Pu Lin

NOAA/OAR/GFDL • Atmospheric Physics Division
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Education

Ph.D. Atmospheric Sciences Mar 2013

University of Washington, Seattle, WA, USA

Thesis: Understanding changes in the stratospheric circulation from observations and simulations

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

Research Experience

Physical Scientist 2024-present

NOAA Geophysical Fluid Dynamics Laboratory

Professional Specialist 2022-2024

Princeton University, Program in Atmospheric and Oceanic Sciences/GFDL

Associate Research Scholar 2015-2022

Princeton University, Program in Atmospheric and Oceanic Sciences/GFDL

Postdoctoral Research Associate 2013-2015

Princeton University, Program in Atmospheric and Oceanic Sciences/GFDL

Understanding the temperature trends in the upper troposphere and lower stratosphere. *Advisor:* Yi Ming and V. Ramaswamy.

Graduate Reserach Assistant 2006-2013

University of Washington, Department of Atmospheric Sciences

Examine stratospheric and tropospheric circulation changes from satellite observations, reanalysis data, General Circulation Model and Chemistry Climate Model simulations. Investigate the stratospheric circulation changes in response to anthropogenic radiative forcings. *Advisor:* Qiang Fu.

Undergraduate Research Assistant 2005-2006

Peking University, Department of Atmospheric Sciences

Using a modified quasi-geostrophic two-layer model that incorporates a non-linear Ekman pumping to simulate the mide-lat.itude baroclinic wave packets. Examine the evolution of the wave packets in the model and its sensitivity to parameters of the Ekman pumping scheme. *Advisor:* Benkui Tan

Publications

In Press

R. L. Beadling, **P. Lin**, J. P. 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.*, doi: 10.1029/2024GL110157.

Refereed papers

A. Nikumbh, **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.

J. P. Clark, **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, e2023MS00968, doi: 10.1029/2023MS003968.

Lin, P., Y. Ming and T. Robinson, 2023: On the resolution sensitivty 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, e020JD034286, 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 teh 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 CO2 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. Zakto, 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

Conference Presentations

Lin, P., C.-Y. Chang, I. Held, T. Merlis and P. Zurita-Gotor, 2024: Compensating energy transport by mean circulation and eddies over the deep tropics simulated in GCMs at different resolutions. Talk. *24th Conference on Atmospheric and Oceanic Fluid Dynamics*, American Meteorological Society, Burlington, VT.

Lin, P., C.-Y. Chang, I. Held, T. Merlis and P. Zurita-Gotor, 2024: Compensating energy transport by mean circulation and eddies over the deep tropics simulated in GCMs at different resolutions. Poster. *CFMIP/CLIVAR meeting on clouds, circulation and climate*, CFMIP/CLIVAR, Boston, MA.

Lin, P. 2024: Tropical tropopause changes simulated in CMIP6 models. Poster. *104th AMS annual meeting*, American Meteorological Society, Baltimore, MD.

Lin, P. 2023: Tropical tropopause changes simulated in CMIP6 models. Poster. *AGU Fall meeting*, American Geophysical Union, San Francisco, CA.

Lin, P. 2023: QBO-MJO relationship in stratosphere-nudged GFDL models. Talk. *QBO workshop*, SPARC, Oxford, United Kingdom.

Lin, P., 2022: Stratosphere simulated in a global ultra-high resolution atmospheric model. Talk. *AGU Fall meeting*, American Geophysical Union, Chicago, IL.

Lin, P., 2022: Stratosphere simulated in a global ultra-high resolution atmospheric model. Poster. *SPARC General Assembly*, SPARC, Boulder, CO.

Lin, P., 2022: Convective organization simulated in global ultra-high resolution model. Talk. *From spectroscopy to climate: radiative constraints on the general circulation*, Princeton Center for Theoretical Sciences, Princeton, NJ.

Lin, P., Y. Ming, and T. Robinson, 2022: On the resolution dependence in GFDL AM4 model: from 50km to 6km. Poster. *3rd Pan-GASS meeting, understanding and modeling atmospheric processes*, WCRP/GEWEX, Monterey, CA.

Lin, P., M. Bushuk, D. Paynter, and R. Beadling, 2021: Bias correction in stratospheric winds leads to stronger surface warming. Talk. *AGU Fall meeting*, American Geophysical Union, New Orleans, LA.

Lin, P., and Y. Ming, 2021: Enhanced climate response to ozone depletion from ozone-circulation coupling. Talk. *Quadrennial Ozone Symposium*, International Ozone Commission, Daejeon, South Korea.

Lin, P., and Y. Ming, 2020: Stronger stratospheric temperature changes simulated with an interactive ozone scheme. Poster. *Susan Solomon Symposium, AMS annual meeting*, American Meteorological Society, Boston, MA.

Lin, P., and Y. Ming, 2019: Stronger stratospheric temperature changes simulated with interactive ozone scheme. Talk. *AGU Fall meeting*, American Geophysical Union, San Francisco, CA.

Paynter, D., L. Silvers, F. Paulot, P. Lin, and L. W. Horowitz, 2019: Evaluating differences in equilibrium climate sensitivity between GFDL CMIP5 and CMIP6 climate models. Poster. *AGU Fall meeting*, American Geophysical Union, San Francisco, CA.

Lin, P., and Y. Ming, 2019: Understanding the climate response to ozone depletion: interactive ozone versus prescribed ozone. Talk. *Joint DynVarMIP-SPARC Dynvar-SNAP Meeting*, SPARC, Madrid, Spain.

Lin, P., I. Held and Y. Ming, 2018: Early development of the 2015/2016 QBO disruption: contributions from extratropical and tropical waves. Talk. *AGU Fall meeting*, American Geophysical Union, Washington DC.

Lin, P. I. Held and Y. Ming, 2018: The early development of the 2015/2016 QBO disruption. Poster. *SPARC 6th General Assembly*, SPARC, Kyoto. Japan.

Lin, P., and Y. Ming, 2017: Simulating climate change with interactive stratospheric ozone. Talk. *AGU Fall meeting*, American Geophysical Union, New Orleans, LA.

Lin, P., 2017: Wave spectra during the unexpected QBO disruption. Talk. *19th Conference on Middle Atmosphere*, American Meteorological Society, Portland, OR.

Lin, P., D. Paynter, L. Polvani, G. Correa, Y. Ming and V. Ramaswamy, 2016: Circulation response to ozone depletion depends on the zonal wind climatology. Talk. *AGU Fall meeting*, American Geophysical Union, San Francisco, CA.

Lin, P. and J. Wilson, 2016: Simulate QBO with interactive ozone. Talk. *SPARC QBO Workshop: The QBO and its global influence-past, present and future*, SPARC, Oxford, United Kingdom.

Lin, P., D. Paynter, Y. Ming and V. Ramaswamy, 2014: Understand changes of the tropical tropopause under global warming. Poster. *AGU Fall meeting*, American Geophysical Union, San Francisco, CA.

Lin, P., Y. Ming and V. Ramaswamy, 2014: A robust tropical bottom-up control of the shallow stratospheric circulation. Talk. *AOGS 11th Annual Meeting*, Asia Oceania Geosciences Society, Sapporo, Japan.

Lin, P. and Q. Fu, 2012: Brewer-Dobson circulation changes in chemistry climate models: shallow versus deep cells. Talk. *AGU Fall meeting*, American Geophysical Union, San Francisco, CA.

Lin, P., Q. Fu, and D. L. Hartmann, 2012: Impacts of tropical SST on stratospheric planetary waves in the Southern Hemisphere. Poster. *Workshop on stratospheric sudden warming and its role in weather and climate variations*,, WCRP/SPARC, Kyoto, Japan.

Lin, P., and Q. Fu, 2011: Comparing lower stratospheric temperature trends in two CCMVal-2 simulations. Poster. *45th CMOS Congress*, Canadian Meteorological and Oceanographic Society, Victoria, BC, Canada.

Lin, P., Q. Fu, and D. L. Hartmann, 2011: Southern Hemisphere stratospheric circulation response to tropical SST forcing. Talk. *91st annual meeting and 16th Conference on Middle Atmosphere*, American Meteorological Society, Seattle, WA.

Lin, P., Q. Fu, and D. L. Hartmann, 2010: Understanding the strengthening of the Brewer-Dobson circulation in Southern Hemisphere spring. Poster. *AGU Fall meeting*, American Geophysical Union, San Francisco, CA.

Fu, Q., P. Lin, S. Solomon, Q. Yang, and D. L. Hartmann, 2009: Has the age of the stratospheric air changed over the past three decades? Talk. *AGU Fall meeting*, American Geophysical Union, San Francisco, CA.

Lin, P., Q. Fu, S. Solomon, and J. M. Wallace, 2009: Understanding the stratospheric temperature trend patterns in high latitudes. *Gordon Research Conferences: Radiation and climate*, New London, NH.

Lin, P., Q. Fu, S. Solomon, and J. M. Wallace, 2008: Understanding the stratospheric temperature trend patterns in Southern Hemisphere high latitudes. Poster. *AGU Fall meeting*, American Geophysical Union, San Francisco, CA.

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

Workshop and Colloquia

Gordon Research Conference: radiation and climate, Lewiston, ME.	Jul 2023
QBOi virtual workshop, online.	Jun 2022

The second joint AerChemMIP/RFMIP/PDRMIP Workshop in support of CMIP6, Princeton, NJ. June 2019

Understanding and modeling the Earth's climate: A symposium in honor of Isaac Held, Princeton, NJ. Oct 2018

Gordon Research Conferences: radiation and climate, Lewiston, ME. Jul 2017

SPARC QBO Workshop: The QBO and its global influence-past, present and future, Oxford, United Kingdom. Sep 2016

Gordon Research Conferences: radiation and climate, Lewiston, ME. Jul 2015

1st WCRP summer school on climate model development, Hamburg, Germany. Jun 2015

Summer school on atmospheric modeling, GFDL, Princeton, NJ. Jul 2012

Gordon Research Conferences: radiation and climate, Waterville, ME. Jul 2011

18th conference on atmospheric and oceanic fluid dynamics, Spokane, WA. Jun 2011

9th Annual University of Washington Program on Climate Change Summer Institute "Climate Feedbacks", Friday Harbor Laboratories, San Juan Island, WA. Sep 2010

Wallace Symposium, University of Washington, Seattle, WA. Sep 2010

17th conference on atmospheric and oceanic fluid dynamics and 15th conference on middle atmosphere, AMS, Stowe, VT. Jun 2009

Summer school on atmospheric data assimilation and retrieval theory, C-SPARC, Banff, Canada. May 2007

Second workshop on recent high latitude climate change, NOAA/PMEL, Seattle, WA. Oct 2007

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

Services

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

Member: AMS committee on middle atmosphere

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

Proposal Reviewer: National Science Foundation, Vienna Science and Technology Fund, German Research Foundation (DFG)

Reviewer:
Journal of the Atmospheric Sciences, Journal of Climate, Journal of Geophysical Research, Geophysical Research Letters, 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.

Computer Skills

Operating systems: Linux, Windows, Mac OS.

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

Document preparation: LaTeX, Microsoft Office Suite, OpenOffice suite.

Professional Memberships

American Geophysical Union

American Meteorological Society