

## Wenchang Yang

Associate Research Scholar

418A Guyot Hall, Department of Geosciences, Princeton University, Princeton, NJ 08544

wenchang@princeton.edu

<https://wy2136.github.io>

## Research Interests

Climate Dynamics, Impact and Modeling

Tropical Cyclone; Volcanic Eruption; Climate and Epidemic Dynamics; Urbanization and Climate

Arctic Sea Ice and Climate; East African Hydroclimate; ITCZ and ENSO; Monsoon; Storm Tracks

## Education

2014 Ph.D., Columbia University

2004 B.S., 2007 M.S., Peking University, China

## Employment

2019 – Present, Associate Research Scholar, Princeton University

2017 – 2019, Postdoctoral Research Associate, Princeton University

2015 – 2017, Postdoctoral Scholar, University of California at Irvine

## Grants and Awards

2024 – 2027 Biophysical models for the effect of climate change on respiratory virus transmission, *Burroughs Wellcome Fund Climate and Health Interdisciplinary Award*, Collaborator.

2024 – 2027 Mitigating Future Warming by Weakening the CO<sub>2</sub> Greenhouse Effect, *Simons Foundation*, Co-I.

2024 – 2028 Deep2Weather: Emulators for Paleoclimate Weather Simulation, *Heising-Simons Foundation*, Co-I.

2022 – 2024 Urbanization and Compound Heat Waves, *Cooperative Institute for Modeling the Earth System at Princeton University*, Co-PI.

2022 – 2024 Assessing Climate and Stochastic Forcing of North Atlantic Tropical Cyclone Activity over the Past Millennium, *NSF*, Co-PI.

2022 – 2026 Investigating Global Cloud Feedback Dependence on Southern Ocean Salinity, *NASA*, Co-I.

2020 – 2023 Investigating Cloud-Circulation Feedbacks in Earth System Models, *DOE*, Co-I.

## Publications

Google Scholar: **2000+** citations over the past five years

<https://scholar.google.com/citations?user=KwpsFXsAAAAJ>

2024 [35] Dominik L. Schumacher et al. (2024): Detecting the human fingerprint in the summer 2022 western–central European soil drought. *Earth Syst. Dynam.*, doi: 10.5194/esd-15-131-2024.

[34] Kortum G, GA Vecchi, TL Hsieh and **W Yang** (2024): Influence of weather and climate on

- multidecadal trends in Atlantic hurricane genesis and tracks. *J. Clim.*, doi: 10.1175/JCLI-D-23-0088.1.
- [33] **Yang W**, E Wallace, GA Vecchii, JP Donnelly, J Emile-Geay, GJ Hakim, LW Horowitz, RM Sullivan, R Tardif, PJ van Hengstum, TS Winkler (2024): Last millennium hurricane activity linked to endogenous climate variability. *Nat. Commun.*, doi: 10.1038/s41467-024-45112-6.
- [32] Paola A. Arias et al. (2024): Interplay between climate change and climate variability: the 2022 drought in Central South America. *Climatic Change*, doi: 10.1007/s10584-023-03664-4.
- 2023 [31] Mariam Zachariah et al. (2023): Attribution of 2022 early-spring heatwave in India and Pakistan to climate change: lessons in assessing vulnerability and preparedness in reducing impacts. *Environmental Research: Climate*, doi: 10.1088/2752-5295/acf4b6.
- [30] Juan Antonio Rivera et al. (2023): T2022 early-summer heatwave in Southern South America: 60 times more likely due to climate change. *Climatic Change*, doi: 10.1007/s10584-023-03576-3.
- [29] Hsieh TL, B Zhang, **W Yang**, GA Vecchi, M Zhao, BJ Soden, C Wang (2023): The Influence of Large-Scale Radiation Anomalies on Tropical Cyclone Frequency. *J. Clim.*, doi: 10.1175/JCLI-D-22-0449.1.
- [28] Friederike EL Otto et al. (2023): Climate change increased extreme monsoon rainfall, flooding highly vulnerable communities in Pakistan. *Environmental Research: Climate*, doi: 10.1088/2752-5295/acbfd5.
- 2022 [27] Sjoukje Y. Philip et al. (2022): Rapid attribution analysis of the extraordinary heatwave on the Pacific Coast of the US and Canada June 2021. *Earth Syst. Dynam.*, doi: 10.5194/esd-13-1689-2022.
- [26] Harrington LJ et al. (2022): Limited role of climate change in extreme low rainfall associated with southern Madagascar food insecurity, 2019-21. *Environmental Research: Climate*, doi: 10.1088/2752-5295/aca695.
- [25] Bhatia K, A Baker, **W Yang**, G Vecchi, T Knutson, H Murakami, J Kossin, K Hodges, K Dixon, B Bronselaer, C Whitlock (2022): A potential explanation for the global increase in tropical cyclone rapid intensification. *Nat. Commun.*, doi: 10.1038/s41467-022-34321-6.
- [24] Hsieh TL, **W Yang**, GA Vecchi, M Zhao (2022): Model spread in the tropical cyclone frequency and seed propensity index across global warming and ENSO-like perturbations. *Geophys. Res. Lett.* doi: 10.1029/2021GL097157.
- 2021 [23] **Yang W**, TL Hsieh, GA Vecchi (2021): Hurricane annual cycle controlled by both seeds and genesis probability. *Proc. Natl. Acad. Sci.* doi: 10.1073/pnas.2108397118.
- [22] Liu M, GA Vecchi, BJ Soden, **W Yang**, B Zhang (2021): Enhanced hydrological cycle increases ocean heat uptake and moderates transient climate sensitivity. *Nat. Clim. Change*.

doi: 10.1038/s41558-021-01152-0.

- [21] Zhang B, BJ Soden, GA Vecchi, **W Yang** (2021): Investigating the causes and impacts of convective aggregation in a high resolution atmospheric GCM. *J. Adv. Model. Earth Syst.*, doi: 10.1029/2021MS002675
- [20] Chan D, GA Vecchi, **W Yang**, P Huybers (2021): Improved simulation of 19th- and 20th-century North Atlantic hurricane frequency after correcting historical sea surface temperatures. *Sci. Adv.* doi: 10.1126/sciadv.abg6931.
- [19] Wang C, BJ Soden, **W Yang**, GA Vecchi (2021): Compensation between cloud feedback and aerosol-cloud interaction in CMIP6 models. *Geophys. Res. Lett.* doi: 10.1029/2020GL091024.
- [18] Baker RE, **W Yang**, G Vecchi, CJE Metcalf, BT Grenfell (2021): Assessing the influence of climate on wintertime SARS-CoV-2 outbreaks. *Nat. Commun.*, doi: 10.1038/s41467-021-20991-1.
- [17] Zhang B, BJ Soden, GA Vecchi, **W Yang** (2021): The role of radiative interactions in tropical cyclone development under realistic boundary conditions. *J. Clim.*, doi: 10.1175/JCLI-D-20-0574.1
- 2020 [16] Baker RE, SW Park, **W Yang**, GA Vecchi, CJE Metcalf, BT Grenfell (2020): The impact of COVID-19 non-pharmaceutical interventions on the future dynamics of endemic infections. *Proc. Natl. Acad. Sci.*, doi: 10.1073/pnas.2013182117
- [15] Hsieh TL, GA Vecchi, **W Yang**, IM Held, ST Garner (2020): Large-scale control on the frequency of tropical cyclones and seeds: a consistent relationship across a hierarchy of global atmospheric models. *Clim. Dyn.*, doi: 10.1007/s00382-020-05446-5
- [14] Jacobson TWP, **W Yang**, GA Vecchi, LW Horowitz (2020): Impact of volcanic aerosol hemispheric symmetry on Sahel rainfall. *Clim. Dyn.*, doi: 10.1007/s00382-020-05347-7
- [13] Wagner CE, M Hooshyar, RE Baker, **W Yang**, N Arinaminpathy, G Vecchi, CJE Metcalf, BT Grenfell (2020): Climatological, virological and sociological drivers of current and projected dengue fever outbreak dynamics in Sri Lanka. *J. R. Soc. Interface*, doi: 10.1098/rsif.2020.0075
- [12] Baker RE, **W Yang**, G Vecchi, CJE Metcalf, BT Grenfell (2020): Susceptible supply limits the role of climate in the early SARS-CoV-2 pandemic. *Science*, doi: 10.1098/rsif.2020.0075
- 2019 [11] Baker RE, A Mahmud, C Wagner, **W Yang**, V Pitzer, C Viboud, G Vecchi, CJE Metcalf, B Grenfell (2019): Epidemic dynamics of respiratory syncytial virus in current and future climates. *Nat. Commun.*, doi: 10.1038/s41467-019-13562-y
- [10] **Yang W**, G Vecchi, S Fueglistaler, L Horowitz, D Luet, Á Muñoz et al. (2019): Climate impacts from large volcanic eruptions in a high-resolution climate model: the importance of forcing structure. *Geophys. Res. Lett.*, doi: 10.1029/2019GL082367
- 2018 [09] **Yang W**, G Magnúsdóttir (2018): Year-to-year variability in Arctic minimum sea ice extent

and its preconditions in observations and the CESM large ensemble simulations. *Sci. Rep.*, doi: 10.1038/s41598-018-27149-y

- 2017 [08] **Yang W**, G Magnusdottir (2017): Springtime extreme moisture transport into the Arctic and its impact on sea ice concentration. *J. Geophys. Res. Atmos.*, doi: 10.1002/2016JD026324
- 2016 [07] **Yang W**, G Magnusdottir (2016): Interannual Signature in daily ITCZ states in the east Pacific in boreal spring, *J. Clim.*, doi: 10.1175/JCLI-D-16-0395.1
- 2015 [06] **Yang W**, R Seager, MA Cane, B Lyon (2015): The rainfall annual cycle bias over East Africa in CMIP5 coupled climate models. *J. Clim.*, **28**, doi: 10.1175/JCLI-D-15-0323.1
- [05] **Yang W**, R Seager, MA Cane, B Lyon (2015): The annual cycle of the East African precipitation. *J. Clim.*, doi: 10.1175/JCLI-D-14-00484.1
- 2014 [04] **Yang W**, R Seager, MA Cane, B Lyon (2014): The East African long rains in observations and models. *J. Clim.*, doi: 10.1175/JCLI-D-13-00447.1
- 2013 [03] **Yang W**, R Seager, MA Cane (2013): Zonal momentum balance in the tropical atmospheric circulation during the global monsoon mature months. *J. Atmos. Sci.*, doi: 10.1175/JAS-D-12-0140.1
- 2008 [02] Nie J, P Wang, **W Yang**, BK Tan (2008): Northern Hemisphere storm tracks in strong AO anomaly winters. *Atmos. Sci. Lett.*, doi: 10.1002/asl.186
- 2007 [01] **Yang W**, J Nie, P Lin, BK Tan (2007): Baroclinic wave packets in an extended quasi-geostrophic two-layer model. *Geophys. Res. Lett.*, doi: 10.1029/2006GL029077

### Manuscripts

- \* Yang et al.: Response of global mean precipitation to surface warming.
- \* Baker R et al.: Projected impact of climate and population change on future influenza outbreak dynamics in the United States.
- \* Wang C et al.: Diagnosing the factors that contribute to the intermodel spread of climate feedback in CMIP6.
- \* Baker R et al.: Increasing intensity of enterovirus outbreaks projected with climate change.
- \* Harding A et al.: Global and regional impact of solar geoengineering on temperature-attributable mortality.
- \* Hari V et al.: Far-reaching influence of Pacific Ocean on the variability of summer rainfall in the Central Europe.
- \* Baker R et al.: Implications of climatic and demographic change for influenza dynamics and evolution.

### Teaching Experience

2021, 2020, 2019 (Fall), Instructor, Princeton University  
*Junior Colloquium of the Geosciences Department*

2009, 2008 (Fall), Teaching Assistant, Columbia University

*Quantitative Models of Climate-Sensitive Natural and Human Systems*  
2006 (Spring), Teaching Assistant, Peking University, China  
*Atmospheric Dynamics*

## Mentoring Experience

### *Princeton Graduate Students:*

Emma Levin (2023–); Gabriel Rios (2022–); Sofia Menemenlis (2021–); Maya Chung (2020–); Chenggong Wang (2019–);

### *Princeton Undergraduate Students:*

Clara Conatser ('25, 2023–); Laeo Crnkovic-Rubsamen ('24, 2023–); Ben Buchovecky ('23, 2023); David Ban ('24, 2022); Charlotte Merchant ('24, 2022–); Grace Liu ('23, 2022–); Demetra Yancopoulos ('22, 2021–2022); Jessica Stikons ('23, 2021–2022); Ryan Eusebi ('22, 2020–2022); Nina Grant ('21, 2020–2021); Emma McMahon ('21, 2019–2021); Alexander Cavoli ('20, 2019–2020); Tess Jacobson ('19, 2018–2020);

## Presentations

2024 Jan 30, AMS Annual Meeting, Baltimore.

*Why is Hydrological Sensitivity Larger in AMIP Uniform Warming Experiments than in CMIP Experiments?*

2023 Jun 05 (poster), 10th Northeast Tropical Workshop.

*How does Global Mean Precipitation Respond to Radiative Forcings?*

May 23 (invited), U of Del.

*Tropical Cyclone Frequency and the Framework of Seeds and Transition Probability*

2022 Mar 21 (invited, virtual), UNCW.

*The Challenge of Understanding Tropical Cyclone Frequency and the Framework of Seeds and Transition Probability*

Feb 07 (invited, virtual), U of Houston.

*Understanding Tropical Cyclone Frequency: the Framework of Seeds and Genesis Probability*

2021 Dec 17 (invited, virtual), AGU Annual Meeting.

*What Drives Atlantic Hurricane Activity in the Last Millennium?*

2020 Dec 11 (virtual), AGU Annual Meeting.

*What controls the annual cycle of the North Atlantic tropical cyclone frequency?*

Jan 15, AMS Annual Meeting, Boston.

*Climate Impacts from Explosive Volcanic Eruptions, Solar Radiation Change and CO<sub>2</sub> Increase.*

2019 Jun 3, 9th Northeast Tropical Workshop, Endicott House, Dedham MA.

*Climate Impact from Explosive Volcanic Eruptions Depends on Latitudinal Distribution of Aerosol Loading.*

- Apr 16-17 (poster), CMI Annual Meeting, Princeton.  
*Climatic Impacts from Large Volcanic Eruptions: the Role of Radiation Forcing Structure.*
- Apr 11, European Geophysical Union Fall Meeting, Vienna, Austria.  
*Inter-hemispherically Asymmetric versus Symmetric Volcanic Forcings and the Impacts on Climate.*
- 2018 Dec 10 (poster), American Geophysical Union Fall Meeting, Washington, D.C.  
*Climate Impact from Inter-Hemisphere Asymmetric Volcanic Eruptions in the FLOR Ensemble Modelling.*
- Apr 27, AOS Student/Postdoc Seminar, Princeton University.  
*Impact of Large Volcanic Eruptions in the FLOR Climate Model.*
- 2016 Dec 16, American Geophysical Union Fall Meeting, San Francisco.  
*Springtime Extreme Moisture Transport into the Arctic - Its Impact and Associated Large-scale Atmospheric circulation.*
- Jun 08, AOS Seminar, Peking University.  
*Decadal Variability of East African Hydroclimate in Observations and Models and the Implication for the Future Projection.*
- 2015 Dec 14 (poster), American Geophysical Union Fall Meeting, San Francisco.  
*The East Pacific Double ITCZ during Boreal Spring in Observations.*
- 2014 Sep 25, AOCD Seminar, Yale University.  
*Why is East Africa Drying during the Spring Rainy Season in Recent Decades?*
- Jun 04, GFDL Seminar, Princeton University.  
*East African Precipitation and Droughts: from Decadal Variability to Annual Cycle.*
- May 28, GloDecH Meeting, Columbia University.  
*The Dual Peaked Seasonal Cycle of Precipitation Over Tropical East Africa.*
- 2013 Dec 9-13 (poster), American Geophysical Union Fall Meeting, San Francisco.  
*The East African Long Rains in Observations and Models.*
- Jun 12, GloDecH Meeting, Columbia University.  
*Decadal Variability of the East African Long Rains in Obs. and Models.*
- 2012 Dec 3-7 (poster), American Geophysical Union Fall Meeting, San Francisco.  
*Zonal Momentum Balance in the Tropical Atmospheric Circulation during the Global Monsoon Mature Months.*
- 2011 Dec 5-9 (poster), American Geophysical Union Fall Meeting, San Francisco.  
*Simulating and Diagnosing the Dynamics of the Global Monsoon in a Simple Tropical Atmosphere Model.*
- Jun 20, Atmosphere-Ocean Science Days, MIT.

*Global Monsoon Simulation in a Simple Numerical Model.*

### Professional Services

Proposal Reviewer for NSF

Journal Reviews

*Nature Climate Change, Nature Communications, Scientific Reports*

*Journal of Climate, Journal of the Atmospheric Sciences, Climate Dynamics*

*Geophysical Research Letters, Journal of Geophysical Research-Atmospheres, Earth's Future*

*Quarterly Journal of the Royal Meteorological Society, International Journal of Climatology*

*Journal of Applied Meteorology and Climatology, Advances in Atmospheric Sciences*

*Bulletin of the American Meteorological Society*

Other Services

2024 Co-chair for the session "Other Topics on Climate Variability And Change" in the AMS annual meeting.

2015 Judge for the Outstanding Student Paper Awards in the AGU Fall Meeting

2010 – 2011, Coordinator for the DOCP Seminars at Lamont, Columbia University

### Professional Associations

American Geophysical Union (AGU), member

American Meteorology Society (AMS), member

### Awards and Honors

2019 Editors' Citation for Excellence in Refereeing for *Geophysical Research Letters*

2007 Faculty Fellowship of GSAS, Columbia University

Second Prize in "Zhong Shengbiao Education Foundation" Student Academic Forum

2005 May 4th Scholarship

2004 Outstanding Graduates of All Universities in Beijing

Outstanding Graduates of Peking University

2002 Merit Student of Peking University

2001 Merit Student of Peking University

2001 – 2004, Cyrus Tang Foundation Scholarship

2000 Merit Student of High Schools in Jiangsu Province, China

1999 First Prize in National High School Mathematics League Tournament, China

Second Prize in National High School Biology Olympiad, Jiangsu, China

Third Prize in National High School Physics Olympiad, Jiangsu, China