

MARK SMALLEY
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EDUCATION

Ph.D. in Atmospheric and Oceanic Sciences **May 13 2016**

University of Wisconsin-Madison

Dissertation: "Precipitation Aggregation and the Local Environment"

GPA: 3.837 (M.S. & Ph.D.)

M.S. in Atmospheric and Oceanic Sciences **2011**

University of Wisconsin-Madison

Thesis: "Effects of Spectral Response Function Differences on CO2 Slicing with an Application to Cloud Climatologies"

B.S. in Physics and Astronomy **2008**

University of Iowa

AWARDS

Best student poster presentation, 17th Conference on Satellite Meteorology and Oceanography, Annapolis, MD **2010**

Waldo Edward & Martha Althaus Smith Memorial Award, University of Iowa **2008**

I.C.R.U Student Research Grant, University of Iowa **2007**

RESEARCH EXPERIENCE

Assistant Researcher I at NASA Jet Propulsion Laboratory UCLA-JIFRESSE **Aug 2019-Present**

329J Aerosols and Clouds

- Investigation of model physics that are required for realistic representation of a continuum of cloud types from shallow cumuli to stratocumuli
- Development of a deep convection tracking algorithm from geostationary satellites

JPL Post-Doctoral Scholar at NASA Jet Propulsion Laboratory NASA-JPL **May 2018-Present**

329J Aerosols and Clouds

- Investigation of model physics that are required for realistic representation of a continuum of cloud types from shallow cumuli to stratocumuli
 - Global observations from NASA A-train instruments provide a benchmark truth for simulations
 - Parameterization is implemented within a single column model initialized by a co-located weather reanalysis
- Statistical research into observed relationships between clouds and precipitation at the global scale

Caltech Post-Doctoral Scholar at NASA Jet Propulsion Laboratory NASA-JPL **Aug 2016-Apr 2018**

329J Aerosols and Clouds

- Improving a shallow and deep convective cloud parameterization
 - Specific parameter values are constrained by global observations from NASA A-train instruments
 - Parameterization is implemented within a single column model initialized by a co-located weather reanalysis
- Statistical research into observed relationships between clouds and precipitation at the global scale

Post-Doctoral Research Scholar UW-Madison Dept. of Atmos. and Ocn. Sciences **May 2016 – Aug 2016**

Tristan L'Ecuyer Research Group

- Assessed precipitation retrievals from space-borne W-band CloudSat radar and surface based WSR-88D radars (NOAA/NSSL Multi-Radar Multi-System; MRMS)
 - Collaboration with the University of Oklahoma

Doctoral Research Assistant UW-Madison Dept. of Atmos. and Ocn. Sciences
Tristan L'Ecuyer Research Group

Jan 2012 – May 2016

- Developed a new approach of describing the spatial characteristics of precipitation
- Established a new functional relationship of probability of precipitation and resolution
 - This led to finding connections between atmospheric states and precipitation spatial characteristics, namely the number of events and their relative spacing, yielding a possible route to general circulation model parameterizations
- Assessed precipitation retrievals from space-borne W-band CloudSat radar and surface based WSR-88D radars (NCEP Stage IV)
- Collaborated on two publications with researchers outside the L'Ecuyer research group
- Mentored and assisted other group members with scripting and their research
- Produced co-located datasets of CloudSat and the NASA MERRA reanalysis, CloudSat and Stage IV, and CloudSat and NMQ/MRMS

Masters Research Assistant UW-Madison Dept. of Atmos. and Ocn. Sciences
Steve Ackerman / Bob Holz Research Group

Aug 2008 - Aug 2011

- Conducted a controlled experiment to study how differences in infrared spectral response functions affect cloud height climatologies
 - Employed observations from a suite of space-born A-train instruments, including passive infrared (MODIS, HIRS), active visible (CALIOP), and passive hyper-spectral infrared (AIRS)
 - Scripted a CO2 Slicing algorithm to retrieve cloud heights from two infrared MODIS channels and MODIS-simulated channels from AIRS
- Utilized the Line-By-Line Radiative Transfer Model to simulate MODIS and HIRS clear-sky observations
- Exploited cluster computing techniques to run the controlled experiment in parallel

PUBLICATIONS

Mark Smalley, K. Suselj, M. D. Lebsock, and J. Teixeira, 2019: A novel framework for evaluating and improving parameterized subtropical marine boundary layer cloudiness. *Mon. Weather Rev.*, **147**, 3241-3260. 10.1175/MWR-D-18-0394.1

Lebsock, M., D., T. S. L'Ecuyer, N. B. Wood, J. M. Haynes and **Mark Smalley**, 2019: Status of the CloudSat Mission, in *Satellite Precipitation Measurement*, Editors: Vincenzo Levizzani, Chris Kidd, Dalia Kirschbaum, Chris Kummerow, Kenji Kummerov and F Joseph Turk, Springer Nature, Switzerland.

Graeme Stephens, A. Behrangi, T. S. L'Ecuyer, M. D. Lebsock, and **Mark Smalley**, Submitted: Revisiting the question - how often does it really rain? *Bull. Amer. Meteor. Soc.*

Graeme Stephens, **Mark Smalley**, and M. D. Lebsock, 2019: The cloudy nature of tropical rains. *J. Geophys. Res. Atmos.*, **124**, 171–188. <https://doi.org/10.1029/2018JD029394>

Mark Smalley, P. E. Kirstetter, and T. L'Ecuyer, 2017: How Frequent is Precipitation over the Contiguous United States? Perspectives from Ground-Based and Spaceborne Radars. *J. Hydro*, **18**, 1657-1672.

Mark Smalley and T. S. L'Ecuyer, 2015: A global assessment of the spatial distribution of precipitation occurrence. *J. Appl. Meteor. Climatol.*, **54**, 2179-2197.

Lars Norin, A. Devasthale, T. S. L'Ecuyer, N. B. Wood, and **Mark Smalley**, 2015: Intercomparison of snowfall estimates derived from the CloudSat Cloud Profiling Radar and the ground-based weather radar network over Sweden. *Atmospheric Measurement Techniques*, **8**, 12.

Mark Smalley, T. S. L'Ecuyer, M. Lebsock, and J. Haynes, 2014: A comparison of precipitation occurrence from the NCEP Stage IV QPE product and the CloudSat Cloud Profiling Radar. *J. Hydrometeorol.*, **15**, 444-458.

PEER REVIEW

Served as a referee for the “Journal of Geophysical Research” and “International Journal of Digital Earth”

FIELD WORK

OLYMPEX-RADEX GPM validation campaign

Nov 10 - Nov 18 2015

Operated the Doppler On Wheels at Lake Quinault

PROGRAMMING LANGUAGES

Fluent in Matlab

Have experience in Python

Have experience in Fortran

TEACHING EXPERIENCE

Academic Tutor UW-Madison Athletic Department

2015

Assisted student physics, astronomy, and atmospheric science learning through weekly meetings

MEMBERSHIPS

American Meteorological Society

American Geophysical Union

EXTRA CURRICULAR ACTIVITIES

Served on the UW-Madison Dept. of Atmos. and Ocn. Sciences Colloquium Committee

2012 – 2015

Invited speakers and organized meetings and logistics for weekly department lecture series

ORAL PRESENTATIONS

Evaluating Marine Boundary Layer Cloudiness in an Eddy-Diffusivity/Mass-Flux Turbulence Parameterization

2018

Oral presentation at the American Geophysical Union Fall Meeting 2018. Washington, D.C.

Evaluating and tuning a single column model with CloudSat/CALIPSO

2018

Oral presentation at CALIPSO/CloudSat Annual Science Operations Review 2018. Boulder, CO

Precipitation aggregation and local atmospheric state

2016

Invited presentation at NASA Jet Propulsion Laboratory. Pasadena, CA

Precipitation aggregation and local atmospheric state

2016

Oral Defense / Dept. of Atmos. and Ocn. Sciences Colloquium Series. Madison, WI

Precipitation aggregation and the local atmospheric state

2016

Talk at CALIPSO/CloudSat Science Team Meeting. Newport News, VA

Impacts of instrument sensitivity and spatial resolution on precipitation retrievals from satellite radars

2015

Talk at the AMS 37th Radar Conference. Norman, OK

The spatial distribution of precipitation and its connection to the local environment

2015

Talk at AOSS Department Seminar. Madison, WI

The spatial distribution of precipitation and its connection to the local environment

2014

Talk at CALIPSO/CloudSat Science Team Meeting. Alexandria, VA

Uncertainties in cloud climatologies due to inter-instrument differences in the spectral response function of HIRS and MODIS **2011**
Talk at AOSS Department Seminar. Madison, WI

POSTER PRESENTATIONS

NASA Satellites and a JPL Parameterization Constrain Physics Required for Accurate Simulation of Low Clouds and Rain **2019**

Poster at the JPL Postdoc Research Day 2019. Pasadena, CA

Essentials for simulating the observed relationship between subtropical marine boundary layer cloudiness and inversion strength **2018**

Poster at the 15th Conference on Cloud Physics 2018. Vancouver, British Columbia

Essentials for realistic simulations of subtropical marine stratocumulus clouds **2018**

Poster at the JPL Postdoc Research Day 2018. Pasadena, CA

Tuning the JPL EDMF Cloud Parameterization with a Suite of A-Train Observations **2017**

Poster at the American Geophysical Union – Fall Meeting 2017. New Orleans, LA

Tuning the JPL EDMF Cloud Parameterization with a Suite of A-Train Observations **2017**

Poster at the American Geophysical Union – Fall Meeting 2017. New Orleans, LA

Improvements to the JPL EDMF Cloud Parameterization by a Suite of A-Train Satellite Observations **2017**

Poster at the JPL Postdoc Research Day 2017. Pasadena, CA

Improvements to the JPL EDMF Cloud Parameterization by a Suite of A-Train Observations **2017**

Poster at the A-Train Symposium 2017. Pasadena, CA

A comparison of precipitation occurrence from the Multi-Radar Multi-Sensor System and the CloudSat Cloud Profiling Radar **2015**

Poster at the AMS 37th Radar Conference. Norman, OK

The relationships between precipitation spatial distributions and the environment **2015**

Poster at the 5th AOSS Poster Reception. Madison, WI

Spatial scaling relationships of precipitation: a perspective from CloudSat **2014**

Poster at the Reid Bryson Earth Day Conference. Madison, WI

A comparison of precipitation occurrence from NCEP's StageIV and CloudSat's Cloud Profiling Radar **2013**

Poster at the American Meteorological Society's Annual Meeting. Austin, TX

Investigating the relationship between CO₂ slicing derived cloud top heights and instrument spectral differences **2010**

Poster at the 17th Conference on Satellite Meteorology and Oceanography. Annapolis, MD

Measurements of mineral dusts' scattering dependence on wavelengths in the visible and a comparison to Mie Theory **2008**

Poster at the I.C.R.U. Spring Undergraduate Research Festival. Iowa City, IA