Dargan M. W. Frierson

CONTACT INFORMATION

Dept. of Atmospheric Sciences
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Seattle, WA 98195-1640

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RESEARCH INTERESTS

Atmospheric general circulation, water vapor, climate change

EMPLOYMENT

University of Washington, Department of Atmospheric Sciences

Assistant Professor, September 2007-September 2012
Associate Professor, September 2012-present

University of Chicago, Department of Geophysical Sciences

NOAA Climate and Global Change Postdoctoral Fellow, September 2005-August 2007
- Host: Raymond T. Pierrehumbert

EDUCATION

Princeton University, Princeton, New Jersey, 2000-2005

Ph.D., Applied Mathematics, December 2005
- Dissertation Topic: "Studies of the General Circulation of the Atmosphere with a Simplified Moist General Circulation Model"
- Advisor: Isaac M. Held, Geophysical Fluid Dynamics Laboratory

M.S., Applied Mathematics, May 2002

North Carolina State University, Raleigh, North Carolina, 1996-2000

B.S., Mathematics and Physics, with minors in English and Italian, May 2000
- 4.0 GPA
- Valedictorian

HONORS AND AWARDS

Department of Atmospheric Sciences Annual Teaching Award, 2009, 2012, 2014.

NSF CAREER Faculty Early Career Development Award, 2009-2014.

University of Washington Royalty Research Fund Award, 2009-2010.

NOAA Climate and Global Change Postdoctoral Fellowship, 2005-2007.

National Science Foundation Graduate Research Fellowship, 2000-2003.

NCSU College of Physical and Mathematical Sciences Scholarly Achievement Award, spring 2000.

NCSU College of Physical and Mathematical Sciences Research Award, spring 2000.

PUBLISHED WORK (ADVISED GRAD STUDENTS IN **bold**, ADVISED UNDERGRADS IN ***bold italics***)

Hirsch's H-index (calculated from Web of Science Cited Reference Search): 23

2014 (7)

Benedict, J. J., Maloney, E. D., Sobel, A. H. and D. M. W. Frierson. Gross moist stability and its impact on MJO simulation in three full-physics GCMs. In press, J. Climate.

Seo, K.-H., Frierson, D. M. W. and J.-H. Son. A mechanism for future changes in Hadley circulation strength in CMIP5 climate change simulations. Geophys. Res. Lett., 41, 5251-5258, doi: 10.1002/2014gl060868, 2014.

Seo, J., Kang, S. M. and D. M. W. Frierson. Sensitivity of intertropical convergence zone movement to the latitudinal position of thermal forcing. J. Climate, 27, 3035-3042, doi: 10.1175/JCLI-D-13-00691.1, 2014.

Feldl, N., Frierson, D. M. W. and G. H. Roe. The influence of regional feedbacks on circulation sensitivity. Geophysical Research Letters, 41, 2212-2220, doi: 10.1002/2014GL059336, 2014.

Kang, S. M., Seager, R., Frierson, D. M. W. and X. Liu. Croll revisited: Why is the Northern Hemisphere warmer than the Southern Hemisphere?. Climate Dynamics, doi: 10.1007/s00382-014-2147-z, 2014.

Scheff, J. and D. M. W. Frierson. Scaling potential evaporation with greenhouse warming. J. Climate, 27, 1539-1558, doi: 10.1175/JCLI-D-13-00233.1, 2014.

Donohoe, A., Frierson, D. M. W. and D. S. Battisti. The effect of ocean mixed layer depth on climate in slab ocean aquaplanet experiments. Climate Dynamics, 43, 1041-1055, doi: 10.1007/s00382-013-1843-4, 2014.

2013 (9)

Frierson, D. M. W., **Hwang, Y.-T.**, Fuckar, N. S., Seager, R., Kang, S. M., Donohoe, A., **Maroon, E. A.**, Liu, X. and D. S. Battisti. Contribution of ocean overturning circulation to tropical rainfall peak in the Northern Hemisphere. Nature Geoscience, 6, 940-944, doi: 10.1038/ngeo1987, 2013.

Ceppi, P., **Hwang, Y.-T.**, Liu, X., Frierson, D. M. W. and D. L. Hartmann. The relationship between the ITCZ and the Southern Hemisphere eddy-driven jet. J. Geophys. Res.-Atmospheres., 118, 5136-5146, doi:10.1002/jgrd.50461, 2013.

Hwang, Y.-T., Frierson, D. M. W. and S. M. Kang. Anthropogenic sulfate aerosol and the southward shift of tropical precipitation in the 20th century. Geophys. Res. Lett., 40, 1-6, doi: 10.1002/grl50502, 2013.

Durran, D. R. and D. M. W. Frierson. Condensation, atmospheric motion, and cold beer. Physics Today, April 2013, p.74, doi: 10.1063/PT.3.1958.

Hwang, Y.-T. and D. M. W. Frierson. Link between the double-Intertropical Convergence Zone problem and cloud bias over Southern Ocean. Proc. Nat. Acad. Sci., early online release, doi: 10.1073/pnas.1213302110, 2013.

Fuckar, N. S., Xie, S.-P., Farneti, R., **Maroon, E.** and D. M. W. Frierson. Influence of the extratropical ocean circulation on the intertropical convergence zone in an idealized coupled general circulation model. J. Climate, 26, 4612-4629, 2013.

Ueyama, R., Gerber, E. P., Wallace, J. M., and D. M. W. Frierson. Reconciling conflicting interpretations of the tropical upwelling in the Brewer-Dobson circulation. J. Atmos. Sci., 70, 1631-1648, 2013.

Friedman, A. R., **Hwang, Y.-T.**, Chiang, J. C. H. and D. M. W. Frierson. The interhemispheric thermal gradient over the 20th century and in future projections. J. Climate, 26, 5419-5433, 2013.

Benedict, J. J., Maloney, E. D., Sobel, A. H., Frierson, D. M. and L. J. Donner. Tropical Intraseasonal Variability in Version 3 of the GFDL Atmosphere Model. J. Climate, 26, 426-449, doi: 10.1175/JCLI-D-12-00103.1, 2013.

2012 (5)

Ceppi, P., **Hwang, Y.-T.**, Frierson, D. M. W., and D. L. Hartmann. Southern Hemisphere jet latitude biases in CMIP5 models linked to shortwave cloud forcing. Geophys. Res. Lett., 39, L19708, doi: 10.1029/2012GL053115, 2012.

Scheff, J., and D. M. W. Frierson. Robust future precipitation declines in CMIP5 largely reflect the poleward expansion of model subtropical dry zones. Geophys. Res. Lett., 39, L18704, doi: 10.1029/2012GL05910, 2012.

Frierson, D. M. W. Frictional dissipation: Blame it on the rain. Science, 335 (6071), 925-926, doi: 10.1126/science.1219015, 2012.

Scheff, J., and D. Frierson. 21st-century multi-model subtropical precipitation declines are mostly mid-latitude shifts. J. Climate, 25, 4330-4347, 2012, doi: 10.1175/JCLI-D-11-00393.1.

Frierson, D. M. W., and **Y.-T. Hwang**. Extratropical influence on ITCZ shifts in slab ocean simulations of global warming. J. Climate, 25, 720-733, 2012.

2011 (8)

Heng, K., Frierson, D. M. W., and P. J. Phillipps. Atmospheric circulation of tidally locked exoplanets II: two-band radiative transfer and convective adjustment. Mon. Not. R. Astron. Soc., 418, 2669-2696, doi:10.1111/j.1365-2966.2011.19658.x, 2011.

Hwang, Y.-T., Frierson, D. M. W., and J. E. Kay. Coupling between Arctic feedbacks and changes in poleward energy transport. Geophys. Res. Lett., 38, L17704, doi:10.1029/2011GL048546, 2011.

Haqq-Misra, J., Lee, S. and D. M. W. Frierson. Tropopause structure and the role of eddies. J. Atmos. Sci., 68, 2930-2944, doi:10.1175/JAS-D-11-087.1, 2011.

Kim, D., Sobel, A. H., Maloney, E. D., Frierson, D. M. W., and I.-S. Kang. A systematic relationship between intraseasonal variability and mean state bias in AGCM simulations. J. Climate, 24, 5506-5520, 2011.

Frierson, D. M. W. and ***N. A. Davis***. The seasonal cycle of midlatitude static stability over land and ocean in global reanalyses. Geophys. Res. Lett., 38, L13803, doi: 10.1029/2011GL047747, 2011.

Elliott, W. P. and D. M. W. Frierson. Atmospheric Structure. The Encyclopedia of Climate and Weather, 2nd Edition, Oxford U.P., 2011.

Frierson, D. M. W., Kim, D., Kang, I.-S., Lee, M. I., and J.-L. Lin. Structure of AGCM-Simulated Convectively Coupled Equatorial Waves and Sensitivity to Convective Parameterization. J. Atmos. Sci., 68, 26-45, 2011.

Hwang, Y.-T., Frierson, D. M. W., Held, I. M., and B. J. Soden. Corrigendum to Held and Soden (2006). J. Climate, 24, 1559-1560, 2011.

2010 (5)

Hwang, Y.-T., and D. M. W. Frierson. Increasing atmospheric poleward energy transport with global warming. Geophys. Res. Lett., 37, L24807, 2010.

Kidston, J., Frierson, D. M. W., and J. A. Renwick. Observations, simulations, and dynamics of jet stream variability and annular modes. J. Climate, 23, 6186-6199, 2010.

Lu, J., Chen, G. and D. M. W. Frierson. The position of the midlatitude storm track and eddy-driven westerlies in aquaplanet AGCMs. J. Atmos. Sci., 67, 3984-4000, 2010.

Barnes, E. A., Hartmann, D. L., Frierson, D. M. W., and J. Kidston. The effect of latitude on the persistence of eddy-driven jets. Geophys. Res. Lett., 37, L11804, doi:10.1029/2010GL043199, 2010.

Sobel, A. H., Maloney, E. D., Bellon, G., and D. M. W. Frierson. Surface fluxes and tropical intraseasonal variability. J. Adv. Model. Earth Syst., 2, doi:10.3894/JAMES.2010.2.2, 2010.

2009 (2)

Mitchell, J. L., Pierrehumbert, R. T., Frierson, D. M. W., and R. Caballero. The impact of methane thermodynamics on seasonal convection and circulation in a model Titan atmosphere. Icarus, 203, 250-264, doi:10.1016/j.icarus.2009.03.043, 2009.

Kang, S. M., Frierson, D. M. W., and I. M. Held. The tropical response to extratropical thermal forcing in an idealized GCM: The importance of radiative feedbacks and convective parameterization. J. Atmos. Sci., 66, 2812-2827, doi:10.1175/2009JAS2924.1, 2009.

2008 (7)

Sobel, A. H., Maloney, E. D., Bellon, G. and D. M. Frierson. The Role of Surface Heat Fluxes in Tropical Intraseasonal Oscillations. Nature Geoscience, 1, 653-657, doi:10.1038/ngeo312, 2008

Chen, G., Lu, J. and D. M. W. Frierson. Phase Speed Spectra and the Latitude of Surface Westerlies: Interannual Variability and Global Warming Trend. J. Climate, 21, 5942-5959, doi:10.1175/2008JCLI2306.1, 2008.

Lu, J., Chen, G., and D. M. W. Frierson. Response of the Zonal Mean Atmospheric Circulation to El Niño versus Global Warming. J. Climate, 21, 5835-5851, doi:10.1175/2008JCLI2200.1, 2008.

Pauluis, O. M., Frierson, D. M. W., and A. J. Majda. Precipitation Fronts and the Reflection and Transmission of Tropical Disturbances. Q. J. Roy. Met. Soc., 134, 913-930, doi:10.1002/qj.250, 2008.

Kang, S. M., Held, I. M., Frierson, D. M. W. and M. Zhao. The Response of the ITCZ to Extratropical Forcing: Idealized Slab Ocean Experiments with a GCM. J. Climate, 21, 3521-3532, doi:10.1175/2007JCLI2146.1, 2008.

Frierson, D. M. W. Midlatitude Static Stability in Simple and Comprehensive General Circulation Models. J. Atmos. Sci., 65, 1049-1062, doi:10.1175/2007JAS2373.1, 2008.

Lin, J.-L., Lee, M.-I., Kim, D., Kang, I.-S., and D. M. W. Frierson. The Impacts of Convective Parameterization and Moisture Triggering on AGCM-Simulated Convectively Coupled Equatorial Waves. J. Climate, 21, 883-909, doi:10.1175/2007JCLI1790.1, 2008.

2007 (5)

Frierson, D. M. W., Lu, J. and G. Chen. The Width of the Hadley Circulation in Simple and Comprehensive General Circulation Models. Geophys. Res. Lett, 34, L18804, doi: 10.1029/2007GL031115, 2007.

Frierson, D. M. W. Convectively Coupled Kelvin Waves in an Idealized Moist General Circulation Model. Journal of the Atmospheric Sciences, 64, 2076-2090, doi:10.1175/JAS3945.1, 2007.

Garner, S. T., Frierson, D. M. W., Held, I. M., Pauluis, O. M. and G. K. Vallis. Resolving Convection in a Global Hypohydrostatic Model. Journal of the Atmospheric Sciences, 64, 2061-2075, doi:10.1175/JAS3929.1, 2007.

Frierson, D. M. W. The Dynamics of Idealized Convection Schemes and Their Effect on the Zonally Averaged Tropical Circulation. Journal of the Atmospheric Sciences, 64, 1959-1976, doi:10.1175/JAS3935.1, 2007.

Frierson, D. M. W., Held, I. M. and P. Zurita-Gotor. A Gray-Radiation Aquaplanet Moist GCM. Part II: Energy Transports in Altered Climates. Journal of the Atmospheric Sciences, 64, 1680-1693, doi:10.1175/JAS3913.1, 2007.

2006 (4)

Frierson, D. M. W. Robust Increases in Midlatitude Static Stability in Global Warming Simulations. Geophysical Research Letters, 33, L24816, doi:10.1029/2006GL027504, 2006.

Mitchell, J. L., Pierrehumbert, R. T., Frierson, D. M. W., and R. Caballero. The Dynamics Behind Titan's Methane Clouds. Proceedings of the National Academy of Sciences, 103, 18421-18426, doi:10.1073/pnas.0605074103, 2006.

Pauluis, O. M., Frierson, D. M. W., Garner, S. T., Held, I. M., and G. K. Vallis. The Hypo-hydrostatic Rescaling and Its Impacts on Modeling of Atmospheric Convection. Theoretical and Computational Fluid Dynamics, 20, 485-499, doi:10.1007/s00162-006-0026-x, 2006.

Frierson, D. M. W., Held, I. M. and P. Zurita-Gotor. A Gray-Radiation Aquaplanet Moist GCM. Part I: Static Stability and Eddy Scales. Journal of the Atmospheric Sciences, 63, 2458-2566, doi:10.1175/JAS3753.1, 2006.

2004 AND BEFORE (2)

Frierson, D. M. W., Majda, A. J. and O. M. Pauluis. Large Scale Dynamics of Precipitation Fronts in the Tropical Atmosphere: A Novel Relaxation Limit. Communications in Mathematical Sciences, 2, 605-640, 2004.

Blondin, J. M., Chevalier, R. A. and D. M. Frierson. Pulsar Wind Nebulae in Evolved Supernova Remnants. Astrophysical Journal, 563, 806-815, 2001.

SUBMITTED (4)

Singh, H. K. A., Frierson, D. M. W. and C. M. Bitz. Global cooling associated with lowering surface orography of Antarctica. Submitted to Geophysical Research Letters.

Maroon, E. A., Frierson, D. M. W. and D. S. Battisti. The location of tropical precipitation in idealized atmospheric general circulation models forced with Andes topography and surface heat fluxes. Submitted to J. Climate.

Scheff, J., and D. M. W. Frierson. Terrestrial aridity and its response to greenhouse warming across CMIP5 models. Submitted to J. Climate.

Chae, Y., Kang, S. M., Kim, B., Jeong, S., and D. M. W. Frierson. Arctic greening can cause earlier seasonality of polar amplification. Submitted to Geophys. Res. Lett.

GRANTS

University of Washington Royalty Research Fund Grant, 2009-2010, PI, $29,518, Energy Transports in Warmer Climates.

NSF CAREER Award, 2009-2014, PI, $576,196, The Effect of Latent Heating on the Hadley Circulation.

National Science Foundation, 2010-2013, PI, $502,662, The Effect of Moist Processes on Midlatitude Static Stability.

NOAA, 2009-2012, Co-investigator (with Adam Sobel, Columbia University and Eric Maloney, Colorado State University), $60,444, The Madden-Julian Oscillation: Model Development and Diagnosis of Mechanisms.

NSF, 4/1/14-3/31/17, $369,056, Local and Remote Influences on the Intertropical Convergence Zone in a Hierarchy of Models.

ADVISING

University of Washington Department of Atmospheric Sciences **2007-present**

Graduate students:
Yen-Ting Hwang: Ph.D., May 2013 (currently faculty at National Taiwan University)
Jack Scheff: Ph.D., August 2014 (currently NSF Postdoctoral Fellow at Lamont-Doherty Earth Observatory)
Elizabeth Maroon: Ph.D. student, co-advised with David Battisti.
Judy Twedt: M.S. student, co-advised with Cecilia Bitz and David Battisti.
Ashly Spevacek: M.S. student.
Stephanie Rushley: M.S. student, co-advised with Daehyun Kim.
Marshall Stoner, M.S., graduated 2010.

Serving/served on Ph.D. or Masters committee of 22 additional students:
Jennifer Fletcher (M.S.), Elizabeth Barnes (M.S. and Ph.D.), Rei Ueyama (Ph.D.), Nicole Feldl (M.S. and Ph.D.), Kelly McCusker (M.S. and Ph.D.), Ed Blanchard-Wrigglesworth (M.S.), Stuart Evans (M.S. and Ph.D.), Chaim Garfinkel (Ph.D.), Aaron Donohoe (Ph.D.), Rob Nicholas (Ph.D.), Bonnie Brown (M.S. and Ph.D.), Adam Skalenakis (M.S.), Benjamin Hillman (M.S.), Erika Navarro (M.S. and Ph.D.), Alyssa Atwood (Ph.D.), Paolo Ceppi (M.S. and Ph.D.), Eowyn Baughman (M.S.), Xiaojuan Liu (M.S.), Jinting Zhang (Ph.D.), Angie Pendergrass (Ph.D.), Jesse Anderson (Ph.D.), Matthew Woelfle (M.S.), Marcella Menegale (M.S.).

Undergraduate research advising:
Robert Marshall: spring 2009-2010 (currently graduate student in Atmospheric and Oceanic Science at CU-Boulder)
Josh Smith: summer 2009-2010 (currently employed at the National Weather Service)
Nick Davis: winter 2010-summer 2011 (currently graduate student in Atmospheric Science at Colorado State University)
Alex Kowaleski: summer 2010 (currently graduate student in Atmospheric Science at Penn State University)
Steven Brey: spring 2011-2012
Weikun Hu: 2011-2012
Joshua Best: winter-spring 2012
Judy Twedt: winter 2012-summer 2013
Stella Choi: summer 2012
Elynn Wu: winter 2013-present

Erin Fox: winter 2013-spring 2013

High school student research advising:
Jaycyl Golding and Galen Richards: summer 2010 (participants in Pacific Science Center Discovery Corps program).

Teaching Experience

University of Washington Department of Atmospheric Sciences

Course number	Title	Quarter
ATM S 509/OCEAN 512	Geophysical Fluid Dynamics I	Winter 2008
ATM S 542	Geophysical Fluid Dynamics II: Balance Dynamics	Spring 2008
ATM S 591	Modeling the General Circulation of the Atmosphere	Autumn 2008
ATM S 442/504	Atmospheric Motions II	Winter 2009
ATM S 542	Geophysical Fluid Dynamics II: Balance Dynamics	Spring 2009
ATM S/OCEAN/ESS 587	Climate Dynamics (co-taught with Steve Riser)	Autumn 2009
ATM S 442/504	Atmospheric Motions II	Winter 2010
ATM S 111	Global Warming: Understanding the Forecast	Spring 2010
ATM S/OCEAN/ESS 587	Climate Dynamics (co-taught with Steve Riser)	Autumn 2010
ATM S 111	Global Warming: Understanding the Forecast	Winter 2011
ATM S 542	Geophysical Fluid Dynamics II: Balance Dynamics	Spring 2011
ATM S 442	Atmospheric Motions II	Winter 2012
ATM S 111	Global Warming: Understanding the Forecast	Spring 2012
ATM S/OCEAN/ESS 587	Climate Dynamics	Autumn 2012
ATM S 591	Modeling the General Circulation of the Atmosphere	Winter 2013
ATM S 220	Exploring the Atmospheric Sciences	Winter 2013
ATM S 111	Global Warming: Understanding the Forecast	Spring 2013
ATM S/OCEAN/ESS 587	Fundamentals of Global Warming Science	Autumn 2013
ATM S 442	Atmospheric Motions II	Winter 2014
ATM S 111	Global Warming: Understanding the Forecast	Spring 2014

Participant in the UW Faculty Fellows Program, fall 2007, a program to improve teaching abilities of new faculty.

Outreach

Co-writing of short films on atmospheric science concepts for elementary and middle school audiences, UW Atmospheric Sciences Outreach, 2009-present. "Can Crushing with Atmospheric Pressure," "Cloud in a Bottle," "Conduction versus Convection," "Ocean Acidification," and "Latent Heat."

Mentor for high school students Jaycyl Golding and Galen Richards, participants in Pacific Science Center Discovery Corps participants, developing demos on condensation as a heat source. Gave presentation at Family Climate Science Night with this program. July-October 2010.

Presented seminar representing Atmospheric Sciences at the Environmental Majors Freshman Interest Group Seminar (General Studies 197: Exploring Environmental Majors at the UW), September 2009, 2010, and 2011.

Presented seminar representing Atmospheric Sciences at the SAMLink Seminar, April 2013.

Presented at Biology Department Ecoseminar (BIOL 560B) on the science of global warming, January 2010.

Presented seminar on "Computer Models of the Earth's Climate" at UW Math Day, March 2011, 2012, and 2013.

Video interview for Gates Foundation-funded high school science module on Climate Change and

Ecology as an expert on climate models. Assistance with testing of the curriculum as expert reader, providing feedback on assignments, March-June 2011.

Presented climate demos at Paws-On Science, Pacific Science Center, April 2012, 2013.

Expert reviewer for Al Gore's 2013 book The Future.

SERVICE

UW Atmospheric Sciences Undergraduate Curriculum Committee member, 2008-present. Helped design Climate Track for the undergraduate major. Current Climate Track faculty mentor. Committee chair, 2012-present.

Chair of ATM S 111 homework committee, 2009, developing HW topics for a unified online database.

Program on Climate Change governing board member, 2009-present.

Organizer, Program on Climate Change Summer Institute on Climate Feedbacks, summer 2010.

Helped prepare two successfully funded Student TechFee grants to upgrade departmental computers and link these together as a Condor cluster for high performance computing, 2009-2010.

Member, Provost's Committee on Interdisciplinary Teaching and Learning, 2012-2013.

WCRP Grand Challenge on Clouds, Climate Sensitivity, and Circulation organizing committee, 2013-present.

Participant in UW Faculty Field Tour, learning about the industry and culture of the state, 2008.

Reviewer for 26 journals/funding agencies: Journal of the Atmospheric Sciences, Journal of Climate, Geophysical Research Letters, Science, Nature, Nature Geoscience, Nature Climate Change, Quarterly Journal of the Royal Meteorological Society, Tellus A, Dynamics of Atmospheres and Oceans, Proceedings of the National Academy of Sciences, Atmospheric Science Letters, Journal of Geophysical Research-Atmospheres, Communications in Mathematical Sciences, Geoscientific Model Development, Climate Dynamics, Journal of Advances in Modeling Earth Systems, Monthly Weather Review, Advances in Science and Research, Physica D: Nonlinear Phenomena, Cold Regions Science and Technology, Earth and Planetary Science Letters, Journal of the Meteorological Society of Japan, Physics of Fluids, the National Science Foundation, and the National Oceanic and Atmospheric Administration.

Member, American Meteorological Society and American Geophysical Union.