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Dustin D. Roten, Ph.D.
Atmospheric Scientist || STEM Educator
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PROFESSIONAL EXPERIENCE

Postdoctoral Fellow [January 2023 - *current*]

Earth Science Division – Tropospheric Composition
Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA

Graduate Research Assistant [Fall 2018 – Fall 2022]

Department of Atmospheric Sciences
The University of Utah, Salt Lake City, UT

Adjunct Instructor, Math [Fall 2020 – Spring 2022]

Department of Mathematics
Forsyth Technical Community College, Winston Salem, NC

Graduate Fellow [Fall 2018 – Spring 2019]

Global Change & Sustainability Center
The University of Utah, Salt Lake City, UT

Graduate Research Assistant [Fall 2016 – Spring 2018]

Department of Mathematical Sciences
Appalachian State University, Boone, NC

Academic Instructor [Summers 2016 - 2018]

Upward Bound
Appalachian State University, Boone, NC

Adjunct Instructor, Physics [Spring 2016]

Division of Arts and Sciences
Wilkes Community College, Wilkesboro, NC

High School Teacher, Mathematics [Fall 2015 – Spring 2016]

Ashe County High School, West Jefferson, NC

EDUCATION

Ph.D. – Atmospheric Sciences [Fall 2018 – Fall 2022]

University of Utah, Salt Lake City, UT
Emphases: Carbon cycle science, remote sensing of CO₂, CO₂ observing networks

M.S. – Engineering Physics [Fall 2016 – Summer 2018]

Appalachian State University, Boone, NC
Concentration: Systems and Laboratory Automation

M.A. – Mathematics [Fall 2016 – Summer 2018]

Appalachian State University, Boone, NC
Emphases: Mathematical modeling, college teaching

B.S. – Physics & Mathematics [Fall 2010 – Spring 2015]

Appalachian State University, Boone, NC
Concentrations: Mathematical Physics, General Mathematics

TECHNICAL SKILLS

Instrumentation

Ultra-high vacuum systems, time of flight mass spectroscopy (TOFMS), data loggers, analog circuits, digital circuits, microcontrollers, environmental sensors, DAQ boards, Arduino, laboratory/instrumentation automation

Modeling/Programming/Scripting Skills

Skills: R/RStudio, MATLAB, Arduino, C, Assembly, LaTeX, X-STILT, HYSPLIT, data acquisition, data analytics, hardware/software interfacing, parallel processing, workflow development, version control

PUBLICATIONS

❖ Peer-Reviewed Publications

D. Roten, J. C. Lin, D. Wu, T. Oda, E. Kort. *Using the OCO-3 Instrument to Constrain On-road CO₂ Emissions in the Los Angeles Basin*. Geophysical Research Letters. 2023. (*in prep.*)

D. Roten, J. C. Lin, L. Kunik, D. Mallia, D. Wu, T. Oda, E. Kort. *The Information Content of Dense Carbon Dioxide Measurements from Space: An Urban-Focused Inversion Approach with Simulated Data from the OCO-3 Instrument*. Atmospheric Chemistry and Physics Discussions. 2022. (DOI: [10.5194/acp-2022-315](https://doi.org/10.5194/acp-2022-315))

D. Roten, D. Wu, B. Fasoli, T. Oda, J. C. Lin. *An Interpolation Method to Reduce the Computational Time in the Stochastic Lagrangian Particle Dispersion Modeling of Spatially Dense XCO₂ Retrievals*. Earth and Space Science. 2021. (DOI: [10.1029/2020EA001343](https://doi.org/10.1029/2020EA001343))

M. Kiel, A. Eldering, **D. Roten**, J. C. Lin, S. Feng, R. Lei, T. Lauvaux, T. Oda, C. M. Roehl, J. Blavier, L T. Iraci. *Urban-focused satellite CO₂ Observations from the Orbiting Carbon Observatory-3: A First Look at the Los Angeles Megacity*. Remote Sensing of Environment – Remote Sensing of Greenhouse Gas Emissions [Special Issue]. 2021. (DOI: [10.1016/j.rse.2021.112314](https://doi.org/10.1016/j.rse.2021.112314))

S. Hogue, **D. Roten**, E. Marland, G. Marland. *Gridded Estimates of CO₂ Emissions: Uncertainty as a Function of Grid Size*. Mitigation and Adaptation Strategies for Global Change. 2018. (DOI: [10.1007/s11027-017-9770-z](https://doi.org/10.1007/s11027-017-9770-z))

❖ Book Chapters

D. Roten, R. Andrew, G. Marland, R. Bun, M. Crippa, D. Gilfillan, M. Jones, G. Janssens-Maenhout, E. Marland, R. Quadrelli. *CO₂ Emissions from Energy Systems and Industrial Processes: Inventories from Data- and Proxy-driven Approaches in Balancing Regional Greenhouse Gas Budgets: Accounting for Natural and Anthropogenic Flows of CO₂ and other Trace Gases*. Elsevier. 2022. (ISBN: [978-0-12-814952-2](https://doi.org/978-0-12-814952-2))

❖ Peer Review Activity

Reviewer for Geoscientific Model Development (European Geophysical Union)

Reviewer for Remote Sensing of Environment (Elsevier)

Reviewer for Nature – Scientific Data (Springer)

PRESENTATIONS [*presenter]

❖ Lead Author Presentations

Detecting Changes in Sector-specific CO₂ Emissions from Space: an Application of OCO-3 over the Los Angeles Basin

D. Roten*, J. C. Lin, E. A. Kort

11) American Geophysical Union (AGU) 2022 Fall Meeting, Chicago, IL (Oral; Dec. 12, 2022)

The Information Content of Dense Carbon Dioxide Measurements from Space: A Case Study with OCO-3

D. Roten*, J. C. Lin, L. Kunik, D. Mallia, D. Wu, T. Oda, E. Kort

10) 18th International Workshop on Greenhouse Gas Measurements from Space (IWGGMS), Virtual (Poster; Jul. 13, 2022)

The Information Content of Dense XCO₂ Retrievals: The Potential of Extracting Sector-Specific Fluxes with OCO-3

D. Roten*, D. Wu, B. Fasoli, L. Kunik, D. Mallia, J. C. Lin, T. Oda, E. Kort

9) American Geophysical Union (AGU) 2021 Fall Meeting, New Orleans, LA (Oral; Dec. 17, 2021)

Quantifying CO₂ Emissions from World Megacities with Emerging Dense Urban CO₂ Satellite Data: Using Lagrangian Particle Dispersion Modeling in a Los Angeles Case Study

D. Roten*, D. Wu, J.C. Lin, T. Oda, M. Kiel, E. Kort

8) American Geophysical Union (AGU) 2020 Fall Meeting, Virtual (Oral; Dec. 16, 2020)

Spatiotemporal Metrics for the Characterization of Point Source FFCO₂ Emissions and Dispersion

D. Roten*, P. Spell, S. Hogue, E. Marland, G. Marland, C. Thaxton

7) American Geophysical Union (AGU) 2017 Fall Meeting, New Orleans, LA. (Poster; Dec. 13, 2017)

6) Celebration of Student Research and Creative Endeavors at Appalachian State University Boone, NC. (Poster; April 2017)

Modeling with 9-12 Mathematics

D. Roten*

5) North Carolina Council of Teachers of Mathematics (NCCTM) 2016 State Conference, Greensboro, NC. (Oral; Oct. 28, 2016)

Production & Storage of Ne³⁺ for Radiative Lifetime Measurements

D. Roten*, T. Dula*, C. Patteson, B. Johnson, A. G. Calamai

4) Celebration of Student Research and Creative Endeavors at Appalachian State University, Boone, NC. (Poster; April 2015)

3) State of North Carolina Undergraduate Research and Creativity Symposium (SNCURCS) at North Carolina State University. Raleigh, NC. (Poster; Nov. 22, 2014)

A Search for Multiply-Charged Ion Production in a Low Energy Ion Trap

D. Roten*, J. Meyer, B. Johnson, A. G. Calamai

2) Celebration of Student Research and Creative Endeavors at Appalachian State University Boone, NC. (Poster; April 2014)

1) State of North Carolina Undergraduate Research and Creativity Symposium (SNCURCS) at the University of North Carolina - Charlotte. Charlotte, NC. (Poster; Nov. 16, 2013)

❖ **Contributions to Presentations**

Monitoring Urban CO₂ Emissions from Space: Insights from NASA's Orbiting Carbon Observatory-3 (OCO-3) Mission

A. Chatterjee, M. Kiel, R. Nelson, D. Wu, **D. Roten**, A. Danjou, R. Lei, T. Kurosu, S. Pandey, J. Laughner, T. Taylor, J. C. Lin, J. Liu, P. Wennberg, T. Lauvaux, S. Feng, T. Oda, C. O'Dell, V. Payne, G. Spiers

American Geophysical Union (AGU) 2022 Fall Meeting, Chicago, IL (Oral; Dec. 14, 2022)

Urban CO₂ Emissions from Cities around the World and their Scaling Relationships with Socioeconomic Variables, determined with Orbiting Carbon Observatory-2

T. Y. Wilmot*, J. C. Lin, D. Wu, **D. Roten**, T. Oda, E. A. Kort

American Geophysical Union (AGU) 2022 Fall Meeting, Chicago, IL (Oral; Dec. 12, 2022)

Monitoring Anthropogenic Emissions: Insights from OCO-3's Snapshot Area Mapping (SAM) Mode

A. Chatterjee*, R. Nelson, M. Kiel, S. Pandey, B. Fisher, G. Spiers, E. Bell, A. Eldering, T. Kurosu, J. C. Lin, J. Liu, C. O'Dell, V. Payne, **D. Roten**, T. Taylor, P. Wennberg, D. Wu, C. Cheng, R. Basilio

18th International Workshop on Greenhouse Gas Measurements from Space, Virtual (Oral; Jul. 13, 2022)

Urban-focused Satellite CO₂ Observations from the Orbiting Carbon Observatory-3: a First Look at the Los Angeles Megacity

M. Kiel*, A. Eldering, **D. Roten**, R. Lei, S. Feng, J. C. Lin, T. Lauvaux, C. M. Roehl, T. Oda.

European Geosciences Union (EGU) General Assembly 2021, Virtual. (Oral; April 2021)

OCO-3 SAM mode: Spatiotemporal Variability of XCO₂ Over the Los Angeles Megacity

M. Kiel*, A. Eldering, **D. Roten**, R. Lei, S. Feng, J. C. Lin, T. Lauvaux, C. M. Roehl, T. Oda.

American Geophysical Union (AGU) 2020 Fall Meeting, Virtual. (Oral; Dec. 16, 2020)

Overcoming challenges in using satellite-based CO₂ data to understand carbon emissions from cities around the world

J. C. Lin*, D. Wu, **D. Roten**, B. Fasoli, T. Oda, E. Kort

American Geophysical Union (AGU) 2019 Fall Meeting, San Francisco, CA. (Oral; Dec. 13, 2019)

Utah-Atmospheric Trace Gas & Air Quality Lab (U-ATAQ).

Ryan Bares*, Logan E. Mitchell, Ben Fasoli, Dave Eriksson, Andrew Meldrum, **Dustin Roten**, John C. Lin

The Air We Breathe: A Multidisciplinary Perspective on Air Quality, University of Utah, Salt Lake City, UT. (Poster; Oct. 3, 2019)

PROFESSIONAL ROLES & MEMBERSHIPS (PAST & PRESENT)

Leadership

National President/President-Elect, Technology & Engineering Education Collegiate Association (TEECA) (2010-2013)

President, Physics and Astronomy (Panda) Club, Appalachian State University (2013-2014)

Vice-President, Physics and Astronomy (PandA) Club, Appalachian State University (2012-2013)

Awards

TEECA Special Recognition Award of Outstanding Service as President (Columbus, Ohio; 2013)

TEECA Special Recognition Award of Outstanding Service as President-Elect (Long Beach, California; 2012)

Membership (Past & Present)

NASA Orbiting Carbon Observatory (OCO-2/3) Science Team Affiliation

Land-Atmosphere Interactions Research (LAIR) Group, University of Utah, Salt Lake City, UT

American Geophysical Union (AGU)

American Meteorological Society (AMS)

Sigma Pi Sigma (SPS)

International Technology and Engineering Educators' Association (ITEEA)

Technology & Engineering Education Collegiate Association (TEECA)

Technology Student Association (TSA) [high school]