

Malaquias Peña Mendez, Ph.D.

Associate Professor, Department of Civil and Environmental Engineering
University of Connecticut
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Education

University of Maryland	College Park, MD	Meteorology	Ph.D. 2003
University of Oklahoma	Norman, OK	Meteorology	MSc. 1999
National Autonomous University of Mexico	Mexico City	Physics	BSc. 1993

Professional Appointments

2017-present	Associate Professor	University of Connecticut
2017-2019	Manager	Eversource Energy Center
2015-2017	Engineer	IMSG at NCEP-NWS, NOAA
2010-2015	Consultant	World Meteorological Organization
2010-2015	Task Leader	IMSG at NCEP-NWS, NOAA
2004-2010	Research Scientist	SAIC at NCEP-NWS, NOAA
2003-2004	Research Associate	University of Maryland
2001-2003	Faculty Assistant	University of Maryland
1999	Research Associate	Univ. of Oklahoma/NSSL-NOAA

Areas of Interest

Data analytics for monitoring, prediction, system control, and decision making; observing networks and data assimilation; numerical weather prediction and Earth system modeling; predictability and estimation theory; environmental modeling.

Mentoring experience

Major Advisor

Muhammad R. Haider (PhD Student, University of Connecticut, Storrs, CT),	2017-to date
Aaron Haegele (MS Student, University of Connecticut, Storrs, CT),	2018-2020
Yue Yin (PhD Student, University of Connecticut, Storrs, CT),	2018-to date
Altan Unlu (PhD Student, University of Connecticut, Storrs, CT),	2020-to date
Panagiotis Mitsopoulos (PhD Student, University of Connecticut, Storrs, CT),	2021-to date
Xinba Li (BS Student, University of Connecticut, Storrs, CT),	2018-to date
Erika Yao (BS Student, University of Connecticut, Storrs, CT),	2019-2020
Frantz Gabriel (BS Student, University of Connecticut, Storrs, CT),	2021-to date
Julia Jackson (BS Student, University of Connecticut, Storrs, CT),	2021-to date

Associate Advisor

Christian Dominguez-Sarmiento (PhD, UNAM, Mexico),	2014
Marcos A. Saucedo (PhD, University of Buenos Aires, Argentina),	2015
Julio Buendia (PhD, College of Post-graduates, State of Mexico, Mexico),	2016
Xinxuan Zhang (PhD, University of Connecticut, Storrs, CT),	2017-2018
Diego Cerrai (PhD Candidate, University of Connecticut, Storrs, CT),	2018-2019
Yagmur Derin (PhD Candidate, University of Connecticut, Storrs, CT),	2018-2019
Peter Watson (PhD Student, University of Connecticut, Storrs, CT),	2018-2021
Michael Walters (MS Student, University of Connecticut, Storrs, CT),	2020
Feifei Yang (PhD Student, University of Connecticut, Storrs, CT),	2020-to date
Marika Koujoula (PhD Student, University of Connecticut, Storrs, CT),	2020-2021

Ismael Guidson (PhD Student, Universidade Federal de Campina Grande, Brazil), 2019-to date

Educational program direction

Power Grid Modernization Certificate (Graduate, Online) Since 2020

Teaching experience

Quantitative Methods for Engineers (Graduate, UConn, Storrs)	Since 2021
Engineering Economics (Undergraduate, UConn, Storrs)	Since 2019
Predictive Analytics for Engineers and Scientists (Graduate, UConn, Storrs)	Since 2018
Environmental Modeling (Undergraduate, UConn, Storrs)	Since 2017
Fluid Mechanics (Undergraduate, UConn, Storrs)	2017
Lectures on probabilistic forecast and its verification (UMD, College Park, MD)	2010-2016
Ensemble modeling and probabilistic forecasts for meteorologist	2014
Numerical weather and climate prediction for meteorologists	2012

Awards

Fulbright Brazil-U.S. Scholar Award; Project title: Ensemble prediction for urban areas”; Period of award: 07/2019-08/2020.

Recent grants

Eversource Energy Inc.	08/2020-07/2022
Title: Fine resolution nowcasting of PV and Loads in Distribution Grids	\$280,000
Eversource Energy Inc.	10/2019-09/2021
Title: Weather and Waves Modeling Research for Offshore Wind Projects	\$245,000
NSF Industry-University Cooperative Research Center -Phase 1	05/2019
Five-University Cooperative Center: ASU, SIU, AU, UConn, USC	
Title: Network-Embedded Smart and Safe Things	\$15,000
GAANN, U.S. Department of Education	10/2018-09/2021
Title: Addressing Aging Infrastructure: From Components to Networks	\$746,250
NOAA Climate Program Office	2016-2017
Title: “An NCEP Monthly Global Ensemble Forecast System”	\$340,000

Contribution to grants

NSF PIRE: Taming Water in Ethiopia: An Interdisciplinary Approach to Improve Human Security in a Water-Dependent Emerging Region. \$4,274,944. PI: Emmanouil Anagnostou
Role: Collaborator

Professional Experience

Software engineering for Earth System modeling

Contributed to algorithm development and evaluation of the NOAA Next Generation Unified Global Coupled System (NGGPS), which consisted of 6-components atmosphere, land, ocean, ice, ocean waves and aerosols. Developed core algorithms to extend the model integrations of the NCEP Global Ensemble Forecasts System (GEFS). Designed a two-tier atmosphere-ocean scheme for this system. Developed algorithms for model evaluation of the 3-components ocean-land-atmosphere coupled Climate Forecast System versions 1 and 2.

End-to-end numerical prediction product development

Managed tasks for the generation, postprocessing and validation of probabilistic numerical forecasts. Developed new techniques for uncertainty estimation of atmospheric variables. Conducted applied research on data assimilation to address issues of model errors and issues with ad hoc prescription of state’s initial uncertainty.

Global and collaborative projects

Experience with large, strategic complex projects involving multiple institutions. Experience on planning, techno-economics assessments. Examples: Eversource Energy Center Management's Grid Modernization project, The International Multi-Model Ensemble (NCEP, ECMWF, UKMet Office, MeteoFrance; 2011). Contributed to subtasks in the North-American Multi-Model Ensemble (NCEP, NCAR, NASA, GFDL, Canadian Meteorological Center), and the NOAA Unified Global Coupled System projects.

Observing field campaigns

The Pan-American Sounding Network for Climate Studies (1997), participated in various observing field campaigns in the SW U.S. and NW Mexico during the North American Monsoon period (July- August) in 1996 and 1999. A stint participation in the North American Monsoon Experiment (2004) project as a forecaster assistant in Tucson, AZ during the observing campaign. Managed a special sounding network from Mexico to Peru during the El Niño event of 1997. Participant in the THORPEX Field Campaigns 2010-2014. Serving as a co-chair of the THORPEX North American regional committee starting in 2010.

Publications in refereed journals

36. Jankov, I., S. Gregory, S. Ravela, Z. Toth, M. Peña, 2021: Partition of Forecast Error into Positional and Structural Components. *Advances in Atmospheric Sciences*, 38, 1012-1019.
35. da Rocha, R.L., D. D. Pinto, F.D. Silva, H.B. Gomes, H.B. Gomes, R. L. Costa, M. P. Pereira, M. Peña, C. Coelho, D. L. Herdies, 2021: An Empirical Seasonal Rainfall Forecasting Model for the Northeast Region of Brazil. *Water*, 31, 1631.
34. Li, X., P. Mitsopoulos, Y. Yin, and M. Peña, 2021: SARAL-Altika Wind and Significant Wave Height for Offshore Wind Energy applications in the New England Region. *Remote Sensing*, 13, 57.
33. Feng, J., Z. Toth, M. Peña, S. Ravela, 2020: A New Measure of Ensemble Central Tendency. *Weather and Forecasting* 35 (3), 879-889.
32. Feng, J., Z. Toth, M. Peña, J. Zhang, 2020: Partition of Analysis and Forecast Error Variance into Growing and Decaying Components. *Quarterly Journal of the Royal Meteorological Society*. Online early release view: <https://doi.org/10.1002/qj.3738>
31. Lillo, S., D. Parsons, M. Peña, 2019: Dynamics behind a record-breaking trough over Mexico and internal atmospheric variability during El Niño. *Bulletin Amer. Meteorol. Soc.* Online version available at DOI 10.1175/BAMS-D-18-0331.1.
30. Li, W., Y. Zhu, X. Zhou, D. Hou, E. Sinsky, C. Melhauser, M. Peña, R. Wobus, H. Guan, 2018: Evaluating the MJO Prediction skill from Different Configurations of NCEP GEFS Extended Forecast. *Climate Dynamics*. 52, 4923-4936.
29. Ping Liu, Yuejian Zhu, Qin Zhang, Jon Gottschalck, Minghua Zhang, Christopher Melhauser, Wei Li, Hong Guan, Xiaqiong Zhou, Dingchen Hou, Malaquias Peña, Guoxiong Wu, Yimin Liu, Linjiong Zhou, Bian He, Wenting Hu, Raymond Sukhdeo, 2018: Climatology of tracked persistent maxima of 500-hPa geopotential height, *Climate Dynamics*, 51, 701-717.
28. Yuejian Zhu, Xiaqiong Zhou, Wei Li, Dingchen Hou, Christopher Melhauser, Eric Sinsky, Malaquias Peña, Bing Fu, Hong Guan, Walter Kolczynski, Richard Wobus, Vijay Tallapragada, 2018: Towards the Improvement of Sub-Seasonal Prediction in the NCEP Global Ensemble Forecast System (GEFS), *J. Geophys. Res.*, 123, 6732-6745.
27. Yuejian Zhu, Xiaqiong Zhou, Malaquias Peña, Wei Li, Christopher Melhauser, Dingchen Hou, 2017: Impact of sea surface temperature forcing on weeks 3 and 4 forecast skill in the NCEP Global Ensemble Forecasting System, *Weather and Forecasting*, 32, 2159-2174.
26. Julio Cesar Buendia-Espinoza, Paulino Perez-Rodriguez, Juan Manuel Gonzalez-Camacho, Sergio Perez-Elizalde, Adolfo Exebio-Garcia, Michel Rosengaus Moshinsky, Malaquias Pena, 2017: Identification of changes in the North Atlantic cyclogenesis using a Gaussian mixture model, *Technologies y Ciencias del Agua*, 8, 5-18.
25. Jie Feng, Zoltan Toth, Malaquias Peña, 2017: Spatially extended estimates of analysis and short-range forecast error variances, *Tellus A*, 69, 1-13.

24. Barradas, A., E. Kalnay, M. Peña, A. Bozorg-Magham, S. Motesharrei, 2017: Driver of the locally coupled ocean-atmosphere anomalies. *Climate Dynamics*, 48, 2153-2172.
23. S. Majumdar, E. Chang, M. Peña, R. Tatusko, Z. Toth, 2015: Planning the next decade of coordinated research on minutes-to-seasonal predictions of high-impact weather. *Bull. Amer. Meteor. Soc.*, 96, 461-464.
22. A. Robertson, A. Kumar, M. Peña, F. Vitart, 2015: International Conference on Sub-seasonal to seasonal prediction. *Bull. Amer. Meteor. Soc.*, 96, ES49-ES53.
21. Peña, M. and Z. Toth, 2014: Estimating analysis and forecast error variances. *Tellus A.* 66, 21767.
20. B. Kirtman et al. M. Peña, 2014: The National Multi-Model Ensemble. *Bull. Amer. Meteor. Soc.*, 95, 585-601.
19. J. Ma, Y. Zhu, D. Hou, X. Zhou, M. Peña, 2014: Ensemble Transform with 3D Rescaling Initialization Method. *Mon. Wea Rev.*, 142, 4053-4073.
18. S. Saha et al. M. Peña, 2014: The NCEP Climate Forecast System Version 2. *Journal of Climate*. 27, 2185-2208.
17. E. Chang, M. Peña, Z. Toth, 2013: International Research Collaboration in High-Impact Weather Prediction. *Bull. Amer. Meteor. Soc.*, 94, ES149-ES151.
16. D. Hou, et. al. M. Pena, Bo Cui, 2013: Climatology-Calibrated Precipitation Analysis at Fine Scales: Statistical Adjustment of Stage IV towards CPC Gauge Based Analysis. *J. Hydrometeorol.*, 14, 2542-2557.
15. E. Becker, H. van den Dool, and M. Peña, 2013: Short-term climate extremes: prediction skill and predictability. *J. Climate*, 26, 512-531. (<http://dx.doi.org/10.1175/JCLI-D-12-00177.1>)
14. Peña, M., Toth, Z. and M. Wei, 2010: Controlling noise in ensemble data assimilation schemes. *Mon. Wea. Rev.*, 138, 1502-1512.
13. Peña, M., and H. van den Dool, 2008: Consolidation of Multi-Method Forecasts by Ridge Regression: Application to Pacific Sea Surface Temperature. *Journal of Climate*, American Meteorological Society. *J. Climate*, 21, 6521–6538.
12. Toth, Z., M. Peña, A. Vinzileos, 2007: Bridging the gap between weather and climate forecasting: Research priorities for intraseasonal prediction. *Bull. Amer. Meteor. Soc.*, 88, 1427-1429.
11. Toth, Z. and M. Peña, 2007: Data Assimilation and Numerical Forecasting with imperfect models: The mapping paradigm. *Physica D*, 230, 146-158.
10. Saha, S., M. Peña, et. al., 2006: The NCEP Climate Forecast System. *Journal of Climate*, 19, 3483-3517. Manuscript available at <http://cfs.ncep.noaa.gov>
9. Peña, M. and E. Kalnay, 2004: Separating fast and slow modes in coupled chaotic systems. *Non-linear Processes in Geophysics*, 11,319-327.
8. Evans, E., N. Bhatti, J. Kinney, L. Pann, M. Peña, S-C Yang, E. Kalnay and J. Hansen, 2004: Rise undergraduates find that regime changes in Lorenz's model are predictable. *Bulletin of the American Meteorological Society*, 85, 520-524.
7. Peña, M., M. Cai and E. Kalnay, 2004a: Lifespan of sub-seasonal locally coupled anomalies. *J. Climate*, 17, 1597-1604.
6. Peña, M., M. Cai and E. Kalnay, 2004b: Coupling Atmospheric Anomalies with the Ocean. *Bulletin of the American Meteorological Society*
5. Peña, M., E. Kalnay and M. Cai, 2003: Statistics of locally coupled ocean-atmosphere anomalies. *Non-linear Processes in Geophysics*, 10, 245-251. European Geophysical Union.
4. Peña, M. and M.W. Douglas, 2002: Characteristics of Central American wet and dry spells during the rainy season. *Monthly Weather Review*, 130, 3054-3073.
3. Peña, M., E. Kalnay and M. Cai, 2001: Coupled ocean and atmosphere intraseasonal anomalies in reanalysis and AMIP data. *WMO Magazine*.
2. Douglas, M., M. Peña and J.L. Santos, 1998: Special Meteorological observations during ENSO 1997/1998 in the Northern Part of South America. *Bull. Inst. Fr. Etudes Andines*, 27, 493-500.

1. Carmona G. and M. Peña, 1992: The application of the renormalization group to diffusion in amorphous material. *Revista Mexicana de Física* 38 (Suplemento 1), 212-220.

Book Chapters

2. Peña, M., L-C Chen, H. van den Dool, 2019: Climate Variability and Long-Term Ensemble Predictions. In: Duan Q., Pappenberger F., Thielen J., Wood A., Cloke H., Schaake J. (eds) *Handbook of Hydrometeorological Ensemble Forecasting*. Springer, Berlin, Heidelberg.

1. Huiling Yuan, Zoltan Toth, Malaquias Peña, Eugenia Kalnay, 2018: Overview of weather and climate systems. In: Duan Q., Pappenberger F., Thielen J., Wood A., Cloke H., Schaake J. (eds) *Handbook of Hydrometeorological Ensemble Forecasting*. Springer, Berlin, Heidelberg.

Selected International Reports

6. H. Yuan, P. Schultz, E.I. Tollerud, D. Hou, Y. Zhu, M. Pena, M. Charles, Z. Toth, 2019: Pseudo-precipitation: A continuous precipitation variable. NOAA Technical Memorandum OAR GSD-62. <https://doi.org/10.25923/3h37-gp49>

5. Penny et al. and M. Peña, 2017. Coupled Data Assimilation for Integrated Earth System Analysis and Prediction, Goals, Challenges and Recommendations. WWRP-World Meteorol. Organization. Available at https://www.wmo.int/pages/prog/arep/wwrp/new/documents/Final_WWRP_2017_3_27_July.pdf

4. M. Peña, 2017. Development and use of numerical seasonal prediction systems. Instituto de Geofísica del Perú. Technical Bulletin, June issue. Available at: http://www.met.igp.gob.pe/publicaciones/Divulgacion_PPR_El_Nino_IGP_201706.pdf

3. M. Peña and B. Mills, 2011. WMO North American Regional Committee: Annual report of activities. Available at: WWRP-WMO website. [Doc4_4_North_American_Regional_Activities.pdf](#)

2. M. Peña and E. Kalnay, 2002: The life span of intraseasonal atmospheric anomalies: dependence on the phase relationship with the ocean. In: Working Group on Numerical Experimentation (WGNE) Blue Book.

1. Douglas, M., M. Peña, R. Villarando, 2000: Special observations of the low-level flow over eastern Bolivia during the 1999 atmospheric mesoscale campaign. 6th Inter. Conf. on Southern Hemisphere Meteorology and Oceanography.

Invited Talks

“Numerical Weather Prediction transformations and uses for better Climate and Environmental Predictions”. Stony Brooks University, Stony Brooks, NY, May 2019.

“Estimating and sampling model uncertainty in coupled NWP systems”. Third RIKEN International Symposium on Data Assimilation and 7th Annual Japan Data Assimilation Workshop. Kobe, Japan, February 2017.

“Routine Diagnostics to Monitor the Next –Generation Unified Global Coupled System (UGCS) model”. NOAA-Environmental Modeling System (NEMS) Workshop. College Park, MD. September, 2016d.

“Exploring ensemble generation approaches for monthly forecasts at NCEP”. NOAA ESRL, Boulder, Colorado, July, 2016c.

“NCEP seasonal ensemble forecasting: the NMME and IMME projects”. Seventh NCEP Ensemble User Workshop. College Park, MD., June 2016b.

“Global ensemble forecasts: Current research and developments”. Argentine’s National Meteorological Service, Buenos Aires, ARGENTINA, March 1st, 2016a.

“Development of a Monthly Global Ensemble Forecast System at NCEP”. Canadian Meteorological Center, Dorval, CANADA. May 5, 2015.

“Predicting anomalies in atmosphere-ocean coupled models.” Symposium of Eugenia Kalnay, AMS. Phoenix, AZ, January 2015b.

“International Multi-Model Ensembles. Current research and developments” American Geophysical Union, San Francisco, CA. December 2014
“Global ensemble forecasts at NCEP: Current research and developments”. At the 20th Anniversary of the CPTEC- Sao Paulo, Brazil. October 11-14, 2014.
“The Multi-Model Ensemble Prediction projects at NCEP”. Technical Meeting of EUROSIP. Toulouse, France. February 2012.

Selected conference papers

M. Peña: Ensemble generation approaches in the NCEP CFSv2. AMS Annual Conference, Seattle, WA, Jan 2017.
M. Peña: Monitoring the performance of the next Climate Forecast System version 3, throughout its development stage at EMC/NCEP, San Francisco, CA, Dec. 2016*e*.
M. Peña: Coupled perturbations in the CFSv2. S2S Extreme Events Workshop, Palisades, N.Y., Dec. 2016*d*.
M. Peña: Tropical influence on the forecast skill variability in the NH. Workshop on Teleconnections. International Center for Theoretical Physics. Trieste, ITALY, October, 2016*c*.
M. Peña: EnKF perturbations in coupled models for subseasonal predictions. International Workshop on Coupled Data Assimilation. Toulouse, FRANCE, October, 2016*b*.
M. Peña: The use of the ensemble covariance matrix to propagate forecast uncertainty across climate model components. Columbia, MD, May 2016*a*.
M. Peña: Monthly Ensemble Forecasts from the NCEP GEFS. AGU, Montreal Canada. May 4, 2015*c*.
M. Peña: The MJO signal in the NCEP GEFS prediction system. Symposium of Madden Julian Oscillation, AMS. Phoenix, AZ, January 2015*a*.
M. Peña: Ensemble generation methods and skill of subseasonal predictions in the NCEP GEFS. World Weather Open Science Conference, Montreal, Canada. August 16-21, 2014.
M. Peña and Z. Toth: An unbiased estimation of analysis and short-range forecast error variances. World Weather Open Science Conference, Montreal, Canada. August 16-21, 2014.
M. Peña: The Monthly GEFS. North American Ensemble Forecast System Workshop. Montreal, Canada. June 17-20, 2014.
M. Peña: A series of training courses on Ensemble Forecasting. Provided at the Meteorological Center in Peru. May 26-30, 2014.
M. Peña: The Extended Range Global Ensemble Forecast System at NCEP. Special Symposium on Advancing Weather and Climate Forecasts: Innovative Techniques and Applications. January 2013. Austin, TX.
M. Tippet, et al. and M. Peña: Recalibrating and Combining Ensemble Predictions. 6th NOAA Annual Climate Diagnostics and Prediction Workshop. Fort Worth, TX, 3-6 October 2011.
M. Peña: Predictions beyond 2-weeks with the NCEP Global Ensemble Forecast System (GEFS). American Geophysical Union, The Meeting of the Americas. Iguazu, Brazil. May 2010.

Service

Associate Editor: Journal of Weather and Forecasting, AMS; MDPI International Journal of Modelling.

Journal Referee: Nature, Quarterly Journal of the Royal Meteorological Society, Journal of Climate, Weather and Forecasting, Monthly Weather Review, Atmosphere, Journal of Non-linear Processes in Geophysics, Journal of Geophysics Letters, Advances in Atmospheric Sciences, Atmosfera, Ocean.

Reviewer: NCEP internal reviewer, NOAA Program for Climate Research.

Workshop organizer:

Annual Summit on Grid Modernization, Storrs, CT, 2019
Workshop on Grid Modernization, Storrs, CT, 2018
US THORPEX-Legacy Planning Meeting, Silver Spring, MD, June 2014
Sixth NCEP Ensemble Users Workshop, College Park, MD, March 2014,
International Conference on Subseasonal forecasting, College Park, MD, October 2013

US THORPEX Workshop, College Park, MD, USA, 19 - 20 September 2012

Advisory panelist:

NOAA UFS Planning, S2S and Ensemble	2018
NOAA Subseasonal-to-Seasonal Task Force, Member	2016-2019
NOAA Climate Development Task Force, Member	2016-2019
Peer-Review Panel for NOAA MAPP funding, Member	2015
NOAA Drought Prediction Task Force, Member	2015-2016
U.S. Climate Prediction Task Force, Member	2013-2014
CO-CHAIR of the U.S. WMO-THORPEX Science Steering Committee	2012-2014
CO-CHAIR of the WWRP North American Regional Committee	2009