

# Brian J. Carroll

## **BUSINESS ADDRESS**

Email: brian.j.carroll@nasa.gov

NASA Langley Research Center, Science Directorate, Lidar Science Branch

*Currently working offsite – please contact if physical address is needed*

## **RESEARCH INTERESTS**

- Lidar applications and retrievals for water vapor, winds, and aerosol
- Planetary boundary layer processes and measurement technologies
- Cloud processes and circulations
- Aerosol distribution and transport
- Air quality
- Remote sensing

## **CURRENT PROJECTS**

- Improvement of differential absorption lidar data processing routines
- Marine cloud process studies utilizing lidar
- Investigating water vapor circulations and related phenomena across scales
- Low-level jets (LLJs) and linkages to convection in the Great Plains

## **EMPLOYMENT**

2020 – Present

### **NASA Postdoctoral Program (NPP) researcher**

NASA Langley Research Center, Hampton, VA

- *Airborne water vapor differential absorption lidar (DIAL) data processing and utilization in studies of the planetary boundary layer, cloud processes, and circulations*

2014 – 2020

### **Graduate Student**

Physics Dept.; University of Maryland, Baltimore County; Baltimore, MD

- *Field measurements and scientific analysis of atmospheric phenomena in the planetary boundary layer*
- *Focuses included remote sensing, lidar, planetary boundary layer, low-level jets*
- *Taught physics laboratory sessions for undergraduates*

Summer 2014, 2016

### **Research Intern**

National Oceanic and Atmospheric Administration ESRL, Boulder, CO

- *Developed algorithm to retrieve mixed layer heights from Doppler lidar scans*
- *Field work and data analysis of Doppler lidar measurement uncertainty and dual-Doppler lidar wind retrievals*

2013 – 2014

### **Undergraduate Research Assistant**

Physics Dept.; University of Maryland, Baltimore County; Baltimore, MD

- *Doppler lidar wind measurements and data visualization*

Summer 2013

### **Research Intern**

Army Research Laboratory, Adelphi, Maryland

- *Doppler lidar wind and turbulence retrievals*

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## EDUCATION

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- Ph. D. Atmospheric Physics; Univ. of Maryland, Baltimore County 2014 – 2020
- B.S. Physics; University of Maryland, Baltimore County 2009 – 2014

## PUBLICATIONS

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1. **Carroll, B. J.**, Demoz, B. B., Turner, D. D., & Delgado, R. (2021). Lidar Observations of a Mesoscale Moisture Transport Event Impacting Convection and Comparison to Rapid Refresh Model Analysis, *Monthly Weather Review*, 149(2), 463-477.
2. Bedka, K. M., Nehrir, A. R., Kavaya, M., Barton-Grimley, R., Beaubien, M., **Carroll, B.**, Collins, J., Cooney, J., Emmitt, G. D., Greco, S., Kooi, S., Lee, T., Liu, Z., Rodier, S., and Skofronick-Jackson, G. (in review 2020) Airborne Lidar Observations of Wind, Water Vapor, and Aerosol Profiles During The NASA Aeolus Cal/Val Test Flight Campaign, *Atmos. Meas. Tech. Discuss.* [preprint], <https://doi.org/10.5194/amt-2020-475>
3. Tangborn, A., Demoz, B., **Carroll, B. J.**, Santanello, J., Anderson, J. (in review 2020). Assimilation of lidar planetary boundary layer height observations. *Atmos. Meas. Tech.* <https://doi.org/10.5194/amt-2020-238>
4. **Carroll, B. J.**, Demoz, B. B., & Delgado, R. (2019). An overview of low-level jet winds and corresponding mixed layer depths during PECAN. *Journal of Geophysical Research: Atmospheres*, 124, 9141-9160. <https://doi.org/10.1029/2019JD030658>
5. Bonin, T.A., **Carroll, B.J.**, Hardesty, R.M., Brewer, W.A., Hajny, K., Salmon, O.E., and Shepson, P.B. (2018). Doppler lidar observations of the mixing height in Indianapolis using an automated composite fuzzy logic approach, *J. Atmos. Ocean. Tech.* 35.3: 473-490. <https://doi.org/10.1175/JTECH-D-17-0159.1>

## AWARDS

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- NASA Group Achievement Award to OWLETS project 2019
- NASA international conference travel grant, *presentation items #4,9* 2019, 2017
- Poster presentation award, *presentation item #8* 2018
- Outstanding graduate teaching assistant 2015
- Poster presentation award, *presentation item #16* 2014

## FIELD EXPERIMENTS

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- LUMEX (2014): Doppler lidar intercomparison and evaluation of uncertainty
- PECAN (2015): Boundary layer meteorology, low-level jets, bore waves, MCSs
  - Doppler lidars, water vapor lidars, ceilometers
- SEAR-MAR (2017): Aircraft observations of the boundary layer
  - Airborne aerosol lidar, mission planning
- OWLETS-2 (2018): Ozone air quality in the Chesapeake Bay and Baltimore region
  - Doppler lidars, ozone lidars, in situ trace gas measurements
- AEROSE (2019): 31-day research cruise focused on aerosols over the tropical Atlantic
  - Ceilometer, in situ trace gas measurements

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## PROFESSIONAL SOCIETIES

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- American Meteorological Society (AMS) Member 2016 – 2020
- American Geophysical Union (AGU) Member 2018 – 2020

## OTHER EXPERIENCE

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- Steering committee member, UMBC Earth Day Symposium 2017, 2018

## SELECTED PRESENTATIONS

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1. Carroll, B., A. Nehrir, S. Kooi, J. Collins, K. Bedka, R. Barton-Grimley. Simultaneous Lidar Profiling of Water Vapor, Aerosol, and Wind over the Eastern Pacific and Implications for Observational Challenges on Clouds, Circulation, and Climate Sensitivity. *American Geophysical Union (AGU) Annual Meeting*, online, December 2020.
2. Carroll, B., A. Nehrir, R. Barton-Grimley, S. Kooi, J. Collins, K. Bedka. Differential Absorption Lidar for Profiling Water Vapor within and above the PBL. *NASA Sounder Science Team Meeting*, online, October 2020.
3. Carroll, B., B. Demoz, R. Delgado. Lidar Observations of a Mesoscale Moisture Transport Event and Comparison to Analysis and Forecast Models. *American Meteorological Society (AMS) Annual Meeting*, Boston, MA, January 2020.
4. Carroll, B., B. Demoz, R. Delgado. Lidar Observations versus Forecast of Water Vapor Transport. *29<sup>th</sup> International Laser Radar Conference*, Hefei, China, 2019.
5. Carroll, B., B. Demoz, R. Delgado. Lidar observations and NAM Forecasts of Water Vapor Transport via Low-Level Jets in PECAN. *American Meteorological Society (AMS) Annual Meeting*, Phoenix, AZ, January 2019.
6. Carroll, B., B. Demoz, R. Delgado. Low-level Jet Turbulence and Impacts on Stability in the Nocturnal Boundary Layer. *AGU Annual Meeting*, Washington, D.C., December 2018.
7. Carroll, B., B. Demoz, R. Delgado. Low-level Jets and Boundary Layer Structure. *NOAA EPP/MSI 9<sup>th</sup> Biennial Education & Science Forum*, Washington, D.C., March 2018.
8. Carroll, B., B. Demoz, R. Delgado, Z. Yang. Boundary Layer Structure and Low-Level Jets during the Plains Elevated Convection at Night (PECAN) Campaign. *AMS Annual Meeting*, Austin, TX, January 2018.
9. Carroll, B., B. Demoz, T. Bonin, R. Delgado. Mixed Layer Depths via Doppler Lidar during Low-level Jet Events. *28<sup>th</sup> International Laser Radar Conference*, Bucharest, Romania, 2017.
10. Carroll, B., B. Demoz, T. Bonin, R. Delgado, K. Vermeesch, D. Whiteman. Low-Level Jets and Mixing Layer Heights in the Plains Elevated Convection at Night (PECAN) Campaign. *AMS Annual Meeting*, Seattle, WA, 2017.
11. Carroll, B., B. Demoz, T. Bonin, R. Delgado, K. Vermeesch, D. Whiteman. A Complete Picture of Boundary Layer Events in the Plains Elevated Convection at Night (PECAN) Campaign. *PECAN 1<sup>st</sup> Science Workshop*, Norman, OK, September 2016.
12. Carroll, B., B. Demoz, T. Bonin, R. Delgado, K. Vermeesch, D. Whiteman. A Complete Picture of Boundary Layer Events in the Plains Elevated Convection at Night (PECAN) Campaign. *NOAA EPP/MSI 8<sup>th</sup> Biennial Education & Science Forum*, New York City, NY, August 2016.
13. Carroll, B., A. Choukulkar, R. Delgado. Dual Doppler Lidar Retrievals in the Lidar Uncertainty Measurement Experiment (LUMEX). *96<sup>th</sup> AMS Annual/15<sup>th</sup> Student Conference*, New Orleans, LA, January 2016.
14. Carroll, B., A. Choukulkar, R. Delgado, et al. Dual Doppler Lidar Wind Profiling in LUMEX. *NOAA/NESDIS Cooperative Research Program Science Symposium*, University of Maryland, September 2015.

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15. Carroll, B., A. Choukulkar, R. Delgado, et al. The Lidar Uncertainty Measurement Experiment (LUMEX) and Dual Doppler Lidar. *95<sup>th</sup> AMS Annual Meeting*, Phoenix, AZ, January 2015.
16. Carroll, B., A. Choukulkar, R. Delgado, et al. The Lidar Uncertainty Measurement Experiment (LUMEX) and Dual Doppler Lidar. *7<sup>th</sup> National Oceanic and Atmospheric Administration-Educational Partnership Program Meeting*, University of Maryland Eastern Shore, Salisbury, Maryland, October 2014.