Resume

Timothy Connor Nelson, Ph.D.
Project Scientist I
University Corporation for Atmospheric Research (UCAR) Cooperative Programs for the Advancement of Earth System Science (CPAESS)
NOAA AOML Quantitative Observing System Assessment Program (QOSAP)
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RELEVANT PROFESSIONAL EXPERIENCE

Project Scientist I   01/30/2023 – present
University Corporation for Atmospheric Research (UCAR) - Cooperative Programs for the Advancement of Earth System Science (CPAESS); NOAA AOML Quantitative Observing System Assessment Program (QOSAP)

Duties:
- Develop the next generation observing system experiment (OSE)/observing system simulation experiment (OSSE) OSE/OSSE system for the new Hurricane Analysis and Forecast System (HAFS) model
- Conduct OSEs and OSSEs, using a control experiment as a reference, to assess the impact of new observations or observing platforms/techniques

Research Scientist II: Satellite Researcher and Science Coordinator   08/01/2022 – 01/27/2023
Research Scientist I: Satellite Researcher and Science Coordinator   01/04/2021 – 07/31/2022
Cooperative Institute for Research in the Atmosphere (CIRA); National Weather Service (NWS) Operations Proving Ground (OPG) Kansas City, MO

Duties:
- 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" to the GOES program at the NWS OPG, leading Satellite Proving Ground efforts
- Train operational forecasters on new and emerging satellite-based techniques and tools
- Manage, design, and conduct operational evaluations, experiments, and exercises (including data denial analyses and statistical analysis) supporting the NWS OPG, as well as writing scientific reports
- Assist the transition from research to operations (R2O) for new and emerging meteorological techniques, technologies, and workflows to support forecast operations and warning decision making processes

Accomplishments:
- Served as project lead for four test bed evaluations/experiments, with two being in-residence and two being virtual
- Aided in the planning, development, implementation, and report writing for 14 additional evaluations/experiments
- Served as a representative for the NWS at the 2022 RGB Developers and Users Workshop in Ft. Collins, CO
- Participated in the 2022 Hazardous Weather Testbed (HWT) Spring Satellite Experiment as an observer, documenting participant feedback on aspects of 7 new satellite products
- Wrote and implemented a python-based software program (called PEx-DC) that extracts statistical information about relevant GOES satellite data (ABI, RGB, and Level-2) within user-drawn polygons in ArcGIS online.

Postdoctoral Research Associate   08/01/2019 – 12/31/2020
Department of Atmospheric and Oceanic Sciences, University of Colorado – Boulder, Boulder, CO

Duties:
- Analyzed soundings and radar data from the RELAMPAGO field campaign using a bulk statistical framework to validate forecasted precipitating convection and assess environmental impacts on situations where convective allowing model (CAM) output was erroneous
- Examined the role of orography and environmental conditions on successful convective initiation through observations and large eddy simulation modeling using NCAR's CM1 model, ran on the NCAR Casper and Cheyenne clusters, and examining the impact of observational data on model output

Accomplishments:
- Lead authored and/or co-authored a total of five peer-reviewed manuscripts submitted to *Monthly Weather Review* and *Journal of Atmospheric Sciences*
- Invited speaker at the University of Louisville Department of Geography and Geosciences

Graduate Research Assistant (Hurricane Dropsonde Group)   06/14/2015 – 08/01/2019
Atmospheric Sciences Research Center**,** Albany, NY

Duties:
- Conducted research to support the 2015 Tropical Cyclone Intensity (TCI) field campaign
- Analyzed the thermodynamics, convection, and turbulence in tropical cyclones with dropsonde-derived vertical velocity fields

Accomplishments:
- Provided briefings to TCI field campaign principal investigators and military scientists at the Office of Naval Research within weeks of starting the position, including a discussion on the signal performance of the dropsondes
- Winner of the 2015–2016 Atmospheric Sciences Research Center (ASRC) Graduate Fellowship
- Developed a prototype vertical-wind measuring dropsonde to improve vertical velocity and indicated airspeed observations in tropical cyclones using dropsondes by including a pitot-static system rather than using GPS fall speed
- Conducted field work with Yankee Environmental Systems (YES, inc.) to build a wind tunnel and rotating arm to test dropsonde kinematics and perform calibration measurements. This also included conducting test drops from a small UAV.
- Contributed material for grant continuance proposals

Graduate Research Assistant (Storm Penetration A-10 Aircraft Group)   08/15/2013 – 05/31/2015
Department of Atmospheric Sciences, South Dakota School of Mines & Technology, Rapid City, SD

Duties:
- Conducted research to support the development and implementation of a storm-penetrating A-10 aircraft to replace the retired T-28 aircraft operated by the South Dakota School of Mines and Technology.
- Conducted research on a secondary grant to support the use of commercial UAVs (Quasar Federal Systems) in the near-storm environment

Accomplishments:
- Developed mission coordination techniques using NCAR's TITAN radar software package
- Installed and maintained a Local Data Manager (LDM) to pull live radar data for ingest into the TITAN software
- Developed a radar-based statistical hail detection model for aiding storm penetration missions and predicting surface hail size incorporating dual-polarimetric radar data from WSR-88D radars
- Developed mission plans for a proposed commercial UAV in the near-storm environment

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)
Major GPA: 3.84/4.0 (Cum Laude)

PEER REVIEWED PUBLICATIONS

J. Marquis, Z. Feng, A. Varble, **T. C. Nelson**, A. Houston, J. M. Peters, J. P. Mulholland, and J. C. Hardin, 2023: Near-cloud atmospheric ingredients for deep convection initiation *Mon. Wea. Rev.,* **EOR**, doi: 10.1175/MWR-D-22-0243.1

Nelson, T. C., J. Marquis, J. Peters, and K. Friedrich, 2022: Environmental Controls on Simulated Deep Moist Convection Initiation Occurring during RELAMPAGO-CACTI, *J. Atmos. Sci.,* **79**, 1941–1964, doi: 10.1175/JAS-D-21-0226.1

Peters, J., H. Morrison, K. K. Chandrakar, **T. C. Nelson**, J. Marquis, J. P. Mulholland, and C. J. Nowotarski, 2022: The role of vertical wind shear in the transition from shallow to deep cumulus convection. Part 1: Theory. *J. Atmos. Sci.,* **79**, 1669–1690, doi: 10.1175/JAS-D-21-0145.1

Peters, J., H. Morrison, K. K. Chandrakar, **T. C. Nelson**, J. Marquis, J. P. Mulholland, and C. J. Nowotarski, 2022: The role of vertical wind shear in the transition from shallow to deep cumulus convection. Part 2: Simulations. *J. Atmos. Sci,* **79**, 1691–1711, doi: 10.1175/JAS-D-21-0144.1

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.,* **149**, 2473–2495, doi: 10.1175/MWR-D-20-0391.1.

Nelson, T. C., J. Marquis, A. Varble, and K. Friedrich, 2021: Radiosonde observations of environments supporting deep moist convection initiation during RELAMPAGO-CACTI, *Mon. Wea. Rev.,* **149**, 289–309, 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. J. Brost, M. Foster, R. Walsh, and K. Crandall-Vigil, 2022: Assessing the utility and impact of satellite data in the watch-to-warning timeframe for severe convective weather, *Wea. Forecasting.*, *in preparation.*

SELECT LEAD-AUTHOR CONFERENCE PROCEEDINGS

Oral Presentations

- **Nelson, T. C.**, R. Walsh, K. Crandall, M. Foster, and J. J. Brost, 2023: Leveraging Satellite Data for Mesoanalysis in National Weather Service Operations: A Upcoming Operations Proving Ground Initiative using Cloud-based Technology. 19th Annual Symposium on Operational Environmental Satellite Systems; 2023 AMS Annual Meeting, 12 January 2023, Denver, CO, presentation.
- **Nelson, T. C.**, R. Walsh, K. Crandall, J. J. Brost, M. Foster, and S. J. Avey, 2022: The use of GOES RGB and ABI data for mesoanalysis in National Weather Service operations. 25th AMS Satellite Meteorology, Oceanography and Climatology (SatMOC) Conference; 2022 AMS Collective Madison Meeting, 11 August 2022, Madison, WI, presentation.
- **Nelson, T. C.**, J.J. Brost, K. Crandall, R. Walsh, M. Foster, R. Difani, and S. J. Avey, 2022: Impact of satellite data in the watch-to-warning gap for severe weather: Results from recent remote experiments by the Operations Proving Ground. 12th Conference on Transition of Research to Operations; 102nd AMS Annual Meeting, 26 January 2022, virtual presentation.
- **Nelson, T. C.**, J.J. Brost, R. Difani, K. Crandall, R. Walsh, M. Foster, and S. J. Avey, 2022: Impact of satellite data in the watch-to-warning gap for fire weather: Results from recent remote experiments by the Operations Proving Ground. 12th Conference on Transition of Research to Operations; 102nd AMS Annual Meeting, 26 January 2022, virtual presentation.
- **Nelson, T. C.,** 2022: The impact of satellite data in mesoanalysis: Results from the 2021 OPG real-time severe weather experiment. TOWR-S Satellite Book Club (SBC) Seminar Series, 20 January 2022, virtual presentation.
- **Nelson, T. C.,** 2021: The use of satellite data in the spring 2021 OPG grassland fire weather experiment and its implications for future operations. TOWR-S Satellite Book Club (SBC) Seminar Series, 4 November 2021, virtual presentation.
- **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.

Poster Presentations

- **Nelson, T. C.,** J. Marquis, J. M. Peters, and K. Friedrich, 2022: Sensitivities of updraft behavior to environmental conditions and terrain circulations during convection initiation. *19th Conference on Mesoscale Processes; 102nd AMS Annual Meeting*, 24 January 2022, virtual poster.
- **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.

LEADERSHIP AND SYNERGISTIC ACTIVITIES

Board Member   January 2023 – present
American Meteorological Society Board of Operational Government Meteorologists (BOGM)

Session Co-chair   January 2022
American Meteorological Society Annual Meeting R2O Conference: Analysis and Nowcast Session

Reviewer

Journal of Operational Meteorology   February 2023 – present
Journal of Geophysical Research – Atmospheres   October 2022 – present
Weather and Forecasting   May 2020 – present
Journal of Weather Modification   October 2018 – present

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

TECHNICAL SKILLS

- **Programming languages**: NCL, C, R, Fortran, Matlab, Python (numpy, pandas, matplotlib, geopandas), Gempak
- **Scripting**: bash, tcsh
- **Modeling**: HAFS, CM1, WRF, simple two-dimensional cloud modeling
- **Visual display**: ArcGIS (online, QGIS, and desktop versions), ESRI, GRAnalyst, HTML (personal website)
- **Operational skills**: Cloud AWIPS, AWIPS-II, LDM, GitHub repository
- **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, Amazon Web Services (cloud computing), NCAR HPC computing via CISL (Casper and Cheyenne)