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## **EDUCATION**

|             |                                                           |                     |
|-------------|-----------------------------------------------------------|---------------------|
| <b>1994</b> | <b>Ph.D. Atmospheric Science, University of Wisconsin</b> | <b>Madison, WI</b>  |
| <b>1983</b> | <b>M.S. Meteorology, University of Wisconsin</b>          | <b>Madison, WI</b>  |
| <b>1979</b> | <b>B.A. Integrated Science, Northwestern University</b>   | <b>Evanston, IL</b> |

## **EMPLOYMENT**

|              |                                                                              |                      |
|--------------|------------------------------------------------------------------------------|----------------------|
|              | <b>Geophysical Fluid Dynamics Laboratory/NOAA</b>                            | <b>Princeton, NJ</b> |
| 2012-present | <b>Supervisory Physical Scientist, GFDL Science Board</b>                    |                      |
| 2001-2012    | <b>Group Leader, <u>Climate Change, Variability and Prediction Group</u></b> |                      |
| 1984- 2001   | <b>Research Meteorologist, Climate Dynamics Group</b>                        |                      |

## **RESEARCH INTERESTS**

- Climate variability, change and predictability on decadal to centennial time scales, with emphasis on:
  - the role of the oceans in climate
  - changes in continental hydrology, including drought and extreme events
  - large-scale modes of climate variability; mechanisms and potential changes
- Use of global coupled ocean-atmosphere models to study climate variability and change
- Interactions between forced climate change and internal variability

## **HONORS & AWARDS**

|                   |                                                                                                       |
|-------------------|-------------------------------------------------------------------------------------------------------|
| <b>2015</b>       | <b>Gold Medal, Department of Commerce</b>                                                             |
| <b>2014</b>       | <b>Thomson Reuters Highly Cited Researcher (<a href="http://highlycited.com">highlycited.com</a>)</b> |
| <b>2014</b>       | <b>Fellow of the American Meteorological Society</b>                                                  |
| <b>2008</b>       | <b>NOAA Administrators Award</b>                                                                      |
| <b>2005</b>       | <b>Silver Medal, Department of Commerce</b>                                                           |
| <b>1996, 2003</b> | <b>Outstanding Scientific Paper Award, NOAA</b>                                                       |
| <b>1980-1983</b>  | <b>National Science Foundation, Graduate Fellowship</b>                                               |
| <b>1979</b>       | <b>Phi Beta Kappa Honorary Society</b>                                                                |

## **WEB OF SCIENCE:**

h-index: 45 (<http://www.researcherid.com/rid/C-5191-2014>)

## **TEACHING**

Lecturer, Princeton University  
Atmospheric and Oceanic Sciences, "*Climate of the Earth: Present, Past and Future*"

## **ADDITIONAL ACTIVITIES**

|                     |                                                                              |
|---------------------|------------------------------------------------------------------------------|
| <b>2014-present</b> | <b>Advisory Board, DOE Accelerated Climate Modeling for Energy project</b>   |
| <b>2012</b>         | <b>Member, International Review Team for UK RAPID Program</b>                |
| <b>2011-2012</b>    | <b>NRC committee on "A National Strategy for Advancing Climate Modeling"</b> |

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|------------------|----------------------------------------------------------------------------|
| 2009-2011        | U.S. CLIVAR Working Group on Decadal Prediction                            |
| 2007-2009        | U.S. AMOC Science Planning Team                                            |
| 2007             | Program Manager, NOAA Climate Predictions and Projections                  |
| 2006-2009        | U.S. CLIVAR Working Group on Drought                                       |
| 2005-2008        | U.S. CLIVAR Prediction, Predictability, and Application Interface Panel    |
| 2004-2005        | U.S. CLIVAR Scientific Steering Committee                                  |
| 2003-2004        | Co-Leader, GFDL Coupled Model Development Team                             |
| 2001-2004        | NSF Arctic System Science Program - OAI, Scientific Steering Committee     |
| 2000-2006        | Joint Scientific Council/CLIVAR Working Group on Coupled Modeling          |
| 2000-2003        | SEARCH Science Steering Committee (Interagency Arctic Program)             |
| 1999-2003        | International CLIVAR Atlantic Implementation Panel                         |
| 1995-2005        | NSF Climate System Laboratory Computing Allocation Panel                   |
| 1995, 2001, 2007 | Intergovernmental Panel on Climate Change, Contributing Author             |
| 1995-1997        | NOAA's Atlantic Climate Change Program, Scientific Working Group           |
| 1995-1996        | Atlantic Climate and Circulation Experiment, Scientific Planning Committee |

## AFFILIATIONS

American Meteorological Society  
American Geophysical Union

## PUBLICATIONS

Publications for 2010-2014 listed below; for a complete list (more than 100 in total) please see

<http://www.gfdl.noaa.gov/bibliography/resulttest.php?author=1019>

Delworth, T.L., F. Zeng, A. Rosati, G.A. Vecchi, A.T. Wittenberg, submitted: **A link between the hiatus in global warming and North American drought**. Accepted, J. Climate.

Winton, M., W.G. Anderson, T.L. Delworth, S.M. Griffies, W.J. Hurlin, and A. Rosati, 2014: **Has coarse ocean resolution biased simulations of transient climate sensitivity?** Geophys. Res. Letters, DOI: 10.1002/2014GL061523

Delworth, Thomas L., and Fanrong Zeng, August 2014: **Regional rainfall decline in Australia attributed to anthropogenic greenhouse gases and ozone levels**. *Nature Geoscience*, 7(8), DOI:10.1038/ngeo2201.

Griffies, Stephen M., Michael Winton, Whit G Anderson, Rusty Benson, Thomas L Delworth, C O Dufour, John P Dunne, P Goddard, A K Morrison, Andrew T Wittenberg, J Yin, and Rong Zhang: **Impacts on ocean heat from transient mesoscale eddies in a hierarchy of climate models**. *Journal of Climate*. DOI:10.1175/JCLI-D-14-00353.1. 11/14

Kapnick, Sarah B., Thomas L Delworth, M Ashfaq, Sergey Malyshev, and P C D Milly, November 2014: **Snowfall less sensitive to warming in Karakoram than in Himalayas due to a unique seasonal cycle**. *Nature Geoscience*, 7(11), DOI:10.1038/ngeo2269

Kim, Hyeong-Seog, Gabriel A Vecchi, Thomas R Knutson, Whit G Anderson, Thomas L Delworth, Anthony Rosati, Fanrong Zeng, and Ming Zhao, November 2014: **Tropical Cyclone Simulation and**

**Response to CO<sub>2</sub> Doubling in the GFDL CM2.5 High-Resolution Coupled Climate Model.** *Journal of Climate*, **27(21)**, DOI:10.1175/JCLI-D-13-00475.1.

Msadek, Rym, Thomas L Delworth, Anthony Rosati, Whit G Anderson, Gabriel A Vecchi, You-Soon Chang, Keith W Dixon, Rich Gudgel, William F Stern, Andrew T Wittenberg, X-Q Yang, Fanrong Zeng, Rong Zhang, and Shaoqing Zhang, September 2014: **Predicting a Decadal Shift in North Atlantic Climate Variability Using the GFDL Forecast System.** *Journal of Climate*, **27(17)**, DOI:10.1175/JCLI-D-13-00476.1.

Vecchi, Gabriel A., Rym Msadek, Whit G Anderson, You-Soon Chang, Thomas L Delworth, Keith W Dixon, Rich Gudgel, Anthony Rosati, William F Stern, G Villarini, Andrew T Wittenberg, Xiaosong Yang, Fanrong Zeng, Rong Zhang, and Shaoqing Zhang, January 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.

Wittenberg, Andrew T., Anthony Rosati, Thomas L Delworth, Gabriel A Vecchi, and Fanrong Zeng, April 2014: **ENSO modulation: Is it decadal predictability?** *Journal of Climate*, **27(7)**, DOI:10.1175/JCLI-D-13-00577.1.

Chang, You-Soon, Shaoqing Zhang, Anthony Rosati, Thomas L Delworth, and William F Stern, February 2013: **An assessment of oceanic variability for 1960–2010 from the GFDL ensemble coupled data assimilation.** *Climate Dynamics*, **40(3-4)**, DOI:10.1007/s00382-012-1412-2.

Doi, Takeshi, Gabriel A Vecchi, Anthony Rosati, and Thomas L Delworth, 2013: **Response to CO<sub>2</sub> doubling of the Atlantic Hurricane Main Development Region in a High-Resolution Climate Model.** *Journal of Climate*. DOI:10.1175/JCLI-D-12-00110.1. 2/13.

Goddard, L M., Rym Msadek, and Thomas L Delworth, et al., January 2013: **A verification framework for interannual-to-decadal predictions experiments.** *Climate Dynamics*, **40(1-2)**, DOI:10.1007/s00382-012-1481-2.

Kapnick, S B., and Thomas L Delworth, 2013: **Controls of Global Snow Under a Changed Climate.** *Journal of Climate*. DOI:10.1175/JCLI-D-12-00528.1. 2/13.

Lee, Hyun-Chul, Thomas L Delworth, Anthony Rosati, Rong Zhang, Whit G Anderson, Fanrong Zeng, Charles A Stock, Anand Gnanadesikan, Keith W Dixon, and Stephen M Griffies, January 2013: **Impact of climate warming on upper layer of the Bering Sea.** *Climate Dynamics*, **40(1-2)**, DOI:10.1007/s00382-012-1301-8.

Msadek, Rym, W E Johns, S G Yeager, G Danabasoglu, Thomas L Delworth, and Anthony Rosati, *in press*: **The Atlantic Meridional Heat transport at 26.5° N and its relationship with the MOC in the RAPID array and the GFDL and NCAR coupled models.** *Journal of Climate*. DOI:10.1175/JCLI-D-12-00081.1. 1/13.

Vecchi, Gabriel A., Rym Msadek, Whit G Anderson, You-Soon Chang, Thomas L Delworth, Keith W Dixon, Rich Gudgel, Anthony Rosati, William F Stern, G Villarini, Andrew T Wittenberg, Xiaosong Yang, Fanrong Zeng, Rong Zhang, and Shaoqing Zhang: **Multi-year Predictions of North Atlantic Hurricane Frequency: Promise and limitations.** *Journal of Climate*. DOI:10.1175/JCLI-D-12-00464.1. 2/13.

Yang, Xiaosong, Anthony Rosati, Shaoqing Zhang, Thomas L Delworth, Rich Gudgel, Rong Zhang, Gabriel A Vecchi, Whit G Anderson, You-Soon Chang, T DelSole, Keith W Dixon, Rym Msadek, William F Stern, Andrew T Wittenberg, and Fanrong Zeng, January 2013: **A predictable AMO-like pattern in GFDL's fully-coupled ensemble initialization and decadal forecasting system.** *Journal of Climate*, **26(2)**, DOI:10.1175/JCLI-D-12-00231.1.

Zhang, Rong, Thomas L Delworth, R Sutton, D Hodson, Keith W Dixon, Isaac M Held, Y Kushnir, D Marshall, Yi Ming, Rym Msadek, J Robson, Anthony Rosati, Mingfang Ting, and Gabriel A Vecchi: **Have Aerosols Caused the Observed Atlantic Multidecadal Variability?** *Journal of the Atmospheric Sciences*. DOI:10.1175/JAS-D-12-0331.1. 1/13.

Delworth, Thomas L., Anthony Rosati, Whit G Anderson, Alistair Adcroft, Ventakramani Balaji, Rusty Benson, Keith W Dixon, Stephen M Griffies, Hyun-Chul Lee, Ronald C Pacanowski, Gabriel A Vecchi, Andrew T Wittenberg, Fanrong Zeng, and Rong Zhang, April 2012: **Simulated climate and climate change in the GFDL CM2.5 high-resolution coupled climate model.** *Journal of Climate*, **25(8)**, DOI:10.1175/JCLI-D-11-00316.1.

Delworth, Thomas L., and Fanrong Zeng, July 2012: **Multicentennial variability of the Atlantic Meridional Overturning Circulation and its climatic influence in a 4000 year simulation of the GFDL CM2.1 climate model.** *Geophysical Research Letters*, **39**, L13702, DOI:10.1029/2012GL052107.

Doi, Takeshi, Gabriel A Vecchi, Anthony Rosati, and Thomas L Delworth, August 2012: **Biases in the Atlantic ITCZ in seasonal-interannual variations for a coarse and a high resolution coupled climate model.** *Journal of Climate*, **25(16)**, DOI:10.1175/JCLI-D-11-00360.1.

Srokosz, M, and Thomas L Delworth, et al., November 2012: **Past, present and future change in the Atlantic meridional overturning circulation.** *Bulletin of the American Meteorological Society*, **93(11)**, DOI:10.1175/BAMS-D-11-00151.1.

Vecchi, Gabriel A., Rym Msadek, Thomas L Delworth, Keith W Dixon, E Guilyardi, E Hawkins, A R Karspeck, J Mignot, J Robson, Anthony Rosati, and Rong Zhang, November 2012: **Comment on "Multiyear Prediction of Monthly Mean Atlantic Meridional Overturning Circulation at 26.5N".** *Science*, **338(6107)**, DOI:10.1126/science.1222566.

Wu, X, Shaoqing Zhang, Z Liu, Anthony Rosati, and Thomas L Delworth, *in press*: **A study of impact of the geographic dependence of observing system on parameter estimation with an intermediate coupled model.** *Climate Dynamics*. DOI:10.1007/s00382-012-1385-1. 4/12

Wu, X, Shaoqing Zhang, Z Liu, Anthony Rosati, Thomas L Delworth, and Y Liu, December 2012: **Impact of Geographic Dependent Parameter Optimization on Climate Estimation and Prediction: Simulation with an Intermediate Coupled Model.** *Monthly Weather Review*, **140(12)**, DOI:10.1175/MWR-D-11-00298.1.

Zhang, Shaoqing, Z Liu, Anthony Rosati, and Thomas L Delworth, January 2012: **A study of enhance parameter correction with coupled data assimilation for climate estimation and prediction using a simple coupled model.** *Tellus A*, **64**, 10963, DOI:10.3402/tellusa.v64i0.10963.

Zhang, Shaoqing, Michael Winton, Anthony Rosati, Thomas L Delworth, and B Huang, *in press*: **Impact of Enthalpy-Based Ensemble Filtering Sea-Ice Data Assimilation on Decadal**

**Predictions: Simulation with a Conceptual Pycnocline Prediction Model.** *Journal of Climate*. DOI:10.1175/JCLI-D-11-00714.1. 10/12.

Donner, Leo J., Bruce Wyman, Richard S Hemler, Larry W Horowitz, Yi Ming, Ming Zhao, J-C Golaz, Paul Ginoux, Shian-Jiann Lin, M Daniel Schwarzkopf, John Austin, G Alaka, W F Cooke, Thomas L Delworth, Stuart Freidenreich, C Tony Gordon, Stephen M Griffies, Isaac M Held, William J Hurlin, Stephen A Klein, Thomas R Knutson, Amy R Langenhorst, Hyun-Chul Lee, Yanluan Lin, B I Magi, Sergey Malyshev, P C D Milly, Vaishali Naik, Mary Jo Nath, R Pincus, Jeff J Ploshay, V Ramaswamy, Charles J Seman, Elena Shevliakova, Joseph J Sirutis, William F Stern, Ronald J Stouffer, R John Wilson, Michael Winton, Andrew T Wittenberg, and Fanrong Zeng, July 2011: **The dynamical core, physical parameterizations, and basic simulation characteristics of the atmospheric component AM3 of the GFDL Global Coupled Model CM3.** *Journal of Climate*, **24(13)**, DOI:10.1175/2011JCLI3955.1.

Mahajan, S, Rong Zhang, and Thomas L Delworth, December 2011: **Impact of the Atlantic Meridional Overturning Circulation (AMOC) on Arctic surface air temperature and sea-ice variability.** *Journal of Climate*, **24(24)**, DOI:10.1175/2011JCLI4002.1.

Mahajan, S, Rong Zhang, Thomas L Delworth, Shaoqing Zhang, Anthony Rosati, and You-Soon Chang, September 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.

Solomon, A, and Thomas L Delworth, et al., February 2011: **Distinguishing the roles of natural and anthropogenically forced decadal climate variability: Implications for prediction US CLIVAR Decadal Predictability Working Group.** *Bulletin of the American Meteorological Society*, **92(2)**, DOI:10.1175/2010BAMS2962.1.

Stock, Charles A., Thomas L Delworth, John P Dunne, Stephen M Griffies, R Rykaczewski, Jorge L Sarmiento, Ronald J Stouffer, and Gabriel A Vecchi, et al., January 2011: **On the use of IPCC-class models to assess the impact of climate on Living Marine Resources.** *Progress in Oceanography*, **88(1-4)**, DOI:10.1016/j.pocean.2010.09.001.

Wu, S, Z Liu, Rong Zhang, and Thomas L Delworth, February 2011: **On the observed relationship between the Pacific Decadal Oscillation and the Atlantic Multi-decadal Oscillation.** *Journal of Oceanography*, **67(1)**, DOI:10.1007/s10872-011-0003-x.

Zhang, D, Rym Msadek, M J McPhaden, and Thomas L Delworth, April 2011: **Multidecadal variability of the North Brazil Current and its connection to the Atlantic Meridional Overturning Circulation.** *Journal of Geophysical Research*, **116**, C04012, DOI:10.1029/2010JC006812.

Zhang, Rong, Thomas L Delworth, Anthony Rosati, Whit G Anderson, Keith W Dixon, Hyun-Chul Lee, and Fanrong Zeng, December 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**, C12024, DOI:10.1029/2011JC007240.

Farneti, Riccardo, Thomas L Delworth, Anthony Rosati, Stephen M Griffies, and Fanrong Zeng, July 2010: **The role of mesoscale eddies in the rectification of the Southern Ocean response to climate change.** *Journal of Physical Oceanography*, **40(7)**, DOI:10.1175/2010JPO4353.1

Farneti, Riccardo, and Thomas L Delworth, October 2010: **The role of mesoscale eddies in the remote oceanic response to altered Southern Hemisphere winds.** *Journal of Physical Oceanography*, **40(10)**, DOI:10.1175/2010JPO4480.1.

Findell, Kirsten L., and Thomas L Delworth, February 2010: **Impact of common sea surface temperature anomalies on global drought and pluvial frequency.** *Journal of Climate*, **23(3)**, DOI:10.1175/2009JCLI3153.1.

Held, Isaac M., Michael Winton, K Takahashi, Thomas L Delworth, Fanrong Zeng, and Geoffrey K Vallis, May 2010: **Probing the fast and slow components of global warming by returning abruptly to pre-industrial forcing.** *Journal of Climate*, **23(9)**, DOI:10.1175/2009JCLI3466.1.

Hurrell, J W., Thomas L Delworth, Stephen M Griffies, and Anthony Rosati, et al., September 2010: **Decadal Climate Prediction: Opportunities and Challenges, 2010** In *OceanObs'09: Sustained Ocean Observations and Information for Society*, Vol. 2, ESA Publication, DOI:10.5270/OceanObs09.cwp.45.

Hurrell, J W., G A Meehl, D Bader, Thomas L Delworth, B P Kirtman, and B A Wielicki, December 2010: **Reply to Comments on "A Unified Modeling Approach to Climate System Prediction".** *Bulletin of the American Meteorological Society*, **91(12)**, DOI:10.1175/2010BAMS3118.1.

Li, F, V Ramaswamy, Paul Ginoux, Anthony J Broccoli, Thomas L Delworth, and Fanrong Zeng, December 2010: **Toward understanding the dust deposition in Antarctica during the Last Glacial Maximum: Sensitivity studies on plausible causes.** *Journal of Geophysical Research*, **115**, D24120, DOI:10.1029/2010JD014791.

Msadek, Rym, Keith W Dixon, Thomas L Delworth, and William J Hurlin, October 2010: **Assessing the predictability of the Atlantic meridional overturning circulation and associated fingerprints.** *Geophysical Research Letters*, **37**, L19608, DOI:10.1029/2010GL044517.

Zhang, Shaoqing, Anthony Rosati, and Thomas L Delworth, October 2010: **The adequacy of observing systems in monitoring AMOC and North Atlantic climate.** *Journal of Climate*, **23(19)**, DOI:10.1175/2010JCLI3677.1.