

Lauren Hoffman

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Research Interests

Polar science; sea ice; machine learning and explainable artificial intelligence; physical oceanography; air–sea–ice interactions; climate variability and predictability; AI-enabled approaches for polar observing applications.

Education

- Sep. 2023 **Ph.D., Chemical Engineering**, *University of California San Diego*, San Diego, CA
Jun. 2019 **M.S., Chemical Engineering**, *University of California San Diego*, San Diego, CA
May 2016 **B.A./B.S., Mechanical Engineering**, *University of San Diego*, San Diego, CA
Mathematics and Chemistry minors; Honors Program. Dean's List, First Honors.

Research Experience

- Jan. 2026–Present **Postdoctoral Researcher**, *University of California Santa Cruz*, Santa Cruz, CA, Advisor: Xavier Prochaska
- Characterizing density-based ocean fronts and associated submesoscale dynamics in high-resolution ocean model output.
 - Developing scalable analysis and visualization workflows for large ocean model datasets.
- Feb. 2024–Dec. 2025 **Postdoctoral Researcher**, *Université catholique de Louvain*, Louvain-la-Neuve, Belgium, Advisor: François Massonnet
- Developed machine learning and explainable AI approaches to predict and understand rapid Arctic sea ice loss events on seasonal to interannual timescales.
- Oct. 2023–Jan. 2024 **Postdoctoral Researcher**, *Scripps Institution of Oceanography, UC San Diego*, San Diego, CA, Advisor: Matt Mazloff
- Implemented components of an operational forecast system for sea-ice motion prediction using machine learning.
- Jun. 2019–Sep. 2023 **Graduate Researcher**, *Scripps Institution of Oceanography, UC San Diego*, San Diego, CA, Advisor: Matt Mazloff
- Investigated upper-ocean salinity response to atmospheric river events in the California Current System using observations and ocean model output.
 - Developed machine learning and explainable AI approaches to predict and understand Arctic sea-ice dynamics from remote sensing data.
- Sep. 2018–Mar. 2019 **Graduate Researcher**, *University of California San Diego*, San Diego, CA, Advisor: Andrea Tao
- Mar. 2018–Aug. 2018 **Research Assistant**, *University of San Diego*, San Diego, CA, Advisor: Truc Ngo
- Mar. 2015–Jun. 2017 **Undergraduate Research Assistant and Honors Thesis**, *University of San Diego*, San Diego, CA, Advisor: Truc Ngo

Industry Experience

- Jun. 2016–Jun. 2018 **Lead Engineer**, *Primo Wind, Inc.*, San Diego, CA
- Implemented design solutions for a small wind turbine system that improved power output and structural stability and optimized sustainability of materials and manufacturing.

Technical Expertise

- Programming Python; MATLAB; UNIX/Linux; LaTeX; BibTeX.
- Software/Tools TensorFlow/Keras; Git; Claude.
- Methods Machine learning; neural networks; explainable artificial intelligence; predictive modeling; data analysis; remote sensing; numerical modeling; scientific computing.
- Models MITgcm; LLC4320; CESM; CMIP6.
- Languages French, intermediate; Spanish, intermediate.

Publications

First-Author Publications

- In progress Hoffman, L., and F. Massonnet. eXplainable AI reveals sea surface temperature patterns associated with slowdowns in the decline of Arctic September sea ice extent in CESM2-LE.
- 2025 Hoffman, L., F. Massonnet, and A. Sticker. Probabilistic forecasts of September Arctic sea ice extent at the interannual timescale with data-driven statistical models. *Journal of Geophysical Research: Machine Learning and Computation*, 2, e2025JH000669. DOI: 10.1029/2025JH000669
- 2025 Hoffman, L., M. Mazloff, S.T. Gille, D. Giglio, and P. Heimbach. Evaluating the trustworthiness of explainable artificial intelligence (XAI) methods applied to regression predictions of Arctic sea-ice motion. *Artificial Intelligence for the Earth Systems*, 4, e240027. DOI: 10.1175/AIES-D-24-0027.1
- 2023 Hoffman, L., M. Mazloff, S.T. Gille, D. Giglio, P. Heimbach, C. Bitz, and K. Matsuyoshi. Machine learning for daily forecasts of Arctic sea-ice motion: an attribution assessment of model predictive skill. *Artificial Intelligence for the Earth Systems*, 2, 230004. DOI: 10.1175/AIES-D-23-0004.1
- 2022 Hoffman, L., M. Mazloff, S.T. Gille, D. Giglio, and A. Varadarajan. Ocean salinity response to atmospheric river precipitation events in the California Current System. *Journal of Physical Oceanography*, 52, 1867–1885. DOI: 10.1175/JPO-D-21-0272.1
- 2018 Hoffman, L., and T.T. Ngo. Affordable solar thermal water heating solution for rural Dominican Republic. *Renewable Energy*, 115, 1220–1230. DOI: 10.1016/j.renene.2017.09.046

Co-Author Publications

- 2026 Dong, X., F. Massonnet, Y. Nie, B. Richaud, Y. Gao, L. Hoffman, Y. Wang, and Q. Yang. Incorporating subsurface oceanic variables improves seasonal Antarctic sea ice prediction with neural networks. *Journal of Geophysical Research: Atmospheres*, 131, e2025JD045470. DOI: 10.1029/2025JD045470
- 2025 Giglio, D., J. Sala, J. Gilson, L. Hoffman, and B. Kawzenuk. Adaptive sampling of the upper ocean by autonomous floats during atmospheric river precipitation. *Geophysical Research Letters*, 52, e2025GL117069. DOI: 10.1029/2025GL117069

- 2020 Ngo, T.T., L. Hoffman, G. Hoople, W. Trevena, U. Shakya, and G. Barr. Surface morphology and drug loading characterization of 3D-printed methacrylate-based polymer facilitated by supercritical carbon dioxide. *The Journal of Supercritical Fluids*, 160, 104786. DOI: 10.1016/j.supflu.2020.104786

Patents

- 2017 McMahon, E., and L. Hoffman. High torque wind turbine blade, turbine, and associated systems and methods. U.S. Patent No. 9,797,370. U.S. Patent and Trademark Office. <https://patents.google.com/patent/US9797370B1/en>.

Invited Talks

- 2025 Earth Science Information Partners (ESIP) Machine Learning Cluster Meeting. Virtual. Oral presentation.
- 2024 Interagency Arctic Research Policy Committee (IARPC) Modelers' Community of Practice March 2024 Meeting – Combining Modeling and Machine Learning Approaches to Understanding the Arctic Earth System. Virtual. Oral presentation.
- 2023 AI for the Study of Environmental Risk (AI4ER) Seminar Series, University of Cambridge. Cambridge, UK.
- 2022 American Meteorological Society Collective Madison Meeting, 17th Conference on Polar Meteorology and Oceanography. Madison, WI. Oral presentation.
- 2022 NOAA Science Seminar Series. Virtual. Oral presentation.

Conference Presentations, Workshops, and Seminars

- 2025 Kavli Institute for Theoretical Physics (KITP), The Physics of Changing Polar Climate. Santa Barbara, CA. Oral presentation.
- 2025 American Meteorological Society Denver Summit, 18th Conference on Polar Meteorology and Oceanography. Denver, CO. Oral presentation.
- 2025 Earth and Climate (ELIC) Seminar Series, Université catholique de Louvain. Louvain-la-Neuve, Belgium. Seminar.
- 2024 Physical Oceanography Dissertation Symposium (PODS). Lihue, HI. Oral presentation.
- 2024 Workshop on the Role of Sea Ice and its Variability in the Climate System, International Centre for Theoretical Physics (ICTP). Trieste, Italy. Poster.
- 2024 Earth and Climate (ELIC) Seminar Series, Université catholique de Louvain. Louvain-la-Neuve, Belgium. Seminar.
- 2023 Mentoring Physical Oceanography Women to Increase Retention (MPOWIR) Pattullo Conference. Warrenton, VA.
- 2023 54th International Liège Colloquium on Ocean Dynamics: Machine learning and data analysis in oceanography. Liège, Belgium. Poster.
- 2023 SeaSAR 2023. Svalbard, Norway.
- 2023 Atmospheric and Ocean Sciences Forum, University of Colorado Boulder. Boulder, CO. Seminar.
- 2023 Scientific Machine Learning Symposium. San Diego, CA. Poster.

- 2023 ECCO Annual Meeting. Pasadena, CA. Oral presentation.
- 2022 9th Annual FIRO Workshop. San Diego, CA. Poster.
- 2022 Observing, Modeling, and Understanding the Circulation of the Arctic Ocean and Sub-Arctic Seas Workshop. Seattle, WA. Poster.
- 2022 Center for Western Weather and Water Extremes (CW3E) Annual Meeting. San Diego, CA. Poster.
- 2022 Ocean Salinity Conference. New York, NY. Oral presentation.
- 2022 UCSD Jacobs School of Engineering Research Expo. San Diego, CA. Poster.
- 2022 Ocean Sciences Meeting. Virtual. Oral presentation.
- 2021 American Meteorological Society 101st Annual Meeting. Virtual. Oral presentation.
- 2020 International Atmospheric Rivers Conference Sponsored Symposium. Virtual.
- 2020 Ocean Sciences Meeting. San Diego, CA.
- 2016 Institute of Electrical and Electronics Engineers Global Humanitarian Technology Conference. Seattle, WA. Poster.

Teaching Experience

- Summer 2020 & 2021 **Instructor, Climate Change and the Ocean**, *University of California San Diego, Academic Connections*, San Diego, CA
 - Course: Climate Change and the Ocean.
 - Developed and implemented a 4-week online pre-college course for high school students, including research and communication skill-building through accessing, plotting, analyzing, and presenting real-world oceanographic data.
- Sep. 2018–Dec. 2020 **Teaching Assistant**, *University of California San Diego*, San Diego, CA
 - Courses: introductory fluid mechanics (3 offerings), advanced fluid mechanics (5 offerings), and material and energy balances (1 offering).
 - Led five hours of weekly discussion sessions with supplementary lectures and problem-solving support.

Guest Lectures

- Winter 2025 Introduction to Machine Learning for Earth and Climate Science. *Forecast, Prediction, and Projection in Climate Science*. UCLouvain.
- Winter 2023 Introduction to Machine Learning for Earth and Climate Science. *Analysis of Physical Oceanographic Data*. Scripps Institution of Oceanography.

Leadership, Service, and Mentorship

- 2025–Present **Co-Lead**, *OASIS Working Group*
 - Coordinate an international Antarctica InSync working group focused on AI-enabled approaches relevant to Antarctic sea ice observing-system design and recommendations.
- ORCAS Working Group Member.
- Peer Review *Journal of Climate*; *Geophysical Research Letters*; *Journal of Geophysical Research: Atmospheres*; *npj*; *Environmental Modelling & Software*; *Open Science Europe*.
- Mentorship Antonio Martinez Soares, Master's Student, Université catholique de Louvain, Fall 2024–Spring 2025.

Kayli Matsuyoshi, Undergraduate Student, Scripps Institution of Oceanography, Summer 2021.

Aniruddh Varadarajan, Undergraduate Student, University of California San Diego, Fall 2020–Spring 2021.

Honors and Awards

- 2021 Interdisciplinary Research Award, UC San Diego.
- Mar.–Jun. 2020 Teaching Assistant Commendation, “For Extraordinary Impact as a Teaching Assistant.”
- 2015–2016 Achievement Rewards for College Scientists (ARCS), \$5,000.
- 2011–2016 Alcala Award, Merit Based Scholarship, \$20,000 annually.
- Fall 2015–Present Tau Beta Pi, Engineering Honor Society.
- Spring 2016–Present Pi Tau Sigma, Engineering Honor Society.

Activities

- 2022-2025 MPOWIR Mentor Group.
- Jan.–Dec. 2021 URGE Pod Member, Unlearning Racism in the Geosciences.
- Feb. 2013–Feb. 2015 Engineers Without Borders, Fundraising Director.

Personal Interests

Bouldering, handstands, backpacking, surfing, guitar, violin, yoga, aimless wandering, and cats.