

Nicola Maher

DECRA/RESEARCH FELLOW · CLIMATE FLUID PHYSICS GROUP

Research School of Earth Sciences, Australian National University, Canberra, Australia

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Education

University of New South Wales

PHD IN CLIMATE SCIENCE

- Supervisors: Matthew England and Alex Sen Gupta
- Title: *Natural drivers of Interannual to Decadal Variations in Surface Climate*

Sydney, Australia

Apr. 2012 - Sept. 2016

Australian National University

BACHELOR OF GLOBAL AND OCEAN SCIENCES WITH HONOURS

- Supervisors: Andy Hogg and Ross Griffiths
- Title: *A laboratory investigation into the effects of westerly wind stress and buoyancy forcing on the Antarctic Circumpolar Current*

Canberra, Australia

Feb. 2007 - Nov. 2010

Work Experience

- 2023- **Research and DECRA Fellow**, Australian National University, Canberra, Australia
Chief Investigator, ARC Centre of Excellence for Climate Extremes
CIRES Research Affiliate, University of Colorado at Boulder, Boulder, USA
- 2020-2023 **CIRES Postdoctoral Fellow**, *Mentors: Jen Kay & Antonietta Capotondi* University of Colorado at Boulder, Boulder, USA
- 2019-2020 **Postdoctoral Researcher**, *Mentor: Jochem Marotzke* Max-Planck Institute for Meteorology, Hamburg, Germany
- 2017-2019 **Alexander von Humboldt Postdoctoral Fellow**, *Mentor: Jochem Marotzke* Max-Planck Institute for Meteorology, Hamburg, Germany
- 2016 **Research Officer (6-weeks)**, University of New South Wales, Sydney, Australia
- 2012-2016 **PhD candidate**, University of New South Wales, Sydney, Australia
- 2011-2012 **Graduate Researcher**, Geoscience Australia, Canberra, Australia

Teaching Experience

- TBD 2024 **EMSC3039/PHYS3039 - Climate Dynamics**, Lecturer/Content Developer ANU
- 2022 **Objective Data Analysis (Empirical Orthogonal Function Analysis)**, Guest Lectures CU Boulder
- 2020/2021 **Objective Data Analysis (Machine Learning)**, Guest Lectures CU Boulder
- 2015 **MSCI2001 Introductory Marine Science**, Field trip demonstrator UNSW
- 2012/2015 **SCI3001 - Physical Oceanography**, Teaching Assistant/ Exam Marker UNSW
- 2010 **Chemistry 1**, Laboratory Demonstrator U Canberra

Research Supervision

- 2023- **Jemma Jeffree**, PHD Student, ANU - Primary Supervisor & Chair
- Brandon Molina**, PHD Student, CU Boulder - Committee Member
- 2023 **Lachlan Nicholls**, Second Semester Special Topics Student, ANU - Co-Supervisor
- 2021 **Brandon Molina**, Summer Project, CU Boulder - Primary Supervisor

Fellowships & Grants

SUBMITTED

Submitted **ARC Discovery Project**, Title: An ensemble approach to studying the ocean's role in climate change. Investigators: Navid Constantinou, Nicola Maher, Andrew Hogg
to DP2024

AWARDED

2023	NASA ROSES-22 A.8 Physical Oceanography , Title: Advanced understanding of 21st century ocean change using CMIP6/AR6 models and NASA observations. Investigators: Jennifer Kay, Nicola Maher, Pedro Di Nezio, Antonietta Capotondi	758,242 USD
	ARC Discovery Early Career Researcher Award , Title: How will Pacific climate variability impact Australia in a warming world? Investigators: Nicola Maher	450,042 AUD
2022	International Exchanges Travel Grant - Royal Society UK , Title: Future tropical Pacific variability in warmer but more stable climates. Investigators: Andrea Dittus, Jennifer Kay, Nicola Maher.	6,000 GBP
2021	Travel Award - Postdoctoral Association of Colorado ,	350 USD
2020	CIRES Visiting Postdoctoral Fellowship - Cooperative Institute for Research in Environmental Sciences , Title: Drivers of Pacific Decadal Variability and its changing impacts in a warming world. Fellowship Supervisors: Jennifer Kay, Antonietta Capotondi	136,625 USD
2016	Humboldt Postdoctoral Fellowship - Alexander von Humboldt Foundation , Title: Role of external forcing in exciting interannual and decadal modes of variability. Fellowship Supervisor: Jochem Marotzke	87,000 EUR
	AXA Postdoctoral Fellowship , Turned down to take Humboldt Fellowship	130,000 EUR
	Travel funding for Early Career Scientists - World Climate Research Programme , To travel to the WCRP conference in Qindao, China	7,000 AUD
	Postgraduate Research Travel Support - University of New South Wales , To travel during my PhD to the AMS Conference in the USA and visit Princeton and NCAR afterwards	7,000 AUD
2012	ARC Laureate Fellowship PHD Scholarship , Title: Natural drivers of Interannual to Decadal Variations in Surface Climate. Fellowship Supervisors: Matthew England, Alex Sen Gupta	164,000 AUD
2010	A.L. Hales Scholarship, Australian National University , Title: A laboratory investigation into the effects of westerly wind stress and buoyancy forcing on the Antarctic Circumpolar Current. Fellowship Supervisors: Andy Hogg, Ross Griffiths.	7,000 AUD

Awards

2018	Uwe Radok Award , Australian Meteorological and Oceanographic Society the best PhD thesis for the previous year in the fields of meteorology, oceanography, glaciology or climatology awarded in Australia
2015	Outstanding Young Scientist Award , International Workshop on Modeling the Ocean

Publications

DETAILS

Google Scholar: <https://scholar.google.com/citations?user=V4N7HDQAAAAJ&hl=en>

ORCID: 0000-0003-3922-9833

IN REVIEW (1)

Capotondi, A., McGregor, S., McPhaden, M.J., Cravatte, S., Holbrook, N.J., Imada, Y., Sanchez, S.C., Sprintall, J., Stuecker, M.F., Ummenhofer, C.C., Zeller, M., Farneti, R., Graffino G., Hu S., Karnauskas K.B., Kosaka Y., Kucharski F., Mayer M., Qiu B., Santoso A., Taschetto A.S., Wang F., Zhang X., Holmes R.M., Luo J-J, **Maher, N.** Martinez-Villalobos, C., Naha, R., Stevenson, S., Sullivan, A., van Rensch, P. Mechanisms of Tropical Pacific Decadal Variability. *Second round of review in Nature Reviews Earth & Environment*

PUBLISHED (23)

- Malagón-Santos, V., Slangen, A. B. A., Hermans, T. H. J., Dangendorf, S., Marcos, M., and **Maher, N.** (2023). Improving Statistical Projections of Ocean Dynamic Sea-level Change Using Pattern Recognition Techniques, *EGU Sphere Ocean Science* 19, 499-515 <https://doi.org/10.5194/os-19-499-2023>
- Maher, N.**, Wills, R.C.J., DiNezio, P., Klavans, J., Milinski, S., Sanchez, S.C., Stevenson, S., Stuecker, M.F. and Wu, X. (2023) The future of the El Niño-Southern Oscillation: Using large ensembles to illuminate time-varying responses and inter-model differences. *Earth System Dynamics* 14, 413-431 <https://doi.org/10.5194/esd-14-413-2023>
- Maher, N.**, Kay, J.E. and Capotondi, A. (2022) Modulation of ENSO Teleconnections over North America by the Pacific Decadal Oscillation. *Environmental Research Letters* 17 114005 <https://doi.org/10.1088/1748-9326/ac9327>
- Maher, N.**, Tabarin, T.P. and Milinski, S. (2022). Combining machine learning and SMILEs to classify, better understand, and project changes in ENSO events, *Earth System Dynamics*, <https://doi.org/10.5194/esd-2021-105>
- Ward, B., F.S.R., and **Maher, N.** (2021). The sensitivity of the ENSO to volcanic aerosol spatial distribution in the MPI large ensemble. *Earth System Dynamics*. 975–996 <https://doi.org/10.5194/esd-12-975-2021>
- Suarez-Gutierrez, L., **Maher, N.**, and Milinski, S. (2021). Exploiting large ensembles for a better yet simpler climate model evaluation. *Climate Dynamics* <https://doi.org/10.1007/s00382-021-05821-w>
- Maher, N.**, Power, S. and Marotzke J. (2021) More accurate quantification of model-to-model agreement in externally forced climatic responses over the coming century. *Nature Communications* 12 <https://doi.org/10.1038/s41467-020-20635-w>
- Milinski, S., **Maher, N.**, and Olonscheck, D. (2020) How large does a large ensemble need to be? *Earth System Dynamics* 11, 885-901 doi.org/10.5194/esd-11-885-2020
- Fiedler, S., Crueger, T., D'Agostino, R., Peters, P., Becker, T., Leutwyler, D., Paccini, L., Burdanowitz, J., Buehler, S.A., Cortes, A.U., Dauhut, T., Dommenges, D., Fraedrich, K., Jungandreas, L., **Maher, N.**, Naumann, A.K., Rugenstein, M., Sakradzija, M., Schmidt, H., Sielmann, F., Stephan, C., Timmreck, C., Zhu, X. and Stevens, B. (2020). Simulated Tropical Precipitation Assessed Across Three Major Phases of the Coupled Model Intercomparison Project (CMIP). *Monthly Weather Review*, 148 (9): 3653–3680 <https://doi.org/10.1175/MWR-D-19-0404.1>
- Lehner, F., Deser, C., **Maher, N.**, Marotzke, J., Fischer, E., Brunner, L., Knutti, R., and Hawkins, E. (2020). Partitioning climate projection uncertainty with multiple Large Ensembles and CMIP5/6 *Earth System Dynamics* <https://doi.org/10.5194/esd-2019-93>
- Maher, N.**, Lehner, F and Marotzke J. (2020) Quantifying the role of internal variability in the climate we will observe in the coming decades. *Environmental Research Letters* <https://doi.org/10.1088/1748-9326/ab7d02>
- Perry, S.J., McGregor, S., Sen Gupta, A., England, E. and **Maher, N.** (2020). Projected late 21st Century changes to the regional impacts of the El Niño-Southern Oscillation. *Climate Dynamics*. <https://doi.org/10.1007/s00382-019-05006-6>
- Maher, N.**, Milinski, S., Suarez-Gutierrez, L., Botzet, M. Dobrynin, M., Kornblueh, L., Kröger, J., Takano, Y., Ghosh, R., Hedemann, C., Li, C., Li, H., Manzini, E., Notz, D., Putrasahan, D., Boysen, L., Claussen, M., Ilyina, T., Olonscheck, D., Raddatz, T., Stevens, B. and Marotzke, J. (2019). The Max Planck Institute Grand Ensemble - Enabling the Exploration of Climate System Variability. *Journal of Advances in Modeling Earth Systems*. <https://doi.org/10.1029/2019MS001639>
- Maher, N.**, Matei, D., Milinski, S., and Marotzke, J. (2018). ENSO change in climate projections: Forced response or internal variability? *Geophysical Research Letters*, 45. <https://doi.org/10.1029/2018GL079764>
- Maher, N.** England, M. H., Sen Gupta, A. and Spence, P. (2018), Role of Pacific trade winds in driving ocean temperature during the recent slowdown and projections under a wind trend reversal, *Climate Dynamics* <https://doi.org/10.1007/s00382-017-3923-3>
- Donat M. G., Lowry, A. L., Alexander, L. V., O’Gorman, P. A. and **Maher, N.** (2016), More extreme rain in the driest and wettest regions of the globe. *Nature Climate Change*, doi:10.1038/nclimate2941
- Maher W., **Maher, N.**, Taylor, A., Krikowa, F., and Mikac, K. M. (2016). The use of the marine gastropod, *Cellana tramoserica* as a biomonitor of metal contamination in near shore environments, *Environmental Monitoring and Assessment*, doi: 10.1007/s10661-016-5380-6
- Maher, N.**, McGregor, S., England, M. H., and Sen Gupta, A. (2015), Effects of volcanism on tropical variability, *Geophysical Research Letters*, 42 ,6024–6033
- Meehl, G. A., Teng, H., **Maher, N.** and England, M. H. (2015), Effects of Mt Pinatubo eruption on decadal climate prediction skill, *Geophysical Research Letters*, 42, 10,840–10,846, doi:10.1002/2015GL066608.
- England, M. H., Kajtar, J. N., **Maher, N.** (2015), Robust warming projections despite the recent hiatus, *Nature Climate Change*, 5, 394-396

Griffin, J., Latief, H., Kongko, W., Harig, S., Horspool, N., Hanung, R., Rojali, A., **Maher, N.**, Fuchs, A., Hossen, J., Upi, S., Dewanto, S. E., Rakowsky, N. and Cummins, P. (2015), *Frontiers in Earth Science*, 3, 32

Maher, N., Sen Gupta, A., and England, M. E. (2014), Drivers of decadal hiatus periods in the 20th and 21st centuries, *Geophysical Research Letters*, 41, 5978–5986

Griffiths, R.W, **Maher, N** and Hughes, G.O. (2011) ,Ocean stratification under oscillatory surface buoyancy forcing, *Journal of Marine Research*, 69, 523-543

SPECIAL ISSUE PERSPECTIVE/PREFACE (1)

Maher, N., Milinski, S and Ludwig, R. (2021) Large ensemble climate model simulations: introduction, overview, and future prospects for utilising multiple types of large ensemble. *Earth System Dynamics* 12, 401–418, <https://doi.org/10.5194/esd-12-401-2021>

BOOK CHAPTERS (1)

McGregor, S., Khodri, M., **Maher, N.**, Ohba, M., Pausata, F. and Stevenson, S. (2020) The effect of strong volcanic eruptions on ENSO. McPhaden, M.J., Santoso, S. and Cai, W. (Eds.) *El Niño Southern Oscillation in a Changing Climate American Geophysical Union*.

CONFERENCE PAPERS (1)

Vietinghoff, D, Heine, C., Böttinger, M., **Maher, N.**, Jungclaus, J.H., Scheuermann, G. Visual Analysis of Spatio-Temporal Trends in Time-Dependent Ensemble Data Sets on the Example of the North Atlantic Oscillation. *accepted PacificVis 2021*

WHITE PAPERS (1)

Maher, N., DiNezio, P., Capotondi, A. and Kay, J. Identifying precursors of daily to seasonal hydrological extremes over the USA using deep learning techniques and climate model ensembles. *AI4ESP: Artificial Intelligence for Earth System Predictability*. Department of Energy. https://www.ai4esp.org/files/AI4ESP1087_Maher_Nicola.pdf

OTHER PUBLICATIONS (2)

Suarez-Gutierrez, L, **Maher, N**, and Milinski, S. (2020). Evaluating the internal variability and forced response in Large Ensembles. *US CLIVAR Variations*, 18, 2.

Maher, N. Natural drivers of interannual to decadal variations in surface climate (2018). *Bulletin of the Australian Meteorological and Oceanographic Society*, 31(2), 9-12

Presentations

INVITED TALKS

2023 *Using Large Ensembles to Investigate ENSO Teleconnections and Future Projections*. AOS Colloquim Series: University of Madison, Wisconsin - transport/accommodation covered by host

2023 *The future of the El Niño-Southern Oscillation: Using large ensembles to illuminate time-varying responses and inter-model differences*. American Meteorological Society - abstract fees waived by conference

2022 *Using large ensembles to investigate the role of model-to-model differences and internal variability in causing uncertainty in climate projections*. Physical Oceanography seminar at the Woods Hole Oceanographic Institution (virtual)

2022 *Modulation of ENSO Teleconnections over North America by Pacific Decadal Variability*. 13th International Conference on Southern Hemisphere Meteorology and Oceanography (virtual)

2021 *How will precipitation change in the future?.* Max Planck Symposium for Alumni and Early Career Researchers (virtual - small thank you posted by host)

2020 *The role of model-to-model differences and internal variability in causing uncertainty in climate projections*. IMAU Colloquium (virtual - small thank you posted by host)

2019 *The Max Planck Grand Ensemble: utilizing the power of a single model large ensemble*. LMU Munich Seminar - transport/accommodation covered by host

- 2019 *ENSO Change in Climate Projections: Forced Response or Internal Variability?*. APS Focus Invited Presentation
- 2018 *ENSO Change in Climate Projections: Forced Response or Internal Variability?*. AGU Invited Presentation
- 2018 *Do we project a frequency change of robustly classified El Niño types?*. AGU Invited Presentation
- 2018 *ENSO change in climate projections: forced response or internal variability?*. FB1 Semianr GEOMAR Kiel - - transport covered by host
- 2018 *Natural drivers of interannual to decadal variations in surface climate*. Keynote seminar at the Australian Meteorological and Oceanographic Society Conference
- 2017 *Hiatus periods: past, present and future*. KAUST Invited Seminar for Earth Science and Engineering Graduate Student - transport/accommodation covered by host
- 2017 *Does ENSO change under external forcing? The influence of volcanic eruptions, greenhouse gas emissions and internal variability.*. KAUST Seminar to Atmospheric and Climate Modelling Research Group- transport/accommodation covered by host
- 2015 *Hiatuses in global warming: the role of volcanic eruptions and Pacific decadal variability*. European Geosciences Union, Vienna
- 2015 *Effects of volcanism on tropical modes of variability*. Greenhouse Conference, Hobart

CONFERENCE PRESENTATIONS AND POSTERS

- Conference presentations (**15**) *American Geosciences Union, Chicago 2022, ICTP/3rd Summer School on Theory, Mechanisms and Hierarchical Modeling of Climate Dynamics: Tropical Oceans, ENSO and their teleconnections, Trieste, 2022, Machine Learning for Earth System Modelling and Analytics and workshop, virtual 2021, European Geosciences Union, virtual 2021, Climate Variability and Change Working Group, Boulder 2021, Taiwan Meeting, Max-Planck Institute for Meteorology Hamburg 2018, European Geosciences Union, Vienna 2018, Australian Meteorologic and Oceanographic Society Conference, Sydney 2018, 4th International Conference on Earth System Modelling, Hamburg 2017, CLIVAR-ICTP Workshop on Decadal Variability and Predictability 2015, International Workshop on Modelling the Ocean, Canberra 2015, American Meteorological Society 2015, Ocean Sciences, Hawaii 2014, Australian Meteorological and Oceanographic Society Conference, Hobart Australia 2014, Australian Meteorological and Oceanographic Society Conference, Melbourne Australia 2013 and 12th ACCESS Model Evaluation Workshop - Opportunities for Collaboration, Melbourne Australia.*
- Presented Seminars (**15**) *Climate Global Dynamics, NCAR, 2022, National Centre for Atmospheric Science Reading, 2021, ATOC Colloquium CU Boulder, 2021, SMILE webinar, 2021, IPSL Paris, 2019, Australian National University GFD Laboratory 2018, Climate Change Research Centre University of New South Wales 2018, ETH Institute for Atmospheric and Climate Science 2017, Canberra University Ecochem Laboratory 2015, Australian National University, GFD Laboratory 2015, Lawrence Livermore National Laboratories 2015, Max-Planck Institute for Meteorology Hamburg 2015, Met Office 2015, University of Exeter 2015 and GFDL seminar 2015.*
- Poster presentations (**15**) *American Geosciences Union, Chicago 2022, American Geophysical Union, virtual 2021, European Geophysical Union, virtual 2020, American Geophysical Union, virtual 2020, The SMILE Workshop 2019, US-Clivar Large Ensemble Workshop Boulder 2019, 2 at European Geosciences Union 2019, American Geosciences Union 2018, ENSO Under a Change Climate, Ecuador 2018, 2 at European Geosciences Union, Vienna 2017, CLIVAR Open Science Conference Qingdao China 2016, European Geosciences Union, Vienna 2015 and WGOMD/SOP Workshop on Sea Level Rise, Ocean/Ice Shelf Interaction and Ice Sheets, Hobart Australia 2013.*

Service

- High-level journals (numbers cited since Oct 2020 not including second/third reviews of the same manuscript). *Nature* (1), *Journal of Climate* (2), *Geophysical Research Letters* (2), *EGUSphere* (1), *Geoscientific Model Development* (2), *Climate of the Past* (1), *Scientific Reports* (1), *PNAS* (1), *Earth System Dynamics* (1), Reviewer
 2024 Hamburg Climate Futures Outlook, Reviewer
 SMILE community and webinars, Co-organiser
 EGU/AGU/WCRP, Conference Session Chair
- 2022 Swiss Data Science Center Proposal (1), Reviewer
- 2019-2021 Special issue: Large Ensemble Climate Model Simulations: Exploring Natural Variability, Change Signals and Impacts in Earth System Dynamics, Lead Editor
 The SMILE Workshop: Understanding natural climate variability, anthropogenic climate change, and their impacts from local to global scales - Targeted Experiments with initial-condition Large Ensembles, Co-organiser
- 2019-2020 Ocean in the Earth System Group meeting, Leader/organiser
 IPCC AR6 report, Expert Reviewer
- 2019 Breakout group on Machine Learning at the Max Planck Institute for Meteorology 2019 retreat, Co-organiser
- 2018-2019 Max Planck Grand Ensemble Project, Manager
- 2017 Humboldt Protection Fellows Symposium, Co-organiser
- 2014-2015 Australian Meteorological and Oceanographic Society Postgraduate Symposium, Co-organiser

Professional Workshops

- 2023 ANU Foundations of HDR Supervision Workshop,
 2019 Max Planck Institute Leadership Competence for Scientists,
 2019 Max Planck Institute Supervising PhD students,
 2018 Workshop on Unconscious biases,
 2018 Max Planck Institute Effective Proposal Writing,
 2018 Sign Up Career-building for female postdocs at Max Planck Institute,
 2018 Advanced Scientific Writing run by Prof. Dr. Jochem Marotzke and Dallas Murphy,
 Scientific writing workshop by Dr Peter Rothlisberg from CSIRO Marine and Atmospheric Research, and co-facilitated by ARCCSS researchers,
 2013

Outreach

- 2023 **360 news article: *How will El Niño change in the future?*** , Lead author
- 2022 **CIRES news article: *El Niño Impacts in North America Depend Partly on North Pacific Ocean*** , Contributing author
Fiske Planetarium on the Clock Tower Project and Climate Change in Our Backyard, Panel Member
Science vs Art Event, Scientist presenter
School Visit - Egg in a Bottle & Greenhouse Gas Effect, Scientist presenter
- 2021 **Max Planck Institute for Meteorology news article: *Exploiting large ensembles for a better yet simpler climate model evaluation*** , Contributing author
Max Planck Institute for Meteorology news article: *More accurate quantification of model-to-model agreement* , Lead author
- 2020 **The Climate Academy Podcast**, Guest Scientist
Max Planck Institute for Meteorology news article: *Substantial biases persist in CMIP6 simulations of tropical precipitation* , Contributing author
Max Planck Institute for Meteorology news article: *Internal variability dominates short-term surface temperature trends* , Lead author
- 2018-2019 **Max Planck Institute for Meteorology twitter account**, Panel Member
- 2013-2016 **Climate Change Research Centre Facebook page**, Team Member