

SOPHIA MACAREWICH

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EDUCATION

University of Michigan **2016 – 2021**
Ph.D., Earth and Environmental Sciences *Ann Arbor, MI*

University of California, Santa Barbara **2012 – 2016**
B.S., Physical Geography and Environmental Studies *Santa Barbara, CA*

RESEARCH INTERESTS

- Paleoclimate
- Earth system modeling
- Extreme rainfall events
- Vegetation-atmosphere interactions
- Climate variability and change
- Water isotopes

RESEARCH EXPERIENCE

NSF National Center for Atmospheric Research, Climate & Global Dynamics Lab **Jan 2023 – present**
Project Scientist I *Remote*

- Projects: Simulation of past and present hydroclimate change using water isotopes; Simulation of ecosystem dynamics under past extreme climate states

University of California, Davis, Dept. Earth & Planetary Sciences **Feb 2022 – Dec 2022**
Postdoctoral Research Fellow *Davis, CA*

- Project: Simulation of western U.S. hydroclimate during the last deglaciation

University of Michigan, Dept. Earth & Environmental Sciences **Sep 2016 – Dec 2021**
Graduate Student Research Assistant *Ann Arbor, MI*

- Projects: Simulation of ocean circulation and temperature during the Late Paleozoic Ice Age; Reconstruction of vegetation-climate interactions in Earth's past

University of California, Santa Barbara, Earth Research Institute **Sep 2014 – Jun 2016**
Student Researcher *Santa Barbara, CA*

- Projects: Ocean circulation and ecology in the Santa Barbara Channel; Extreme downslope wind and warming events in Santa Barbara

University of California, Santa Barbara, Marine Science Institute **Mar 2013 – Feb 2015**
Student Researcher *Santa Barbara, CA*

- Projects: Captive spawning of endangered abalone for the NOAA fisheries White Abalone Recovery Plan

RESEARCH GRANTS

Heising-Simons Foundation **2024 – 2028**
Co-Principal Investigator | \$729,568 *University Corporation for Atmospheric Research*

- Award: paleoWeather, A new paradigm for examining extreme events in past climates

NSF Atmospheric & Geospace Sciences Postdoctoral Research Fellowship **2022 – 2023**
Principal Investigator | \$180,000 *University of California, Davis*

- Award: Hydroclimate Response of the Southwestern United States to Past and Future Atlantic Meridional Overturning Circulation Weakening

HONORS AND AWARDS

- NSF Atmospheric & Geospace Sciences Postdoctoral Research Fellowship | UC Davis | 2022
- Michigan Institute for Computational Discovery and Engineering Fellowship (Honorable Mention) | UMich | 2018
- Rackham Merit Fellowship | UMich | 2016
- Jack and Laura Dangermond Undergraduate Scholarship | UC Santa Barbara | 2015
- Undergraduate Research and Creative Activities Slam (1st Place) | UC Santa Barbara | 2015

9. Sun, C., Otto-Bliesner, B.L., Zhu, J., Brady, E.C., **Macarewich, S.I.** (in review). Collapsed Atlantic Meridional Overturning Circulation during Heinrich Stadials triggered by Cordilleran Ice Sheet Meltwater. *Science Advances*.
8. Oster, J.L., **Macarewich, S.I.**, Lofverstrom, M., de Wet, C., Montañez, I.P., Lora, J.M., Skinner, C.B., Tabor, C. (2023). North Atlantic meltwater during Heinrich Events drives wetter climate with more atmospheric rivers in western North America. *Science Advances*. DOI: <https://www.science.org/doi/10.1126/sciadv.adj2225>
7. Matthaeus, W.J., **Macarewich, S.I.**, Richey, J.D., Montañez, I.P., McElwain, J.C., White, J.D., Wilson, J.P., Poulsen, C.J. (2023). A Systems Approach to Understanding How Plants Transformed Earth's Environment in Deep Time. *Annual Review of Earth and Planetary Sciences*. DOI: <https://doi.org/10.1146/annurev-earth-080222-082017>
6. **Macarewich, S.I.** and Poulsen, C.J. (2022). Glacial-interglacial controls on ocean circulation and temperature during the Permo-Carboniferous. *Paleoceanography and Paleoclimatology*. DOI: <https://doi.org/10.1029/2022PA004417>
5. Chen, J., Montañez, I.P., Zhang, S., Isson, T.T., **Macarewich, S.I.**, Planavsky, N.J., Zhang, F., Rauzi, S., Daviau, K., Yao, L., Qi, Y., Wang, Y., Poulsen, C.J., Fan, J., Anbar, A., Shen, S. Wang, X. (2022). Marine anoxia linked to abrupt global warming during Earth's penultimate icehouse. *Proceedings of the National Academy of Sciences*. DOI: <https://doi.org/10.1073/pnas.2115231119>
4. **Macarewich, S.I.**, Poulsen, C.J., and Montañez, I.P. (2021). Simulation of oxygen isotopes and circulation in a late Carboniferous epicontinental sea with implications for proxy records. *Earth and Planetary Science Letters*. DOI: <https://doi.org/10.1016/j.epsl.2021.116770>
3. Matthaeus, W.J., **Macarewich, S.I.**, Richey, J.D., Wilson, J.P., McElwain, J.C., Montañez, I.P., DiMichele, W.A., Hren, M.T., Poulsen, C.J., White, J.D. (2021). Freeze tolerance influenced forest cover and hydrology during the Pennsylvanian. *Proceedings of the National Academy of Sciences*. DOI: <https://doi.org/10.1073/pnas.2025227118>
2. White, J.D., Montañez, I.P., Wilson, J.P., Poulsen, C.J., McElwain, J.C., DiMichele, W.A., Hren, M.T., **Macarewich, S.I.**, Richey J., Matthaeus, W.J. (2020). Paleo-BGC to Simulate the Dynamic Response of Late Pennsylvanian Plants to Elevated O_2 And Aridification. *American Journal of Science*. DOI: <https://doi.org/10.2475/09.2020.01>
1. Richey, J.D., Montañez, I.P., White, J.D., DiMichele, W.A., Matthaeus, W.J., Poulsen, C.J., **Macarewich, S.I.**, Looy, C.V. (2020). Modeled physiological mechanisms for observed changes in the late Paleozoic plant fossil record. *Palaeogeography, Palaeoclimatology, Palaeoecology*. DOI: <https://doi.org/10.1016/j.palaeo.2020.110056>

INVITED PRESENTATIONS

- **Invited Speaker.** *Evaluating Water Isotope Tracers in the Variable-Resolution Community Earth System Model using USNIP (US Network for Isotopes in Precipitation)*, Water Isotope Systematics: Improving Modern and Paleoclimate Interpretations Session, AGU Fall Meeting. San Francisco, CA: December 2023.
- **Invited Speaker.** *Opportunities for Using Variable Resolution CESM in Paleoclimate Research*, Community Earth System Model (CESM) Winter Paleoclimate Working Group Meeting. Online: February 2023.
- **Invited Speaker.** *Uncertainty and complexity in paleoclimate simulations*, Paleoclimate Data Assimilation Workshop, University of Arizona. Tucson, AZ: October 2022.
- **Invited Speaker.** *Reconstructing a deep time Earth system: ocean dynamics and vegetation-climate interactions of the penultimate icehouse*, UC Davis, Dept. of Earth and Planetary Sciences seminar series. Davis, CA: May 2022.
- **Invited Speaker.** *Reconstructing a deep time Earth system: vegetation-climate dynamics of the penultimate icehouse*, UC Santa Barbara, Earth Research Institute, Climate Meetings. Online: February 2022.
- **Invited Speaker.** *Reconstructing a deep time Earth system: The penultimate icehouse* with Dr. Isabel Montañez, earth2earth: UK-wide geoscience seminar series. Online: April 2021.

Research Talks

- **Macarewich, S.I.**, Otto-Bliesner, B.L., Zhu, J., Brady, E., Feng, R., Tabor, C., Nusbaumer, J., Tierney, J., Walters, A., Lora, J., Sun, C., “Atmospheric river activity over the past 56 million years in an unprecedented set of high-resolution CESM simulations”. Climate evolution from early Eocene to mid-Pliocene, Univ. of Connecticut. August 2024.
- **Macarewich, S.I.**, Otto-Bliesner, B.L., Zhu, J., Brady, E., Feng, R., Tabor, C., Nusbaumer, J., Tierney, J., Walters, A., Lora, J., Sun, C., “Atmospheric river activity over the past 56 million years in an unprecedented set of high-resolution CESM simulations”. International Atmospheric River Conference, La Jolla, CA. June 2024.
- **Macarewich, S.I.**, Otto-Bliesner, B.L., Zhu, J., Brady, E., Feng, R., Tabor, C., Nusbaumer, J., Tierney, J., Walters, A., Lora, J., Sun, C., “Atmospheric river activity over the past 56 million years in an unprecedented set of high-resolution CESM simulations”. NCAR Community Earth System Model Workshop, Boulder, CO. June 2024.
- **Macarewich, S.I.**, Matthaues, W.J., Richey, J.D., Montañez, I.P., McElwain, J.C., White, J.D., Wilson, J.P., Poulsen, C.J., “A Systems Approach to Understanding How Plants Transformed Earth’s Environment in Deep Time”. NCAR Community Earth System Model Workshop, Boulder, CO. June 2023.
- **Macarewich, S.I.**, Poulsen, C.J., Matthaues, W.J., Richey, J.D., White, J.D., Montañez, I.P., DiMichele, W.A., Hren, M.T., McElwain, J.C., Wilson, J.P., “Ecosystem-to-Global Scale Modeling of Vegetation-Climate Feedbacks During the Late Paleozoic Ice Age with Fossil-Based Plant Functional Types”. Goldschmidt, Honolulu, HI. July 2022.
- **Macarewich, S.I.**, Chen, J., Montañez, I.P., Zhang, S., Isson, T.T., Planavsky, N.J., Zhang, F., Rauzi, S., Daviau, K., Yao, L., Qi, Y., Wang, Y., Poulsen, C.J., Fan, J., Anbar, A., Shen, S., Wang, X., “Ocean deoxygenation linked to abrupt global warming during the Earth’s penultimate icehouse”. National Center for Atmospheric Research (NCAR) Paleoclimate Working Group, Virtual. February 2021.
- **Macarewich, S.I.**, Matthaues, W.J., Richey, J.D., Poulsen, C.J., White, and J.D., Montañez, I.P., “Ecosystem-to-global scale modeling of vegetation-climate feedbacks during the Late Paleozoic Ice Age”. American Geophysical Union Fall Meeting, Virtual. December 2020.
- **Macarewich, S.I.** and Poulsen, C.J., “Controls on Permo-Carboniferous tropical climate in Pangaea: Insights from iCESM”. CLIVAR Water Isotopes and Climate Workshop, Boulder, CO. October 2019.
- **Macarewich, S.I.**, Poulsen, C.J., Montañez, I.P., “A new method for constraining seawater conditions in ancient epicontinental seas, with implications for oxygen isotope secular curves”. Community Earth System Model Workshop, Boulder, CO. June 2019.
- **Macarewich, S.I.**, Poulsen, C.J., Montañez, I.P., “Decoupling of ancient epicontinental sea and open ocean $\delta^{18}\text{O}$ in an isotope-enabled Earth system model”. European Geophysical Union, Vienna, Austria. June 2019.

Research Posters

- **Macarewich, S.I.**, Welker, J., Herrington, A.R., Nusbaumer, J., Dar, S., Fiorella, R., Zhu, J., Otto-Bliesner, B.L., Brady, E. “Evaluating Water Isotope Tracers in the Variable-Resolution Community Earth System Model using the USNIP (United States Network of Isotopes in Precipitation)”. CESM Workshop, Boulder, CO. June 2024.
- **Macarewich, S.I.**, Herrington, A.R., Nusbaumer, J., Otto-Bliesner, B.L., Brady, E. “Evaluating a Variable-Resolution Approach For Simulating Water Isotopes in the Continental United States Using VR-iCESM”. Geological Society of America Rocky Mountain Section Meeting, Fort Collins, CO. May 2023.
- **Macarewich, S.I.** and Poulsen, C.J., “Global Climate Simulations of Glacial-Interglacial Ocean Circulation and Temperature During the Permo-Carboniferous”. American Geophysical Union Fall Meeting, New Orleans, LA. December 2021.
- **Macarewich, S.I.**, Poulsen, C.J., Richey, J.D. and Montañez, I.P., “A Model-Based Evaluation of Permo-Carboniferous Climate Change in Tropical Pangaea”. American Geophysical Union Fall Meeting, San Francisco, CA. December 2019.
- **Macarewich, S.I.**, Poulsen, C.J., Montañez, I.P. and Griffis, N.P., “Decoupling of Late Paleozoic epicontinental sea and open ocean $\delta^{18}\text{O}$ in a fully coupled isotope-enabled Earth system model”. American Geophysical Union Fall Meeting, Washington, D.C. December 2018.

TECHNICAL SKILLS

Languages: Python, NCAR Command Language, Fortran, Matlab

Computational models: Community Earth System Model, Functionally Assembled Terrestrial Ecosystem Simulator, GENESIS Global Climate Model

TEACHING EXPERIENCE

- **Lecturer**, *Paleoclimate Applications with CESM: Past climates inform our future*, Community Earth System Model (CESM) Tutorial—National Center for Atmospheric Research. August 2024, July 2023.
- **Guest Lecturer**, *Deep-time Paleoclimates* with Dr. James Zachos, Department of Earth and Planetary Sciences—University of California, Santa Cruz. Winter 2020.
- **Graduate Student Instructor**, *Introduction to Environmental Science in the Rockies*, Department of Earth and Environmental Science—Camp Davis, University of Michigan. Summer 2017 and Summer 2018.

OUTREACH AND MENTORSHIP

Research

- Research mentor for Emily Nigro, a graduate student at Stanford University, in the NSF Significant Opportunities in Atmospheric Research and Science (SOARS) Program in Boulder, CO. April – August 2024.
- Captain Judge for Colorado-Wyoming Junior Academy of Science Symposium, Evaluated and provided feedback on independent research projects developed by high school students in Boulder, CO. April 2023.

Education

- Dana Hills High School Marine Ecology Field Course, Taught high school students about marine ecology field concepts in Baja California, May 2019.
- University of Michigan Earth Camp, Taught students from Detroit-area high schools meteorology concepts and facilitated a high-altitude weather balloon launches in Ypsilanti, MI and Jackson Hole, WY, June – July 2017.
- Great Lakes National Ocean Sciences Bowl, Served as a moderator for an academic competition where teams of high school students are tested on ocean and Great Lakes knowledge at the University of Michigan, February 2017.

Mental Health

- Graduate Modules on Mental Health, Developed course modules on mental health topics for the first-year graduate seminar in the Earth and Environmental Sciences at University of Michigan, October – November 2020.
- Meditation and Mindfulness CommuniTEA, Organize and lead biweekly meetings on meditation and mindfulness to advocate for mental wellness amongst early career scientists in the Earth and Environmental Sciences at University of Michigan, February – December 2020.

SERVICE

Committee Member

- Co-lead of Advocates for Early Career CGD Staff (ACES) in the National Center for Atmospheric Research (NCAR) Climate and Global Dynamics Lab. Online. March 2024–*Current*.
- NCAR Early Career Scientist Assembly. Online. March 2024–*Current*.
- NCAR Community Earth System Model (CESM) Tutorial. Boulder, CO. October 2023–*Current*.
- Paleoclimate Advances Webinar Series for the CESM Paleoclimate Working Group. Online. October 2023–*Current*.

Session Convener

- American Geophysical Union Fall Meeting: *Advances in Understanding the Causes, Mechanisms, and Impacts of Quaternary Abrupt Climate Changes and Their Implications for the Future*. San Francisco, CA. December 2023–2024.
- NCAR CESM Workshop: *(Ultra-)High Resolution and Regionally-Refined Modeling*. Boulder, CO. June 2023.
- CESM Paleoclimate Working Group Winter Meeting: *Vegetation Session*, Online. February 2023.
- American Geophysical Union Fall Meeting: *Phanerozoic climate through space and time: Approaches, advances, and challenges in reconstructing the evolution of Earth's climate*. New Orleans, LA. December 2021.

Reviewer

- For manuscripts published in *Palaeogeography*, *Palaeoclimatology*, *Palaeoecology*, *Geophysical Research Letters*, *Paleoceanography and Paleoclimatology*, *Proceedings of the National Academy of Sciences*, *Nature Communications*, *Climate Dynamics*, *EGUsphere*, and *Journal of Geophysical Research*