Curriculum Vitae

Timothy Connor Nelson, Ph.D.

Research Scientist I/Satellite Researcher and Science Coordinator
Cooperative Institute for Research in the Atmosphere
NOAA/NWS Operations Proving Ground
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EDUCATION

Doctor of Philosophy in Atmospheric Sciences August 2019
University at Albany, State University of New York, Albany, NY
Dissertation title: "A Revised Technique for Measuring Vertical Velocity using Dropsondes"
Advisor: Lee Harrison
Committee members: Kristen L. Corbosiero, Brian Tang, and Ryan Torn
GPA: 3.9/4.0

Master of Science in Atmospheric and Environmental Sciences May 2015
South Dakota School of Mines & Technology, Rapid City, SD
Thesis title: "Utilizing TITAN Software to Model Hail Size in Mission Guidance for the Future Storm Penetration A-10 Aircraft"
Advisor: Andrew Detwiler
Committee members: Donna V. Kliche and Kyle Caudle
GPA: 3.9/4.0

Bachelor of Science in Meteorology – Geography May 2013
Ohio University, Athens, Ohio
Research advisors: Ryan L. Fogt (Ohio University) and Andy Roche (National Weather Service Charleston, WV)
Cum Laude
Major GPA: 3.84/4.0

RESEARCH AND PROFESSIONAL EXPERIENCE

Research Scientist I/Satellite Researcher and Science Coordinator January 2021–present
Cooperative Institute for Research in the Atmosphere/NOAA/NWS Operations Proving Ground – Kansas City, MO

- Test and validate proposed new satellite dependent products and decision aids for operational forecasters with an emphasis on exploring the value of advanced satellite derived products for observing or predicting public weather hazards
- Serve as a "Satellite Liaison" at the NWS OPG, leading Satellite Proving Ground efforts
- Train operational forecasters on new and emerging satellite-based techniques and tools

Research Affiliate January 2021–present
Department of Atmospheric and Oceanic Sciences, University of Colorado – Boulder, Boulder, CO

- Analyzing key updraft-environment interactions supporting or limiting convection through observations from the joint 2018–2019 RELAMPAGO-CACTI field campaigns and large eddy simulation modeling using NCAR's CM1 model

Postdoctoral Research Associate August 2019–January 2021
Department of Atmospheric and Oceanic Sciences, University of Colorado – Boulder, Boulder, CO

- Analyzed soundings and radar data from the RELAMPAGO field campaign
- Examined the role of orography and environmental conditions on successful convective initiation through observations and large eddy simulation modeling using NCAR's CM1 model

Graduate Research Assistant (Hurricane Dropsondes) June 2015–August 2019
Atmospheric Sciences Research Center**,** Albany, NY

- Analyzed the thermodynamics, convection, and turbulence in tropical cyclones with dropsonde-derived vertical velocity fields
- Developed methods to improve vertical velocity and indicated airspeed observations using dropsondes by including a pitot-static system rather than using GPS fall speed
- Contributed material for grant continuance proposal

Hurricane Research Division (HRD) Forecast Discussion Leader July 2016
Atmospheric Sciences Research Center**,** Albany, NY

- Co-lead an HRD map discussion focusing on invests 91E in the Eastern Pacific and 96L in the Atlantic

Tropical Cyclone Intensity (TCI) Experiment June 2015–October 2015
Atmospheric Sciences Research Center**,** Albany, NY

- Participant during the Office of Naval Research funded experiment
- Analyzed the signal strength from the eXpendable Digital Dropsondes to the National Aeronautics and Space Administration WB-57

Graduate Research Assistant (Storm Penetration A-10 Aircraft) August 2013–June 2015
Department of Atmospheric Sciences, South Dakota School of Mines & Technology, Rapid City, SD
- Developed mission coordination techniques using NCAR's TITAN radar software package
- Developed a radar based statistical hail detection model for aiding storm penetration missions and predicting surface hail size

Co-Op Student Intern March 2014–September 2014
National Weather Service, Rapid City, SD (KUDX), Rapid City, SD
- Developed skills using AWIPS and simulations to issue warnings
- Developed severe weather forecasting techniques

Undergraduate Student Researcher October 2011–May 2013
National Weather Service, Charleston, WV (KRLX)
and Department of Geography, Ohio University, Athens, OH
- Performed a case study on the observed lightning during the September 16th 2010 Tornado outbreak in Ohio
- Developed a lightning jump algorithm applicable for the National Weather Service cloud-to-ground lightning data

Undergraduate Forecaster January 2012–September 2012
Scalia Laboratory for Atmospheric Analysis, Athens, Ohio
- Provided timely and accurate forecasts for the public near the Athens, Ohio area
- Placed near-term and long-term forecasts online and over the phone

TEACHING AND TUTORING EXPERIENCE

Lecturer August 2020–January 2021
Department of Atmospheric and Oceanic Sciences, University of Colorado – Boulder, Boulder, CO
- Instructor (1 semester) for *ATOC 4710: Introduction to Atmospheric Physics*, consisting of 20 upperclassmen students
- Material covered includes: 1) atmospheric composition and structure; 2.) atmospheric radiation/optics; 3.) atmospheric thermodynamics; and 4.) cloud physics. The course focuses on both descriptive and quantitative methods.

Adjunct Faculty Member (Mathematics) August 2018–January 2019
Division of Math, Science, Technology and Health, SUNY Schenectady County Community College, Schenectady, NY
- Instructor (1 semester) for *MAT 134-51: College Mathematics*, consisting of 26 community college students
- Developed and implemented all course material and syllabus
- Material covered includes: 1) solving linear equations in one variable; 2) interpreting word problems into algebraic language; 3) graphing linear equations in two variables; 4) interpreting slope in regard to various applications; and 5) evaluating functions for numeric inputs

Academic Tutor February 2016–August 2018
Department of Atmospheric and Environmental Sciences, University at Albany, State University of New York, Albany, NY
- Lead tutoring sessions once a week for undergraduate Atmospheric and Environmental Sciences students in the subject areas of: meteorology, calculus, physics, and chemistry

Guest Lecturer Spring 2017, October 2016
Department of Atmospheric and Environmental Sciences, University at Albany, State University of New York, Albany, NY
- Lead a graduate lecture in *ATM 621: Structure and Dynamics of Extratropical Cyclones* focusing on the development of polar lows and their convective characteristics
- Covered an undergraduate lecture in *ATM 210: Atmospheric Structure, Thermodynamics, and Circulation* focusing on atmospheric relative humidity, the Clausius-Clapeyron equation, the Bergeron-Findeisen process, Köhler curves, and droplet growth and formation

Graduate Student Mentor August 2017–May 2018
Department of Atmospheric and Environmental Sciences, University at Albany, State University of New York, Albany, NY
- Aided two graduate students in their first year in the Atmospheric Sciences program at the University at Albany

Peer Mentor November 2011–May 2013
Ohio University Chapter of the American Meteorological Society, Athens, Ohio
- Aided a total of four underclassmen and guided them through the meteorology program at Ohio University
- Held one-on-one and small group meetings with underclassmen to discuss progress towards their degree and their future aspirations

PEER REVIEWED PUBLICATIONS

Nelson, T. C., J. Marquis, A. Varble, and K. Friedrich, 2020: Radiosonde observations of environments supporting deep moist convection initiation during RELAMPAGO-CACTI, *Mon. Wea. Rev.,* doi: 10.1175/MWR-D-20-0148.1.

Nelson, T. C., L. Harrison, and K. L. Corbosiero, 2020: Temporal and spatial autocorrelations from eXpendable Digital Dropsondes (XDDs). *J. Atmos. Oceanic Technol*, **37**, 381–399, doi: 10.1175/JTECH-D-19-0032.1.

Nelson, T. C., L. Harrison, and K. L. Corbosiero, 2019: Examination of the eXpendable Digital Dropsonde-Derived Vertical Velocities from the Tropical Cyclone Intensity (TCI) Experiment. *Mon. Wea. Rev.*, **147**, 2367–2386, doi: 10.1175/MWR-D-18-0414.1

Ditchek, S. D., **T. C. Nelson,** M. Rosenmayer, and K. L. Corbosiero, 2016: The relationship between tropical cyclones at genesis and their maximum attained intensity. *J. Climate*, **30**, 4897–4913, doi:10.1175/JCLI-D-16-0554.1.

MANUSCRIPTS IN REVIEW, REVISION, OR PREPARATION

Nelson, T. C., J. Marquis, J. Peters, J. Mulholland, and K. Friedrich, 2021: Cloud-scale simulations of convection initiation using observed near-cloud environments from RELAMPAGO-CACTI. *In preparation*

Peters, J., H. Morrison, K. K. Chandrakar, **T. C. Nelson**, J. Marquis, J. P. Mulholland, and C. J. Nowotarski, 2021: The role of vertical wind shear in the transition from shallow to deep cumulus convection. Part 1: theory. *In preparation*

Marquis, J., A. Varble, P. Robinson, **T. C. Nelson**, and K. Friedrich, 2021: Low-level mesoscale and cloud-scale interactions promoting deep convective initiation. *Mon. Wea. Rev., in review.*

Nelson, T. C., and L. Harrison, 2020: A revised technique for measuring vertical velocity using dropsondes, *J. Atmos. Oceanic Technol.*, *being drafted for resubmission*.

Nelson, T. C., 2020: Orographic effects during an extreme precipitation event in western South Dakota. *In preparation.*

NON-PEER REVIEWED PUBLICATIONS

Nelson, T. C., and L. Harrison, 2019: Revisiting the wind-finding equations for dropsondes. *Available from the authors upon request.*

Nelson, T. C., 2015: SDSM&T AES 2015 Report No. 1: Storm Penetration A-10 (SPA-10) project manual for TITAN. South Dakota School of Mines and Technology, 67 pp. *Available from the Atmospheric and Environmental Sciences program at South Dakota School of Mines and Technology upon request.*

Nelson, T. C., and A. B. Young, 2012: Lightning: A parameter for predicting tornadoes and updraft strength. Department of Geography. Ohio University, 24 pp. *Available from the authors upon request.*

INVITED PRESENTATIONS

Nelson, T. C., 2019: Measuring, Depicting, and Analyzing Atmospheric Convection. Department of Geography and Geosciences, University of Louisville, 4 November 2019, Louisville, KY.

SELECT LEAD-AUTHOR CONFERENCE PRESENTATIONS

Oral Presentations

Nelson, T. C., J. Marquis, A. Varble, and K. Friedrich, 2021: Analysis of Observed Near-cloud Environments Supporting Convective Initiation during RELAMPAGO-CACTI and their Impacts within Idealized Cloud-scale Simulations. *101st American Meteorological Society Annual Meeting, Processes Across Scales: Engaging with Communities in the Physical and Social Sciences - Mesoscale Symposium*, 11 January 2021, New Orleans, LA, presentation.

Nelson, T. C., L. Harrison, and K. L. Corbosiero, 2018: Dropsonde-derived Vertical Velocities from the 2015 Tropical Cyclone Intensity (TCI) Experiment. *33rd Conference on Hurricanes and Tropical Meteorology*, 17 April 2018, Ponte Vedra, FL, presentation.

Nelson, T. C., and L. Harrison, 2016: Convective Asymmetries Measured by eXpendable Digital Dropsondes (XDDs) in Tropical Cyclones. *Tropical Cyclone Intensity (TCI) Workshop*, 16 October 2016, Boulder, CO, presentation.

Nelson, T. C., A. G. Detwiler, and D. V. Kliche, 2014: Utilizing TITAN Software for Hail Analysis to Aid in Mission Guidance. *Weather Modification Association Annual Meeting*, 23 April 2015, Fargo, ND, presentation.

Nelson, T. C., A. G. Detwiler, and D. V. Kliche, 2014: Utilizing TITAN Software for Hail Analysis to Aid in Mission Guidance. *SDSM&T Student Research Symposium*, 31 March 2015, Rapid City, SD, presentation.

Nelson, T. C., A. G. Detwiler, and D. V. Kliche, 2014: Utilizing TITAN Software for Hail Analysis to Aid in Mission Guidance. *20th Conference on Planned and Inadvertent Weather Modification*, *95th American Meteorological Society Annual Meeting*, 8 January 2015, Phoenix, AZ, presentation.

Nelson, T. C. and A. G. Detwiler, 2014: Examining Atmospheric Phenomena Using Storm Penetration Unmanned Aerial Vehicles. *Northern Plains Convective Storms Symposium*, 19–20 May 2014, Grand Forks, ND, University of North Dakota, presentation.

Poster Presentations

Nelson, T. C., J. Marquis, A. Varble, and K. Friedrich, 2020: Cloud-scale Simulations of Convection Initiation using Observed Near-cloud Environments from RELAMPAGO-CACTI. *American Geophysical Union Fall Meeting*, *Atmospheric Convection: Processes, Dynamics, and Links to Weather and Climate*, 10 December 2020, San Francisco, CA, poster.

Nelson, T. C., and J. Marquis, 2019: Analysis of Environments Leading to Convective Initiation during the RELAMPAGO Campaign. *Earth System & Space Science (ESSS) Poster Conference*, University of Colorado Boulder, 6 December 2019, Boulder, CO, poster.

Nelson, T. C., L. Harrison, and K. Corbosiero, 2017: Measuring Convection using eXpendable Digital Dropsondes (XDDs) in Tropical Cyclones. *8th Northeast Tropical Meteorology Workshop*, 21 June 2017, Rensselaerville, NY, poster.

Nelson, T. C., L. Harrison, and K. Corbosiero, 2017: Convective Asymmetries Measured Dropsondes in Tropical Cyclones. *97th American Meteorological Society Annual Meeting, Robert A. Houze, Jr. Symposium*, 24 January 2017, Seattle, WA, poster.

Nelson, T. C. and A. B. Young, 2013: September 16th 2010 Tornado Outbreak: An Electrical Dynamic Analysis. Ohio University Student Expo, 11 April 2013, Athens, OH, Ohio University, poster.

GRANTS AND FELLOWSHIPS

Atmospheric Sciences Research Center (ASRC) Graduate Fellowship, Albany, NY — August 2015–August 2016

- Won a merit-based research fellowship offered by the ASRC to a first-year graduate student

LEADERSHIP AND SYNERGISTIC ACTIVITIES

Reviewer — May 2020–present
Weather and Forecasting

Poster Judge
Earth System & Space Science (ESSS) Poster Conference, University of Colorado Boulder — December 2019
American Meteorological Society, Atlanta, GA — January 2014

Reviewer — October 2018–present
Journal of Weather Modification

Intradepartmental Educational Resource Chair — August 2017–August 2018
Department of Atmospheric and Environmental Sciences Graduate Student Committee, University at Albany, State University of New York, Albany, NY

American Meteorological Society Student Conference Planning Committee — March 2017–March 2018
2018 American Meteorological Society Student Conference Planning Committee, Austin, TX

Student Conference Poster Sub-committee — March 2017–March 2018
2018 American Meteorological Society Student Conference Planning Committee, Austin, TX

SUNY Albany Graduate School Visit Host — February 2017–April 2017
Department of Atmospheric and Environmental Sciences, University at Albany, State University of New York, Albany, NY

President — June 2014–May 2015
SDSM&T Student Chapter of the American Meteorological Society, Rapid City, SD

Events Coordinator — May 2012–May 2013
Ohio University Chapter of the American Meteorological Society, Athens, Ohio

Vice President January 2012–May 2012
Ohio University Chapter of the American Meteorological Society, Athens, Ohio

National Weather Service StormReady Committee February 2010–May 2010
Ohio University Chapter of the American Meteorological Society, Athens, Ohio

Paraprofessional Staff August 2012–May 2013
Residential Housing, Ohio University, Athens, Ohio

TECHNICAL SKILLS

- Programming languages: NCL, C, R, Fortran, Matlab, Python (numpy, pandas, matplotlib)
- Scripting: bash, tcsh
- Modeling: CM1, simple two-dimensional cloud modeling, simFlow CFD
- Visual display: ArcGIS, ESRI, GRAnalyst
- Other software: simFlow CAD-based CFD software, ParaView, EAGLE (limited knowledge), FreeCAD, Arduino Sketch, Unix and Linux (Ubuntu, Scientific Linux), Mac OS, Windows OS, Microsoft Word, Microsoft PowerPoint, Microsoft Excel
- Other skills: electronics soldering, analog circuitry

HONORS AND AWARDS

Outstanding Graduating Senior (Undergraduate), Athens, Ohio May 2013
- Awarded by the Ohio University Geography Department to select undergraduate seniors who illustrated academic excellence

Ohio University Student Expo Poster Winner, Athens, Ohio May 2013
Won 2nd place in the Undergraduate Mathematics and Geography poster session

SOCIETIES AND MEMBERSHIPS

Member September 2012–present
American Meteorological Society

Member July 2020–present
American Geophysical Union