

Curriculum Vitae

Dr. Darren S. McKague

Research Investigator and Lecturer,
Atmospheric, Oceanic and Space Sciences Department
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RESEARCH ACTIVITIES

- Current research activities: the development of calibration hardware and techniques for passive microwave remote sensing, geophysical remote sensing and radiative transfer.
 - Member of the Global Precipitation Mission (GPM) Inter-Calibration Working Group, focused on the inter-calibration of space-borne microwave radiometers.
 - Engaged in research focused on the remote sensing of the hydrologic cycle, sea surface winds, and passive microwave remote sensing of hurricanes.
- Areas of expertise: mathematical inversion techniques, radiative transfer, microwave radiometer calibration, and passive microwave remote sensing of the Earth.

EDUCATION

August 2001: University of Colorado at Boulder, Boulder Colorado
Ph.D. Astrophysical, Planetary, and Atmospheric Sciences
December 1995: University of Colorado at Boulder, Boulder Colorado
M.S. Astrophysical, Planetary, and Atmospheric Sciences
March 1993: Wayne State University, Detroit Michigan
B.S. Physics, Summa cum Laude

PROFESSIONAL EXPERIENCE

Research Investigator and Lecturer, University of Michigan

December 2007 to Present:

- Research Investigator in the area of passive microwave remote sensing. Developing new passive microwave remote sensing calibration techniques and remote sensing algorithms.
- Lecturer for AOSS/Aero 582/583. Lecturing and co-leading (with Prof. Zurbuchen) classes for Masters of Engineering in Space Engineering. Foci of classes are space mission design, space mission technologies, and technical management of space missions.
- Advisor for AOSS Masters of Engineering in Space Engineering (MEng), Masters of Science in Atmospheric Sciences, and Sequential Graduate, Undergraduate Studies (SGUS) programs.

Principal Systems Engineer, Ball Aerospace & Technologies Corp.:

December 2002 to December 2007:

- Head of the Microwave Initiative for the Civil Space Systems in charge of the development and marketing of Pre-Phase A design concepts for space-borne microwave instruments: both capture lead and lead systems engineer in the concept development of space-borne remote sensing instruments for a number of proposals to NASA and NOAA; involved in concept development, requirements definition, system trades, Statement of Work (SOW) development, Costing, and development of proposal/marketing presentations
- Head of the Microwave Development Testbed Lab developing active and passive hardware testing, characterization, and calibration techniques: developed hardware designs and brass-board demonstration units for candidate space-borne technologies, focusing in particular on microwave/mm-wave radiometer calibration schemes and combined passive and active radar/radiometer designs
- Lead scientist and calibration lead for Global Precipitation Mission Microwave Imager (GMI) proposal and program: design including detailed trade analyses, CAIV studies, specification development, SOW development and sub-contractor interface, Earned Value Analysis (EVA) and costing for the calibration subsystems of the GMI instrument from pre-proposal concept through System Readiness Review to the Integrated Baseline Review
- Member of Algorithm IPT for NPOESS Space Environmental Sensor Suite (SESS) and Aerosol Polarimetry Sensor (APS) proposal: in charge of retrieval algorithm development for a number of SESS products and technical support on retrieval algorithm documentation on the APS proposal
- Completed course work specific to EVA, engineering specification development, SOW development, proposal writing, and CMM certification (Aerospace industry best practices)

Research Scientist, Cooperative Institute for Research in the Atmosphere (CIRA):

April 2001 to December 2002:

- Developed new algorithms for the remote sensing of water vapor profiles, clouds, temperature profiles, and surface emissivity in the microwave
- Developed Optimal Estimation algorithm for the real-time retrieval of temperature profiles, water vapor profiles, cloud liquid water, surface temperature and surface emissivity from AMSU data
- Created observational operators and radiative transfer models for the assimilation of microwave observations into numerical weather and climate models
- Developed radiative transfer models for microwave data exploitation

Research Scientist, STC-METSAT:

October 2001 to December 2002:

- General consulting on remote sensing and mathematical inversion techniques

Systems Engineer, Raytheon:

August 1999 to March 2001:

- Assisted in the design of a new passive microwave sensor (CMIS) including the development of the radiative transfer section of an end-to-end model of the sensor, CAIV analysis, requirement flow-down, and general instrument level trades to Preliminary Design Review level
- Created and validated remote sensing algorithms for the retrieval of atmospheric and surface parameters such as cloud ice water path, precipitation, sea surface wind direction, snow cover/depth

Graduate Research Assistant, University of Colorado:

March 1997 to August 2001:

- Created a novel cloud and precipitation retrieval algorithm fusing data from visible, infrared, and microwave satellite measurements based on Bayes' Theorem
- Modeled radiative transfer in the visible, infrared, and microwave for clear skies, clouds, and precipitation over a variety of Earth surfaces

May 1994 to March 1997:

- Researched sensitivity of microwave precipitation retrieval to microphysical assumptions
- Analyzed Doppler Radar profiler data and disdrometer data for the retrieval of raindrop size distributions
- Modeled microwave radiative transfer for the simulation of satellite measurements
- Conducted microwave precipitation algorithm intercomparison

Undergraduate Research Assistant, Wayne State University:

September 1992 to July 1993:

- Investigated metallic thin film deposition for the fabrication of metallic crystalline superlattices.

TEACHING EXPERIENCE

Lecturer, AOSS/Aero 582-583

January 2008 to Present:

- Lecturing students in Masters of Engineering in Space Engineering on principles of space mission design and technical management.

Teaching Assistant, University of Colorado:

September 1993 to April 1995:

- Taught undergraduate labs in Astronomy and Meteorology; developed lab modules for Meteorology course

Teaching Assistant, Wayne State University:

September 1991 to April 1992:

- Taught undergraduate labs in Physics and Astronomy

Various:

- Guest lecturer for remote sensing course at CSU
- Guest lecturer for seminar series at Ball Aerospace & Technologies Corp.

PROFESSIONAL MEMBERSHIP

- Member, Institute of Electrical and Electronics Engineers (IEEE)
- Member, American Geophysical Union (AGU)

- Member, American Meteorological Society (AMS)
- Member, National Research Council Committee on Radio Frequencies (2007-present)

HONORS/AWARDS

- *ATOC Exceptional Service Award* for outstanding contributions to PAOS department
- Inducted into *Phi Beta Kappa* Honor Society
- Received the *Vaden W. Miles Award* for outstanding scholastic achievement
- President of the Wayne State University chapter of *The Society of Physics Students*
- Awarded *Wayne State University Presidential Merit Scholarship*
- Multiple outstanding achievement awards for system engineering at Ball Aerospace & Technologies Corp.

SELECTED REFEREED PUBLICATIONS:

- Garand, L., D.S. Turner, M. Larocque, J. Bates, S. Boukabar, P. Brunel, F. Chevallier, G. Deblonde, R. Engelen, M. Hollingshead, D. Jackson, G. Jedlovec, J. Joiner, T. Kleespies, D.S. McKague, L. McMillin, J.-L. Moncet, J.R. Pardo, P.J. Rayer, E. Salathe, R. Saunders, N.A. Scott, P. Van Delst, and H. Woolf, 2001: Radiance and Jacobian intercomparison of radiative transfer models applied to HIRS and AMSU channels. *J. Geophys. Res.*, **106**, 24017-24031.
- McKague, Darren, K. Franklin Evans, Susan Avery, 1998: Assessment of the Effects of Drop Size Distribution Variations Retrieved from UHF Radar on Passive Microwave Remote Sensing of Precipitation. *Journal of Applied Meteorology*: **37**, No. 2, 155–165.
- McKague, Darren, K. Franklin Evans, 2002: Multichannel Satellite Retrieval of Cloud Parameter Probability Distribution Functions. *Journal of the Atmospheric Sciences*: **59**, No. 8, 1371–1382.
- McKague, Darren, Christopher Ruf, John J. Puckett, 2008: Vicarious Calibration of the Global Precipitation Mission Microwave Radiometers. *Proceedings IGARSS '08*, Boston, Massachusetts USA.
- Naik, R., A. Poli, Darren McKague, A. Lukaszew, and L.E. Wenger, 1995: Strain Induced Perpendicular Magnetic Anisotropy of <100>-Oriented Ni-Cu Superlattices. *Phys. Rev. B*, **51**, 3549-3553.
- Smith, E.A., P. Bauer, F.S. Marzano, C.D. Kummerow, D. McKague, A. Mugnai, and G. Panegrossi, 2002: Intercomparison of microwave radiative transfer models in precipitating clouds. *IEEE Trans. Geosci. Remote Sens.*, **40**, 541-549.