

Baird Langenbrunner

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SUMMARY

I am a climate scientist with expertise in global and regional climate modeling, land-atmosphere interaction, climate change, and uncertainty quantification. I use models and Earth system observations to understand the impacts of human activity on the global environment and the resulting feedbacks on regional hydroclimate.

CAREER AND EDUCATION

Postdoctoral scholar

UC Irvine Department of Earth System Science July 2017–Present
Advisors: [Mike Pritchard](#) and [Jim Randerson](#)
UCLA Department of Atmospheric and Oceanic Sciences December 2015–July 2017
Advisor: [J. David Neelin](#)

University of California, Los Angeles, CA

Ph.D. Atmospheric and Oceanic Sciences December 2015
M.S. Atmospheric and Oceanic Sciences June 2013

Brown University, Providence, RI

Sc.B. Geophysics May 2009

Additional coursework

Principles of Microeconomics (online version of MIT 14.01, taken via edX) Spring 2018

RESEARCH EXPERIENCE

Graduate student researcher, UCLA Summer 2010–Winter 2015

- *Dissertation:* *Quantifying uncertainty in precipitation climatology, twenty-first century change, and teleconnections in global climate models*
- *Committee:* J. David Neelin, Alex Hall, C. Roberto Mechoso, and Glen MacDonald

Senior thesis and part-time research scientist, Brown University Fall 2008–Summer 2010

- Used empirical statistical downscaling techniques to explore the contribution of lightning to nitrogen oxide (NO_x) deposition (with Meredith Hastings)

NSF Research Experience for Undergraduates Fellow, CSU, Fort Collins Summer 2008

- Used an idealized estuary model to simulate the movement of point source pollution with implications for aquaculture (with Karan Venayagamoorthy)

Undergraduate student researcher, Brown University Summer 2007–Fall 2008

- Analyzed environmentally stable isotopes in lake sediment to reconstruct temperature and precipitation during Holocene (with Yongsong Huang)

PUBLICATIONS

Langenbrunner, B., M. S. Pritchard, G. J. Kooperman, and J. T. Randerson, 2018: Why does Amazon precipitation decrease when tropical forests respond to increasing CO₂? *Earth's Future*, **in review**. submitted & in review

13. Chen, Y., B. Langenbrunner, and J. T. Randerson, 2018: Future drying in Central America and northern South America linked with Atlantic meridional overturning circulation. *Geophysical Research Letters*, **45**, 9226–9235. published

12. Swain, D., B. Langenbrunner, A. Hall, and J. D. Neelin, 2018: Increasing precipitation volatility in twenty-first-century California. *Nature Climate Change*, **8**, 427–433.

11. Langenbrunner, B., and J. D. Neelin, 2017: Pareto-optimal estimates of California precipitation change. *Geophysical Research Letters*, **44** (24), 12,436–12,446.
10. Langenbrunner, B., and J. D. Neelin, 2017: Multiobjective constraints for climate model parameter choices: Pragmatic Pareto fronts in CESM1. *Journal of Advances in Modeling Earth Systems*, **9** (5), 2008–2026.
9. Lintner, B. R., B. Langenbrunner, J. D. Neelin, B. T. Anderson, M. J. Niznik, G. Li, and S.-P. Xie, 2016: Characterizing CMIP5 model spread in simulated rainfall in the Pacific Intertropical Convergence and South Pacific Convergence Zones. *Journal of Geophysical Research: Atmospheres*, **121** (19).
8. Langenbrunner, B., J. D. Neelin, B. R. Lintner, and B. T. Anderson, 2015: Patterns of precipitation change and climatological uncertainty among CMIP5 models, with a focus on the midlatitude Pacific storm track. *Journal of Climate*, **28**, 7858–7872.
7. Anderson, B. T., B. R. Lintner, B. Langenbrunner, J. D. Neelin, E. Hawkins, and J. Syktus, 2015: Sensitivity of terrestrial precipitation trends to the structural evolution of sea surface temperatures. *Geophysical Research Letters*, **42** (4), 1190–1196.
6. Berg, N., A. Hall, F. Sun, S. Capps, D. Walton, B. Langenbrunner, and J. D. Neelin, 2015: Twenty-first-century precipitation changes over the Los Angeles region. *Journal of Climate*, **28** (2), 401–421.
5. Maloney, E. D., S. J. Camargo, E. Chang, B. Colle, R. Fu, K. L. Geil, Q. Hu, X. Jiang, N. Johnson, K. B. Karnauskas, J. Kinter, B. Kirtman, S. Kumar, B. Langenbrunner, K. Lombardo, L. N. Long, A. Mariotti, J. E. Meyerson, K. C. Mo, J. D. Neelin, Z. Pan, R. Seager, Y. Serra, A. Seth, J. Sheffield, J. Stroeve, J. Thibeault, S.-P. Xie, C. Wang, B. Wyman, and M. Zhao, 2014: North american climate in CMIP5 experiments: Part III: Assessment of Twenty-first Century projections. *Journal of Climate*, **27** (6), 2230–2270.
4. Sheffield, J., S. J. Camargo, R. Fu, Q. Hu, X. Jiang, N. Johnson, K. B. Karnauskas, S. T. Kim, J. Kinter, S. Kumar, B. Langenbrunner, E. Maloney, A. Mariotti, J. E. Meyerson, J. D. Neelin, S. Nigam, Z. Pan, A. Ruiz-Barradas, R. Seager, Y. L. Serra, D.-Z. Sun, C. Wang, S.-P. Xie, J.-Y. Yu, T. Zhang, and M. Zhao, 2013: North american climate in CMIP5 experiments. Part II: Evaluation of historical simulations of intraseasonal to decadal variability. *Journal of Climate*, **26** (23), 9247–9290.
3. Sheffield, J., A. P. Barrett, B. Colle, D. Nelun Fernando, R. Fu, K. L. Geil, Q. Hu, J. Kinter, S. Kumar, B. Langenbrunner, K. Lombardo, L. N. Long, E. Maloney, A. Mariotti, J. E. Meyerson, K. C. Mo, J. David Neelin, S. Nigam, Z. Pan, T. Ren, A. Ruiz-Barradas, Y. L. Serra, A. Seth, J. M. Thibeault, J. C. Stroeve, Z. Yang, and L. Yin, 2013: North american climate in CMIP5 experiments. Part I: Evaluation of historical simulations of continental and regional climatology. *Journal of Climate*, **26** (23), 9209–9245.
2. Neelin, J. D., B. Langenbrunner, J. E. Meyerson, A. Hall, and N. Berg, 2013: California winter precipitation change under global warming in the Coupled Model Intercomparison Project phase 5 ensemble. *Journal of Climate*, **26** (17), 6238–6256.
1. Langenbrunner, B., and J. D. Neelin, 2013: Analyzing ENSO teleconnections in CMIP models as a measure of model fidelity in simulating precipitation. *Journal of Climate*, **26** (13), 4431–4446.

TEACHING EXPERIENCE

Lecture and co-organizer, UC Irvine

Earth System Science Python Tutorial; see [GitHub repository](#) for details

Ongoing

Certificate in Teaching Excellence, CIRTLL Associate Level

UC Irvine Division of Teaching and Learning

January, 2018

Guest lecturer, UCLA

AOS 112: Climate Change Assessment for undergraduates (5 lectures)

AOS 209: Climate Change Assessment for graduate students (2 lectures)

Developed interactive Python scripts; taught upper-level undergraduates and graduate students how to analyze climate model data using a hierarchy of open-source software; instructor: J. David Neelin

Fall 2016, Spring 2017

Lecturer and co-organizer, UCLA

Spring 2016

AOS 281: Introduction to Python in the Atmospheric and Oceanic Sciences
Weekly seminar with ~20 participants composed of AOS undergraduate and graduate students, faculty, and staff

Lecturer, UCLA

Winter 2016

AOS C110/C227: Advanced dynamic and synoptic meteorology
Cross-listed undergraduate and graduate course in midlatitude atmospheric dynamics, quasigeostrophic theory, and weather forecasting; 6 hours per week (4 hours of lecture and 2 hours of forecasting lab)

Teaching assistant, UCLA

Spring 2012, 2013, 2014

AOS 102: Climate Change and Climate Modeling (course lead: J. David Neelin)
Upper-level undergraduate course for science majors; taught weekly discussion sections, held office hours, graded homework and exams (responsible for 70+ students); guest lecturer when instructor absent

INVITED TALKS

NASA Jet Propulsion Laboratory Seminar

May 2018

UC Irvine Department of Earth System Science Seminar, Pritchard and Randerson Groups, UC Irvine

March 2017

NOAA Geophysical Fluid Dynamics Laboratory Dynamics Seminar, Princeton University

June 2016

SELECTED CONFERENCE PRESENTATIONS

Langenbrunner, B., M. S. Pritchard, G. J. Kooperman, and J. T. Randerson, 2018: Why does Amazon precipitation decrease in the physiological response to increased CO₂? National Center for Atmospheric Research. June 18–20, Boulder, CO. **(Talk)**

Langenbrunner, B., and J. D. Neelin, 2017: Pareto-optimal estimates of California precipitation change. American Geophysical Union Fall Meeting. December 11–15, New Orleans, LA. **(Poster)**

Langenbrunner, B., and J. D. Neelin, 2016: Seeking deep convective parameter updates that improve tropical Pacific climatology in CESM using Pareto fronts. American Geophysical Union Fall Meeting. December 12–16, San Francisco, CA. **(Talk)**

Langenbrunner, B., and J. D. Neelin, 2016: Multiobjective constraints for CESM1 parameter choices: High-dimensional model reduction strategies and pragmatic Pareto fronts. National Center for Atmospheric Research. June 20–23, Breckenridge, CO. **(Poster)**

Langenbrunner, B., J. D. Neelin, B. R. Lintner, and D. N. Bernstein, 2016: Identifying leading spatial patterns of model uncertainty and bias in perturbed physics ensembles and multi-model ensembles. American Meteorological Society 96th Annual Meeting. January 10–14, New Orleans, LA. **(Talk)**

Langenbrunner, B., J. D. Neelin, B. T. Anderson, and B. R. Lintner, 2015: Precipitation change uncertainties in global warming simulations, and why they matter for California. Los Angeles Basin Earth and Planetary Sciences Student Research Symposium. April 24, UCLA, Los Angeles, CA. **(Talk, awarded 2nd place)**

Langenbrunner, B., J. D. Neelin, A. Hall, N. Berg, B. T. Anderson, and B. R. Lintner, 2015: Twenty-first century climate model precipitation projections and uncertainty patterns for the California region. American Geophysical Union Chapman Conference on California drought: Causes, impacts, and policy. April 20–22, UC Irvine, Irvine, CA. **(Poster)**

Langenbrunner, B., J. D. Neelin, and D. N. Bernstein, 2014: Investigating intermodel uncertainty in global and regional precipitation change within the CMIP5 ensemble. Graduate Climate Conference. October 31–November 2, Pack Forest Conference Center, Eatonville, WA. **(Poster)**

Langenbrunner, B., J. D. Neelin, and D. N. Bernstein, 2014: Spatial modes of model uncertainty in global and regional precipitation change. Institute for Mathematics Applied to Geosciences (IMAGE): Pattern scaling, climate model emulators, and their application to the new scenario process. April 23–24, NCAR, Boulder, CO. **(Poster)**

Langenbrunner, B., J. D. Neelin, and J. E. Meyerson, 2013: Analysis of teleconnections in CMIP models as a measure of model fidelity in simulating precipitation. World Climate Research Programme, Coupled Model Intercomparison Project phase 5 (CMIP5) Model Analysis. March 5–9, University of Hawaii, Honolulu, HI. **(Poster)**

Langenbrunner, B., J. D. Neelin, and J. E. Meyerson, 2011: Analysis of precipitation teleconnections in CMIP models as a measure of model fidelity in simulating precipitation. American Geophysical Union Fall Meeting. December 5–9, San Francisco, CA. **(Poster)**

AWARDS AND FELLOWSHIPS

California Council on Science and Technology Policy Fellowship – selected as finalist (interview declined)	2017
NOAA Climate & Global Change Postdoctoral Fellowship – selected as alternate	2016
Dissertation Year Fellowship (UCLA Graduate Division)	2014–2015
Morris Neiberger Award – for excellence in graduate teaching (UCLA AOS)	2014
AOS Fellowship – for science communication and outreach on behalf of department (UCLA AOS)	2013
Brian Bosart Award – for service to students and the department (UCLA AOS)	2012
Chancellor's Prize – awarded on basis of academic merit (UCLA Graduate Division)	2010–2013
Elected to Sigma Xi (Brown University)	2009
NSF Research Experience for Undergraduates (REU) Fellowship (CSU Fort Collins)	2008
Undergraduate Teaching and Research Award (Brown University Dept. of Geological Sciences)	2008
CRC Press Award for Achievement in Undergraduate Chemistry (Brown University Dept. of Chemistry)	2007

SERVICE AND PUBLIC OUTREACH

DIRECT-STEM Symposium , to encourage diversity in STEM graduate education, CSULA	April 2018
Science advisor , The Learning Design Group, UC Berkeley	Spring 2015–Present
SolarReserve , Green Lunch Speaker Series (with Kathleen Schiro), Santa Monica, CA.	April 2017
Climate change education assembly , elementary school outreach day at Citizens of the World Mar Vista Charter School, CA	January 2017
Children's Water Education Festival , annual event during Spring, UC Irvine	2012–2017
Study Smart Tutors , paid SAT and college prep tutoring for groups of high school students from low-income backgrounds, Southern California	2014–2015
Math and Physical Sciences Council (MPSC) , UCLA	2013–2015
AOS Chi Epsilon Pi , treasurer, student-faculty representative, outreach coordinator, and president	2011–2015
Exploring your universe , annual UCLA science event held during Fall	2011–2015
Weather dance performance , invited talk by AOS graduate students, UCLA Center for the Art of Performance	October 2013
Aquarium of the Pacific Education Volunteer , Long Beach, CA	2010–2011
Let's Get Ready! , volunteer SAT and college prep tutoring for groups of high school students from low-income backgrounds, Providence, RI	2009–2010
Sustainable Food Initiative (SuFI) , Brown University	2005–2009

PROFESSIONAL ACTIVITIES

• Potsdam Summer School: <i>The Skin of Our Planet—the Earth Surface System</i> University of Potsdam, Germany	Summer 2018
• Community Earth System Model (CESM) Tutorial National Center for Atmospheric Research (NCAR), Boulder, CO	Summer 2015
• American Meteorological Society (AMS) member	2012–Present
• American Geophysical Union (AGU) member	2008–Present
• Reviewer for <i>Climatic Change</i> , <i>Climate Dynamics</i> , <i>Geophysical Research Letters</i> , <i>Geoscientific Model Development</i> , <i>Journal of Advances in Modeling Earth Systems</i> , <i>Journal of Atmospheric and Oceanic Technology</i> , <i>Journal of Climate</i> , <i>Nature</i>	

TECHNICAL SKILLS

- **Advanced knowledge** of Python/Numpy/Scipy, UNIX/LINUX shell environments and scripting, the NCAR Command Language (NCL), and command-line tools for NetCDF analysis (NCO, CDO), Git/GitHub/GitLab
- **Intermediate knowledge** of Fortran; **rudimentary knowledge** of MATLAB, GrADS
- **Research experience:** Modifying, running, and analyzing the Community Earth System Model (CESM) and the Weather Research and Forecasting Model (WRF); advanced geospatial techniques (objective analysis, methods in linear algebra); linear and nonlinear multivariate regression; multiobjective optimization; evolutionary algorithms

Last updated October, 2018