



Dustin D. Roten

Ph.D. Candidate

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PROFESSIONAL EXPERIENCE

Graduate Research Assistant (The University of Utah, Salt Lake City, UT) [Fall 2018 - *current*]

- Current member of the Land-Atmosphere Interactions Research (LAIR) group, Department of Atmospheric Sciences. (Principal Investigator & Advisor: Dr. John C. Lin).
- Inversion analyses of space-based CO₂ observations using OCO-2/3 instruments and X-STILT model.
- Assisting in the maintenance of the Utah Urban Carbon Dioxide Network (UUCON).

Adjunct Instructor, Mathematics (Forsyth Technical Community College, Winston Salem, NC) [Fall 2020 - *current*]

- Instructor of both lecture and laboratory components of the introductory statistics course “Statistical Methods I” [MAT 152] in an online asynchronous format.

Global Change & Sustainability Center (GCSC) Fellow (The University of Utah, Salt Lake City, UT) [Fall 2018 – Summer 2019]

- Fellows participated in a seminar series and project-based course in which local air quality was identified as the theme.
- Deliverables included: qualitative research on air quality communication to the public, effects of air quality on outdoor activities, recommendations for an improved air quality monitoring system, and a city-wide charter for an air quality legislative board.

Graduate Research Assistant (Appalachian State University, Boone, NC) [Fall 2016 – Spring 2018]

- Past member of the Marland research group, Department of Mathematical Sciences. (Co-Principal Investigators & Advisors: Eric Marland, Gregg Marland)

Upward Bound Academic Instructor (Appalachian State University, Boone, NC) [Summers 2016 - 2018]

- Summer instructor for high school statistics, pre-calculus (CC Math III), calculus, physics, and problem-solving/design courses.

Adjunct Instructor, Physics (Wilkes Community College, Wilkesboro, NC) [Spring 2016]

- Instructor of both lecture and laboratory components of the introductory physics course “Physics – Mechanics” [PHY 131] in a hybrid format.
- This role also required the planning, setup, and maintenance of all relevant laboratory exercises and instrumentation.

High School Teacher, Mathematics (Ashe County High School, West Jefferson, NC) [Fall 2015 – Spring 2016]

- Instructed multiple sections of Common Core Math III in addition to a section of Advanced Functions and Modeling.

EDUCATION

Ph.D. – Atmospheric Sciences (Emphasis: Urban Carbon Cycle, Air Quality, Atmospheric Modeling) [*expected Summer 2022*]

Topic: *Using dense atmospheric XCO₂ observations from space-based instruments to constrain urban/megacity sinks and sources*
University of Utah, Salt Lake City, UT

M.S. – Engineering Physics (Concentration: Systems and Laboratory Automation) [Fall 2016 – Summer 2018]

Appalachian State University, Boone, NC

M.A. – Mathematics (Concentration: College Teaching; Emphasis: Mathematical Modeling) [Fall 2016 – Summer 2018]

Appalachian State University, Boone, NC

B.S. – Physics & Mathematics (Concentrations: Mathematical Physics, General Mathematics) [Fall 2010 – Spring 2015]

Appalachian State University, Boone, NC

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. 2022. (*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: A High-Resolution 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)

PRESENTATIONS [*presenter]

❖ Lead Author Presentations

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

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. (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. (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. (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. (Oct. 3, 2019)

PROFESSIONAL ROLES & MEMBERSHIPS (PAST & PRESENT)

Leadership

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

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

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

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]

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)