# Maike Sonnewald, Ph.D.

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## Position and affiliations

| | |
|---|---|
| 2023–present | Assistant Professor at **University of California, Davis** |
| 2023–present | Visiting Scholar at **Princeton University** |
| 2022–present | Affiliate Assistant Professor at **University of Washington** |
| 2020–present | Affiliate Researcher at **NOAA Geophysical Fluid Dynamics Laboratory** |
| 2022–present | Associate Editor: American Meteorological Society (AMS) **Journal of Artificial Intelligence for the Earth Systems** |

## Education

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|---|---|
| 2011-2016 | **University of Southampton**, UK. Ph.D. Complex Systems Simulation at the National Oceanography Center Dissertation: *Ocean model utility dependence on horizontal resolution* Advisors: George Nurser, Joel J.-M. Hirschi, and James Dyke Fellowship: Engineering and Physical Sciences Research Council (ESPRC, UK) |
| 2006-2011 | **University of Southampton**, UK. M. Sci. *magna cum laude*, complex systems simulation, 2011 M. Sci. *magna cum laude*, physical oceanography, 2010 |

## Professional history

### Past positions

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|---|---|
| 2020–2023 | Associate Research Scholar at **Princeton University** |
| 2016–2020 | Postdoctoral Associate at **Massachusetts Institute of Technology** Advisors: C. Wunsch, P. Heimbach, and S. Dutkiewicz |

### Other positions

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|---|---|
| 2023 | Visiting Professor at **Université catholique de Louvain, Belgium** |
| 2019–2022 | Visiting Scientist at **University of Washington** |
| 2017–2019 | Visiting Scientist at **Harvard University** |
| 2018–2019 | Visiting Scientist at **Université Grenoble Alpes, France** |
| 2016–2018 | Visiting Scientist at **University of Texas at Austin** |

# Honours and spotlights

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|---|---|
| 2023 | Certificate of recognition from the **California State Assembly** |
| 2023 | **UC Davis Faculty Scholar of the Center for the Advancement of Multicultural Perspectives on Science (CAMPOS)** |
| 2021 | Spotlight paper at the International Conference on Machine Learning (ICML) |
| 2021 | Featured on the cover of the Journal of Advances in Modeling Earth Systems (JAMES) |
| 2021 | Invited core member for Kavli Institute for Theoretical Physics (KITP) program "ML in the Physics of Climate". |
| 2019 | Winner at Simons Foundation visualization competition |
| 2017 | **Kaufman Teaching Certificate Program (KTCP)** awarded from MIT |

# Selected grants

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|---|---|
| 2023 | $578,000 – Principle investigator for "Improving coastal sea level predictions with ocean process insight guided by machine learning". NOAA Climate Program Office. |
| 2023 | £958,000 – Co-investigator for "Bridging theory to reality in projections of the Asian and West African monsoons (BRIDGE)". National Environmental Research Council (UK). |
| 2021 | $31,032 – Amazon Sustainability Data Initiative (ASDI) |
| 2020 | $48,595 – ASDI |

# Policy impact

## Committees and panels

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|---|---|
| 2024 | **Expert committee member** for the "Computational system and modeling framework for frontier Earth system science and climate simulation/projection international summit". More information. |
| | Invitation by Kelvin Droegenmeier, recently serving as Director of The White House Office of Science and Technology Policy. |
| 2024 | Panel member at the **American Meteorological Society Washington Forum** which examines public policy issues across the weather, water, and climate enterprise. More information. |
| 2024 | Panel member at the **California Ocean Science Trust** symposium on "Fishery Disasters under Climate Change". |

## Invited talks and contributions

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|---|---|
| 2024 | Invited talk at the **American Meteorological Society Washington Forum** on "The Weather/Climate Data needed for Reliable AI" |
| 2024 | Invited talk on "Ocean predictability potential" at the **California Ocean Science Trust** symposium on "Fishery Disasters under Climate Change" |
| 2024 | Invited talk to **UC Davis College of Engineering Executive Committee** |
| 2023 | Invited talk on "Predictability, Predictions, and Applications Interface" for **US CLIVAR** by the World Climate Research Program under United Nations auspices. More information. |
| 2022 | Invited talk on "Physical Oceanography and AI" for **US CLIVAR** the World Climate Research Program under United Nations (UN) auspices. More information. |
| 2022 | Invited talk to **NOAA GFDL HQ site review**. |
| 2021 | Citation by the **World Meteorological Organization (WMO)** of the UN in a concept note on the status, opportunities and challenges of data handling and application of AI in the environmental modeling field, with recommendations for actions for WMO to support the community in its response. More information. |
| 2021 | Keynote at a **Department of Energy** AI workshop on "Ocean Grand Challenges". |
| 2021 | Featured in **NOAA's artificial intelligence strategic plan 2021-2025**, a response to the President's Executive Order on Maintaining American Leadership in AI. View document. |
| 2020 | Cited in a **European Union** policy recommendation: "Directorate-General for Internal Policies of the Union report on Artificial intelligence and the fisheries sector". More information. |
| 2020 | Invited talk **NOAA Senior Management Meeting**, Oceanic and Atmospheric Research |
| 2020 | Contributed to the science basis for **New Zealand's** Marine Protected Area legislation |

# Review articles (total: 4)

Notable impact in blue

[-] Lai C-Y, Hassanzadeh P, Sheshadri A, **Sonnewald M**, Ferrari R, Balaji V. "Machine learning for climate physics and simulations", in press, *Annual Reviews of Condensed Matter Physics.*

- Impact factor: 23, DOI: `http://doi.org/10.48550/arXiv.2404.13227`

[1] Bronner, U., **Sonnewald, M.** and Wisbeck, M., "Marine modeling as the key to sustainable use and protection of the marine environment", invited, 2023, The International Hydrographic Review.

 - DOI: `https://doi.org/10.58440/ihr-29-a04`


[2] **Sonnewald, M.**, Brajard, J., Duben, P., Lguensat, R. and Balaji, V., "Bridging theory, simulation, and observations of the global ocean using Machine Learning". Invited, 2021, *Environmental Research Letters*.

 - Impact factor: 6.9, DOI: `https://doi.org/10.58440/ihr-29-a04`

 - **Citation by World Meteorological Organization (WMO)**. Available here.

[3] Irrgang, C., Boers, N., **Sonnewald, M.**, Elizabeth A. Barnes, Christopher Kadow, Staneva, J., and Saynisch-Wagner, J. "Towards neural Earth system modelling by integrating artificial intelligence in Earth system science". 2021, *Nature Machine Intelligence*.

 - Impact factor: 25.9, DOI: `https://doi.org/10.1038/s42256-021-00374-3`

 - Coverage by five news outlets

# Peer reviewed publications (total: 11)

* indicates student advised, notable impact in blue

[**5**] Khatri, H., Griffies, S.M., Storer, B.A., Buzzicotti, M., Aluie, H., **Sonnewald, M.**, Dussin, R. and Shao, A., "A scale-dependent analysis of the barotropic vorticity budget in a global ocean simulation". *Journal of Advances in Modeling Earth Systems*.

 - Impact factor: 8.5, DOI: `https://doi.org/10.1029/2023MS003813`


[4] Yik, W.*, **Sonnewald, M.**, Clare, M.*, Lguensat, R. "Southern Ocean Dynamics Under Climate Change: New Knowledge Through Physics-Guided Machine Learning". 2023, *Conference on Neural Information Processing Systems (NeurIPS) Climate Change AI workshop*.

 - Impact factor: 23.27, DOI: `https://doi.org/10.48550/arXiv.2310.13916`

[5] **Sonnewald, M.**, Reeve, K., Lguensat, R. "A supergyre modulates the global overturning through upwelling in the Southern Ocean". 2023, *Nature Commun. Earth Environ.*

 - Impact factor: 7.9, DOI: `https://doi.org/10.1038/s43247-023-00793-7`


[6] Jones, D., **Sonnewald, M.**, Rosso, I., Zhou, S., and Boehme, L., "Unsupervised classification identifies coherent thermohaline structures in the Weddell Gyre". 2023, *Ocean Science*.

 - Impact factor: 4.3, DOI: `https://doi.org/10.5194/egusphere-2022-1484`

[7] Clare, M.\*, **Sonnewald, M.**, Lguensat, R., Deshayes, J. and Balaji, V., "Explainable Artificial Intelligence for Bayesian Neural Networks: Towards trustworthy predictions of ocean dynamics". 2022, *Journal of Advances in Modeling Earth Systems.*

   - Impact factor: 8.5, DOI: `https://doi.org/10.1029/2022MS003162`

[8] Kaiser, B., Saenz, J.A., **Sonnewald, M.** and Livescu, D., "Automated identification of dominant physical processes". 2022, *Engineering Applications of Artificial Intelligence.*

   - Impact factor: 7.8, DOI: `https://doi.org/10.1016/j.engappai.2022.105496`

[9] Krasting, J., De Palma, M., **Sonnewald, M.**, John, J. and Dunne, J. "Regional Sensitivity Patterns of Arctic Ocean Acidification Revealed With Machine Learning". 2022, *Nature Commun. Earth Environ.*

   - Impact factor: 7.9, DOI: `https://doi.org/10.1038/s43247-022-00419-4`

[10] **Sonnewald, M.**, and Lguensat, R. "Revealing the impact of global heating on North Atlantic circulation using transparent machine learning". 2021, *Journal of Advances in Modeling Earth Systems.*

   - Impact factor: 8.5, DOI: `https://doi.org/10.1029/2021MS002496`

   - Cover Feature and in "Machine Learning Application to Earth System Modeling" edition.

[11] **Sonnewald, M.**, and Lguensat, R. , Radhakrishnan, A., Sayibou, Z.\*, Wittenberg, A.T. and Balaji, V. "Revealing the impact of global warming on climate modes using transparent machine learning and a suite of climate models". 2021, *International Conference on Machine Learning: Climate Change AI.*

   - Impact factor: Available: `https://www.climatechange.ai/papers/icml2021/13`

   - Workshop Spotlight.

[12] **Sonnewald, M.**, Dutkiewicz, S., Hill, C. and Forget, G. "Elucidating Ecological Complexity: Unsupervised Learning determines global marine eco-provinces", 2020, *Science Advances.*
   - Impact factor: 13.1, DOI: `https://doi.org/10.1126/sciadv.aay4740`

   - Data in science basis for **New Zealand's Marine Protected Area legislation**

   - **Cited in European Union policy recommendation**. Available here.

   - Coverage by seven news outlets

[13] Le Bras, I., **Sonnewald, M.**, and Toole, J.M. "A bulk Potential Vorticity budget for the western North Atlantic based on observations". 2019, *Journal of Physical Oceanography.*

- Impact factor: 3.5, DOI: `https://doi.org/10.1175/JPO-D-19-0111.1`

[14] **Sonnewald, M.**, Wunsch, C. and Heimbach, P. "Unsupervised Learning Reveals Geography of Global Ocean Dynamical Regions". 2019, *Journal of Earth and Space Science.*

- Impact factor: 3.7, DOI: `https://doi.org/10.1029/2018EA000519`

- **Featured in NOAA's AI strategic plan responding to the President's Executive Order on Maintaining American Leadership in AI**. Available here.

- In "Geoscience paper of the future" edition

- Coverage by four news outlets

[17] **Sonnewald, M.**, C. Wunsch, and P. Heimbach, "Linear Predictability: A Sea Surface Height Case Study". 2018, *Journal of Climate.*

- Impact factor: 5.5, DOI: `DOI.org/10.1175/JCLI-D-17-0142.1`

[**18**] Bulczak, A.I., Bacon, S., Naveira Garabato, A.C., Ridout, A., **Sonnewald, M.**, and Laxon, S.W. "Seasonal Variability of Sea Surface Height in the Coastal Waters and Deep Basins of the Nordic Seas". 2014, *Geophysical Research Letters.*

- Impact factor: 5.2, DOI: `DOI:10.1002/2014GL061796`

[19] **Sonnewald, M.**, Hirschi, J.J.-M., Marsh, R., McDonagh, E.L. and King, B.A. "Atlantic meridional ocean heat transport at 26N: impact on subtropical ocean heat content variability". 2013, *Ocean Science.*

- Impact factor: 4.3, DOI: `DOI:10.5194/os-9-1057-2013`

[-] Rosenfeld K., **Sonnewald M.** et al., "Building Understandable Messaging for Policy and Evidence Review (BUMPER) with AI". In review. `doi:10.48550/arXiv.2402.13979`.

[-] Dräger S, **Sonnewald M.** The Importance of Architecture Choice in Deep Learning for Climate Applications. In revision. `doi:10.48550/arXiv.2402.13979`.

## Other publications (total: 3)

[20] **The ECCO Consortium**. "A Twenty-Year Dynamical Oceanic Climatology: 1994-2013. Part 1: Active Scalar Fields", 2017, **MIT DSpace**: `https://dspace.mit.edu/handle/1721.1/107613`.

[21] **The ECCO Consortium**. "A Twenty-Year Dynamical Oceanic Climatology: 1994-2013. Part 2: Velocities and Property Transports". 2017, *MIT DSpace*: `https://dspace.mit.edu/handle/1721.1/109847`.

[22] Gille, S., Abernathey, A., Chereskin, T., Cornuelle, B., Heimbach, P., Mazloff, M., Menemenlis, D., Rocha, C., Soares, S., **Maike Sonnewald**, Villas Boas, B., and Wang, J. "Open Code Policy for NASA Space Science: A perspective from ocean modeling and ocean data analysis". 2018, *NASA White Paper*, Available: `https://tinyurl.com/NASA-WhitePaper`

# Academic keynotes and invited talks
## Total: 82, including in Policy impact (8) & Service (2) sections

| | |
|---|---|
| 2024 | <u>total: 2</u> |
| - | **UC San Diego, Scripps Institute of Oceanography**: "Deciphering Southern Ocean Circulation: New Perspectives Through Machine Learning. |
| - | **Dynamics Days:** "Equations as emergent phenomena determined using machine learning: An ocean case study. |
| 2023 | <u>total: 11</u> |
| - | **UC Davis** Atmospheric Science: "Physics-Informed Machine Learning to Push the Ocean Frontier in Climate" |
| - | **UC Davis** Applied Mathematics: "Physics-Informed Machine Learning to Push the Ocean Frontier in Climate" |
| - | **CLIVAR** Predictability, Predictions, and Applications Interface: "Escaping "black box" machine learning to increase trust and accelerate discovery". 100 views |
| - | **United Nations** International Telecommunication Union: "Physics-informed ML to push the ocean frontier in climate". Over 500 views. |
| - | **University of Toronto** Nobel Seminar Series: "Elucidating driving mechanisms in the North Atlantic and Southern Ocean dynamics: Physics-informed and trustworthy ML for ocean science" |
| - | **University of Liege** 54th international Liege colloquium on ocean dynamics. |
| - | **UCLouvain**: "Physics-informed machine learning to push the ocean frontier in climate: A Southern Ocean case study" |
| - | **Institut Pierre-Simon Laplace - Sciences du climat (IPSL)**: "Physics-informed machine learning to push the ocean frontier in climate: A Southern Ocean case study. |
| - | **University of Miami**: "Elucidating Driving Mechanisms in North Atlantic and Southern Ocean Dynamics: Physics-Informed and Trustworthy Machine Learning for Ocean Science". Over 350 views |

- **UC Davis** Computer Science: "Physics-informed and trustworthy computation for climate resilience.

- **Sorbonne University**: "Elucidating Driving Mechanisms in North Atlantic and Southern Ocean Dynamics: Physics-Informed and Trustworthy Machine Learning for Ocean Science.

2022 | total: 13

- **CLIVAR** Physical Oceanography: "A supergyre in the Southern Ocean modulates the global overturning: insight guided by interpretable machine learning.

- **Climate Informatics**: "Asking how the Southern Ocean responds to global heating and understanding why the answer emerged."

- **U. Cambridge**: "Intelligent solutions to monitor ocean health".

- **SIAM Mathematics of Data Science**: "Developing and Learning from Trust in Machine Learning".

- **SIAM Geosciences Webinar Series:** "Understanding the Ocean's response in a Future Climate". Over 200 views

- **Max Planck Institute for Meteorology**: "The response of the ocean's overturning to global warming: A robust blueprint for trustworthy AI for climate analysis".

- **Institute for Mathematical and Statistical Innovation (IMSI)** at **U. Chicago**: "Elucidating drivers of Southern Ocean circulation change: A blueprint for interpretable and explainable machine learning"

- **MIT** Earth Atmosphere and Planetary Science: "Intelligent solutions to monitor and predict ocean health"

- **MIT** Mechanical Engineering: "Intelligent solutions to monitor and predict ocean health"

- **UC Berkeley**: "Data driven understanding of ocean systems"

- **University of Liege**: "Intelligent solutions to monitor and predict ocean health"

- **U. Wisconsin-Madison**: "Revealing the impact of climate change on North Atlantic circulation using transparent machine learning"

- **U. Rhode Island**: "Revealing the impact of climate change on North Atlantic circulation using transparent machine learning"

2021 | Talks total: 15

- **American Geophysical Union (AGU):** "Revealing the impact of climate change on North Atlantic circulation using transparent machine learning".

- **Dept of Energy** AI workshop: "Ocean Grand Challenges.

- **Climate Change AI webinar**: "A robust blueprint for trustworthy AI for climate analysis". Over 2500 views.

- **NOAA**, AI workshop: "Revealing the impact of climate change on North Atlantic circulation using transparent machine learning".

- **US National Center for Atmospheric Research** CGD Series: "Revealing mechanisms of change in the Atlantic Meridional Overturning Circulation under global heating". over 225 views.

- **KITP** ML for Climate Physics: "Revealing the Impact of Global Heating on the Meridional Overturning Circulation with transparent machine learning. Over 50 views

- **IMSI U. Chicago**: "Elucidating ecological complexity: Unsupervised learning determines global marine eco-provinces". Available.

- **GEOMAR Helmholtz Centre for Ocean Research (Ger.)**: "Solutions to understand and monitor the ocean and climate".

- **Summit for Incorporating Data Science and Open Science in Aquatic Research:** "Understanding the ocean's response in a future climate: A robust blueprint for trustworthy AI for climate analysis".

- **International Conference on Machine Learning**: "Revealing the impact of global warming on climate modes using transparent machine learning".

- **UC Santa Cruz**: "Revealing the impact of global warming on ocean circulation: A robust blueprint for trustworthy AI for climate analysis".

- **Scripps Institute of Oceanography** "Revealing the Impact of Global Heating on the Meridional Overturning Circulation".

- **Potsdam Institute for Climate Impact**: "Revealing the Impact of Global Heating on the Meridional Overturning Circulation".

- **Technical U. Munich**: "Revealing the Impact of Global Heating on the Meridional Overturning Circulation".

- **U. Washington**: "Revealing the Impact of Global Heating on the Meridional Overturning Circulation".

2020 | Talks total: 6

- **Second NOAA Workshop on Leveraging AI in the Environmental Sciences**, "Elucidating Ecological Complexity: Unsupervised Learning determines global marine eco-provinces"

- **Los Alamos National Laboratory**, "Living on the Manifold: A geography of ocean dynamical regimes from eddy to global scale". Los Alamos, USA.

- **U. Washington** Department of Mechanical Engineering, "Living on the Manifold: A geography of ocean dynamical regimes from eddy to global scale".

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|---|---|
| - | **U. Washington**, Department of Ocean Sciences, "Living on the Manifold: A geography of ocean dynamical regimes from eddy to global scale". |
| - | **U. Washington**, "Elucidating Ecological Complexity: Unsupervised Learning determines global marine eco-provinces". |
| - | **U. British Columbia**, "Ocean exploration with machine learning: An Antidote to Chaos?" |
| 2019 | Talks total: 7 |
| - | **AGU**: "Unsupervised Learning Reveals Geography of Global Ocean Dynamical Regions" |
| - | **U. Bergen**, "Ocean exploration with machine learning: An Antidote to Chaos?" |
| - | **Princeton University**, "Ocean exploration with machine learning: An Antidote to Chaos?" |
| - | **Norway-US bilateral AI workshop**, "Elucidating ocean ecological complexity" |
| - | **Norway-US bilateral AI workshop**, "Recognising ocean physical regimes". Austin, USA. |
| - | **Woods Hole Oceanographic Institute**: "Ocean exploration with machine learning: An Antidote to Chaos?" Woods Hole, USA. |
| - | **U. Tromsø (Nor.)**: "Ocean exploration with machine learning: An Antidote to Chaos?" Tromsø, Norway. |
| 2012–2018 | Total talks: 18 |
| 2018 | **MIT**, "Machine learning for global biogeography?" |
| - | **Columbia University**, LDEO: , "Linear predictability: A sea surface height case study" |
| 2017 | **Stony Brook University**, "Linear predictability: A sea surface height case study". |
| Others | **Yale University**,**WHOI**, **MIT** (2018 & 2015), **U. Texas at Austin**, **U. Washington**, **Oregon State University**, **U. Oxford**, **MIT** (Two invited student talks), **U. Bristol**, **NOCS** (2015, 2014 & 2013) and **MONCACO meeting**. |

# Teaching and advising

## Postdoc advising

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| Upcoming | TBF, UC Davis, NOAA-CPO |
| 2023–present | Arijeet Dutta, U. Birmingham, NERC-BRIDGE |

# Graduate advising

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| 2024–present | Avery Wood, UC Davis |
| 2024–present | Makayla Mcdevit, UC Davis |
| 2023 | Simon Draeger, UC Davis, |
| 2023–present | Lily Walker, Okinawa Institute for Science and Technology (JP) |
| 2021–present | Yvonne Jenniges, Alfred Wegener Institute (DE) |
| 2021 | Mariana Clare, Imperial College London, National Centre for Scientific Research (CNRS, Fr), <br> subsequently researcher at European Center for Medium Range Weather Forecasting. |
| 2021–2022 | Giangiacomo Navarra, Georgia Tech. <br> subsequently postdoc at Princeton. |

# Undergraduate advising

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| 2024–present | Jasper Dong, UC Davis, Undergraduate. |
| 2023–2024 | William Yik, Harvey-Mudd, Holling Scholar (NOAA). Undergraduate. <br> subsequently in Ph.D. program at University of Washington with Department of Energy Fellowship. |
| 2021 | Zouberou Sayibou, Bronx Community College, Undergraduate. <br> subsequently transfer to Stanford. |

# Thesis and/or candidacy committee member

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| 2024 | Xuefeng Xu, UC Davis, Graduate. (QE) |
| 2023 | Lin Yao, UC Davis, Graduate. (QE) |
| 2023 | Mohamed Abuelanin Hussien, UC Davis, Graduate. (QE) |
| 2023 | Vishal Singh, UC Davis, Graduate. (QE) |
| 2021–present | Jacob Cohen, University of Washington. Graduate. |

## Instructor on record

2024    **ECS171**: UC Davis. Lecturer on record, "Introduction to Machine Learning", undergraduate. *Participants: 100, developed material, taught.*

2023    **European Centre for Medium-Range Weather Forecasts (ECMWF) Massive Open Online Course**: "Machine Learning in Weather and Climate". Registered: over 9000, developed material, taught.

2021    **AOS 551**: Princeton University. Lecturer on record, "Deep learning in geophysical fluid dynamics". Graduate level. Participants: 10, developed material, taught.

## Courses and lectures

2023    **Lecture:** UCLovaine (Belgium). Machine Learning for oceanography Participants: 50, developed material, taught.

2023    **Lecture:** Ocean Data Science Summer School. Participants: 17, developed material, taught.

2023    **ECS293**: Guest lecture.

2022    **Lecture:** Ocean Data Science Summer School. Participants: 17, developed material, taught.

2022    **Lecture:** GEOMAR Helmholz (Germany): "Rossby Wave theory". Participants: over 30, developed material, taught.

2022    **Lecture:** University of Washington: "Uses and misuses of machine learning for geoscience". Undergraduate level. Participants: 20, developed material, taught.

2020    **Lecture:** GFDL Holling, CIMES and Lapenta interns, undergraduate level: "Machine learning for the geosciences" *Class size 6, developed material, taught.*

2019    **Lecture:** Harvard University: "Machine Learning in Geoscience", graduate. *Class size 10, developed material, taught*

2019    **Lecture:** Harvard University: "The good, the bad and the ugly of applied unsupervised learning", graduate and undergraduate. *class size 60, developed material, taught.*

2013    **Teaching Assistant**: National Oceanography Centre (UK). "Physical Oceanography II & II", undergraduate. Participants: 50.

2012    **Teaching Assistant**: National Oceanography Centre (UK). "MSc Fieldwork Boat Week". Participants: set by ship capacity.

## Tutorials and workshops

2021   **Tutorial/workshop:** Society for Industrial and Applied Mathematics (SIAM): Conference on Mathematical and Computational Issues in the Geosciences. Milan, Italy, graduate and undergraduate. Participants 60, developed material, taught.

2021   **Tutorial**: NOAA-GFDL: General. Participants: over 20, developed material, taught.

2019   **Tutorial/workshop: (3 day)**, Princeton University & GFDL workshop at graduate level: "Machine learning and climate modeling", graduate. *Class size 20-30, developed material, taught*

2018   **Tutorial**, AGU: "Vector Calculus in ECCO", general. Over 100, developed material.

2014   **Tutorial:** SCCS, "Finite differences methods", graduate. *Class size over 40, developed material, taught.*

2014   **Tutorial:** SCCS "Importance of model validation", graduate. *Class size over 40, developed material, taught.*

# Service

## Invited talks

2024   **UC Davis CoE Dean's Executive Committee:** "Building a resilient future under climate change".

2024   **UC Davis - Sandia National Lab Research Partnership Symposium** on Climate Security: "Computational Climate and Ocean Group".

## Invited panels

2024   **AMS Washington Forum** on "The Weather/Climate Data Needed for Reliable AI"

2024   **California Ocean Science Trust** symposium on Fishery Disasters under Climate Change

2022   **US CLIVAR** Physical Oceanography review panel

2021   **Incorporating Data Science and Open Science in Aquatic Research Summit** with over 600 participants.

2020   **AGU Fall Meeting** on "Challenges and opportunities of applying AI, ML and DL to problems in the environmental and geosciences" with over 1200 participants.

2020   **NOAA Workshop** on "Leveraging AI in the Environmental Sciences" with over 60 participants.

# Reviewing

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|---|---|
| Reviewing | Nature, Journal of Advances in Modeling Earth Systems, Geophysical Research Letters, Ocean Modelling, Journal of Geophysical Research, Journal of Physical Oceanography, Data Science and others. |
| 2022 | Times Higher Education: Reputation Survey for International Academics. |
| 2018 | Planning workshop: **NSF US Software Sustainability Institute**, which now improves the recognition , development, and use, of software for a more sustainable research enterprise. More information. |
| 2017 | NASA review panel |
| | Reviewer:6. |

# Conference, workshop, and seminar organization

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|---|---|
| 2024 | Organizer for **UC Davis CAMPOS** research colloquia |
| 2024 | Convener for "Interpretable Machine Learning for Marine Sciences" at **AGU** |
| 2024 | Program committee **Platform for Advanced Scientific Computing (PASC)** |
| 2024 | Convener for "New Knowledge Through Machine Learning Guided Exploration of Large-Scale Data Sets in Physical Oceanography" at **OSM** |
| 2023 | Convener for "Interpretable Machine Learning for Marine Sciences" at **AGU** |
| 2023 | Program committee for the 12th International Conf. on **Climate Informatics** |
| 2023 | Convener for Machine learning for Earth System modeling at **European Geosciences Union (EGU)** |
| 2022 | Convener for "Interpretable Machine Learning for Marine Sciences" at **AGU** |
| 2022 | Convener for "Machine learning for Earth system modelling" at **EGU** |
| 2021 | Program committee for Climate Change AI's workshop "Tackling Climate Change with Machine Learning" at **NeurIPS** |
| 2021 | Convener for "Machine learning for Earth system modelling" at **EGU** |
| 2021 | Organizer and host for GFDL seminar series. |

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| 2020 | Head convener for "Exploration in observed and model oceanographic data using interpretable ML", oral and poster, at **AGU** |
| 2020 | Convener for "Machine Learning for Weather and Climate Modeling", oral and poster, at **AGU** |
| 2020 | Session chair for "Exploiting Space- and Ground-Based Observations and EnhancingEarth System Prediction" at the 2nd **NOAA Workshop** on Leveraging AI in Environmental Sciences |
| 2020 | Co-convener for "Machine learning for Earth System modelling", oral and poster, at **EGU** |
| 2019 | Co-convener for a breakout session, "Open Source Software Revolution" at **OceanObs'19** |
| 2019 | Head convener for "Innovation and Exploration of Observations and Earth System Models Using Machine Learning and Big Data Analysis", oral and poster, **AGU** |
| 2016 | Organizer for "MIT Sack Lunch" seminar |

## Selected diversity, equity and inclusion activities

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|---|---|
| 2024 | **Interaction**: TechxNova, a 501(c)(3) non-profit organization focused on empowering youth in Space and Computer Sciences and advocating to bridge social gaps in STEM |
| 2024 | **Interaction**: "Bytes & Bites" event hosted by UC Davis's Girls Who Code. |
| 2024 | **Media feature**: UC Davis international women's day. |
| 2023 | **Advising:** Hollings NOAA internship at the time targeted at underserved minorities. |
| 2021-2023 | **POD member:**, **Unlearning racism in Geoscience (URGE)**. Program to develop anti-racist policies and strategies at Princeton University. |
| 2022 | **Talk:** International Women's Day NextGEOSS/GEO EDI. |
| 2021 | **Advising:** CIMES internship targeted at underserved minorities. |
| 2020 | *Taught "Climate change 101"*, **Virtual "Summer Climate Camp" by black led SynergyEd**. Class size 10, ages 11-13 years. |
| 2020 | **Motivational speaker**: **Bronx Community College**, NYC, USA. Effort by the Bronx Community College STEM Advisory Board to encourage students to consider STEM careers. |

## Selected recent public engagement and outreach

2024 | **Guardian interview**: Interviewed for article "Atmospheric river storms are getting stronger, and deadlier".

2024 | **UCDavis Progress in Engineering**: Front page article.

2024 | **UCDavis CoE feature**: Features in article on climate.

2023 | **Podcast interview:** AGU "Third pod from the sun" and "Carry the two" collaboration.

2019 | *Nautical day at the MIT museum*: **MIT Museum**, USA.

2016 | *Copezilla team*: **Red Bull Flugtag, (video: min 13)**, Boston, USA. **MIT outreach activity, 3600 views**.