Lori T. Sentman, PhD

Research Physical Scientist
Earth System Processes and Interactions Division
NOAA/Geophysical Fluid Dynamics Laboratory
201 Forrestal Road
Princeton, NJ 08540
http://www.gfdl.noaa.gov/lori-thompson-sentman-homepage

Tel: 609-452-6563
Fax: 609-987-5063
Lori.Sentman@noaa.gov

EDUCATION:

Ph.D., Atmospheric Science
Rutgers University, The Graduate School of New Brunswick
New Brunswick, NJ
Advisor: Anthony J. Broccoli
Thesis: "How the Central American Seaway Alters Large-Scale Ocean Circulation, Climate and Marine Biogeochemistry"
2012-2018
NOAA/OAR Graduate Studies Program, 2012-2014

M.S., Environmental Science, Atmospheric Science option
Rutgers University, The Graduate School of New Brunswick
New Brunswick, NJ
Advisors: Roni Avissar, Alan Robock
Research: Numerical modeling of air pollution, global and regional climate, and land surface
January 2002

B.S., Earth and Atmospheric Science
Rutgers University, Cook College
New Brunswick, NJ
Advisor: Nathan Reiss
May 1997

EXPERIENCE:

09/08 to Present

National Oceanic and Atmospheric Administration (NOAA)
Geophysical Fluid Dynamics Laboratory, Physical Scientist
Earth System Processes and Interactions division
Develop and improve NOAA GFDL Earth System Models (ESMs) to research global climate-carbon cycle interactions and feedbacks involving the terrestrial biosphere, ocean ecosystems, and climate on varying temporal and spatial scales. Focus areas include climate-carbon cycle interactions and feedbacks in past, present, and future climate, CO2-emisison overshoot, stabilization, and recovery scenarios for policy target, response of physical ocean mean state, climate mean state, climate interannual variability, and ocean biogeochemistry to geologically-induced ocean circulation changes, reconstruction and assessment of climate and carbon natural variability during the last millennium, role of ocean formulation on climate sensitivity, equilibrium climate sensitivity response to Earth system forcing, ocean response to historical volcanic eruptions, sensitivity of CO_2 fertilization to climate, and the decadal to centennial scale impact land use on the terrestrial carbon. Execution, analysis, and data publishing of ESM2M CMIP5/IPCC AR5 and AerChemMIP ESM4.1 CMIP6 experiments. Effective communication of research via oral presentations and written manuscripts.

03/08 to 09/08

High Performance Technologies, Inc., Associate II-Software Engineer: NOAA/Geophysical Fluid Dynamics Laboratory, Princeton, NJ.

Contracted at the National Oceanic and Atmospheric Administration's (NOAA) Geophysical Fluid Dynamics Laboratory (GFDL) as part of the Climate and Ecosystems group. Tasks include model execution and management of the earth system model components and the mixed layer ocean model, development of improved earth system models and research on the interactions and feedbacks of the biosphere with climate on varying time scales. Research initiatives include sensitivity of CO2 fertilization, impact of climate on the terrestrial carbon cycle and the effect of land use on the terrestrial carbon stores and stocks from decadal to centennial time scales. Effective communication of research via oral presentations and written manuscripts.

01/02 to 03/08 **RS Information Systems, Inc./Wyle Laboratories, Software Engineer: NOAA/Geophysical Fluid Dynamics Laboratory, Princeton, NJ.**
Contracted at the National Oceanic and Atmospheric Administration's (NOAA) Geophysical Fluid Dynamics Laboratory (GFDL) as part of the Climate and Ecosystems group. Tasks include model execution and management of the earth system model components and the mixed layer ocean model, development of improved earth system models and research on the interactions and feedbacks of the biosphere with climate on varying time scales. Designed and created an automated vegetation analysis post processing suite for model and observation comparison. Investigation into the terrestrial biosphere and climate responses to increased radiative and photosynthetic carbon dioxide levels. As a member of the Modeling Services group for over four years, provided public and internal release support for the Flexible Modeling System (FMS). Designed and created an automated database of FMS model development integrations used by the model development teams to catalogue and track the model development effort. Provided detailed source code module web-based documentation for the land model, LaD, and the nonhydrostatic atmospheric model ZETAC. Liaison to the Land Model Development Team (LMDT) and the Single Column Model (SCM), providing technical and programming support for two land models and the single column atmospheric model; performance profiling, ensuring bitwise reproducibility across restarts and processor counts, diagnostic support, code management and model development. Wrote user guides for the public and internal releases of the model infrastructure and the component models. I/O and data conversion from GRIB, binary, ASCII and HDF4 to netCDF, following the CF metadata conventions and using the netCDF decoders package. Conducted four hands-on tutorials and one refresher demonstration of PowerPoint 2000, as well as numerous other presentations and a Flexible Runtime Environment workshop.

02/05 to 08/05 **Princeton University, Scientific Programming Consultant**
Installed the National Aeronautics and Space Administration (NASA)/Goddard Space Flight Center (GSFC) Land Information System (LIS) on various platforms for the Department of Civil and Environmental Engineering, including Linux workstations, a Linux cluster and a Beowulf cluster at Princeton University. Used GrADS scripts for the development of a web-based diagnostic interface for testing and validation.

02/00 to 01/02 **Rutgers University, Department of Environmental Science, Graduate Assistant**
Studied land surface parameterizations using a regional nonhydrostatic atmospheric model, the Regional Atmospheric Modeling System (RAMS). Studied and analyzed the effects of land surface heterogeneity on precipitation rates during the Amazonian wet season. Used a one dimensional radiative convective model to study the effects of land surface on Amazonia's radiative and hydrological balances. Additional modeling research projects include the sensitivity of RAMS eddy diffusivity parameterizations, parameterizing the uptake of soil water through plant roots, the environmental cycle of polychlorinated biphenyls, and a critical review of atmospheric

dispersion modeling. FORTRAN 90 programming and Perl scripting in a Unix environment.

05/96 to 09/97

National Oceanic and Atmospheric Administration (NOAA)
National Weather Forecast Office/Mount Holly, Student Career Experience Program (SCEP) intern
Wrote and transmitted daily and extended local forecasts, nowcasts, fire weather forecasts and Transcribed Weather Enroute Broadcasts (TWEBs) aviation forecasts and Terminal Aerodrome Forecasts (TAFs). Experience in aviation routine weather reports (METAR) via the Automated Surface Observing System (ASOS). Broadcast watches, warnings and hourly observations on the National Oceanic and Atmospheric Administration (NOAA) weather radio. Experience on the radar and hydrology shifts. Conducted research into the propagation of sea breezes across New Jersey using the Next Generation Weather Radar system (NEXRAD). Created an internal web-based station duty manual using Hypertext Markup Language (HTML).

PUBLICATIONS:

Sanderson, B. M., V. Brovkin, R. Fisher, D. Hohn, T. Ilyina, C. Jones, C., et al. (2024). **flat10MIP: An emissions-driven experiment to diagnose the climate response to positive, zero, and negative CO_2 emissions**, *EGUsphere* [preprint], https://doi.org/10.5194/egusphere-2024-3356

Zeng, G., N.L. Abraham, A.T. Archibald, S.E. Bauer, M. Deushi, L.K. Emmons, et al. (2022). **Attribution of stratospheric and tropospheric ozone changes between 1850 and 2014 in CMIP6 models.** https://www.essoar.org/doi/10.1002/essoar.10510050.1

Chemke, R., L. Zanna, C. Orbe, L.T. Sentman, L.M. Polvani (2022). **The future intensification of the North Atlantic winter storm track: the key role of dynamic ocean coupling**. *J. Clim*., 35(8), https://doi.org/10.1175/JCLI-D-21-0407.1

Allen, R., L.W. Horowitz, V. Naik, N. Oshima, F.M. O'Connor, S. Turnock, et al. (2021). **Significant climate benefits from near-term climate forcer mitigation in spite of aerosol reductions.** *Env. Res. Lett*., 16(3), https://doi.org/10.1088/1748-9326/abe06b

Allen, R., L. Horowitz, V. Naik, N. Oshima, F. O'Connor, S. Turnock, et al. (2020). **Climate and air quality impacts due to mitigation of non-methane near-term climate forcers.** *Atmos. Chem. Phys.*, 20(16), https://doi.org/10.5194/acp-20-9641-2020

Stevenson, D. S., Zhao, A., Naik, V., O'Connor, F. M., Tilmes, S., Zeng, G., et al. **Trends in global tropospheric hydroxyl radical and methane lifetime since 1850 from AerChemMIP**, *Atmos. Chem. Phys. Discuss*., 20(21), https://doi.org/10.5194/acp-20-12905-2020

Morgenstern, O., F.M. O'Connor, B.T. Johnson, G. Zeng, J.P. Mulcahy, J. Williams, et al. 2020: **Reappraisal of the climate impacts of ozone-depleting substances**. *Geophys. Res. Lett.*, 47(20), https://doi.org/10.1029/2020GL088295

Dunne, J. P., Winton, M., Bacmeister, J., Danabasoglu, G., Gettelman, A., Golaz, J.-C., et al. 2020: **Comparison of equilibrium climate sensitivity estimates from slab ocean, 150-year, and longer simulations.** *Geophys. Res. Lett.,* 47, e2020GL088852. https://doi.org/10.1029/2020GL088852

Dunne, J. P., Horowitz, L. W., Adcroft, A. J., Ginoux, P., Held, I. M., John, J. G., et al. 2020: **The GFDL Earth System Model version 4.1 (GFDL-ESM 4.1): Overall coupled model description and simulation characteristics**. *Journal of Advances in Modeling Earth Systems*, 12, e2019MS002015.

https://doi.org/10.1029/2019MS002015

Krasting, J. P., R. J. Stouffer, S. M. Griffies, R. W. Hallberg, S. L. Malyshev, B. L. Samuels, and L. T. Sentman, 2018: **Role of Ocean Model Formulation in Climate Response Uncertainty.** *J. Climate*, 31, 9313–9333. https://doi.org/10.1175/JCLI-D-18-0035.1.

Sentman, L. T., Dunne, J. P., Stouffer, R. J., Krasting, J. P., Toggweiler, J. R., Broccoli, A. J., 2018: **The Mechanistic Role of the Central American Seaway in a GFDL Earth System Model. Part 1: Impacts on Global Ocean Mean State and Circulation.** *Paleoceanography and Paleoclimatology*, 33(7). https://doi.org/10.1029/2018PA003364

Sentman, L., 2018: **How the Central American Seaway alters large-scale ocean circulation, climate and marine biogeochemistry,** (Doctoral dissertation). Retrieved from Rutgers University Community Repository (https://doi.org/doi:10.7282/T3JW8J31). New Brunswick, NJ: Rutgers University.

Ding, Y., G. Chepurin, G. Stenchikov, A. Robock, L. T. Sentman, & J. P. Krasting, 2014: **Ocean Response to Volcanic Eruptions in Coupled Model Intercomparison Project 5 (CMIP5) Simulations.** *J. Geophys. Res. – Oceans*, 119(9). https://doi.org/10.1002/2013JC009780

Dunne, J. P., et al. 2013: **GFDL's ESM2 global coupled climate-carbon Earth System Models Part II: Carbon system formulation and baseline simulation characteristics**. *J. Climate*, 26(7). https://doi.org/10.1175/JCLI-D-12-00150.1

Dunne, John P., et al. 2012: **GFDL's ESM2 global coupled climate-carbon Earth System Models Part I: Physical formulation and baseline simulation characteristics.** *J. Climate*, 25(19). https://doi.org/10.1175/JCLI-D-11-00560.1

Sentman, L. T., E. Shevliakova, R. J. Stouffer, & S. Malyshev, 2011: **Time Scales of Terrestrial Carbon Response Related to Land-Use Application: Implications for Initializing an Earth System Model.** *Earth Interactions*, 15, 1-16. https://doi.org/ 10.1175/ei401.1

Shevliakova, E., S. W. Pacala, S. Malyshev, G. C. Hurtt, P.C.D. Milly, J. P. Caspersen, et al. 2009: **Carbon Cycling under 300 Years of Land-use Change: the Importance of the Secondary Vegetation Sink.** *Global Biogeochem. Cycles*, 23, GB2022. https://doi.org/10.1029/2007GB003176

Shevliakova, E., S. W. Pacala, S. Malyshev, G. C. Hurtt, P.C.D. Milly, J. P. Caspersen, et al. 2009: **Carbon Cycling under 300 Years of Land-use Change: the Importance of the Secondary Vegetation Sink.** *Nature Reports Climate Change*, 5. https://doi.org/10.1038/climate.2009.35

Anderson, J. L., et al. 2004: **The new GFDL global atmosphere and land model AM2/LM2: Evaluation with prescribed SST simulations.** *J. Climate*, 17(24), 46414673.

PRESENTATIONS:

"Quantifying Equilibrium Climate Sensitivity to Atmospheric Chemistry and Composition Representations in GFDL-CM4.0 and GFDL-ESM4.1", *American Geophysical Union Fall Meeting*, Washington, D.C., December 2024.

"Quantifying Equilibrium Climate Sensitivity to Atmospheric Chemistry and Composition Representations in GFDL-CM4.0 and GFDL-ESM4.1", *ECS & Cloud Feedback Virtual Symposium*, December 2024.

"Climate-Carbon Tipping Points in the Earth System GFDL-ESM4", *TipMIP Meeting*, Templin, Germany, November 2023.

"Development and application of new GFDL Slab Ocean Models to Quantify Equilibrium Climate Sensitivity with Earth System Feedbacks", *GFDL AM5 Development Meeting*, Princeton, NJ, March 2023.

"Understanding the Last Millennium Ocean Carbon Cycle with a GFDL Earth System Model", *Ocean Sciences Meeting*, San Diego, CA, February 2020.

"Earth System Implications of a Central American Seaway", *GFDL External Review*, Princeton, NJ, October 2019.

"How the Central American Seaway Alters Large-Scale Ocean Circulation, Climate and Marine Biogeochemistry", *National Oceanic and Atmospheric Administration Cooperative Science Center for Earth System Sciences and Remote Sensing Technologies (NOAA-CESSRST)*, New York, NY, November 2018.

"New Insights on the Long-term Biogeochemical Impacts of a Changing Ocean Circulation", *ATT: Marine biogeochemistry training school on biogeochemical and ecological dimensions of a changing ocean,* Universidade do Algarve, Faro, Portugal, June 2018.

"New Insights on the Long-term Biogeochemical Impacts of a Changing Ocean Circulation", *OAR Senior Management Meeting Spotlight Presentation*, Nationally-broadcast teleconference, April 2018.

"Earth System Implications of a Central American Seaway", *GFDL*, Princeton, NJ, January 2018.

"How the Central American Seaway Alters Large-Scale Ocean Circulation, Climate and Marine Biogeochemistry", *GFDL*, Princeton, NJ, January 2018.

"How the Central American Seaway Alters Large-Scale Ocean Circulation, Climate and Marine Biogeochemistry", *Rutgers University*, New Brunswick, NJ, October 2017.

"Paleoclimate: Understanding the Past to Improve Predictions of the Future", *The Ronald J. Stouffer Symposium*, GFDL, Princeton, NJ, June 2016.

"Earth System Implications of a Central American Seaway", *Connecting Paleo and Modern Oceanographic Data to Understand AMOC Over Decades to Centuries*, NCAR, Boulder, CO, May 2016.

"The Role of the Central American Seaway on the Earth System: Sensitivity Study using an Earth System Model", *Princeton University*, May 2015.

"The Role of the Central American Seaway on the Earth System: Sensitivity Study using an Earth System Model", *Rutgers University*, October 2014.

"The Role of the Central American Seaway (CAS) Closure on Ocean Circulation", *Rutgers University*, December 2013.

"Evaluation of Historical Carbon Cycle Changes in the GFDL ESM CMIP5 Simulations", *Rutgers University*, December 2013.

"Uncertainty in the Global Carbon Cycle from Land-Use Application of Earth System Model Initialization", *Key Uncertainties in the Global Carbon-Cycle: Perspectives across terrestrial and ocean ecosystems*, ASP Researcher Workshop, NCAR, Boulder, CO, August 2013.

"GFDL Atmospheric Chemistry-Climate and Earth System Models", *Rutgers University*, April 2013.

"Land Ecosystems and Biogeochemical Cycling", *GFDL External Review*, July 2009.

"The Importance of Land Use for the Evaluation of Terrestrial Carbon: Preindustrial Equilibrium or Transient?" *QUEST/GLASS land benchmarking workshop*, Exeter, UK, June 2009.

"The New Mixed-Layer Model: SM2.1-LM3V", *GFDL*, February 2008.

AWARDS:

NOAA Administrator's Award, 2022.
OAR Awards for Exemplary Service, Individual award recipient, 2020.
U.S. Dept. of Commerce Silver Medal, Scientific/Engineering Achievement, 2014.
NOAA/OAR Graduate Studies Program, 2012-2014.
RSIS Employee of the Month, Science and Engineering Division. October 2002.
RSIS Delighting the Customer Award, June 2002.
RSIS Delighting the Customer Award, January 2002.

COMMITTEES:

Paleoclimate Model Intercomparison Project (PMIP), Pre-Pliocene Working Group, GFDL representative, 2013-present
GFDL Early Career Scientist Committee, 2016-present

PROFESSIONAL SERVICES:

Review Editor, Editorial Board, *Frontiers in Climate – Predictions and Projections,* 2021-present
Scientific research mentor, Rebecca Monge, Carmel High School Science Research Program, NY, 2018-present
Expert reviewer - IPCC 1.5˚C Special Report Chapter 3, "Impacts of 1.5°C global warming on natural and human systems"
Expert reviewer - National Climate Assessment Second Order Draft Land Cover and Land Use Change chapter.
Expert reviewer - Second Order Draft WGI contribution to the IPCC Fifth Assessment Report
Reviewer, *Climate Dynamics*
Reviewer, *Climate of the Past*
Reviewer, *Earth System Dynamics*
Reviewer, *JGR-Biogeosciences*
Reviewer, *Journal of Climate*
Reviewer, *Journal of Geophysical Research Atmospheres*
Reviewer, *Nature Geosciences*
Reviewer, NOAA Office of Education Undergraduate Scholarship Program (Hollings)

COMMUNITY OUTREACH:

"Weather for 3rd Graders", Invited presenter, Monmouth Junction Elementary School, NJ, October 2024.

"NOAA Climate Projections & Research", Invited presenter, Crossroads North Middle School, Monmouth Junction, NJ, June 2024.

"STEM Career Exploration", Invited speaker, Girl Scouts of America Troop 80367, Kendall Park, NJ, March 2024.

"The Carbon Cycle Game", Presenter, NOAA GFDL Bring Your Child to Work Day, Princeton, NJ, April 2024.

"Climate & the Carbon Cycle", Invited speaker, Monmouth Junction Elementary School, NJ, May 2023.

"What's Matter?", Invited presenting scientist, Monmouth Junction Elementary School, NJ, May 2021.

"Severe Weather: Thunderstorms, Hurricanes, & Tornadoes", Invited presenting scientist, Monmouth Junction Elementary School, NJ, November 2020.

"Tornadoes for 1st Graders", Invited presenting scientist, Monmouth Junction Elementary School, NJ, June 2019.

Panelist and reviewer – Rider University Independent Scholarship and Creative Activities Presentations Day, May 2019.

"No pressure! All about barometers", Invited Presenting Scientist, Monmouth Junction Elementary School NJ, February 2019.

"Clouds & Thunderstorms", Invited Presenting Scientist, Monmouth Junction Elementary School, Monmouth Junction, NJ, June 2018.

"Matter, Water Cycle, Clouds, & Hurricanes", Invited Presenting Scientist, Monmouth Junction Elementary School, Monmouth Junction, NJ, May 2018.

"Math, Science, & Technology Night", Invited Presenting Scientist, Greenbrook Elementary School, Kendall Park, NJ, February 2018.

"Weather for Preschoolers: Clouds", Sand Hills Preschool, Kendall Park, NJ. May 2017.

"Weather for 1st Graders: The Water Cycle, Clouds, and Storms", Monmouth Junction Elementary School, Monmouth Junction, NJ, May 2017.

"Weather for Kindergarteners: Clouds, Thunder and Lightning Science", Monmouth Junction Elementary School, Monmouth Junction, NJ, April 2016.

"Monmouth Junction Elementary School Annual Science Fair", Visiting Scientist and Lead Coordinator, Brooks Crossing Elementary School, Monmouth Junction, NJ, February 2016-present.

"Weather for Preschoolers.", Sand Hills Preschool, Kendall Park, NJ. May 2015.

"Thunderstorms for Kindergarteners", Deans Crossing School, Monmouth Junction, NJ. December 2013.

"Weather for Kindergarteners, Part II: Thunder and Lightning", Deans Crossing School, Monmouth Junction, NJ. March 2012.

"Weather for Kindergarteners, Part I: Clouds", Deans Crossing School, Monmouth Junction, NJ. December 2011.

"The Water Cycle II", Plainsboro Library, Plainsboro, NJ. July 22, 2009.

"The Water Cycle I", Plainsboro Library, Plainsboro, NJ. July 8, 2009.

Rapporteur, Climate Working Group (CWG) CRM Program Review. March 25, 2008.

"Science and Engineering Expo", Princeton University, Princeton, NJ. March 19, 2008.

"2008 Young Women's Conference", Plasma Physics Laboratory, Princeton, NJ. March 14, 2008.

"Weather, Oceans and Climate", Plainsboro Library, Plainsboro, NJ. October 18, October 25, November 8, November 15, November 29 and December 6, 2007.

PROFESSIONAL ORGANIZATIONS:

American Meteorological Society
American Geophysical Union
Earth Science Women's Network

RELEVANT SKILLS:

Python, Jupyter, Fortran 90, C/C+, C-shell, bash, Unix, Ferret, R, GitHub, High-performance computing, XML, HTML, MySQL.