

## Research Interest

I am interested in studying changes of the atmospheric general circulation across timescales, especially over the upper troposphere and lower stratosphere, where dynamical, radiative, chemical and thermodynamical processes are tightly coupled. As a core developer of GFDL's atmospheric model AM5, I am leading the model development related to the stratosphere. I have developed and implemented schemes that yields better representation of the ozone-circulation coupling as well as the non-orographic gravity waves. I have also been developing and analyzing the aquaplanet global atmospheric model at the horizontal resolution varying from O(100km) to O(1km), which provides unique opportunities to study the complex coupling of the Earth system across timescales.

## Employment

<b>Research Physical Scientist</b> NOAA/OAR/GFDL	2024-2025
<b>Professional Specialist</b> Princeton University, Program in Atmospheric and Oceanic Sciences/GFDL	2022-2024
<b>Associate Research Scholar</b> Princeton University, Program in Atmospheric and Oceanic Sciences/GFDL	2015-2022
<b>Postdoctoral Research Associate</b> Princeton University, Program in Atmospheric and Oceanic Sciences/GFDL Understanding the temperature trends in the upper troposphere and lower stratosphere. <i>Advisor:</i> Yi Ming and V. Ramaswamy.	2013-2015
<b>Graduate Reserach Assistant</b> University of Washington, Department of Atmospheric Sciences	2006-2013

## Education

<b>Ph.D. Atmospheric Sciences</b> University of Washington, Seattle, WA, USA Thesis: Understanding changes in the stratospheric circulation from observations and simulations	Mar 2013
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Advisor: Qiang Fu

**B.S. Atmospheric Sciences**

Jun 2006

Peking University, Beijing, China

Thesis: Baroclinic wave packet in a modified quasi-geostrophic two-layer model

Advisor: Benkui Tan

## Services

**AMS committee on middle atmosphere** : Member 2022-2024, Vice Chair 2025-2027.

**Program Chair** : 22nd Conference on Middle Atmosphere, American Meteorological Society, 24-28 June 2024, Burlington, VT.

**Session Co-convenor** : Stratosphere-troposphere coupling and links to climate across time scales, 104th Annual Meeting, American Meteorological Society, 28 January - 1 February, 2024, Baltimore, MD

**Reviewer:** *WMO/UNEP Scientific Assessment of Ozone Depletion: 2018, 2022*

**Proposal Reviewer:** National Science Foundation, Vienna Science and Technology Fund, German Research Foundation.

**Reviewer:**

*Nature Climate Change, Bulletin of the American Meteorological Society, Journal of the Atmospheric Sciences, Journal of Climate, Journal of Geophysical Research, Geophysical Research Letters, Journal of Advances in Modeling Earth System, Quarterly Journal of the Royal Meteorological Society, Atmospheric Chemistry and Physics, Climate Dynamics, Journal of the Meteorological Society of Japan, Advances in Atmospheric Sciences, Annales Geophysicae, International Journal of Climatology, Journal of Meteorological Research, Theoretical and Applied Climatology, Weather and Climate Dynamics.*

## Publications

### *Refereed papers*

Rivoire, L., M. Linz, J. L. Neu, **P. Lin**, M. L. Santee, 2025: Satellite nadir-viewing geometry affects the magnitude and detectability of long-term trends in stratospheric ozone. *Atmos. Chem. Phys.*, 25, 2269-2289, doi: 10.5194/acp-25-2269-2025.

Beadling, R. L., **P. Lin**, J. Krasting, W. Ellinger, A. Coomans, J. Milward, K. Turner, X. Xu, T. Martin and M. J. Molina, 2024: From the surface to the stratosphere: large-scale atmospheric response to Antarctic meltwater. *Geophys. Res. Lett.*, 51, e2024GL110157, doi: 10.1029/2024GL110157.

- Nikumbh, A. C., **P. Lin**, D. Paynter and Y. Ming, 2024: Does increasing horizontal resolution improve the simulations of intense tropical rainfall? *Geophys. Res. Lett.*, 51, e2023GL106708, doi: 10.1029/2023GL106708.
- Clark, J. P., **P. Lin** and S. Hill, 2024: ITCZ response to disabling parameterized convection in global fixed-SST aquaplanet simulations at 50km and 6km resolutions. *J. Adv. Model Earth S.*, 16, e2023MS003968, doi: 10.1029/2023GL106708.
- Lin, P.**, Y. Ming and T. Robinson, 2023: On the resolution sensitivity of equatorial precipitation in a GFDL global atmospheric model. *J. Adv. Model Earth Sy.*, 15, e2022MS003300, doi: 10.1029/2022MS003300.
- Martin, Z. K. and coauthors, 2023: The lack of a QBO-MJO connection in climate models with a nudged stratosphere. *J. Geophys. Res.*, 128, e2023JD038722, doi: 10.1029/2023JD038722.
- Morgenstern, O., and coauthors, 2022: Comparison of Arctic and Antarctic stratospheric climates in chemistry versus no-chemistry climate models. *J. Geophys. Res.*, 127, e2022JD037123, doi: 10.1029/2022JD037123.
- Andrews, T., and coauthors, 2022: On the effect of historical SST patterns on radiative feedback. *J. Geophys. Res.*, 127, e2022JD036675, doi: 10.1029/2022JD036675.
- Lawrence, Z. D., and coauthors, 2022: Quantifying stratospheric biases and identifying their potential sources in subseasonal forecast systems. *Weather and Climate Dynamics*, 3, 977-1001, doi:10.5194/wcd-3-977-2022.
- Abalos, M. and coauthors, 2021: The Brewer-Dobson circulation in CMIP6. *Atmos. Chem. Phys*, 21, 13571-13591, doi: 10.5194/acp-21-13571-2021.
- Freidenreich, S., D. Paynter, **P. Lin**, V. Ramaswamy, A. L. Jones, D. Feldman and W. D. Collins, 2021: An investigation into biases in instantaneous aerosol radiative effects calculated by shortwave parameterizations in two Earth System Models. *J. Geophys. Res.*, 126, e2019JD032323, doi: 10.1029/2019JD032323.
- Lin, P.**, and Y. Ming, 2021: Enhanced climate response to ozone depletion from ozone-circulation coupling. *J. Geophys. Res.*, 126, e2020JD034286, doi: 10.1029/2020JD034286.
- Ming, Y., **P. Lin**, V. Naik, F. Paulot, L. W. Horowitz, P. A. Ginoux, V. Ramaswamy, N. G. Loeb, Z. Shen, C. E. Singer, R. X. Ward, Z. Zhang, and N. Bellouin, 2021: Assessing the influence of COVID-19 on the shortwave radiative fluxes over the East Asian Marginal Seas. *Geophys. Res. Lett.*, 48, e2020GL091699, doi: 10.1029/2020GL091699.
- Zhou, X. R. Atlas, I. L. McCoy, C. S. Bretherton, C. Bardeen, A. Gettelman, **P. Lin** and Y. Ming, 2021: Evaluation of cloud and precipitation simulations in CAM6 and AM4 using observations over the Southern Ocean. *Earth and Space Science*, 8, e2020EA001241, doi: 10.1029/2020EA001241.

- Guan, W., X. Jiang, X. Ren, G. Chen, **P. Lin**, and H. Lin, 2020: The leading intraseasonal variability mode of wintertime surface air temperature over the North American sector. *J. Clim.*, 33, 9287-9306, doi: 10.1175/JCLI-D-20-0096.1.
- Atlas, R. L., C. S. Bretherton, P. N. Blossey, A. Gettelman, C. Bardeen, **P. Lin** and Y. Ming, 2020: How well do large-eddy simulations and global climate models represent observed boundary layer structures and low clouds over the summertime Southern Ocean? *J. Adv. Model Earth Sy.*, 12, e2020MS002205, doi: 10.1029/2020MS002205.
- Horowitz, L. W. and coauthors, 2020: The GFDL atmospheric chemistry-climate model AM4.1: Model description and simulation characteristics. *J. Adv. Model Earth Sy.*, 12, e2019MS002032, doi: 10.1029/2019MS002032
- Ayarzagüena, B. and coauthors, 2020: Uncertainty in the response of sudden stratospheric warmings and stratosphere-troposphere coupling to quadrupled CO<sub>2</sub> concentrations in CMIP6 models. *J. Geophys. Res.*, 125, e2019JD032345, doi: 10.1029/2019JD032345
- Fu, Q., R. H. White, M. Wang, B. Alexander, S. Solomon, A. Gettelman, D. S. Battisti, and **P. Lin**, 2020: The Brewer-Dobson circulation during the Last Glacial Maximum. *Geophys. Res. Lett.*, 47, e2019GL086271, doi: 10.1029/2019GL086271
- Fu, Q., S. Solomon, H. A. Pahlavan and **P. Lin**, 2019: Observed changes in Brewer-Dobson circulation for 1980-2018. *Environ. Res. Lett.*, 14, 114026, doi: 10.1088/1748-9326/ab4de7
- Held, I. M., and coauthors, 2019: Structure and Performance of GFDL's CM4.0 Climate Model. *J. Adv. Model Earth Sy.*, 11, 3691-3727, doi: 10.1029/2019MS001829
- Lin, P.**, I. M. Held and Y. Ming, 2019: The Early Development of the 2015/16 Quasi-Biennial Oscillation Disruption. *J. Atmos. Sci.*, 76, 821-836, doi: 10.1175/JAS-D-18-0292.1
- Zhao, M., and coauthors, 2018: The GFDL Global Atmosphere and Land Model AM4.0 /LM4.0: 1. Simulation characteristics with prescribed SSTs. *J. Adv. Model Earth Sy.*, 10, 691-734, doi: 10.1002/2017MS001208
- Zhao, M., and coauthors, 2018: The GFDL Global Atmosphere and Land Model AM4.0 /LM4.0: 2. Model description, sensitivity studies, and tuning strategies. *J. Adv. Model Earth Sy.*, 10, 735-769, doi: 10.1002/2017MS001209
- Pan, F., X. Huang, S. S. Leroy, **P. Lin**, L. L. Strow, Y. Ming and V. Ramaswamy, 2017: The Stratospheric Changes Inferred from 10 Years of AIRS and AMSU-A Radiances. *J. Clim.*, 30, 6005-6016, doi: 10.1175/JCLI-D-17-0037.1
- Lin, P.**, D. Paynter, L. Polvani, G. J. P. Correa, Y. Ming and V. Ramaswamy, 2017: Dependence of model-simulated response to ozone depletion on stratospheric polar vortex climatology. *Geophys. Res. Lett.*, 44, 6391-6398, doi: 10.1002/2017GL073862

- Jia, L., X. Yang, G. Vecchi, R. Gudgel, T. Delworth, S. Fueglistaler, **P. Lin**, A. Scaife, S. Underwood and S.-J. Lin, 2017: Seasonal Prediction Skill of Northern Extratropical Surface Temperature Driven by the Stratosphere. *J. Clim.*, 30, 4463-4475, doi: 10.1175/JCLI-D-16-0475.1
- Geng, L., L. T. Murray, L. J. Mickley, **P. Lin**, Q. Fu, A. J. Schauer and B. Alexander, 2017: Isotopic evidence of multiple controls on atmospheric oxidants over climate transitions. *Nature*, 546, 133-136, doi: 10.1038/nature22340
- Solomon, S., D. Ivy, M. Gupta, J. Bandoro, B. Santer, Q. Fu, **P. Lin**, R. R. Garcia, D. Kinnison and M. Mills, 2017: Mirrored changes in Antarctic ozone and temperature. *J. Geophys. Res.*, 122, 8940-8950, doi: 10.1002/2017JD026719
- Hardiman, S. **P. Lin**, A. Scaife, N. Dunstone, and H.-L. Ren, 2017: The influence of dynamical variability on the observed Brewer-Dobson circulation trend. *Geophys. Res. Lett.* 44, 2885-2892. doi: 10.1002/2017GL072706
- Lin, P.**, D. Paynter, Y. Ming and V. Ramaswamy, 2017: Changes of the tropical tropopause layer under global warming. *J. Clim.*, 30, 1245-1258. doi: 10.1175/JCLI-D-16-0457.1
- Guan, X., J. Huang, R. Guo, H. Yu, **P. Lin** and Y. Zhang, 2015: Role of radiatively forced temperature changes in enhanced semi-arid warming in the cold season over east Asia. *Atmos. Chem. Phys.*, 15, 13777-13786. doi: 10.5194/acp-15-13777-2015
- Fu, Q., **P. Lin**, S. Solomon and D. L. Hartmann, 2015: Observational evidence of strengthening of the Brewer-Dobson circulation since 1980. *J. Geophys. Res. Atmos.*, 120, 10214-10228. doi: 10.1002/2015JD023657
- Guan, X., J. Huang, R. Guo, and **P. Lin**, 2015: The role of dynamically induced variability in the recent warming trend slowdown over the Northern Hemisphere. *Sci. Rep.*, 5, 12669. doi: 10.1038/srep12669
- Lin, P.**, Y. Ming and V. Ramaswamy, 2015: Tropical climate change control of the lower stratospheric circulation. *Geophys. Res. Lett.*, 42, 941-948. doi: 10.1002/2014GL062823
- Smoliak, B. V., J. M. Wallace, **P. Lin** and Q. Fu, 2014: Dynamical adjustment of the Northern Hemisphere surface temperature field: methodology and application to observations. *J. Clim.*, 28, 1613-1629. doi: 10.1175/JCLI-D-14-00111.1
- Fueglistaler, S., M. Abalos, T. J. Flannaghan, **P. Lin** and W. J. Randel, 2014: Variability and trends in dynamical forcing of tropoical lower stratospheric temperature. *Atmos. Chem. Phys.*, 14, 13439-13453. doi: 10.5194/acp-14-13439-2014
- Geng, L., J. Cole-Dai, B. Alexander, J. Erbland, J. Savarino, A. J. Schauer, E. J. Steig, **P. Lin**, Q. Fu and M. C. Zako, 2014: On the origin of the occasional springtime nitrate concentration maximum in Greenland snow. *Atmos. Chem. Phys.*, 14, 13361-13376. doi: 10.5194/acp-14-13361-2014

- Lin, P.**, and Q. Fu, 2013: Changes in various branches of the Brewer-Dobson circulation from an ensemble of chemistry climate models. *J. Geophys. Res. Atmos.*, 118, 73-84, doi: 10.1029/2012JD018813
- Lin, P.**, Q. Fu, and D. L. Hartmann, 2012: Impact of tropical sea surface temperatures on Southern Hemisphere stratospheric planetary waves. *J. Clim.*, 25, 5030-5046, doi: 10.1175/JCLI-D-11-00378.1
- Wallace, J. M., Q. Fu, B. V. Smoliak, **P. Lin**, and C. M. Johanson, 2012: Simulated versus observed patterns of warming over the extratropical Northern Hemisphere continents during the cold season. *Proc. Natl. Acad. Sci. USA*, 109, 14337-14342, doi: 10.1073/pnas.1204875109
- Fu, Q., and **P. Lin**, 2011: Poleward shift of subtropical jets inferred from satellite-observed lower stratospheric temperatures. *J. Clim.*, 24, 5597-5603, doi: 10.1175/JCLI-D-11-00027.1
- Fu, Q., S. Solomon, and **P. Lin**, 2010: On the seasonal dependence of tropical lower-stratospheric temperature trends. *Atmos. Chem. Phys.*, 10, 2643-2653, doi: 10.5194/acp-10-2643-2010
- Lin, P.**, Q. Fu, S. Solomon, and J. M. Wallace, 2009: Temperature trend patterns in Southern Hemisphere high latitudes: Novel indicators of stratospheric change. *J. Clim.*, 22, 6325-6341, doi: 10.1175/2009JCLI2971.1
- Yang, W., J. Nie, **P. Lin**, and B. Tan, 2007: Baroclinic wave packets in an extended quasigeostrophic two-layer model. *Geophys. Res. Lett.*, 34, L05822, doi: 10.1029/2006GL029077

## Invited Lectures

NASA/GSFC Atmospheric Chemistry and Dynamics Laboratory seminar	May 2019
University of Reading Meteorology Departmental Seminar	Oct 2016
Columbia University SEAS Colloquium in Climate Science	Oct 2015
Peking University Atmospheric and Oceanic Sciences Colloquium	Aug 2014
Columbia University SEAS Colloquium in Climate Science	Apr 2014
University of Washington Atmospheric Science Colloquium	Mar 2013
Geophysical Fluid Dynamics Laboratory Seminar	Jul 2012
Peking University Atmospheric and Oceanic Sciences Colloquium	Feb 2012
University of Washington Atmospheric Dynamics Seminar	Oct 2009

## Teaching Experience

**Teaching Assistant** ATM S 111: Global Warming 2009

University of Washington, Department of Atmospheric Sciences

Create and grade homework assignments and exam questions, lead weekly discussion sections, hold office hours.

*Professor:* David S. Battisti

## Computer Skills

**Operating systems:** Linux, Windows, Mac OS.

**Programming languages:** MATLAB, Fortran 77/95, Python, NCAR Command Language, IDL.

**Document preparation:** L<sup>A</sup>T<sub>E</sub>X, Microsoft Office Suite, OpenOffice suite.

## Professional Memberships

American Geophysical Union

American Meteorological Society