxide, doctoral dissertation, Colorado State University, Libraries, 2019.

**Nelson, R. R.**, O'Dell, C. W.: The Impact of Improved Aerosol Priors on Near-Infrared Measurements of Carbon Dioxide, *Atmos. Meas. Tech.*, doi:10.5194/amt-12-1495-2019, 2019.

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. E., 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 Orbiting Carbon Observatory-2 with the version 8 ACOS algorithm, *Atmos. Meas. Tech.*, 11, 6539-6576, <https://doi.org/10.5194/amt-11-6539-2018>, 2018

**Nelson, R. R.**, Crisp, D., Ott, L. E., O'Dell, C. W.: High-accuracy measurements of total column water vapor from the Orbiting Carbon Observatory-2, *Geophys. Res. Lett.*, 43, 12261-12269, doi:10.1002/2016GL071200, 2016.

**Nelson, R. R.**, O'Dell, C. W., Taylor, T. E., Mandrake, L., and Smyth, M.: The potential of clear-sky carbon dioxide satellite retrievals, *Atmos. Meas. Tech.*, 8, 1671-1684, doi:10.5194/amt-9-1671-2016, 2016.

Taylor, T. E., O'Dell, C. W., Frankenberg, C., Partain, P. T., Cronk, H. Q., Savtchenko, A., **Nelson, R. R.**, Rosenthal, E. J., Chang, A. Y., Fisher, B., Osterman, G. B., Pollock, R. H., Crisp, D., Eldering, A., and Gunson, M. R.: Orbiting Carbon Observatory-2 (OCO-2) cloud screening algorithms: validation against collocated MODIS and CALIOP data, *Atmos. Meas. Tech.*, 9, 973-989, doi:10.5194/amt-9-973-2016, 2016

**Nelson, R. R.:** The impact of aerosols on space-based retrievals of carbon dioxide, master's thesis, Colorado State University, Libraries, 2015.

**Nelson, R. R.:** Measuring atmospheric carbon dioxide from space, *Physics Today*, doi:10.1063/PT.5.4006, 2014