

# MIMI HUGHES

[mimi.hughes@noaa.gov](mailto:mimi.hughes@noaa.gov)

325 Broadway St., NOAA/ESRL/PSD

Boulder, CO 80305

work: (303) 497-4865; cell: (818) 825-3540

## EDUCATION

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**Ph.D.** Atmospheric and Ocean Sciences, University of California, Los Angeles, CA, 2008

**M.S.** Atmospheric and Oceanic Sciences, University of California, Los Angeles, CA, 2004

**B.S.** Electrical Engineering (Magna cum laude) and Mathematics (Cum laude),  
Pennsylvania State University, University Park, PA, 2002

## PROFESSIONAL EXPERIENCE

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**Oct. 2010-pres. CIRES, University of Colorado, Boulder, CO**

**Research Scientist II (RS1 from Oct. 2010-Jun. 2014)**

Regional climate of mid-latitude mountains: I research atmospheric rivers and orographic precipitation using both a regional reanalysis downscaling and observations. I focus on understanding what controls the distribution of orographic precipitation when wintertime cyclones (often containing atmospheric rivers) impinge on the western United States' topography, and the connections between these features of regional climate and the global climate system.

Arctic science: I am involved in the testing and development of the recently developed Regional Arctic System Model, and am testing the impact of spectral nudging on the atmospheric component of that model with the goal of improved sea-ice forecasts. I also am using the Weather, Research, and Forecast (WRF) model to downscale the ERA-Interim reanalysis to 50- and 10-km horizontal resolution for a climatological investigation of near-surface wind extremes in the Arctic.

**Oct. 2008-Sept. 2010 NOAA ESRL PSD Water Cycle Branch**

**Boulder, CO**

**Postdoctoral Research Associate**

Generated an 11-year, 6km downscaling of California with WRF. Validated this downscaling against wind-profiler data and sounding data to assess its applicability for investigations of dynamics of the Sierra Barrier Jet. Investigated low-frequency variability and trends of Santa Ana winds in observations over the past half century. Generated meteorological data for ARkStorm.

**2002-Sept. 2008**

**Climate Sensitivity Research Lounge**

**Los Angeles, CA**

**Research Assistant**

Researched mesoscale climate dynamics of Southern California using a high-resolution (6km) climate reconstruction created with MM5. I focused on three aspects of the climate that are unresolvable by traditional climate models: the

diurnal cycle of surface air temperature and wind, the interaction of topography with precipitation, and the dynamical causes of the Santa Ana winds.

**2000-2002 Atmospheric Sensing and Lidar Lab University Park, PA**

**Undergraduate Research Assistant**

Designed and built the receiver for a Rayleigh Lidar, focusing on the integration of optical choppers into the system. Advisor: Dr. Tim Kane

**1999-2000 Applied Research Laboratory University Park, PA**

**Co-operative Education Student**

Implemented and tested a nonlinear algorithm for adaptive filtering. Tested its robustness compared to both signal/noise ratio and number of input signals.

### **TEACHING EXPERIENCE**

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**2014 CU Boulder, Atmos. and Ocean. Sci. Boulder, CO**

Guest lecturer: ATOC 5050 – Introductory dynamics

**2014 CU Boulder, Atmos. and Ocean. Sci. Boulder, CO**

Instructor: ATOC 1050 – Weather and the Atmosphere

**2005 UCLA Dept. of Atmos. and Ocean. Sci. Los Angeles, CA**

Teaching Assistant: AOS 1 – Climate Change: from puzzles to policy

**1999 Learning Resource Center University Park, PA**

Supplemental Instruction Leader – Introduction to Statistics

### **PUBLICATIONS**

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**Hughes M, Cassano JJ, Roberts A., Maslowski W. (2015) Sensitivity of Arctic climate in the Regional Arctic System Model to atmospheric nudging. *J. Clim.*, in prep.**

**Hughes M, Cassano JJ (2015) The climatological distribution of extreme Arctic winds, and implications for ocean and sea ice processes. *JGR-Atmospheres*, in press. DOI 10.1002/2015JD023189.**

**Hughes M, Mahoney K, Neiman P, Moore BJ, Alexander M, Ralph FM (2014) The Landfall and Inland Penetration of a Flood-Producing Atmospheric River in Arizona. Part II: Sensitivity of modeled precipitation to terrain height and atmospheric river orientation. *J. Hydromet.*, 15, 1954–1974.**

**Hughes M, Neiman PJ, Sukovich E, and Ralph FM (2012) Representation of the Sierra Barrier Jet in 11 years of a high-resolution dynamical reanalysis downscaling compared**

with long-term wind profiler observations, *JGR-Atmospheres*, 117, doi:10.1029/2012JD017869.

**Hughes M**, Hall A, and Kim, J (2011) Human-induced changes in wind, temperature and relative humidity during Santa Ana events. *Clim. Change*. 109 (S1), 119-132.

**Hughes M** and Hall A (2010) Local and synoptic mechanisms causing Southern California's Santa Ana winds, *Clim. Dyn.* 34:847-857 DOI: 10.1007/s00382-009-0650-4.

**Hughes M**, Hall A, and Kim, J (2009) Anthropogenic Reduction of Santa Ana winds, California Environmental Protection Agency and California Energy Commission Report CEC-500-2009-030-F.

**Hughes M**, Hall A, Fovell, RG (2009) Blocking in areas of complex topography and its influence on rainfall distribution, *J. Atmos. Sci.*, 66:508-518, DOI: 10.1175/2008JAS2689.1.

**Hughes M**, Hall A, Fovell RG (2007) Dynamical controls on the diurnal cycle of temperature in complex topography. *Clim. Dyn.* 29:277–292.

Hamman, J, Nijssen B, Brunke M, Cassano J, DuVivier A, **Hughes M**, Lettenmaier D, Maslowski W, Roberts A, Zeng X (2015) Land Surface Climate in the Regional Arctic System Model, *J. Clim.*, submitted.

Lundquist J, **Hughes M**, Henn B; Gutmann, ED; Livneh, B; Dozier, J; Neiman P (2015) High-elevation precipitation patterns: using snow measurements to assess daily gridded datasets across the Sierra Nevada, California, *J. Hydromet.*, in press. DOI <http://dx.doi.org/10.1175/JHM-D-15-0019.1>

Alexander M, Scott JD, Swales D, **Hughes M**, Mahoney K, Smith CA (2014) Moisture Pathways into the U.S. Intermountain West Associated with Heavy Winter Precipitation Events. *J. Hydrometeorol*, 16, 1184–1206. DOI: <http://dx.doi.org/10.1175/JHM-D-14-0139.1>

Roberts A, Cassano J, DuVivier A, **Hughes M**, Maslowski W, Osinski R, Craig A, and Nijssen B (2014) Simulating transient ice-ocean Ekman transport in the Regional Arctic System Model and Community Earth System Model, *Ann. Glaciol.* (2014).

Neiman P, **Hughes M**, Moore BJ, Ralph FM, Sukovich E (2013) Sierra Barrier Jets, Atmospheric Rivers, and Precipitation Characteristics in Northern California: A Composite Perspective Based on a Network of Wind Profilers, *Mon. Wea. Rev.*, 141, 4211–4233.

Kingsmill DE, Neiman PJ, Moore BJ, **Hughes M**, Yuter SE, Ralph FM (2013) Kinematic and thermodynamic structures of Sierra barrier jets and overrunning atmospheric rivers

during a land-falling winter storm in northern California. *Mon. Wea. Rev.* **141**, 2015–2036.

Capps SB, Hall A, **Hughes M** (2013) Sensitivity of Southern California wind energy to turbine characteristics. *Wind Energ.*, **17**: 141–159.

Wayand N, Lundquist J, Hamlet A, **Hughes M**, Feld S (2013) Intercomparison of Meteorological Forcing Data from Empirical and Mesoscale Model Sources in the N.F. American River Basin in northern Sierra Nevada, California, *J. Hydromet.*, **14**, 677–699.

Neiman P, Ralph FM, Moore BJ, **Hughes M**, Mahoney K, Cordeira JM, Dettinger M (2013) The Landfall and Inland Penetration of a Flood-Producing Atmospheric River in Arizona. Part I: Observed Synoptic-Scale, Orographic, and Hydrometeorological Characteristics, *J. Hydrometeor.*, **14**, 460-484.

Berg N, Hall A, Capps SB, **Hughes M** (2012) El Niño-Southern Oscillation Impacts on Winter Winds over Southern California, *Clim. Dyn.*, **40**:1-2, pp 109-121.

Dettinger MD, Ralph FM, **Hughes M**, Das T, Neiman P, Cox D, Estes G, Reynolds D, Hartman R, Cayan D, Jones L (2012) Design and quantification of an extreme winter storm scenario for emergency preparedness and planning exercises in California. *Natural Hazards*.

Gershunov A, Rajagopalan B, Overpeck J, Guirguis K, Cayan D, **Hughes M**, Dettinger M, Castro C, Schwartz R, Anderson M, Ray A, Barsugli J, Cavazos T, Alexander M (2012) The Southwest Weather and Climate Extremes of the Future, Chapter 7, in: *Assessment of Climate Change in the Southwest United States: a Technical Report Prepared for the U.S. National Climate Assessment*. A report by the Southwest Climate Alliance [Gregg Garfin, Angela Jardine, Robert Merideth, Mary Black, and Jonathan Overpeck (eds.)]. Tucson, AZ: Southwest Climate Alliance.

Dong C, McWilliams J, Hall A, **Hughes M** (2011) Numerical Simulation of a Synoptic Event in the Southern California Bight, *J. Geophys. Res.*, **116**, C05018, doi:10.1029/2010JC006578.

Neiman PJ, Schick LJ, Ralph FM, **Hughes M**, Wick GA (2011) Flooding in Western Washington: The connection to atmospheric rivers. *J. of Hydrometeorology*. **12**:6, 1337-1358

Porter, K., A. Wein, ... **M. Hughes**, ... P. J. Neiman, ... F. M. Ralph, et al. (2011): Overview of the ArkStorm Scenario, U.S. Geological Survey Open-File Report, 2010-1312, 183 p. and appendixes.

Moritz MA, Moody TJ, Krawchuk MA, **Hughes M**, and Hall A (2010), Spatial variation in extreme winds predicts large wildfire locations in chaparral ecosystems, *Geophys. Res. Lett.*, 37, L04801, doi:10.1029/2009GL041735.

Neiman PJ, Sukovich EM, Ralph FM, **Hughes M** (2010) A Seven-Year Wind Profiler–Based Climatology of the Windward Barrier Jet along California’s Northern Sierra Nevada. *Mon. Wea. Rev.*, 138, 1206-1233.

#### **LEAD AUTHOR CONFERENCE PRESENTATIONS AND SEMINARS**

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Hughes M, Cassano J, Roberts A, and Maslowski W; Sensitivity of Arctic climate to spectral nudging in the Regional Arctic System Model, IUGG 26<sup>th</sup> General Assembly, Prague, Czech Republic, June. 2015.

Hughes M and Cassano J; The climatological distribution of extreme Arctic winds, and implications for ocean and sea ice processes. CMOS and polar AMS, Whistler, BC, June 2015 (presented by J Cassano)

Hughes M, Jackson D, Gutmann E, Wick GA; Objective identification of atmospheric rivers, and implications for extreme precipitation at the basin scale, AGU 2014 fall meeting, San Francisco, CA, Dec. 2014 (**Invited**)

Hughes M, Cassano J, Roberts A, and Maslowski W., Sensitivity of Arctic climate to spectral nudging in the Regional Arctic System Model, AGU 2014 fall meeting, San Francisco, CA, Dec. 2014.

Hughes M, K. Mahoney, P. J. Neiman, B. J. Moore, M. Alexander, and F. M. Ralph Impacts of upstream terrain height and integrated water vapor transport angle on resultant precipitation during an inland-penetrating atmospheric river event, AMS Mountain Meteorology, San Diego, CA, Aug. 2014

\*Hughes M, D Jackson, Gutmann E, and G Wick, Objective identification of atmospheric rivers, and implications for extreme precipitation at the basin scale, GEWEX 7<sup>th</sup> International Scientific Conference, The Hague, Netherlands, July 2014 \*(Awarded outstanding early career scientist presentation)

Hughes M, Exploring climate extremes in complex terrain: Applications of dynamical downscaling, Institute of Arctic and Alpine Research, University of Colorado, Boulder, CO Jan 2014 (**Invited**)

Hughes M, Dynamical downscaling and orographic precipitation: Understanding climatological precipitation in mountainous terrain, Department of Earth & Atmospheric Sciences, University of Northern Colorado, Greeley, CO Sept 2013 (**Invited**)

Hughes M and Cassano JJ, The climatological distribution of extreme Arctic winds, and implications for ocean and sea ice processes, 12<sup>th</sup> AMS Polar Meteorology and Oceanography, Seattle, WA, April 2013

- Hughes, M, Sukovich E, Neiman P, and FM Ralph, Representation of the Sierra Barrier Jet in 11 years of a high-resolution dynamical reanalysis downscaling, 15<sup>th</sup> AMS Mountain Meteorology, Steamboat Springs, CO August 2012
- Hughes, M, Mahoney K, Neiman P, Ralph F, Moore B, and Dettinger M, The Landfall and Inland Penetration of a Flood-Producing Atmospheric River in Arizona. Part 2: Impacts of WRF Resolution on water vapor transports and precipitation, 15<sup>th</sup> AMS Mountain Meteorology, Steamboat Springs, CO August 2012
- Hughes, M. Understanding climate processes in complex terrain: Applications of dynamical downscaling, ASP Summer Colloquium on the Weather-Climate Intersection, Boulder, CO, June 2012 **(Invited)**
- Hughes, M, Sukovich E, Neiman P, and FM Ralph, Representation of the Sierra Barrier Jet in 11 years of a high-resolution dynamical reanalysis downscaling, American Geophysical Union annual meeting, San Francisco, CA, Dec. 2011
- \*Hughes, M, Cayan D, and Hall A, Low-frequency variability of and impact of climate change on Southern California's Santa Ana winds, WCRP Climate Research in Service to Society, Denver, CO, Oct. 2011 \*(Awarded Outstanding early career Poster Presentation)
- Hughes, M, Hall, A, and Kim, J, Local and synoptic mechanisms controlling Southern California's Santa Ana winds, and implications in a changing climate. Scripps Institution of Oceanography, Climate Atmospheric Science and Physical Oceanography, April 2011 **(Invited)**
- Hughes, M, Hall, A, and Kim, J, Local and synoptic mechanisms controlling Southern California's Santa Ana winds, and implications in a changing climate. NOAA ESRL Physical Sciences Division seminar, Boulder, CO, March 2011 **(Invited)**
- Hughes, M, Sukovich E, Neiman P, Sierra Barrier Jets that occur simultaneously with atmospheric river events in a high resolution dynamical downscaling of the North American Regional Reanalysis, American Geophysical Union annual meeting, San Francisco, CA, Dec. 2010
- Hughes, M, Sukovich E, Neiman P, and Ralph FM, North-south variability of the Sierra Barrier Jet, and its downscaling representation. CalWater Annual meeting, La Jolla, CA, October 2010.
- Hughes, M, Cayan D, Hall A, Kim J, Ralph FM, Human-induced changes in wind, temperature, and relative humidity during Santa Ana wind events. Boulder Laboratories Postdoctoral Poster Symposium, Boulder, CO, June 2010.
- Hughes, M, Hall, A, and Kim, J, Anthropogenic Reduction of Santa Ana winds, American Geophysical Union annual meeting, San Francisco, CA, Dec. 2008
- Hughes, M, Hall, A, and Kim, J, Anthropogenic Reduction of Santa Ana winds, Fifth Annual Climate Change Research Conference, Sacramento, CA, Sept. 2008

Hughes, M, Mesoscale dynamics of Southern California's climate, National Weather Service, Oxnard office, Oxnard, CA June 2008

Hughes, M, Hall, A, and Fovell, RG, On the distribution of rainfall in complex topography, 12<sup>th</sup> AMS Conference on Mesoscale Processes, Waterville Valley, NH, August 2007

Hughes, M, Hall, A, and Fovell, RG, Blocking in areas of complex topography, and its influence on rainfall distribution, Mesoscale and Microscale Meteorology division of the National Center for Atmospheric Research, Boulder, CO, June 2007

Hughes, M, Hall, A, and Fovell, RG, Links between diurnal cycles of temperature and wind in complex topography, 22<sup>nd</sup> Pacific Climate (PACLIM) Workshop, Pacific Grove, CA, March 2006

Hughes, M, and Hall, A, The origins of Southern California's climate diversity, 85<sup>th</sup> Annual AMS general meeting, San Diego, CA, January 2005

Hughes, M, and Hall, A, Small scale variations in the diurnal amplitude of surface air temperature in Southern California, AGU Fall meeting, San Francisco, CA, 2004

#### **FELLOWSHIPS AND AWARDS**

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Outstanding Early Career Scientist Presentation Award at GEWEX 7<sup>th</sup> International Scientific Conference, July 2014

Travel grant to GEWEX 7<sup>th</sup> International Science Conference at The Hague, July 2014.

Outstanding Poster Presentation Award at WCRP Open Science Conference, Oct. 2011

National Research Council Postdoctoral Research Associateship, 2008-2010

Bjerknes Memorial Award "for research involving the understanding of climate dynamics at the regional scale", Dept of Atmos. & Ocean. Sci., UCLA, Fall 2007.

Dissertation year fellowship, UCLA, 2007-2008

Regents stipend, UCLA, 2006-2007

Brian Lance Bosart Award, "for unselfish service to fellow students and positive contribution to department life while demonstrating a firm commitment to academics". Department of Atmospheric and Oceanic Sciences, UCLA, Fall 2005.

National Science Foundation Graduate Research Fellowship, 2003-2006

Eugene V. Cota-Robles Fellowship, UCLA, 2002-2003

IGPP UCLA Fellowship, 2002-2003

McNair Scholar, 2001-2002

Schreyer Honor's College scholarship, 1997-2001

#### **FUNDED PROPOSALS**

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J Lundquist (PI), C Chickadel, N Cristea, and **M Hughes** (Co-Investigator), 2014-2017: Sensing and Simulation Spatial Snow and Streamflow in the Sierra, NASA Terrestrial Hydrology. CU sub-contract: \$27,428.

J Lundquist and **M Hughes**, 2014-2017: Collaborative Research: Unraveling Orographic Precipitation Patterns by Combined Hydrologic and Atmospheric Analysis, NSF, Hydrological Sciences Program. CU portion: \$96,203 (\$342,606 total award).

**M Hughes**, 2013-2015: Characterization of Atmospheric River events within Reanalysis Products and their Impact on Extreme Precipitation in the Western United States. National Oceanic and Atmospheric Administration, Climate Program Office. \$234,166.

W Maslowski, A Roberts, J Clement Kinney, JJ Cassano, and **M Hughes**, 2012-2015: Physically consistent eddy-resolving state estimation and prediction of the coupled pan-Arctic climate system at daily to interannual time scales using the Regional Arctic Climate Model (RACM). Office of Naval Research, Arctic and Global Prediction Program, CU portion: \$142,012.

**M Hughes**, 2008-2010: Connections between atmospheric rivers, orographic precipitation, and climate variability. National Research Council Research Applications Program Postdoctoral Fellowship, \$92,000.

**M Hughes** (as M Abel), 2003-2006: Verification of satellite data with a Rayleigh LIDAR system. National Science Foundation Graduate Research Fellowship. \$75,000

## **PROFESSIONAL SERVICES AND OUTREACH ACTIVITIES**

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Member of CIRES Member's Council, July 2015-present

Participant, American Meteorological Society Summer Policy Colloquium, June 2015

CIRES outstanding performance award review committee member 2015

AMS Mountain Meteorology committee member

NSF steering committee for connecting atmospheric and hydrological processes 2013-2014

Reviewer for: Nature Geoscience, Quarterly Journal of the Royal Meteorological Society, Journal of Applied Meteorology and Climatology, Geophysical Research Letters, International Journal of Biometeorology, Journal of the Atmospheric Sciences, Journal of Hydrometeorology, Journal of Atmospheric and Oceanic Technology, Monthly Weather Review, International Journal of Wildland Fire, Weather and Forecasting, Climate Dynamics, Journal of Geophysical Research – Atmospheres, and NSF Atmospheric and Geospace Sciences

Member of the Workplace Advisory Committee in NOAA ESRL's Physical Sciences Division (2010-present)

Chair of the Parent Appreciation Committee at Commerce Children's Center (2012-2015)

Served as a judge for Campbell Elementary School's annual science fair (held every March) in 2013, 2014, and 2015

UCLA Chi Epsilon Pi -- Faculty Representative, 2003-2007

Member of AMS and AGU since 2002