Qiu Yang

Assistant Professor at Peking University (PKU) Department of Atmospheric and Oceanic Sciences, School of Physics 209 Chengfu Road, Haidian District, Beijing, China qiu.yang@pku.edu.cn https://qiuyang50.github.io/ Last update: November 9, 2023

RESEARCH INTERESTS

- [1] Multi-scale organization of tropical convection, such as Madden-Julian Oscillation, diurnal cycle, ITCZ, convectively coupled equatorial waves, mesoscale convective systems, Monsoon, and El Niño
- [2] Modeling of mid-latitude extreme precipitation, such as mesoscale convective systems
- [3] Theoretical modeling of large-scale atmospheric flows, such as multi-scale asymptotic models and stochastic dynamic models
- [4] Computational fluid dynamics methods for idealized and intermediate models, cloud-resolving simulations, and general circulation models
- [5] E3SM multiscale modeling framework, multicloud parameterization, and convective momentum transport parameterization

PROFESSIONAL EXPERIENCE

Assistant Professor

- · Address: Department of Atmospheric and Oceanic Sciences, School of Physics, Peking University
- Research Interest: Large-scale convective organization (e.g., MJO), Atmospheric dynamical theory and modeling, High-resolution cloud-resolving simulation

Research Scientist

- · Address: Atmospheric Sciences and Global Change Division, Pacific Northwest National Laboratory (PNNL), USA
- \cdot Project: 1) Water Cycle and Climate Extremes Modeling, 2) E3SM Multiscale Modeling Framework
- $\cdot\,$ Project PI: Lai-yung Ruby Leung (PNNL)

Visiting Scholar

- $\cdot\,$ Climate and Global Dynamics Laboratory, National Center for Atmospheric Research (NCAR), USA
- \cdot Host: Mitchell Moncrieff

Visiting Scholar

- $\cdot\,$ Department of Mathematics and Statistics, University of Victoria (UVic), Canada
- \cdot Host: Boualem Khouider

Postdoc Associate

- $\cdot\,$ Address: Center for Atmosphere Ocean Science, Courant Institute, New York University, USA
- \cdot Project: Upscale Impact of Mesoscale Convective Systems on Tropical Weather and Climate
- \cdot Mentor: Andrew Majda (NYU), Mitchell Moncrieff (NCAR), and Boualem Khouider (UVic)

2023 Nov.-present

2020 Sep.–2023 Oct.

2018 Mar.-May

2017 Jul.–2020 Aug.

2017 Sep.–Dec., 2019 May–Jul.

Ph.D. in Mathematics and Atmosphere & Ocean Sciences

- · Center for Atmosphere Ocean Science, Courant Institute, New York University (NYU), NY, USA
- Thesis: Multi-Scale Models for the Scale Interaction of Organized Tropical Convection
- · Advisor: Andrew J. Majda (NYU)

B.S. in Mathematics (major) and Physics (minor)

2008 fall-2012 spring

2012 fall-2017 spring

- $\cdot\,$ Zhiyuan College, Shanghai Jiao Tong University (SJTU), Shanghai, China
- $\cdot\,$ Thesis: Optimal Transport of Water in the Biological Network
- $\cdot\,$ Advisor: David Cai (NYU) and Dan Hu (SJTU)

PUBLICATIONS

Below * denotes corresponding author and my name is marked in **bold**.

2023

- [20] Xingchao Chen*, Ruby Leung, Zhe Feng, Xingchao Chen, Qiu Yang, 2023: Environmental controls on MCS's lifetime rainfall over tropical oceans. Geophysical Research Letters, https://doi.org/10. 1029/2023GL103267
- [19] Qiu Yang*, L. Ruby Leung, Zhe Feng, Xingchao Chen: A Moist Potential Vorticity Model for Mid-Latitude Mesoscale Convective Systems over the Land. Journal of the Atmospheric Sciences, https: //doi.org/10.1175/JAS-D-22-0244.1 (media coverage: DOE EESM program research highlight https://climatemodeling.science.energy.gov/research-highlights/building-theoretical-dynamicalmodel-thunderstorms-over-united-states)
- [18] Xingchao Chen*, Ruby Leung, Zhe Feng, Xingchao Chen, Qiu Yang, 2023: Diurnal MCS prior to the genesis of tropical cyclone Mora (2017): the role of convectively forced gravity waves. Journal of the Atmospheric Sciences, https://doi.org/10.1175/JAS-D-22-0203.1.

2022

- [17] Qiu Yang*, L. Ruby Leung, Zhe Feng, Xingchao Chen, 2022: Impact of Global Warming on U.S. Summertime Mesoscale Convective Systems: A Simple Lagrangian Parcel Model Perspective. Journal of Climate, https://doi.org/10.1175/JCLI-D-22-0291.1 (media coverage: ???)
- [16] Qiu Yang*, Walter Hannah, L. Ruby Leung, 2022: Convective Momentum Transport and its Impact on the Madden-Julian Oscillation in E3SM-MMF. Journal of Advances in Modeling Earth Systems. e2022MS003206, https://doi.org/10.1029/2022MS003206
- [15] Fengfei Song*, L. Ruby Leung, Zhe Feng, Xingchao Chen, Qiu Yang, 2022: Historical and future changes of large-scale environments for spring MCS initiation over the U.S. Great Plains. Geophysical Research Letters, 49(15), e2022GL098799, https://doi.org/10.1029/2022GL098799
- [14] Xingchao Chen*, L. Ruby Leung, Zhe Feng, Qiu Yang, 2022: Precipitation-moisture interactions over tropical oceans: consecutive roles of different convective systems. Geophysical Research Letters, 49(7), p.e2022GL097836, https://doi.org/10.1029/2022GL097836

2021

[13] Qiu Yang*, L. Ruby Leung, Zhe Feng, Fengfei Song, Xingchao Chen, 2021: A Simple Lagrangian Parcel Model for the Initiation of Summer-time MCSs over the Central US, Journal of the Atmospheric Sciences, 78(11), 3537-3558, https://doi.org/10.1175/JAS-D-21-0136.1 (media coverage: DOE EESM program research highlight https://climatemodeling.science.energy.gov/ research-highlights/building-theoretical-model-thunderstorms-over-central-united-states)

- [12] Xingchao Chen*, L. Ruby Leung, Zhe Feng, Fengfei Song, Qiu Yang, 2021: Mesoscale Convective Systems Dominate the Energetics of the South Asian Summer Monsoon Onset, Geophysical Research Letters, e2021GL094873, https://doi.org/10.1029/2021GL094873
- [11] Qiu Yang*, Andrew J. Majda, Nan Chen, 2021: ENSO Diversity in a Tropical Stochastic Skeleton Model for the MJO, El Nino, and Dynamic Walker Circulation, Journal of Climate, 34(9), pp. 3481-3501, https://doi.org/10.1175/JCLI-D-20-0447.1

2019

- [10] Qiu Yang*, Andrew J. Majda, Noah D. Brenowitz, 2019: Effects of Rotation on the Multiscale Organization of Convection in a Global 2D Cloud Resolving Model, Journal of the Atmospheric Sciences, 76(11), pp.3669-3696, https://doi.org/10.1175/JAS-D-19-0041.1
- [9] Qiu Yang*, Andrew J. Majda, Mitchell W. Moncrieff, 2019: Upscale Impact of Mesoscale Convective Systems and Its Parameterization in An Idealized GCM for An MJO Analog above the Equator, Journal of the Atmospheric Sciences, 76(3), pp.865-892, https://doi.org/10.1175/JAS-D-18-0260.1
- [8] Qiu Yang, Boualem Khouider*, Andrew J. Majda, Michele De La Chevrotiere, 2019: Northward Propagation, Initiation and Termination of Boreal Summer Intraseasonal Oscillations in a Zonally Symmetric Model, Journal of the Atmospheric Sciences, 76(2), pp.639-668, https://doi.org/10. 1175/JAS-D-18-0178.1
- Qiu Yang*, Andrew J. Majda, 2019: Upscale Impact of Mesoscale Disturbances of Tropical Convection on 2-Day Waves. Journal of the Atmospheric Sciences, 76(1), pp.171-194, https://doi.org/10.1175/ JAS-D-18-0049.1

2018

- [6] Noah D. Brenowitz*, Andrew J. Majda, Qiu Yang, 2018: The Multiscale Impacts of Organized Convection in Global 2-D Cloud-Resolving Models. Journal of Advances in Modeling Earth Systems, 10(8), pp.2009-2025, https://doi.org/10.1029/2018MS001335
- [5] Qiu Yang* and Andrew J. Majda, 2018: Upscale Impact of Mesoscale Disturbances of Tropical Convection on Convectively Coupled Kelvin Waves. Journal of the Atmospheric Sciences, 75(1), pp.85-111, https://doi.org/10.1175/JAS-D-17-0178.1

2014-2017 (my Ph.D. studies)

- [4] Qiu Yang*, Andrew J. Majda and Boualem Khouider, 2017: ITCZ Breakdown and Its Upscale Impact on the Planetary-Scale Circulation over the Eastern Pacific. Journal of the Atmospheric Sciences, 74(12), pp.4023-4045, https://doi.org/10.1175/JAS-D-17-0021.1
- [3] Qiu Yang* and Andrew J. Majda, 2017: Upscale Impact of Mesoscale Disturbances of Tropical Convection on Synoptic-Scale Equatorial Waves in Two-Dimensional Flows. Journal of the Atmospheric Sciences, 74(9), pp.3099-3120, https://doi.org/10.1175/JAS-D-17-0068.1
- [2] Andrew J. Majda and Qiu Yang*, 2016: A Multi-Scale Model for the Intraseasonal Impact of the Diurnal Cycle over the Maritime Continent on the Madden-Julian Oscillation. Journal of the Atmospheric Sciences, 73(2), pp.579-604, https://doi.org/10.1175/JAS-D-15-0158.1
- Qiu Yang* and Andrew J. Majda, 2014: A Multi-scale Model for the Intraseasonal Impact of the Diurnal Cycle of Tropical Convection. Theoretical and Computational Fluid Dynamics, 28(6), pp.605-633, https://doi.org/10.1007/s00162-014-0336-3

CONFERENCES AND TALKS

[38] **09/27/2023 Invited colloquium talk** in the Department of Meteorology and Atmospheric Science at the Pennsylvania State University. The title of my talk is "*Two theoretical frameworks on mid-latitude mesoscale convective systems over the Land*".

- [37] **07/25/2023** Seminar talk at the Atmospheric and Oceanic Sciences in the University of Wisconsin-Madison. The title of my talk is "Impact of Global Warming on U.S. Summertime Mesoscale Convective Systems: A Simple Lagrangian Parcel Model Perspective".
- [36] 07/25/2023 Seminar talk at the Department of Earth, Atmospheric and Planetary Sciences in the Purdue University. The title of my talk is "Impact of Global Warming on U.S. Summertime Mesoscale Convective Systems: A Simple Lagrangian Parcel Model Perspective".
- [35] 07/17/2023 Oral talk at the AMS 20th Conference on Mesoscale Processes in Madison, Wisconsin. The title of my talk is "Impact of Global Warming on U.S. Summertime Mesoscale Convective Systems: A Simple Lagrangian Parcel Model Perspective".
- [34] 05/17/2023 Seminar talk at the Center for Atmosphere Ocean Science (CAOS) Colloquium in New York University. The title of my talk is "Impact of Global Warming on U.S. Summertime Mesoscale Convective Systems: A Simple Lagrangian Parcel Model Perspective".
- [33] 04/21/2023 Seminar talk at the Atmospheric and Oceanic Sciences Colloquium (ATOC) in University of Colorado Boulder. The title of my talk is "Impact of Global Warming on U.S. Summertime Mesoscale Convective Systems: A Simple Lagrangian Parcel Model Perspective".
- [32] 04/20/2023 Seminar talk at the Mesoscale & Microscale Meterorology (MMM) Laboratory of NCAR. The title of my talk is "Impact of Global Warming on U.S. Summertime Mesoscale Convective Systems: A Simple Lagrangian Parcel Model Perspective".
- [31] 04/13/2023 Seminar virtual talk in the Meteorology seminar at the department of earth, ocean, & atmospheric science in Florida State University. The title of my talk is "Impact of Global Warming on U.S. Summertime Mesoscale Convective Systems: A Simple Lagrangian Parcel Model Perspective".
- [30] 04/10/2023 Seminar talk in the Atmospheric & Chemistry Seminar at the department of atmospheric sciences, University of Washington. The title of my talk is "Impact of Global Warming on U.S. Summertime Mesoscale Convective Systems: A Simple Lagrangian Parcel Model Perspective".
- [29] 12/15/2022 Oral talk in AGU fall meeting session "A45H: Understanding and Modeling of Mesoscale and Severe Local Convective Storm Processes III Oral". The title of my talk is "Impact of Global Warming on U.S. Summertime Mesoscale Convective Systems: A Simple Lagrangian Parcel Model Perspective".
- [28] 12/14/2022 Oral talk in AGU fall meeting session "A33E: High-Resolution Earth System Modeling on Large Supercomputers I Oral". The title of my talk is "Convective Momentum Transport and its Impact on the Madden-Julian Oscillation in E3SM-MMF".
- [27] **06/13/2022 Invited virtual talk** in Canadian Applied And Industrial Mathematics Society (CAIMS) annual meeting, MS14 session: Models for the Atmosphere, Climate, and Ocean Dynamics. The title of my talk is "A Simple Lagrangian Parcel Model for the Initiation of Summertime Mesoscale Convective Systems over the United States".
- [26] 01/25/2022 Remote poster presentation in the AMS's 10th Symposium on the Madden-Julian Oscillation and Sub-Seasonal Monsoon Variability of the AMS 102nd Annual Meeting. The title of my talk is "Upscale Impact of Mesoscale Convective Systems on the Madden-Julian Oscillation and Its Parameterization in a Coarse-Resolution GCM".
- [25] 01/24/2022 Remote presentation in the AMS's 19th Conference on Mesoscale Process of the AMS 102nd Annual Meeting. The title of my talk is "A Simple Lagrangian Parcel Model for the Initiation of Summer-time Mesoscale Convective Systems over the Central United States".
- [24] 12/14/2021 Virtual talk in the 2021 AGU fall meeting. The title of my talk is "A Simple Lagrangian Parcel Model for the Initiation of Summer-time Mesoscale Convective Systems over the Central United States".

- [23] 12/13/2021 Virtual talk in the 2021 AGU fall meeting. The title of my talk is "Upscale Impact of Mesoscale Convective Systems on the Madden-Julian Oscillation and Its Parameterization in a Coarse-Resolution GCM".
- [22] **09/02/2021** Virtual talk in the Climate Extremes monthly meeting. The title of my talk is "A Simple Lagrangian Parcel Model for the Initiation of Summer-time MCSs over the Central US".
- [21] 05/11/2021 Virtual talk in the 34th Conference on Hurricanes and Tropical Meteorology in New Orleans, LA. The title of my talk is "Upscale Impact of Mesoscale Convective Systems on the Madden-Julian Oscillation and Its Parameterization in a Coarse-Resolution GCM".
- [20] **01/08/2020** Seminar talk at the Institute of Natural Sciences, Shanghai Jiao Tong University. The title of my talk is "Upscale Impact of Mesoscale Convective Systems on the Madden-Julian Oscillation and Its Parameterization in a Coarse-Resolution GCM".
- [19] **01/03/2020** Seminar talk at the Atmosphere-Ocean Department, Peking University. The title of my talk is "Upscale Impact of Mesoscale Convective Systems on the Madden-Julian Oscillation and Its Parameterization in a Coarse-Resolution GCM".
- [18] **01/02/2020** Seminar talk at the Institute of Atmospheric Physics, Chinese Academy of Sciences. The title of my talk is "Upscale Impact of Mesoscale Convective Systems on the Madden-Julian Oscillation and Its Parameterization in a Coarse-Resolution GCM".
- [17] **12/27/2019** Seminar talk at the Atmosphere-Ocean Department, Fudan University. The title of my talk is "Upscale Impact of Mesoscale Convective Systems on the Madden-Julian Oscillation and Its Parameterization in a Coarse-Resolution GCM".
- [16] 12/11/2019 AGU fall meeting at San Francisco, poster presentation entitled "Upscale Impact of Mesoscale Convective Systems on the Madden-Julian Oscillation and Its Parameterization in a Coarse-Resolution GCM"..
- [15] 07/25/2019 Invited talk in the celebration conference in honor of Professor Andrew J. Majda's 70th birthday, "Scientific Grand Challenges and New Perspectives in Applied Mathematics: Ocean, Atmosphere and Climate Sciences" at University of Victoria. Oral talk entitled "Upscale Impact of Mesoscale Convective Systems on the CCEWs and MJO and Its Parameterization in an Idealized GCM".
- [14] 12/21/2018 2018 Young Mathematician Forum at Department of Mathematical Sciences, Shanghai Jiao Tong University, China, Oral talk entitled "Multi-scale interactions of organized tropical convection: from multi-scale asymptotic models to comprehensive numerical simulations".
- [13] 12/19/2018 Academic Colloquium at Department of Atmospheric and Oceanic Sciences, Fudan University, China, Oral talk entitled "Upscale Impact of Mesoscale Convective Systems and Its Parameterization in an Idealized GCM for a MJO Analog above the Equator".
- [12] 12/10/2018 AGU fall meeting at Washington, DC, poster presentation entitled "Upscale Impact of Mesoscale Convective Systems and Its Parameterization in an Idealized GCM for a MJO Analog above the Equator".
- [11] **05/03/2018 Invited talk** in Climate & Global Dynamics (CGD) research report at NCAR, Oral Talk entitled "Upscale Impact of Mesoscale Convective Systems and Its Parameterization in GCMs: an idealized testbed".
- [10] 04/16/2018 American Meteorological Society's 33rd Conference on Hurricanes and Tropical Meteorology, Oral Talk entitled "Upscale Impact of Mesoscale Disturbances of Tropical Convection on Convectively Coupled Kelvin Waves".
- [9] 12/11/2017 AGU fall meeting at New Orleans, Poster Presentation.

- [8] 11/29/2017 Applied math seminar in Department of Mathematics and Statistics at UVic, Victoria, Canada, Oral Talk.
- [7] 05/09/2017 Seminar talk at Department of Atmosphere Science, Princeton University, New Jersey, Oral Talk.
- [6] 12/12/2016 AGU fall meeting at San Francisco, Poster Presentation.
- [5] 09/15/2016 AOCD seminar series at Department of Geology & Geophysics, Yale University, New Haven, Oral Talk.
- [4] 01/28/2016 Multidisciplinary University Research Initiative (MURI) Workshop, New York, Oral Talk.
- [3] **09/01/2015** Columbia Workshop "Monsoons & ITCZ: the annual cycle in the Holocene and the future", New York, USA, Poster Presentation.
- [2] 04/01/2015 BIRS Workshop "Stochasticity and Organization of Tropical Convection", Banff, Canada, Oral Talk.
- 08/16/2014 The World Weather Open Science Conference (WWOSC), Montreal, Canada, Poster Presentation.

HONORS

2016 2012-2017 2010	
	Spring 2015
Since 09/01/2022	
Sep 2022	
Jun 2023	
since 2017	
Severe Local	
Dec 2022	
city and	
Dec 2018	
NNL 2022	
Since 2019	

COMPUTER SKILLS

Programming languages:

Fortran, C++, MATLAB, Python, Linux, High-Performance Computing clusters, Latex, Lyx

Running and revising codes for models:

System for Atmospheric Modeling (SAM), Weather Research and Forecasting Model (WRF), HOMME dynamic core for CAM, both deterministic and stochastic multicloud models

LANGUAGE

English (fluent), Mandarin (native)

REFERENCES

[1] Andrew J. Majda (my Ph.D. advisor)

- Title: Member of US National Academy of Sciences, Morse Professor of Arts and Science at the Courant Institute of New York University
- Affiliation: Center for Atmosphere and Ocean Science, Courant Institute of Mathematical Sciences, New York University, USA

Email: jdm11@cims.nyu.edu (This email belongs to his secretary Jacquelyn Mileski)

[2] Lai-yung Ruby Leung (principal investigator of my current projects)

Title: Member of US National Academy of Engineering, Battelle Fellow at Pacific Northwest National Laboratory, Fellow of American Meteorological Society, Fellow of American Geophysical Union

Affiliation: Atmospheric Science and Global Change Division at Pacific Northwest National Laboratory, USA

Email:
ruby.leung@pnnl.gov

[3] Mitchell W. Moncrieff (one of my Postdoc mentors)

Title: NCAR Senior Scientist, Fellow of American Meteorological Society, Fellow of Royal Meteorological Society

Affiliation: Climate and Global Dynamics Laboratory, National Center for Atmospheric Research, USA Email: moncrief@ucar.edu

[4] Boualem Khouider (one of my Postdoc mentors)

Title: Professor, Editor of the Journal "Mathematics of Climate and Weather Forecasting" Affiliation: Department of Mathematics and Statistics, University of Victoria, Canada Email: khouider@uvic.ca