

## Dr. Annareli Morales

National Center for Atmospheric Research  
Advanced Studies Program  
P.O. Box 3000, Boulder, CO 80307

Office: 303-497-1614  
Email: [amorales@ucar.edu](mailto:amorales@ucar.edu)  
Website: <https://staff.ucar.edu/users/amorales>

### Education

Ph.D. University of Michigan, Atmospheric, Oceanic, and Space Sciences	2019
M.S. University of Michigan, Atmospheric, Oceanic, and Space Sciences	2016
M.S. Colorado State University, Atmospheric Science	2014
B.S. University of Illinois at Urbana-Champaign, Atmospheric Science and Geology	2012

### Research Experience

*Advanced Study Program (ASP) Postdoctoral Fellow,* 2019-Present  
*National Center for Atmospheric Research (NCAR)*

Hosted by Andreas Prein at the Mesoscale and Microscale Meteorology (MMM) and performing research on orographic precipitation, and precipitation intermittency and variability in southwestern Mexico using merged satellite observational datasets.

*Orographic Precipitation Sensitivity to Microphysical and Environmental* 2014-2019  
*Parameter Perturbations in Moist, Nearly Neutral Flow, University of Michigan (UM)*

Performed independent research on the sensitivity of orographic precipitation to microphysical, environmental, and mountain geometry perturbations under the guidance of Derek Posselt and Hugh Morrison. I ran idealized simulations of flow characteristic of atmospheric rivers using Cloud Model 1, and configured model source code and microphysics scheme to test hypotheses. Implemented a statistical algorithm to the model design and used the programming languages NCL and GrADS to visualize and analyze model output.

*Effect of Latent Heating on Mesoscale Vortex Development* 2012-2014  
*During Extreme Precipitation: Colorado, September 2013, Colorado State University (CSU)*

Performed independent research on the effects of latent heat release to the enhancement of a mesoscale vortex during the 2013 Colorado Floods under the guidance of Russ Schumacher and Sonia Kreidenweis. I implemented code to the Thompson microphysics scheme within the Weather Research and Forecasting (WRF) model to output microphysical process rates and ran WRF with different latent heating settings.

*Sensitivity of a Simulated Deep Convective Storm to WRF Microphysical* Summer 2012  
*Schemes and Horizontal Resolution, Significant Opportunities*  
*in Atmospheric Research and Sciences (SOARS) Program Student Research Intern*

Simulated an idealized, single-cell deep convective storm using WRF and tested the sensitivity of storm development, intensity, structure, and precipitation efficiency for different

microphysical parameterizations and horizontal grid spacings under the guidance of Hugh Morrison and Cecille Villanueva-Birriel.

*PartMC Model Simulations of Internally Mixed Aerosol Particles,* University of Illinois (UIUC) Fall 2011

Simulated dust and sea salt particles using the Particle-resolved Monte Carlo aerosol model to understand how the internal mixing processes develops under the guidance of Nicole Reimer and Joseph Ching.

*Semi-Empirical Functions Describing the Response of Short-Lived Radicals to their Driving Forces in the WRF/Chem Model, SOARS Program Student Research Intern* Summer 2011  
Analyzed WRF-Chem model output to correlate the short-lived hydroxyl radical with its environmental and chemical driving factors under the guidance of Sasha Madronich and Alma Hodzic.

### Field Work Experience

*Remote Sensing of Electrification, Lightning, and Mesoscale/Microscale Processes with Adaptive Ground Observations (RELAMPAGO) Field Campaign, Argentina* Fall 2018

Launched radiosondes to gather atmospheric data during deep convection initiation in the provinces of Córdoba and Mendoza for 7 intensive observation periods. Responsible for training students to use Vaisala sounding system, setting up UHF and GPS antennas and surface stations, as well as preparing balloons and sondes. Provided Spanish translation and participated in numerous education and outreach activities with local and rural schools around Córdoba.

*Doppler On Wheels (DOW) Field Project, UIUC Radar Meteorology Course* Fall 2010  
Collected data on boundary layer rolls using the DOW7 mobile radar and analyzed Bragg Scattering from clear air echo. I used the GR2Analyst and NCAR/SOLO software to characterize the early Fall boundary layer.

*Profiling of Winter Storms (PLOWs) Project, Wisconsin, USA* Spring 2009  
Launched radiosondes to gather atmospheric data during winter storms.

### Publications

6. **Morales, A.,** D. J. Posselt, H. Morrison, 2020: Can different combinations of environmental conditions and microphysical parameter values produce a similar orographic precipitation distribution? *J. Atmos. Sci., In Review*
5. **Morales, A.,** D. J. Posselt, H. Morrison, F. He, 2019: Assessing the Influence of Microphysical and Environmental Parameter Perturbations on Orographic Precipitation, *J. Atmos. Sci.*, **76**(5), 1373-1395.

4. **Morales, A.**, H. Morrison, D. J. Posselt, 2018: Orographic precipitation response to perturbations in microphysical parameters for idealized moist nearly neutral flow. *J. Atmos. Sci.*, **75**, 1933-1953.
3. **Morales, A.**, R. S. Schumacher, and S.M. Kreidenweis, 2015: Mesoscale vortex development during extreme precipitation: Colorado, September 2013. *Mon. Wea. Rev.*, **143**, 4943-4962.
2. **Morales, A.**, 2015: Cyclonic circulation development during extreme precipitation. *Down to Earth, Physics Today*. Published Online April 21, 2015.
1. Morrison, H., **A. Morales**, and C. Villanueva-Birriel, 2015: Concurrent sensitivities of an idealized deep convective storm to parameterization of microphysics, horizontal grid resolution, and environmental static stability. *Mon. Wea. Rev.*, **143**, 2082-2104.

### Presentations

“Special Session: Panel Discussion on Inclusiveness”, AMS 19<sup>th</sup> Mountain Meteorology Virtual Conference, July 2020. [Invited panelist]

**Morales, A.**: “*Understanding Environmental and Microphysical Parameter Relationships using a Markov Chain Monte Carlo Approach*”. Cloud-scale modelling workshop, Boulder, CO, January 2020 [Oral]

**Morales, A.**: “*Lost and Found*”. Why AGU Scientists Study the Earth and Space, eLightning session and panel discussion, AGU Fall Meeting, San Francisco, CA, December 2019 [Invited]

**Morales, A.**, D. J. Posselt, H. Morrison: “*Multivariate Sensitivity Analysis of Orographic Precipitation Within an Idealized Atmospheric River Environment*”.

AMS Annual Meeting, Boston, MA, January 2020 [Poster presented by Derek J. Posselt]

- AGU Fall Meeting, San Francisco, CA, December 2019 [Poster]
- 13<sup>th</sup> Annual Earth System and Space Science Poster Conference, Boulder, CO, December 2019 [Poster]

**Morales, A.**, D. J. Posselt, H. Morrison, and F. He: “*Orographic Precipitation from Atmospheric Rivers: Exploring the response to microphysics and environmental parameter perturbations*”.

NOAA Physical Science Division Seminar, Boulder, CO, December 2018. [Oral]

**Morales, A.**, D. J. Posselt, H. Morrison, and F. He: “*Orographic Precipitation Response to Microphysical and Environmental Perturbations for Idealized Moist Nearly Neutral Flow*”.

- AGU Fall Meeting, Washington, D.C., December 2018 [Poster]
- 8<sup>th</sup> Annual Young Scientist Symposium on Atmospheric Research, Fort Collins, CO, Oct. 2018 [Oral]
- AMS Mountain Meteorology Conference, Santa Fe, NM, June 2018. [Oral]

**Morales, A.**: “*Flooding in Colorado*”

- Seminar for HERS program, NCAR, Boulder, CO, July 2018. [Invited]
- Seminar for Bridge to the Geosciences program, NCAR, Boulder, CO, June 2018. [Invited]

- Morales, A.:** “*Orographic Precipitation: Exploring the Response to Microphysics and Environmental Parameter Perturbations*”. NCAR MMM Seminar, Boulder, CO, May 2018. [Oral]
- Posselt, D.J., G. Tierney, F. He, and **A. Morales:** “*Moist Processes as Triggers for Tipping Points in Weather-Climate Interactions*”. AMS 98<sup>th</sup> Annual Meeting, Austin, TX, Jan 2018 [Poster]
- Morales, A.,** D.J. Posselt, and H. Morrison: “*Sensitivity of Orographic Precipitation to Microphysics Parameter and Process Perturbations*”.
- JPL Earth Science Seminar, Pasadena, CA, July 2017 [Oral]
  - American Meteorological Society (AMS) 98<sup>th</sup> Annual Meeting, Austin, TX, Jan 2018 [Poster]
- Morales, A.,** D.J. Posselt, and H. Morrison: “*Sensitivity of Orographic Precipitation to Ice Microphysics Parameter Perturbations*”.
- AMS 17<sup>th</sup> Conference on Mesoscale Processes, San Diego, CA, July 2017 [Oral]
  - 7<sup>th</sup> Annual Young Scientist Symposium on Atmospheric Research, Fort Collins, CO, Oct. 2017 [Oral]
- Morales, A.,** and D.J. Posselt: “*Evaluating the Influence of Microphysics on Orographic Precipitation*”. AMS 17<sup>th</sup> Conference on Mountain Meteorology, Burlington, VT, June 2016 [Oral]
- Morales, A.,** and D.J. Posselt: “*Evaluating the influence of ice microphysics on an idealized simulation of orographic precipitation*”.
- American Geophysical Union Annual Fall Meeting, San Francisco, CA, Dec 2015 [Poster]
  - AMS 16<sup>th</sup> Conference on Mesoscale Processes, Boston, MA, Aug 2015 [Oral]
- Morales, A.,** R. Schumacher, and S. Kreidenweis: “*Effect of Latent Heating on Mesoscale Vortex Development during Extreme Precipitation: Colorado, September 2013*”.
- American Meteorological Society (AMS) 16<sup>th</sup> Conference on Mesoscale Processes, Boston, MA, Aug 2015 [Poster]
  - AMS 95<sup>th</sup> Annual Meeting, Phoenix, AZ, Jan 2015 [Poster]
- Schumacher, R., and **A. Morales:** “*Mesoscale Atmospheric Processes during the September 2013 Extreme Rainfall and Flooding in Colorado*”. AMS 95<sup>th</sup> Annual Meeting, Phoenix, AZ, June 2015. [Oral]
- Schumacher, R., and **A. Morales:** “*Atmospheric Processes Associated with the September 2013 Colorado Extreme Rainfall and Flooding*”. AMS 16<sup>th</sup> Conference on Mountain Meteorology, San Diego, CA, Aug 2014. [Oral]
- Morales, A.,** C. Villanueva-Birriel, H. Morrison: “*Concurrent Sensitivities of an Isolated Deep Convective Storm to Parameterization of Microphysics, Horizontal Resolution, and Environmental Sounding*”. AMS 94<sup>th</sup> Annual Meeting, Atlanta, GA, Feb 2014. [Oral]
- Roy, G., **A. Morales,** A. Gonzalez: “*¡UADY, CSU, y Tu!*”. Disaster Awareness and Prevention Conference, Merida, Yucatán, Mexico, Jun 2013 [Oral]

**Morales, A., C. Villanueva-Birriel, H. Morrison:** “*Sensitivity of a Simulated Deep Convective Storm to WRF Microphysical Schemes and Horizontal Resolution*”.

- Center for Multiscale Modeling of Atmospheric Processes (CMMAP) Student Summer Colloquium, Fort Collins, CO, Aug 2013 [Oral]
- CSU Atmospheric Chemistry Colloquium, Fort Collins, CO, Jul 2013 [Oral]
- AMS 93<sup>rd</sup> Annual Meeting, Austin, TX, Jan 2013 [Poster]
- CSU American Association for Aerosol Research (AAAR) Student Chapter’s Young Scientist Symposium in Atmospheric Research, Fort Collins, CO, Oct 2012 [Oral]
- SOARS Oral Colloquium and Poster Session, Boulder, CO, Aug 2012 [Oral and Poster]

**Morales, A., A. Hodzic, S. Madronich:** “*Semi-Empirical Functions Describing the Response of Short-Lived Radicals to their Driving Forces in the WRF/Chem Model*”.

- 11<sup>th</sup> AMS Student Conference, New Orleans, LA, Jan 2012 [Poster]
- Society for Advancement of Chicanos and Native Americans in Science (SACNAS) Annual Meeting, San Jose, CA, Oct 2011 [Poster]
- SOARS Oral Colloquium and Poster Session, Boulder, CO, Aug 2011

### Teaching Experience

*UM Department of Climate and Space Sciences and Engineering (CLaSP)* Winter 2017  
*Graduate Student Instructor, CLIMATE 102 - Extreme Weather (16-week course, 3 credits)*

Prepared and graded exams, held review sessions and weekly office hours, answered daily questions through email and Active Learning Platform, and guest lectured on Thunderstorms and Lightning for a class of over 180 undergraduate students.

*Autonomous University of Yucatán (UADY) Engineering Department, Mexico* Summer 2013  
*Instructor, Introduction to Meteorology and Hurricanes (2-week course, 2 credits)*

Taught introductory meteorology concepts for 20 undergraduate/graduate engineering students through lectures, homework, daily weather discussions, and hands-on experiments in Spanish. The course goal was to raise interest and encourage students to obtain higher degrees in atmospheric science and have them return to UADY in hopes of developing a graduate program with a focus in hurricane forecasting.

### Mentoring Experience

*SOARS Program, Writing Mentor* 2017, 2018  
Edited and provided critique for undergraduate student’s presentations, research paper, and abstract

*Pre-College Internship Program (PRECIP), Science Mentor* 2016  
Developed 6-week science project for high school student and taught her to run a model to understand orographic precipitation and to use GrADS scripts to analyze results. I mentored, encouraged, and answered her questions on performing scientific research and starting college.

Student presented her results during the NCAR poster session and produced a final research paper.

*SOARS Program, Peer Mentor* 2012  
Provided peer support and advice for new student intern.

*High School Internship and Research Opportunities (HIRO) Program, Peer Mentor* 2011  
Provided peer support, encouragement, and guidance on research project for high school student intern analyzing radar data.

### Technical Skills

- Computer: Mac OS, Windows OS, Microsoft Office, Adobe Illustrator, Linux command line, LaTeX
- Scripting Languages: NCL, GrADS, MATLAB, Bash, Shell, some Fortran and R
- Language: Fluent in English and Spanish
- Software: Vaisala DigiCORA Sounding System MW4

### Professional Development

NCAR Citizen Science Short Course, Online 2020  
NCAR ASP Leadership and Diversity, Equity, and Inclusion Training 2020  
Engaged Scientist Workshop, “Communication Tools for Effective Outreach” 2019  
ESWN Professional Development Workshop: Leadership Skills for Success  
in the Scientific Workforce 2019  
Atmospheric River Summer Colloquium at Scripps Institute of Oceanography 2019  
ASP Summer Colloquium on Interaction of Precipitation with Orography 2017  
University of Washington, OLYMPEX Workshop 2017  
Introduction to Bayesian Statistics Workshop, NCAR 2016  
Studies of Precipitation, Flooding, and Rainfall Extremes Across Disciplines  
Workshops 2013, 2014  
CSU Professional Development Institute workshops 2013, 2014

### Organizational Service

UCAR Work From Home Task Force (Core Team) 2020  
NCAR MMM Associate Director Search Committee 2020  
AMS Latinx Committee, Academia Ambassador Lead 2020-Present  
Denver/Boulder Local Chapter of the AMS, President 2019-2020  
ASP Social Networking Committee 2019-Present  
AMS Mountain Meteorology Committee Student Member 2017-2019  
Climate and Space Sciences Session Co-Chair for UM Engineering Graduate Symposium 2016  
SOARS Newsletter Subcommittee 2016-2017

Event Coordinator for department Graduate Undergraduate Student Organization	2016-2017
CLaSP Department Grievance Committee Member	2015-2017
Co-developer and organizer of Monthly “Ladies Lunch” in CLaSP	2015-2016
Membership chair for UM Grad Chapter of Society of Hispanic Professional Engineers	2015
UM College of Engineering Department Visit Committee member	2015
Session chair and member of AMS Student Conference Planning Committee	2013-2015
CSU Graduate Student Council, Atmospheric Science M.S. Representative	2013-2014
CSU American Association for Aerosol Research (AAAR) Student Chapter, Member and Secretary	2012-2014

### Education and Outreach

STEAM Camp presentation (Invited), Colorado Migrant Education Program	2020
“Ask NCAR” Virtual Presentation for K-12 students and public audience, Boulder, CO	2020
Womxn of Color in STEM panel (Invited), CU-Boulder, Boulder, CO	2020
Career Panel for students at CU-Boulder (Invited), Boulder, CO	2019
Career Panel for students at Metro State University, Denver, CO	2019
“STEMinists of Color” career panel (Invited), Community College of Denver, CO	2019
Volunteer in radar booth, Super Science Saturday, Boulder, CO	2019
Presenter at Q&A Session for high school girls in ZClub, Boulder, CO	2019
Panelist in ASP Postdoc panel for graduate students (Invited), Boulder, CO	2019
Presentations at multiple schools discussing RELAMPAGO campaign, Argentina	2018
Guest lecturer on precipitation and clouds, South Kitsap School District, Seattle, OR,	2018
Morales Physical Science Scholarship at Morton East High School, Cicero, IL	2018-Present
Volunteer in storm surge booth, Super Science Saturday, Boulder, CO	2017
Graduate School Panelist (Invited), Undergraduate Leadership Workshop, Boulder, CO	2017
Presenter at Chelsea Elementary PTO Science Night, Chelsea, MI	2017
Presenter/coordinator of Science Expo at Casa de la Esperanza, Longmont, CO	2016
Presenter during engineering workshop for middle school girls, Ann Arbor, MI	2016
Panelist during SHPE Graduate School Q&A session, Ann Arbor, MI	2016
Flood expert for students at Northside Elementary School, Ann Arbor, MI	2015
Volunteer at science booth during Chelsea Science Night, Chelsea, MI	2015
Organizer/presenter of outreach activity at Family Center, Fort Collins, CO	2014
Speaker for Exploring Your Horizons workshop, Boulder, CO	2014
Developer/organizer of Super Science Saturday science booth, Boulder, CO	2013
Volunteer at UCAR/Spark Booth at Northern Colorado Maker Faire, , Loveland, CO	2013
Organizer/presenter at Little Shop of Physics Open House, Fort Collins, CO	2013
Volunteer at UCAR/Spark Booth during Super Science Saturday, Boulder, CO	2012
Volunteer at UCAR/Spark Booth during WeatherFest, New Orleans, LA	2012
Presenter/translator during Science Expo at Casa de la Esperanza, Longmont, CO	2011

## Honors and Awards

ASP Postdoctoral Fellowship, UCAR/NCAR	2019
UM Richard F. and Eleanor A. Towner Prize for Distinguished Academic Achievement	2018
UM Rackham Predoctoral Fellowship	2018-2019
UM ScholarPOWER PhD Candidate Achievement Award	2017
NCAR ASP Summer Colloquium on Interaction of Precipitation with Orography	2017
UM Rackham Conference Travel Grant	2015, 2017, 2018
Warner Internship for Scientific Enrichment Award, NCAR RAL	2016
ASP Graduate Visitor Program – NCAR Mesoscale and Microscale Meteorology Lab	2016
2 <sup>nd</sup> Place Poster Presentation – AMS 16 <sup>th</sup> Conference on Mesoscale Processes	2015
UM Rackham Merit Fellowship	2015-2016, 2017-2018
SOARS Graduate Fellowship – CSU	2012-2014
UIUC High Distinction in Atmospheric Science	2012
UIUC Yoshi Ogura Undergraduate Research Award	2012
UIUC Dean’s List Honor Roll	2011, 2012
SACNAS National Conference Travel Scholarship	2011
UIUC Horace Wu Dining Service Scholarship	2011, 2012
League of United Latin American Citizens Scholarship	2008