

ARONNE MERRELLI

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Space Science and Engineering Center
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EDUCATION

- 2008 – 2012 **University of Wisconsin–Madison**
Ph.D., Dept. of Atmospheric and Oceanic Sciences
Thesis title: The Atmospheric Information Content of Earth’s
Far Infrared Spectrum
Advisor: David D. Turner
- 2006 – 2008 **University of Dayton**
M.S., Electro Optics
- 1999 – 2000 **California Institute of Technology**
Graduate Coursework in Astrophysics
- 1995 – 1998 **Carnegie Mellon University**
B.S., Physics, Minor in Mathematics
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PROFESSIONAL AND RESEARCH EXPERIENCE

- 2014 – present Space Science and Engineering Center, Madison, WI.
Assistant Researcher
Staff researcher at SSEC, supervised by David C. Tobin.
- Member of OCO-2 Science team, continuing postdoctoral research on 3D scattering effects for the OCO-2 carbon dioxide retrieval algorithm.
 - Part of Calibration/Validation team for the Cross Track Infrared Sounder (CrIS) Science Data Record (SDR). Helped develop “obs - calc” framework, to compare measured spectra versus forward model calculations from NWP analysis. Performed obs - calc studies to support development and validation of candidate calibration algorithms.
 - Research involving passive microwave retrievals of hydrometeors in arctic conditions, using data from the ICECAPS project.
 - Supported data processing for Micro Rain Radar (MRR) datasets, contributing to the IMProToo project from M. Maahn.

2013 – 2014

Space Science and Engineering Center, Madison, WI.

Research Associate

Postdoctoral research appointment with Professor Ralf Ben-
nartz. Primary research is funded through the NASA Or-
biting Carbon Observatory-2 (OCO-2) mission. Additional
research on several projects related to hyperspectral infrared
measurements.

- Implemented framework combining SHDOM 3D radiative transfer code with state of the art Oxygen A-band and shortwave infrared Carbon Dioxide spectroscopic databases from the OCO-2 science team.
- Work with Colorado State collaborators (C. O'Dell, T. Taylor, I. Polonsky) to run OCO-2 simulator and OCO-2 Level 2 retrieval codes.
- Work with Freie Universität Berlin colleagues on Oxygen A-band radiative transfer simulations.
- On-site support for the Scanning High-resolution Interferometer Sounder (S-HIS) deployment for the NASA Hurricane and Severe Storm Sentinel (HS3) program
- Improvements to the LBLDIS radiative transfer code to enable calculation of spectrally resolved heating rates throughout the thermal infrared

2008 – 2012

Cooperative Institute for Meteorological Satellite Studies,
Space Science and Engineering Center, Madison, WI.

Graduate Research Assistant

Research on retrievals of geophysical variables using Far In-
frared (FIR) radiance spectra, and effects of FIR radiative
transfer in global atmosphere models.

- Implementation of Optimal Estimation algorithms, including nonlinear retrieval methods and optimal channel selection.
- Simulation of hyperspectral infrared spectra (FIR and MIR) using line-by-line radiative transfer models
- Information content analyses of simulated hyperspectral FIR radiance measurements for retrievals of thermodynamic profiles and ice cloud properties; comparison to hyperspectral MIR radiance measurements.
- Analysis of General Circulation Model data (NCAR CESM) with modified FIR radiative transfer modules.

2003 – 2008

Ball Aerospace & Technologies Corp., Fairborn, OH.

Engineer/Scientist, Advanced Multi-Spectral Sensors Group

Responsible for various tasks related to processing and exploitation of data collected from R&D sensors operated by government customers. Specific research included:

- Improved background and noise suppression algorithms

- Developed uncertainty estimation methods for signal extractions
- Developed and applied calibration, characterization, and artifact removal methods for array sensors
- Developed various data simulations for array sensors for software testing
- Analyzed specific high value or specialized data collections
- Evaluation of signal processing and tracking algorithms as applied to specific sensor data streams
- Documentation of algorithms and analyses through technical reports and briefings
- Integration of new algorithms and improvements into prototype software tools
- Requirements development and systems engineering support for processing and exploitation software development teams

2001 – 2003

Raytheon Missile Systems, Tucson, AZ.

Systems Engineer, Telemetry Data Lab

Worked in the Integration, Test & Analysis center, supporting internal Raytheon programs. Performed tasks on a wide range of telemetry related activities, including:

- Development of a prototype software tool for the reduction, display, and presentation of telemetry data, with emphasis on handling large size datasets
- Custom software tools for specific data displays, using both IDL and MATLAB GUI toolkits
- Support for various real-time telemetry data collection activities

2000

California Institute of Technology, Pasadena, CA.

Research Assistant, Department of Physics

Part of the Infrared Astronomy group in the Caltech Physics department. Research focused on observations of radio loud galaxies at high redshifts, using high resolution spectroscopy of emission lines and broadband imaging using near IR and mid IR instruments.

1999

Carnegie Mellon University, Pittsburgh, PA.

Technical Assistant, Department of Physics

Supported commissioning of the Sloan Digital Sky Survey spectroscopic systems. Integration and testing of telescope guiding systems for spectroscopic observations. Development of software pipeline to create spectroscopic observation plates from target selection data. Analyzed commissioning data.

FIELD EXPERIENCE

- 2013, 2014 On-site support for S-HIS during NASA Hurricane and Severe Storm Sentinel (HS3) field campaign.
Science and technical support for S-HIS during long duration Global Hawk flights.
- 2011 On-site Science Technician for ICECAPS project, Summit, Greenland.
Responsible for instrument monitoring and operations for a suite of remote sensing instruments sited at Summit Camp. Instrument suite included LIDAR, passive microwave radiometers, millimeter wave cloud radar, infrared radiometers, and twice daily balloon radiosonde launches.

PUBLICATIONS

Merrelli, A., Bennartz, R., O'Dell, C. W., and Taylor, T. E.: Estimating bias in the OCO-2 retrieval algorithm caused by 3-D radiation scattering from unresolved boundary layer clouds. *Atmos. Meas. Tech.* 8, 1641-1656, DOI:10.5194/amt-8-1641-2015, (2015).

Baum, B. A., Yang, P., Heymsfield, A. J., Bansemer, A., Merrelli, A., Schmitt, C., & Wang, C.: Ice cloud single-scattering property models with the full phase matrix at wavelengths from 0.2 to 100 μm . *Journal of Quantitative Spectroscopy and Radiative Transfer*, 146, 123-139, DOI: 10.1016/j.jqsrt.2014.02.029, (2014).

Merrelli, A. & Turner, D. D.: Information content for cloud ice microphysics in the far-infrared radiance spectrum. *International Radiation Symposium 2012 conference proceedings*, Berlin, Germany (2012).

Turner, D. D., Merrelli, A., Vimont, D. & Mlawer, E. J.: Impact of modifying the longwave water vapor continuum absorption model on community Earth system model simulations. *J. Geophys. Res.*, Vol. 117, D04106 (2012).

Merrelli, A. & Turner, D. D.: Comparing Information Content of Upwelling Far Infrared and Mid Infrared Radiance Spectra for Clear Atmosphere Profiling. *J. Atmos. Oceanic Technol.*, Vol. 29, Issue 4, pp 510 - 526 (2011).

Tucker, D. L., et. al., The Sloan Digital Sky Survey monitor telescope pipeline. *Astronomische Nachrichten* 327, 821-843 (2006).

Castander, F. J., Nichol, R. C., Merrelli, A., and the SDSS collaboration: The First Hour of Extragalactic Data of the Sloan Digital Sky Survey Spectroscopic Commissioning: The Coma Cluster. *The Astronomical Journal*, Vol. 121, Issue 5, pp 2331 - 2357 (2001).

Romer, A. K., Nichol, R. C., Holden, B. P., Ulmer, M. P., Pildis, R. A., Merrelli, A. J., Adami, C., Burke, D. J., Collins, C. A., Metevier A. J., Kron,

R. G. and Commons, K.: The Bright SHARC Survey: The Cluster Catalog. The Astrophysical Journal Supplement Series 126, 209 (2000).

Nichol, R. C., Romer, A. K., Holden, B. P., Ulmer, M. P., Pildis, R. A., Adami, C., Merrelli, A. J., Burke, D. J., and Collins, C. A.: The Bright SHARC Survey: The X-Ray Cluster Luminosity Function. The Astrophysical Journal Letters 521, L21 (1999).

PRESENTATIONS AND POSTERS

“Comparing Cross-track Infrared Sounder Observations with Forward Model Calculations”, Merrelli, Aronne; Tobin, David; Knuteson, Robert; Greenwald, Thomas; Revercomb, Hank; Abstract IN13C-3656 Presented at 2014 Fall Meeting, AGU, San Francisco, Calif., 15-19 Dec 2014.

“Radiative transfer studies in support of OCO-2: A look at clouds, shadows, and the ocean surface”, R. Bennartz, A. Merrelli, C. O’Dell, T. Taylor, A. Hollstein, J. von Bismarck, J. Fischer, R. Preusker. Presentation at 2013 OCO-2 Science Team meeting, Cal Tech, March 2013.

“Impact of RHUBC-I Water Vapor Continuum Absorption Updates on Climate Simulations with CESM”, A. Merrelli, D. D. Turner, D. Vimont, E. Mlawer. Poster Presentation at the third Science Team Meeting of the Atmospheric Systems Research program, Arlington, VA, March 2012.

“Comparing Clear Atmosphere Profiling with FIR and MIR Radiance Spectra”, A. Merrelli, D. D. Turner, Oral Presentation at the 2011 Far Infrared Workshop, Madison, WI, November 2011.

“Comparing Information Content of Mid and Far Infrared Spectra for Clear-Sky Atmospheric Profile Retrievals” A. Merrelli, D. D. Turner. Poster Presentation at the 2010 AGU Fall Meeting, San Francisco, CA, December 2010.

“Comparing high resolution far and mid infrared spectra for clear - sky atmospheric profile retrievals”, A. Merrelli, D. D. Turner. Poster Presentation at the 13th Conference on Atmospheric Radiation, American Meteorological Society, Portland, OR, June 2010.

“Objective Comparison of High Resolution FIR and MIR Spectral Observations for Atmospheric Retrievals”, Aronne Merrelli and David D. Turner. Poster Presentation at the first Science Team meeting of the Atmospheric Systems Research program, Bethesda, MD, March 2010.

“Water Vapor Absorption in the Far Infrared”, A. Merrelli and D. Turner. Poster presentation at the 6th annual NOAA CoRP Symposium, City College, New York City, August 2009.

“Defective pixel correction and restoration in staring remote sensor focal

plane arrays”, A. Ferro, L. Vettel, B. Everding, A. Merrelli, Ball Aerospace & Technologies Corp. Oral presentation at SPIE Great Lakes Photonics Symposium, 2006.

“Sloan Digital Sky Survey: Over One Million Spectra”, with A. Pope, S. Burles, M. Newcomb, R. Nichol, R. Owen, and the SDSS collaboration. Poster presentation at the 194th meeting of the American Astronomical Society, Chicago, IL, June 1999. #04.11.

TECHNICAL SKILLS

- Highly proficient at data analysis and scientific programming with Python, MATLAB and IDL.
- Experience with radiative transfer codes SHDOM, LBLRTM, RRTM, LBLDIS, and the NCAR CESM global climate model.
- Basic knowledge of Cython, C, Fortran
- Past Experience in TCL, LabView, Code V