

David B. Bonan

Research Interests

Climate dynamics, including sea ice, polar climate, climate feedbacks, the hydrological cycle, energetic processes in the land, oceans, and atmosphere, and large-scale circulations of atmosphere and oceans

Education

- 2021 – now **Ph.D., Environmental Science and Engineering**
California Institute of Technology Pasadena, CA
Advisors: Tapio Schneider & Andrew Thompson
Dissertation: Transient and equilibrium responses of Earth's climate to greenhouse-gas forcing
- 2019 – 2021 **M.S., Environmental Science and Engineering**
California Institute of Technology Pasadena, CA
Advisors: Tapio Schneider & Andrew Thompson
- 2015 – 2019 **B.S., Atmospheric Sciences | Minor, Applied Mathematics | College Honors**
University of Washington Seattle, WA
Advisors: Kyle Armour & Gerard Roe

Appointments & Experience

- 2023 **Visiting Researcher**
Earth and Planetary Science, University of California, Berkeley Berkeley, CA
Host: William Boos
- 2022 **Visiting Researcher**
Bjerknes Centre for Climate Research, University of Bergen Bergen, NO
Hosts: Marius Årthun, Lea Svendsen
- 2019 – now **Graduate Research Assistant**
Environmental Science and Engineering, California Institute of Technology Pasadena, CA
- 2018 **Ernest F. Hollings Scholar**
Geophysical Fluid Dynamics Laboratory, National Oceanic and Atmospheric Administration Princeton, NJ
- 2017 – 2019 **Mary Gates Research Fellow**
Department of Atmospheric Sciences, University of Washington Seattle, WA
- 2017 – 2018 **Undergraduate Research Assistant**
Department of Earth and Space Sciences, University of Washington Seattle, WA
- 2016 – 2018 **Undergraduate Research Assistant**
Department of Atmospheric Sciences, University of Washington Seattle, WA
- 2016 – 2019 **Assistant**
Program on Climate Change, University of Washington Seattle, WA
- 2016 – 2017 **Illustrator**
American Alpine Club Golden, CO
- 2014 – now **Freelance Artist**
Self Employed Boulder, CO

Honors, Awards, & Fellowships

- 2022 The Nansen Legacy Research Fellowship
2022 Advanced Climate Dynamics Course Participant in Rondane, Norway
2022 CalGFD Student Presentation Award
2021 – 2024 National Science Fellowship Graduate Research Fellowship
2019 – 2020 American Meteorological Society Graduate Fellowship

- 2019 – 2020 California Institute of Technology Graduate Fellowship
- 2019 AGU Editors' Highlight: "Sources of uncertainty in the meridional pattern of climate change"
- 2018 Mary Gates Research Scholarship
- 2018 American Meteorological Society Senior Named Scholarship
- 2018 American Alpine Club Research Grant
- 2017 Mary Gates Research Scholarship
- 2017 – 2019 National Oceanic and Atmospheric Administration Ernest F. Hollings Scholarship
- 2015 – 2019 CenturyLink Scholarship
- 2015 Premier Members Credit Union Scholarship

Publications

Peer-Reviewed

2023

13. Siler, N., **D.B. Bonan**, and A. Donohoe (2023): Diagnosing mechanisms of hydrologic change under global warming in the CESM1 Large Ensemble. *Journal of Climate*, 36 (23), 8243-8257. doi: 10.1175/JCLI-D-23-0086.1
12. Dörr, J., **D.B. Bonan**, M. Årthun, L. Svendsen, and R.C.J. Wills (2023): Forced and internal components of observed Arctic sea-ice changes. *The Cryosphere*, 17 (9), 4133-4153. doi: 10.5194/TC-17-4133-2023
11. Wilson, E.A., **D.B. Bonan**, A.F. Thompson, N. Armstrong, and S.C. Riser (2023): Mechanisms for abrupt summertime circumpolar surface warming in the Southern Ocean. *Journal of Climate*, 36 (20), 7025-7039. doi: 10.1175/JCLI-D-22-0501.1
10. **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
9. **Bonan, D.B.**, N. Siler, G.H. Roe, and K.C. Armour (2023): Energetic constraints on the pattern of changes to the hydrological cycle under global warming. *Journal of Climate*, 36 (10), 3499-3522. doi: 10.1175/JCLI-D-22-0337.1

2022

8. **Bonan, D.B.**, A.F. Thompson, E.R. Newsom, S. Sun, and M. Rugenstein (2022): Transient and equilibrium responses of the Atlantic overturning circulation to warming in coupled climate models: the role of temperature and salinity. *Journal of Climate*, 35 (15), 5173-5193. doi: 10.1175/JCLI-D-21-0912.1

2021

7. **Bonan, D.B.**, T. Schneider, I. Eisenman, and R.C.J. Wills (2021): Constraining the date of a seasonally ice-free Arctic using a simple model. *Geophysical Research Letters*, 48 (18), e2021GL094309. doi: 10.1029/2021GL094309
6. **Bonan, D.B.**, F. Lehner, and M.M. Holland (2021): Partitioning uncertainty in projections of Arctic sea ice. *Environmental Research Letters*, 16 (4), 044002. doi: 10.1088/1748-9326/ABE0EC

2020

5. Bushuk, M., M. Winton, **D.B. Bonan**, E. Blanchard-Wrigglesworth, and T. Delworth (2020): A mechanism for the Arctic sea ice spring predictability barrier. *Geophysical Research Letters*, 47 (13), e2020GL088335. doi: 10.1029/2020GL088335
4. **Bonan, D.B.** and E. Blanchard-Wrigglesworth (2020): Nonstationary teleconnection between the Pacific Ocean and Arctic sea ice. *Geophysical Research Letters*, 47 (2), e2019GL085666. doi: 10.1029/2019GL085666

2019

3. **Bonan, D.B.**, J.E. Christian, and K. Christianson (2019): Influence of North Atlantic climate variability on glacier mass balance in Norway, Sweden and Svalbard. *Journal of Glaciology*, 65 (252), 580-594. doi: 10.1017/JOG.2019.35
2. **Bonan, D.B.**, M. Bushuk, and M. Winton (2019): A spring barrier for regional predictions of summer Arctic sea ice. *Geophysical Research Letters*, 46 (11), 5937-5947. doi: 10.1029/2019GL082947

2018

1. **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 (17), 9131-9140. doi: 10.1029/2018GL079429

Submitted

- **Bonan, D.B.**, J. Dörr, R.C.J. Wills, A.F. Thompson, and M. Årthun: Sources of low-frequency variability in observed Antarctic sea ice. *The Cryosphere*.
- Dong, Y., L.M. Polvani, and **D.B. Bonan**: Recent multi-decadal Southern Ocean surface cooling unlikely caused by Southern Annular Mode trends. *Geophysical Research Letters*.

- **Bonan, D.B.**, N. Feldl, N. Siler, J.E. Kay, K.C. Armour, I. Eisenman, and G.H. Roe: The influence of climate feedbacks on regional hydrological changes under global warming. *Geophysical Research Letters*.

Selected Presentations

Invited Seminars & Colloquia

- Energetic perspectives on the response of the hydrological cycle to warming. Atmospheric & Climate Dynamics Seminar, University of Washington, Seattle, Washington, November 2023
- Energetic constraints on regional hydrological changes under global warming. Climate Analysis Section, National Center for Atmospheric Research, Boulder, Colorado, March 2023
- Forced and internal components of observed Arctic and Antarctic sea-ice changes. Paleo and Polar Climate Section, National Center for Atmospheric Research, Boulder, Colorado, March 2023
- Investigating the response of the hydrological cycle to global warming in idealized models. Bjerknes Centre for Climate Research Seminar, University of Bergen, Bergen, Norway, October 2022
- Transient and equilibrium responses of the Atlantic overturning circulation to warming. Physical Oceanography Seminar, University of Bergen, Bergen, Norway, September 2022
- Examining the response of the hydrological cycle to global warming in simple models. Physics of Oceans and Atmospheres Seminar, Oregon State University, Virtual, April 2022
- Insights into the climate response from a conceptual model of the ocean-atmosphere system. Large Scale Dynamics Series, Colorado State University, Fort Collins, Colorado, September 2021

Conferences & Workshops

- Constraints on future changes to the Atlantic meridional overturning circulation under warming. American Geophysical Union Fall Meeting, San Francisco, California, December 2023
- How radiative feedbacks shape the response of the hydrological cycle to global warming. American Geophysical Union Fall Meeting, Chicago, Illinois, December 2022
- Using observations and a simple model to constrain the date of a seasonally ice-free Arctic. American Geophysical Union Fall Meeting, Virtual, December 2021
- Transient and equilibrium responses of the AMOC to warming in coupled climate models. European Geophysical Union General Assembly, Virtual, April 2021.
- The role of internal variability and atmospheric teleconnections in determining Arctic sea ice loss. American Geophysical Union Fall Meeting, Virtual, December 2020 (invited)
- Mechanisms for an AMOC recovery: insights from millennial-length simulations in complex coupled climate models. American Geophysical Union Fall Meeting, Virtual, December 2020
- Partitioning uncertainty in projections of Arctic sea ice. Working Group on Large Ensembles, United States Climate Variability and Predictability Program, Virtual, October 2020 (invited)
- A spring barrier for regional predictions of summer Arctic sea ice. Ocean Sciences Meeting, San Diego, California, February 2020
- Is there a spring predictability barrier for Arctic sea ice? Conference on Polar Meteorology and Oceanography, Boulder, Colorado, May 2019

Poster

- Probing the fast and slow responses of temperature and precipitation to greenhouse-gas forcing. American Geophysical Union Fall Meeting, San Francisco, California, December 2023
- A conceptual model of the coupled ocean-atmosphere system. Conference on Polar Meteorology and Oceanography, Madison, Wisconsin, August 2022
- Partitioning and constraining uncertainty in projections of Arctic sea ice. Ocean Sciences Meeting, Virtual, February 2022 (invited)
- Energetic constraints on the pattern of changes to the hydrologic cycle under global warming. Cloud Feedback Model Intercomparison Project Meeting, Virtual, September 2021
- The role of radiative feedbacks in driving uncertainty in the meridional pattern of climate change. American Geophysical Union Fall Meeting, Washington, D.C., December 2018
- Sources of uncertainty in the meridional pattern of climate change. Program on Climate Change Symposium, University of Washington, Seattle, Washington, February 2018

Workshops & Courses

Workshops

- "The Pattern Effect: Coupling of SST Patterns, Radiative Feedbacks, and Climate Sensitivity". United States Climate Variability and Predictability Program. Boulder, Colorado, May 2022
- "CESM Polar Modeling Workshop", National Center for Atmospheric Research, Boulder, Colorado, August 2019
- "CESM Tutorial". National Center for Atmospheric Research, Boulder, Colorado, August 2019
- "Sources of Uncertainty in Long-term Climate Projections". Program on Climate Change Summer Institute, University of Washington, Friday Harbor, Washington, September 2018
- "Using Past Observations to Constrain Future Climate Variability and Change". Program on Climate Change Workshop, University of Washington, Seattle, Washington, February 2018
- "Annual West Antarctic Ice sheet Workshop". University of Washington, Coupeville, Washington, October 2017
- "The Climate of Antarctica and the Southern Ocean". Program on Climate Change Summer Institute, University of Washington, Friday Harbor, Washington, September 2016

Courses

- "Dynamics of the Global Water Cycle". Advanced Climate Dynamics Course, Rondane, Norway, September 2022

Teaching, Mentoring, & Advising

Teaching

- Spring 2023 Teaching Assistant, ESE 136: Climate Models, California Institute of Technology (Instr: Tapio Schneider, Lenka Novak)
- Fall 2021 Teaching Assistant, ESE 102: Earth's Oceans, California Institute of Technology (Instr: Andrew Thompson)
- Fall 2020 Teaching Assistant, ESE 101: Earth's Atmosphere, California Institute of Technology (Instr: Tapio Schneider)

Mentoring

- 2021 – now Mentor, Division of Geological and Planetary Sciences, California Institute of Technology
- 2020 – now Mentor, Graduate Student Mentorship Initiative (GSMI) – Científico Latino

Advising

- 2023 – now Sydney Vernon, Undergraduate Student, California Institute of Technology (co-advised with Tapio Schneider)
- 2022 – 2023 Manali Nayak, Undergraduate Student, Ohio State University (co-advised with Emily Newsom, Andy Thompson)

Service and Synergistic Activities & Leadership

Service and Synergistic Activities

Peer Reviewer: *Communications Earth & Environment*, *Nature Communications*, *Environmental Research: Climate*, *Journal of Advances in Modeling Earth Systems*, *Earth's Future*, *The Cryosphere*, *Geophysical Research Letters*, *Journal of Climate*, *Annals of Glaciology*, *Journal of Geophysical Research: Oceans*, *Climate Dynamics*

Session Organizer: 2022 AMS Conference on Polar Meteorology and Oceanography, 2021 AMS Conference on Polar Meteorology and Oceanography

Leadership

- 2021 – now Student Representative, American Meteorological Society (AMS) Committee on Polar Meteorology and Oceanography

Volunteering and Outreach & Writing

Volunteering and Outreach

- Design for a workshop titled "Confronting Earth System Model Trends with Observations: The Good, the Bad, and the Ugly", September 2023.
- Behind The Book with Gaia Vince – Nomad Century: "How Climate Migration Will Reshape Our World". Caltech Public Programming, Pasadena, California, November 2022.
- Design for a workshop titled "The Pattern Effect: Coupling of SST patterns, radiative feedbacks, and climate sensitivity", May 2022.
- Eliot Arts Magnet Academy Middle School Science, Technology, Engineering, Environment and Health Night, Altadena, California, January 2020.

- Climate Science Workshops for High School Science Teachers: “Does a few degrees of global warming matter?” Seattle, Washington, May 2019.
- University of Washington, College of the Environment Student Visit Day. Seattle, Washington, August 2017.

Writing

- The Future of Arctic sea ice. Polar Bears International. September 2021.
- Making the esoteric pertinent: a talk with Prof. Inez Fung. Program on Climate Change, University of Washington. March 2017.
- An emerging scientist explores the intersection of climate activism and science. Program on Climate Change, University of Washington. September 2016.

Professional Memberships

American Geophysical Union (AGU), American Meteorological Society (AMS), European Geophysical Union (EGU)