Duncan Watson-Parris

Scripps Institution of Oceanography and Halıcıoğlu Data Science Institute,
University of California San Diego, La Jolla, CA, USA
dwatsonparris@ucsd.edu | ORCID: 0000-0002-5312-4950 | Google Scholar | Lab Website

My research develops machine learning methods for climate science: building differentiable and data-driven Earth system models, quantifying aerosol–cloud interactions and their contribution to uncertainty in climate projections, and extracting new process understanding from large observational datasets. My group works at the interface of physics-based and AI approaches to sharpen projections of future climate change.

Research Experience

- **2023–Present** | Assistant Professor, University of California San Diego
  - I lead the interdisciplinary Climate Analytics Lab, which harnesses machine learning to improve projections of future climate change and extract new knowledge from huge observational datasets
- **2023–Present** | Faculty Fellow, San Diego Supercomputing Centre, UCSD
  - Using the experimental NSF funded 'Voyager' supercomputer for peta-scale inference tasks
- **2020–2023** | Senior Research Associate and Course Director, University of Oxford
  - Leading the use of machine learning for climate science and course director for iMIRACLI
- **2015–2020** | Post-doctoral Research Associate, University of Oxford
  - Research on the understanding and improvement of aerosol processes in climate models

Professional Experience

- **2025–Present** | Academic Consultant, Reflective.org, San Francisco
  - Advising nonprofit research organization on use of machine learning for improving understanding of solar radiation management
- **2020–2021** | Independent Consultant, Oxford University Innovation, Oxford
  - European Space Agency 'Digital Twin Earth Precursor' project (worth >£500k total)
- **2011–2015** | Data Analytics Consultant, Tessella Ltd., Abingdon
  - Completed various projects for national and multi-national R&D organisations, obtaining certifications in software engineering, business analysis and project management.

Education

- **2007–2011** | PhD Theoretical Physics, University of Manchester
  - Title: Carrier localization in InGaN/GaN quantum wells
- **2003–2007** | First Class BSc. (Hons.) Theoretical and Computational Physics, Cardiff University
  - Project: Computer simulation studies of spin-glass systems

Honors and Awards

- **2025** | NSF CAREER Award, National Science Foundation
- **2024** | Google Academic Research Award, Google Research
- **2020** | Machine Learning Research Award, Amazon Web Services
- **2019** | Best Paper Award, NeurIPS Climate Change AI Workshop
- **2019** | Best Paper Award, ICML Climate Change AI Workshop
- **2015** | Alan Taylor Visiting Lectureship, University of Oxford
- **2009** | Selected for journal special-issue cover, ICNS-8
- **2009** | Research Student Conference Fund, Institute of Physics (ICNS-8)
- **2009** | Travel Award, UK Nitrides Consortium

Grants and Funding

PI or Co-PI on awarded grants totalling >$7M.

- **2025** | Co-PI: Climate Co-Pilot: A Multimodal AI Agent for Climate Resilience in the MENA Region: $1.5m (ADIA)
- **2025** | PI: GAIA – A Campus Collaboration for AI-Driven Climate and Ocean Research: $18k (UCSD ORI)
- **2025** | Co-PI: Emergent science-policy issues around climate geoengineering proposals: $16k (UCSD ORI)
- **2025** | PI: CAREER: The large-scale buffering of shallow cloud perturbations: $1.0m (NSF)
- **2024** | PI: ClimateBench v2.0 Probabilistic model scoring: $270,000 (Google)
- **2024** | Co-PI: GENIE: generative foundation model for automated climate science: $1m (DARPA)
- **2024** | Co-PI: Identification of clouds microphysical seedability in an actionable manner: $1.5m (UAEREP)
- **2021** | Named Researcher: "ML4CLOUDS": ~£800k total (NERC)
- **2020** | Machine Learning Research Award: $40,000 (AWS)
- **2018** | Co-I: "iMIRACLI on AWS": $150,000 (AWS)
- **2018** | NVIDIA GPU Grant: ca. £2,000 (NVIDIA)
- **2017** | Co-I: Access to Environmental Analytics for Developing Countries: £50,399 (STFC)

Teaching Experience

- **Spring 2024, 2025, 2026** | SIO(C) 209 – Deep Learning for Geo and Environmental Sciences
  - Graduate course introducing deep learning for a wide range of environmental applications
- **Fall 2023, 2024, 2025** | DSC 200 – Data Science Programming
  - Graduate course covering relevant programming concepts and structures such as object orientation.
- **September 2022** | 2nd iMIRACLI summer school, Stockholm
  - Designed, organized and managed a two-week summer school for the 15 PhD students enrolled on the iMIRACLI Marie Curie ITN across Europe, as well as 2 other invited students.
- **May 2021** | Machine Learning for Climate Physics, Virtual
  - An invited extra-curricular lecture for Oxford Physics Undergraduate students.
- **September 2020** | 1st iMIRACLI summer school, Virtual
  - Designed, organized and managed a two-week summer school for the 15 PhD students enrolled on the iMIRACLI Marie Curie ITN across Europe, as well as 8 other invited students.
- **September 2015–Present** | Big data analysis, Environmental Research DTP (Oxford University)
- **2015–2017** | CIS user-workshop, International
- **December 2016** | Python for climate scientists, Oxford University
- **October 2016–May 2017** | Physics of the Atmosphere and Oceans
- **Guest lectures** | SIOG232 (Spring 2026); SIO90 (Winter 2026); DSC106 x2 (Fall 2025); COGS9 (Fall 2024); CCS102 (Winter 2023)

Invited Presentations

- **2026** | Plenary Speaker at 31st Annual CESM Workshop, Boulder, CO
- **2026** | Center for Climate Sciences Special Seminar, NASA Jet Propulsion Lab, Pasadena, CA
- **2026** | 2026 US CLIVAR SSC meeting, Washington DC
- **2026** | Cornell Climate Seminar, Cornell University, NY
- **2026** | AMS Annual Meeting (AS311: Aerosol-Cloud Interactions in Warm Clouds), Houston, TX
- **2026** | 7th National Research Platform (7NRP) meeting, "Climate Science on NRP", San Diego, CA
- **2025** | Keynote, "Roots and Routes", NeurIPS 2025 CCAI Workshop, San Diego, CA
- **2025** | Keynote at EGU 2025 Townhall on Machine Learning for Paleo, Vienna
- **2025** | Centre for Climate Research Singapore, Singapore (virtual)
- **2025** | Noble Seminar, University of Toronto, Canada
- **2024** | AGU Fall Meeting (IN32A), Washington DC
- **2024** | Environmental & Climate Sciences Department Seminar, Brookhaven National Laboratory, NY
- **2024** | Department of Atmospheric Science, University of Wyoming, Laramie
- **2024** | NCAR Computational and Information Systems Laboratory, Denver, CO
- **2024** | NOAA Chemical Sciences Laboratory, Denver, CO
- **2024** | AAAS 2024 Annual Meeting, Denver, Colorado
- **2024** | Berkeley Atmospheric Science Symposium, UC Berkeley

- **2023** | AGU Fall Meeting (A033: Boundary Layer Clouds and Climate Change), San Francisco
- **2023** | AGU Fall Meeting (A086: Lagrangian and Climatological Transitions), San Francisco
- **2023** | Learning the Earth through Artificial Intelligence and Physics Annual Meeting, New York
- **2023** | Earth and Planetary Sciences, University of California, Riverside
- **2023** | Department of Atmospheric and Oceanic Sciences, University of California, Los Angeles
- **2023** | 'Climate and Radiation' Gordon Research Conference, Maine
- **2023** | CASPO, Scripps Institution of Oceanography, San Diego
- **2023** | Department of Environmental Science and Engineering, Caltech
- **2023** | ESA EarthCARE Validation Team, Virtual
- **2023** | Panellist on AI and Climate Science Bridge program at AAAI 2023, Virtual
- **2023** | AI4ER Doctoral Training Center, University of Cambridge, Virtual
- **2023** | The Institute for Mathematical and Statistical Innovation, Chicago
- **2023** | AGU Fall Meeting (A073 - Models, In situ, and Remote sensing of Aerosols), Chicago
- **2022** | Meteorology and Air Quality, Wageningen University, Netherlands
- **2022** | Rosenstiel School of Marine, Atmospheric, and Earth Science, University of Miami
- **2022** | Transformers in Environmental Science (keynote), Magdeburg, Germany
- **2022** | Department of Geosciences, University of Oslo
- **2022** | NextGEMS Storms and Science, Virtual
- **2022** | Institute for Climate and Atmospheric Science, University of Leeds
- **2022** | ETH AI centre in Zurich on AI & Sustainability, Virtual
- **2022** | UN AI for Good 'Accelerating Climate Science with AI', Virtual
- **2021** | International Aerosol Modeling Algorithms Conference, Virtual
- **2021** | Machine Learning for Climate, UC Santa Barbara
- **2021** | ISC High Performance, Virtual
- **2021** | US CLIVAR Data Science Webinar
- **2021** | Institute for Atmospheric and Climate Science, ETH Zurich
- **2021** | Department of Atmospheric, Oceanic and Planetary Physics, University of Oxford
- **2020** | Climate, Atmosphere and Oceanography, Hebrew University
- **2020** | Department of Atmospheric Science, University of Wyoming
- **2020** | ECMWF-ESA Workshop on ML for Earth System Observation and Prediction
- **2020** | Department of Computer Science, University of Bath
- **2020** | NCAS@Reading Science Meeting, Reading (cancelled due to COVID19)
- **2018** | World Climate Research Programme workshop, Ringberg
- **2017** | Swedish Meteorological and Hydrological Institute

Publications

Published peer-reviewed papers: 90; First author: 14. Currently >5500 citations; h-index 37.

* *denotes a (co-)supervised student/postdoc led paper.*

Peer-Reviewed Journal Articles

80. Beadling, R. L., Swaminathan, R., Beucher, R., Blockley, E., Brands, S., Hassler, B., Hegedűs, D., Hoffman, F. M., Lee, J., Lewis, J., Lu, J., Malinina, E., Medeiros, B., Scoccimarro, E., Tjiputra, J., Turner, B., and **Watson-Parris, D.**: Observational Data for Next-Generation Climate Model Evaluation: Requirements, Considerations, and Best Practices, Bulletin of the American Meteorological Society, 107, E813–E835, https://doi.org/10.1175/bams-d-25-0079.1, 2026.

79. Fiedler, S., O'Connor, F. M., **Watson-Parris, D.**, Allen, R. J., Collins, W. J., Griffiths, P. T., Kasoar, M., Kikstra, J., Kok, J. F., Murray, L. T., Paulot, F., Sand, M., Turnock, S. T., Weber, J., Wilcox, L. J., and Naik, V.: AerChemMIP2 – unraveling the role of reactive gases, aerosol particles, and land use for air quality and climate change in CMIP7, Geoscientific Model Development, 19, 3477–3508, https://doi.org/10.5194/gmd-19-3477-2026, 2026.

78. Bhatti, Y. A., **Watson-Parris, D.**, Regayre, L. A., Jia, H., Neubauer, D., Im, U., Svenhag, C., Schutgens, N., Tsikerdekis, A., Nenes, A., Irfan, M., van Diedenhoven, B., Arifi, A., Fu, G., and Hasekamp, O. P.: Uncertainty in Aerosol Effective Radiative Forcing from Anthropogenic and Natural Aerosol Parameters in ECHAM6.3-HAM2.3, Atmospheric Chemistry and Physics, 26, 269–293, https://doi.org/10.5194/acp-26-269-2026, 2026.

77. *Davenport, E. H., Madan, J. V., Gjini, R., Brzenski, J., Ho, N., Hsu, T.-Y., Liang, Y., Liu, Z., Manivannan, V., Pham, E., Vutukuru, R., Williams, A. I. L., Yang, Z., Yu, R., Lutsko, N. J., Hoyer, S., and **Watson-Parris, D.**: JCM

v1.0: A Differentiable, Intermediate-Complexity Atmospheric Model, EGUsphere, 1–20, https://doi.org/10.5194/egusphere-2025-6266, 2026.

76. *Reichelt, T., Rainforth, T., and **Watson-Parris, D.**: Calibration of Climate Model Parameterizations Using Bayesian Experimental Design, Machine Learning: Earth, 2, 015003, https://doi.org/10.1088/3049-4753/ae2edb, 2026.

75. Rahaman, M., Hasana, M., Rahman, S. S., Noor, M. S. M., Abedin, R. R., Tahmid, M. T., **Watson-Parris, D.**, Choudhury, T., Islam, A. B. M. A. A., and Rahman, T.: Forecasting Occupational Survivability of Rickshaw Pullers in a Changing Climate with Wearable Data, Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies, 9, 1–25, https://doi.org/10.1145/3770712, 2025.

74. Talvinen, S., Kim, P., Tovazzi, E., Holopainen, E., Cremer, R., Kühn, T., Kokkola, H., Kipling, Z., Neubauer, D., Teixeira, J. C., Sellar, A., **Watson-Parris, D.**, Yang, Y., Zhu, J., Krishnan, S., Virtanen, A., and Partridge, D. G.: Towards an improved understanding of the impact of clouds and precipitation on the representation of aerosols over the Boreal Forest in GCMs, Atmospheric Chemistry and Physics, 25, 14449–14478, https://doi.org/10.5194/acp-25-14449-2025, 2025.

73. Jordan, G., Malavelle, F., Haywood, J., Chen, Y., Johnson, B., Partridge, D., Peace, A., Duncan, E., **Watson-Parris, D.**, Neubauer, D., Laakso, A., Michou, M., and Nabat, P.: How well are aerosol–cloud interactions represented in climate models? – Part 2: Isolating the aerosol impact on clouds following the 2014–2015 Holuhraun eruption, Atmospheric Chemistry and Physics, 25, 13393–13428, https://doi.org/10.5194/acp-25-13393-2025, 2025.

72. *Baño-Medina, J., Sengupta, A., Michaelis, A., Monache, L. D., Kalansky, J., and **Watson-Parris, D.**: Harnessing AI Data-Driven Global Weather Models for Climate Attribution: An Analysis of the 2017 Oroville Dam Extreme Atmospheric River, https://doi.org/10.1175/AIES-D-24-0090.1, 2025.

71. Herbert, R. J., Williams, A. I. L., Weiss, P., **Watson-Parris, D.**, Dingley, E., Klocke, D., and Stier, P.: Regional variability of aerosol impacts on clouds and radiation in global kilometer-scale simulations, Atmospheric Chemistry and Physics, 25, 7789–7814, https://doi.org/10.5194/acp-25-7789-2025, 2025.

70. **Watson-Parris, D.**, Wilcox, L. J., Stjern, C. W., Allen, R. J., Persad, G., Bollasina, M. A., Ekman, A. M. L., Iles, C. E., Joshi, M., Lund, M. T., McCoy, D., Westervelt, D. M., Williams, A. I. L., and Samset, B. H.: Surface temperature effects of recent reductions in shipping SO2 emissions are within internal variability, Atmospheric Chemistry and Physics, 25, 4443–4454, https://doi.org/10.5194/acp-25-4443-2025, 2025.
Highlighted in Science

69. *Baño-Medina, J., Sengupta, A., Doyle, J. D., Reynolds, C. A., **Watson-Parris, D.**, and Monache, L. D.: Are AI weather models learning atmospheric physics? A sensitivity analysis of cyclone Xynthia, npj Climate and Atmospheric Science, 8, 92, https://doi.org/10.1038/s41612-025-00949-6, 2025.

68. Nowack, P. and **Watson-Parris, D.**: Opinion: Why all emergent constraints are wrong but some are useful – a machine learning perspective, Atmospheric Chemistry and Physics, 25, 2365–2384, https://doi.org/10.5194/acp-25-2365-2025, 2025.

67. Petrenko, M., Kahn, R., Chin, M., Bauer, S. E., Bergman, T., Bian, H., Curci, G., Johnson, B., Kaiser, J. W., Kipling, Z., Kokkola, H., Liu, X., Mezuman, K., Mielonen, T., Myhre, G., Pan, X., Protonotariou, A., Remy, S., Skeie, R. B., Stier, P., Takemura, T., Tsigaridis, K., Wang, H., **Watson-Parris, D.**, and Zhang, K.: Biomass burning emission analysis based on MODIS aerosol optical depth and AeroCom multi-model simulations: implications for model constraints and emission inventories, Atmospheric Chemistry and Physics, 25, 1545–1567, https://doi.org/10.5194/acp-25-1545-2025, 2025.

66. Russo, M. R., Bartholomew, S. L., Hassell, D., Mason, A. M., Neininger, E., Perman, A. J., Sproson, D. A. J., **Watson-Parris, D.**, and Abraham, N. L.: Virtual Integration of Satellite and In-situ Observation Networks (VISION) v1.0: In-Situ Observations Simulator (ISO_simulator), Geoscientific Model Development, 18, 181–191, https://doi.org/10.5194/gmd-18-181-2025, 2025.

65. Myhre, G., Samset, B. H., Stjern, C. W., Hodnebrog, Ø., Kramer, R., Smith, C., Andrews, T., Boucher, O., Faluvegi, G., Forster, P. M., Iversen, T., Kirkevåg, A., Olivié, D., Shindell, D., Stier, P., and **Watson-Parris, D.**: The warming effect of black carbon must be reassessed in light of observational constraints, Cell Reports Sustainability, 100428, https://doi.org/10.1016/j.crsus.2025.100428, 2025.

64. **Watson-Parris, D.**: Integrating Top-Down Energetic Constraints With Bottom-Up Process-Based Constraints for More Accurate Projections of Future Warming, Geophysical Research Letters, 52, e2024GL114269, https://doi.org/10.1029/2024GL114269, 2025.

63. Lütjens, B., Ferrari, R., **Watson-Parris, D.**, and Selin, N. E.: The Impact of Internal Variability on Benchmarking Deep Learning Climate Emulators, Journal of Advances in Modeling Earth Systems, 17, e2024MS004619,

https://doi.org/10.1029/2024MS004619, 2025.

62. *Baño-Medina, J., Sengupta, A., **Watson-Parris, D.**, Hu, W., and Delle Monache, L.: Toward Calibrated Ensembles of Neural Weather Model Forecasts, Journal of Advances in Modeling Earth Systems, 17, e2024MS004734, https://doi.org/10.1029/2024MS004734, 2025.

61. Dewey, M., Hansson, H.-C., **Watson-Parris, D.**, Samset, B. H., Wilcox, L. J., Lewinschal, A., Sand, M., Seland, Ø., Krishnan, S., and Ekman, A. M. L.: AeroGP: Machine Learning How Aerosols Impact Regional Climate, Journal of Geophysical Research: Machine Learning and Computation, 2, e2025JH000741, https://doi.org/10.1029/2025JH000741, 2025.

60. Fiedler, S., Naik, V., O'Connor, F. M., Smith, C. J., Griffiths, P., Kramer, R. J., Takemura, T., Allen, R. J., Im, U., Kasoar, M., Modak, A., Turnock, S., Voulgarakis, A., **Watson-Parris, D.**, Westervelt, D. M., Wilcox, L. J., Zhao, A., Collins, W. J., Schulz, M., Myhre, G., and Forster, P. M.: Interactions between atmospheric composition and climate change – progress in understanding and future opportunities from AerChemMIP, PDRMIP, and RFMIP, Geoscientific Model Development, 17, 2387–2417, https://doi.org/10.5194/gmd-17-2387-2024, 2024.

59. Jordan, G., Malavelle, F., Chen, Y., Peace, A., Duncan, E., Partridge, D. G., Kim, P., **Watson-Parris, D.**, Takemura, T., Neubauer, D., Myhre, G., Skeie, R., Laakso, A., and Haywood, J.: How well are aerosol–cloud interactions represented in climate models? – Part 1: Understanding the sulfate aerosol production from the 2014–15 Holuhraun eruption, Atmospheric Chemistry and Physics, 24, 1939–1960, https://doi.org/10.5194/acp-24-1939-2024, 2024.

58. *Bouabid, S., **Watson-Parris, D.**, Stefanović, S., Nenes, A., and Sejdinovic, D.: Aerosol optical depth disaggregation: toward global aerosol vertical profiles, Environmental Data Science, 3, https://doi.org/10.1017/eds.2024.15, 2024.

57. Toll, V., Rahu, J., Keernik, H., Trofimov, H., Voormansik, T., Manshausen, P., Hung, E., Michelson, D., Christensen, M. W., Post, P., Junninen, H., Murray, B. J., Lohmann, U., **Watson-Parris, D.**, Stier, P., Donaldson, N., Storelvmo, T., Kulmala, M., and Bellouin, N.: Glaciation of liquid clouds, snowfall, and reduced cloud cover at industrial aerosol hot spots, Science (New York, N.Y.), 386, 756–762, https://doi.org/10.1126/science.adl0303, 2024.

56. Eidhammer, T., Gettelman, A., Thayer-Calder, K., **Watson-Parris, D.**, Elsaesser, G., Morrison, H., Lier-Walqui, M. V., Song, C., and McCoy, D.: An extensible perturbed parameter ensemble for the Community Atmosphere Model version 6, Geoscientific Model Development, 17, 7835–7853, https://doi.org/10.5194/gmd-17-7835-2024, 2024.

55. Gettelman, A., Eidhammer, T., Duffy, M. L., McCoy, D. T., Song, C., and **Watson-Parris, D.**: The Interaction Between Climate Forcing and Feedbacks, Journal of Geophysical Research: Atmospheres, 129, e2024JD040857, https://doi.org/10.1029/2024JD040857, 2024.

54. Gettelman, A., Christensen, M. W., Diamond, M. S., Gryspeerdt, E., Manshausen, P., Stier, P., **Watson-Parris, D.**, Yang, M., Yoshioka, M., and Yuan, T.: Has Reducing Ship Emissions Brought Forward Global Warming?, Geophysical Research Letters, 51, e2024GL109077, https://doi.org/10.1029/2024GL109077, 2024.

53. *Bouabid, S., Sejdinovic, D., and **Watson-Parris, D.**: FaIRGP: A Bayesian Energy Balance Model for Surface Temperatures Emulation, Journal of Advances in Modeling Earth Systems, 16, e2023MS003926, https://doi.org/10.1029/2023MS003926, 2024.

52. Song, C., McCoy, D. T., Eidhammer, T., Gettelman, A., McCoy, I. L., **Watson-Parris, D.**, Wall, C. J., Elsaesser, G., and Wood, R.: Buffering of Aerosol-Cloud Adjustments by Coupling Between Radiative Susceptibility and Precipitation Efficiency, Geophysical Research Letters, 51, e2024GL108663, https://doi.org/10.1029/2024GL108663, 2024.

51. Regayre, L. A., Deaconu, L., Grosvenor, D. P., Sexton, D. M. H., Symonds, C., Langton, T., **Watson-Paris, D.**, Mulcahy, J. P., Pringle, K. J., Richardson, M., Johnson, J. S., Rostron, J. W., Gordon, H., Lister, G., Stier, P., and Carslaw, K. S.: Identifying climate model structural inconsistencies allows for tight constraint of aerosol radiative forcing, Atmospheric Chemistry and Physics, 23, 8749–8768, https://doi.org/10.5194/acp-23-8749-2023, 2023.

50. Yik, W., Silva, S. J., Geiss, A., and **Watson-Parris, D.**: Exploring Randomly Wired Neural Networks for Climate Model Emulation, Artificial Intelligence for the Earth Systems, 1–34, https://doi.org/10.1175/aies-d-22-0088.1, 2023.

49. *Manshausen, P., **Watson-Parris, D.**, Christensen, M. W., Jalkanen, J.-P., and Stier, P.: Rapid saturation of cloud water adjustments to shipping emissions, Atmospheric Chemistry and Physics, 23, 12545–12555, https://doi.org/10.5194/acp-23-12545-2023, 2023.

48. *Williams, A. I. L., **Watson-Parris, D.**, Dagan, G., and Stier, P.: Dependence of fast changes in global and local

precipitation on the geographical location of absorbing aerosol, Journal of Climate, 1–38, https://doi.org/10.1175/jcli-d-23-0022.1, 2023.

47. *Manshausen, P., **Watson-Parris, D.**, Wagner, L., Maier, P., Muller, S. J., Ramminger, G., and Stier, P.: Pollution tracker: Finding industrial sources of aerosol emission in satellite imagery, Environmental Data Science, 2, https://doi.org/10.1017/eds.2023.20, 2023.

46. **Watson-Parris, D.**, Rao, Y., Olivié, D., Seland, Ø., Nowack, P., Camps-Valls, G., Stier, P., Bouabid, S., Dewey, M., Fons, E., Gonzalez, J., Harder, P., Jeggle, K., Lenhardt, J., Manshausen, P., Novitasari, M., Ricard, L., and Roesch, C.: ClimateBench v1.0: A Benchmark for Data-Driven Climate Projections, Journal of Advances in Modeling Earth Systems, 14, https://doi.org/10.1029/2021ms002954, 2022.
Highlight: "How AI is improving climate forecasts." Nature

45. Salzmann, M., Ferrachat, S., Tully, C., Münch, S., **Watson-Parris, D.**, Neubauer, D., Siegenthaler-Le Drian, C., Rast, S., Heinold, B., Crueger, T., Brokopf, R., Mülmenstädt, J., Quaas, J., Wan, H., Zhang, K., Lohmann, U., Stier, P., and Tegen, I.: The Global Atmosphere-aerosol Model ICON-A-HAM2.3–Initial Model Evaluation and Effects of Radiation Balance Tuning on Aerosol Optical Thickness, Journal of Advances in Modeling Earth Systems, 14, https://doi.org/10.1029/2021ms002699, 2022.

44. *Harder, P., **Watson-Parris, D.**, Stier, P., Strassel, D., Gauger, N. R., and Keuper, J.: Physics-informed learning of aerosol microphysics, Environmental Data Science, 1, e20, https://doi.org/10.1017/eds.2022.22, 2022.

43. *Williams, A. I. L., Stier, P., Dagan, G., and **Watson-Parris, D.**: Strong control of effective radiative forcing by the spatial pattern of absorbing aerosol, Nature Climate Change, 1–8, https://doi.org/10.1038/s41558-022-01415-4, 2022.

42. **Watson-Parris, D.**, Christensen, M. W., Laurenson, A., Clewley, D., Gryspeerdt, E., and Stier, P.: Shipping regulations lead to large reduction in cloud perturbations, Proceedings of the National Academy of Sciences, 119, e2206885119, https://doi.org/10.1073/pnas.2206885119, 2022.
Highlight: "Air pollution cools climate more than expected – this makes cutting carbon emissions more urgent." The Conversation

41. **Watson-Parris, D.** and Smith, C. J.: Large uncertainty in future warming due to aerosol forcing, Nature Climate Change, 1–3, https://doi.org/10.1038/s41558-022-01516-0, 2022.

40. Kasim, M. F., **Watson-Parris, D.**, Deaconu, L., Oliver, S., Hatfield, P., Froula, D. H., Gregori, G., Jarvis, M., Khatiwala, S., Korenaga, J., Topp-Mugglestone, J., Viezzer, E., and Vinko, S. M.: Building high accuracy emulators for scientific simulations with deep neural architecture search, Machine Learning: Science and Technology, 3, 015013, https://doi.org/10.1088/2632-2153/ac3ffa, 2022.
Highlight: "From models of galaxies to atoms, simple AI shortcuts speed up simulations by billions of times." Science

39. Christensen, M. W., Gettelman, A., Cermak, J., Dagan, G., Diamond, M., Douglas, A., Feingold, G., Glassmeier, F., Goren, T., Grosvenor, D. P., Gryspeerdt, E., Kahn, R., Li, Z., Ma, P.-L., Malavelle, F., McCoy, I. L., McCoy, D. T., McFarquhar, G., Mülmenstädt, J., Pal, S., Possner, A., Povey, A., Quaas, J., Rosenfeld, D., Schmidt, A., Schrödner, R., Sorooshian, A., Stier, P., Toll, V., **Watson-Parris, D.**, Wood, R., Yang, M., and Yuan, T.: Opportunistic experiments to constrain aerosol effective radiative forcing, Atmospheric Chemistry and Physics, 22, 641–674, https://doi.org/10.5194/acp-22-641-2022, 2022.

38. Manshausen, P., **Watson-Parris, D.**, Christensen, M. W., Jalkanen, J.-P., and Stier, P.: Invisible ship tracks show large cloud sensitivity to aerosol, Nature, 610, 101–106, https://doi.org/10.1038/s41586-022-05122-0, 2022.
Nature Briefing: "Finding the invisible traces of shipping in marine clouds"

37. Che, H., Stier, P., **Watson-Parris, D.**, Gordon, H., and Deaconu, L.: Source attribution of cloud condensation nuclei and their impact on stratocumulus clouds and radiation in the south-eastern Atlantic, Atmospheric Chemistry and Physics, 22, 10789–10807, https://doi.org/10.5194/acp-22-10789-2022, 2022.

36. Whaley, C. H., Mahmood, R., Salzen, K. V., Winter, B., Eckhardt, S., Arnold, S., Beagley, S., Becagli, S., Chien, R.-Y., Christensen, J., Damani, S. M., Dong, X., Eleftheriadis, K., Evangeliou, N., Faluvegi, G., Flanner, M., Fu, J. S., Gauss, M., Giardi, F., Gong, W., Hjorth, J. L., Huang, L., Im, U., Kanaya, Y., Krishnan, S., Klimont, Z., Kühn, T., Langner, J., Law, K. S., Marelle, L., Massling, A., Olivié, D., Onishi, T., Oshima, N., Peng, Y., Plummer, D. A., Popovicheva, O., Pozzoli, L., Raut, J.-C., Sand, M., Saunders, L. N., Schmale, J., Sharma, S., Skeie, R. B., Skov, H., Taketani, F., Thomas, M. A., Traversi, R., Tsigaridis, K., Tsyro, S., Turnock, S., Vitale, V., Walker, K. A., Wang, M., **Watson-Parris, D.**, and Weiss-Gibbons, T.: Model evaluation of short-lived climate forcers for the Arctic Monitoring and Assessment Programme: a multi-species, multi-model study, Atmospheric Chemistry and Physics, 22, 5775–5828, https://doi.org/10.5194/acp-22-5775-2022, 2022.

35. Sand, M., Samset, B. H., Myhre, G., Gliß, J., Bauer, S. E., Bian, H., Chin, M., Checa-Garcia, R., Ginoux, P., Kipling, Z., Kirkevåg, A., Kokkola, H., Le Sager, P., Lund, M. T., Matsui, H., van Noije, T., Olivié, D. J. L., Remy,

S., Schulz, M., Stier, P., Stjern, C. W., Takemura, T., Tsigaridis, K., Tsyro, S. G., and **Watson-Parris, D.**: Aerosol absorption in global models from AeroCom phase III, Atmospheric Chemistry and Physics, 21, 15929–15947, https://doi.org/10.5194/acp-21-15929-2021, 2021.

34. *Langton, T., Stier, P., **Watson-Parris, D.**, and Mulcahy, J. P.: Decomposing Effective Radiative Forcing Due to Aerosol Cloud Interactions by Global Cloud Regimes, Geophysical Research Letters, 48, https://doi.org/10.1029/2021gl093833, 2021.

33. Dagan, G., Stier, P., and **Watson-Parris, D.**: An Energetic View on the Geographical Dependence of the Fast Aerosol Radiative Effects on Precipitation, Journal of Geophysical Research: Atmospheres, 126, https://doi.org/10.1029/2020jd033045, 2021.

32. **Watson-Parris, D.**, Sutherland, S. A., Christensen, M. W., Eastman, R., and Stier, P.: A Large-Scale Analysis of Pockets of Open Cells and Their Radiative Impact, Geophysical Research Letters, 48, https://doi.org/10.1029/2020gl092213, 2021.

31. Brown, H., Liu, X., Pokhrel, R., Murphy, S., Lu, Z., Saleh, R., Mielonen, T., Kokkola, H., Bergman, T., Myhre, G., Skeie, R. B., **Watson-Parris, D.**, Stier, P., Johnson, B., Bellouin, N., Schulz, M., Vakkari, V., Beukes, J. P., van Zyl, P. G., Liu, S., and Chand, D.: Biomass burning aerosols in most climate models are too absorbing, Nature Communications, 12, https://doi.org/10.1038/s41467-020-20482-9, 2021.

30. Gettelman, A., Lamboll, R., Bardeen, C. G., Forster, P. M., and **Watson-Parris, D.**: Climate Impacts of COVID-19 Induced Emission Changes, Geophysical Research Letters, 48, https://doi.org/10.1029/2020gl091805, 2021.
Highlight: "COVID-19 lockdowns temporarily raised global temperatures." AGU/Eos

29. **Watson-Parris, D.**: Machine learning for weather and climate are worlds apart, Philosophical Transactions of the Royal Society A, 379, 20200098, https://doi.org/10.1098/rsta.2020.0098, 2021.

28. *Witt, C. S. D., Tong, C., Zantedeschi, V., Martini, D. D., Kalaitzis, A., Chantry, M., **Watson-Parris, D.**, and Bilinski, P.: RainBench: Towards Data-Driven Global Precipitation Forecasting from Satellite Imagery, Proceedings of the AAAI Conference on Artificial Intelligence, 35, 14902–14910, https://doi.org/10.1609/aaai.v35i17.17749, 2021.

27. Zhang, S., Stier, P., and **Watson-Parris, D.**: On the contribution of fast and slow responses to precipitation changes caused by aerosol perturbations, Atmospheric Chemistry and Physics, 21, 10179–10197, https://doi.org/10.5194/acp-21-10179-2021, 2021.

26. **Watson-Parris, D.**, Williams, A., Deaconu, L., and Stier, P.: Model calibration using ESEm v1.1.0 – an open, scalable Earth system emulator, Geoscientific Model Development, 14, 7659–7672, https://doi.org/10.5194/gmd-14-7659-2021, 2021.

25. Dagan, G., Stier, P., and **Watson-Parris, D.**: Aerosol Forcing Masks and Delays the Formation of the North Atlantic Warming Hole by Three Decades, Geophysical Research Letters, 47, https://doi.org/10.1029/2020gl090778, 2020.

24. Wood, T., Maycock, A. C., Forster, P. M., Richardson, T. B., Andrews, T., Boucher, O., Myhre, G., Samset, B. H., Kirkevåg, A., Lamarque, J.-F., Mülmenstädt, J., Olivié, D., Takemura, T., and **Watson-Parris, D.**: The Southern Hemisphere Midlatitude Circulation Response to Rapid Adjustments and Sea Surface Temperature Driven Feedbacks, Journal of Climate, 33, 9673–9690, https://doi.org/10.1175/jcli-d-19-1015.1, 2020.

23. Allen, R. J., Lamarque, J.-F., **Watson-Parris, D.**, and Olivié, D.: Assessing California Wintertime Precipitation Responses to Various Climate Drivers, Journal of Geophysical Research: Atmospheres, 125, https://doi.org/10.1029/2019jd031736, 2020.

22. **Watson-Parris, D.**, Bellouin, N., Deaconu, L. T., Schutgens, N. A. J., Yoshioka, M., Regayre, L. A., Pringle, K. J., Johnson, J. S., Smith, C. J., Carslaw, K. S., and Stier, P.: Constraining Uncertainty in Aerosol Direct Forcing, Geophysical Research Letters, 47, https://doi.org/10.1029/2020gl087141, 2020.

21. Bellouin, N., Quaas, J., Gryspeerdt, E., Kinne, S., Stier, P., **Watson-Parris, D.**, Boucher, O., Carslaw, K. S., Christensen, M., Daniau, A.-L., Dufresne, J.-L., Feingold, G., Fiedler, S., Forster, P., Gettelman, A., Haywood, J. M., Lohmann, U., Malavelle, F., Mauritsen, T., McCoy, D. T., Myhre, G., Mülmenstädt, J., Neubauer, D., Possner, A., Rugenstein, M., Sato, Y., Schulz, M., Schwartz, S. E., Sourdeval, O., Storelvmo, T., Toll, V., Winker, D., and Stevens, B.: Bounding Global Aerosol Radiative Forcing of Climate Change, Reviews of Geophysics, 58, https://doi.org/10.1029/2019rg000660, 2020.

20. Che, H., Stier, P., Gordon, H., **Watson-Parris, D.**, and Deaconu, L.: Cloud adjustments dominate the overall negative aerosol radiative effects of biomass burning aerosols in UKESM1 climate model simulations over the south-eastern Atlantic, Atmospheric Chemistry and Physics, 21, 17–33, https://doi.org/10.5194/acp-21-17-2021, 2020.

19. McCoy, I. L., McCoy, D. T., Wood, R., Regayre, L., **Watson-Parris, D.**, Grosvenor, D. P., Mulcahy, J. P., Hu, Y., Bender, F. A.-M., Field, P. R., Carslaw, K. S., and Gordon, H.: The hemispheric contrast in cloud microphysical properties constrains aerosol forcing, Proceedings of the National Academy of Sciences of the United States of America, 117, 18998–19006, https://doi.org/10.1073/pnas.1922502117, 2020.

18. Haywood, J. M., Abel, S. J., Barrett, P. A., Bellouin, N., Blyth, A., Bower, K. N., Brooks, M., Carslaw, K., Che, H., Coe, H., Cotterell, M. I., Crawford, I., Cui, Z., Davies, N., Dingley, B., Field, P., Formenti, P., Gordon, H., Graaf, M. D., Herbert, R., Johnson, B., Jones, A. C., Langridge, J. M., Malavelle, F., Partridge, D. G., Peers, F., Redemann, J., Stier, P., Szpek, K., Taylor, J. W., **Watson-Parris, D.**, Wood, R., Wu, H., and Zuidema, P.: The CLoud–Aerosol–Radiation Interaction and Forcing: Year 2017 (CLARIFY-2017) measurement campaign, Atmospheric Chemistry and Physics, 21, 1049–1084, https://doi.org/10.5194/acp-21-1049-2021, 2020.

17. Richardson, T. B., Forster, P. M., Smith, C. J., Maycock, A. C., Wood, T., Andrews, T., Boucher, O., Faluvegi, G., Fläschner, D., Hodnebrog, Ø., Kasoar, M., Kirkevåg, A., Lamarque, J.-F., Mülmenstädt, J., Myhre, G., Olivié, D., Portmann, R. W., Samset, B. H., Shawki, D., Shindell, D., Stier, P., Takemura, T., Voulgarakis, A., and **Watson-Parris, D.**: Efficacy of Climate Forcings in PDRMIP Models, Journal of Geophysical Research: Atmospheres, 124, 12824–12844, https://doi.org/10.1029/2019jd030581, 2019.

16. Heikenfeld, M., Marinescu, P. J., Christensen, M., **Watson-Parris, D.**, Senf, F., van den Heever, S. C., and Stier, P.: tobac 1.2: towards a flexible framework for tracking and analysis of clouds in diverse datasets, Geoscientific Model Development, 12, 4551–4570, https://doi.org/10.5194/gmd-12-4551-2019, 2019.

15. Dagan, G., Stier, P., and **Watson-Parris, D.**: Analysis of the Atmospheric Water Budget for Elucidating the Spatial Scale of Precipitation Changes Under Climate Change, Geophysical Research Letters, 46, 10504–10511, https://doi.org/10.1029/2019gl084173, 2019.

14. Dagan, G., Stier, P., and **Watson-Parris, D.**: Contrasting Response of Precipitation to Aerosol Perturbation in the Tropics and Extratropics Explained by Energy Budget Considerations, Geophysical Research Letters, 46, 7828–7837, https://doi.org/10.1029/2019gl083479, 2019.

13. Hodnebrog, Ø., Myhre, G., Samset, B. H., Alterskjær, K., Andrews, T., Boucher, O., Faluvegi, G., Fläschner, D., Forster, P. M., Kasoar, M., Kirkevåg, A., Lamarque, J.-F., Olivié, D., Richardson, T. B., Shawki, D., Shindell, D., Shine, K. P., Stier, P., Takemura, T., Voulgarakis, A., and **Watson-Parris, D.**: Water vapour adjustments and responses differ between climate drivers, Atmospheric Chemistry and Physics, 19, 12887–12899, https://doi.org/10.5194/acp-19-12887-2019, 2019.

12. Fanourgakis, G. S., Kanakidou, M., Nenes, A., Bauer, S. E., Bergman, T., Carslaw, K. S., Grini, A., Hamilton, D. S., Johnson, J. S., Karydis, V. A., Kirkevåg, A., Kodros, J. K., Lohmann, U., Luo, G., Makkonen, R., Matsui, H., Neubauer, D., Pierce, J. R., Schmale, J., Stier, P., Tsigaridis, K., Noije, T. V., Wang, H., **Watson-Parris, D.**, Westervelt, D. M., Yang, Y., Yoshioka, M., Daskalakis, N., Decesari, S., Gysel-Beer, M., Kalivitis, N., Liu, X., Mahowald, N. M., Myriokefalitakis, S., Schrödner, R., Sfakianaki, M., Tsimpidi, A. P., Wu, M., and Yu, F.: Evaluation of global simulations of aerosol particle and cloud condensation nuclei number, with implications for cloud droplet formation, Atmospheric Chemistry and Physics, 19, 8591–8617, https://doi.org/10.5194/acp-19-8591-2019, 2019.

11. **Watson-Parris, D.**, Schutgens, N., Reddington, C., Pringle, K. J., Liu, D., Allan, J. D., Coe, H., Carslaw, K. S., and Stier, P.: In situ constraints on the vertical distribution of global aerosol, Atmospheric Chemistry and Physics, 19, 11765–11790, https://doi.org/10.5194/acp-19-11765-2019, 2019.

10. Tegen, I., Neubauer, D., Ferrachat, S., Drian, C. S.-L., Bey, I., Schutgens, N., Stier, P., **Watson-Parris, D.**, Stanelle, T., Schmidt, H., Rast, S., Kokkola, H., Schultz, M., Schroeder, S., Daskalakis, N., Barthel, S., Heinold, B., and Lohmann, U.: The global aerosol–climate model ECHAM6.3–HAM2.3 – Part 1: Aerosol evaluation, Geoscientific Model Development, 12, 1643–1677, https://doi.org/10.5194/gmd-12-1643-2019, 2019.

9. Smith, C. J., Kramer, R. J., Myhre, G., Forster, P. M., Soden, B. J., Andrews, T., Boucher, O., Faluvegi, G., Fläschner, D., Hodnebrog, Ø., Kasoar, M., Kharin, V., Kirkevåg, A., Lamarque, J.-F., Mülmenstädt, J., Olivié, D., Richardson, T., Samset, B. H., Shindell, D., Stier, P., Takemura, T., Voulgarakis, A., and **Watson-Parris, D.**: Understanding Rapid Adjustments to Diverse Forcing Agents, Geophysical Research Letters, 45, https://doi.org/10.1029/2018gl079826, 2018.

8. Myhre, G., Kramer, R. J., Smith, C. J., Hodnebrog, Ø., Forster, P., Soden, B. J., Samset, B. H., Stjern, C. W., Andrews, T., Boucher, O., Faluvegi, G., Fläschner, D., Kasoar, M., Kirkevåg, A., Lamarque, J.-F., Olivié, D., Richardson, T., Shindell, D., Stier, P., Takemura, T., Voulgarakis, A., and **Watson-Parris, D.**: Quantifying the Importance of Rapid Adjustments for Global Precipitation Changes, Geophysical Research Letters, 45, https://doi.org/10.1029/2018gl079474, 2018.

7. **Watson-Parris, D.**, Schutgens, N., Winker, D., Burton, S. P., Ferrare, R. A., and Stier, P.: On the Limits of CALIOP for Constraining Modeled Free Tropospheric Aerosol, Geophysical Research Letters, 45, 9260–9266,

https://doi.org/10.1029/2018gl078195, 2018.

6. Lund, M. T., Samset, B. H., Skeie, R. B., **Watson-Parris, D.**, Katich, J. M., Schwarz, J. P., and Weinzierl, B.: Short Black Carbon lifetime inferred from a global set of aircraft observations, npj Climate and Atmospheric Science, 1, 31, https://doi.org/10.1038/s41612-018-0040-x, 2018.

5. **Watson-Parris, D.**, Schutgens, N., Cook, N., Kipling, Z., Kershaw, P., Gryspeerdt, E., Lawrence, B., and Stier, P.: Community Intercomparison Suite (CIS) v1.4.0: a tool for intercomparing models and observations, Geoscientific Model Development, 9, 3093–3110, https://doi.org/10.5194/gmd-9-3093-2016, 2016.

4. Badcock, T. J., Hammersley, S., **Watson-Parris, D.**, Dawson, P., Godfrey, M. J., Kappers, M. J., McAleese, C., Oliver, R. A., and Humphreys, C. J.: Carrier density dependent localization and consequences for efficiency droop in InGaN/GaN quantum well structures, Japanese Journal of Applied Physics, 52, 2013.

3. Hammersley, S., **Watson-Parris, D.**, Dawson, P., Godfrey, M. J., Badcock, T. J., Kappers, M. J., McAleese, C., Oliver, R. A., and Humphreys, C. J.: The consequences of high injected carrier densities on carrier localization and efficiency droop in InGaN/GaN quantum well structures, Journal of Applied Physics, 111, 083512, https://doi.org/10.1063/1.3703062, 2012.

2. **Watson-Parris, D.**, Godfrey, M. J., Dawson, P., Oliver, R. A., Galtrey, M. J., Kappers, M. J., and Humphreys, C. J.: Carrier localization mechanisms in InxGa1-xN/GaN quantum wells, Physical Review B - Condensed Matter and Materials Physics, 83, 2011.

1. Hammersley, S., Badcock, T. J., **Watson-Parris, D.**, Godfrey, M. J., Dawson, P., Kappers, M. J., and Humphreys, C. J.: Study of efficiency droop and carrier localisation in an InGaN/GaN quantum well structure, Physica Status Solidi (C), 2196, https://doi.org/10.1002/pssc.201001001, 2011.

Conference Papers

8. *Cachay, S. R., **Watson-Parris, D.**, and Yu, R.: U-Cast: A Surprisingly Simple and Efficient Frontier Probabilistic AI Weather Forecaster, in: Forty-third International Conference on Machine Learning, https://doi.org/10.48550/arXiv.2604.09041, 2026.

7. *Irvin, J. A., Han, J., Wang, Z., Alharbi, A., Zhao, Y., Bayarsaikhan, N.-E., Visioni, D., Ng, A. Y., and **Watson-Parris, D.**: Spatiotemporal Pyramid Flow Matching for Climate Emulation, in: Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), https://arxiv.org/abs/2512.02268, 2026.

6. Varambally, S., Fisher, M., Thakker, J., Chen, Y., Xia, Z., Jafari, Y., Niu, R., Jain, M., Manivannan, V. V., Novack, Z., Han, L., Eranky, S., Cachay, S. R., Berg-Kirkpatrick, T., **Watson-Parris, D.**, Ma, Y., and Yu, R.: Zephyrus: An Agentic Framework for Weather Science, in: The Fourteenth International Conference on Learning Representations, https://openreview.net/forum?id=aVeaNahsID, 2026.

5. Wang, K., Varambally, S., **Watson-Parris, D.**, Ma, Y., and Yu, R.: Discovering Latent Causal Graphs from Spatiotemporal Data, in: Forty-second International Conference on Machine Learning, https://openreview.net/forum?id=WPeAraSKAK, 2025.

4. Lyu, B., Cao, Y., **Watson-Parris, D.**, Bergen, L., Berg-Kirkpatrick, T., and Yu, R.: Adapting While Learning: Grounding LLMs for Scientific Problems with Tool Usage Adaptation, in: Forty-second International Conference on Machine Learning, https://openreview.net/forum?id=owulFly8oQ, 2025.

3. *Manivannan, V. V., Jafari, Y., Eranky, S., Ho, S., Yu, R., **Watson-Parris, D.**, Ma, Y., Bergen, L., and Berg-Kirkpatrick, T.: ClimaQA: An Automated Evaluation Framework for Climate Question Answering Models, in: The Thirteenth International Conference on Learning Representations, https://openreview.net/forum?id=goFpCuJalN, 2024.

2. *Niu, R., Wu, D., Kim, K., Ma, Y., **Watson-Parris, D.**, and Yu, R.: Multi-Fidelity Residual Neural Processes for Scalable Surrogate Modeling, in: Forty-first International Conference on Machine Learning, https://openreview.net/forum?id=QRDfBIhrJq&referrer=%5Bthe%20profile%20of%20Dongxia%20Wu%5D(%2Fprofile%3Fid%3D~Dongxia_Wu1), 2024.

1. **Watson-Parris, D.**, Godfrey, M. J., Oliver, R. A., Dawson, P., Galtrey, M. J., Kappers, M. J., and Humphreys, C. J.: Energy landscape and carrier wave-functions in InGaN/GaN quantum wells, in: Physica Status Solidi (C) Current Topics in Solid State Physics, 2255–2258, 2010.

Book Contributions and Other Publications

2. Whaley, C. H., Mahmood, R., von Salzen, K., Eckhardt, S., Winter, B., Bruhwiler, L., Langner, J., Thomas, M. A., Devasthale, A., Arnold, S., Beagley, S., Becagli, S., Chien, R.-Y., Christensen, J., Damani, S. M., Dong, X., Evangeliou, N., Faluvegi, G., Flanner, M., Fu, J., Gauss, M., Giardi, F., Gong, W., Hjorth, J. L., Huang, L., Im, U., Kanaya, Y., Klimont, Z., Krishnan, S., Kühn, T., Law, K., Marelle, L., Massling, A., Onishi, T., Oshima, N., Peng, Y., Plummer, D., Popovicheva, O., Pozzoli, L., Raut, J.-C., Sand, M., Saunders, L. N., Schmale, J., Sharma, S.,

Skeie, R., Skov, H., Taketani, F., Traversi, R., Tsigaridis, K., Tsyro, S., Turnock, S., Vitale, V., Walker, K. A., Wang, M., **Watson-Parris, D.**, and Weiss-Gibbons, T.: Modeling of short-lived climate forcers, in: AMAP Assessment 2021: Impacts of Short-lived Climate Forcers on Arctic Climate, Air Quality, and Human Health, AMAP, https://pure.iiasa.ac.at/id/eprint/19571/, 2021.

1. Allan, J. and **Watson-Parris, D.**: Measurements of ambient aerosol properties, in: Aerosols and Climate, Elsevier, 2021.

Mentoring

Postdoctoral Scholars

- Jorge Baño-Medina (project advisor, 2023–2025)
- Andrew Williams (2025–2026)

Doctoral Students (Chair/Co-Chair)

- Willa Tobin (2025–present)
- Salva Cachay (co-chair, 2025–present)
- LaKeta Kemp (2024–present)
- Giorgia Nicolaou (2024–present)
- Sophie Synn (co-chair, 2023–present)
- Varan Madan (chair, 2023–present)
- Peter Manshausen (co-supervisor, 2020–2024, graduated works at NVIDIA)
- Andrew Williams (co-supervisor, 2019–2023, graduated faculty at Columbia)
- Shipeng Zhang (co-supervisor, 2018–2020, graduated faculty at Nanjing)

Doctoral Committee Memberships

Sumanth Varambally (2025–present); Kyle Ivey (2025–present); Sourita Saha (2025–present); Erica De Biasio (2025–present); Abbey Williams (2024–present); Brandon Duran (2024–present); Grace Cawley (2024–present); Luke Fairbanks (2024–present); Michaela Alksne (2024–present); Rebecca Gjini (2024–present); Masfiqur Rahaman (2024–present); Severine Soltani (2024–2025, graduated); Anthony Wilson (2024–2026); David Vishny (2023–2025, graduated); Jessica Wan (2023–2025, graduated); Raymond Leibensperger (2023–2025, graduated); Randall Clark (2023, graduated)

Masters Students

Pradyumna Sripada (2025–present); Jackson Wilke (2025–present); Shreejith Suthraye Gokulnath (2025–2026); Noah Barton (2023–2025); Rishabh Patni (2023–2025); Harsha Gangala (2023–2024, graduated); Harin Radha-Krishnan (2023–2024, graduated); Jesse Wang (2022); Matthew Wan (2021); Thomas Matthews (2019); Robin Gan (2019); Sam Sutherland (2018)

Undergraduate Research Students

- Isabella Anderson; Sebastian Modafferi; Sophia Wynn; Eric Pham; Nick Ho; Jack Lim; Shensi Li; Brooks Niu; Karina Shah; Pratham Aggarwal; Thaarak Sriram

Other

- Climate Change Faculty for Stanford AI for Climate Change Bootcamp (2020–present)
- Super Mentor for Frontier Development Lab (FDL) summer projects (2019–present)

Contributed Presentations

30 oral presentations and 6 posters

Service and Outreach

Conference and Workshop Organisation

- Planning Committee Member, UCSD AI Symposium, 2026
- Co-Convener, "Understanding reactive gases, aerosols, and land use for air quality and climate change", CMIP 2026 Community Workshop, Kyoto
- Co-Convener, "Advances in Approaches for Earth System Model Uncertainty Quantification: Integrating Models and Observations", AGU 2025
- Co-Convener, "Machine Learning for Climate Science" session, EGU 2026
- Lead Convener, "Machine Learning for Climate Science" session, EGU 2025
- Co-Convener "GC13 – Advances in Emulating Earth System Models", AGU 2024

- Co-Convener "GC21 – Deep Learning for Climate and Weather", AGU 2024
- Lead Convener, "Machine Learning for Climate Science" session, EGU 2024
- Co-Convener, "GC015 - Aerosols as Drivers of Climate Risk", AGU 2023
- Co-Convener, "GC055 - Deep Learning for Climate Science and Weather Prediction", AGU 2023
- Co-Convener, "GC036 - Developments in impacts-relevant physical model emulation", AGU 2023
- Lead Convener of "Machine Learning for Climate Science" session at EGU 2023
- Program committee member for Climate Change AI workshop at NeurIPS 2022
- Lead Convener of "Machine Learning for Climate Science" session at EGU 2022 (>200 attendees)
- Co-chair of the UN AI for Good - Accelerating Climate Science with AI series (2021–2022)
- Meta-reviewer for Climate Change AI workshop at ICML 2021
- Chair of "Machine Learning" session at UK Atmospheric Science Conference 2021
- Program committee member for Climate Change AI workshop at NeurIPS 2020
- Program committee member for AI for Earth Sciences workshop at NeurIPS 2020
- Co-chair of 10th "Climate Informatics" international conference (2020)
- Organising Committee member for "Machine Learning for Nowcasting" workshop (2020)
- Co-host of the 1st "Oxford Machine Learning in Climate Science" workshop (2018)
- Co-convener of the machine learning in climate forum of the Oxford Climate Research Network

Editorial

- Editor for Atmospheric Chemistry and Physics
- Editor for Environmental Data Science

Peer Review

Nature Scientific Data; NeurIPS '26 (Area Chair); National Academies of Sciences, Engineering, and Medicine (Workshop Proceedings); ICLR 2025; NeurIPS '25; NeurIPS '24; Proceedings of the National Academy of Sciences; Science Advances; Geophysical Research Letters; Journal of Geophysical Research – Atmospheres; Nature Communications; Atmospheric Chemistry and Physics (Letters); Geoscientific Model Development; Journal of Advances in Modelling Earth Systems; Atmospheric Environment; International Journal of Climatology; AGU Books; IEEE Transactions on Geoscience and Remote Sensing; Reviews of Geophysics

Proposal Review

NSF CSSI Panel Reviewer (2026); Panelist for NSF Site Visit of NSF AI Institute; ETH Zurich Research Commission; Swiss Data Science Center (SDSC) Collaborative Data Science Projects; Research Council of Norway for Chinese-Norwegian Collaboration Projects within Climate Systems; Climate Change AI Innovation Grants (meta-reviewer)

Open-Source Projects

- Lead developer and maintainer of the Earth System Emulator (ESEm) which enables easy emulation and calibration of Earth System Models and data, such as ClimateBench
- Lead developer and maintainer of CIS, a climate data fusion tool (>100,000 downloads)
- Also developed CALIOPy and CMORize
- Contributor to many other popular libraries such as iris, cartopy and xarray

Outreach

- "Industrial Pollution Can Increase Snowfall and Reduce Cloud Cover" in UCSD Today (2024)
- "El Niño fingered as likely culprit in record 2023 temperatures" in Science magazine (2024)
- "We've been accidentally cooling the planet - and it's about to stop" in The Washington Post (2024)
- "Generative AI in Science" in ACM (2024)
- "How AI is improving climate forecasts" in Nature (2024)
- "We're changing the clouds' An unforeseen test of geoengineering is fueling record ocean warmth" in Science magazine (2023)
- "Tiny Aerosols Pose a Big Predicament in a Warming World" in Wired magazine (2023)
- "Air pollution cools climate more than expected – this makes cutting carbon emissions more urgent" The Conversation (2022)
- "Tiny aerosols present a big challenge for global warming" in the National Observer (2022)
- Guest lecture at DeepMind UNIQ+ graduate student access programme
- AGU News article "COVID-19 lockdowns temporarily raised global temperatures": https://bit.ly/3p20zc8 (2021)
- Contributed material and instructional video to "ESA AI for Earth Monitoring" MOOC (2021)

- Featured in "Climate Researchers Enlist Big Cloud Providers for Big Data Challenges" Wall Street Journal (2020)
- Interviewed in Amazon Web Services for the "Fix This" podcast (https://bit.ly/37ZhGWL) and a blog post by the CTO of Amazon: https://www.allthingsdistributed.com/2020/11/science-of-climate-change.html (2020)
- "Climate change: difficult choices" Science Week at Europa School, Culham (2020)
- "Stargazing+" open day for children with additional support needs (2019)
- "Stargazing+" open day for children with additional support needs (2018)
- "Climate change: what is it all about?" Science Week at Europa School, Culham (2017)
- "Stargazing live" departmental public day (2017)

Committee Memberships

- Co-chair of "AerChemMIP2" CMIP7 modelling exercise
- Member, WCRP Digital Earths Lighthouse Activity – Model-Data Fusion for Climate Working Group (2026–present)
- Steering committee member of the AeroCom international modelling consortium
- Steering committee member of the HAMMOZ aerosol model community
- Steering committee member of "Composition Air quality Climate inTeractions Initiative"
- Steering committee member of CLIVAR "Micro2Macro" program

Other

- Advisory Panel: "PROCEED" DOE EPSCoR project (DOE)
- Co-organised a departmental Equality, Diversity and Inclusion (EDI) session (2021)
- AGU Outstanding Student Presentation Award (OSPA) judge (2019)

Professional Memberships

- American Geosciences Union
- European Geosciences Union
- Institute of Physics
- British Computer Society (2012–2015)