Zheng Wu, PhD
Department of Atmospheric and Environmental Sciences, SUNY Albany
ETEC 423
1400 Washington Avenue
Albany, NY 12222
United States
zwu26@albany.edu, OrcID: https://orcid.org/0000-0002-2054-5724

Research Interests

Atmosphere and climate dynamics

Large-scale atmospheric circulation, atmospheric dynamics, and variability

Stratosphere-troposphere coupling and global remote connections

Future climate projections and climate change

Weather and climate extreme events

ML/AI

Data-driven discovery of climate dynamics
Deep learning and XAI methods for predictability and prediction

Modeling

Numerical modeling of the atmosphere using model hierarchies

Education

Ph.D., Atmospheric Sciences, University of Utah, United States — 08.2017 - 12.2019
Thesis title: Understanding Variations in the Frequency of Model-Simulated Stratospheric Sudden Warming Events — Date of defense: 06.12.2019
Advisor: Thomas Reichler

M.S., Atmospheric Sciences, University of Utah, United States — 08.2015 - 07.2017
Thesis title: Sensitivity of stratosphere-troposphere interaction to surface forcing in an idealized model — Date of defense: 31.06.2017
Advisor: Thomas Reichler

B.S., Atmospheric Sciences, Sun Yat-sen University, China — 09.2011 - 06.2015
Thesis title: Extreme precipitation in China during global warming hiatus — Date of defense: 28.05.2015
Advisor: Song Yang

Employment History

Current position: Assistant Professor, Department of Atmospheric and Environmental Sciences, SUNY Albany, USA — 09.2023 - present

Post-doctoral researcher, Institute for Atmospheric and Climate Science, ETH Zürich, Switzerland — 02.2020 - 07.2023
Employed as part of a collaborative grant "Beyond Weather – EXtending the PrEdiCTability of the Atmosphere over Europe (EXPECT)" with the Swiss Data Science Center (SDSC)
Advisor: Daniela I.V. Domeisen

Graduate Research Assistant, Department of Atmospheric Sciences, University of Utah, United States — 08.2015 - 12.2019

Advisor: Thomas Reichler

Assistant at the Atmospheric Exploratory Lab, Department of Atmospheric Sciences, Sun Yat-sen University, China — 02.2013 - 04.2015
Advisor: Ruoyu Bao, Li Sun

Prizes, awards, fellowships

EGU Roland Schlich Travel Award	05.2022
DynVar & SNAP Workshop travel grant, Madrid, Spain	10.2019
University of Utah travel grant for AGU meeting 2016	12.2016
Dynamical Core Model Intercomparison Project 2016 Workshop travel grant, NCAR, Boulder, USA	06.2016
Third Prize Scholarship, Sun Yet-sen University, China	09.2014

Peer-Reviewed Journal and Conference Publications

de Fondeville, R., **Wu, Z.**, Székely, E., Obozinski, G., and Domeisen, D. I. V.: Improved extended-range prediction of persistent stratospheric perturbations using machine learning, Weather Clim. Dynam., 4, 287–307, https://doi.org/10.5194/wcd-4-287-2023, 2023.

Menzel, M. E., Waugh, D. W., **Wu, Z.**, and Reichler, T.: Replicating the Hadley Cell and subtropical jet disconnect in idealized atmospheric models, EGUsphere [preprint], https://doi.org/10.5194/egusphere-2023-1645, 2023 (under review).

Zheng, C., Domeisen, D. I.V., Garfinkel, C. I., Jenney, A. M., Kim, H., Wang, J., **Wu**, **Z.**, Stan, C.: The impact of vertical model levels on the prediction of MJO teleconnections. Part I: The tropospheric pathways in the UFS global coupled model, 2023 (submitted).

Wu, Z., Beucler, T., Székely, E., Ball, W. T., & Domeisen, D. I. V.: Modeling Stratospheric Polar Vortex Variation and Identifying Vortex Extremes Using Explainable Machine Learning. *Environmental Data Science, 1*, E17. https://www.doi.org/10.1017/eds.2022.19, 2022.

Karpechko, A. Y., Afargan-Gerstman, H., Butler, A. H., Domeisen, D. I., Kretschmer, M., Lawrence, Z., Manzini, E., Sigmond, M., Simpson, I.R. & **Wu, Z.**: Northern Hemisphere Stratosphere-Troposphere Circulation Change in CMIP6 Models. Part 1: Inter-Model Spread and Scenario Sensitivity. *Journal of Geophysical Research: Atmospheres*, e2022JD036992, https://doi.org/10.1029/2022JD036992, 2022.

Wu, R. W.-Y., **Wu, Z.,** and Domeisen, D. I. V.: Differences in the sub-seasonal predictability of extreme stratospheric events, *Weather Clim. Dynam.*, 3, 755–776, https://doi.org/10.5194/wcd-3-755-2022, 2022.

Wu, Z., Jiménez-Esteve, B., de Fondeville, R., Székely, E., Obozinski, G., Ball, W. T., and Domeisen, D. I. V.: Emergence of representative signals for sudden stratospheric warmings beyond current predictable lead times, *Weather Clim. Dynam*., 2, 841–865, https://doi.org/10.5194/wcd-2-841-2021, 2021.

Zhang, P., Chen, G., Ma, W., Ming, Y. and **Wu, Z.**: Robust atmospheric river response to global warming in idealized and comprehensive climate models, *Journal of Climate*, 34(18), pp.7717-7734, https://doi.org/10.1175/JCLI-D-20-1005.1, 2021.

Wu, Z. and Reichler, T.: Variations in the frequency of stratospheric sudden warmings in CMIP5 and CMIP6 and possible causes, *Journal of Climate*, 33(23), pp.10305-10320, https://doi.org/10.1175/JCLI-D-20-0104.1, 2020.

Wu, Z. and Reichler, T.: Surface control of the frequency of stratospheric sudden warming events,

Journal of Climate, 32(15), pp.4753-4766, https://doi.org/10.1175/JCLI-D-18-0801.1, 2019.

Wu, Z. and Reichler, T.: Towards a More Earth-Like Circulation in Idealized Models, *Journal of Advances in Modeling Earth Systems*, 10(7), pp.1458-1469, https://doi.org/10.1029/2018MS001356, 2018.

Organization of conferences

Co-lead a case study at Lorentz Center Workshop, Leiden, the Netherlands	09.2022
Co-convener of session AS1.5 Stratospheric dynamics, EGU General Assembly, Vienna, Austria	2022 - present

Scientific reviewing activities

Reviewer for Journal of Climate	2021 - present
Reviewer for International Conference on Climate Informatics	2022 - present
Reviewer for Journal of Geophysical Research - Atmosphere	2022 - present
Reviewer for Geophysical Research Letters	2022 - present
Reviewer for Environmental Research Letters	2023 - present

Invited Talks

"*Emergence of representative signals for sudden stratospheric warmings beyond current predictable lead times*"
UNIL Climate Physics Journal Club, University of Lausanne, Switzerland 11.2022

"*Extended-range predictability of stratospheric extreme events suggested by dynamical mode decomposition*"
S2S webinar on AI/ML methods for S2S prediction, S2S prediction project 01. 2021

"*Extended-range predictability of stratospheric extreme events suggested by mode decomposition diagnosis*"
Department of Earth, Atmospheric, and Planetary Sciences seminar, Purdue University, USA 01. 2021

Presentations for Conference / Workshop / Summit

"*Extended-range predictability of stratospheric extreme events using explainable machine learning*" (poster presentation)
SPARC General Assembly 2022, Reading, UK 10.2022

"*Recurrent Neural Networks for time series prediction*" (oral presentation)
Lorentz Center Workshop 2022, Leiden, the Netherlands 09. 2022

"*Modeling Stratospheric Polar Vortex Variation and Identifying Vortex Extremes Using Explainable Machine Learning*" (oral presentation)
Climate Informatics 2022, Asheville, USA 05. 2022

"*Identifying precursors for extreme stratospheric polar vortex events using an explainable neural network*" (oral presentation)
EGU General Assembly 2022, Vienna, Austria 05. 2022

"*Identifying Precursors for Extreme Stratospheric Polar Vortex Events Using an Explainable Neural Network*" (oral presentation)
102nd AMS Annual Meeting & 21st Conference on Artificial Intelligence 01.2022

for Environmental Science, Denver, USA

"*Emergence of Representative Signals for Sudden Stratospheric Warmings Beyond Current Predictable Lead Times*" (oral presentation)
102nd AMS Annual Meeting & 21st Conference on Middle Atmosphere, Denver, USA 01. 2022

"*BEYOND WEATHER Extending the PrEdiCTability of the Atmosphere over Europe (EXPECT)*" (poster presentation)
AI+X Summit, Zurich, Switzerland 10. 2021

"*Extended-range predictability of sudden stratospheric warming events suggested by mode decomposition*" (vPICO presentation)
EGU General Assembly 2021, Vienna, Austria 04. 2021

"*Mode-Decomposition Diagnosis for the Dynamical Processes of Sudden Stratospheric Warming Events*" (poster presentation)
AGU Fall Meeting 2020, online 12. 2020

"*Mode-decomposition Diagnosis for the Dynamical Processes of Sudden Stratospheric Warming Events*" (poster presentation)
ECMWF-ESA Workshop on Machine Learning 10.2020
for Earth System Observation and Prediction, online

"*Variations in The Frequency of Sudden Stratospheric Warmings in CMIP5 and CMIP6*" (poster presentation)
EGU General Assembly 2020, online 05. 2020

"*What sets the model-simulated SSW frequency?*" (poster presentation)
Joint DynVarMIP/CMIP6 and SPARC DynVar & SNAP Workshop, Marid, Spain 10. 2019

"*Role of Surface Forcing for Stratosphere-Troposphere Coupling in an Idealized Model*" (oral presentation)
19th Conference on Middle Atmosphere, Portland, USA 06.2017

"*Towards a More Earth-like Circulation in a Dry Dynamical Core Model*" (poster presentation)
AGU Fall Meeting 2016, San Francisco, USA 12. 2016

"*Towards a More Earth-like Circulation in a Dynamical Core Model*" (poster presentation)
Dynamical Core Model Intercomparison Project 2016, Boulder, USA 06.2016

Computing skills

Programming/Software: Python (incl. TensorFlow, Keras), Matlab, IDL, Fortran 77/90, C shell
Toolkits: NCO, CDO