

CLIMATE CHANGE RESEARCH CENTRE
ANNUAL REPORT
2021



www.ccrc.unsw.edu.au

Climate Change
Research Centre

OUR MISSION

THE CCRC ACTIVELY ENGAGES IN WORLD-CLASS RESEARCH FOCUSED ON CLIMATE SYSTEM SCIENCE TO HELP BETTER UNDERSTAND, PREDICT, AND ADAPT TO CLIMATE VARIABILITY AND CLIMATE CHANGE. WE ALSO EDUCATE UNSW STUDENTS, SUPPORT STEM, ENGAGE IN PUBLIC OUTREACH, AND ADVISE THE GOVERNMENT AND PRIVATE SECTORS ON CLIMATE-RELATED SCIENCE AND THE CAUSES AND CONSEQUENCES OF GLOBAL WARMING. WE ARE THE FOUNDATION FOR THE ARC CENTRE OF EXCELLENCE FOR CLIMATE EXTREMES.

RESEARCH HIGHLIGHTS

- Discrepancies in the simulation of Australian terrestrial carbon are due to differences in carbon residence times: 10.5194/bg-18-5639-2021
- Tropical deep convection, and not the three major land masses, control the zonal wave 3 pattern in the Southern Hemisphere: 10.1038/s41561-021-00811-3
- Strengthening of the Atlantic Meridional Overturning Circulation at the end of deglaciations controls the abrupt initiation of African Humid Periods: 10.1038/s43247-021-00309-1
- Future marine heatwaves around Australia will become more severe due to global warming, but their statistics will also change: 10.1029/2020GL091323
- New school sensor network enhances our understanding of smoke pollution during Black Summer fires: 10.1016/j.atmosenv.2021.118450
- Machine learning can be used to forecast droughts: 10.1029/2021WR031829
- A predator-prey model, in which small-scale atmospheric structures are “hungry” for large-scale convective potential, can simulate convection that is not well represented in climate models: 10.1175/JAS-D-20-0337.1
- Despite differences in structure, resolution, and parameterisations, climate models simulate consistent future changes for many ocean currents: 10.1038/s41598-021-88934-w
- In most regions, hailstorm severity is expected to increase with climate change: 10.1038/s43017-020-00133-9
- Antarctic shelf waters will warm twice as much under high emission than under medium-low emission scenarios: 10.1029/2021GL092752

AWARDS & HONOURS

- Andy Pitman: 2021 Fellow of the Australian Academy of Science
- Alex Sen Gupta, Lisa Alexander, Matt England: 2021 Clarivate highly cited authors
- Jason Evans: 2021 Biennial Medal, Modelling and Simulation Society of Australia and New Zealand
- Melissa Hart: 2021 Finalist Eureka award for Innovation in Citizen Science
- Andréa Taschetto: Outstanding Associate Editor Award, Journal of Southern Hemisphere Earth Systems Science
- Jason Evans: 2021 Fellow of the Royal Society of New South Wales

RESEARCH OUTPUTS

1 book, 1 book section, and 130 journal articles:

- 20 publications with student first authors
- 2 publications in Nature, 2 in Science
- 13 publications in Nature family journals

NATIONAL & INTERNATIONAL LEADERSHIP

Multiple federal and state government briefings on the Intergovernmental Panel on Climate Change, Sixth Assessment Report (IPCC AR6): Andy Pitman, Lisa Alexander, Katrin Meissner, and Steve Sherwood.

A model of bushfire growth and smoke aerosol generation, developed at CCRC by Steve Sherwood and David Fuchs, was used by the NSW Department of Planning, Industry and Environment (NSW DPIE) in 2021 for smoke forecasts.

The CCRC delivered a NESA-accredited professional development workshop for high school teachers, and a workshop at the yearly STA NSW conference. The CCRC was invited by the international Office of Climate Education to contribute to a statement on improving climate education at schools, which was then presented in Glasgow at the COP26 (Sanaa Hobeichi).

INTERNATIONAL LEADERSHIP

- Gab Abramowitz: Global Land Atmosphere System Study panel, World Research Climate Programme (WCRP)
- Lisa Alexander: Chair, World Meteorological Organization (WMO); Expert Team, Sector-specific Climate Indices; Executive Committee, International Association of Meteorology and Atmospheric Sciences (IAMAS); Executive Committee, International Union of Geodesy; Fellow, Australian Meteorological and Oceanographic Society (AMOS); World Health Organisation (WHO) - World Meteorological Organisation (WMO) Working Group on Occupational Health
- Melissa Hart: Elected board member, International Association for Urban Climate
- Katrin Meissner: Committee of Experts for the German Excellence Strategy; Executive Committee and Scientific Committee for Past Global Changes (PAGES); Steering Committee, Cycles of Sea-Ice Dynamics in the Earth System Working Group (C-SIDE) PAGES; Conference Chair, Environment Research 2021; Scientific Committee, PAGES Open Science Meeting 2021
- Laurie Menviel: Steering Committee, International Union for Quaternary Research (INQUA) Ternation 5 to 0 scientific group and organiser of 2022 workshop; Steering Committee, PAGES working group on Quaternary Interglacials (QUIGS)

- Agus Santoso: Member, CLIVAR Pacific Decadal Variability working group
- Andréa Taschetto: Climate and Ocean Variability Predictability and Change (CLIVAR) Pacific Regional Panel and Pacific Decadal Variability Working Group; CLIVAR Research Foci Tropical Basin Interactions

NATIONAL LEADERSHIP

- Matt England: Australian Bureau of Meteorology Science Advisory Committee
- Jason Evans: University representative, National Environmental Science Program Climate Systems Hub; Coordinator, CORDEX-AustralAsia
- Laurie Menviel: Scientific advisory committee, Australian Earth-System Simulator National Research Infrastructure (ACCESS-NRI), Development of the decadal plan for the Australian Antarctic Science Program (AASP)
- Andy Pitman: Terrestrial Ecosystem Network (TERN) science advisory committee; National Committee for Data in Science, Australian Academy of Science; National Committee for Earth System Science, Australian Academy of Science
- Alex Sen Gupta: National Committee for Earth System Science, Australian Academy of Science

EDITORIAL ROLES

- Lisa Alexander: Editor-in-Chief, *Weather and Climate Extremes*
- Jason Evans: Editor, *Journal of Climate*
- Laurie Menviel: Co-Editor-in-Chief, *Climate of the Past*
- Katrin Meissner: Editorial Board, *Environmental Research Letters*
- Andy Pitman: Associate Editor, *International Journal of Climatology*
- Agus Santoso: Editor, *Journal of Climate*; Associate Editor, *Frontiers in Climate*
- Alex Sen Gupta: Guest Associate Editor, *Frontiers Special Issue: Advances in Marine Heatwave Interactions*
- Steven Sherwood: Review Editor, *Science*; Editorial Board, *Current Climate Change Reports*
- Andrea Taschetto: Guest Associate Editor, *Frontiers in Climate, Dynamics and Impacts of Tropical Climate Variability: Understanding Trends and Future Projection*; Review Editor of *Frontiers in Climate, Predictions and Projections*; Associate Editor of the *Journal of Southern Hemisphere Earth Systems Science*

GRADUATIONS

PhD STUDENTS

Shannon Bengtson
Earl Duran
Yiling Liu
David Webb

HONOURS STUDENTS

Julia Potgieter
Leanne Lee
Alex Ingall
Josh Li
Anthea Micalopoulous
Matt Pudig
Kaia Reynolds-Earler
Claire Rocuet
Jordan Lorenzatto

PHILANTHROPY

Three undergraduate vacation research scholarships funded by John Church's donation in 2021. The donation was also used to develop CCRC's alumni network.

NEW ADVISORY BOARD

Prof Timothy Bralower (Chair, Penn State University, USA)
Dr Helen Cleugh (Allenby Science Australia)
Dr Stephanie Downes (Deloitte)
A/Prof Fiona Johnson (Scientia Fellow, Civil Engineering, UNSW)
Scientia Prof John Kaldor (Kirby Institute, UNSW)
Dr Georgina Kelly (Executive Director, Department of Planning Industry and Environment)
Dr Rachel Law (Group Leader, CSIRO Oceans and Atmosphere)
Vice Admiral Paul Maddison (Director, Defence Research Institute, ADFA, UNSW)
Prof Ben Newell (Psychology, UNSW).

MEDIA HIGHLIGHTS

- 59 newspaper articles
 - 13 radio interviews
 - 5 TV interviews
 - 4 Conversation articles
- Lawyers Weekly: The great 'known unknowns' with climate change in the law, Lawyers Weekly, August 2021, Andy Pitman and Katrin Meissner
 - The Conversation: Back so soon, La Niña? Here's why we're copping two soggy summers in a row, December 2021, Andréa Taschetto and Agus Santoso
 - The Sydney Morning Herald: World's oceans changing as currents show new patterns, April 2021, Matt England.
- ABC news, ABC Radio, Channel 9 news, Channel 7 news, CNet, CBS California, Cimpatco TV, COSMOS Magazine, Lawyers Weekly, National Radio, New York Times, Sydney Morning Herald, The Australian, The Conversation, The Daily Telegraph, The Guardian, Washington Post

TEACHING NEWS

- New course CLIM 2002 (Risks and Impacts of a Changing Climate) launched in 2021
- >400 enrolments in CLIM 1001 (Introduction to Climate Change) in 2021 despite overall drop in student numbers due to Covid.

ARC GRANTS & FELLOWSHIPS COMMENCING IN 2021

NAME	GRANT	GRANT ID	AWARDED
ALEX SEN GUPTA	ARC SPECIAL RESEARCH INITIATIVE	SR200100012	\$ 39,515
IAN GOODWIN	ARC SPECIAL RESEARCH INITIATIVE	SR200100012	\$ 7,416
JAN ZIKA	ARC SPECIAL RESEARCH INITIATIVE	SR200100012	\$ 39,515
JOHN CHURCH	ARC SPECIAL RESEARCH INITIATIVE	SR200100012	\$ 14,832
LAURIE MENVIEL	ARC SPECIAL RESEARCH INITIATIVE	SR200100012	\$ 39,515
MATTHEW ENGLAND	ARC SPECIAL RESEARCH INITIATIVE	SR200100012	\$4,753,975
STEVEN SHERWOOD	ARC LINKAGE PROJECT	LP200100138	\$ 362,500

OUR VISION

THE CCRC IS A WORLD-LEADING RESEARCH CENTRE IN CLIMATE SCIENCE, EDUCATING AND ENABLING THE AUSTRALIAN AND GLOBAL COMMUNITY TO DEAL WITH RISKS ASSOCIATED WITH CLIMATE VARIABILITY AND CLIMATE CHANGE.

