# Yuan-Ming Cheng

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## SUMMARY

Motivated by the need to mitigate weather and climate risks, my research focuses on subseasonal to seasonal predictions, high-impact weather events, and hurricanes. By leveraging statistical analysis, machine learning, and numerical modeling, I strive to provide expertise to support operational needs and inform decision-making processes.

## APPOINTMENTS

**Research Scientist at NOAA PSL and CIRES** 2023–present

- Develop a data-driven linear inverse model (LIM) to deliver real-time forecasts for the U.S. hydroclimate conditions at the subseasonal-to-seasonal (S2S) time scales
- Improve the LIM for the NOAA Climate Prediction Center, supporting their operational weeks 3-4 forecasts
- Develop process-oriented diagnostic tools to identify forecasts of opportunity and investigate physical mechanisms to improve S2S forecast

**National Research Council Postdoctoral Research Associate at NOAA PSL** 2019–2023

- Led projects funded by the NRC and NOAA to work with Dr. George Kiladis on subseasonal to synoptic-scale circulations in the tropics and their interactions with mid-latitude circulations and mesoscale convective systems
- Performed extensive statistical analysis, such as principal component, power spectrum, and regression analyses, of observations and reanalysis data and compared results against an empirical dynamical model

**Graduate Research Assistant at University at Albany** 2014–2019

- Characterized the variability of African easterly waves and documented their interactions with equatorial and mid-latitude circulations by utilizing statistical analyses, case studies, and numerical modeling
- Investigated tropical cyclone genesis using WRF mechanism-denial experiments and tested model sensitivity to parameterization by verifying them against observations

**Research Assistant at Typhoon Dynamics Research Center** 2009–11, 2013–14

- Investigated dynamics of tropical cyclones such as secondary eyewall formation, boundary layer dynamics, and oceanic feedback using MM5 and WRF ensemble simulations at National Taiwan University

**Weather Officer as a Second Lieutenant, Taiwan Air Force** 2011–2012

- Led daily weather discussions and issued daily forecasts to military personnel as an operational forecaster

## PROFESSIONAL SKILLS

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|---|---|
| **Programming** | Python, NCL, Fortran, GrADS, Shell script, GitHub, CDO, NCO |
| **Data** | Satellite data, reanalyses, numerical weather prediction ensemble data |
| **Statistical analysis** | PCA, regression, power spectrum analysis |
| **Modeling** | WRF, MM5, Dynamical Research Empirical Atmospheric Model |

## EDUCATION

**Ph.D., Atmospheric Sciences, University at Albany, State University of New York** 2019

Thesis title: Variability of African easterly waves

**M.S., Atmospheric Sciences, National Taiwan University** 2011

Thesis title: The role of boundary layer dynamical processes in tropical cyclone intensity (Dean's Award for the Best M.S. Thesis)

**B.S., Chemical Engineering, National Taiwan University** 2009

Minor in Atmospheric Sciences

## REFEREED PUBLICATIONS

**Cheng, Y.-M.**, J. Dias, G. Kiladis, Z. Feng, and L. R. Leung, 2023: Mesoscale convective systems modulated by convectively coupled equatorial waves. *Geophys. Res. Lett.*, **50**(10), doi.org/10.1029/2023gl103335.

**Cheng, Y.-M.**, S. Tulich, G. N. Kiladis, and J. Dias, 2022: Two extratropical pathways to forcing tropical convective disturbances *J. Climate, **35**, 2987–3009*, doi.org/10.1175/JCLI-D-22-0171.1.

Laura A. Holt, François Lott, Rolando R. Garcia, George N. Kiladis, **Y.-M. Cheng** et al., 2020: An evaluation of tropical waves and wave forcing of the QBO in the QBOi models. *Quart. J. Roy. Met. Soc., **148**,1541–1567*, doi.org/10.1002/qj.3827.

**Cheng, Y.-M.**, C. D. Thorncroft, and G. N. Kiladis, 2019: Two contrasting behaviors of African easterly waves. *J. Atmos. Sci., **76**, 1753–1768*, doi.org/10.1175/JAS-D-18-0300.1.

## BOOK CHAPTER

Antoine Venaille, Juliana Dias, **Yuan-Ming Cheng**: Large-scale Atmospheric Dynamics: Equatorial Waves in *Atmospheric Dynamics*, currently being edited by Caroline Muller, Riwal Plougonven, and Gwendal Rivière

## FIELD EXPERIENCE

**DOTSTAR–Dropwindsonde Observations for Typhoon Surveillance near TAiwan Region** 2010

As a surveillance flight quality control specialist, I collected data on research flights into typhoons using the NCAR-Atmospheric Sounding Processing Environment program.

**ATOMIC–Atlantic Tradewind Ocean–Atmosphere Mesoscale Interaction Campaign** 2020

I led daily weather briefings to inform observations for the field campaign.

## HONORS AND AWARDS

National Research Council Research Associateship Award 2019–2023
Dean's Award for the Best M.S. Thesis, College of Science, National Taiwan University 2011

## SERVICES

**Associate Editor** for Weather and Forecasting 2024–present
**Reviewer** for IPCC 6$^{th}$ Assessment Report, Quart. J. Roy. Meteor. Soc., J. Climate, J. Geophys. Res. Atmos., Mon. Wea. Rev., J. Atmos. Sci., and J. Appl. Meteor.

**Co-chair** of the Tropical Waves Session at the 35th Conference on Hurricanes and Tropical Meteorology 2022
**Lead and coordinator of outreach programs** at University at Albany 2015–2019

## INVITED TALK

Department of Earth System Sciences, University of Hamburg 2023

## PROFESSIONAL DEVELOPMENT

**NOAA/NCAR Open Hackathon** 2023

Selected to attend a NOAA/NCAR-NVIDIA Hackathon where we improved and optimized our scientific computation project by 100 times using GPU architectures.

**Mind the Gap 2 Workshop** 2022

Selected to participate in a National Science Foundation-sponsored workshop dedicated to educating the next generation of atmospheric scientists for careers in industry.

## SELECTED CONFERENCE PRESENTATIONS

**Cheng, Y.-M.**, J. Albers, M. Newman, M. Gehne, 2024: Evaluating the MJO's Impact on North American Subseasonal Forecasts in a Real-time Linear Inverse Model. 35$^{th}$ Conference on Hurricanes and Tropical Meteorology, Long Beach, CA

**Cheng, Y.-M.**, J. Albers, M. Newman, M. Gehne, 2024: Influence of Trends on Weeks 3-4 Temperature Prediction. 48$^{th}$ Climate Diagnostics and Prediction Workshop and 21$^{st}$ Climate Prediction Applications Science Workshop, Tallahassee, FL

**Cheng, Y.-M.**, G. N. Kiladis, J. Dias, and S. Tulich, 2022: Impact of convectively coupled equatorial waves on the characteristics and organization of MCSs. 35$^{th}$ Conference on Hurricanes and Tropical Meteorology, New Orleans, LA.

**Cheng, Y.-M.**, S. Tulich, and G. Kiladis, 2021: Two extratropical pathways to forcing tropical convection. 34$^{th}$ Conference on Hurricanes and Tropical Meteorology, online.

**Cheng, Y.-M.**, C. D. Thorncroft, and G. Kiladis, 2020: African easterly wave characteristics: climate variability and trends. 100$^{th}$ AMS Annual Meeting, Boston, MA.

**Cheng, Y.-M.**, and C. D. Thorncroft, 2018: Variability of African easterly wave structures. 33$^{rd}$ Conference on Hurricanes and Tropical Meteorology, Ponte Vedra, FL.

Alland, J. J., and **Y.-M. Cheng**, 2018: The role of African easterly waves north of the African easterly jet on tropical cyclogenesis. 33$^{rd}$ Conference on Hurricanes and Tropical Meteorology, Ponte Vedra, FL.

**Cheng, Y.-M.**, and C. D. Thorncroft, 2017: A survey of synoptic waves over West Africa. General Assembly 2017, European Geosciences Union, Vienna, Austria.

**Cheng, Y.-M.**, and C. D. Thorncroft, 2016: Three-dimensional structure of African easterly waves based on empirical orthogonal functions. 32$^{nd}$ Conference on Hurricanes and Tropical Meteorology, San Juan, PR.

**Cheng, Y.-M.**, and C.-C. Wu, 2014: The role of boundary layer dynamics on tropical cyclone intensity. 31$^{st}$ Conference on Hurricanes and Tropical Meteorology, San Diego, CA.

Chun-Chieh Wu, S.-P. Kuan, **Y.-M. Cheng**, and Y.-H. Huang, 2013. Unbalanced dynamics of secondary eyewall formation in tropical cyclones part II: Analyses from higher-resolution simulations. 31$^{st}$ Conference on Hurricanes and Tropical Meteorology, San Diego, CA.

**Cheng, Y.-M.**, and C.-C. Wu, 2011: The role of boundary layer dynamical processes in tropical cyclone intensity. Asia Oceania Geoscience Society 8th Annual General Meeting, Taipei, Taiwan.