

Liping Zhang

Project Scientist II

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Geophysical Fluid Dynamics Laboratory (GFDL),

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Education:

- Ph.D. in physical oceanography, Ocean University of China, 2012
- B.S. in marine science, Ocean University of China, 2008

Research Experience:

- Project Scientist I, II UCAR. 2019-now
- Associate research scholar, Princeton University. 2016-2019
- Postdoc research associate and visiting scientist, Princeton University. 2014-2015
- Research Associate, CIMAS, University of Miami. 2011-2013
- Graduate Research Associate, Ocean University of China. 2008-2011

Research Interests:

- Decadal variability and predictability
- Interactions between anthropogenic forced climate change and natural variability
- Hydrological cycle and its associated salinity and water vapor variability
- Interactions between global climate change and regional climate change
- General circulation of the Ocean and Atmosphere

On service of individuals in technical and societies:

Associate Editor in *Frontiers in Climate*

Member, Climate Variability and Predictability (CLIVAR), Process Study and Model Improvement Panel 2019-2023

Co-chair and presenter, 2019 US CLIVAR Summit, Session: Seasonal-to-Decadal prediction: Decadal variability and predictability over the Southern Ocean and implications for interpreting recent observed trends

2020 US CLIVAR Summit, Session: Subseasonal-to-Decadal prediction: Decadal prediction system developed at GFDL.

2021 US CLIVAR Summit, Session: Subseasonal-to-Decadal prediction.

2022 US CLIVAR Summit, Session: Cross-Scale Interactions in the Climate System.

Journal Reviewer:

Nature Climate Change, Nature communication, npj, Climate and Atmospheric Science, Journal of Climate, Climate Dynamics, Journal of Geophysical Research-ocean, Journal of Meteorological Research, Entropy, Journal of Ocean University of China, Atmospheric and Oceanic Science Letters, PLOS ONE, Atmosphere, GFDL Internal Review

Grant Reviewer:

US National Science Foundation (NSF); British National Science Foundation

Supervisee:

Supervise summer intern: Ana Bolivar from Florida International University
Collaborate with Yushi Morioka from JAMSTEC
Supervise students: Lingya Hong; Shujun Li; Dalin Yi Li

Median interviewer:

Carbon Brief, 2018: <https://www.carbonbrief.org/natural-ocean-fluctuations-help-explain-antarctic-sea-ice-changes>

Science Daily, 2012: <https://www.sciencedaily.com/releases/2012/01/120130102538.htm>

Climate Science, 2012: <https://pielkeclimatesci.wordpress.com/2012/02/15/new-paper-enhanced-warming-over-the-global-subtropical-western-boundary-currents-by-wu-et-al-2012/>

SPIEGEL ONLINR, 2012: <http://www.spiegel.de/wissenschaft/natur/klimawandel-golfstrom-erwaermt-sich-noch-schneller-als-der-atlantik-a-812056.html>

Publications: * indicates corresponding author; _ indicates student/visitor supervising

Submitted or to be submitted:

1. **Liping Zhang***, Thomas L. Delworth, Xiaosong Yang, Fanrong Zeng, Feiyu Lu, Yushi Morioka and Mitchell Bushuk: The role of the subsurface ocean in the 2016-2021 Antarctic Sea ice retreat and associated multiyear predictability. First revision to Nature communication earth & environment. 2022.
2. **Liping Zhang***, Thomas L. Delworth, Xiaosong Yang, Yushi Morioka, Fanrong Zeng and Feiyu Lu: Skillful decadal prediction skill over the Southern Ocean based on SPEAR Model-Analogs. To be submitted to Nature communication earth & environment. 2022.
3. Yushi Morioka, **Liping Zhang**, Thomas L. Delworth, Xiaosong Yang, Fanrong Zeng, Masami Nonaka, and Swadhin K. Behera: Multidecadal variability and predictability of Antarctic Sea Ice in GFDL SPEAR_LO model. To be submitted to JGR-oceans.

Peer-reviewed journal articles

1. Youngji Joh et al. Enhanced wind-driven Kuroshio Extension decadal variability under anthropogenic climate change. *npj Climate and Atmospheric Science* 5 (1), 1-9.
2. Thomas L. Delworth, William Cooke, Vaishali Naik, David Paynter and **Liping Zhang**: A weakened AMOC may prolong greenhouse gas induced Mediterranean drying even with significant and rapid climate change mitigation. *Proceedings of the National Academy of Sciences* 119 (35), e2116655119.
3. Mitchell Bushuk et al. 2021, Seasonal prediction and predictability of regional Antarctic Sea ice. *Journal of climate*, in press.
4. Liwei Jia, et al. 2022, Skillful seasonal prediction of North American summertime heat extremes. *Journal of climate*, <https://doi.org/10.1175/JCLI-D-21-0364.1>. 2022.
5. Kai-Chih Tseng, Nathaniel C. Johnson and et al. When will humanity notice its influence on atmospheric rivers? *Journal of Geophysical Research Atmospheres*, DOI: 10.1029/2021JD036044. 2022.
6. Bushuk, Mitchell, et al., in press: Mechanisms of regional Arctic sea ice predictability in two dynamical seasonal forecast systems. *Journal of Climate*. DOI:10.1175/JCLI-D-21-0544.1. January 2022.
7. Leon Hermason et al. WMO Global Annual to Decadal Climate Update: A prediction for 2021-2025. *Bulletin of the American Meteorological Society* 103(4), DOI: 10.1175/BAMS-D-20-0311.1. 2022.
8. Joh, Youngji, Thomas L Delworth, Andrew T Wittenberg, William F Cooke, Xiaosong Yang, Fanrong Zeng, Liwei Jia, Feiyu Lu, Nathaniel C Johnson, Sarah B Kapnick, Anthony Rosati, **Liping Zhang**, and Colleen McHugh, in press: Seasonal-to-decadal variability and prediction of the Kuroshio Extension in the GFDL Coupled Ensemble Reanalysis and Forecasting system. *Journal of Climate*. DOI:10.1175/JCLI-D-21-0471.1.
9. **Zhang, Liping*** et al. February 2022: Roles of meridional overturning in subpolar Southern Ocean SST trends: Insights from ensemble simulations. *Journal of Climate*, 35(5), DOI:10.1175/JCLI-D-21-0466.11577-1596.
10. Goosse, Hugues, Quentin Dalaiden, Marie G P Cavitte, and **Liping Zhang**, January 2021: Can we reconstruct the formation of large open-ocean polynyas in the Southern Ocean using ice core records? *Climate of the Past*, 17(1), DOI:10.5194/cp-17-111-2021111-131.
11. Mao, Rui, Seong-Joong Kim, Dao-Yi Gong, Xiaohong Liu, Xinyu Wen, and **Liping Zhang**, et al., August 2021: Increasing difference in interannual summertime surface air temperature between interior East Antarctica and the Antarctic Peninsula under future climate scenarios. *Geophysical Research Letters*, 48(16), DOI:10.1029/2020GL092031.
12. Tseng, Kai-Chih, et al., September 2021: Are multiseasonal forecasts of atmospheric rivers possible? **Geophysical Research Letters**, 48(17), DOI:10.1029/2021GL094000.
13. Yang, Xiaosong, Thomas L Delworth, Fanrong Zeng, **Liping Zhang**, William F Cooke, Matthew J Harrison, Anthony Rosati, Seth D Underwood, Gilbert P Compo, and Chesley McColl, November 2021: On the development of GFDL's decadal prediction system: Initialization approaches and retrospective forecast assessment. *Journal of Advances in Modeling Earth Systems*, 13(11), DOI:10.1029/2021MS002529.
14. Zhang, Gan et al., October 2021: Seasonal predictability of baroclinic wave activity. *npj Climate and Atmospheric Science*, 4, 50, DOI:10.1038/s41612-021-00209-3.
15. Delworth, Thomas L., et al., 2020: SPEAR – the next generation GFDL modeling system for seasonal to multidecadal prediction and projection. *Journal of Advances in Modeling Earth Systems*, 12(3), DOI:10.1029/2019MS001895.
16. Smith, D M., et al, July 2020: North Atlantic climate far more predictable than models imply. *Nature*, 583, DOI:10.1038/s41586-020-2525-0796-800.

17. **Liping Zhang***, Thomas L. Delworth, William Cooke, Hugues Goosse, Bushuk Mitchell, Yushi Morioka and Xiaosong Yang, 2021: The dependence of internal multidecadal variability in the Southern Ocean on the ocean background mean state. *Journal of climate*, 34, 1061-1080.
18. **Liping Zhang*** and William Cooke, 2020: Simulated changes of Southern Ocean air-sea heat flux feedback in a warmer climate. *Climate dynamics*, DOI:10.1007/s00382-020-05460-7.
19. **Liping Zhang***, Thomas L. Delworth, William Cooke and Xiaosong Yang, 2019: Natural variability of Southern Ocean convection as a driver of observed climate trends. *Nature Climate Change*, 9, 59-65. <https://doi.org/10.1038/s41558-018-0350-3>.
20. **Liping Zhang***, Thomas L. Delworth, Xiaosong Yang, Richard G. Gudgel, Liwei Jia, Gabriel A. Vecchi and Fanrong Zeng, 2017: Estimating decadal predictability for the Southern Ocean using the GFDL CM2.1 model. *Journal of Climate*, 30, 5187-5203, DOI: <http://dx.doi.org/10.1175/JCLI-D-16-0840.1>
21. **Liping Zhang***, Thomas L. Delworth and Liwei Jia, 2017: Diagnosis of decadal predictability of Southern Ocean sea surface temperature in the GFDL CM2.1 model. *Journal of Climate*, 30, 6309-6328, DOI: <http://dx.doi.org/10.1175/JCLI-D-16-0537.1>
22. Thomas L. Delworth, Fanrong Zeng, Gabriel A. Vecchi, Xiaosong Yang, **Liping Zhang** and Rong Zhang, 2016: The North Atlantic Oscillation as a driver of rapid climate change in the Northern Hemisphere. *Nature Geoscience*, 9, 509-512.
23. Thomas L. Delworth, Fanrong Zeng, **Liping Zhang**, Rong Zhang, Gabriel Vecchi, Xiaosong Yang, 2016: The central role of ocean dynamics in connecting the North Atlantic Oscillation to the extratropical component of the Atlantic Multidecadal Oscillation, Accepted by *Journal of Climate*, JCLI-D-16-0358.
24. **Liping Zhang*** and Thomas L. Delworth, 2016: Impact of the Antarctic bottom water formation on the Weddell Gyre and its northward propagation characteristics in GFDL model, *Journal of Geophysical Research: Oceans*, 121,5825-5846.
25. **Liping Zhang*** and Thomas L. Delworth, 2016: Simulated response of the Pacific decadal oscillation to climate change, *Journal of climate*, 24, 3971-3988.
26. **Liping Zhang***, Thomas L. Delworth and Fanrong Zeng, 2016: The impact of multidecadal Atlantic meridional overturning circulation variations on the Southern Ocean. *Climate Dynamics*, p1-21, doi:10.1007/s00382-016-3190-8.
27. Shujun Li, **Liping Zhang*** and Lixin Wu, 2016, Decadal potential predictability of upper ocean heat content over the twentieth century, *Climate Dynamics*, doi 10.1007/s00382-016-3513-9.
28. **Liping Zhang*** and Thomas L. Delworth, 2015: Analysis of the Characteristics and Mechanisms of the Pacific Decadal Oscillation in a Suite of Coupled Models from the Geophysical Fluid Dynamics Laboratory, *Journal of climate*, 28 (19), 7678-7701.
29. **Liping Zhang*** and C. Zhao, 2015: Processes and mechanisms for the model SST biases in the North Atlantic and North Pacific: A link with the Atlantic meridional overturning circulation, *J. Adv. Model. Earth Syst.*, 7(2), 739-758.
30. **Liping Zhang***, C. Wang, Z. Song, and S.-K. Lee, 2015: Remote effect of the model cold bias in the tropical North Atlantic on the warm bias in the tropical southeastern Pacific, *J. Adv. Model. Earth Syst.*, 6(4), 1016-1026.
31. X Wang, C Wang, **Liping Zhang** and X Wang, 2015: Multidecadal variability of Tropical Cyclone Rapid Intensification in the Western North Pacific. *J. Climate*, 28, 3806-3820.
32. LD Yi, **Liping Zhang***, L Wu, 2015: On the mechanisms of decadal variability of the North Pacific Gyre Oscillation over the 20th century, *Journal of geophysical Research Oceans*, 120(9), 6114-6129.

33. ZY Song, HL Liu, CZ Wang, **Liping Zhang**, FL Qiao, 2014: Evaluation of the eastern equatorial Pacific SST seasonal cycle in CMIP5 models, *Ocean Science*, 10(5), 837-843.
34. C. Wang, **Liping Zhang***, S.-K. Lee, L. Wu and C. R. Mechoso, 2014: A global perspective on climate model biases. *Nature climate Change*, 4, 201-205.
35. Hong, L., **Liping Zhang***, Z. Chen, and L. Wu, 2014: Linkage between the Pacific Decadal Oscillation and the low frequency variability of the Pacific Subtropical Cell. *J. Geophys. Res. Oceans*, 119, 3464–3477.
36. **Liping Zhang***, C. Wang and S.-K. Lee, 2014: Potential role of Atlantic warm pool-induced freshwater forcing in the Atlantic meridional overturning circulation: Ocean-sea ice coupled model simulations. *Climate dynamics*, 43, 553-574.
37. **Liping Zhang***, C. Wang, 2013, Multidecadal North Atlantic Sea surface temperature and Atlantic Meridional overturning circulation variability in CMIP5 historical simulations. *Journal of Geophysical Research: oceans*, 118, 5772-5791.
38. C. Wang, **Liping Zhang***, Sang-Ki Lee, 2013: Response of Freshwater Flux and Sea Surface Salinity to Variability of the Atlantic Warm Pool. *J. Climate*, 26, 1249–1267.
39. C. Wang, **Liping Zhang***, 2013: Multidecadal Ocean Temperature and Salinity Variability in the Tropical North Atlantic: Linking with the AMO, AMOC, and Subtropical Cell. *J. Climate*, 26, 6137–6162.
40. **Liping Zhang***, Lixin Wu, Bolan Gan, 2013: Modes and Mechanisms of Global Water Vapor Variability over the Twentieth Century. *J. Climate*, 26, 5578–5593.
41. **Liping Zhang***, and C. Wang, 2012: Remote influences on freshwater flux variability in the Atlantic warm pool region. *Geophysical Research Letters*, 39, L19714, doi:10.1029/2012GL053530
42. Lixin Wu, Wenju Cai, **Liping Zhang**, Hisashi Nakamura, Axel Timmermann, Terry Joyce, Michael McPhaden, Michael Alexander, Bo Qiu, Martin Visbeck, Ping Chang, and Benjamin Giese, 2012: Enhanced warming over the global subtropical western boundary currents. *Nature Climate Change*, DOI: 10.1038/NCLIMATE1353.
43. **Liping Zhang**, Lixin Wu, 2012: Can Oceanic Freshwater Flux Amplify Global Warming? *Journal of Climate*, 25, 3417–3430.
44. **Liping Zhang**, Lixin Wu, and Jiaxu Zhang, 2011: Coupled Ocean-Atmosphere Responses to Recent Freshwater Flux Changes over the Kuroshio-Oyashio Extension Region. *Journal of Climate*, 24, 1507-1524.
45. **Liping Zhang**, Lixin Wu, and Jiaxu Zhang, 2011: Simulated Response to Recent Freshwater Flux Change over the Gulf Stream and Its Extension: Coupled Ocean-Atmosphere Adjustment and Atlantic-Pacific Teleconnection. *Journal of Climate*, 24, 3971-3988.
46. **Liping Zhang**, C. Wang and Lixin Wu, 2011: Low-Frequency Modulation of the Atlantic Warm Pool by the Atlantic Multidecadal Oscillation. *Climate Dynamics*, 39, 1661-1671.
47. **Liping Zhang***, Lixin Wu, and Lisan Yu, 2011: Oceanic Origin of Recent La-Nina Like Warming Trend in the Tropical Pacific, *Advance in Atmospheric Science*, 28, 1-9, AAS20100129.
48. **Liping Zhang***, Lixin Wu, Xiaopei Lin, and Dexing Wu, 2010: Modes and Mechanisms of Sea Surface Temperature Low-Frequency Variations over the Coastal China Seas. *Journal of Geophysical Research*, 115, doi:10.1029/2009JC006025
49. Lixin Wu, Yan Sun, Jiaxu Zhang, **Liping Zhang** and Shoshiro Minobe, 2010: Coupled Ocean-Atmosphere Response to Idealized Freshwater Forcing over the Western Tropical Pacific, *Journal of Climate*, 23, 1945-1954.
50. Chun Li, Lixin Wu, Qi Wang, Liwei Qu and **Liping Zhang**, 2009: An intimate coupling of ocean-atmospheric interaction over the extratropical North Atlantic and Pacific. *Climate dynamics*, 32, 753-765.

Conference Presentations:

- Liping Zhang et al. “Roles of meridional overturning in subpolar Southern Ocean SST trends: Insights from ensemble simulations”, Poster, virtual workshop on Societally Relevant Multi-Year Climate predictions. 2022 Mar.
- Liping Zhang et al. “Roles of meridional overturning in subpolar Southern Ocean SST trends: Insights from ensemble simulations”, Oral, virtual WCRP workshop on attribution of multi-annual to decadal changes in the climate system. 2021 Sep.
- Liping Zhang et al. “Roles of meridional overturning in subpolar Southern Ocean SST trends: Insights from ensemble simulations”, Oral, virtual AGU meeting, 2021 Dec.
- Liping Zhang et al. “The dependence of Southern Ocean low frequency variability on the ocean mean state”, poster, virtual AGU meeting, 2020 Dec.
- Liping Zhang et al. “The decadal prediction system developed at GFDL”, Oral talk, 2020 Aug, Oral talk in CLIVAR virtual summer summit.
- Liping Zhang et al. “The dependence of Southern Ocean low frequency variability on the ocean mean state”, oral talk, 2020 Feb, Ocean science meeting, San Diego, Calif.
- Liping Zhang et al. “Decadal variability and predictability in the Pacific, Atlantic and Southern Oceans”, oral talk, 2019 Oct, NOAA/GFDL external review.
- Liping Zhang and Tom Delworth, William Cooker and Xiaosong Yang. “Decadal variability and predictability in the Southern Ocean and Atlantic Ocean” Oral talk in CLIVAR summer summit, Aug 2019, Long Beach, CA.
- Liping Zhang and Tom Delworth, William Cooker and Xiaosong Yang. “Natural variability of Southern Ocean convection as a driver of observed climate trends”, 2019 May, NOAA/GFDL Poster Expo.
- Liping Zhang and Tom Delworth, William Cooker and Xiaosong Yang. “Decadal variability and predictability in the Southern Ocean” Oral seminar in GFDL, Feb 2019, Princeton, NJ.
- Liping Zhang and Tom Delworth, William Cooker and Xiaosong Yang. “Decadal variability and predictability in the Southern Ocean” Oral presentation, EGU meeting, April 2019, Vienna, Austria.
- Liping Zhang and Tom Delworth, William Cooker and Xiaosong Yang. “Decadal variability and predictability in the Southern Ocean – implications for interpreting recent observed trends” Oral presentation, AGU meeting, Dec 2018, Washington, D.C.
- Liping Zhang and Tom Delworth and Fanrong Zeng. “Estimating decadal predictability for the Southern Ocean using the GFDL CM2.1 model” Poster presentation, ocean science meeting, Feb 2018.
- Liping Zhang “Estimating decadal predictability for the Southern Ocean using the GFDL CM2.1 model” Oral presentation, 2017 GFDL annual science meeting, Nov 2017.
- Liping Zhang and Thomas L. Delworth, 2017: Simulated response of the Pacific decadal oscillation to climate change. Poster. 97th American Meteorological Society Annual Meeting, Seattle, WA.
- Liping Zhang and Thomas L. Delworth, 2016: Simulated response of the Pacific decadal oscillation to climate change. Poster. NOAA/GFDL Poster Expo.
- Liping Zhang and Thomas L. Delworth, 2016: Impact of the Antarctic bottom water on the Weddell Gyre and its northward propagation characteristics in GFDL model Poster. NOAA/GFDL Poster Expo.
- Liping Zhang and Thomas L. Delworth, 2015: The impact of multidecadal Atlantic meridional overturning circulation variations on the Southern Ocean. Poster. 2015 AGU Fall Meeting, American Geophysical Union, San Francisco, CA.

- Liping Zhang and Thomas L. Delworth, 2015: Analysis of the characteristics, mechanism and predictability of the Pacific Decadal Oscillation in a suite of GFDL climate models. Talk. NOAA/GFDL lunchtime seminar.
- Liping Zhang and Thomas L. Delworth, 2015: Impact of multidecadal Atlantic meridional overturning circulation variations on the Southern Ocean. Talk. AGU JOINT ASSEMBLY, Montreal, Canada.
- Liping Zhang and Thomas L. Delworth, 2014: Analysis of the characteristics, mechanism and predictability of the Pacific Decadal Oscillation in a suite of GFDL climate models. Invited talk. Ocean University of China formal seminar.
- Liping Zhang and Thomas L. Delworth, 2014: Pacific decadal oscillation and North American hydroclimate. Poster. NOAA/GFDL Poster Expo.
- Liping Zhang and Thomas L. Delworth, 2014: The Pacific Decadal Oscillation and North American Hydroclimate. Poster. NOAA/GFDL Science Review.
- Liping Zhang, 2013: Role of Atlantic Warm Pool-induced freshwater forcing in the AMOC. Poster. U.S. AMOC/U.K. RAPID International Science Meeting ‘AMOC Variability: Dynamics and Impacts’ Hilton Baltimore - Baltimore, MD.
- Liping Zhang, 2012: Role of the Atlantic Warm Pool in the Atlantic Meridional Overturning Circulation: Ocean-Sea Ice Coupled Model Simulations. Talk. NOAA/AOML formal seminar.

Field Experience:

- East China Sea and Northwestern Pacific, CTD and Lowered ADCP deployment and data analysis, 2009

Skills

- **Computer**
Fortran Language; C Language; Matlab; Grads; Linux; Unix; Windows
- **Numerical models**
The Geophysical Fluid Dynamical Laboratory model (GFDL);
Community Climate System Model (CCSM);
Fast Ocean and Atmosphere Model (FOAM);
Hybrid Coordinate Ocean Model (HYCOM)
- **Others**
Data Analysis; Statistics Methods; CTD&ADCP (Lowered, Mooring, Shipboard)
Manipulation and analysis.