

# Rong Zhang

Senior Scientist

GFDL/NOAA

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## History of Employment

*2018 - Present* **Ocean and Cryosphere Division Head**, GFDL, NOAA  
**Science Board Member**, GFDL, NOAA  
**Supervisory Oceanographer**, ZP-5, GFDL, NOAA

*2016 - 2018* **Oceanographer**, ZP-5 (equivalent to full professor), GFDL, NOAA

*2006 - 2016* **Oceanographer**, ZP-4, GFDL, NOAA

*2023 - 2024* **Director of Graduate Studies**, AOS Program, Princeton University

*2019 - Present* **Executive Board Member**, CIMES, Princeton University

*2015 - Present* **Faculty Member**, AOS Program, Princeton University

*2004 - 2006* **Associate Research Scholar**, AOS Program, Princeton University

*2002 - 2003* **Postdoctoral Research Associate**, AOS Program, Princeton University

## Degrees

2001 **Ph. D. Climate Physics and Chemistry**, MIT

1997 **M. A. Physics**, Boston University

1995 **B. E. Electronic Engineering**, Tsinghua University

## Research Interests

Abrupt climate change and low frequency variability in the coupled ocean-atmosphere system, global teleconnections of climate change, impact of Atlantic meridional overturning circulation (AMOC) on global and regional phenomena (such as Gulf Stream separation, ITCZ position, Sahel, Indian, and East Asian monsoon, Atlantic Hurricane activity, Arctic sea ice, northern hemisphere surface temperature, and North Pacific climate variability), meridional coherence and fingerprints of AMOC variability, mechanisms of AMOC and Atlantic multidecadal variability (AMV)

## University Teaching

*2014 - Present* Lectures for AOS 573: Physical Oceanography, AOS Program, Princeton University

*2008 - 2014* Guest Lectures for AOS 577: Weather and Climate Dynamics, Climates of the Earth: Present, Past, and Future, AOS Program, Princeton University

## Honor and Service to Community

AGU Union Fellow Committee, 2024-2025  
AGU College of Fellows Distinguished Lecturer, 2024-2025  
Fellow, American Geophysical Union, 2023  
Bernhard Haurwitz Memorial Lecturer, American Meteorological Society, 2020  
Fellow, American Meteorological Society, 2018  
Faculty Committee on the Graduate School, Princeton University, 2023-2024

Graduate Work Committee, AOS Program, Princeton University, 2021-2024  
Editor, *Journal of Climate*, 2016-2022  
International CLIVAR AMOC Task Team, 2021-Present  
Science Advisory Board, Bjerknes Climate Prediction Unit, Bergen, Norway, 2018-Present  
Scientific Organizing Committee, International Workshop on Improving Modelling of the AMOC, Exeter, UK, 2024  
Chair, Scientific Organizing Committee, GFDL 2017 Science Symposium  
GFDL Research Council, 2014-2016  
Scientific Organizing Committee, US AMOC Science Team Meeting, Santa Fe, NM, 2017  
Chair, US AMOC Task Team IV, 2016-2017; Vice-Chair, US AMOC Task Team IV, 2015-2016  
Scientific Organizing Committee, International Paleo-AMOC Workshop, Boulder, CO, 2016  
Scientific Organizing Committee, GFDL 60th Anniversary Symposium, Princeton, NJ, 2015  
Scientific Steering Committee, RAPID/US AMOC International Science Meeting, Bristol, UK, 2015  
US AMOC Executive Committee, 2010-2014, 2015-2017  
Steering Committee, Model Development Team, GFDL, 2012-2017  
Chair, US AMOC Task Team II, 2013-2014; Vice-Chair, US AMOC Task Team II, 2010-2013  
Scientific Organizing committee, US AMOC Annual Meeting, Boulder, CO, 2012  
US CLIVAR Phenomena, Observations, and Synthesis (POS) Panel, 2011-2013  
AGU Editors' Citation Award for Excellence in Refereeing for GRL, 2012  
Invited Contributing Author of IPCC AR5, 2011-2012  
Convener, EGU General Assembly, Vienna, Austria, 2007  
Session Chair/Co-Chair, AGU Ocean Sciences Meeting, Portland, OR, 2004, 2018

## Professional Memberships

American Geophysical Union  
American Meteorological Society

## Publications

Joshi, R., and **R. Zhang**, 2023, Impacts of the North Atlantic biases on the upper troposphere/lower stratosphere over the extratropical North Pacific. *npj Climate and Atmospheric Science*, 6, DOI:10.1038/s41612-023-00482-4.

Guo, H., Y. Ming, S. M. Fan, A. T. Wittenberg, **R. Zhang**, M. Zhao, & L. Zhou, 2022, Two-moment bulk cloud microphysics with prognostic precipitation in the GFDL CM4.0 model: Performance and simulation characteristics. *JAMES*, <https://doi.org/10.1029/2022MS003111>

- Wei, X., and **R. Zhang**, 2022, A Simple Conceptual Model for the Self-sustained Multidecadal AMOC Variability. *Geophysical Research Letters*, e2022GL099800.
- Thomas, M., and **R. Zhang**, 2022, Two sources of deep decadal variability in the central Labrador Sea open-ocean convection region. *Geophysical Research Letters*, e2022GL098825.
- Zhang, R.**, and M. Thomas, 2021, Horizontal circulation across density surfaces contributes substantially to the long-term mean northern Atlantic Meridional Overturning Circulation. *Communications Earth & Environment*, 2 (1), 1-12, <https://www.nature.com/articles/s43247-021-00182-y>
- Menary, M., J. Robson, R. P. Allan, B. Booth, C. Cassou, G. Gastineau, J. M. Gregory, D. Hodson, C. Jones, J. Mignot, M. A. Ringer, R. Sutton, L. J. Wilcox, and **R. Zhang**, 2020, Aerosol-forced AMOC changes in CMIP6 historical simulations. *Geophysical Research Letters*. DOI:10.1029/2020GL088166.
- Winton, M., A. Adcroft, J. P. Dunne, I. M. Held, E. Shevliakova, M. Zhao, H. Guo, W. Hurlin, J. Krasting, T. Knutson, D. Paynter, L. G. Silvers, and **R. Zhang**, 2020, Climate sensitivity of GFDL's CM4.0. *Journal of Advances in Modeling Earth Systems*, 12, <https://doi.org/10.1029/2019MS001838>.
- Held, I. M., H. Guo, A. Adcroft, J. P. Dunne, L. W. Horowitz, J. Krasting, E. Shevliakova, M. Winton, M. Zhao, M. Bushuk, A. T. Wittenberg, B. Wyman, B. Xiang, **R. Zhang**, W. Anderson, V. Balaji, L. Donner, K. Dunne, J. Durachta, P. P. G. Gauthier, P. Ginoux, J. C. Golaz, S. M. Griffies, R. Hallberg, L. Harris, M. Harrison, W. Hurlin, J. John, P. Lin, S. J. Lin, S. Malyshev, R. Menzel, P. C. D. Milly, Y. Ming, V. Naik, D. Paynter, F. Paulot, V. Rammasswamy, B. Reichl, T. Robinson, A. Rosati, C. Seman, L. G. Silvers, S. Underwood, N. Zadeh, 2019, Structure and performance of GFDL's CM4. 0 climate model. *Journal of Advances in Modeling Earth Systems*, 11, <https://doi.org/10.1029/2019MS001829>.
- Adcroft, A, W. Anderson, V. Balaji, C. Blanton, M. Bushuk, C. O. Dufour, J. P. Dunne, S. M. Griffies, R. Hallberg, M. J. Harrison, I. M. Held, M. F. Jansen, J. G. John, J. P. Krasting, A. R. Langenhorst, S. Legg, Z. Liang, C. McHugh, A. Radhakrishnan, B. G. Reichl, T. Rosati, B. L. Samuels, A. Shao, R. Stouffer, M. Winton, A. T. Wittenberg, B. Xiang, N. Zadeh, **R. Zhang**, 2019, The GFDL global ocean and sea ice model OM4. 0: Model description and simulation features. *Journal of Advances in Modeling Earth Systems*, 11, <https://doi.org/10.1029/2019MS001726>.

- Zhang, R.**, R. Sutton, G. Danabasoglu, Y. Kwon, R. Marsh, S. G. Yeager, D. E. Amrhein, and C. M. Little, 2019, A Review of the Role of the Atlantic Meridional Overturning Circulation in Atlantic Multidecadal Variability and Associated Climate Impacts, *Reviews of Geophysics*, DOI:10.1029/2019RG000644.
- Yan, X., **R. Zhang**, and T. R. Knutson, 2019, A multivariate AMV index and associated discrepancies between observed and CMIP5 externally forced AMV. *Geophysical Research Letters*, 46, DOI:10.1029/2019GL082787.
- Li, F., M. S. Lozier, G. Danabasoglu, N. P. Holliday, Y. Kwon, A. Romanou, S. G. Yeager, and **R. Zhang**, 2019, Local and downstream relationships between Labrador Sea Water volume and North Atlantic meridional overturning circulation variability. *Journal of Climate*, 32 (13), 3883-3898.
- Yan, X., **R. Zhang**, and T. R. Knutson, 2018, Underestimated AMOC variability and implications for AMV and predictability in CMIP models. *Geophysical Research Letters*, 45, DOI:10.1029/2018GL077378.
- Zhang, R.**, 2017, On the Persistence and Coherence of Subpolar Sea Surface Temperature and Salinity Anomalies Associated with the Atlantic Multidecadal Variability. *Geophysical Research Letters*, DOI:10.1002/2017GL074342.
- Yan, X., **R. Zhang**, and T. R. Knutson, 2017, The role of Atlantic overturning circulation in the recent decline of Atlantic major hurricane frequency. *Nature Communications*, 8, 1695, DOI:10.1038/s41467-017-01377-8 .
- Li, D., **R. Zhang**, and T. R. Knutson, 2018, Comparison of Mechanisms for Low-Frequency Variability of Summer Arctic Sea Ice in Three Coupled Climate Models. *Journal of Climate*, 31, DOI:10.1175/JCLI-D-16-0617.1 .
- Li, D., **R. Zhang**, and T. R. Knutson, 2017, On the Discrepancy between Observed and CMIP5 Multi-Model Simulated Barents Sea Winter Sea Ice Decline, *Nature Communications*, 8:14991, doi:10.1038/ncomms14991.
- Smedsrud, L. H., M. H. Halvorsen, J. C. Stroeve, **R. Zhang**, and Kjell Kloster, 2017, Fram Strait sea ice export variability and September Arctic sea ice extent over the last 80 years. *The Cryosphere*, 11, 65-79, doi:10.5194/tc-11-65-2017.
- Delworth, T. L., F. Zeng, L. Zhang, **R. Zhang**, G. A. Vecchi, 2017, The central role of ocean dynamics in connecting the North Atlantic Oscillation to the extratropical component of the Atlantic Multidecadal Oscillation,

*Journal of Climate*, doi: 10.1175/JCLI-D-16-0358.1

Knutson, T. R., **R. Zhang**, and L. Horowitz, 2016, Prospects for a Prolonged Slowdown in Global Warming in the Early 21st Century, *Nature Communications*, 7, doi: 10.1038/ncomms13676.

Barcikowska, M., T. R. Knutson, and **R. Zhang**, 2016, Observed and simulated fingerprints of multidecadal climate variability, and their contributions to periods of global SST stagnation. *Journal of Climate*, 30, 721-737, doi:10.1175/JCLI-D-16-0443.1.

**Zhang, R.**, R. Sutton, G. Danabasoglu, T. L. Delworth, W. M. Kim, J. Robson, and S. G. Yeager, 2016, Comment on "The Atlantic Multidecadal Oscillation without a role for ocean circulation". *Science*, 352, doi:10.1126/science.aaf1660.

Delworth, T. L., F. Zeng, G. A. Vecchi, X. Yang, L. Zhang, and **R. Zhang**, 2016, The North Atlantic Oscillation as a driver of rapid climate change in the Northern Hemisphere. *Nature Geoscience*, 9, doi:10.1038/ngeo2738.

Brown, P. T., S. Lozier, **R. Zhang**, and W. Li, 2016, The necessity of cloud feedback for a basin-scale Atlantic Multidecadal Oscillation. *Geophys. Res. Lett.*, 43, doi:10.1002/2016GL068303.

Saba, V. S., S. M. Griffies, W. G. Anderson, M. Winton, M. A. Alexander, T. L. Delworth, J. A. Hare, M. J. Harrison, A. Rosati, G. A. Vecchi, and **R. Zhang**, 2016, Enhanced warming of the northwest Atlantic Ocean under climate change. *Journal of Geophysical Research*, 121, doi:10.1002/2015JC011346.

Sanchez-Franks, A. and **R. Zhang**, 2015, Impact of the Atlantic meridional overturning circulation on the decadal variability of the Gulf Stream path and regional chlorophyll and nutrient concentrations, *Geophys. Res. Lett.*, 42, doi:10.1002/2015GL066262.

Zhang J. and **R. Zhang**, 2015, On the evolution of Atlantic Meridional Overturning Circulation Fingerprint and implications for decadal predictability in the North Atlantic, *Geophys. Res. Lett.*, 42, doi:10.1002/2015GL064596.

**Zhang, R.** 2015, Mechanisms for low frequency variability of summer Arctic sea ice extent, *PNAS*, 112, doi: 10.1073/pnas.1422296112.

**Zhang, R.** 2015, Atlantic Meridional Overturning Circulation (AMOC) and Climate,

Chapter 8 in the book “Climate Change: Multidecadal and Beyond”, World Scientific Series on Asia-Pacific Weather and Climate, Vol. 6, pp125-140.

Keenlyside N. S., J. Ba, J. Mecking, N. Omrani, M. Latif, **R. Zhang**, R. Msadek, 2015, North Atlantic Multi-Decadal Variability –Mechanisms and Predictability, Chapter 9 in the book “Climate Change: Multidecadal and Beyond”, World Scientific Series on Asia-Pacific Weather and Climate, Vol. 6, pp 141-158.

Griffies, S. M., M. Winton, W. G. Anderson, R. Benson, T. L. Delworth, C. O. Dufour, J. P. Dunne, P. Goddard, A. K. Morrison, A. T. Wittenberg, J. Yin, and **R. Zhang**, 2015, Impacts on ocean heat from transient mesoscale eddies in a hierarchy of climate models. *Journal of Climate*, 28, DOI:10.1175/JCLI-D-14-00353.1.

Msadek, R., T. L. Delworth, A. Rosati, W. G. Anderson, G. A. Vecchi, Y.-S. Chang, K. W. Dixon, R. Gudgel, W. F. Stern, A. T. Wittenberg, X.-Q. Yang, F. Zeng, **R. Zhang**, and S. Zhang, 2014, Predicting a Decadal Shift in North Atlantic Climate Variability Using the GFDL Forecast System. *Journal of Climate*, 27, DOI:10.1175/JCLI-D-13-00476.1.

Lynch-Stieglitz, J, M Schmidt, L G Henry, W B Curry, L C Skinner, S Mulitza, **R. Zhang**, and P. Chang, 2014, Muted change in Atlantic overturning circulation over some glacial-aged Heinrich events. *Nature Geoscience*, 7(2), DOI:10.1038/ngeo2045.

Vecchi, G. A., R. Msadek, W. G. Anderson, Y-S Chang, T. L. Delworth, K. W. Dixon, R. Gudgel, A. Rosati, W. F. Stern, G. Villarini, A. T. Wittenberg, X. Yang, F. Zeng, **R. Zhang**, and S. Zhang, 2014, Reply to Comment on Multi-year Predictions of North Atlantic Hurricane Frequency: Promise and limitations. *Journal of Climate*, 27(1), DOI:10.1175/JCLI-D-13-00381.1.

**Zhang, R.**, and T. R. Knutson, 2013: The role of global climate change in the extreme low summer Arctic sea ice extent in 2012 [in “Explaining Extreme Events of 2012 from a Climate Perspective”]. *Bull. Amer. Meteor. Soc.*, 94 (9).

**Zhang, R.**, T. L. Delworth, R. Sutton, D. Hodson, K. W. Dixon, I. M. Held, Y. Kushnir, J. Marshall, Y. Ming, R. Msadek, J. Robson, A. Rosati, M. Ting, and G. A. Vecchi, 2013, Have Aerosols Caused the Observed Atlantic Multidecadal Variability?. *Journal of the Atmospheric Sciences*, 70, DOI:10.1175/JAS-D-12-0331.1.

- Vecchi, G. A., R. Msadek, W. G Anderson, Y-S Chang, T. L Delworth, K. W Dixon, R. Gudgel, A. Rosati, W. F Stern, G Villarini, A. T Wittenberg, X. Yang, F. Zeng, **R. Zhang**, and S. Zhang, 2013, Multi-year Predictions of North Atlantic Hurricane Frequency: Promise and limitations. *Journal of Climate*, 26, DOI:10.1175/JCLI-D-12-00464.1.
- Leech, P J., J Lynch-Stieglitz, and **R. Zhang**, 2013, Western Pacific Thermocline Structure and the Pacific Marine Intertropical Convergence Zone during the Last Glacial Maximum. *Earth and Planetary Science Letters*, 363, DOI:10.1016/j.epsl.2012.12.026.
- Lee, H C., T. L Delworth, A. Rosati, **R. Zhang**, W. G. Anderson, F. Zeng, C. A Stock, A. Gnanadesikan, K. W Dixon, and S. M Griffies, 2013, Impact of climate warming on upper layer of the Bering Sea. *Climate Dynamics*, 40, DOI:10.1007/s00382-012-1301-8.
- Yang, X., A. Rosati, S. Zhang, T. L Delworth, R. Gudgel, **R. Zhang**, G. A Vecchi, W. G Anderson, Y-S Chang, T. DelSole, K. W Dixon, R. Msadek, W. F Stern, A. T Wittenberg, and F. Zeng, 2013, A predictable AMO-like pattern in GFDL's fully-coupled ensemble initialization and decadal forecasting system. *Journal of Climate*, 26, DOI:10.1175/JCLI-D-12-00231.1.
- Delworth, T. L., A. Rosati, W. G Anderson, A. Adcroft, V. Balaji, R. Benson, K. W. Dixon, S. M. Griffies, H C Lee, R. C Pacanowski, G. A Vecchi, A. T Wittenberg, F. Zeng, and **R. Zhang**, 2012, Simulated climate and climate change in the GFDL CM2.5 high-resolution coupled climate model. *Journal of Climate*, 25, DOI:10.1175/JCLI-D-11-00316.1
- Vecchi, G. A., R. Msadek, T. L Delworth, K. W. Dixon, E Guilyardi, E Hawkins, A R Karspeck, J Mignot, J Robson, A. Rosati, and **R. Zhang**, 2012: Comment on "Multiyear Prediction of Monthly Mean Atlantic Meridional Overturning Circulation at 26.5°N". *Science*, 338(6107), DOI:10.1126/science.1222566.
- Zhang, R.**, T. L Delworth, A. Rosati, W. G Anderson, K. W. Dixon, H C Lee, and F. Zeng, 2011, Sensitivity of the North Atlantic Ocean circulation to an abrupt change in the Nordic Sea overflow in a high resolution global coupled climate model. *Journal of Geophysical Research*, 116, DOI:10.1029/2011JC007240
- Mahajan, S, **R. Zhang**, and T. L Delworth, 2011, Impact of the Atlantic Meridional Overturning Circulation (AMOC) on Arctic surface air temperature and sea-ice variability. *Journal of Climate*, 24, DOI:10.1175/2011JCLI4002.1.

- Mahajan, S, **R. Zhang**, T. L Delworth, S. Zhang, A. Rosati, and Y-S Chang, 2011, Predicting Atlantic meridional overturning circulation (AMOC) variations using subsurface and surface fingerprints. *Deep-Sea Research, Part II*, 58(17-18), DOI:10.1016/j.dsr2.2010.10.067.
- Wu, S, Z Liu, **R. Zhang**, and T. L Delworth, 2011: On the observed relationship between the Pacific Decadal Oscillation and the Atlantic Multi-decadal Oscillation. *Journal of Oceanography*, 67, DOI:10.1007/s10872-011-0003-x.
- Chen, M-T, X. Lin , Y. Chang , Y. Chen , L. Lo , C. Shen , Y. Yokoyama , D. W. Oppo , W. Thompson, and **R. Zhang**, 2010, Dynamic millennial-scale climate changes in the Northwestern Pacific over the past 40,000 years. *Geophysical Research Letters*, 37, L23603, doi:10.1029/2010GL045202.
- Zhang, R.**, 2010: Northward Intensification of Anthropogenically Forced Changes in the Atlantic Meridional Overturning Circulation (AMOC). *Geophysical Research Letters*, 37, L24603, doi:10.1029/2010GL045054.
- Zhang, R.**, 2010: Latitudinal dependence of Atlantic Meridional Overturning Circulation (AMOC) variations. *Geophysical Research Letters*, 37, L16703, doi:10.1029/2010GL044474.
- Joyce, T M., and **R. Zhang**, 2010: On the path of the Gulf Stream and the Atlantic Meridional overturning circulation. *Journal of Climate*, 23, doi:10.1175/2010JCLI3310.1.
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- Delworth, T. L., **R. Zhang**, and M E Mann, 2007: Decadal to centennial variability of the Atlantic from observations and models In *Ocean Circulation: Mechanisms and Impacts, Geophysical Monograph Series 173*, Washington, DC, American Geophysical Union, 131-148.
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- Zhang, R.**, 2007: Anticorrelated multidecadal variations between surface and subsurface tropical North Atlantic. *Geophysical Research Letters*, 34, L12713, doi:10.1029/2007GL030225.
- Zhang, R.**, and G. K Vallis, 2007: The role of bottom vortex stretching on the path of the North Atlantic Western Boundary Current and on the Northern Recirculation Gyre. *Journal of Physical Oceanography*, 37(8), 2053-2080.

- Zhang, R.**, and T. L. Delworth, 2007: Impact of the Atlantic Multidecadal Oscillation on North Pacific climate variability. *Geophysical Research Letters*, 34, L23708, doi:10.1029/2007GL031601.
- Zhang, R.**, and T. L. Delworth, 2006: Impact of Atlantic multidecadal oscillations on India/Sahel rainfall and Atlantic hurricanes. *Geophysical Research Letters*, 33, L17712, doi:10.1029/2006GL026267.
- Zhang, R.**, 2006: How Cold Were the Tropics and Subtropics at the Last Glacial Maximum? *Quaternary Science Reviews*, 25, 1150-1151.
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- Zhang, R.**, and T. L. Delworth, 2005: Simulated Tropical Response to a Substantial Weakening of the Atlantic Thermohaline Circulation. Letter in *Journal of Climate*, 18, 1853-1860.
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**Zhang, R.**, M. J. Follows and J. Marshall, 2003: Reply to Comment by Roberta M. Hotinski, Lee R. Kump, and Karen L. Bice on “Could the Late Permian Deep Ocean Have Been Anoxic?” *Paleoceanography*, 18(4), 1095, doi:10.1029/2002PA00851.

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Harrington, S., **R. Zhang**, P. H. Poole, F. Sciortino, and H. E. Stanley, 1997: Liquid-liquid Phase Transition: Evidence from Simulations, *Physical Review Letters*, 78: (12) 2409-2412.

Stanley H. E., L. Cruz, S. Harrington, P. H. Poole, S. Sastry, F. Sciortino, F. W. Starr, and **R. Zhang**, 1997: Cooperative Molecular Motions in Water: The Liquid-liquid Critical Point Hypothesis, *Physica A*, 236: (1-2) 19-37.

## Conference Talks

**Zhang, R.**, Invited talk: “Understanding low-frequency AMOC variability and associated predictability over the Atlantic-Arctic region” at the international Workshop on Climate Prediction and Services over the Atlantic-Arctic Sector, Bergen, Norway, May, 2024.

**Zhang, R.**, Invited talk: “Understanding changes in the North Atlantic Ocean circulation and the associated impacts on climate” at the WCRP Open Science Conference, October, 2023.

**Zhang, R.**, Invited talk: “Understanding multidecadal AMOC variability” at the international Summer School on Theory, Mechanisms and Hierarchical Modeling of Climate Dynamics: Atlantic Variability and Tropical Basin Interactions at Interannual to Multi-Decadal Time Scales, August, 2023.

**Zhang, R.**, Invited lecture: “Understanding the AMOC-AMV linkage and associated climate impacts” at the international Summer School on Theory, Mechanisms and Hierarchical Modeling of Climate Dynamics: Atlantic Variability and Tropical Basin Interactions at Interannual to Multi-

Decadal Time Scales, August, 2023.

**Zhang, R.**, Invited lecture: “Understanding the AMOC from modelling and observational perspectives” at the international Summer School on Theory, Mechanisms and Hierarchical Modeling of Climate Dynamics: Atlantic Variability and Tropical Basin Interactions at Interannual to Multi-Decadal Time Scales, August, 2023.

**Zhang, R.**, Invited talk: “Understanding multidecadal AMOC variability and associated impacts” at the international workshop “Meeting AMOC Observation Need in a Changing Climate”, July, 2023.

**Zhang, R.**, Invited talk: “A holistic perspective in understanding Atlantic Multidecadal Variability”, at the 36<sup>th</sup> Conference on Climate Variability and Change, the 103rd AMS Annual Meeting, January, 2023.

**Zhang, R.**, Invited talk: “A Review of the Gulf Stream and Associated Impacts on Weather and Climate from the Modeling Perspective”, at the US CLIVAR Workshop “Whither the Gulf Stream Workshop: Present Understanding and Future Opportunities for Elucidating the Role of the Gulf Stream in Weather and Climate, June, 2022.

**Zhang, R.**, “On the long-term mean AMOC across the Arctic-Atlantic gateways and the downstream subpolar North Atlantic” at 2022 US AMOC Science Team meeting, April, 2022.

**Zhang, R.**, “On the Long-term Mean AMOC across the Arctic-Atlantic Gateways and the Downstream Connection to the Subpolar North Atlantic” at 2022 Ocean Science meeting, March, 2022.

**Zhang, R.**, Invited talk: “A Review of the Interbasin Impacts of Atlantic Multidecadal Variability”, at the virtual WCRP-CLIVAR Workshop “Climate Interactions among the Tropical Basins”, February, 2021.

**Zhang, R.**, Invited Bernhard Haurwitz Memorial Lecture: “The role of AMOC in Atlantic Multidecadal Variability and associated decadal predictability”, at the 34<sup>th</sup> Conference on Climate Variability and Change, the 101st AMS Annual Meeting, January, 2021.

**Zhang, R.**, Invited talk: “Understanding Atlantic Multidecadal Variability and associated decadal predictability”, at the AGU Fall Meeting, December, 2020.

- Zhang, R.**, Invited talk: “Low-Frequency AMOC Variability and Associated Climate Impacts”, at the AOML/GFDL Science Connections Workshop, August, 2020.
- Zhang, R.**, Invited talk: “The Role of AMOC in Atlantic Decadal Predictability”, at the JpGU-AGU Joint Meeting, July, 2020.
- Zhang, R.**, Invited talk: “Mechanisms for decadal climate predictability in the Atlantic-Arctic sector”, at the International Workshop on Climate Prediction in the Atlantic-Arctic Sector, Bergen, Norway, June, 2019.
- Zhang, R.**, Invited talk: “The Atlantic Multidecadal Variability: Mechanism, Predictability, and Associated Impact on Hurricane Activity” at the 98<sup>th</sup> AMS Annual Meeting, Austin, TX, January, 2018.
- Zhang, R.**, “Some Recent Applications of the Observed Extra-Tropical AMOC Fingerprint” at the 2018 International AMOC Science Meeting, Miami, FL, July, 2018.
- Zhang, R.**, Invited talk: “The Atlantic multidecadal variability: Mechanism , Predictability, and the Associated Impact on Hurricane Activity” at Workshop on Atlantic Climate Variability-Dynamics, Prediction and Hurricane Risk, Columbia University, NYC, NY, September, 2017.
- Zhang, R.**, Invited talk: “What we’ve learned from AMOC modeling efforts about AMOC processes and its role in weather and climate” at US CLIVAR Summit, Baltimore, MD, August, 2017.
- Zhang, R.**, Invited talk: “Decadal variability and potential predictability in the Atlantic” at US CLIVAR Summit, Baltimore, MD, August, 2017.
- Zhang, R.**, “Low-frequency variability in the North Atlantic-Arctic sector” at US AMOC Annual meeting, Santa Fe, NM, May, 2017.
- Zhang, R.**, Invited talk: “Low Frequency Variability in the North Atlantic-Arctic Sector”, at the Fourth Santa Fe Climate Conference, Santa Fe, NM, February, 2017.
- Zhang, R.**, Invited talk: “Mechanisms for low frequency variability and predictability in the North Atlantic Sector and Arctic” at Workshop on Climate Prediction in the Arctic-Atlantic Sector, Bergen, Norway, June, 2016.
- Zhang, R.**, Invited talk: “The Atlantic Meridional Overturning Circulation: Paleo Aspects, Recent Behavior, and Abrupt Climate Change” at the Ronald

J. Stouffer Symposium, Princeton, NJ, June, 2016.

**Zhang, R.**, Invited talk: “AMOC Impacts on Climate” at International Paleo-AMOC Workshop, Boulder, CO, May, 2016.

**Zhang, R.**, Invited talk: “The impact of low-frequency variability of the Atlantic on Arctic sea ice extent” at CLIVAR-ICTP International Workshop on Decadal Climate Variability and Predictability, Trieste, Italy, November, 2015.

**Zhang, R.**, Invited talk: “Ocean’s Role in Climate Change” at GFDL 60th Anniversary Symposium, Princeton, NJ, November, 2015.

**Zhang, R.**, Invited talk: “Impact of AMOC on the Low Frequency Variability of Summer Arctic Sea Ice Extent” at RAPID-US AMOC International Science Meeting, Bristol, UK, July, 2015.

**Zhang, R.**, Invited talk: “Impact of AMOC on Arctic sea ice and atmosphere heat transport into the Arctic” at 2014 US AMOC Science Team Meeting, Seattle, WA, September, 2014.

**Zhang, R.**, Invited talk: “Atlantic Meridional Overturning Circulation and Climate” at forum “The Role of Oceans in Multidecadal Climate Variability” Beijing, China, September, 2013.

**Zhang, R.**, Invited talk: “Atlantic Meridional Overturning Circulation and Climate” at Davos Atmosphere and Cryosphere Assembly 2013, Davos, Switzerland, July, 2013.

**Zhang, R.**, et al., Have Aerosols Caused the Observed Atlantic Multidecadal Variability? 2013 AMOC/ RAPID Meeting, Baltimore, MD, July, 2013.

**Zhang, R.**, Invited talk of AMOC Fingerprints at the 2012 US AMOC Annual meeting, mini-workshop of AMOC Fingerprints, Boulder, CO, August, 2012.

**Zhang, R.**, Invited talk: “Atlantic Meridional Overturning Circulation and Climate” at the National Taiwan University (NTU) International Science Conference on Climate Change, Taipei, Taiwan, September, 2012.

**Zhang R.**, Invited talk on the review of US AMOC Program at the 2011 US CLIVAR Summit, July, 2011, Woods Hole, MA.

**Zhang, R.**, et al., Atlantic Meridional Overturning Circulation (AMOC) Adjustment to an Abrupt Change in the Nordic Sea Overflow in a High

Resolution Global Coupled Climate Model, RAPID/USAMOC  
International Science Meeting, July, 2011, Bristol, UK.

**Zhang R.** Latitudinal Dependence of Atlantic Meridional Overturning Circulation (AMOC) Variations, 2010 US Atlantic Meridional Overturning Circulation (AMOC) Annual Meeting, June, 2010, Miami, FL.

**Zhang R.** Invited talk "Observed and Modeled Fingerprints of the Atlantic Meridional Overturning Circulation". First U.S. Atlantic Meridional Overturning Circulation (AMOC) Annual Meeting, Annapolis, MD, May, 2009.

**Zhang R.** and T. L. Delworth, Invited talk "Impact of the Atlantic Multidecadal Oscillation on North Pacific Climate Variability". AGU Ocean Sciences Meeting, Orlando, FL, March, 2008.

**Zhang R.**, and T. L. Delworth, The impact of the Atlantic ocean variability on Indian summer monsoon rainfall. EGU General Assembly, Vienna, Austria, April, 2007.

**Zhang R.**, and T. L. Delworth, Simulated Tropical Response to a Substantial Weakening of the Atlantic Thermohaline Circulation. *U.S. CLIVAR Atlantic Science Conference*, Miami, FL, February 2005

**Zhang R.**, and G. Vallis, The Great Salinity Anomalies Events and the Low Frequency Variability in the North Atlantic. *AGU Ocean Sciences Meeting*, Portland, OR, January, 2004.

**Zhang R.**, M. Follows and J. Marshall, Self-sustained Thermohaline Oscillations in Paleo Oceans. *AMS 13th Conference on Atmospheric and Oceanic Fluid Dynamics*, Breckenridge, CO, June, 2001.

**Zhang R.**, M. Follows, J. P. Groztinger and J. Marshall, Modeling Circulation and Biogeochemical Cycles in the Late Permian Ocean. *AGU Ocean Sciences Meeting*, San Antonio, TX, January, 2000.