

# Baird Langenbrunner

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## CAREER AND EDUCATION

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### 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

## RESEARCH EXPERIENCE

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**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<sub>x</sub>) 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 hydrology over the Holocene (with Yongsong Huang)

## WORK IN PROGRESS

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Langenbrunner, B., M. S. Pritchard, and J. T. Randerson, 2018: Why does amazonian precipitation decrease in the plant physiological response to increased CO<sub>2</sub>? **In preparation.**

Swain, D., B. Langenbrunner, A. Hall, and J. D. Neelin, 2017: Increasing weather whiplash in 21st century California. **In review at Nature Climate Change.**

## PUBLISHED WORK

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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

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### Certificate in Teaching Excellence

In progress

UC Irvine Division of Teaching Excellence and Innovation

### Guest lecturer, UCLA

Fall 2016, Spring 2017

**AOS 112:** Climate Change Assessment for undergraduates (course lead: J. David Neelin)

**AOS 209:** Climate Change Assessment for graduate students (course lead: J. David Neelin)

Developed interactive Python scripts; taught upper-level undergraduates and graduate students how to analyze climate model data using a hierarchy of open-source software (five total lectures)

### 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

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UC Irvine Department of Earth System Science Seminar, Irvine, CA.

March 2017

NOAA Geophysical Fluid Dynamics Laboratory Dynamics Seminar; Princeton University, Princeton, NJ.

June 2016

## SELECTED CONFERENCE PRESENTATIONS

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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 2<sup>nd</sup> 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

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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

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<b>Science advisor</b> , Berkeley, CA	Spring 2015–Present
<ul style="list-style-type: none"><li>• The Learning Design Group at UC Berkeley</li><li>• Advise and provide digestible climate data to curriculum specialists developing K–12 earth science lesson plans that adhere to Next Generation Science Standards; topics have included ocean circulation and precipitation/convection</li></ul>	
<b>SolarReserve</b> , Green Lunch Speaker Series (with Kathleen Schiro); Santa Monica, CA.	April 2017
<b>Climate change assembly</b> , Citizens of the World Mar Vista Charter School, CA	January 2017
<ul style="list-style-type: none"><li>• Prepared and taught hour-long climate change lesson to 100 3<sup>rd</sup> graders (with AOS outreach group)</li></ul>	
<b>Children's Water Education Festival</b> , UC Irvine	2012–2017
<ul style="list-style-type: none"><li>• Two-day event held at UC Irvine every spring; prepared and taught 30-minute lessons to 3<sup>rd</sup>–5<sup>th</sup> graders about water resources and climate change in the Los Angeles region</li></ul>	
<b>Math and Physical Sciences Council (MPSC)</b> , UCLA	2013–2015
<ul style="list-style-type: none"><li>• Part of the UCLA Graduate Student Association; represented the interests of STEM graduate students to the campus-wide Graduate Student Association; interacted with department representatives and attended Graduate Council meetings during the academic year; helped organize school-wide events for graduate students</li></ul>	
<b>AOS Chi Epsilon Pi</b> , UCLA	2011–2015
<ul style="list-style-type: none"><li>• Atmospheric and Oceanic Sciences graduate student organization; served as treasurer, student-faculty representative, outreach coordinator, and president through the course of five years</li></ul>	
<b>Explore your universe!</b> , UCLA	2011–2015
<ul style="list-style-type: none"><li>• Annual weekend event held in the fall at UCLA; helped organize and staff departmental participation; gave a talk on the California drought in 2014 (with Daniel Dauhajre)</li></ul>	
<b>Weather dance performance</b> , UCLA Center for the Art of Performance	October 2013
<ul style="list-style-type: none"><li>• Organized and gave an invited talk with other UCLA AOS graduate students about the climate system, followed by a question and answer session with audience</li></ul>	
<b>Aquarium of the Pacific Education Volunteer</b> , Long Beach, CA	October 2010–2011
<b>Sustainable Food Initiative (SuFI)</b> , Brown University	2005–2009

## PROFESSIONAL ACTIVITIES

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<ul style="list-style-type: none"><li>• Community Earth System Model (CESM) Tutorial</li></ul>	Summer 2015
National Center for Atmospheric Research (NCAR), Boulder, CO	
<ul style="list-style-type: none"><li>• American Meteorological Society (AMS) member</li></ul>	2012–Present
<ul style="list-style-type: none"><li>• American Geophysical Union (AGU) member</li></ul>	2008–Present
<ul style="list-style-type: none"><li>• Reviewer for <i>Journal of Climate</i>, <i>Climatic Change</i>, <i>Geophysical Research Letters</i>, <i>Journal of Atmospheric and Oceanic Technology</i>, <i>Nature</i></li></ul>	

## TECHNICAL SKILLS

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- **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)
- **Basic knowledge** of MATLAB, Fortran, 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 March, 2018*