

Angeline G Pendergrass, PhD

Advanced Studies Program Postdoctoral Research Fellow
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Education

- 2013 PhD University of Washington, Department of Atmospheric Sciences, Seattle, WA
Dissertation: *The atmospheric energy constraint on precipitation change*
- 2009 MS University of Washington, Department of Atmospheric Sciences, Seattle, WA.
Thesis: *Time-averaged data assimilation for midlatitude climates: towards paleoclimate applications*
- 2006 BS University of Miami, Coral Gables, FL, GPA 3.98
Magna cum laude, Majors: Meteorology, Math and Physics, Minor: French
Honors thesis: *Climate feedbacks in the surface radiation budget*

Research Interests

Precipitation on large scales, its variability and change, and its role in the surface and atmospheric energy budgets. Atmospheric radiative processes and large-scale dynamics. Climate sensitivity and feedbacks. Interactions between the atmosphere and surface ocean. Global climate models, stochastic climate models, atmospheric radiative transfer models.

Publications

- [1] **Pendergrass, A.G.**, and D.L. Hartmann, Changes in the distribution of rain frequency and intensity in response to global warming. In review at *Journal of Climate*.
- [2] **Pendergrass, A.G.**, and D.L. Hartmann, Two modes of change of the distribution of rain. In review at *Journal of Climate*.
- [3] Donohoe, A., K.C. Armour, **A.G. Pendergrass**, and D.S. Battisti, Shortwave and longwave radiative contributions to global warming under increasing CO₂. Submitted to *PNAS*.
- [4] **Pendergrass, A.G.**, and D.L. Hartmann (2014), The atmospheric energy constraint on global-mean precipitation. *Journal of Climate*, 27, 757-768.
- [5] **Pendergrass, A.G.**, and D.L. Hartmann (2012), Global-mean precipitation and black carbon in AR4 simulations, *Geophysical Research Letters*, 39, L01703.
- [6] **Pendergrass, A.G.**, G. Hakim, D. Battisti, and G. Roe (2012), Coupled air-mixed-layer temperature predictability for climate reconstruction, *Journal of Climate*, 25(2), 459-472.
- [7] **Pendergrass, A.G.**, and H. Willoughby (2009), Diabatically induced secondary flows in tropical cyclones. Part I: Quasi-steady forcing, *Monthly Weather Review*, 137(3), 805-821.

Honors and Awards

NCAR Advanced Studies Program Postdoctoral Fellowship, 2014
Science Editor's Choice (DOI:10.1126/science.335.6066.264-d, Pendergrass and Hartmann 2012)
National Defense Science and Engineering Graduate Research Fellow, 2006
Achievement Rewards for College Scientists Foundation Fellow, 2006
University of Washington Program on Climate Change honorary fellow, 2006
Phi Beta Kappa, 2005
American Meteorological Society Undergraduate Scholarship, 2005
American Meteorological Society Industry/Undergraduate Scholarship, 2004
Foote Fellow, University of Miami, 2002
Bowman Foster Ashe Scholarship, 2002
Karl Cless Scholarship, 2002

Research experience

- *Variability in energetics of regional precipitation change*, mentor: Clara Deser. Postdoctoral work, National Center for Atmospheric Research, 2014-present.
- *Global precipitation changes with climate*, advisor: Dennis Hartmann. PhD work, University of Washington, 2010-13.
 - Analysis of daily precipitation in CMIP5 models and GPCP and TRMM observations.
 - Analysis of global-mean precipitation and atmospheric radiative changes in CMIP3 and 5 global climate models.
 - Diagnosis of changes in atmospheric radiation in climate models.
- *Paleoclimate data assimilation*, advisors: Greg Hakim, David Battisti and Gerard Roe. Masters work, University of Washington, 2007-10.
 - Design and evaluation of ensemble-based data assimilation systems for application to paleoclimate proxy data.
 - Coded SPEEDY (a model of intermediate complexity) and a quasi-geostrophic channel model coupled to a slab ocean into a data assimilation system, using FORTRAN.
 - Idealized experiments using an ensemble system with a two-variable stochastic model.
 - Resulted in a masters thesis, presentation, paper, and a funded NSF grant.
- *Climate feedbacks in the surface radiation budget*, advisor: Brian Soden. Undergraduate thesis research, University of Miami, 2005-06.
 - Analyzed radiative feedback kernels for the surface radiation budget and applied them to climate changes in CMIP3 models.
 - Resulted in an undergraduate honors thesis.
- *Effects of secondary circulations structure on vortex intensification rate*, advisor: Hugh Willoughby. Tropical meteorology class project. University of Miami, 2006-07.
 - Sensitivity analysis of a simple 2D, steady-state model of a hurricane-like vortex.
 - Resulted in a paper.

- *Analysis of a sea fog event on the Yellow Sea*, mentor: Gang Fu. Research Experience for Undergraduates Marine science in China, Ocean University of China, Qingdao, China, Summer 2005.
 - Case study of a particularly dense sea fog event using satellite data, surface observations, and regional model output.
 - Resulted in a project write-up and presentation.
- *Ensemble forecast bias correction*, mentor: Kim Elmore. National Weather Center Research Experience for Undergraduates, Norman, OK, Summer 2004.
 - Compared mean and lagged-linear regression methods of bias correction for window lengths of five to ten days for surface temperature forecasts over New England.
 - Resulted in a project write-up and presentation and a poster at AMS Annual Meeting 2005.
- *Water vapor transport in the Inter-American Seas*, advisor: Chidong Zhang. Undergraduate research project, University of Miami, 2003.
 - Analyzed profiler data from a ship-based profiler and water vapor tracer data from a model.

Teaching experience

- *Co-facilitator*, seven class meetings, ATMS 501 (graduate introduction to atmospheric sciences), Dennis Hartmann, Autumn 2013.
- *Co-facilitator*, two class meetings, ATMS 552 (graduate objective analysis), Dennis Hartmann, Winter 2013.
- *Guest lecturer*, one lecture on QG energy transport, ATMS 442 (upper-level undergraduate atmospheric dynamics), Dargan Frierson, Winter 2012.
- *Guest lecturer*, three lectures on the general circulation of the atmosphere, ATMS 321 (Climate Variability and Change), Steve Warren, Winter 2012.
- *Teaching assistant*, ATMS 111 Global Warming, Dargan Frierson. Designed and led 4 one-hour discussion sections per week. Along with one other TA, designed homework, quizzes, and tests for 219 student lecture. Administered clicker questions each day of lecture. University of Washington, Winter 2011.
- *Teaching assistant*, ATMS 101 Weather, Bob Houze. Designed and led three one-hour discussion sections per week. Along with one other TA, designed and graded homework, quizzes, and tests for 180 student lecture. University of Washington, Fall 2007.
- *Math tutor*. Tutored students for any math class offered by the university on a walk-in basis, including but not limited to calculus, probability and statistics. University of Miami, Math Department, 2003-2006.
- *Student assistant*, Meteorological Instrumentation, Bruce Albrecht, University of Miami. Helped run 300-level class aboard Royal Caribbean Explorer of the Seas. Gave tours to the public.
- *Grader*, Linear algebra, University of Miami. Graded homework assignments for a 300-level linear algebra class.

Fieldwork

- *CTD Watch Stander*, CLIVAR P6 Leg 2, Chief Scientist Ruth Curry, 4 January - 10 February 2010, Papeete, Tahiti to Valparaiso, Chile, R/V Melville, Scripps Institution of Oceanography.
 - Prep, deploy, recover, monitor and operate the CTD/rosette, oversee sampling and take water samples on an oceanographic research cruise transecting the remote southeast Pacific Ocean for 38 days.
- *Graduate student science crew member*, 22 - 26 April 2013, NEMO Deployment and Shelf Science Cruise, Chief Scientist Matthew Alford, Washington Coast, R/V Thompson, University of Washington Applied Physics Lab.

Service, Outreach and Leadership

- Reviewer for *Journal of Climate*, *Monthly Weather Review*, *Climate Dynamics*, and *Quarterly Journal of the Royal Meteorological Society*.
- Review panel member, NASA
- Outreach, UW Atmospheric Sciences
 - Development of a severe weather presentation
 - Visits to schools and fairs
 - Presentations for visiting student groups.
- Conference planning and leadership
 - Abstract committee member and climate dynamics session chair, Graduate Climate Conference 2012.
 - Executive organizing collective co-leader, Graduate Climate Conference 2009. Executive organizing committee for weekend conference of 80 climate graduate students. Along with 4 other students, acquired \$20,000 funding, put together all logistics and scientific program.
 - Social committee chair, Graduate Climate Conference 2007.
 - Planning committee member and undergraduate session chair, American Meteorological Society Student Conference 2008, New Orleans, LA.
 - Seattle liaison, American Meteorological Society Student Conference 2011, Seattle, WA.
- Student organization leadership
 - Sea kayak tzar, UW Kayak Club, 2012-13
 - President, University of Miami Atmospheric Sciences Club, 2004-06
 - Founder, University of Miami American Meteorological Society Student Chapter, 2005, and President, 2005-06
- Forecast team coordinator, UW American Meteorological Society Student Chapter weather forecasters for Ocean Adventure Rowing Northwest
 - Coordinate weather forecasts and contribute weather-related content to outreach and education for a team of four open-ocean rowers
 - Salish Sea Expedition, April-May 2012, circumnavigating Vancouver Island and Africa to the Americas Expedition, January-March 2013
- Coordinator, UW Atmospheric Sciences Second Friday Club, 2006-2009.

- Sky Warn Weather Spotter, trained 2011
- Critical reviewer of *Modern Marine Weather*, 2nd edition, by David Burch

Presentations and Posters

- Conference talk *Changes in the distribution of rain in response to warming in models and observations*, GEWEX, The Hague, Netherlands, July 2014
- Seminar (invited) *Changes in the distribution of rain in response to warming*, Max Planck Institute for Meteorology Joint Seminar, Hamburg, Germany, June 2014
- Poster *A simple model relating precipitation and vertical velocity to moisture and radiative cooling*, Latsis Symposium, Zurich, Switzerland, June 2014
- Talk *Changes in the distribution of rain frequency and intensity in response to warming*, Climate Variability and Climate Change Working Group Meeting, March 2014
- Seminar (invited) *Changes in the distribution of rain in response to warming*, New York University Center for Atmosphere Ocean Science colloquium, March 2014
- Colloquium *The atmospheric energy constraint on global precipitation*, UW Atmospheric Sciences Colloquium, 6 December 2013
- Poster *The atmospheric energy constraint on global-mean precipitation change*, Gordon Research Conference on Radiation and Climate, July 2013
- Talk *The atmospheric energy constraint on global-mean precipitation change*, Gordon Research Seminar on Radiation and Climate, July 2013
- Seminar (invited) *The atmospheric energy constraint on global-mean precipitation change*, NASA Jet Propulsion Laboratory, June 2013
- Seminar *The atmospheric energy constraint on global-mean precipitation change*, UW Atmospheric Sciences Physics and Chemistry Seminar, April 2013
- Talk *Atmospheric radiative controls on global precipitation*, Climate Variability and Climate Change Working Group Meeting, March 2013
- Conference talk *Precipitation and the atmospheric radiative response to CO₂*, AG Pendergrass and DL Hartmann, American Geophysical Union Fall Meeting, December 2012
- Poster *Global mean precipitation today and tomorrow: it is controlled by atmospheric radiative cooling*, AG Pendergrass and DL Hartmann, Graduate Climate Conference, October 2012
- Seminar (invited) *Global-mean precipitation, aerosol forcing and climate feedbacks in AR4 simulations*, AG Pendergrass and DL Hartmann, Oregon State University, April 2012
- Poster *A1b black carbon, reflecting aerosol, and precipitation*, AG Pendergrass and DL Hartmann, American Geophysical Union Fall Meeting, December 2011
- Seminar *Absorbing aerosols and the hydrologic cycle in AR4*, UW Program on Climate Change Graduate Student Seminar, October 2011
- Poster *The global hydrologic cycle and the atmospheric energy budget*, AG Pendergrass and DL Hartmann, Gordon Research Conference on Radiation and Climate, 2011
- Seminar *Time-averaged data assimilation for midlatitude climates: towards paleoclimate applications*, AG Pendergrass (G Hakim, D Battisti, G Roe), UW Atmospheric Physics and Chemistry Seminar, 2009
- Conference talk *Atmospheric circulation from ice core accumulation using data assimilation*, AG Pendergrass, G Hakim, D Battisti, G Roe, Graduate Climate Conference, 2009
- Poster *Ensemble forecast bias correction*, AG Pendergrass and K Elmore, American Meteorological Society Student Conference, 2005

Conferences and workshops attended

Global Water and Energy Cycle (GEWEX) Meeting, The Hague, Netherlands, July 2014
Global Water and Energy Cycle (GEWEX) Summer Session, Delft, Netherlands, July 2014
Latsis Symposium 2014, Atmosphere and climate dynamics: From clouds to global circulations, June 2014, Zurich, Switzerland
Climate Variability and Climate Change Working Group Meeting, March 2014, Boulder, CO
UW Program on Climate Change Summer Institute, September 2013, Friday Harbor, WA
Gordon Research Seminar and Conference on Radiation and Climate, July 2013, New London, NH
Climate Variability and Climate Change Working Group Meeting, March 2013, Boulder, CO
American Geophysical Union Fall Meeting, December 2012, San Francisco, CA
Graduate Climate Conference, October 2012, Enumclaw, WA
UW Program on Climate Change Summer Institute, September 2012, Friday Harbor, WA
Advancing Toward Professorship in Biology, Ecology and Earth Systems Sciences, April 2012, Corvallis, OR
American Geophysical Union Fall Meeting, December 2011, San Francisco, CA
UW Program on Climate Change Summer Institute, September 2011, Friday Harbor, WA
Gordon Research Conference on Radiation and Climate, July 2011, Waterville, ME
Gordon Research Seminar on Radiation and Climate, July 2011, Waterville, ME
American Meteorological Society Student Conference, January 2011, Seattle, WA
UW Program on Climate Change Summer Institute, September 2010, Friday Harbor, WA
Graduate Climate Conference, April 2009, Enumclaw, WA
UW Program on Climate Change Summer Institute, September 2008, Friday Harbor, WA
National Weather Center REUnion, July 2008, Norman, OK
American Meteorological Society Annual Meeting, January 2008, New Orleans, LA
American Meteorological Society Student Conference, January 2008, New Orleans, LA
Graduate Climate Conference, October 2007, Enumclaw, WA.
UW Program on Climate Change Summer Institute, September 2007, Friday Harbor, WA
Students in Physical Oceanography Retreat, January 2007, Friday Harbor, WA
UW Program on Climate Change Summer Institute, September 2006, Leavenworth, WA
American Meteorological Society Annual Meeting, January 2006, Atlanta, GA
American Meteorological Society Student Conference, January 2006, Atlanta, GA
Second Marine Science Forum, June 2005, Qingdao, China
American Meteorological Society Annual Meeting, January 2005, San Diego, CA
American Meteorological Society Student Conference, January 2005, San Diego, CA

Societies and Affiliations

- American Meteorological Society
- University of Washington Student Chapter of the American Meteorological Society
- American Geophysical Union
- Earth Science Women's Network
- Program on Climate Change, University of Washington