Nicole Feldl

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Current position

Associate Professor, University of California, Santa Cruz

Research Interests

Climate dynamics • Polar amplification • Large-scale atmospheric circulations • Climate feedbacks and climate sensitivity • Games for learning

Positions

2022-present Associate Professor
Earth and Planetary Sciences
University of California, Santa Cruz

2016-2022 Assistant Professor
Earth and Planetary Sciences
University of California, Santa Cruz

2015-2016 National Science Foundation Postdoctoral Research Fellow
Environmental Science and Engineering
California Institute of Technology

2013-2015 Foster and Coco Stanback Postdoctoral Scholar
Environmental Science and Engineering
California Institute of Technology
HOST: Simona Bordoni

2007-2013 Graduate Research Assistant
Atmospheric Sciences
University of Washington

2005-2007 Project Engineer
UNAVCO, a non-profit university-governed consortium,
facilitates geoscience research and education using geodesy

2002-2005 Graduate Research Assistant
Geological Sciences
University of Colorado, Boulder

Visiting Appointments

2023-2024 Princeton University and the NOAA Geophysical Fluid Dynamics Laboratory, October–March.

Education

2013 PhD in Atmospheric Sciences
University of Washington
advisor: Gerard Roe

2005 MS in Geological Sciences
University of Colorado
advisor: Roger Bilham

2002 BS in Geological Sciences *summa cum laude*
University of North Carolina at Chapel Hill

Honors & Awards

2025 Shared Equity Leadership Fellow, UC Santa Cruz

2023 Visiting Research Scholar, Princeton University and the NOAA Geophysical Fluid Dynamics Laboratory

2018 NSF CAREER Award

2015 NSF Postdoctoral Research Fellowship

2013 Foster and Coco Stanback Postdoctoral Fellowship

2012 Washington NASA Space Grant Consortium Graduate Fellowship

2011 Outstanding Poster Presentation, World Climate Research Programme Open Science Conference, Denver

2009 Advanced Climate Dynamics Course participant, Bergen, Norway

2007 Achievement Rewards for College Scientists (ARCS) Fellowship, Seattle Chapter

2005 Outstanding Geoscience Student Award, Association for Women Geoscientists, Denver Chapter

2004 Longley, Warner, and Wahlstrom Award, University of Colorado

2002 Op White Prize in Geology, University of North Carolina at Chapel Hill

Grants

UCSC Total: $4.78 million, including $1.64 million as PI and $3.13 million as Co-PI.

2025-present Co-PI, NSF, CAIG: Stability and Physical Consistency of AI-based Climate Emulators for Estimating Forced Responses, RISE-2425667 (PI: Ashesh Chattopadhyay). $898,642

2024-present Co-PI, NSF, EAGER: Pedogenic Carbonates Record Insolation Driven Surface Melting in Antarctica, OPP-2423761 (PI: Terrence Blackburn). $299,055

2023-present PI, NSF, Collaborative Research: Identifying Model Biases in Poleward Heat Transport: Atmosphere-Ocean Partitioning, Trends over the Historical Period and Sub-Seasonal Variability, AGS-2311541. $71,477

2022-present Lead PI, DOE, Extreme Moist Transport Events as a Driver of Arctic Amplification, DE-SC0023070. $774,367

2018-2024 PI, NSF, CAREER: The Lapse Rate Feedback and Other Mechanisms of High-Latitude Climate Change, AGS-1753034. $798,235

2019-2022 Co-PI, NSF, REU: The Lamat Summer Research Program on High Performance Computing in Astrophysics, AST-1852393. $388,081

2018-2021 Co-PI, NSF, MRI: Acquisition of a High Performance Computer for Computational Science at UC Santa Cruz, AST-1828315. $1,547,000

2015-2016 PI, NSF, PRF: Coupling Between Regional Climate Feedbacks and Large-scale Circulation in a Hierarchy of Models, AGS-1524569. $86,000

Publications

Journal Articles

Advisees are underlined. H-index 19, cumulative citations 1756 (Google Scholar, October 2024).

37 Audette, A., **N. Feldl**, H. Singh, K. Heyblom, and H. Wang (2024), Numerical water tracers enabled in the atmospheric component of the Energy Exascale Earth System Model, in preparation.

36 England, M. R., **N. Feldl**, and I. Eisenman (2024), Sea ice perturbations in aquaplanet simulations: Isolating the physical climate responses from model interventions, *Environmental Research: Climate*, 3, 045031, doi:10.1088/2752-5295/ad9b45.

35 Lee, Y.-C., W. Liu, A. Federov, **N. Feldl**, and P. C. Taylor (2024), Impacts of Atlantic meridional overturning circulation weakening on Arctic amplification, *Proceedings of the National Academy of Sciences*, 121(39), doi:10.1073/pnas.2402322121.

34 Chung, P.-C., and **N. Feldl** (2024), Sea ice loss, water vapor increases, and their interactions with atmospheric energy transport in driving seasonal polar amplification, *Journal of Climate*, 37, 2713–2725, doi:10.1175/JCLI-D-23-0219.1.

33 Bonan, D. B., **N. Feldl**, N. Siler, J. E. Kay, K. C. Armour, I. Eisenman, and G. H. Roe (2024), The influence of climate feedbacks on regional hydrological changes under global warming, *Geophysical Research Letters*, 51, e2023GL106648, doi:10.1029/2023GL106648.

32 England, M. R., and **N. Feldl** (2024), Robust polar amplification in ice-free climates relies on ocean heat transport and cloud radiative effects, *Journal of Climate*, 37, 2179–2197, doi:10.1175/JCLI-D-23-0151.1.

31 Kaufman, Z. S., **N. Feldl**, and C. Beaulieu (2024), Warm Arctic-Cold Eurasia pattern driven by atmospheric blocking in models and observations, *Environmental Research: Climate*, 3(1), 015006, doi:10.1088/2752-5295/ad1f40.

30 **Feldl, N.**, and T. M. Merlis (2023), A semi-analytical model for water vapor, temperature, and surface-albedo feedbacks in comprehensive climate models, *Geophysical Research Letters*, 50, e2023GL105796, doi:10.1029/2023GL105796.

29 Linke, O., **N. Feldl**, and J. Quaas (2023), Current-climate sea ice amount and seasonality as constraints for future Arctic amplification, *Environmental Research: Climate*, 2(4), 045003, doi:10.1088/2752-5295/acf4b7.

28 Bonan, D. B., **N. Feldl**, M. D. Zelinka, and L. C. Hahn (2023), Contributions to regional precipitation change and its polar-amplified pattern under warming, *Environmental Research: Climate*, 2(3), 035010, doi:10.1088/2752-5295/ace27a.

27 Merlis, T. M., **N. Feldl**, and R. Caballero (2022), Changes in poleward atmospheric energy transport

over a wide range of climates: Energetic and diffusive perspectives and a priori theories, *Journal of Climate*, 35(20), 2933–2948, doi:10.1175/JCLI-D-21-0682.1.

26 Santer, B. D., S. Po-Chedley, **N. Feldl**, J. C. Fyfe, Q. Fu, S. Solomon, M. England, K. B. Rodgers, M. F. Stuecker, C. Mears, C.-Z. Zou, C. J. W. Bonfils, G. Pallotta, M. D. Zelinka, N. Rosenbloom, J. Edwards (2022), Robust anthropogenic signal identified in the seasonal cycle of tropospheric temperature, *Journal of Climate*, 35(18), 6075–6100, doi:10.1175/JCLI-D-21-0766.1.

25 Singh, H., **N. Feldl**, J. E. Kay, and A. L. Morrison (2022), Climate sensitivity is sensitive to changes in ocean heat transport, *Journal of Climate*, 35(9), 2653–2674, doi:10.1175/JCLI-D-21-0674.1.

24 Kaufman, Z. S., and **N. Feldl** (2022), Causes of the Arctic's lower-tropospheric warming structure, *Journal of Climate*, 35(6), 1983–2002, doi:10.1175/JCLI-D-21-0298.1.

23 Taylor, P. C., R. C. Boeke, L. N. Boisvert, **N. Feldl**, M. Henry, Y. Huang, P. L. Langen, W. Liu, F. Pithan, S. A. Sejas, and I. Tan (2022), Process drivers, inter-model spread, and the path forward: A review of amplified Arctic warming, *Frontiers in Earth Science*, 9:758361, doi:10.3389/feart.2021.758361.

22 **Feldl**, **N.**, and T. M. Merlis (2021), Polar amplification in idealized climates: The role of ice, moisture, and seasons, *Geophysical Research Letters*, 48, e2021GL094130, doi:10.1029/2021GL094130.

21 **Feldl**, **N.**, S. Po-Chedley, H. K. A Singh, S. Hay, and P. J. Kushner (2020), Sea ice and atmospheric circulation shape the high-latitude lapse rate feedback, *npj Climate and Atmospheric Science*, 3, 41, doi:10.1038/s41612-020-00146-7.

20 Kaufman, Z. S., **N. Feldl**, W. Weijer, and M. Veneziani (2020), Causal interactions between Southern Ocean polynyas and high-latitude atmosphere-ocean variability, *Journal of Climate*, 33, 4891–4905, doi:10.1175/JCLI-D-19-0525.1.

19 Siler, N., G. H. Roe, K. C. Armour, and **N. Feldl** (2019), Revisiting the surface-energy-flux perspective on the sensitivity of global precipitation to climate change, *Climate Dynamics*, 52, doi:10.1007/s00382-018-4359-0.

18 Bonan, D. B., K. C. Armour, G. H. Roe, N. Siler, and **N. Feldl** (2018), Sources of uncertainty in the meridional pattern of climate change, *Geophysical Research Letters*, 45, doi:10.1029/2018GL079429.

17 Kim, D., S. M. Kang, Y. Shin, and **N. Feldl** (2018), Sensitivity of polar amplification to varying insolation conditions, *Journal of Climate*, 31, 4933–4947, doi:10.1175/JCLI-D-17-0627.1.

16 Anderson, B. T., **N. Feldl**, and B. R. Lintner (2018), Emergent behavior of Arctic precipitation in response to enhanced Arctic warming, *Journal of Geophysical Research: Atmospheres*, 123, doi:10.1002/2017JD026799.

15 **Feldl**, **N.**, B. T. Anderson, and S. Bordoni (2017), Atmospheric eddies mediate lapse rate feedback and Arctic amplification, *Journal of Climate*, 30, 9213–9224, doi:10.1175/JCLI-D-16-0706.1.

14 **Feldl**, **N.**, S. Bordoni, and T. M. Merlis (2017), Coupled high-latitude climate feedbacks and their impact on atmospheric heat transport, *Journal of Climate*, 30, 189–201, doi:10.1175/JCLI-D-16-0324.1.

13 Yang, J., J. Leconte, E. T. Wolf, C. Goldblatt, **N. Feldl**, T. Merlis, Y. Wang, D. D. B. Koll, F. Ding, F. Forget, and D. S. Abbot (2016), Differences in water vapor radiative transfer among 1D models can significantly affect the inner edge of the habitable zone, *The Astrophysical Journal*, 826, doi:10.3847/0004-637X/826/2/222.

12 **Feldl**, **N.**, and S. Bordoni (2016), Characterizing the Hadley Circulation response through regional climate feedbacks, *Journal of Climate*, 29, 613–622, doi:10.1175/JCLI-D-15-0424.1.

11 Roe, G. H., **N. Feldl**, K. C. Armour, Y.-T. Hwang, and D. M. W. Frierson (2015), The remote impacts of climate feedbacks on regional climate predictability, *Nature Geoscience*, 8, 135–139, doi:10.1038/ngeo2346.

10 Feldl, N., D. M. W. Frierson, and G. H. Roe (2014), The influence of regional feedbacks on circula-

tion sensitivity, *Geophysical Research Letters*, 41, 2212–2220.

9 Rose, B. E. J., K. C. Armour, D. S. Battisti, **N. Feldl**, and D. D. B. Koll (2014), The dependence of transient climate sensitivity and radiative feedbacks on the spatial pattern of ocean heat uptake, *Geophysical Research Letters*, 41, doi:10.1002/2013GL058955.

8 **Feldl**, **N.**, and G. H. Roe (2013), Four perspectives on climate feedbacks, *Geophysical Research Letters*, 40, doi:10.1002/grl.50711.

7 **Feldl**, **N.**, and G. H. Roe (2013), The nonlinear and nonlocal nature of climate feedbacks, *Journal of Climate*, 26, 8289–8304, doi:10.1175/JCLI-D-12-00631.1.

6 **Feldl**, **N.**, and G. H. Roe (2011), Climate variability and the shape of daily precipitation: A case study of ENSO and the American West, *Journal of Climate*, 24, 2483–2499.

5 **Feldl**, **N.**, and G. H. Roe (2010), Synoptic weather patterns associated with intense ENSO rainfall in the southwest United States, *Geophysical Research Letters*, 37.

4 **Feldl**, **N.**, and R. Bilham (2006), Great Himalayan earthquakes and the Tibetan Plateau, *Nature*, 444, 165–170.

3 Bilham, R., E. R. Engdahl, **N. Feldl**, and S. P. Satyabala (2005), Partial and complete rupture of the Indo-Andaman plate boundary 1847-2004, *Seismological Research Letters*, 76, 299–311.

2 Hough, S. E., R. Bilham, N. Ambraseys, and **N. Feldl** (2005), The 1905 Kangra and Dehra Dun earthquakes, *Geological Survey of India Special Publications*, 85, 15–22.

1 Hough, S. E., R. Bilham, N. Ambraseys, and **N. Feldl** (2005), Revisiting the 1897 Shillong and 1905 Kangra earthquakes in northern India: Site response, Moho reflections and a triggered earthquake, *Current Science*, 88, 1632–1638.

Professional Activities

Activities and Memberships in Professional Associations

2024 Member of Organizing Committee, Polar Amplification Model Intercomparison Project (PAMIP) Workshop, October 2024.

2023-present Member Representative to the University Corporation for Atmospheric Research (UCAR).

2023-2024 Co-Chair of Scientific Organizing Committee, Workshop on Polar Amplification of Climate Change across Hemispheres and Seasons, Boulder, Colorado, January 2024.

2023 Lead, Application for UC Santa Cruz to join the University Corporation for Atmospheric Research (UCAR) as a new member.

2022 Session Chair, Idealized Model Approaches to the Atmosphere and Ocean Circulation, AMS Conference on Atmospheric and Oceanic Fluid Dynamics, Breckenridge.

2018-2021 Co-Lead Designer, *Warmer*, a web-based game designed to teach middle and high school students about the feedbacks and forcings that govern global climate change.

2014-present Member, American Meteorological Society

2004-present Member, American Geophysical Union

Editor

Guest Editor, Focus on Arctic Amplification collection, *Environmental Research: Climate*.

Reviewer

Journals

Geophysical Research Letters, Journal of Climate, Journal of Geophysical Research: Atmospheres, Nature Geoscience, Environmental Research: Climate, Nature Communications, npj Climate and Atmospheric Science, Earth's Future, Proceedings of the National Academy of Sciences, Science Advances, Journal of Advances in Modeling Earth Systems, Climate Dynamics.

Funding Agencies

National Science Foundation (ad hoc and panel), National Oceanic and Atmospheric Administration.

Invited Presentations

2024 University of Michigan, Climate and Space Sciences and Engineering Seminar, September 2024.

2024 ECS and Cloud Feedback Virtual Symposium, March 2024.

2024 Lamont-Doherty Earth Observatory, Ocean and Climate Physics Seminar, February 2024.

2024 Yale University, Atmosphere, Ocean, and Climate Dynamics Seminar, January 2024.

2023 Johns Hopkins University, Bromery Seminar, October 2023.

2023 IARPC (Interagency Arctic Research Policy Committee), Modelers Community of Practice Webinar, April 2023.

2022 Princeton Center for Theoretical Science, From Spectroscopy to Climate Workshop, August 2022.

2022 Stormtracks 2022 Workshop, Olèron Island, France, June 2022.

2022 University of California, Los Angeles, Atmospheric and Oceanic Sciences Seminar, April 2022.

2022 Stanford University, Earth System Science Seminar, March 2022.

2022 University of Trento (Italy), Weather and Climate: From Fundamentals to Applications Seminar, March 2022.

2021 PAMIP (Polar Amplification Model Intercomparison Project) Webinar, December 2021.

2021 ECS and Cloud Feedback Virtual Symposium, July 2021.

2021 DOE RGMA Program, High-Latitude Processes and Feedbacks Webinar, June 2021.

2021 University of California, Irvine, Earth System Science Seminar, May 2021.

2021 University of Chicago, Geophysical Sciences Seminar, May 2021.

2021 George Mason University, Climate Dynamics Seminar, April 2021.

2021 Leipzig University (Germany), Graduate School for Clouds, Aerosols and Radiation, Advanced Training Module: The Lapse-rate feedback in the Arctic, March 2021.

2021 McGill University (Canada), Atmospheric and Oceanic Sciences Seminar, February 2021.

2021 University of California, Riverside, Hewett Club Lecture, February 2021.

2021 University of California, Los Angeles, Atmospheric Dynamics Seminar, January 2021.

2020 Stanford University, Atmosphere, Ocean, and Climate Dynamics Seminar, November 2020.

2020 Scripps Institution of Oceanography, Climate Journal Club, October 2020.

2020 National Taiwan University (Taiwan), postponed due to COVID-19 pandemic.

2020 University of Toronto (Canada), Noble Seminar in Atmospheric Physics, March 2020.

2018 DOE RGMA Program, High-Latitude Processes and Feedbacks Webinar, February 2018.

2017 Lawrence Livermore National Laboratory, Climate and Weather Seminar, November 2017.

2017 San Jose State University, Geology Club Seminar, October 2017.

2017 University of California, Santa Cruz, Geophysical and Astrophysical Fluid Dynamics Seminar, May 2017.

2015 MIT, Atmospheric Science Seminar, Cambridge, November 2015.

2015 University of Rochester, Earth and Environmental Sciences Seminar, April 2015.

2015 University of California, Santa Cruz, Earth and Planetary Sciences Seminar, March 2015.

2015 Boston University, Earth and Environment Department Seminar, February 2015.

2015 Colorado College, Environmental Program Seminar, January 2015.

2014 Portland State University, Geography Seminar, November 2014.

2014 University of California, Berkeley, Earth and Planetary Science Seminar, March 2014.

2014 Caltech, Environmental Science and Engineering Seminar, February 2014.

2013 University of Washington, Atmospheric Sciences Colloquium, June 2013.

2013 NCAR, CESM Climate Variability and Change Working Group Meeting, March 2013.

2010 University of Washington, Atmospheric and Climate Dynamics Seminar, January 2010.

University Service

Member, Graduate Student Awards Committee, 2024–2025, 2023–2024

Coordinator, Whole Earth Seminar Series, Winter 2025, Fall 2017

Member, Graduate Admissions Committee, 2022–2023, 2021–2022, 2020–2021, 2019–2020

Member, Thesis Committee: Mason Leandro (PhD 2023), Carver Bierson (PhD 2020), John O'Brien (PhD 2019)

Member, Faculty Search Committee for Astronomy and Astrophysics, 2017–2018

Member, Faculty Search Committee for Fresh Water, 2016–2017

Advising

Postdoctoral Scholars

2024-present Weiming Ma (Pacific Northwest National Laboratory, co-advised by Hailong Wang)

2023-present Alexandre Audette

2021-2023 Mark England - now Royal Commission for the Exhibition of 1851 Research Fellow at the University of Exeter

PhD Students

2024-present Parke Funderburk

2020-present Po-Chun Chung

2017-2022 Zachary Kaufman (NSF Graduate Research Fellow) - now postdoc at Stanford University

MS Students

2021-2024 Hayes Devaney (Cota-Robles Fellow)

Undergraduate Researchers

Benjamin Theunissen (2023; NOAA Hollings Scholar), Henry Olling (2023–2024), Emiliia Dyrenkova (2020–2021; Lamat Fellow), Omar Rosales Cortez (2019), Ricky Calzada (2018–2019), Flor Vanessa Maciel (2018–2019; Koret Scholar)

Graduate Game Designers

co-advised with Elizabeth Swensen

Devi Acharya (2021)

Undergraduate Game Designers

co-advised with Elizabeth Swensen

Dallas Truong (2020), Janel Catajoy (2019–2020), Xueer Zhu (2019–2020), Amber Sargeant (2019–2020), Sean Song (2018–2020), Tiffany Phan (2018–2020), Joshua Husting (2018–2019), Alexandria McGill (2018–2019), Emily Rodriguez (2018–2019)

Teaching

University of California, Santa Cruz

Introduction to Weather and Climate (EART 12; lower division)

Winter 2023, Winter 2022, Winter 2021, Fall 2019, Winter 2019, Winter 2018, Fall 2016

The Atmosphere (EART 121; upper division)

Fall 2022, Fall 2020, Fall 2018

Modeling Earth's Climate (EART 124; upper division)

Spring 2024, Winter 2023, Spring 2022, Spring 2021, Spring 2020, Spring 2018

Hydroclimatology (EART 252; graduate)

Fall 2021 (with Margaret Zimmer), Winter 2020 (with Margaret Zimmer)

Topics in Atmospheric Science (EART 290M; graduate)

Fall 2017 (with Noah Finnegan), Spring 2017

University of Washington

Introduction to Weather (ATMS 101; lower division), Summer 2011

Teaching Assistantships

Climate and Climate Change (ATMS 211), University of Washington, Spring 2010

Earth System and Climate (ESS 201), University of Washington, Winter 2009

Introduction to Geology (GEOL 1030), University of Colorado, Spring 2003

Introduction to Geology (GEOL 1030), University of Colorado, Fall 2002