Annual Report 2013

UNSW AUSTRALIA

Our Vision

The CCRC strives to make fundamental contributions to our understanding of the Earth's climate system and be recognised as one of the world's top research programs in physical and biophysical climate sciences.

Climate Change Research Centre
University of New South Wales

ANNUAL REPORT 2013

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1. The Climate Change Research Centre at a Glance

2013 Key Achievements:

- *$3.3 million external research revenue*
- 124 peer reviewed publications, predominantly in top tier (former ERA A/A*) journals. Up from 84 publications in 2012.
- Three staff directly involved in writing and editing IPCC AR5, released in September
- CCRC staff extensively quoted and interviewed in the media with over 200 articles, interviews, appearances or quotes
- 15 contributions to *The Conversation* (Op Eds, articles, quotes)
- 29 PhD students supervised in the Centre

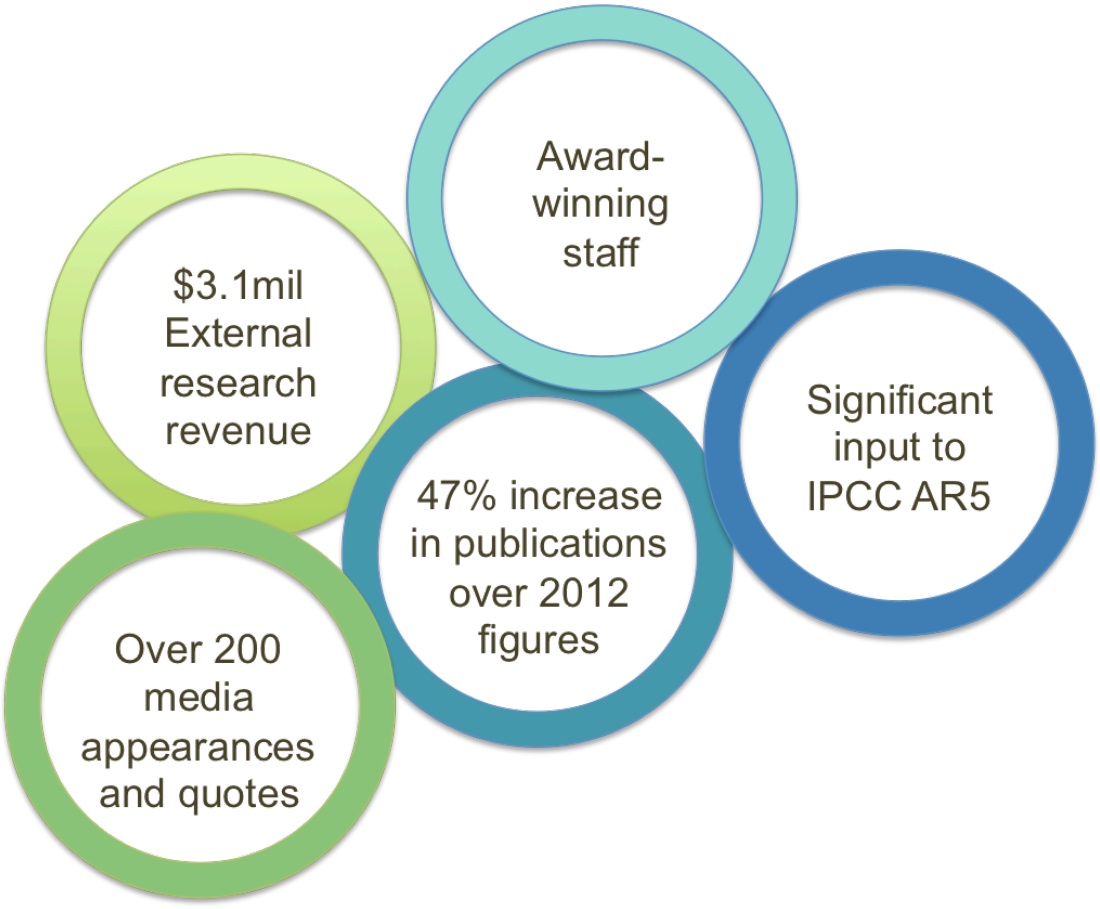
UNSW CCRC is a multi-disciplinary research group comprising one of the largest university research facilities of its kind in Australia.

CCRC houses research expertise in the key areas of Earth's climate: atmospheric, oceanic and terrestrial processes. We apply basic scientific principles to pressing questions on climate dynamics, global climate change, and extremes of weather and climate.

The Climate Change Research Centre (CCRC) was formed within the Faculty of Science in 2008 with initial financial support from the DVC Research and the Faculty. The Centre and its staff now reside in the School of Biological Earth and Environmental Science (BEES). CCRC also hosts the UNSW lead node of the Australian Research Council Centre of Excellence for Climate System Science.

CCRC research focuses on basic climate system science across several core disciplines. The CCRC interacts with numerous schools and Centres on campus. Within the Faculty of Science particularly strong research and teaching synergies exist between the Centre and the Schools of Mathematics and Statistics, Physics and Biological Earth and Environmental Sciences (BEES). Its research focus is innovative and arguably unique among university units worldwide, and it has quickly grown into the largest hub of such research in the Australian region.

2012 saw the CCRC continue its successful track record in attracting grant funding and producing and publishing excellent, world-class research.



2 Director's Report - 2013

The look of the CCRC changed considerably in 2013, as we expanded further into space on the north side of the Mathews building that was formerly occupied by the School of Psychology (they are now often seen using our seminar room which we gratefully offered to help them in return). This has been a boon to the centre as having some staff located off campus in the facility on Eurimbla Avenue was not ideal. New staff are now located in a sunny new wing, featuring a separate entrance. Thus far, no anxious students have yet been observed using this new "back door" to escape from their approaching supervisors, which I take as a sign that their projects are all going well.

Accolades for our academic staff in 2013 included the promotion of Gab Abramowitz to Senior Lecturer, and the awarding of the the Australian Academy of Science Dorothy Hill award to Lisa Alexander. This award is given to the top female early- to mid-career Earth Scientist in Australia. DECRA Fellow Sarah Perkins also was one of the New South Wales "Tall Poppy" award winners for 2013, continuing a string of such awards for CCRC staff since its founding. Unfortunately 2013 also saw the departure of Dr. Joe Kidston from the CCRC.

On the heels of his successful organisation of workshops for managers and professional staff of ARC Centres of Excellence, our own Stephen Gray was duly awarded UNSW's top award for managerial staff for the year. He continued to lead our admin team that includes Bronwen Smith, Vilia Co and Swa Rath (co-ordinated between work for the CCRC and the ARC Centre for Climate System Science or ARCCSS). At the end of the year, Vilia Co left us temporarily for maternity leave and Susana Widjaja stepped in to handle our finances. In October Swa Rath left the CCRC as Simone Purdom returned from her own maternity leave begun in 2012, though Swa did vow to return one day.

Research continues to grow at the CCRC, with healthy growth in publications from the previous year. Highlights included a *Nature* paper by Agus Santoso and others at the CCRC helping to explain the so-called "haitus" in recent rise in global-mean surface temperature, and CCRC participation in new reconstructions of southern-hemisphere climate change over the last two millennia published in *Nature Geoscience* and other journals, which have shown more clearly than before how unusual the 20th century was compared to earlier ones.

Our staff continue to be very active in international activities including contribution to the Intergovernmental Panel on Climate Change (IPCC) report delivered in 2013, service to scientific organisations, and public outreach and media. Several of our staff have joined

the editorial boards of international journals this year, and we continue to be strong contributors to influential media such as The Conversation.

Finally in 2013 the CCRC commenced its gradual move into School of Biological, Environmental and Earth Sciences (BEES). So far the disruption to daily life at the CCRC has been imperceptible except that we moved the schedule of our graduate student evaluations forward by two months to align them with the BEES examination timetable, forcing us to have a one-off slug of three exam rounds in a single calendar year (many thanks to our postgraduate coordinator Katrin Meissner for handling that!). Further coordination and consolidation will bring further changes but we hope that these will continue to have minimal impact on our day-to-day activities.

Professor Steven Sherwood

3 Personnel

2013 Personnel Highlights:

- Dr Erik van Sebille and Dr Shayne McGregor took up ARC DECRA Fellowships commencing in 2013
- DrGab Abramowitz was promoted to Senior Lecturer
- We welcomed three new post doctoral researchers in 2013 funded by grants held by CCRC staff as well as two research assistants and a research associate funded by ARCCSS grants.
- The Centre plays regular host to sabbatical visitors, national & international collaborators and seminar speakers

Continuing staff appointed to the CCRC include one Laureate Fellow (England), and two ARC Future Fellows (Meissner and Evans). Fixed term staff include an ARC Australian Research Fellow, an ARC Postdoctoral Fellow, three ARC DECRA Fellows and three Super Science Fellows.

The CCRC also houses Chris Turney, a Laureate Fellow appointed to BEES. Chris' research group includes Future Fellow Dr Chris Fogwill.

The Centre continues to attract distinguished visitors on sabbatical stays including Dr Michael Eby (University of Victoria, BC) and Professor Sonia Seneviratne (ETH-Zurich) and Dr Hong Yin from the Chinese Meteorological Administration.

The Centre is also a sought out destination for international researchers making shorter visits. We welcomed around 20 research visitors to the CCRC in as well as hosting many seminar speakers from around Australia and overseas; thus demonstrating that the Climate Change Research Centre has critical momentum that enhances UNSW's reputation at the very forefront of Climate Science in Australia.

A full list of personnel associated with the Centre in 2013 appears in Appendix C.

4 Research outputs, Centre impact and grant summary

2013 Impact

- One paper published in *Nature*. (Santoso et al). 12 papers published in *Nature* family journals. 13 papers in *Geophysical Research Letters.* 12 papers published in *Journal of Climate.*

- Significant media coverage of Centre research accomplishments in 2013 including:
  - 27 TV appearances/interviews
  - 51 Radio appearances/interviews
  - Over 100 print and online articles, interviews and op eds

- Lisa Alexander, Steven Sherwood (Chapter Lead Authors) and Andy Pitman (Review Editor) made significant contributions to the IPCC Fifth Assessment Report.

The CCRC published 124 individual peer reviewed outputs in 2013 which continues the Centre's upward trend from 67 in 2011 and 87 in 2012. The CCRC continues to publish papers primarily in the highest impact, high quality journals - those ranked A and A* under the former ERA scheme and those with a high Thomson ISI impact factor. See Appendix A for a full list of publications.

Category	2012 Outputs (non weighted)	2013 Outputs (non weighted)
A1	1	0
B1	2	3
C1	84	119
E1	0	2

The Centre has gone from strength to strength since its formation, culminating in the successful bid for the ARC Centre of Excellence for Climate System Science (ARCCSS) which has been operating successfully since 1 July 2011. In addition to ARCCSS Director Andy Pitman, three CCRC academic staff are Chief Investigators in the Centre of Excellence - Alexander, England and Sherwood - each dedicating 0.3 FTE of their time to ARCCSS activities. A further 13 CCRC staff were Associate Investigators in 2013. (Abramowitz, Evans, Green, Kidston, Maharaj, McGregor, Meissner, Menviel, Santoso, Sen Gupta, Taschetto, van Sebille, and Waterman).

The two centres successfully share space and administrative support and there are significant opportunities for collaboration across the research strengths and foci of both groups.

UNSW and the CCRC particularly benefit from access to supercomputing resources at NCI as well as increased collaboration with overseas partners via the linkages formally established the Centre of Excellence. The CCRC graduate student experience further enhanced by ARCCSS activities such as winter schools, writing workshops, visits to Australian partner universities and opportunities for travel to overseas labs, summer schools and workshops and the mentorship and pastoral care provided by both the CCRC Postgraduate Coordinator (Katrin Meissner in 2013) and the ARRCCS Graduate Director, Dr Melissa Hart.

Two existing CCRC post doctoral researchers were awarded DECRAs in 2013: Shayne McGregor for his project on the termination of el Niño Southern Oscillation ents and to Erik van Sebille whose project examines inter-ocean exchange around Australia.

A full listing of research projects in progress in 2013 appears in Appendix B.

Below are some highlights of other ***awards, contributions and service*** throughout 2012

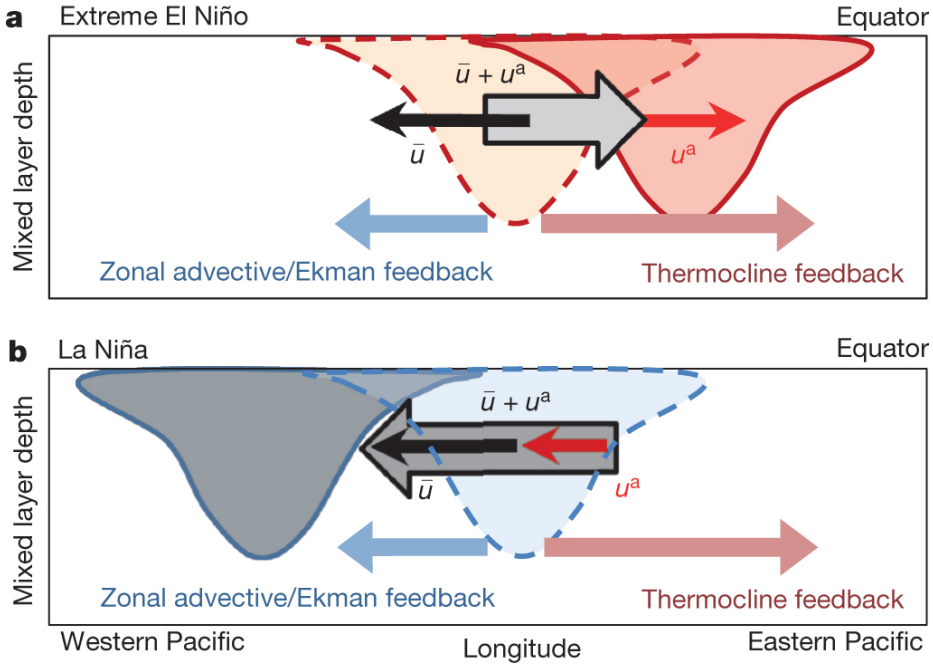
- A number of CCRC staff were involved in the preparation of the IPCC's Fifth Assessment Report (AR5): Lisa Alexander and Steven Sherwood are chapter lead authors; and Andy Pitman is a Review Editor. These and other IPCC authors associated with ARCCSS were highly active in communicating the findings contained in the IPCC's Working Group 1 Fifth Assessment Report which was released in September 2013.
- CCRC Staff gave over 40 public science talks in 2013 and participated in several high level briefings to local, state and federal government and to the business community
- Lisa Alexander was awarded the Australian academy of Science Dorothy Hill Award
- Sarah Perkins received the 2013 NSW Young Tall Poppy Award
- Shayne McGregor and Sarah Perkins selected as state finalists for Fresh Science
- Stephen Gray was awarded the UNSW Vice Chancellor's Staff Excellence Award for People Management
- Jason Evans coordinated the Centre's active participation in high level talks with senior Chinese State delegates visiting UNSW for the Australia-China Climate Change Forum.
- The Centre's media profile is highlighted in Appendix D

Snapshot 1 - Research: Global warming doubles odds of abnormal El Nino

Unusual El Ninos, like those that led to the extraordinary super El Nino years of 1982 and 1997, will occur twice as often under even modest global warming scenarios. That is the finding of *new collaborative research published in Nature* led by the authors from the Climate Change Research Centre and ARC Centre of Excellence for Climate System Science, which has for the first time revealed the cause of these events.

These unusual El Nino events differ from the more common kind in that sea surface temperatures start warming in the west of the Pacific Basin and spread eastwards. Under normal El Ninos, ocean surface temperatures first warm in the cold eastern Pacific and then expand west, in the direction of the Trade Winds and the ocean currents along the equator.

Schematic of competing effects on zonal propagation direction during ENSO events.



A Santoso *et al*. *Nature* (2013) doi:10.1038/nature12683

"These unusual El Ninos appeared for the first time in the available record sometime after the mid 1970s," said lead author, Dr Agus Santoso. Scientists have struggled to explain why they occurred and if the frequency would change in the future. "The most common theory used to explain these unusual El Ninos was that competing air and ocean feedbacks drove the direction of the warming," Dr Santoso said. "But if this was true, La Ninas would have propagated in the same direction. Observations show they do not."

In a world first, the researchers found the key to the mystery was the weakening of westward flowing currents along the Equator in the Pacific Ocean. As these currents weakened and even reversed, it allowed the heat during these unusual El Nino events to spread more easily into the eastern Pacific. La Nina events didn't behave in a similar way, because the currents are strong and flow to the west.

Importantly, using observations and climate models, the researchers were able to determine what this could mean for the future frequency of these unusual El Ninos. "Using observations we demonstrated the likely role of the weaker currents in the unusual behavior," Dr Santoso said. "These currents are well represented in a number of climate models. Using these models we confirmed, even under modest global warming scenarios, these unusual El Nino events doubled in frequency. "

Past experience shows that these Super El Nino events bring more than just unusual weather conditions - they matter for people and economies. The 1982 and 1997 events led to highly unusual weather events worldwide causing disruption in fisheries and agriculture costing tens of billions of dollars and leading to the deaths of tens of thousands of people. During the 1982 event, in the US alone crop losses were estimated at $10-12 billion (the equivalent of $24-26 billion in current terms).

"While more frequent eastward propagating El Ninos will be a symptom of a warming planet, further research is underway to determine the impact of such events in a climate that is going to be significantly warmer than today," said co-author, Dr Wenju Cai, a senior scientist at CSIRO.

5 Research supervision and teaching

The Climate Change Research Centre has a growing cohort of postgraduate research students. There were 29 individual students enrolled in the centre's PhD program and two honours students supervised in 2013.

The CCRC continued its robust annual progress review scheme, led by Post Graduate coordinator Katrin Meissner. In addition to the stipulated annual reviews and presentations for all students, the Centre runs half-yearly "informal" committee meetings for all enrolled students where progress can be discussed and students can raise any concerns they may have. Feedback from students regarding the Centre's review process is overwhelmingly positive. The centre also invites a nominated student representative to join its bi-monthly staff meetings.

Two PhD students and one master's student had their awards conferred in 2013.

- Tristan Sasse. PhD thesis title: A novel empirical approach to diagnose patterns of air-sea carbon dioxide fluxes and ocean acidification (Supervised by Ben McNeil)

- Emily Shaw. PhD thesis title: Variability of carbonate chemistry in the southern Great Barrier Reef: implications for future ocean acidification (Supervised by Ben McNeil)

- Yue Li. MS thesis title: Evaluation of Monsoon Seasonality and Tropospheric Biennial Oscillation Transitions in Observations and CMIP Models (Supervised by Alex Sen Gupta)

Centre staff continued to be engaged in undergraduate teaching. Courses run by CCRC staff are CLIM1001 – Introduction to Climate Change, MSCI0501 – The Marine Environment (with the School of BEES), CLIM2001 – Fundamentals of Atmospheric Science (with the School of Physics) GEOS2241 – Peak Carbon: Climate Change and Energy Policy and CLIM3001 – Climate Systems Science.

Snapshot 2 - Impact: IPCC AR5

by Steve Sherwood and Lisa Alexander

CCRC Director Professor Steve Sherwood was Lead Author, Chapter 7: Clouds and Aerosols, Working Group I Contribution to the IPCC Fifth Assessment Report Climate Change 2013: The Physical Science Basis.

Dr Lisa Alexander was Lead Author, Chapter 2: Observations: Atmosphere and Surface, Working Group I Contribution to the IPCC Fifth Assessment Report Climate Change 2013: The Physical Science Basis.

This story first appeared in *The Conversation*.

The part of Intergovernmental Panel on Climate Change (*IPCC*) Fifth Assessment Report, dealing with the physical basis of climate change, has now been released.
The report – released today in Stockholm – is more than 2,000 pages long, has assessed nearly 10,000 peer-reviewed scientific studies, most of them published since the previous assessment in 2007, and (as with previous assessments) went through *three rounds of detailed review* by 1,089 expert and government reviewers worldwide to ensure balance and accuracy.

So what new does it have to say about our climate problem?

The short answer, at least with respect to the big picture: not much. Despite a recent slowdown of *surface ocean warming*, the world is still warming and humans are still behind most if not all of the change. Much larger changes loom in the future if business-as-usual continues. If emissions come down, those changes won't be as bad.
Little progress has been made in narrowing the range of future global warming rates or quantifying the role of aerosols (airborne particles such as soot) in offsetting the warming to date. Confidence in regional predictions of climate remains low. This does not mean, however, that no progress has been made.

First, the report does ratchet up confidence in the basics. Each of the last three decades has been successively warmer that any preceding decade since widespread observations began in 1850. While previous reports already stated that the world is warming, and that human greenhouse gas emissions (mainly carbon dioxide) were causing warming, AR5 expresses 95% *certainty* that the latter caused more than half of the former.
Indeed human activities can account for all the observed warming, and there is no evidence of a significant contribution from natural causes. This warming is now more clearly evident in the deep ocean. We are also more confident in the positive feedback on global warming by water vapour, clouds, and the net release of CO_2 from perturbed ecosystems.

Projected warming by 2100 is still about 3-5C above 2005, under the *high-emissions scenario*. AR5 takes a longer view than previous reports, noting that the most likely global warming by 2200 under this scenario is a shocking 9C above preindustrial. It also expands its consideration of the *palaeoclimate* record indicating that the last three decades were likely the warmest of the last 1400 years.
There has been a lot of fuss about the *slower warming* over the past 10-15 years, which AR5 acknowledges and attributes at least in part to natural variations within the climate system. AR5 also acknowledges that short term trends are a poor indicator of long term changes.

When combined with all other evidence this has a fairly small effect on the conclusions, reflected in a range of 1.5-4.5C per doubling of CO_2 for the so-called "equilibrium climate sensitivity". This is a return to the range in the first three assessment reports but broader than the 2.0-4.5C range assessed in 2007. The upper limit of the "transient climate response," a related measure, is also down by 0.5C.

New studies have shifted a few conclusions on the question of whether predicted changes can be detected in past observations. It is now clear that *both major ice sheets* and nearly all glaciers are melting. *High-rainfall events* (behind disasters such as recent Queensland floods) now seem to be heavier in many places.

But AR5 expresses less confidence that *tropical cyclones* are on the increase globally or that there are more *droughts globally*. This does not mean these things aren't happening but reflects a more nuanced understanding of how difficult it is to confirm them based on the imperfect information available.

Projected future climate changes remain what they have been for years: hotter summers and heat waves, milder winters, heavier extreme rains, and longer periods between rain in most places.

Probably the biggest change since 2007 is that sea level by 2100 in the high-emissions scenario is now expected to be 0.5-1.0 meters.

One new topic not covered in previous IPCC assessments is *climate geoengineering*, including measures to remove carbon dioxide from the atmosphere or to reflect more sunlight to space in order to offset the impact of emissions. The report is not optimistic about either option. Reflecting additional sunlight to space is possible but carries many risks and does not fully address the impacts of CO_2. The IPCC mitigation assessment, due in early 2014, is likely to take this topic up further.

Do we need another blockbuster IPCC report in 2019? Possibly not. As we authors can now attest from personal experience, these reports require a massive investment of time.

Some advocate changing to a system more like the US *Climate Change Science Program* (CCSP), run about a decade ago, in which smaller and more frequent reports are targeted at key areas of interest to policymakers. This idea, or other possible innovations, deserves serious consideration and was trialled in the IPCC's SREX (*Special Report on Extremes*) published in 2011.

The trend in the last several IPCC reports has been growing certainty about the basic things that we already thought we knew. This collectively gives us every reason to think that CO_2 emissions are a serious problem—but with little reduction in stubborn projection uncertainties.
The take-home message may simply be that while scientists should continue to strive for improvement, policymakers and the public had best get on with decisions based on the information at hand, rather than hoping for a crystal ball to appear.

6 Statement of financial performance for 2013

Summary of statement of financial performance

The Climate Change Research Centre's total revenue for 2013 was $6,138,679. 53.7% of this was from external income sources. The remainder was from a combination of Faculty and Central/Strategic funds, including generous co-support associated with Matthew England's Laureate Fellowship, Super Science, LIEF and MREII grants. Operating Funds accounted for 30% of the Centre's funding in 2013.

Of the $3.2m research revenue earned in 2013, $2.48m (77.5%) was Category 1 income.

At 81% of total expenditure, people costs account for by far the largest portion of the centre's expenditure across all fund types.

Total 2013 expenditure was $6,065,133.

Full countersigned financial statement follows.

7 Statement of in-kind contributions including academic and other salaries, infrastructure and other resources provided to the Centre

The Centre gratefully acknowledges support provided by UG student administrative staff in the Schools of BEES and Physics as well as assistance from the Science Student Centre, Faculty of Science Finance team, the Research Strategy Office and significant support from the Grants Management Office.

Renovations and expansion of the Centre's space in the Mathews Building was largely funded by Faculty small capital works budget. Project Managers from Facilities Management provided invaluable time and effort to ensure the project was completed on time with minimal disruption to the Centre.

Climate Change Research Centre - CCRC

Statement of Financial Performance
for the Year Ended 31 December 2013

	Notes	2013 $	2012 $
Funds:			
Research Funds		**3,294,682**	**3,832,602**
ARC Research Funds	1	2,364,701	2,402,178
NHMRC Research Funds	1	115,494	120,824
Other External Research Funds		783,960	878,594
Fundraising Contributions	2	30,000	-
Faculty Contributions	3	**1,859,286**	**1,000,628**
UNSW Contributions		**984,712**	**992,570**
Strategic Funds	4	342,507	782,570
MREII		85,416	-
Super Science & LIEF UNSW Contributions		210,000	210,000
EB Gap	5	346,789	-
Total Funds:		6,138,679	5,825,800
Costs:			
People Costs	6	4,675,053	4,132,850
Scholarship Stipends		277,785	171,888
Travel	7	421,259	279,927
Equipment		312,312	115,054
Other Non People Costs		378,723	371,509
Total Costs:		6,065,133	5,071,227
Operating result		73,546	754,572
Opening Balance: Surplus(Deficit) from Prior Year		2,175,029	1,420,457
Correction of Prior Year Opening Balance	8	8,024	-
Adjusted Opening Balance		-	-
Closing Balance: Surplus(Deficit)		2,256,599	2,175,029

Notes to the Statement of Financial Performance

1 2013 Category 1 income was $2.5m, similar with 2012 figures.

2 Disbursement of funds from Expert Team on Climate Risk and Sector-specific Climate Indices (ET-CRSCI) Research Fund to Centre's FC funds in 2013

3 Faculty's 2013 CCRC contribution consist of a 46% increase from 2012

4 Sources of UNSW funding for 2013 included $287K in SIR50 fund, $18k from SIR30 fund, and $35k in SPF04 funds.

5 Change in the EB gap process allows identification of EB Gap in 2013.

6 76% of the Centre's total 2013 expenditure was on people costs compared to 81% in 2012, 82% in 2011, 74% in 2010 and 75% in 2009. In 2013, 38% of people costs came from base operating and strategic (SPF01, SPF02, SIR30, SIR50) funds meaning that more than half of the centre's salaries and on-costs are supported by fellowships or research grants.

7 In 2013, 80% was funded by external grants compared to 74% in 2012.

8 Correction of the classification of career advancement fund

U Stamios

Urania Stamios CPA
Science Faculty Finance Manager

17.6.2014

Date

8 CCRC Management and oversight

Until the end of 2012 CCRC stood as an autonomous staffing unit within the faculty. From 2013 the CCRC became a centre situated within The School of Biological, Earth and Environmental Sciences (BEES). In 2013 there were 11 continuing academic staff, one teaching fellow and 33 fixed term research staff employed at the centre for all or part of the year.

The CCRC is overseen by an Advisory Committee chaired by Professor Chris Tinney (AD-R, Faculty of Science). The other members of the Advisory Committee are: Michael Ashley (Physics), Rob Brooks, (EERC/BEES), Mark Holzer (Mathematics and Statistics) and Richard Stuetz (WRC/Civil and Environmental Engineering).

The make up of the committee is a reflection of the collaborative ties the Centre has with different Schools and Centres across UNSW. The Management Committee primarily has a strategic advisory role.

Responsibility for day to day management and operation of the centre is shared between the Director, Centre Manager and staff with delegated portfolios (such as the PG Coordinator, IT coordinator, UG Coordinator, Honours Coordination, Marketing/outreach coordinator, etc). The centre leadership team works closely and cooperatively with the Faculty of Science executive group and faculty committees. The Centre Director meets regularly with the Head of School of BEES as the two organisations come together more closely through finding shared synergies and alignment of processes and roles.

The CCRC's PhD and undergraduate programs are officially administered by BEES, but the centre manages its own finances, teaching development, administration and IT (including an investment of 0.5 EFT in the Faculty IT unit), as well as administration relating to postgraduate student applications, enrolment and scholarships and the formal postgraduate review process.

In late 2012 the Climate Change Research Centre was formally reviewed by the UNSW Centres Secretariat. The findings of the review panel, released in early 2013, were positive stating: "The Climate Change Research Centre (CCRC) has delivered high quality research publications in high-impact journals, and built an enviable interdisciplinary reputation. CCRC's success in leading a bid to establish a CoE confirms its effectiveness to date." The review panel was also in favour of a strategy of positioning the Centre within a school which has been enacted though the organizational amalgamation with BEES whilst retaining its own physical space and closely knit collegiality.

Appendix A – 2013 Publications

Book Sections

Breuer, L., J. F. Exbrayat, I. Plesca, W. Buytaert, T. Ehmann, T. Peters, E. Timbe, K. Trachte, and D. Windhorst, 2013: Global Climate Change Impacts on Local Climate and Hydrology. *A Tropical Mountain Ecosystem of South Ecuador: Ecosystem Services, Biodiversity and Environmental* Springer, 265 - 274.

Rosenfield, D., R. Wood, L. J. Donner, and S. C. Sherwood, 2013: Aerosol Cloud-Mediated Radiative Forcing: Highly Uncertain and Opposite Effects from Shallow and Deep Clouds. *Climate Science for Serving Society: Research, Modelling and Prediction Priorities* Springer 105 -149.

Sherwood, S. C., M. J. Alexander, A. R. Brown, N. A. Mcfarlane, E. P. Gerber, G. Feingold, A. Scaife, and W. W. Grabowski, 2013: Climate Processes: Clouds, Aerosols and Dynamics. *Climate Science for Serving Society: Research, Modelling and Prediction Priorities* Springer, 73 - 103.

Zwiers, F. W., **L. V. Alexander,** G. C. Hegerl, T. R. Knutson, J. P. Kossin, P. Naveau, **N. Nicholls,** C. Schar, S. Seneviratne, and X. Zhang, 2013: Climate Extremes: Challenges in Estimating and Understanding Recent Changes in the Frequency and Intensity of Extreme Climate and Weather Events. *Climate Science for Serving Society*, G. R. Asrar and J. W. Hurrell, Eds., Springer, 339-389.

Journal Articles

Ackerley, D., A. Lorrey, J. A. Renwick, S. J. Phipps, S. Wagner, and A. Fowler, 2013: High-resolution modelling of mid-Holocene New Zealand climate at 6000 yr BP. *The Holocene* **23,** 1272 - 1285.

Ahmed, M., K. Anchukaitis, A. Asrat, H. P. Borgaonkar, M. Braida, B. Buckley, U. Buntgen, B. M. Chase, D. A. Christie, E. R. Cook, M. Curran, H. F. Diaz, J. Esper, Z. X. Fan, N. P. Gaire, Q. Ge, J. Gergis, J. f. Gonzalez rouco, H. Goosse, S. W. Grab, N. Graham, R. Graham, M. Grosjean, S. T. Hanhijarvi, D. S. Kaufman, T. Kiefer, K. Kimura, A. A. Korhola, P. J. Krusic, A. Lara, A. M. Lezine, C. Ljungqvist, A. Lorrey, J. Luterbacher, V. Masson delmotte, D. Mccarroll, J. R. Mcconnell, N. P. Mckay, M. Morales, A. Moy, R. Mulvaney, I. Mundo, T. Nakatsuka, R. Nuekom, S. Nicholson, H. Oerter, J. G. Palmer, S. J. Phipps, et al, 2013: Continental-scale temperature variability during the past two millennia. *Nature Geoscience* **6,** 339 -346.

Aiken, C., A. Santoso, S. McGregor, and M. H. England, 2013: The 1970's shift in ENSO dynamics: A linear inverse model perspective. *Geophysical Research Letters* **40,** 8.

Alexander, L. and S. Perkins, 2013: Debate heating up over changes in climate variability. *Environmental Research Letters* **8,** 041001-041001.

Andela, N., R. A. M. De Jeu, Y. Y. Liu, A. Van Dijk, and T. R. McVicar, 2013: Global changes in dryland vegetation dynamics (1988–2008) assessed by satellite remote sensing: comparing a new passive microwave vegetation density record with reflective greenness data. *Biogeosciences*, **10,** 6657-6676.

Anwar, M. R., D. L. Liu, I. Macadam, and G. Kelly, 2013: Adapting agriculture to climate change: a review. *Theoretical and Applied Climatology* **133,** 1-2.

Argueso Barriga, D., J. P. Evans, and L. Fita Borrell, 2013: Precipitation bias correction of very high resolution regional climate models. *Hydrology and Earth System Sciences*, **17,** 4379-4388.

Argueso Barriga, D., J. P. Evans, L. Fita Borrell, and K. Bormann, 2013: Temperature response to future urbanization and climate change. *Climate Dynamics* **May**.

Arzel, O. and M. H. England, 2013: Wind-stress feedback amplification of abrupt millennial-scale climate changes. *Climate Dynamics*, **40,** 983 - 995.

Ashok, K., c. Nagaraju, and A. Sen Gupta, 2013: Decadal changes in the relationship between the Indian and Australian summer monsoons. *Climate Dynamics*

Baker, A., C. Bradley, and S. J. Phipps, 2013: Hydrological modeling of stalagmite δ18O response to glacial-interglacial transitions. *Geophysical Research Letters* **40,** 3207 - 3212.

Bell, J., A. Ganachaud, A. Hobday, J. Johnson, A. Sen Gupta, R. J. Matear, and M. S. Pratchett, 2013: Mixed responses of tropical Pacific fisheries and aquaculture to climate change. *Nature Climate Change* **3,** 591 - 599.

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IPCC, 2013. *Climate Change 2013: The Physical Science Basis. Contribution ofWorking Group I to the 5th Assessment Report (AR5) of the Intergovernmental Panel on Climate Change.* Stocker, T.F., D. Qin, G-K. Plattner, M. Tignor, S. K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds). Cambridge University Press, Cambridge, U.K.

CCRC - Active Research Projects

Investigators Pitman, A.

GrantScheme ARC LIEF Shared Grant

GrantTitle Strengthening merit-based access and support at the new nci petascale supercomputing facility

Duration 2012 -- 2016 **Award Budget:** $600,000

Investigators Pitman, A. Sherwood, S Alexander, L England, M.

GrantScheme ARC Centres of Excellence

GrantTitle ARC Centre of Excellence for Climate System Science

Duration 2011 -- 2017 **Award Budget:** $21,400,000

Investigators England, M. Pitman, A Sherwood, S Evans, J Barker, P

GrantScheme ARC Super Science Fellowships

GrantTitle Precipitation-groundwater interactions over Eastern Australia: climate change impacts at multiple scales

Duration 2010 -- 2013 **Award Budget:** $835,200

Investigators McGregor, S.

GrantScheme ARC DECRA Fellowships

GrantTitle Understanding the termination of el nino-southern oscillation events

Duration 2013 -- 2015 **Award Budget:** $375,000

Investigators van Sebille, E.

GrantScheme ARC DECRA Fellowships

GrantTitle Inter-ocean exchange around Australia and its relation to regional and global climate

Duration 2013 -- 2015 **Award Budget:** $374,394

Investigators Evans, J.

GrantScheme ARC Linkage Grants

GrantTitle Will East Coast Lows change in frequency or intensity in the future?

Duration 2012 -- 2015 **Award Budget:** $240,000

Investigators Spence, P.

GrantScheme France-Australia Science Innovation Collaboration (FASIC)

GrantTitle Development and evaluation of high-resolution global ocean simulations: an assessment and optimization of French and Australian modelling efforts.

Duration 2012 -- 2013 **Award Budget:** $6,000

Investigators Taschetto, A.
GrantScheme ARC ARF
GrantTitle Modes of Pacific Ocean variability and their relationship to regional Southern Hemisphere climate
Duration 2010 -- 2014 **Award Budget:** $240,548

Investigators Sijp, W.
GrantScheme ARC ARF
GrantTitle ARF The equable climate conundrum: the role of the global ocean in multiple climate regimes.
Duration 2010 -- 2014 **Award Budget:** $502,830

Investigators Evans, J.
GrantScheme ARC Linkage Grants (Industry portion)
GrantTitle Will East Coast Lows change in frequency or intensity in the future?
Duration 2012 -- 2015 **Award Budget:** $150,000

Investigators Pitman, A. Sherwood, S Alexander, A
GrantScheme Intergovernmental Panel On Climate Change
GrantTitle Intergovernmental panel on climate change travel support.
Duration 2010 -- 2013 **Award Budget:** $145,000

Investigators Alexander, L Karoly, D. Vose, R. Pitman, A.
GrantScheme ARC Linkage Grants
GrantTitle Transforming our research capacity in the analysis of climate extremes
Duration 2011 -- 2014 **Award Budget:** $295,000

Investigators Alexander, L Karoly, D. Vose, R.
GrantScheme ARC Linkage Grants (Industry portion)
GrantTitle Transforming our research capacity in the analysis of climate extremes
Duration 2011 -- 2014 **Award Budget:** $150,000

Investigators England, M.
GrantScheme ARC Laureate Fellowships
GrantTitle Future risks associated with ocean surface warming: impacts on climate, rainfall, carbon, and circulation
Duration 2011 -- 2016 **Award Budget:** $1,250,252

Investigators England, M.

GrantScheme ARC Laureate Fellowships

GrantTitle Salary support - future risk associated with ocean surface warming: impacts on climate, rainfall, carbon and circulation.

Duration 2011 -- 2016 **Award Budget:** $652,960

Investigators England, M.

GrantScheme ARC Laureate Fellowships

GrantTitle Postdoctoral research associate - John Spence - future risks associated with ocean surface warming: impacts on climate, rainfall, carbon, and circulation

Duration 2011 -- 2016 **Award Budget:** $400,910

Investigators England, M.

GrantScheme ARC Laureate Fellowships

GrantTitle Postdoctoral research associate - Agus Santoso - future risks associated with ocean surface warming: impacts on climate, rainfall, carbon, and circulation

Duration 2011 -- 2016 **Award Budget:** $400,910

Investigators England, M.

GrantScheme ARC Laureate Fellowships

GrantTitle Postgraduate researcher (1) - David Hutchinson - future risks associated with ocean surface warming: impacts on climate, rainfall, carbon, and circulation

Duration 2011 -- 2015 **Award Budget:** $106,676

Investigators England, M.

GrantScheme ARC Laureate Fellowships

GrantTitle Postgraduate researcher (2) - Nicola Maher - future risks associated with ocean surface warming: impacts on climate, rainfall, carbon, and circulation

Duration 2010 -- 2013 **Award Budget:** $106,676

Investigators Pitman, A.

GrantScheme NSW Environmental Trust Research Program

GrantTitle Dynamically downscaled climate projections for the Eastern Seaboard.

Duration 2011 -- 2014 **Award Budget:** $199,856

Investigators Sen Gupta, A. England, M. Karumuri, A

GrantScheme ARC Discovery Grants

GrantTitle The Changing relationship between the South Asian and Australian monsoon in a warming world.

Duration 2011 -- 2013 **Award Budget:** $300,000

CCRC - Active Research Projects

Investigators Pitman, A. Abramowitz, G. Leunig, R.

GrantScheme ARC Discovery Grants

GrantTitle Are proposed land-based sinks for greenhouse gases resilient to climate change and natural variability?

Duration 2011 -- 2014 **Award Budget:** $300,000

Investigators McNeil, B. Meissner, K. Matear, R.

GrantScheme ARC Discovery Grants

GrantTitle Examining the vulnerability of ocean carbon biogeochemistry in a high CO2 world

Duration 2011 -- 2014 **Award Budget:** $270,000

Investigators Green, D. Bambrock, H. Alexander, L.

GrantScheme NHMRC Project Grant

GrantTitle Health impacts of climate change on indigenous Australians: identifying climate thresholds to enable the development of informed adaptation strategies

Duration 2011 -- 2014 **Award Budget:** $358,749

Investigators Meissner, K.

GrantScheme ARC Future Fellowships

GrantTitle What caused abrupt climate change events in the past and what can they tell us about the future?

Duration 2010 -- 2014 **Award Budget:** $613,192

Investigators England, M.

GrantScheme Contract Research

GrantTitle Science advisory panel for the Climate Commission.

Duration 2011 -- 2014 **Award Budget:** $4,545

Investigators Pitman, A.

GrantScheme Contract Research

GrantTitle Science advisory panel for the Climate Commission

Duration 2011 -- 2014 **Award Budget:** $4,545

Investigators Evans, J.

GrantScheme Contract Research

GrantTitle Narclim (NSW and ACT regional climate model).

Duration 2011 -- 2014 **Award Budget:** $683,027

CCRC - Active Research Projects

Investigators Evans, J.

GrantScheme State Government Contract

GrantTitle Powp: Narclim (NSW and ACT regional climate model).

Duration 2011 -- 2014 **Award Budget:** $56,973

Investigators Evans, J.

GrantScheme ARC Future Fellowships

GrantTitle How will climate change affect sub-daily precipitation? (project costs)

Duration 2011 -- 2015 **Award Budget:** $67,369

Investigators Waterman, S.

GrantScheme ARC DECRA Fellowships

GrantTitle Ingredients of the eddy soup in Southern Ocean dynamics: processes, climate impacts and parameterisation

Duration 2012 -- 2015 **Award Budget:** $375,000

Investigators Evans, J.

GrantScheme ARC Future Fellowships

GrantTitle How will climate change affect sub-daily precipitation? (Salary support)

Duration 2011 -- 2015 **Award Budget:** $514,528

Investigators Kidston, J.

GrantScheme ARC DECRA Fellowships

GrantTitle The cause of the poleward shift of earth's storm tracks and jet streams

Duration 2012 -- 2014 **Award Budget:** $255,000

Investigators Pitman, A. Hirsch, A.

GrantScheme CSIRO Scholarship

GrantTitle OCE PhD scholarship for Annette Hirsch. Earth system science. Role of land surface dynamics in climate processes.

Duration 2012 -- 2015 **Award Budget:** $21,000

Investigators Abramowitz, G.

GrantScheme EIF Subcontract

GrantTitle Development of research infrastructure to support the protocol for the analysis of land surface models (pals) online web application.

Duration 2012 -- 2014 **Award Budget:** $285,000

CCRC - Active Research Projects

Investigators	Evans, J. Bormann, K.
GrantScheme	Contract Research
GrantTitle	CSIRO Marine and Atmospheric Research - contract research.
Duration	2012 -- 2013
Award Budget:	$10,000

Investigators	Phipps, S.
GrantScheme	CSIRO - CoE subproject
GrantTitle	Geoengineeering model simulations
Duration	2013 -- 2013
Award Budget:	$98,628

Investigators	Pitman, A.
GrantScheme	AECOM AUSTRALIA PTY LTD/Contract Research (**)
GrantTitle	Commonwealth Coastal Project + Peer review of the science project
Duration	2013 -- 2013
Award Budget:	$6,750

Investigators	Santoso, A.
GrantScheme	Government Grants (Non-Cat 1)
GrantTitle	CSIRO CoE Contract - Tropical Variability in a Warming World 2013
Duration	2013 -- 2013
Award Budget:	$90,909

Investigators	Evans, J.
GrantScheme	Contract Research - Institute of Engineers Australia
GrantTitle	Phase 1 – Modelling and Analysis of rainfall extremes in the Greater Sydney region
Duration	2013 -- 2014
Award Budget:	$163,538

Investigators	Evans, J.
GrantScheme	UNSW MREI
GrantTitle	2013 UNSW Major Research Equipment & Infrastructure Scheme: Computational server and associated data storage system
Duration	2013 -- 2013
Award Budget:	$85,416

Appendix C
Centre Personnel 2013

Professors

Prof Matthew England (Australian Laureate Fellow, CCRC Deputy Director)
Prof Andy Pitman (ARCCSS Director)
Prof Steven Sherwood (CCRC Director)
Prof Chris Turney (ARC Laureate Fellow, Adjunct)

Faculty

Dr Gab Abramowitz
Dr Lisa Alexander
A/Prof Jason Evans (ARC Future Fellow)
Dr Donna Green
Dr Melissa Hart (ARCCSS Graduate director)
Dr Joseph Kidston (ARC DECRA Fellow) (resigned November 2013)
Dr Angela Maharaj
Dr Ben McNeil
A/Prof Katrin Meissner (ARC Future Fellow)
Dr Alex Sen Gupta

Post Doctoral Research Fellows, Research Associates and Research Assistants

Dr Joe Andersen
Dr Daniel Argueso
Dr Simon Borlace
Dr Claire Carouge
Dr Aiken Christopher
Dr Patrice Constanza
Dr Charlotte Cook
Dr Mark Decker
Dr Alejandro di Luca
Dr Markus Donat
Dr Jean-Francois Exbrayat
Dr Lluis Fita Borrell
Dr Chris Fogwill
Dr Leela Frankcombe
Dr James Gilmore
Dr Daniel Hernandez-Deckers
Dr Nicolas Jourdain
Dr Jatin Kala
Dr Jules Katjar
Dr Yi Liu
Dr Ruth Lorenz
Dr Shayne McGregor
Dr Laurie Menviel
Dr Steven Phipps
Dr Agus Santoso
Dr Willem Sijp
Dr Paul Spence
Dr Andrea Taschetto
Dr Erik van Sebille
Dr Stephanie Waterman
Dr Leanne Webb
Dr Kirien Whan
Dr Hongang Yang

Professional Staff

Vilia Co
Stephen Gray
Simone Purdon
Swa Rath
Bronwen Smith
Alvin Stone
Joe Zhou (Intern)

Higher Degree Research Students (and their primary supervisor)

Esteban Abellan Villardon (McGregor)
Witold Bagniewski (Meissner)
Alice Barthel (Waterman)
Kathryn Bormann (Evans)

Chris Bull (Van Sebille)
Cameron Cairns (Kidston)
Hamish Clarke (Pitman)
Timothy Cowan (England)
Annika Dean (Green)
David Fuchs (Sherwood)
Ned Haughton (Abramowitz)
Annette Hirsch (Pitman)
Willem Huiskamp (Turney)
David Hutchinson (England)
Agata Imielska (Alexander)
Andrew King (Alexander)
Karin Kvale (Meissner)
Yue Li (Sen Gupta)
Ian Macadam (Pitman)
Nicola Maher (England)
Penny Maher (Sherwood)
Sarah Niklas (Green)
Acacia Pepler (Alexander)
Shirley Qin (Sen Gupta)
Nina Ridder (England)
Jessica Roe (Turney)
Tristan Sasse (Ben McNeil)
Graham Simpkins (England)
Bevan Warren (Green)

Honours Students (and their primary supervisor)

James Goldie (Sherwood)
Marissa Parry (Green)

Adjuncts, Visiting Fellows and Visiting Researchers

Prof Rodrigo Caballero
Dr Jay Chakroborty
Dr Andrew Cook
Dr Marc Dorgeville
Dr Robert Dunn
Dr Michael Eby
Prof Chris Folland
Prof Jonathan Gregory
Dr Will Hobbs
Dr William Kessler
Prof Mojib Latif
Dr Yi Ming
Prof Michael Molitor
Dr George Nurser
Prof Jonathan Overpeck
Dr Oleg Saenko
Prof Sonia Seneviratne
Dr Katy Sheen
Dr Peter Stott
Dr Remi Tailoux
Prof David Thompson
Dr Caroline Ummenhofer
Dr Simon Wild
Dr Hong Yin

Affiliated UNSW Staff

Prof Mike Archer
A/Prof Jeremy Bailey
Dr Dale Dominey-Howes
A/Prof Gary Froyland
A/Prof Mark Holzer
Dr Fiona Johnson
Prof Jane McAdam
Dr Robin Robertson
A/Prof Scott Sisson
Prof Ashish Sharma
Dr Krishna Shrestha
Amelia Thorpe

Visiting Students and Research Interns

Kaitlin Alexander
Nicholas Calhau
Vittoria Capuano
David Crock
Caio Fest
Jennifer Halstead
Arnaud Lasgorceix
Andrew Lowry
Chelsea Nam
Peter Nguyen
Elisa Spreitzer
Chloe Vandervord

Appendix D
Media and publicity

IDKey	MediaType	MediaOutlet	MediaActivity	ArticleProgramName
Alexander, L.	TV	ABC	Recorded interview	Catalyst
Alexander, L.	TV	Swedish public television	Recorded interview	
Alexander, L.	Radio	ABC radio national	Recorded interview	Breakfast show
Alexander, L.	Newspaper	Sydney Morning Herald	Interview	
Alexander, L.	Newspaper	Canberra Times	Interview	Scientists take plunge in bid to help understand our climate future
Alexander, L.	Newspaper	Canberra Times	Interview	Australia has "much to lose" from climate change
Alexander, L.	Online	The Conversation	Opinion editorial	IPCC Fifth Assessment Report: more certainty, not much news
Alexander, L.	TV	local TV station - Fiji One. Fiji One	Recorded interview	News
Alexander, L.	Newspaper	Fiji Times	Press conference	Experts talk climate change
Alexander, L.	Magazine	New Scientist	Interview and quoted	The night: The heat of the night is intensifying
Alexander, L.	Online	The Conversation	News story based on MR	Number of hot days and hot temperatures have increased
Argueso, D.	Press/Media Release	CoECSS	Media release	Sydney's urban areas to be hit hardest by global warming
Argueso, D.	Radio	ABC 702 / News Radio ABC	Interview	Morning Show
Argueso, D.	Radio	Adelaide 891 ABC	Live interview	Morning Show
Argueso, D.	Radio	3CW Melboune	Interview on air	Afternoon Show
Argueso, D.	Radio	Triple J	Interview	Hack
Argueso, D.	Radio	2SER FM	Live interview	N/A
Argueso, D.	Newspaper	Sydney Morning Herald	Interview for article	City living to get more hot and bothered
Argueso, D.	Online	ZeeNews.com	Story from media release	Sydney`s urban areas to face sharp rise in night temperature: Study
Argueso, D.	Online	TruthDive	From media release	Sydney?s urban areas to face sharp rise in night temperature: study
Argueso, D.	Online	International Business Times	Taken from media release	Australia's Cities Getting Hotter by 3.7 Degrees
Argueso, D.	Online	Weather Zone	From media release	Sydney temperatures to rise by nearly 4 degrees by 2050: researchers
Argueso, D.	Online	Science Daily	Taken from media release	Sydney's Urban Areas to Be Hit Hardest by Global Warming
Argueso, D.	Online	ABC Online	ABC radio interview and media release	Sydney temperatures to rise by nearly 4 degrees by 2050: researchers
Argueso, D.	Online	Top News NZ	From media release	Researchers Fear Sydney Temperature will Rise by 2050
Clarke, H.	Newspaper	The Australian	Paper quoted	Bushfires raise temperature of climate now
Donat, M.	Newspaper	Adelaide Advertiser	Quotes used in article on heatwave	Mercury Rising
Donat, M.	Newspaper	NewScientist		Australia faces another week of 'catastrophic' heat
Donat, M.	Newspaper	Herald Sun	journalist backgrounding	The heat is on: Bureau warns of longer heatwave
Donat, M.	Newspaper	Canberra Times / SMH	Interview and media release	Heat extremes rising over land, confounfing 'hiatus' claims, scientists say
England, M.	Radio	ABC 702 Radio	Interview	Recent weather and its relation to climate trends, SST etc.
England, M.	TV	ABC TV News	Interview	Atmospheric CO2 concentrations now exceeding 400ppm for the first time in 3 million years
England, M.	Newspaper	Sydney Morning Herald	Interview	Emissions targets too low: experts
England, M.	TV	ABC 1 Lateline	Interview and quotes for package	Lateline
England, M.	TV	ABC 1 Lateline	Interview and quotes for global warming rates	Lateline
England, M.	TV	ABC24	Live interview	Weekend Breakfast
England, M.	Newspaper	Sydney Morning Herald	Interviewed and quoted	Global warming likely to 'energise' El Nino effect, research shows
England, M.	Television	ABC1 Television	Pre-record	Lateline

England, M.	Press/Media Release	CoECSS	MR	Rapid upper ocean warming linked to declining aerosols
England, M.	Radio	612 ABC Brisbane	Interview on air	Afternoons with Kelly Higgins-Devine
England, M.	TV	ABC News 24	Pre-record	Afternoon Live
England, M.	Radio	ABC News Radio	Interview with Glen Bartholomew	ABC News Radio
Frankcombe, L.	Online	Nature	journalist backgrounding, interview	Nature News
Green, D.	Online	The Conversation	Opinion piece	Carbon tax showdown: the rocky road ahead for Abbott
King, A.	Online	The Conversation	Op-Ed	The blame for rain is mainly done in vain
McGregor, S.	Newspaper	Sydney Morning Herald	Interview, MR and quotes	Global warming like to 'energise' El Nino effect , research shows
McGregor, S.	Online	Business Spectator	MR republished	El Nino gets more extreme as globe warms
McGregor, S.	Online	Nature World News	MR republished	El Niño Activity Increased Over Last Century, New Research Suggests
McGregor, S.	Radio	ABC South East	Radio interview	Breakfast
McGregor, S.	Press/Media Release	CoECSS	MR	El Nino events get more extreme as globe warms
McGregor, S.	Newspaper	SMH	provide press release	Global warming likely to 'energise' El Nino effect
McGregor, S.	Radio	ABC south eastern radio	Live interview	Mornings with Tim Holt
McGregor, S.	Radio	ABC rural	Recorded interview	News
Perkins, S.	Newspaper	The Age	Journalist interview	Summer that Refuses to throw in the towel
Perkins, S.	Online	The Conversation	Article	More angry, more often: March heatwave signals a new normal
Perkins, S.	Radio	5aaa	Live intreview	
Perkins, S.	TV	Prime7	Pre-recorded interveiw	Heatwaves
Perkins, S.	Online	UNSWTV (youtube)	Video tied in with media release	The Heat Goes On
Perkins, S.	TV	LIVE TV	Recorded interview	
Perkins, S.	Radio	Radio national	Recoarded interview	Drive with Liz Ellis
Perkins, S.	TV	ABC news	Recorded interview	News
Perkins, S.	Online	the conversation	Op ed piece	NA
Perkins, S.	Newspaper	Sydney Morning Herald	Interview for article	Towards a hotter, wilder future
Perkins, S.	Radio	Triple J - Hack	Pre-record interview	IPCC assesses climate change
Perkins, S.	Online	The Conversation	Interviewed and quoted	Sweaty September smashes records, with more heat to come
Perkins, S.	Newspaper	Sydney Morning Herald	Op-ed	Sydney heatwave: Is it hot enough for you?
Perkins, S.	Newspaper	Ballarat Courier	interviewed and quoted	2050 looms for our climate
Perkins, S.	Radio	ABC Radio National	Live interivew	Fran Kelly mornings
Perkins, S.	Online	The Conversation	Interviewed and quoted	Climate change 'unprecendented' by 2050: study
Perkins, S.	Online	The Climate Insitute	video	What keeps a climate scientist up at night?
Perkins, S.	Newspaper	SMH	interview	Towards a hotter, wilder, future
Perkins, S.	Radio	ABC	live interview	Perth Drive with Russell Wolf
Perkins, S.	Online	the conversation	journalist backgrounding/comment	climate change "unprecedented" by 2050
Perkins, S.	Newspaper	SMH	journalist backrounding	New climates for Melbourne, Sydney, predicted
Perkins, S.	Online	SMH	op-ed	sydney heatwave - is it hot enough for you?
Perkins, S.	Radio	ABC radio national	live interview	AM with Fran Kelly
Perkins, S.	Online	news.com.au	intertviewed and quoted	10 simple points about climate change
Perkins, S.	Radio	Triple J Hack	Package quoted	Segment investigating the link between current bushfires and climate change
Perkins, S.	Online	Green Lifestyle	interview	
Perkins, S.	Online	Wall st Jounral	interview and quoted	
Perkins, S.	TV	CH10	interview	Wake up
Perkins, S.	Radio	BBC radio	interview	BBC world service
Perkins, S.	Online	SMH	interview	never say never about climate change
Phipps, S.	Online	UNSW Newsroom	Media release	Past 100 years reverses 1400 years of global cooling
Phipps, S.	Newspaper	Sydney Morning Herald	Newspaper article	20th century 'hottest in 1400 years'

Phipps, S.	CoECSS Website	CoECSS website	Op-Ed	New insights into the climate of the past 2,000 years
Phipps, S.	Radio	Community radio	Recorded interview	Coral, tree rings yield further evidence that humans changed climate
Phipps, S.	Online	ABC Science website	Online news article	Late 20th century hottest in over 1000 years
Phipps, S.	Online	ABC Science	Quote	Slower warming 'may give climate reprieve'
Phipps, S.	Newspaper	The Australian	Quote	CO2 temperature spike 'lower than previously thought'
Phipps, S.	Online	The Conversation	Op-Ed	Long-term warming, short-term variability: why climate change is still an issue
Pitman, A.	Newspaper	The Australian	Interview	"Extremes more common" with climate change
Pitman, A.	TV	ABC	Interview	
Pitman, A.	Online	CIO	Event report	ANU launches Australia's largest supercomputer Half of its processing power to be dedicated to Earth system science
Pitman, A.	Newspaper	The Australian	Interview as part of opening	Australia unveils most powerful computer
Pitman, A.	Online	Channel NewsAsia	Report on speech at opening	Lifestyle
Pitman, A.	Online	AFP	AFP report of opening	MSN News
Pitman, A.	Online	Get Living		New supercomputer Australia’s most powerful
Pitman, A.	Online	The Australian	Comments in blog for the Australian	
Pitman, A.	Radio	ABC Radio	ABC 702 radio today interview with James Valentine	Breakfast with James Valentine
Pitman, A.	Online	Lateline		AusSMC - Briefing of media around the process of the IPCC
Pitman, A.	Radio	The Wire, 2SER Radio	Interview	Global warming hiatus
Pitman, A.	Newspaper	The Australian	Interview	Science solid on global warming, IPCC declares
Pitman, A.	Radio	ABC 666 Canberra	Pre-recorded interview	
Pitman, A.	TV	ABC1 News	Pre-record interview	IPCC report
Pitman, A.	Radio	Radio National PM	Pre-record interview	:atest IPCC report: human influence on climate confirmed
Pitman, A.	TV	Lateline	Pre-record as part of package	IPCC urges world to reduce greenhouse emissions
Pitman, A.	Online	ABC Online	Interview and quotes	IPCC climate change report: Human role in global warming now even clearer
Pitman, A.	Online	The Guardian	Interview and quotes	IPCC report: Australia can expect 6C rise on hottest days
Pitman, A.	Online	Sciblogs	Quotes	IPCC climate report: How did the scientists react
Pitman, A.	Newspaper	Sydney Morning Herald	Interview and quotes	Climate scientist want urgent action
Pitman, A.	Newspaper	Sydney Morning Herald	Interview and quotes	Emissions targets too low
Pitman, A.	Newspaper	The Australian	Interview and quotes	Scientist laments concerted effort to discredit IPCC
Pitman, A.	Radio	Radio Adelaide	Interview for package	The Wire with James Besanvalle
Pitman, A.	TV	ABC 1 Lateline	Interview and quotes for package	Lateline
Pitman, A.	TV	ABC 1 Lateline	Interview and quotes for global warming rates	Lateline
Pitman, A.	Online	The Conversation	Opinion editorial	The Conversation
Pitman, A.	Newspaper	The Land	Taken from quotes	Warming needs urgent action
Pitman, A.	Online	Climate Spectator	Taken from quotes	Aust scientists call for deeper cuts
Pitman, A.	Newspaper	The Australian	Additional story based on launch	Australia uneils its fastest computer
Pitman, A.	Newspaper	Sydney Morning Herald	Interviewed and quoted	Australia vulnerable in a warming planet, leaked IPCC report finds
Pitman, A.	Newspaper	Sydney Morning Herald	Interviewed and quoted	Bushfire risk could rise in coming years
Pitman, A.	Radio	2UE	Interviewed for news	News
Pitman, A.	Radio	3WM	Quoted in news bulletin	News
Pitman, A.	Magazine	New Scientist	Quoted	Record heat behind bushfires
Pitman, A.	TV	ABC News 24	Interviewed and quoted	The bush fire has created a secondary battle with a political dispute about climate
Pitman, A.	Magazine	The Economist	quoted	Dark Day at Yellow Rock
Pitman, A.	Radio	ABC News Radio	Pre record quotes	Katy Hayman report about extreme weather fueling blue Mountains bushfires
Pitman, A.	Radio	Radio National ABC	Package quoted	NSW Govt accused of climate change cutbacks
Pitman, A.	TV	7:30 ABC1	Package quoted	Scientists say climate change link to bushfires demands action

Santoso, A.	Radio	2UE	Quotes for news	News
Santoso, A.	Online	Climate Spectator	Media release reprint	"Reverse" El Ninos to increase in frequency
Santoso, A.	Online	International Business Times	Quote from media release	Australia to Face Extreme El Nino Weather; Ranks Low in Climate Change Performance Index
Santoso, A.	Online	Australasian Science	Interview from MR	Global warming doubles odds of abnormal El Nino
Santoso, A.	Online	Scinews.com	Quotes and story from media release	Climate Scientists Identify Cause of Super El Niño Events
Santoso, A.	Online	Science Alert	Reprint from MR	Extreme El Nino cause found
Santoso, A.	Online	Phys Org	Reprint from MR	Cause of El Nino abnormality found
Santoso, A.	Newspaper	Sydney Morning Herald	Interview by Peter Hannam	Australia to face stronger El Nino weather patterns from global warming
Santoso, A.	Online	Eco News	From MR	Study: super El Niño will be twice as frequent
Santoso, A.	Newspaper	Daily Examiner	From MR	El Ninos to hit twice as often: Nature report
Santoso, A.	Online	ABC Environment	Recorded interview	Climate change to make 'Super El Nino' events twice as likely
Sen Gupta, A.	Newspaper	Australian	Journalist backgrounding	Ozone action linked to hiatus
Sen Gupta, A.	TV	SBS	Interview	Evening news
Sen Gupta, A.	Press/Media Release	Australian Musium	Journalist backgrounding,	New model could give 12 months warning on El Niño
Sen Gupta, A.	Online	ABC	Journalist backgrounding,	Warming could make El Nino more intense
Sherwood, S.	Radio	ABC Radio	live interview	
Sherwood, S.	Online	Business Spectator	Article	Research Finds New Roadblock to Geoengineering
Sherwood, S.	Magazine	The Conversation	Article/op-ed	Carbon Dioxide hits 400 ppm
Sherwood, S.	Online	BBC-Graham Readfearn	Interview in column	Climate change will be slower than thought, study shows – or does it?
Sherwood, S.	Newspaper	BBC News	News story	Climate slowdown means extreme rates of warming 'not as likely'
Sherwood, S.	Radio	ABC	news story	ABC World Today
Sherwood, S.	TV	ABC	Recorded interview	ABC Science with Sarah Clarke
Sherwood, S.	Online	The Convesration		As temperatures rise, tropical forests absorb less CO2
Sherwood, S.	Online	The Conversation	editorial	Study offers clues on 20th century global warming wobbles
Sherwood, S.	Newspaper	Sydney Morning Herald	Interview for article	Climate: world on path to disaster.
Sherwood, S.	Newspaper	Sydney Morning Herald	Interview for article	Clouds' role in warming more certain, report shows
Sherwood, S.	Radio	Radio National Breakfast with Fran Kelly	Interview for package	World tracking for dangerous climate change
Sherwood, S.	Newspaper	Sydney Morning Herald	Commentary as part of live IPCC report	IPCC report: Latest climate change findings
Sherwood, S.	Online	The Conversation	Opinion editorial	IPCC Fifth Assessment Report: more certainty, not much news
Sherwood, S.	Radio	ABC 666 Canberra	live interview	Mornings with Genevieve Jacobs
Sherwood, S.	TV	ABC	recorded interview	7pm evening news
Sherwood, S.	Newspaper	The Age	Article	Clouds' role in warming more certain, report shows
Sherwood, S.	TV	ABC	live appearance	Q&A
Sherwood, S.	Newspaper	Daily Examiner, Grafton	Interview and quotes for article	Australia left in dust in climate change
Sherwood, S.	Newspaper	The Sunday Age	Article	The tide is rising
Sherwood, S.	Radio	ABC RN - PM	Interviewed and quoted	The planet is warming and we are mostly to blame: IPCC report
Sherwood, S.	Online	ABC Online	Interviewed and quoted	Draft IPCC report predicts sea levels to rise a metre by end of the century
Sherwood, S.	TV	ABC1 Lateline	Interviewed and quoted	Government axes Climate Commission
Sherwood, S.	Newspaper	news.com.au	Interviewed and quoted	Role of clouds on climate change needs study, say Greenhouse 2013 scientists
Sherwood, S.	TV	Channel 7	Live studio interview	Weekend Sunrise
van Sebille, E.	Radio	ABC Radio National	Recording Interview	Breakfast
van Sebille, E.	Radio	ABC NewsRadio	pre-recorded interview	ABC News Radio
van Sebille, E.	Radio	ABC Radio Tropical North	on-air live interview	Mornings with Kim Cleidon
van Sebille, E.	Radio	ABC Radio National (Pacific)	On-air live interview	
van Sebille, E.	Radio	ABC Radio	On-air live interview	

van Sebille, E.	Radio	Newcastle/Canberra Radio New Zealand International	prerecorded interview	Dateline Pacific
van Sebille, E.	Film/Documentary	International (The Weather Chanel, SBS Australia, VPRO, etc)	co-hosting episode	Tipping Points
van Sebille, E.	Online	The Conversation	Opinion piece	Leave the ocean garbage alone. We need to stop polluting first
van Sebille, E.	Online	NeCTAR	Follows media release	Researcher seeks solutions to ocean rubbish using NeCTAR cloud
van Sebille, E.	Radio	ABC Radio National	On-air interview	Life Matters
van Sebille, E.	Press/Media Release	CoECSS	MR	Plastics will pollute our oceans for hundreds of years
van Sebille, E.	Radio	TripleR Melbourne	On-air live interview	Radio Marinara
van Sebille, E.	Radio	3RRR-FM	On-air live interview	Saturday Science
van Sebille, E.	Magazine	Cosmos Magazine	Article	Tracking the Ocean's Trash
van Sebille, E.	Radio	2GB	Live on-air phone interview	Rev Bill Crews
van Sebille, E.	Newspaper	Canberra Times	Interview for article	Tropical life a grave threat to south coast
van Sebille, E.	Online	Hyperallergic	Report on Adrift website	Where plastic flows: visualising environmental data
van Sebille, E.	TV	ABC News 24	Interview	Exploring the sea floor and the insides of turtles to examine the impact of plastics
van Sebille, E.	Radio	Triple J - Hack	Pre-record for wrap	IPCC 95% man caused climate change
van Sebille, E.	Radio	ABC Southeast NSW	Live on-air interview	Mornings
van Sebille, E.	Radio	ABC Adelaide	Live on-air interview	Afternoons with Deb Tribe
van Sebille, E.	Radio	Eastside FM	prerec interview	Arts - Wednesday
van Sebille, E.	Online	news.com.au	interview	10 simple points about climate change
van Sebille, E.	Press/Media Release	CoECSS	MR	Fukushima radioactive plume to reach US in three years
van Sebille, E.	Online	Science 2.0	From media release	Article
van Sebille, E.	Online	Natural News Buzz	Taken from MR	Fukushima's radioactive plume to reach American shores in 2014
van Sebille, E.	Online	Salon	Taken from MR	Fukushima radiation set to hit the US by 2014
van Sebille, E.	Online	Science Daily	Taken fromMR	Fukushima radioactive plume to reach US in 3 years
van Sebille, E.	Online	Global News	Taken from MR	Fukushima waste to reach west coast of Canada in 3 years
van Sebille, E.	Online	Phys.Org	Taken from MR	Fukshima radioactive plume to reach US in 3 years
van Sebille, E.	Online	Science Recorder	Taken from MR	Radioactive ocean plume from Fukushima to reach US coast in 2014
van Sebille, E.	Online	Science World Report	Taken from MR	Fukushima radioactive plume hits US California coast in three years.
van Sebille, E.	Online	Red Orbit	Taken from MR	Fuksuhima radioactive plume expected to reach US shores by 2014.
van Sebille, E.	Online	Zee News India	Taken from MR	Fukushima radioactive plume to reach US in three years
van Sebille, E.	Online	UPI	Taken from MR	Fukushima radioactive plume being tracked towards the US west coast
van Sebille, E.	Online	Newsroom America	Taken from MR	Fukushima radioactive plume to reach US in 3 years
van Sebille, E.	Online	TGDaily	Taken from MR	Fukushima radioactive plume to reach US in 3 years
van Sebille, E.	Online	Health	Taken from MR	Ocean plume from Japan nuke disaster will reach US by 2014
van Sebille, E.	Online	healthfinder.gov	Taken from MR	Ocean plume form Japan nuke disaster will reach US by 2014
van Sebille, E.	Online	Truth Dive	Taken from MR	Fukushima radioactive plume to reach US in three years
van Sebille, E.	Online	MSN News	Interview and MR	Rumour: Fukushima radiation to hit US by 2014
van Sebille, E.	Radio	ABC 702 Sydney	Live on-air interview	Drive