Curriculum Vitae: Christopher L. Castro

Contact information:

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Professional Preparation

Colorado State University	Atmospheric Science	Ph.D.	2005
Colorado State University	Atmospheric Science	M.S.	2000
Pennsylvania State University	Meteorology with Highest Distinction	B.S.	1997

Appointments

2016-date Associate Professor, Department of Hydrology and Atmospheric Sciences, University of Arizona, Tucson, Arizona, USA.

2006-2016 Associate Professor (2012-2016) and Assistant Professor (2006-2012), Department of Atmospheric Sciences and Institute of Atmospheric Physics, University of Arizona, Tucson, Arizona, USA.

1997-2006 Postdoctoral Fellow (2005-2006), and Graduate Research Assistant (1997-2005), Department of Atmospheric Science, Colorado State University, Fort Collins, Colorado, USA.

1996-1997 Student Protégé, Significant Opportunities in Atmospheric Research and Science (SOARS) Program, University Corporation for Atmospheric Research, National Center for Atmospheric Research, Boulder, Colorado, USA.

Research Interests

Regional atmospheric modeling and dynamical downscaling, climate variability and change, numerical weather prediction, the North American monsoon, synoptic and mesoscale

meteorology, hydrometeorology, organized convection and severe weather, and land-atmosphere interactions.

Honors and Awards

- Strategic Environmental Research and Development Program (SERDP), Resource Conservation and Resiliency, Project of the Year (2017), Principal Investigator
- Award for Excellence at the Student Interface, Department of Hydrology and Atmospheric Sciences, University of Arizona (2016)
- Honorary Commander, 25th Operational Weather Squadron, United States Air Force, Davis-Monthan Air Force Base, Tucson, Arizona (2014-2016, permanent alumnus)
- United States Fulbright Scholar Exchange Program, NEXUS Scholar (2014-2016)
- National Aeronautics and Space Administration (NASA), Earth System Science Fellowship (2000-2003)
- Evan Pugh Scholar Award, Pennsylvania State University (1997)
- Jerome N. Berhmann Award, Department of Meteorology, Pennsylvania State University (1997)
- Pennsylvania State University Diversity Scholarship (1993-1997)

Publications and Scholarly Work (Google scholar H-index value: 20):

Peer-Reviewed Papers (descending chronological order by year), with doi reference numbers

*Indicates graduate student advisee as first author

*Moker, J.M., **C.L. Castro**, Y.L. Serra, A. Arellano, and D.K. Adams, 2018. Convective-permitting hindcast simulations during the North American Monsoon GPS Transect Experiment 2013: Establishing Baseline Model Performance Without Data Assimilation. *J. Appl. Meteor. Climatol*., accepted.

*Carrillo, C.M., **C.L. Castro**, G.M. Garfin, H. Chang, and M.S. Bukovsky, 2018. Pacific SST-related teleconnective influences on North American monsoon precipitation within North American Regional Climate Change Assessment Program (NARCCAP) models. *Int. J. Climatol.*, in press.

Amador, J.A., T. Ambrizza, R.W. Arritt, **C.L. Castro**, T. Cavazos, R. Cerezo-Mota, R. Fuentes-Franco, F. Giorgi, G. Guiliani, H. Lee, M. Méndez-Pérez, and E.R. Rivera, 2018. Putting into action the REGCM4.6 regional climate model for climate change, variability, and modeling over Central America. *Atmósfera* **31**(2), 185-188. http://dx.doi.org/10.20937/ATM.2018.31.02.06

*Luong, T.M., **C.L. Castro**, T.M. Nguyen, W.W. Cassell, and H. Chang, 2018. Improvement in the Modeled Represenation of North American Monsoon Precipitation Using a Modified Kain-Fritsch Parameterization Scheme. *Atmosphere*, **9**(1), 31. http://doi.org/10.3390/atmos9010031

Switanek, M.B., P.A. Troch, **C.L. Castro**, A. Leuprecht, H. Chang, R. Mukherjee, and E.M.C. Demaria, 2017. Scaled distribution mapping: A bias correction method that preserves raw

climate model projected changes. *Hydrology and Earth System Sciences*, **21**(6), 2649-2666.
http://doi.org/10.5194/hess-21-2649-2017

*Luong, T., **C.L. Castro**, H. Chang, M. Jares, T. Lahmers, J. Mazon, C.M. Carrillo, and D.K. Adams, 2017. The More Extreme nature of Monsoon Precipitation in the Southwest U.S. As Revealed by a Long-term Climatology of Simulated Severe Weather Events. *J. Appl. Meteor. Climatol*., **56**, 2509-2529.
http://doi.org/10.1175/JAMC-D-16-0358.1

*Minjarez-Sosa, C.M., **C.L. Castro**, K.L. Cummins, J. Waissmann, and D.K. Adams, 2017. An Improved QPE Over Complex Terrain Employing Cloud to Ground Lightning Occurrences. *J. Appl. Meteor. and Climatol*., **56**, 2489-2507.
http://doi.org/10.1175/JAMC-D-16-0097.1

*Carrillo, C., **C.L. Castro**, H. Chang and T. Luong, 2017. Multi-year climate variability in the Southwestern United States within a context of a dynamically downscaled twentieth century reanalysis. *Clim. Dyn*., 49, 4217-4236.
http://doi.org/10.1007/s00382-017-3569-1

Niraula, R., T. Meixner, H. Ajami, M. Rodell, D. Gochis, and **C.L. Castro**, 2017. Comparing potential recharge estimates from three Land Surface Models across the western US. *J. Hydrology*, **545**, 410-423.
http://doi.org/10.1016/j.hydrol.2016.12.028

Niraula, R., T. Meixner, F. Dominguez, N. Bhatterai, M. Rodell, H. Ajami, D. Gochis, and **C. Castro**, 2017. How might recharge change under projected climate change in the western U.S.? *Geophys. Res. Lett*., 44, 10,407-10,418.
http://doi.org/10.1002/2017GL075421

Castro, C.L., H. Chang, Q. Ding., R. Arritt, and E. Salathé, 2016. Toward a new paradigm of convective-permitting modeling in subseasonal-to-seasonal forecasting of warm season precipitation extremes. *US CLIVAR Variations Newsletter*, **14(4)**, 1-7.
http://usclivar.org/newsletter/newsletter

Armenteras, D., C. Gibbes, C.A. Vivacqua, J.S. Espinosa, W. Duleba, F. Gonçalves, and **C. Castro**, 2016. Interactions between Climate, Land Use, and Vegetation Fire Occurrences in El Salvador. *Atmosphere*, **7(2)**, 26
http://doi.org/10.3390/atmos70026

*Mazon, J.J., **C.L. Castro**, D.K. Adams, C. Carrillo, and J.J. Brost, 2016. Objective Climatological Analysis of Extreme Events During the North American Monsoon. *J. Appl. Meteor. and Climatol.*, **55**, 2431-2450.
http://doi.org/10.1175/JAMC-D-16-0075.1

*Lahmers, T.M, **C.L. Castro**, D.K. Adams, Y.L. Serra, and J.J. Brost, 2016. Long-term changes in the climatology of transient inverted troughs over the North American Monsoon region and their effects on severe weather. *J. Climate*, **29**, 6027-6064
http://doi.org/10.1175/JCLI-D-15-0726.1

Serra, Y.L., D.K. Adams, C. Minjarez-Sosa, J.M. Moker, Jr., **C. Castro**, A. Arellano, A. Quintanar, L.C. Alatorre, A. Granados-Olivas, E. Vazquez, K.L. Holub, and C. DeMets, 2016. The North American Monsoon GPS Transect Experiment 2013. *Bull. Amer. Meteor. Soc*., **97**, 2103-2115.
http://doi.org/10.1175/BAMS-D-14-00250.1

Meixner, T., A.H. Manning, D.A. Stonestrom, D.M. Allen, H. Ajami, K.W. Blasch, A.E. Brookfield, **C.L. Castro**, J.F. Clark, D.J. Gochis, A.L. Flint, K.L. Neff, R. Niraula, M. Rodell, B.R. Scanlon, K. Singha, and M.A. Walvoord, 2016. Implications of Projected Climate Change for Groundwater Recharge in the Western United States. *J. Hydrology*, **534**, 124-138. https://doi.org/10.1016/j.jhydrol.2015.12.027

Chang, H, **C.L. Castro**, C.M. Carrillo, and F. Dominguez, 2015. The more extreme nature of U.S. warm season climate in the recent observational record and two "well performing" dynamically downscaled CMIP3 models. *J. Geophys. Res. Atmos.*, **120**, 8244-8263. http://doi.org/10.1002/2015JD023333

*Carrillo, C.M., **C.L. Castro**, C.A. Woodhouse, and D. Griffin, 2015. Low frequency variability of the North American Monsoon as diagnosed through early and latewood tree-ring chronologies in the Southwest U.S. *Int. J. Climatol*.,36, 2254-2272. http://doi.org/10.1002/joc.4493

Shamir, E., S.B. Megdal, C. Carrillo, **C.L. Castro**, H. Chang, K. Chief, F.E. Corkhill, S. Eden., K.P. Geogakakos, K.M. Nelson, and J. Prietto, 2015. Climate change and water resources management in the Upper Santa Cruz River, Arizona. *J. Hydrology*, **521**, 18-33. https://doi.org/10.1016/j.jhydrol.2014.11.062

Rajagopal, S., F. Dominguez, H.V. Gupta, P.A. Troch, and **C.L. Castro**, 2014. Physical Mechanisms of Climate-Induced Drying of Two Semiarid Watersheds in the Southwest United States. *J. Hydrometeor*., **15**, 1404-1418. http://doi.org/10.1175/JHM-D-13-0106.1

Rivera, E.R., F. Dominguez, and **C.L. Castro**, 2014. Atmospheric River and Cool Season Extreme Precipitation Events in the Verde River Basin of Arizona. *J. Hydrometeor*., **15**, 813-829. http://doi.org/10.1175/JHM-D-12-0189.1

Seastrand, S., Y. Serra, **C. Castro**, and E. Ritchie, 2014. The dominant synoptic-scale modes of North American monsoon precipitation, *Int. J. Climatol*., 35, 2019-2032. http://doi.org/10.1002/joc.4104

*Ciancarelli, B., **C.L. Castro**, C. Woodhouse. F. Dominguez, H. Chang, C. Carrillo, and D. Griffin, 2014. Dominant patterns of US warm season precipitation variability in a fine resolution observational record, with a focus on the southwest. *Int. J. Climatol*., 34, 687-707 http://doi.org/10.1002/joc.3716

Griffin, D., C.A. Woodhouse, D.M. Meko, D.W. Stahle, H.L. Faulstich., C. Carrillo, R. Touchan, **C.L. Castro**, and S.W. Leavitt, 2013. North American monsoon precipitation reconstructed from tree-ring latewood, *Geophys. Res. Lett*, 40, 954-958. http://doi.org/10.1002/grl.50184

Meko, D.M, R. Touchan, J.V. Díaz, D. Griffin, C.A. Woodhouse, **C.L. Castro**, C. Carrillo, and S.W. Leavitt, 2013. Sierra San Pedro Mártir, Baja California, cool-season precipitation reconstruction from earlywood width of Abies concolor tree rings. *J. Geophys. Res.—Biogeosci*., **118**, 1660-1673 http://dx.doi.org/10.1002/2013JG002408

Woodhouse, C.A., D.M. Meko, D. Griffin, and **C.L. Castro**, 2013. Tree rings reveal multi-season drought variability in the lower Rio Grande Basin, USA. *Water Resour. Research*, 49.

http://doi.org/10.1002/wrcr.20098

Castro, C.L., H. Chang, F. Dominguez, C. Carrillo, J. Kyung-Schemm, H-M.H. Juang, 2012. Can a Regional Climate Model Improve the Ability to Forecast the North American Monsoon? *J. Climate*, **25**, 8212-8237. http://doi.org/10.1175/JCLI-D-11-00441.1

Dominguez, F., E. Rivera, D.P. Lettenmaier, and **C.L. Castro**, 2012. Changes in winter precipitation extremes for the western United States under a warmer climate as simulated by regional climate models. *Geophys. Res., Lett*, **39**, L05803. http://doi.org/10.1029/2011GL050762

*Minjarez-Sosa, C.M., **C.L. Castro**, K.L. Cummins, E.P. Krider, and J. Waissmann, 2012. Toward Development of Improved QPE in Complex Terrain Using Cloud-to-Ground Lightning Data: A Case Study for the 2005 Monsoon in Southern Arizona. *J. Hydrometeor*., **13**, 1855-1873. http://doi.org/10.1175/JHM-D-11-0129.1

Troung, N.M, V.T. Hang, R.A. Pielke Sr., **C.L. Castro**, and K. Dairaku, 2012. Synoptic-scale physical mechanisms associated with the Mei-yu front: A numerical case study in 1999. *Asia-Pacific J. Atmos. Sci*., 4, 433-448. https://doi.org/10.1007/s13143-012-0039-x

Wi, S., F. Dominguez, M. Durcik, J. Valdes, H.F. Diaz, and **C.L. Castro**, 2012. Climate change projection of snowfall in the Colorado River Basin using dynamical downscaling. *Water Resour. Res*., **48**, W05504, http://doi.org/10.1029/2011WR010674

Leavitt,S., C.A. Woodhouse, **C.L. Castro**, W.E. Wright, D.M. Meko, R. Touchan, D. Griffin, and B. Ciancarelli, 2011. The North American monsoon in the U.S. Southwest: Potential for investigation with tree-ring carbon isotopes. *Quarternary International*, **235**, 101-107. http://dx.doi.org/10.1016/j.quaint.2010.05.006

Zeng, X., M. Barlage, **C. Castro**, and K. Fling, 2010. Comparison of land-precipitation coupling strength using observations and models. *J. Hydrometeor.*, **11**, 980-995. https://doi.org/10.1175/2010JHM1226.1

*Bieda III, S.W., **C.L. Castro**, S.L. Mullen, A. Comrie, and E. Pytlak, 2009. The Relationship of Transient Inverted Upper-Level Troughs to Variability of the North American Monsoon System. *J. Climate*, **22**, 4213-4227. http://doi.org/10.1175/2009JCLI2487.1

Castro, C.L., A.B. Beltrán-Przekurat, and R.A. Pielke, Sr., 2009. Spatiotemporal variability of precipitation, modeled soil moisture and vegetation greenness in North American within the recent observational record. *J. Hydrometeor.*, **10**, 1355-1378. http://doi.org/10.1175/2009JHM1123.1

Switanek, M.B., P.A. Troch, and **C.L. Castro**, 2009. Improving Predictions of Climate Variability and Water Availability at the Catchment Scale. *J. Hydrometeor*., **10**, 152-1533. http://doi.org/10.1175/2009JHM1073.1

Troung, N.M., T.T. Tien, R.A. Pielke, Sr., **C.L. Castro**, and G. Leoncini, 2009. A modified Kain-Fritsch Scheme and its application for simulation of an extreme precipitation event in Vietnam. *Mon. Wea. Rev*., **137**, 766-789. http://doi.org/10.1175/2008MWR2434.1

Weiss, J.L., **C.L. Castro**, and J.T. Overpeck, 2009. Distinguishing Pronounced Droughts in the Southwestern U.S.A.: Seasonality and Effects of Warmer Temperatures *J. Climate*, **22**, 5918-5932. http://doi.org/10.1175/2009JCLI2905.1

Lyon, S.W., F. Dominguez, D.J. Gochis, N.A. Brunsell, **C.L. Castro**, F.K. Chow, Y. Fan, D. Fuka, P.A. Kucera, S.W. Nesbitt, N. Salzmann, J. Schmidli, P.K. Snyder, A.J. Teuling, T.E. Twine, S. Levis, J.D. Lundquist, G.D. Salvucci, A.M. Sealy, and M.T. Walter, 2008. Coupling Terrestrial and Atmospheric Water Dynamics to Improve Prediction in a Changing Environment. *Bull. Amer. Meteor. Soc*., **89**, 1275-1279. http://doi.org/10.1175/2008BAMS2547.1

Rockel, B., **C.L. Castro**, R.A. Pielke, Sr., H. von Storch, and G. Leoncini, 2008. Dynamical downscaling: Assessment of model system dependent retained and added variability for two different regional climate models . *J. Geophys. Res.*, **113**, D21107. http://doi.org/10.1029/2007JD009461

Castro, C.L., R.A. Pielke, Sr., and J.O. Adegoke, 2007. Investigation of the Summer Climate of the Contiguous U.S. and Mexico Using the Regional Atmospheric Modeling System (RAMS). Part I: Model Climatology (1950-2002). *J. Climate*, 20, 3866-3887. http://doi.org/10.1175/JCLI4211.1

Castro, C.L., R.A. Pielke, Sr., J.O. Adegoke, S.D. Schubert, and P.J. Pegion, 2007. Investigation of the Summer Climate of the Contiguous U.S. and Mexico Using the Regional Atmospheric Modeling System (RAMS). Part II: Model Climate Variability. *J. Climate*, 20, 3888-3901. http://doi.org/10.1175/JCLI4212.1

Pielke Sr., R.A., D. Stokowski, J.-W. Wang, T. Vukicevic, G. Leoncini, T. Matsui, **C. Castro**. D. Niyogi, C.M. Kishtawal, A. Biazar, K. Doty, R.T. McNider, U. Nair, and W.K. Tao, 2007. Satellite-based model parameterization of diabatic heating. *EOS*, Vol. 88, 8, 20 February, 96-97.

Castro, C.L, R.A. Pielke Sr., and G. Leoncini, 2005. Dynamical Downscaling: Assessment of value retained and added using the Regional Atmospheric Modeling System (RAMS). *J. Geophys Res*., **110**, D05108 http://doi.org/10.1029/2004JD004721

Hanamean, J.R. Jr., R.A. Pielke Sr., **C.L. Castro**, D.S. Ojima, B.C. Reed, and Z. Gao, 2003. Vegetation greenness impacts on maximum and minimum temperatures in northeast Colorado. Meteorol. Appl., 10, 203-2015. http://doi.org/10.1017/S1350482703003013

Chase, T.N., R.A. Pielke Sr., and **C. Castro**, 2003. Are Present Day Climate Simulations Accurate Enough for Reliable Regional Downscaling? *Water Resources Update*, **124**, 26-33.

State of the Climate in 2002, 2003: A.M. Waple and J.H. Lawrimore, Eds., R.A. Pielke Sr. and **C.L. Castro**, Contributors. *Bull. Amer. Meteor. Soc.*, **84**, S1-S68. https://journals.ametsoc.org/doi/pdf/10.1175/1520-0477-87.6.S1

Castro, C.L., T.B. McKee, and R.A. Pielke Sr., 2001. The Relationship of the North American Monsoon to Tropical and North Pacific Sea Surface Temperatures as Revealed by Observational Analyses, *J. Climate*, **14**, 4449-4473. http://doi.org/10.1175/1520-0442(2001)014<4449:TROTNA>2.0.CO;2

Papers Currently Submitted or in Revision

Cassell, W.W., **C.L.Castro**, T. Luong, Q. Xiao, and A. Arellano. Simulating organized convection during the 2004 North American Monsoon Experiment and its sensitivity to initial conditions. *Atmósfera*., in revision.

Luong, T.M., **C.L. Castro**, S. Grossman-Clarke, M. Jares, and H. Chang. The Impact of Urbanization on North American Monsoon Precipitation in Arizona within the Context of Severe Weather Events. *Atmosphere*, in revision.

Papers Currently in Preparation

Chang, H., G-Y Niu., **C.L. Castro**, and R. Monson. Improving warm season precipitation prediction over the U.S. through the community NOAH-MP land surface model coupled with WRF. *J. Geophys. Res. Atmos*., submitted.

Books and Book Chapters

Centeno, R., D.K. Adams, J. Amador Astúa, **C.L. Castro**, T. Cavazos, R. López, C. Lizárraga Celaya, V. Castro, and E. López, 2016. Fenómenos Climáticos y Su Relevancia Para El Cambio Climático Regional Futuro, Capítulo 12 de *Reporte Mexicano de Cambio Climático: Bases Científicas, Modelos, y Modelación*, [English Tranlation: Climate phenonmena y their relevance for future regional climate change, Chapter 12 of *Mexican Climate Change Report: Scientific bases, models, and modeling*] B. López, editor. National Autonomous University of Mexico, Program in Climate Change Research. Mexico City, D.F., Mexico.

Cayan, D, M. Tyree, K.E. Kunkel, **C. Castro**, A. Gurshonov, J. Barsugli, A.J. Ray, J. Overpeck, M. Anderson, B. Rajagopalan, I. Rangwala, and P. Duffy, 2013: Future Climate: Projected Average, Chapter 6 of *Assessment of Climate Change in the Southwest United States: A Report Prepared for the National Climate Change Assessment*. A report by Southwest Climate Alliance. G. Garfin, A. Jardine, R. Merideth, M. Black, and S. Leroy, Eds., Washington, DC: Island Press.

Gurshunov, A., J. Overpeck, K. Guirguis, D. Cayan, M. Dettinger, **C. Castro**, R.E. Schwartz, M. Anderson, A.J. Ray, J. Barsugli, R. Cavazos, and M. Alexander. Future Climate: Projected Extremes, Chapter 7 of *Assessment of Climate Change in the Southwest United States: A Report Prepared for the National Climate Change Assessment*. A report by Southwest Climate Alliance. G. Garfin, A. Jardine, R. Merideth, M. Black, and S. Leroy, Eds., Washington, DC: Island Press.

Technical Reports

Castro, C.L., 2017. Assessing climate change impacts for DoD installations in the southwest United States during the warm season. Strategic Environmental Research and Development Program, Final Rep. RC-2205, 113 pp. www.serdp-estcp.org/Program-

Areas/Resource-Conservation-and-Resliency/Infrastructure-Resiliency/Vulnerability-and-Impact-Assessment/RC-2205.

Kotamarthi, R., L. Mearns, K. Hayhoe, **C.L. Castro**, and D. Wuebbles, 2016. *Use of Climate Information for Decision Making and Impacts Research: State of Our Understanding*. Strategic Environmental Research and Development Program (SERDP) Project RC-2242, Technical Report. 54 pp. www.dtic.mil/dtic/tr/fulltext/u2/1029525.pdf

Jones, R., McGregor, J., **C. Castro**, and J. Smith, 2015. *Climate Change and Impact Modeling Experts' Report, TA-8090: Building Capacity for Climate Resilience, Climate and Impact Modeling Advisory Group*. Prepared for the Government of Tajikistan and the Asian Development Bank. 35pp.

Selected Invited Talks (2010-present)

Assessing Climate Change Impacts for DoD Installations in the Southwest United States During the Warm Season (SERDP Project of the Year poster presentation). *SERDP and ESTCP 2017 Symposium*. Washington, DC. 27-30 November 2017.

CORDEX Latinoamérica: Proyección del cambio climático en la escala regional para la toma de decisiones y evaluación de sus impactos. [English Translation: Latin American CORDEX: Climate change projection at the regional scale for decision making and impacts evaluation]. *13 Reunión de Consulta de la Comisión de Geofísica. Pan American Institute for Geography and History*. Panama City, Panama 23-24 Octobeter 2017.

More Extreme Monsoon Precipitation in the Southwestern U.S. and the Potential Implications for DoD Facilities. *New Resource Conservation Insights in Desert Environments. SERDP & ESTCP Webinar Series*. 5 October 2017.

Potential for Improved S2S Forecasts of the North American Monsoon. *Workshop on improving the skill of long-rang weather forecasts (subseasonal to seasonal (S2S) precipitation forecasting*. Western States Water Council and California Department of Water Resources. San Diego, California. 17-19 May 2017.

Evaluating changes in extreme events during the North American monsoon using convective-permitting regional atmospheric modeling. Invited department seminar: Jackson School of Geosciences, University of Texas at Austin. 28 April 2017.

The more extreme nature of North American monsoon precipitation in the Southwest United States. Invited seminar: Centro de Previsão de Tempo e Estudios Climáticos (CPTEC), Cachoeira Paulista, Brazil. 21 March 2017.

Evaluating changes in extreme events during the North American monsoon using convective-permitting regional atmospheric modeling. *Second Workshop on Climate Change, Variability, and Modeling over Central America and Mexico*. University of Costa Rica, San José, Costa Rica. 14-18 November 2016.

Las capacidades emergentes de modelos atmosféricos que permiten convección en la investigación del clima (In Spanish) [English translation: Emerging capabilities in convective-permitting atmospheric models in climate research]. *Sexto Congreso Nacional de Investigación en Cambio Climático*. University of Sonora, Hermosillo, Sonora, Mexico. 17-18 October 2016.

Toward physically confident climate change projections in the Southwest United States and beyond. Invited department seminar: Department of Atmospheric Sciences, University of Washington. April 2016.

Evaluating Changes in Extreme Weather During the North American Monsoon in the Southwest U.S. Using High Resolution, Convective-Permitting Atmospheric modeling. Presentation A11F-010, *American Geophysical Union Fall Meeting*, San Francisco, California, 14-18 December 2015.

El uso de modelos atmosféricas para mejorar predicciones del tiempo en la región del monzón de Norteamérica (In Spanish) [English translation: The use of atmospheric models to improve weather forecast prediction in the North American monsoon region]. *Reunión anual de Unión Geofísica Mexicana.* Puerto Vallarta, Mexico, 2-7 November 2015

The North American Monsoon: It's What Makes Summer Weather Interesting in the Southwest US. CoCoRAHS webinar series. Colorado Climate Center, Colorado State University. 15 October 2015.

The use of regional atmospheric models to improve weather forecasts and climate projections for the North American monsoon. Invited seminar, Applied Physics Laboratory, University of Washington. 22 September 2015.

El uso de modelos atmosféricos para mejorar predicciones del tiempo y proyecciones del clima en México y Centroamérica. (In Spanish) [English translation: The use of regional models to improve weather forecasts and climate projections in Mexico and the Central America] Invited seminar, Departamento de Ciencias Atmosféricas, Universidad Nacional Autónoma de México. 20 March 2015

Ensuring a robust regional model experimental design for future projection of extreme weather during the North American monsoon in the Southwest United States. Invited presentation. U.S. Army Research Laboratory, Las Cruces, New Mexico, USA. 18 December 2014.

Climate Variability and change and the North American monsoon: What have we learned since NAME and where are we going? *Reunión anual de Unión Geofísica Mexicana.* Puerto Vallarta, Mexico, 2-7 November 2014

Creating a unified perspective of the North American monsoon: for the paleoclimate record to climate change projections. Invited presentation at BTU Cottbus and Free University University of Berlin, Germany. June 2014

Proyecciones del cambio climático en Latinoamérica: ¿Cómo se puede generar información útil en la escala regional para tomar decisiones? *12th Reunión de Consulta de la Comisión de Geofísica. Instituto Panamericano de Geografía e Historia*. Montevideo, Uruguay, 18-19 November 2013

Can a regional climate model improve the ability to forecast the North American monsoon? *National Center for Environmental Prediction, Climate Test Bed Seminar Series*. Camp Springs, Maryland, USA, March 19 2012

Use of Dynamical Downscaling to Improve Regional Climate Change Projections in the Southwest U.S. *National Water Resources Association Meeting*. Tucson, Arizona, USA, 17 November 2011.

¿Cómo se pueden mejorar las proyecciones del cambio climático y las mediciones ambientales en el Caribe? (In Spanish) [English translation: How can climate change projections and environmental monitoring be improved in the Caribbean?] Presented at *Second Joint Technical Meeting of the Pan American Institute for Geography and History*. Panama City, Panama, 15-17 June 2011

Use of Dynamical Downscaling to Improve Regional Climate Change Projections in the Southwest U.S. *Workshop on Water Management and Climate Change in Northern Arizona*. Northern Arizona University, Flagstaff, Arizona, USA, 8 June 2011.

Creating dynamically downscaling seasonal climate forecast and climate change projection information for the North American Monsoon region suitable for decision making purposes. *25th Conference on Hydrology, 91st American Meteorological Society Annual Meeting,* Seattle, Washington, USA, 22-27 January 2011.

Creating dynamically downscaled seasonal climate forecast and climate projection information for the North American Monsoon region suitable for decision making purposes. *International Workshop on Dynamic Downscaling*. Tsukuba City, Ibaraki, Japan, 18-20 January 2011.

¿Cómo se pueden mejorar las proyecciones del cambio climático y las mediciones ambientales en el Caribe? (In Spanish) [English translation: How can climate change projections and environmental monitoring be improved in the Caribbean?]. Invited presentation at FUNGLODE (National Environmental Agency of the Dominican Republic), sponsored by the U.S. Department of State. Santo Domingo, Dominican Republic, 14 Oct 2010.

Towards Improvement of Climate Change Projections and Environmental Monitoring in the Caribbean Region. Invited presentation at the University of the West Indies, sponsored by the U.S. Department of State. Kingston, Jamaica, 12 Oct 2010.

Ground based GPS Receiver Network to Study the North American Monsoon. *Workshop Towards a Unified GPS Network in Mexico*. Puerto Vallarta, Jalisco, Mexico, 20-22 September 2010.

On the appropriateness of spectral nudging in regional climate models. Invited seminar. Arizona State University. Tempe, Arizona, USA, 7 April 2010.

¿Qué se necesita para mejorar los pronósticos estacionales y las proyecciones del cambio climático del monzón norteamericano? (In Spanish) [English translation: What is necessary to improve seasonal forecasts and climate change projections of the North American monsoon?] Invited Seminar. University of Sonora. Hermosillo, Sonora, Mexico, 26 February 2010.

What is necessary to improve seasonal climate forecasts and climate change projections of the North American Monsoon? Southeast Arizona chapter of the American Meteorological Society (SEACAMS), Tucson, Arizona, USA, 18 February 2010.

On the appropriateness of spectral nudging in regional climate models (invited presentation). *International Workshop on Dynamic Downscaling Over Japan*. Tsukuba City, Ibaraki, Japan, 25 – 27 January 2010.

Research Grants and Contracts as Principal or Co-Principal Investigator

Funding amounts provided in U.S. dollars

<u>Currently active projects</u>

A New Hydrometeorological Testbed in Northern Mexico for Improved Weather Forecasts and Climate Monitoring

Binational Consortium for Regional Scientific Development and Innovation, University of Arizona – National Council for Science and Technology, Consortium for Arizona –Mexico Arid Environments (CAZMEX)
$60,000 8/2017-7/2018
Principal Investigator

Improvement of WRF-Hydro National Water Model architecture and calibration methods for semi-arid environments with complex terrain.
National Oceanic and Atmospheric Administration, Climate Program Office
$367,453 8/2017-7/2019
Principal Investigator

"Impact of Total Column Water Vapor Measurements of Short- to Medium- Range Forecasts of North American Monsoon Precipitation"
U.S. National Science Foundation (NSF) grant
$482,591, 4/2013-4/2015 (with no-cost extension till 4/2018)
Co-Principal Investigator

Projects Completed

"Collaborative Research: Processes and Patterns in the North American Monsoon Macrosystem"
U.S. National Science Foundation (NSF) grant
$2,297,560, 7/2011-7/2016 (no-cost extension till 8/2017)
Co-Principal Investigator

"Colorado River Basin Streamflow projection under IPCC CMIP5 scenarios: from the global to basin scale using an integrated dynamic modeling approach"
United States Geological Survey (USGS), Department of the Interior (DOI) grant, with matching funding from United States Bureau of Reclamation (USBR), Salt River Project (SRP), and Central Arizona Project (CAP)
$172,895 (USGS-DOI), Match funding: $80,000 (USBR), $50,000 (SRP), $40,000 CAP,
9/2013-9/2015 (with no cost extension till 12/2016)
Principal Investigator

"Assessing climate change impacts for DoD installations in the Southwest United States during the warm season"
Strategic Environmental Research and Development Program (SERDP) grant
$645,869, 3/2012-3/2015 (no-cost extension till 12/2016)
Principal Investigator

"Incorporating Climate Information and Stakeholder Engagement in Groundwater Resource Planning and Management""
U.S. National Oceanic and Atmospheric Administration (NOAA) grant
$251,544, 4/2012-4/2014
Co-Principal Investigator

"Columbian workshop on WRF Modeling"
Vaisala, Inc. (on behalf of the Columbian Air Force
$21,594, 08/2012 – 11/2012
Principal Investigator

"Feasibility of dynamically downscaled water resource projections for the Colorado and Rio Grande River Basins"
Technology and Research Institution Fund (TRIF) through the University of Arizona Water Sustainability Program, administered by the Board of Regents of the State of Arizona
$40,000, 08/2011 – 06/2012

"Further development of dynamically downscaled climate change projection information for water resource decision making in the Southwest U.S.
Technology and Research Institution Fund (TRIF) through the University of Arizona Water Sustainability Program, administered by the Board of Regents of the State of Arizona
$32,716, 01/2011 – 06/2011

"Hydrologic Extremes in a Changing Climate: How much information can regional climate models provide?"
U.S. Department of Energy
$366,783, 08/2009-07/2011
Co-Principal Investigator

"An Investigation of North American Monsoon Variability using Instrumental and Tree-Ring data"
U.S. National Science Foundation
$630,586, 09/2008 – 08/2011
Co-Principal Investigator

"Use of Regional Atmospheric Modeling to Improve Short and Long-term Forecasting Capability of the North American Monsoon System"
U.S. National Science Foundation
$374,928, 07/2008 – 06/2011
Principal Investigator

"Processes Linking Easterly Waves and the North American Monsoon System"
U.S. National Science Foundation
$449,419, 07/2008 – 06/2011
Co-Principal Investigator

"Using Regional Atmospheric Modeling to Investigate Heavy Monsoon Rainfall Events in Arizona and Socioeconomic Implications"
Science Foundation Arizona
$81,000, 07/2008 -06/2009
Principal Investigator

Academic course instructor

Graduate-level, University of Arizona
ATMO 558: Mesoscale Meteorological Modeling
ATMO 529: Objective Analysis in the Atmospheric and Related Sciences
ATMO 574: Weather Analysis and Forecasting I

Graduate level, National Autonomous University of Mexico
Mesoscale Meteorological Modeling (taught in Spanish)

Undergraduate level, University of Arizona
ATMO 436/536: Fundamentals of Weather and Climate
ATMO 170a: Introduction to Weather and Climate

Graduate student advisees (at the University of Arizona) and degrees completed

Ph.D, Atmospheric Sciences.: Dr. Carlos Minjarez-Sosa, Dr. Carlos Carrillo, Dr. Thang Luong
M.S, Atmospheric Sciences.: Stephen Bieda III, Brittany Ciancarelli, William Cassell, Jennifer Stutler, Jeremy Mazon, Megan Jares, Sujan Pal
M.S., Hydrometeorology: Timothy Lahmers

Postdoctoral advisees (at the University of Arizona)

Dr. Hsin-I Chang, Department of Atmospheric Sciences

Selected Professional Service (Jan 2007-present)

Standing committee on promotion and continuing status, Department of Hydrology and Atmospheric Sciences, University of Arizona (2016-present)
Membership Committee, American Meteorological Society (joined 2016-present)
Faculty Advisory Committee, College of Science, University of Arizona (2016-present)
Director of Graduate Studies for Atmospheric Sciences, Department of Hydrology and Atmospheric Sciences, University of Arizona (2015-present)
Member, US CLIVAR Predictability, Predictions, Applications and Interface (PPAI) Panel (2015-present)
Contributor, National Climate Change Assessment of Mexico (2016)
Climate modeling expert advisory panel for Tajikistan, Asian Development Bank Project TA-8090 (November 2014)
Contributing editor, Special issue of *Meteorologische Zeitschrift* on regional climate modeling with COSMO-CCLM
Contributing lead author, Southwest Climate Change Assessment (published 2013)

U.S. Representative to Geophysics Commission, Pan American Institute for Geography and History (2009-2012)

Conference Session Chair, Regional Climate Modeling and/or Downscaling, American Meteorological Society Meeting (2012-2015)

Proposal reviewer for National Oceanic and Atmospheric Administration (NOAA), Office of Global Programs, National Science Foundation, Austrian Science Fund, U.S. Bureau of Reclamation (USBR), Environmental Production Agency (EPA), and National Aeronautic and Space Administration (NASA), Department of Energy (DOE).

Reviewer for numerous professional journals principally focused to the atmospheric sciences and related fields

Faculty Senate, University of Arizona (2012-2014)

Local organizing committee, *35th National Weather Association Meeting*, Tucson, Arizona, Oct. 2-7, 2010.

Contributed to planning and establishment of new graduate program in Hydrometeorology at the University of Arizona (2009-11).

Faculty member, Climate and Global Change Minor Program, University of Arizona, (Fall 2006-present)

Provided sworn expert witness testimony in case *State of Arizona vs. James Ray* (2013)

Provided training the use of the Weather Research and Forecasting Model for operational weather forecasting by the Colombian Air Force (2012)

Interviews to NHK Broadcasting Corporation (Japan) in production of documentary on North American Monsoon (summer 2011)

U.S. Department of State, Invited speaker to countries of Jamaica and Dominican Republic on the subject of climate change in the Caribbean (2010)

Synergistic Activities

(i) Improving seasonal forecasts for the warm season: Demonstrated a methodological approach to improve the accuracy of U.S. warm season seasonal forecasts by dynamical downscaling of the Climate Forecast System (CFS) global seasonal forecast model. This work was performed in collaboration with NOAA National Center for Environmental Prediction (NCEP), Climate Prediction Center (CPC) and Environmental Modeling Center (EMC).

(ii) Water resource projection at the regional and local scale: Working in collaboration with the major water resource providers in the Southwest (CAP, USBR, and SRP) and colleagues in the Department of Hydrology to provide dynamically climate change projection information (considering select CMIP3 and CMIP5 models) for water resource projection in through the Colorado River Basin.

(iii) Contributions to Weather Research and Forecasting model: Research has resulted in improved model parameterizations for convection schemes and land surface models (accounting for urbanization and dynamic vegetation)

(iii) Engagement of local operational weather forecasting community: Collaborative activity with the National Weather Service, Tucson Office, and the 25th Operational Weather Squadron at Davis-

Monthan Air-Force base. Real-time operational forecast practices are being implemented in research methodologies, for example in characterizing severe weather during the North American Monsoon.

(iv) Developing improved capacity for weather and climate research in Latin America: Conducting collaborative research with the Universidad Autónoma de México (UNAM) and Universidad de Sonora to investigate the use of global positioning satellite-derived atmospheric precipitable water for assimilation into a convective-resolving numerical weather prediction model, for improved forecast of organized convection during the North American Monsoon. Assistance provided in training of graduate students and visiting scientists from Mexico, Peru, and Colombia. Through involvement with the Pan American Institute for Geography and history, broader scientific community research activities in the areas of weather and climate are being presented at their various meetings.

Professional societies

Member, American Meteorological Society

Member, American Geophysical Union

Languages

Fluent in English (as U.S. citizen native speaker) and Spanish