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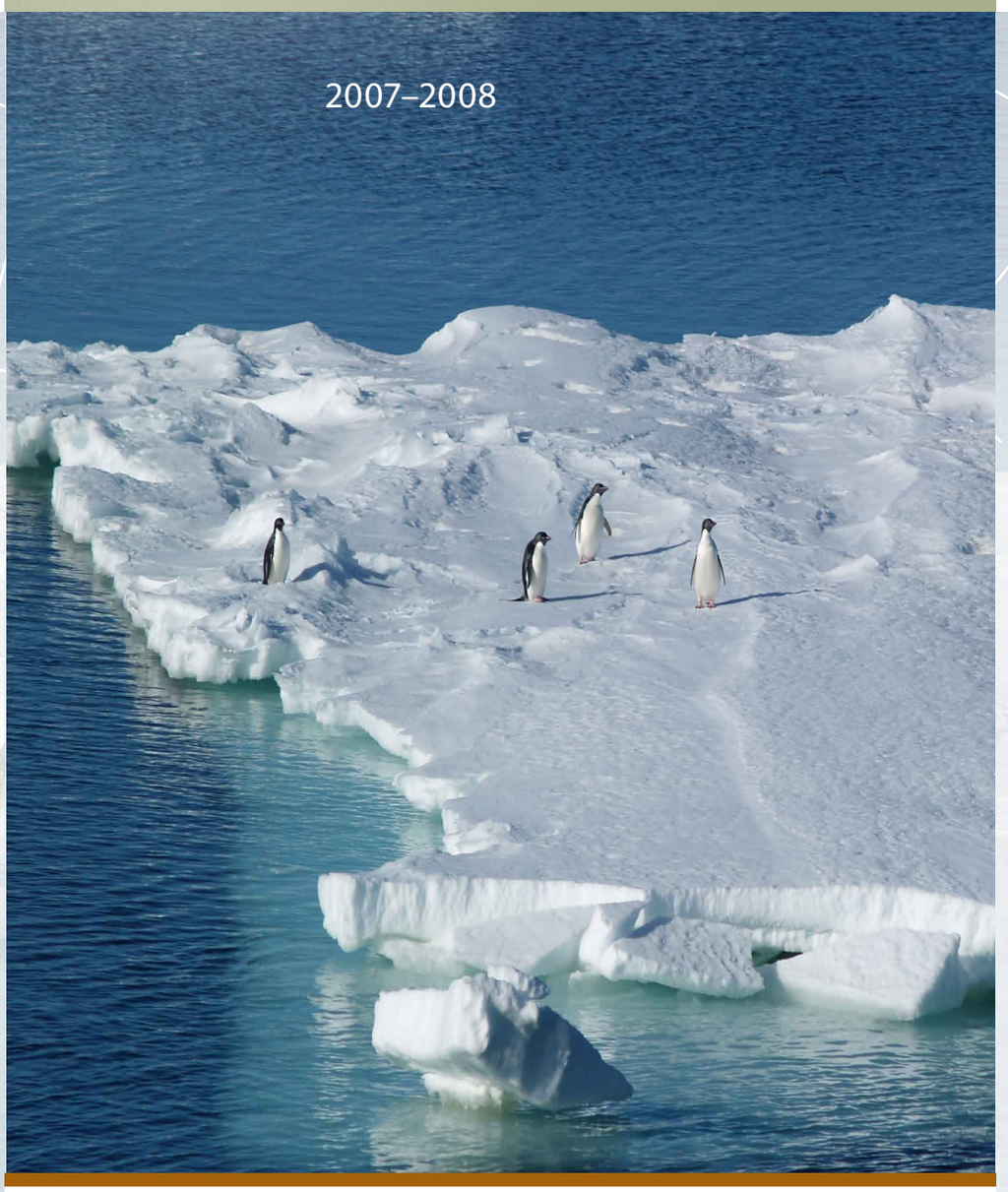
ANTARCTIC CLIMATE & ECOSYSTEMS
COOPERATIVE RESEARCH CENTRE

ANNUAL REPORT:

2007–2008



Established and supported under the Australian Government's Cooperative Research Centres Program

ACE CRC leads Australia's effort to understand the roles of Antarctica and the Southern Ocean in the global climate system and climate change.

Our research focuses on projecting future changes in sea level; understanding ocean processing of greenhouse gases; and managing marine ecosystems, as well as analysing the policy implications of our science.

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Photo inside front cover: Simon Marsland

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Australian Government
Department of the Environment, Water, Heritage and the Arts
Australian Antarctic Division

UTAS

CSIRO

Australian Government
Bureau of Meteorology

executive summary

Activities of the Antarctic Climate & Ecosystems Cooperative Research Centre (ACE CRC) during 2007–2008 have been focused significantly through our large involvement in the International Polar Year 2007–2008 (IPY).

IPY is an interdisciplinary and internationally coordinated program involving more than 60 nations, and designed to advance our understanding of the polar regions and their significance for the Earth's climate, ecosystems and societies. It is one of the most ambitious international science programs ever attempted, and ACE CRC scientists are involved in more than 20 internationally endorsed IPY projects. We took a leadership role in many of these, including two of the largest Southern Ocean IPY projects. Through an intensive spring and summer of field oceanographic research, we have achieved a new understanding of the links between physical conditions and biological productivity in the Antarctic sea ice zone, and we have generated improved information on the changes that are occurring to the Southern Ocean climate, as well as the processes causing them.

For the Climate Variability & Change (CVC) Program and the Antarctic Marine Ecosystems (AME) Program, a key voyage was the Sea-ice Physics and Ecosystem Experiment (SIPEX), led by Dr Anthony Worby and a major component of Antarctic sea-ice investigations during IPY. We measured sea-ice thickness characteristics using airborne radar, laser and photo surveys and correlated these observations with in-situ and satellite measurements. The relationships between the physical sea-ice environment and the structure of Southern Ocean ecosystems were investigated using a novel, remotely operated underwater vehicle beneath the ice, instrumented with optical sensors. A specially designed trawl net was also used to directly sample under the ice and to examine krill in that environment.

Two other key voyages, part of the CVC Program, made a major contribution to the IPY Climate of Antarctica and the Southern Ocean (CASO) project. The leader of this project, Dr Steve Rintoul, coordinated research cruises of many nations to provide the first circumpolar snapshot of the physical, biogeochemical and ecological environments of the Southern Ocean region. The data collected on these voyages provided evidence that Antarctic Bottom Water in the Australian Antarctic Basin continues to freshen at a rapid rate, and that the complex ocean circulation over the Antarctic continental shelf is involved in moving dense water from the shelf.

Within the Ocean Control of Carbon Dioxide (CO_2) Program we have shown that the natural input of iron to the ocean from the Heard and Kerguelen islands and surrounding plateau sediments increases phytoplankton, zooplankton and bacterial populations, and results in greater export of carbon to deep waters. A suite of full-water column micronutrient trace elements was measured for the first time during the CASO voyage as a major contribution to the IPY GEOTRACES project. This will allow us to identify processes that control distributions of key trace elements and isotopes in the ocean, and establish the sensitivity of these distributions to changing environmental conditions.

Following the significant achievements of last year, the CO_2 Program convened an international workshop on ocean acidification, funded by the Department of Climate Change (DCC, formerly AGO). This provided a timely opportunity to communicate the state-of-play in science knowledge to research users and government.

Our Sea-Level Rise (SLR) Program delivered new and improved estimates of ocean warming and sea-level rise. We have determined that, since 1961, the trend in ocean thermal expansion has been 50% larger than previous estimates, and that with this correction, there is now good agreement between the observed variability in ocean thermal expansion and the ocean warming inferred from global climate models. These results stress that careful and ongoing quality control of sea level observations is required to confidently detect, attribute and project future changes.

The SLR Program also developed a new method for assessing the combined impact of sea-level rise and extreme events on flooding at the coast. An analysis of extreme events showed how the frequency of extreme coastal flooding events would increase dramatically during the 21st century, with far-reaching implications for our coasts.

Following recommendations from our Third Year Review, in August 2006, the ACE CRC developed a strategy to promote our research to end-users. A business development plan identified a key opportunity for promoting our sea-level rise expertise to coastal infrastructure owners and planners. A sea-level rise consultancy unit has been developed, and this unit is now supporting industry and government entities in providing coastal infrastructure risk assessments taking into account the potential impacts of a rising sea level.

A significant new body of work to deliver research to end-users is the three-year Climate Futures for Tasmania project (CFT), funded by both Commonwealth and Tasmanian State Government agencies and Hydro Tasmania. It works with stakeholders across a range of Tasmanian enterprises, including agriculture and water management, to produce detailed assessments of possible future Tasmanian climates in a form that these stakeholders can apply to their strategic decision making. CFT involves leading-edge modelling techniques and may well prove a useful model for broader applicability elsewhere in Australia.

To better translate our research outputs into forms useful to research users in the spheres of law, public policy and regulation, the regular Research Users Forums held by our Policy Program (POL) have been refocused towards a roundtable format on specific issues. A new series of Position Analysis papers has also been developed to provide contemporary analyses of relevant topics to research users. .

Our Education Program continues to be a high priority focus and we currently have 67 graduate students enrolled. ACE CRC plays a major role in training the next generation of environmental scientists for Australia, while at the same time our graduate students make a very significant contribution to our research outputs.

Ian Allison

Acting CEO

national research priorities

The International Polar Year (IPY) has highlighted the importance of climate change and its impacts in polar regions, and emphasized that some of the most significant current changes to both climate and ecosystems are occurring near the poles.

ACE CRC has taken a major role in IPY and our research contributions to that program are directly aligned with our key objectives and to the goals of the national research priorities.

At the same time, the social, political and environmental context of climate change within Australia has shifted considerably. There is an increasing effort towards investigating adaptation and mitigation strategies, but this can only be undertaken within a framework of the best scientific assessment of current change and future projections. Australia's capacity to respond to climate change and variability demands the best possible science to continually improve our understanding of the climate system, and ACE CRC research addresses the key role of the Antarctic and Southern Ocean in climate and ecosystem processes.

National research priority highlights

- The CVC Program participated in four major research cruises. Data from these, and from robotic ocean-profiling buoys, provided evidence of freshening of the surface waters south of Australia, suggesting significant melt of ice shelves around Antarctica, and also changes in Antarctic Bottom Water around Adélie Land. New airborne and undersea technologies were used to determine the physical characteristics of Antarctic sea-ice and the links between these and sea-ice ecosystems (with the AME Program). A new delineation of ocean currents near Antarctica was also mapped, showing their relationship to associated ecosystems.
- ACE CRC expanded its research into the uptake of atmospheric CO_2 by the ocean and its impacts on marine organisms. Study of the shell weights of marine phytoplankton and zooplankton was undertaken to determine if ocean acidification due to CO_2 absorption is reducing the ability of these organisms to build shells. An international workshop, 'Ocean Acidification: Australian impacts in the global context', hosted by ACE CRC and CMAR, resulted in a communiqué to government.
- The SLR Program has shown that ocean thermal expansion over the last four decades has been 50% greater than assessed by IPCC, and that global sea level rise is near the upper limit of IPCC projections. A new method for assessing the combined impact of sea-level rise and extreme events on flooding at the coast has been applied to locations around Australia. This indicates that the frequency of extreme flooding events will increase dramatically during this century, with far-reaching implications for coastal assets and infrastructure.
- A new publication series, ACE CRC Position Analysis papers, has been developed to provide contemporary analyses of relevant science topics to government and decision makers. The first of these was on ocean acidification. Staff of the POL Program also provided advice to the Department of Foreign Affairs & Trade on the science of ocean fertilisation, as part of the Australian brief for UN discussions on the Law of the Sea, and to Department of Environment, Water, Heritage & the Arts and Attorney-General's Department for a meeting of the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter.
- The CFT project was initiated in October 2007 to deliver climate projections for Tasmania at a fine scale and across a wide range of impact areas. These projections, under a range of greenhouse emission scenarios, will inform a range of stakeholders about the likely impacts of climate change. CFT will provide an accessible basis for subsequent climate change research, by archiving fine-scale climate model outputs for the entire state of Tasmania.

NATIONAL RESEARCH PRIORITIES	CRC RESEARCH (%)
AN ENVIRONMENTALLY SUSTAINABLE AUSTRALIA: Transforming the way we use our land, water, mineral, and energy resources through a better understanding of environmental systems and using new technologies	
Sustainable use of Australia's biodiversity	30%
Responding to climate change and variability	70%

governance & management

Core partners

Australian Antarctic Division (AAD)

Australian Bureau of Meteorology (BoM)

CSIRO Division of Marine and Atmospheric Research (CMAR)

University of Tasmania (UTAS)

Supporting partners

Alfred Wegener Institute (AWI, Germany)

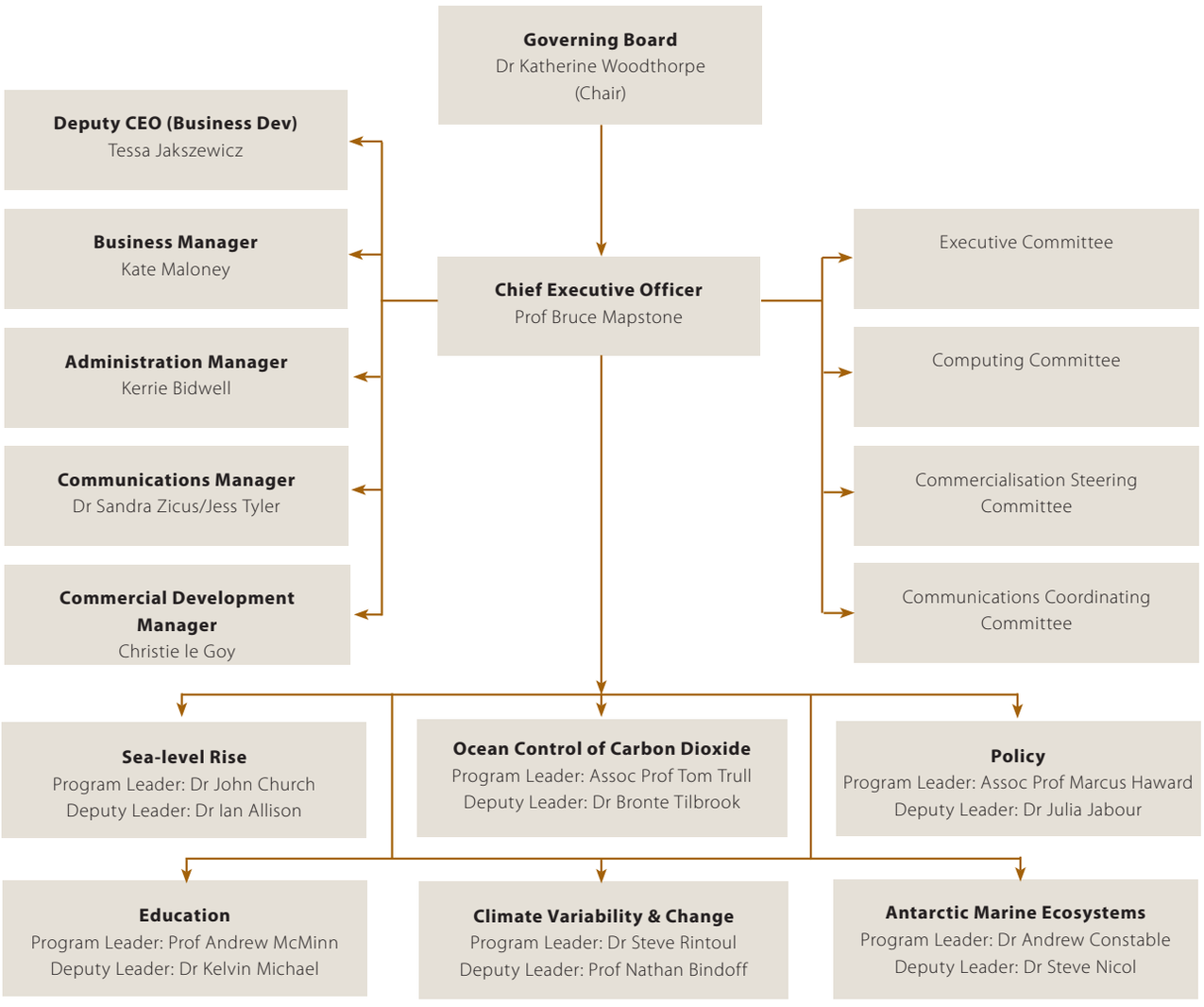
The Department of Climate Change (DCC)

The Australian National University (ANU)

National Institute of Water & Atmospheric Research (NIWA, New Zealand)

Silicon Graphics International (SGI)

Tasmanian Department of Economic Development (DED)



Governing Board

The ACE CRC Governing Board has an independent Chair and members from the core partners and key research users. The Australian Antarctic Division holds an additional *ex-officio* seat in recognition of the magnitude of its contribution.

Dr Katherine Woodthorpe is a management adviser and professional director, specialising in innovation and commercialisation issues and during 2007 she was appointed Chief Executive of AVCAL. Her varied background is in science, technology, human resources, commercialisation and government interaction. Her areas of expertise include developing strategies for rapid growth, commercialisation of technology, products and services, venture capital and private equity.

Dr Greg Ayers is Chief of CSIRO's Division of Marine & Atmospheric Research, having previously served as Chief of Atmospheric Research. He has pursued broad scientific interests across a range of topics in marine and atmospheric biogeochemistry. He currently serves on the editorial boards of four international scientific journals.

Mr Howard Bamsey is Deputy Secretary of the Department of Climate Change and head of the Australian Greenhouse Office. In 2006 he was appointed as Co-chair to the United Nations 'Dialogue on Long-term Cooperative Action on Climate Change'. He spent over twenty years in the Australian foreign service and served in the United Nations centres of New York, Geneva and Vienna, as well as other capitals. His positions include Ambassador to the United Nations in Geneva and Ambassador for the Environment.

Mr Tony Coleman has more than 38 years of experience in the insurance, investment and finance sectors. His current position is Chief Risk Officer for IAG and previously he was a senior corporate finance partner of PricewaterhouseCoopers. Tony is a former president of the Institute of Actuaries of Australia (IAAust) and was named Actuary of the Year by IAAust in 2004. Tony is also a member of the Australian Climate Group, actively promoting a better understanding of global warming and climate change in the community.

Mr Greg Johannes is Deputy Secretary (Policy), Tasmanian Department of Premier and Cabinet. His background is in industry, policy, environmental management and public affairs. He has held senior positions in industry, commonwealth and state government. His areas of expertise include commercialisation of public-sector R&D, small business development, biotechnology and innovation. Prior to his current position he was Executive Director of the Tasmanian Office of Climate Change.

Professor Johanna Laybourn-Parry commenced her appointment as Pro Vice-Chancellor (Research) at the University of Tasmania in 2007. Her research background is as a polar scientist working on carbon cycling in lakes and glaciers. Her Antarctic research has been conducted with the Australian Antarctic Program at Davis Station and with the United States Long Term Ecological Research Program in the McMurdo Dry Valleys. She has worked at universities including Stirling University, Lancaster University and Nottingham University and Melbourne's La Trobe University.

Dr Geoff Love joined the Bureau of Meteorology in 1975, and in 1997 was promoted to Deputy Director (Services). He was appointed Secretary of the Intergovernmental Panel on Climate Change, located at the World Meteorological Organisation Secretariat in Geneva in April 2002 and returned to the position of Director of Meteorology in August 2003. Dr Love holds a BSc (Hons) and MSc from La Trobe University, a PhD from Colorado State University and an MBA from Deakin University. His international experience includes a position as Vice President and President of the World Meteorological Organisation Commission for Basic Systems. He has published a large number of scientific papers on tropical meteorology, climate and various aspects of applied meteorology.

Dr Tony Press has been Director of the Australian Antarctic Division since November 1998. Key achievements in that position have included implementing the Government's goals for Australia's Antarctic Program, taking a lead role in developing measures to combat illegal fishing in the Southern Ocean and introducing a new era of air transport in Antarctica. Dr Press has been a Board member of the ACE CRC since its inception, a member and former Chair of the Board of its predecessor, the Antarctic and Southern Ocean CRC, and was a founding Board member of the CRC for the Sustainable Use of Tropical Savannas.

Mr Bill Trestrail was recently appointed Vice President of Silicon Graphics International (Asia Pacific), where he is responsible for all operations of SGI in this region. Previously, he joined SGI in 1995 as ACT State Manager and since then has held various positions including National Defence Business Unit Manager and National Sales Manager – Corporate & Government. Prior to joining SGI, he held a number of sales and management roles with Seer Technologies, Informix Software and Australian Consolidated Technologies in Canberra, Sydney and Brisbane.

Board Member	Organisation	Position / Role
Dr Katherine Woodthorpe (Chair)	AVCAL	Chief Executive
Dr Greg Ayers	CMAR	Director Science & Policy (Chief-on-secondment)
Mr Howard Bamsey	DCC	Deputy Secretary
Prof Alan Canty (retired 4 Sept 2007)	UTAS	Pro Vice-Chancellor (Research)
Mr Tony Coleman (joined 4 Mar 2008)	IAG	Chief Risk Officer
Dr Bill Downey (retired 1 Feb 2008)	BoM	Deputy Director Corporate Activities
Mr Greg Johannes	DED/DPAC	Deputy Secretary
Prof Johanna Laybourn-Parry (joined 4 Dec 2007)	UTAS	Pro Vice-Chancellor (Research)
Dr Geoff Love (joined 4 Mar 2008)	BoM	Director
Prof Bruce Mapstone (*ex-officio)*	ACE CRC	Chief Executive Officer
Dr Tony Press	AAD	Director
Prof Michael Stoddart (*ex-officio*)	AAD	Chief Scientist
Mr Bill Trestrail	SGI	Vice President Asia Pacific

***Board Meetings 2007–2008**: 4 Sept 2007, 4 Dec 2007, 4 Mar 2008, 1 Jul 2008.*

Executive Committee

The ACE CRC Executive Committee advises the CEO and Board on a range of matters relating to management of resources and coordination of research across the ACE CRC portfolio. It comprises all program leaders, selected deputies and ACE CRC administration, together with representatives from the Tasmanian Partnership of Advanced Computing (TPAC), the Bureau of Meteorology (BoM) and the research student body.

Member	ACE CRC Position
Dr Neil Adams (BoM)	Researcher
Dr Ian Allison AAD	Deputy Leader, SLR Program
Ms Kerrie Bidwell ACE CRC (Secretary)	Administration Manager
Prof Nathan Bindoff TPAC	Director
Ms Jane Broweleit/Pier van de Merwe UTAS	PhD student
Dr John Church CMAR	Leader, SLR Program
Dr Andrew Constable AAD	Leader, AME Program
Assoc Prof Marcus Haward UTAS	Leader, Policy Program
Ms Tessa Jakszewicz	Deputy CEO (Business Development)
Ms Christie Ie Goy ACE CRC	Manager, Research Delivery and Commercial Development
Prof Andrew McMinn UTAS	Leader, Education Program
Ms Kate Maloney ACE CRC	Business Manager
Prof Bruce Mapstone ACE CRC (Chair)	Chief Executive Officer
Dr Kelvin Michael UTAS	Deputy Leader, Education Program
Dr Stephen Rintoul CMAR	Leader, CVC Program
Dr Jason Roberts AAD	Chair Computing Committee
Assoc Prof Thomas Trull CMAR/UTAS	Leader, CO2 Program
Dr Sandra Zicus/Ms Jess Tyler ACE CRC	Communications Manager

Executive Committee meetings 2007–2008: 3 Aug 2007; 21 Feb 2008; 11 Jun 2008

Computing Committee

The ACE CRC Computing Committee supports the science, education and policy programs of the ACE CRC through advice on information technology, infrastructure and management. This support is focused primarily on those components of the ACE CRC based at the University of Tasmania's Hobart campus. The ACE CRC Computing Committee advises the ACE CRC Executive Committee and CEO.

Member	Position
Ms Kerrie Bidwell ACE CRC (Secretary)	Administration Manager
Mr John Dalton UTAS	Information Technology Resources
Mr Leigh Gordon UTAS	Information Technology Resources
Mr Nick Grundy UTAS (*ex-officio*)	Information Technology Resources
Assoc Prof Marcus Haward UTAS	Leader, Policy Program
Mr Glenn Hyland AAD	Researcher
Mr Ben Joseph ACE CRC	Computer Support Officer
Dr Jan Leiser ACE CRC	Researcher
Ms Kate Maloney ACE CRC	Business Manager
Prof Bruce Mapstone ACE CRC	Chief Executive Officer
Dr Richard Matear CMAR	Researcher
Dr Kelvin Michael UTAS	Deputy Leader, Education Program
Dr Benedicte Pasquer ACE CRC	Researcher
Dr Jason Roberts AAD (Chair)	Researcher
Dr Roland Warner AAD	Researcher

Computing Committee meetings 2007–2008: 5 Mar 2008

Commercialisation Steering Committee

The ACE CRC Commercialisation Steering Committee provides advice on commercialisation opportunities arising from ACE CRC activities. The ACE CRC Commercialisation Steering Committee advises the CEO, Executive Committee and Board of the ACE CRC.

Member	Position
Mr Rod Allen AAD	General Manager Corporate
Ms Laura Denholm UTAS	Manager Office of Research Services
Ms Christie le Goy ACE CRC	Commercial Development Manager
Ms Wendy Spencer DED	Director, Innovation Science & Technology Unit
Dr Steve Pendlebury BoM	Regional Director Tasmania
Prof Bruce Mapstone ACE CRC (Chair)	Chief Executive Officer
Ms Jackie Zanetti CMAR	Business Development Manager

Commercialisation Steering Committee meetings 2007–2008: Throughout the year the committee members maintained contact via a number of out-of-session communications.

Communications Coordinating Committee

The ACE CRC Communication Coordinating Committee is a network of communicators within the ACE CRC and its partner organisations. It was formed to support the implementation of the ACE CRC communications plan by coordinating with the partner agencies' public communication and reporting strategies. Informal gatherings and regular email/on-line discussion between a number of the Committee members were held throughout the year.

Member	Position
Ms Carol Altman UTAS	Media Manager
Mrs Sally Chambers AAD	General Manager, Corporate Communications
Mr Craig McAulay CMAR	Communications Officer
Mr David Grant BoM	Public Affairs Manager
Ms Jess Tyler ACE CRC (Chair)	Communications Manager

Communications Coordinating Committee meetings 2007–2008: 7 May 2008

Key staff appointments

The following cash-funded appointments were made during the year:

Member	ACE CRC Position	ACE CRC Program
Ms Jess Tyler	Communications Manager	Administration

Major equipment purchases

The following major equipment purchases were made during the year:

Equipment (AU$)	ACE CRC Program
Stereomicroscope (27,607)	CO2
Robotic ocean profiling floats (308,000)	CVC
Time Series ocean moorings (100,000)	CO2
Clean seawater supply debubblers and other equipment (20,000)	CO2

research programs

The Antarctic Climate & Ecosystems Cooperative Research Centre is a partnership dedicated to the study of atmospheric, cryospheric and oceanic processes of the Southern Ocean, their role in global and regional climate change, and their impact on sustainable management of Antarctic marine ecosystems.

Based in Hobart, Tasmania, the ACE CRC has five major research programs. This research, combined with an integrated research training and education program, provides a focus for Australia's national effort to understand the variability of Antarctica and Southern Ocean processes and their role in our national and global future.

The ACE CRC works closely with Australian and international stakeholders to ensure that the research focus remains relevant and the results are made accessible in useful forms. Knowledge gained from ACE CRC research is disseminated through dedicated communications and research delivery programs as well as by publication in the research literature.

The nature of Antarctic and global climate research is such that collaboration is essential. The study of global climate is multidisciplinary by nature, and relies on a wide range of research conducted by multiple organisations in many countries. For Antarctic research, distances are vast, conditions are harsh and costs are enormous. The ACE CRC's collaborative efforts result in increased logistical and scientific support – such as ship time, satellite data, and access to computer facilities, data bases and models – that is necessary to maintain Australia's leadership position in this field of research.

As well as ongoing collaborations among the different research programs within the ACE CRC, our researchers were involved in 31 national collaborative projects and 60 international collaborative projects involving 15 different countries. They also served on 20 national and 47 international committees, working groups and editorial boards. Eight ACE CRC researchers participated in exchanges with international research groups, and ACE CRC hosted 23 international visitors.

National and international collaborative projects, committee memberships, staff exchanges and international visitors are detailed in the appendices.

Honours and awards

In 2007, Al Gore and the Intergovernmental Panel on Climate Change (IPCC) received the Nobel Peace Prize:

"...for their efforts to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations for the measures that are needed to counteract such change."

The win recognised the contribution by a large team of Australian climate scientists to the various IPCC assessment reports – many from the ACE CRC – and it highlighted the important work by Australia in identifying the critical role of the Antarctic and Southern Ocean in global climate. Several other ACE CRC researchers have also distinguished themselves in their fields during 2007–2008.

Staff name	Honour	Reason	Date
John Church	Eureka Prize	Estimates of sea-level rise and its implications	Aug 2007
Kurt Lambeck	Hon Professorship, Chinese Academy of Science		Sept 2007
	Science Finalist, in *The Bulletin* Smart 100		2007
Ian Allison, Nathan Bindoff, John Church, Will Howard, John Hunter, Steve Rintoul, Tas van Ommen and Anthony Worby	Recognition by IPCC in its Nobel Peace Prize win	Contribution to the various IPCC assessment reports	Dec 07
Anthony Worby	Australia Day Achievement Award	SIPEX: 'Teachers Experiencing Antarctica' program	Jan 2008
Andrew Constable	Pew Fellow in Marine Conservation	Ecosystem-based management	Feb 2008
Delphine Lannuzel	SCAR Fellowship	Iron as a micronutrient in the Antarctic sea zone	Mar 2008

Climate Variability & Change (CVC)

improving our ability to predict the impact of Southern Ocean processes on climate, sea-level, marine ecosystems and the marine carbon cycle

Ocean Control of Carbon Dioxide (CO2)

determining carbon dioxide uptake and its effects on the ocean, and relating ocean processing of carbon dioxide to predictions of human-induced global change

Antarctic Marine Ecosystems (AME)

exploring relationships among the biological patterns and processes of the marine ecosystems around East Antarctica and relating them to physical oceanographic processes to assist in development of sustainable management strategies

Sea-level Rise (SLR)

improving our ability to project and respond to future changes in sea-level by increasing our understanding of historical and future sea-level change and factors that control these

Policy (POL)

providing analyses of possible policy implications arising from the science research programs and addressing issues that will help Australia formulate its input to Antarctic and Southern Ocean affairs and manage its interests in the region

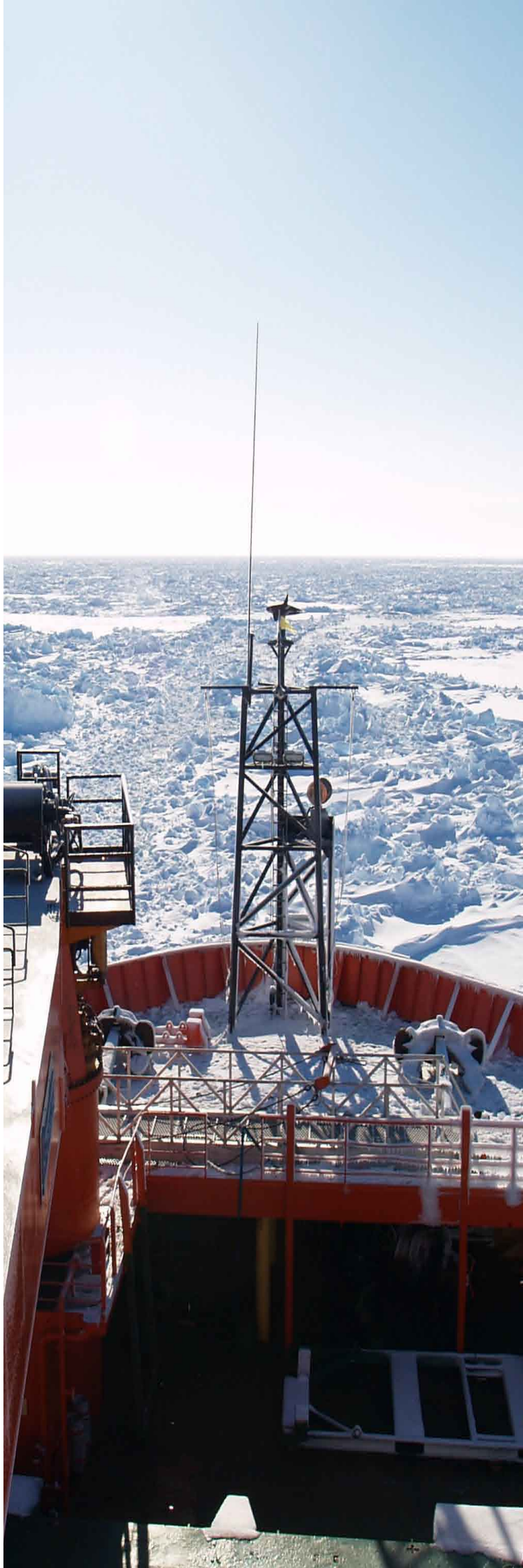


Photo: Sandra Zicus

climate variability & change

Variability in the physical environment of the Southern Ocean influences regional and global climate, the distribution and productivity of marine organisms, the ocean uptake and storage of carbon dioxide, and the rate and pattern of sea-level rise. Understanding the variability of the coupled ocean–atmosphere–ice system is therefore a prerequisite for all of the ACE CRC research programs.

More reliable projections of climate variability and change and their impacts will allow Australia to plan for the future and minimise the risks of a variable and evolving climate. Specific applications of CVC Program research will include improved predictions of the status of Southern Ocean ecosystems, improved marine resource management, marine impact studies, public good services such as search and rescue, guidance for safe Antarctic shipping operations, and research into global ocean and climate dynamics.

Program leader: Dr Steve Rintoul, CMAR

Objectives

- **To characterise the variability of Southern Ocean currents, sea-ice and climate and to understand the causes of their variability.** Our present understanding of Southern Ocean variability is limited, primarily due to the lack of data. New tools (including autonomous floats, highly accurate satellites and improved numerical models) and measurements collected over the last decade make it now possible to investigate the variability of the Australian sector of the Southern Ocean.
- **To determine the likelihood and impact of significant changes in the Southern Ocean physical environment.** Changes such as a slow-down in the Southern Ocean overturning circulation, a decrease in sea-ice extent, or an alteration in circulation patterns in the atmosphere and ocean would have substantial impacts on Antarctic ecosystems and Australian and global climate. We need to determine the risk of such changes in order to develop robust management strategies for Southern Ocean resources and to guide planning for the impacts of future changes in climate.
- **To combine state-of-the-art ocean observations and numerical models to provide simulations and forecasts of ocean currents and sea-ice for Southern Ocean applications.** Knowledge of ocean variability can provide opportunities for prediction and is required to assess the accuracy of model simulations and to combine models and data in sensible ways.

Key achievements 2007–2008

- Conducted four major expeditions over the first season of the International Polar Year: SIPEX, CEAMARC/CASO, CASO/GEOTRACES and the Macquarie Ridge Experiment. (CVC-01, CVC-02, CO2 Program)
- Tested ideas about how the Southern Ocean overturning circulation works in a joint French–Australian project, using a state-of-the-art, eddy resolving ocean model. We found that the prevailing theory, based on a two-dimensional view of the current, was not supported by the model results. (CVC-01, CVC-04)
- New insights into interactions between ocean circulation and sea ice were published during the year. We discovered a remarkable sea ice tongue that forms each year near the West Ice Shelf. The study shows how ocean currents and wind combine to form the sea ice tongue and suggests a link to the enhanced biological productivity in this area. A second study used data collected from instruments on seals to provide the first estimates of the rate of sea ice formation in the pack ice over the continental shelf. (CVC-01, CVC-02)
- Produced the first detailed snapshot maps of fast-ice extent, and estimates of its real extent and type around East Antarctic coast, using an image correlation technique applied to *RADARSAT* satellite *ScanSAR* images from the Novembers of 1997 and 1999. (CVC-02)
- Showed that in the west Antarctic Peninsula region atmospheric anomalies have a dramatic impact on sea ice extent and conditions, air temperature and snowfall. This is the only Antarctic sector to have undergone a statistically-significant sea ice retreat over the past 30 years, and the work highlights the key role of wind-driven ice dynamics in this change. (CVC-02)
- Published work on changes in several Southern Ocean water masses. New global and regional analyses of water mass changes have been undertaken using comprehensive profile data sets. This work illustrated changes in surface freshwater flux that are consistent with changes in freshwater fluxes from greenhouse gases. (CVC-01, CVC-04)

Plans for 2008–2009

The year will be devoted to analysing observations collected during the heavy field season in 2007–2008, however, several important field projects will also be carried out:

- The glaciology group will conduct a major field project to recover an ice core from the Aurora Basin, to provide a highly resolved record of climate variability over the past 2,000 years and to add important information for calibrating and interpreting inland cores.
- A current meter mooring array will also be deployed as part of a major US-Australian project to measure ocean currents over the continental slope near Casey. Moorings deployed last year to measure export of Antarctic Bottom Water will be recovered by French collaborators aboard the French vessel *l'Astrolabe*.

CVC scientists will also be contributing to a number of major workshops and conferences, including sessions at the SCAR IPY conference in Russia and the 9th International Conference on Southern Hemisphere Meteorology and Oceanography in Melbourne.

Projects

CVC-01: Variability of Southern Ocean currents and air–sea interaction

Project leader: Steve Rintoul, CMAR

Project aim: To characterise and understand the variability of the Southern Ocean and to use this knowledge to improve models.

Research outcomes include advances in understanding Southern Ocean dynamics, improved projections of climate variability and change from models that better represent Southern Ocean processes, an enhanced ability to manage and assess the status of marine ecosystems, and ocean circulation estimates for use in maritime operations.

CVC-02: Ocean–atmosphere–cryosphere interactions at the Antarctic margin

Project leader: Anthony Worby, AAD

Project aim: To characterise and understand the variability of Southern Ocean sea-ice and the interaction between the ocean, atmosphere and cryosphere at the Antarctic margin.

Sea-ice is critically important in both the physical and biological processes of the Southern Ocean, affecting many other processes that are essential to driving and maintaining the global climate system. Our research supports more reliable predictions of variability and change in the sea-ice zone and of the effects on climate and ecosystems.

CVC-03: Climate history

Project leader: Tas van Ommen, AAD

Project aim: To provide records of past climate from ice cores and ocean sediment cores that will help improve understanding of underlying climate mechanisms and factors that drive climate and natural climate variability.

Our research is providing new data and interpretations that put current climate conditions in the context of long-term patterns in past climate. These provide an improved capability for detecting and attributing contemporary climate change, a better understanding of uncertainties in climate assessments and the capacity to better verify models.

CVC-04: Simulation of ice–ocean–atmosphere interaction and climate

Project leader: Nathan Bindoff, UTAS/CMAR

Project aim: To develop a better understanding of seasonal and decadal variations and long-term trends in Southern Ocean water masses.

We are testing numerical simulations of the Southern Ocean and its components, validating them against observations from other ACE CRC research. This allows us to diagnose the processes acting in the Southern Ocean that influence and respond to global and regional climate. The resulting climate models will deliver more reliable projections of climate variability and change and their impacts.

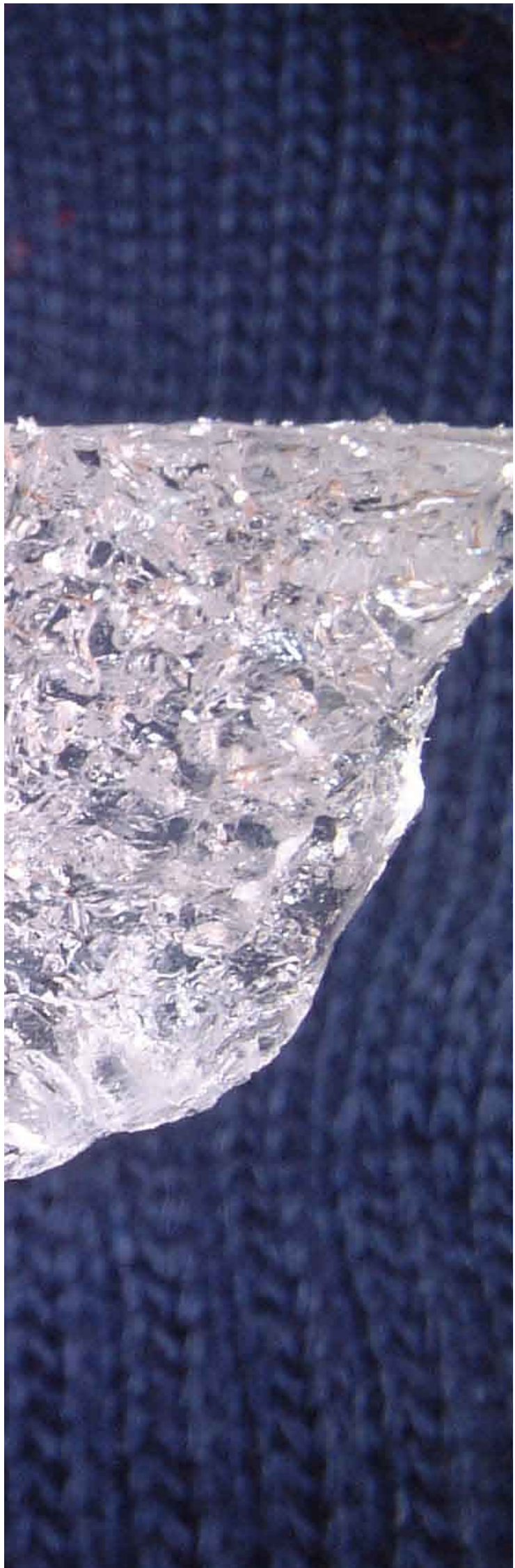


Photo: Tas van Ommen

ocean control of carbon dioxide

The ocean currently absorbs about one-third of the carbon dioxide (CO_2) emitted by human activities. Determining to what degree this uptake can help keep atmospheric levels of CO_2 low is essential for predicting future atmospheric concentrations of greenhouse gases.

Accumulating CO_2 in the ocean makes the water more acidic, reducing the shell-forming ability of certain marine organisms such as corals, molluscs and many phytoplankton. This may alter the mix of species that do well in Southern Ocean ecosystems, with a potentially major impact on marine ecosystems.

Understanding these complex processes is a key focus of the ACE CRC CO2 Program. Our research results are useful both in international assessment processes, such as the IPCC, and for Australian agencies addressing emissions management and policy.

Program leader: Assoc Prof Tom Trull, ACE CRC/CMAR

Objectives

- **To determine the current magnitude of uptake of anthropogenic atmospheric CO_2 by the Southern Ocean south of Australia.** This work is contributing to an assessment of global ocean uptake and will help quantify relationships between ocean circulation and CO_2 uptake.
- **To determine the role of upper ocean dynamics in the control of phytoplankton production and biological carbon export to the deep ocean.** Understanding how this natural sequestration process works is important for discerning human impacts on the Earth's climate.
- **To determine the influence of iron availability on Southern Ocean plankton community structure and the associated ecosystem control of carbon transfer to the deep ocean.** Research is determining the availability of iron and other micronutrients needed for plankton growth through extensive surveys and process studies of ecosystem responses. This helps us assess the benefits and risks of proposals to increase biological sequestration of carbon through controlled iron fertilisation.
- **To determine the impact of increasing CO_2 concentrations on phytoplankton and on the relative growth rates of different classes of Southern Ocean phytoplankton.** Laboratory experiments and field studies are determining how phytoplankton communities and associated ecosystems respond to increased concentrations of CO_2. The results will be incorporated into computer models to assess the impacts on marine ecosystems in the Southern Ocean.
- **To develop simulations of future scenarios of global and regional ocean–carbon cycle dynamics.** These assessments assist Australian and other governments in devising effective short- and long-term mitigation and adaptation strategies.

Key achievements

- Contributed to a special volume of *Deep Sea Research II*, detailing carbon cycling and ecosystem responses to natural iron inputs from the Heard-Kerguelen plateau. (CO2-02, CO2-03, CO2-05)
- Developed a position analysis jointly with Commonwealth regulatory agencies and the POL Program on ocean acidification. (CO2-02, CO2-03, CO2–04)
- Submitted papers examining the relationship between ocean circulation and CO_2 uptake, including the design of effective monitoring strategies. (CO2-01, CO2-05)
- Convened international workshops, 'Ocean Acidification' (CO2-01, CO2-04) and 'Biogeochemistry of the Subantarctic Zone.' (CO2-01, C02-02, CO2-03, CO2-04, CO2-05)
- Measured chemical distributions across the Southern Ocean from *AuroraAustralis*, *Southern Surveyor*, and *l'Astrolabe*, including CO_2 and alkalinity, biogenic minerals and trace metals, using a an ultra-clean seawater sampling system provided by partner NIWA as part of the GEOTRACES project. These observations provide a baseline for assessing the magnitude of ocean uptake of CO_2, its impacts, and the role of trace elements in controlling phytoplankton growth. (CO2-01, CO2-02, CO2-03, and the CVC Program)
- Measured the weights of carbonate shells formed by plankton (coccolithophores, foraminifera, and pteropods) to determine if ocean acidification is reducing the ability of these organisms to precipitate their carbonate shells. (CO2-02, CO2-04)

Plans for 2008–2009

A major focus will be analysing samples and interpreting results from the large field programs of 2007–2008 (SAZ-SENSE, SIPEX, CASO, GEOTRACES). Planned field work includes continuing to develop the Southern Ocean time series moored observatory collaboratively with IMOS; monitoring surface ocean carbon chemistry and microbial ecology from the *l'Astrolabe* repeat sections; and a new effort to determine the abundance and influence of iron on coastal Antarctic sea-ice ecosystems.

Projects

CO2-01: Carbon uptake in the Southern Ocean

Project leader: Bronte Tilbrook, CMAR

Project aim: To describe the variability and large-scale biological and physical drivers of the air–sea exchange of CO_2 in the Southern Ocean south of Australia.

This work is helping to define the role of the Southern Ocean in controlling atmospheric CO_2 concentrations, to allow more robust predictions of how the Southern Ocean uptake may be altered in future. It is also contributing to a major new initiative to determine regional- and global-scale carbon budgets to develop useful strategies to manage future CO_2 emissions.

CO2-02: Carbon export processes

Project leader: Tom Trull, ACE CRC/CMAR

Project aim: To estimate rates of phytoplankton growth and subsequent transfer of organic matter between the ocean surface and the deep sea, identify the major processes that control these rates, and develop conceptual models of the sensitivity of these processes to climate variability and change.

The overall outcome will be a clearer view of the processes that transfer carbon to the deep sea in the Southern Ocean and their role in regulating atmospheric CO_2. This is a necessary step towards developing and verifying reliable carbon cycle models to simulate future atmospheric CO_2 levels. Understanding this process will also help in interpreting past changes in the Southern Ocean environment and estimating future changes.

CO2-03: Iron biogeochemistry

Project leader: Andrew Bowie, ACE CRC

Project aim: To evaluate the importance of iron and other trace micronutrient elements in Southern Ocean biogeochemical cycles.

We are mapping the distribution of dissolved iron in waters south of Australia, fingerprinting supply and removal mechanisms and quantifying the influence of trace elements on phytoplankton growth and community structure in sub-Antarctic ecosystems. This project is feeding vital information into biogeochemical and ecosystem models.

These will help predict the role of Southern Ocean biology in past and future regulation of atmospheric CO_2 via ecosystem control of carbon transfer to the deep ocean. The research is also supporting assessments of the risk and efficacy of proposals to increase carbon sequestration through iron fertilisation in the Southern Ocean.

CO2-04: Effect of elevated CO_2 on phytoplankton

Project leader: Simon Wright, AAD

Project aim: To describe how Southern Ocean phytoplankton and microbial communities will change as atmospheric CO_2 concentrations increase.

We are studying the likely changes in phytoplankton species and size distribution as well as the rate of CO_2 uptake through photosynthesis, and the extent to which CO_2 is recycled through the food web or sedimented to the deep ocean. The results will be important in developing ecosystem models that will assess the impacts of climate change on Antarctic marine ecosystems, and in providing advice for ecosystem-based management for Southern Ocean fisheries, particularly those regulated through CCAMLR.

CO2-05: Biogeochemical simulations

Project leader: Richard Matear, CMAR

Project aim: To quantify the Southern Ocean uptake of atmospheric CO_2 and explore potential feedbacks of projected global warming on this uptake by developing and applying ocean carbon models.

The results of this research will support predictions of the Southern Ocean's role in absorbing and storing anthropogenic CO_2 in the future and how future atmospheric CO_2 levels will change.

Photo: Donna Roberts

antarctic marine ecosystems

The Southern Ocean, in particular the coastal region around Antarctica, hosts a vast and complex marine ecosystem that supports the fisheries of Australia and several other nations. In comparison with the Atlantic, Pacific and Indian Oceans, this region remains relatively under-sampled and poorly understood, but is internationally acknowledged as a region of great ecological importance.

The ACE CRC Antarctic Marine Ecosystems Program is exploring relationships among the biological patterns and processes of the marine ecosystem around East Antarctica and relating them to physical oceanographic processes. This knowledge will help guide Australian government and industry decision-makers in formulating policy and management strategies in response to harvesting resources and to future climate change.

Program leader: Dr Andrew Constable, AAD

Objectives

- **To identify how biological productivity is affected by sea-ice extent and properties, and by ocean circulation.** Productivity in the Southern Ocean has been linked to the winter sea-ice cover and to large-scale ocean circulation patterns, both of which are sensitive to climate change. We are using a variety of new and historical data to test the hypothesis that reduced sea-ice extent due to climate warming or other factors will lead to a smaller sea-ice algal community and to explore what impacts such changes would have further up the food chain.
- **To quantify and describe processes that link sea-ice and primary/secondary productivity.** Our research is resulting in models of the small-scale processes linking the physical and biological components of the Antarctic marine ecosystem. The models are used as the basis for predicting the impacts of physical or biological changes on the overall function of the ecosystem.
- **To project the effects of long-term change on Antarctic ecosystems.** We are using remote sensing of ocean colour and water movements, as well as field-based oceanographic and biological measurements, to improve our ability to accurately model the effects of ocean circulation and sea-ice on biological productivity.
- **To translate predictions of the effects of climate change on Southern Ocean ecosystems into sustainable management models.** A combination of field data and models is being used to predict the effects of ecosystem changes on harvested species and the food web. This work is being used in combination with models of fishery dynamics for more effective management of marine living resources.

Key achievements

- Conducted the SIPEX voyage, jointly organised by the ACE CRC and the AAD, to focus on understanding the links between sea-ice physics, sea-ice biology and the pelagic food web. It was one of eight Australian-led projects contributing to the International Polar Year (IPY).
- Deployed an instrumented ROV with optical sensors under the sea-ice to measure the amount of algae within the sea-ice. A specially-designed trawl net was also used to sample the environment directly under the ice and to examine the size and abundance of krill in that environment. It also provided live krill for physiological and growth experiments in the ship's laboratories.
- Submitted all manuscripts for a special volume in the journal *Deep Sea Research II* on the results of the BROKE-West voyage. This voyage undertook a large-scale survey of krill, along with oceanography and all levels of biota, in the region from 30°E to 80°E.

Plans for 2008–2009

- Scientists from the AME Program and other CRC Programs will provide critical input to the CCAMLR–IWC workshop to evaluate data inputs for developing ecosystem models.
- Spatially-structured ecosystem and food web models will be completed for eastern Antarctica to investigate the effects of krill fisheries on the Antarctic marine ecosystems.
- A dynamic model of primary production in sea-ice will be completed and tested using available data for eastern Antarctica.
- A volume on the results of BROKE-West will be completed and papers substantially progressed on the outcomes of the SIPEX study.

Projects

AME-01: Prediction of ecosystem variability and change for sustainable management

Project leader: Andrew Constable, AAD

Project aim: To develop a framework for marine ecosystem modelling, including a coupled biophysical model of the Southern Ocean.

This framework is being developed to explore and assess the consequences in the Southern Ocean of historical exploitation of biota, the ecological sustainability of exploitation and conservation strategies and the impacts of climate change on the ecology. A key outcome will be flexible software that can be used by researchers to simulate the Southern Ocean ecosystem at any scale.

AME-02: Processes linking physical and biological elements in the sea-ice zone

Project leader: Klaus Meiners, ACE CRC

Project aim: To identify and quantify the relative importance of processes that link physical and biological elements of Antarctic marine ecosystems in the sea-ice zone.

We are evaluating the effect of sea-ice on the Antarctic marine ecosystem to help develop and validate an ecosystem modelling framework that will be used in making assessments of the impact of historical and potential future changes on the ecosystems. Our work is improving the science-based, sustainable management and conservation plans of CCAMLR and the IWC.

AME-03: Large-scale biological patterns and oceanographic processes

Project leader: Steve Nicol, AAD

Project aim: To describe the large-scale relationships between the biological patterns and oceanographic processes of the marine ecosystem of the Southern Ocean around East Antarctica and to use this knowledge to assess the impact of climate change.

This research is helping guide Australian government and industry decision-makers in formulating policy and management strategies in response to future climate change.

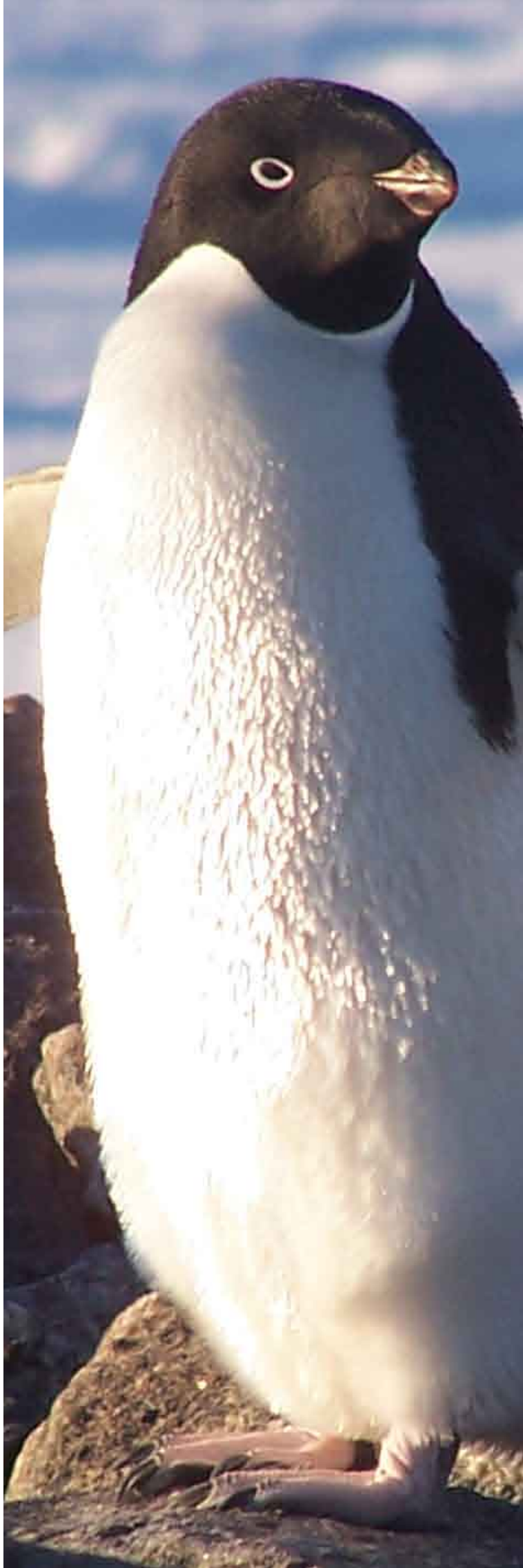


Photo: Simon Marsland

sea-level rise

The Sea-level Rise Program is reducing uncertainties related to estimates of 20th century sea-level rise and projections for the 21st century and beyond.

More reliable projections of sea-level rise and estimates of potential changes in sea-level variability (particularly related to extreme events, such as severe storms and tidal surges) allow better planning of coastal land use and development of infrastructure to minimise the impacts of sea-level rise and any changes in the intensity/frequency of extreme events. The results contribute directly to the IPCC assessment reports. Decreased uncertainties are also important in successful intergovernmental negotiations under the United Nations Framework Convention on Climate Change.

Program leader: Dr John Church, CMAR

Objectives

- **To narrow estimates of the range of 20th century global-averaged and regional sea-level rise.** We are enhancing our knowledge of sea-level rise over the past century through analyses of historical and new data. This improves tests of models that project future sea levels and increases our confidence in the projections.
- **To improve estimates of the different contributions to 20th century sea-level rise.** We are using in-situ and satellite observations and measurements, combined with computer modelling, to improve understanding of how different processes interacted to affect sea-level rise and its regional distribution during the 20th century. This reduces uncertainties in future projections, especially at regional and local scales.
- **To significantly reduce the range of 21st century projections of sea-level rise.** Our research results are increasing the precision of projections for global average and regional sea levels in the 21st century, enabling society to develop appropriate responses to projected changes.
- **To forecast change in extreme events during the 21st century for strategic locations.** We are assessing how climate change will affect the frequency and intensity of natural extreme events around Australia and selected South Pacific locations. This helps coastal planners assess the vulnerability of different parts of the coastline and provide guidance for adaptation and mitigation strategies to protect coastal communities and assets.
- **To address key uncertainties in the longer-term projections of sea-level rise.** Sea level will continue to rise after 2100, potentially by several metres, because of ongoing warming and resultant expansion of the ocean, as well as changes in the Antarctic and Greenland ice sheets.

Key achievements 2007–2008

- Published estimates of regional sea-level rise in the Australian region from 17 IPCC models. The regional sea-level rise results from the same models were provided to the SCAR draft report 'Antarctic Climate Change and the Environment'. (SLR-02)
- Showed that since 1961, the trend in ocean thermal expansion is 50% larger than previous estimates. There is good agreement between the variability in observed and modelled ocean thermal expansion and the sum of observed contributions approximately equals the observed sea-level rise. (SLR-01, SLR-02)
- Developed a method for assessing the impact of sea-level rise and extreme events on coastal flooding. (SLR-01, SLR-04)
- Showed, using data on extreme events for 29 locations around Australia, how the frequency of extreme coastal flooding events will increase during the 21st century (SLR-01, SLR-04).
- Determined an estimate of current climate extreme sea-level events for Westernport and Port Phillip Bay, the western Victorian coast and the Tamar River valley. (SLR-04)
- Found that under high sea-level rise scenarios for 2070, the '1-in-100-year-event' becomes a '1-in-2-to-5-year-event' for a number of locations along the Victorian coast, through research on Corner Inlet and Gippsland Lakes. (SLR-04)
- Extended the storm surge analysis to include Tasmania, South Australia, Western Australia and New South Wales. Hydrodynamic modelling of tides around Bass Strait, Tasmania and the New South Wales coast have enabled gridded tide height frequency data to be generated. Ongoing analysis of this data has included joint probability analysis of the tide heights with the modelled surge heights, which will provide a 'first pass' estimate of the 1-in-100 year storm tide height along the 'Smartline' (defining Australia's coastline) being developed for the First Pass National Coastal Vulnerability Assessment. (SLR-04)
- Published new sub-ice shelf bathymetry of the Amery Ice Shelf based on modelling tidal motions and new seismic data.

Plans for 2008–2009

- We plan to complete a reassessment of ocean thermal expansion estimates from historical observations for the period from 1990 to as close as possible to the present. We will then compare it to the IPCC Fourth Assessment Report model simulations and attempt a reassessment of the sea-level budget for the corresponding period.
- We anticipate completing a study on the distribution of observed ocean-thermal expansion.
- Through an international collaboration, we will continue a global analysis of extremes in sea-level records.
- A technique for estimating the occurrence of sea-level extremes will be applied to sites and infrastructure around Australia. Training workshops, seminars and a web interface will deliver the technique to policy-makers, developers, planners and engineers.

- Analysis of storm tide surfaces around Tasmania's coastline will feed into the Climate Futures for Tasmania project.
- We plan to reduce the uncertainty in regional estimates by eliminating models that have unrealistic control simulations, and to investigate the mechanisms which govern local patterns of sea-level rise.
- A model of the circulation, and melting and freezing processes under the Amery Ice Shelf will be completed. We believe that this will be the first such model to include the dynamics of frazil ice.

Projects

SLR-01: Observations of sea-level rise

Project leader: John Church, CMAR

Project aim: To produce new estimates of historical sea-level change and changes in the observed frequency of extreme events.

These estimates are an essential element in the IPCC assessments.

SLR-02: Estimates of ocean thermal expansion

Project leader: John Church, CMAR

Project aim: To increase confidence in our understanding of changes in sea level during the 20th century by developing more accurate estimates of observed 20th century thermal expansion.

Confirmation that climate models are realistically simulating observations results in reduced uncertainty of future projections of thermal expansion.

SLR-03: Ice sheet and glacier contributions to sea-level rise

Project leader: Ian Allison, AAD

Project aim: To deliver more robust estimates of snow and ice changes in Antarctica and Greenland during the 20th and 21st centuries.

Modelling the Antarctic and Greenland ice sheets delivers estimates of longer-term contributions to changes in sea level from ice discharge or melt water from the ice sheets. We are also drawing on international efforts to estimate contributions to changes in sea level from glacier melting as well as from ice sheets. These improved projections will help guide Australian decision-makers in formulating policy and management strategies to respond to sea-level change induced by climate change.

SLR-04: Modelling extreme events

Project leader: Kathleen McInnes, CMAR

Project aim: To provide Australia-wide guidance about the impact of climate change on extreme sea-level hazard due to the combined effect of rising sea levels and changed behaviour of severe storm events under future climate conditions.

We are investigating how climate change may affect the frequency and intensity of extreme sea-level events around Australia and selected South Pacific locations due to future changes in severe weather systems and increases in average sea level.

Photo: John Hunter

policy

Australia will face a range of challenges over the next decade in managing its Southern Ocean interests. We are contributing to the national benefit by providing greater understanding of the nature of international marine resources and environmental regulation, the patterns of interaction amongst stakeholders, and the types of institutional forms that support and/or inhibit the effectiveness of these regimes.

The Policy Program also ensures that scientific outputs from the other ACE CRC research programs are able to contribute to policy development and outcomes for partner agencies and research users within Australian government agencies.

Program leader: Assoc Prof Marcus Haward, ACE CRC/UTAS

Objectives

- **To translate research outputs into forms useful to research users in the spheres of law, public policy and regulation.** Improving integration of Australian government goals, objectives and interests in the work of the science programs increases the policy relevance of our research and provides the greatest opportunity for use of relevant research in policy formulation. For example, we have created science-policy working groups to develop position analyses on key issues of ocean acidification, ocean fertilisation and sea-level rise.
- **To identify emergent issues influencing developments in legal and political regimes in the Southern Ocean and Antarctica.** Scientific research on Antarctic and Southern Ocean climate and ecosystems has direct impacts on the management of the region and raises a number of policy issues. Linking our science research to potential policy implications is a core business of the Policy Program.
- **To contribute to improved effectiveness of public policy management arrangements and regimes governing the Southern Ocean and Antarctica.** There are a large number of international regimes and legal instruments that affect the Southern Ocean. We are exploring issues related to the effectiveness of these regimes and looking at the interconnections between them. One result of this research is advice about options for refining and improving regulatory processes underpinning these instruments to make them more robust and effective.

Key achievements 2007–2008

- Refocused the scope of the Research Users Forum towards a roundtable format on specific issues. Deliberate efforts were made to ensure active involvement by users, encouraging 'user pull', rather than 'ACE CRC push' regarding research. (POL-01, POL-02, POL-03, POL-04)
- Held new-format roundtables on ocean acidification, sea-level rise and ocean fertilisation
- Developed a model for ACE CRC position analysis papers to provide contemporary analyses of relevant topics to research users and policy/decision-makers.
- Continued to develop internal *ad-hoc* science–policy working groups linking with relevant ACE CRC scientists.
- Released new position analysis paper on ocean acidification; sea-level rise paper prepared for production; ocean fertilisation round table held. (POL-1, POl-3, POl-4)
- Developed briefs for position analyses on: bioregionalisation and marine ecosystems; ice-sheet mass balance and ice shelves; sea-ice and shipping.
- Provided material to DFAT on ocean fertilisation as part of Australian brief for UN discussions on the Law of the Sea November, 2007, and to DEWHA and Attorney-General's Department as part of the May 2008 meeting of the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention). (POL-01, POL-03, POL-04)
- Provided input on biological prospecting to AAD prior to the Antarctic Treaty Consultative Meeting XXXI. (POL-01. POL-02, POL-03)
- Released the publication *Looking South: Australia's Antarctic Agenda* (The Federation Press, September 2007) edited by Lorne Kriwoken, Julia Jabour and Alan Hemmings. (POL-01, POL-02, POL-03, POL-04)

Plans for 2008–2009

We will maintain engagement with research users through targeted forums and will continue to develop position analyses on emergent issues and topics, enhanced by ongoing contributions from staff from AAD and DCC.

Projects

POL-01: Improving the effectiveness of Southern Ocean regimes

Project leader: Marcus Haward, UTAS

Project aim: To assess the effectiveness of relevant international and regional instruments and regimes, given domestic effect in Australia through national legislation and policy, and to identify gaps, strengths and weaknesses in these regimes.

A key question is the relationship between the Law of the Sea Convention and the Antarctic Treaty System. While much has been written on this nexus, neither the question of the relationship between these instruments, nor how this relationship affects other regimes that cover the Southern Ocean, is yet fully explored.

POL-02: Management of marine living resources in the Southern Ocean

Project leader: Julia Jabour, UTAS

Project aim: To identify and assess the utility of the regimes managing areas and species in the Southern Ocean and their place in international law. This project focuses on isolating specific problems of marine living resources management with broad applicability to Australia's national interest, including factors that could affect these interests.

POL-03: The nexus between the Antarctic Treaty System and international instruments and regimes in marine areas south of latitude 60°S

Project leader: Marcus Haward, ACE CRC/UTAS

Project aim: To identify the impact and influence of the nexus between the Antarctic Treaty System and other international instruments and regimes in the Antarctic Treaty Area.

This project focuses on the extent to which actions by Australia or other parties under regimes such as the Law of the Sea Convention, the Convention on Biological Diversity and/or the World Heritage Convention may directly challenge the primary Australian objective of maintaining the Antarctic Treaty System and affect Australia's goal of enhancing its influence within the system.

POL-04: Managing science and intensive public policy: Institutional arrangements and climate change policy

Project leader: Rosemary Sandford, ACE CRC

Project aim: To reduce the science–policy gap in integrating climate science research and Australian public policy.

This project is a comparative study of institutional structures and knowledge management systems for integrating climate science research and Australian public policy. It will provide a comprehensive analysis of how Australian scientific and public policy institutions and systems manage climate change knowledge, policy-making and implementation as they relate to the predicted impacts of climate variability and change. It considers four resource policy issue areas: coastal zones, water use, wild fisheries and aquaculture, and international aid. Outcomes include a better understanding of links and gaps in climate science and policy, and opportunities for improving science–policy integration. It will enhance understanding of the importance of key clearance points in developing and implementing climate policy as they affect all levels of government in Australia.

Photo: Simon Marsland

Research outputs and milestones

Output / Milestone	Description			Reasons why not and strategies to achieve unmet milestones
Outcome 1: Reliable climate forecasts				
Output 1.1	**Assessment of the variability of Southern Ocean currents and sea-ice**	**2006** **2010**	**Yes** **On track**	
Milestone 1.1.1	Complete circumpolar oceanographic transect at 30°S with Japan	2004	Yes	
Milestone 1.1.2	Complete oceanographic transects at 115°E (WOCE I9) and across Kerguelen boundary current (joint with CO2 and collaboration with Japan). Complementary observations at 0°E by AWI (Germany)	2005	Yes	
Milestone 1.1.3	Complete oceanographic survey of shelf/slope waters between 30°E and 80°E (joint with AME; collaboration with Germany)	2006	Yes	
Milestone 1.1.4	Quantify transport and variability of bottom waters in Australian sector (with Japan) and compare to Atlantic sector (with Germany)	2007	In prog	Quality control of mooring data and analysis underway
Milestone 1.1.5	Deploy array of ARGO profiling floats (collaboration with Germany, USA and others)	2007	Yes	
Milestone 1.1.6	Census of water mass changes from recent and historical data	2008	Yes	
Milestone 1.1.7	Assessment of variability and change of the sea-ice mass budget in the Indian Ocean sector of the Southern Ocean	2008	In prog	Unsuitable weather during SIPEX prevented direct satellite calibration against in-site measurements of ice thickness. Developing new approaches to combine ship-based and remote sensing data to derive maps of sea-ice thickness
Milestone 1.1.8	Identification and quantification of physical mechanisms driving variability in the ocean–ice system in the Australian Antarctic sector	2009	In prog	
Output 1.2	**Production of scenarios of changes in Southern Ocean circulation and sea-ice and their impact on ecosystems, carbon uptake and sea-level rise**	**2009**	**In prog**	
Milestone 1.2.1	Assess influence of projected changes in Southern Ocean climate on basal melting of ice shelves and assess impact on the Southern Ocean of resulting changes on freshwater inputs and/or changes in iceberg discharge	2007	In prog	Recent changes in Antarctic Bottom Water have been attributed to enhanced basal melting of ice shelves. An ocean–ice shelf model has been developed and is being used to conduct sensitivity studies. Enhanced surface freshening in the water mass census suggest significant contributions of ice shelf melt in the Southern Ocean and support the Antarctic Bottom Water changes observed around Adelie Land
Milestone 1.2.2	Estimation of sensitivity of overturning strength to changes in forcing from forward and inverse models	2008	In prog	CASO voyage was rescheduled over two voyages. In addition, since this milestone was set, the IPCC models have been developed and incorporation into our scientific research. This has caused a delay in the originally estimated delivery date. Global coupled models are under development. Sensitivity studies have been completed with high-resolution ocean–ice model. Studies of variations in buoyancy forcing in IPCC-class models to determine sensitivity of overturning circulation in an eddy resolving model has been published. Inverse model under construction
Milestone 1.2.3	Past changes of annual- to centennial-scale climate variability in the Southern Ocean: its sea-ice cover and the southern atmosphere inferred from ice core proxy records	2009	In prog	
Outcome 2: Efficient, safe and sustainable operations in Antarctic waters				
Output 2.1	**Forecasts of currents and sea-ice**	**2005** **2010**	**Yes** **On track**	
Milestone 2.1.1	Construct data-assimilating ocean model	2005	Yes	
Milestone 2.1.2	Produce ocean analyses (hindcasts) covering the last decade	2008	Yes	
Milestone 2.1.3	Operational fully-coupled ocean–sea-ice analysis and forecast system	2010	In prog	

Output / Milestone	Description			Reasons why not and strategies to achieve unmet milestones
Outcome 3: Sustainable management of Antarctic marine living resources				
Output 3.1	**Incorporation of physical and biological information into Antarctic ecosystems model**	**2005** **2009**	**Yes** **In prog**	
Milestone 3.1.1	Development of under-ice remote sensing instrumentation for autonomous underwater vehicle	2004	No	Joint proposal with NERC to use Autosub failed on technical grounds. Development was not completed in time for preparations for winter sea-ice voyage. Modified research program successfully implemented on SIPEX
Milestone 3.1.2	Testing of the hypothesis that there has been a major change in sea-ice extent in the 1950s and 1960s using data from ice cores, sediment cores, penguin rookeries and operational data	2005	In prog	Biological data for eastern Antarctica was more sparse than anticipated. Data available for statistical and dynamic modelling will be reviewed by a joint workshop of the Scientific Committees of CCAMLR and IWC to be co-convened by Andrew Constable in August 2008. Analyses will then be undertaken of changes in eastern Antarctica
Milestone 3.1.3	Submission to CCAMLR of an estimate of the biomass of krill in Division 5842	2006	Yes	
Milestone 3.1.4	Autumn/winter/spring process study voyages	2007–2009	In prog	
Milestone 3.1.5	Development of an observation-based model that links physical variables (sea-ice–oceanography–meteorology) with biological productivity at the primary and secondary levels	2008	In prog	
Milestone 3.1.6	Development of a region-based predictive model that integrates existing climate models with higher trophic level ecosystem models	2010	In prog	
Outcome 4: Recognition of oceanic carbon sinks and their impacts to examine the justification for and permit the effective management of carbon dioxide emissions				
Output 4.1	**An estimate of the current inventory of anthropogenic CO_2 in the Southern Ocean south of Australia**	**2005** **2009**	**Yes** **On track**	
Milestone 4.1.1	Measurement of anthropogenic CO_2 contents along the WOCE/CLIVAR I9 section from Western Australia to Antarctica	Mar 2005	Yes	
Milestone 4.1.2	Measurement of anthropogenic CO_2 contents on a transect along the Antarctic shelf	Mar 2006	Yes	
Milestone 4.1.3	Measurement of anthropogenic CO_2 contents along the WOCE/CLIVAR SR3 section from Tasmania to Antarctica	Mar 2008	In prog	Voyage rescheduling has slightly delayed this milestone. The sampling was successfully completed in March 2008 under the CASO program. Sample analysis is under way and the milestone will be completed in calendar year 2008
Output 4.2	**Determination of the role of stratification in biological carbon export to the deep sea to inform estimates of future carbon export in an increasingly stratified ocean**		**Yes**	
Milestone 4.2.1	Development of a model with explicit ecosystem structure linking stratification and export over seasonal timescales	2006	Yes	
Milestone 4.2.2	Comparison of the model to observations of stratification and surface export in the Southern Ocean south of Australia	2008	In prog	Some delay due to staff absences. Successful major field program (SAZ-SENSE) provided additional observations. Carbon budgets are currently being compiled to enable comparison to the model
Milestone 4.2.3	Comparison of the model to observations of export to deep sediment traps in the Southern Ocean south of Australia	2010	On track	
Output 4.3	**Determination of the role of iron limitation for biological carbon export to the deep sea**			
Milestone 4.3.1	Examination of the links between iron supply and export in an area of natural iron inputs	2003–2005	Yes	
Milestone 4.3.2	Quantification of the response of Southern Ocean ecosystems to controlled iron fertilisation (2005 and 2009) with assessments of efficacy and risk issued in 2005 and 2010	2005–2010	On track	

Output / Milestone	Description			Reasons why not and strategies to achieve unmet milestones
Output 4.4	**Determination of the role of elevated CO_2 levels on phytoplankton communities**			
Milestone 4.4.1	Laboratory experiments under elevated CO_2	2007	Yes	
Outcome 5: Estimates of sea-level change resulting from anthropogenic climate change used as one of the bases for intergovernmental climate change negotiations				
Output 5.1	**Review of 20th century sea-level change**			
Milestone 5.1.1	Revised estimates of historical (20th century and early 21st century) sea-level change	Jun 2004 Dec 2009	Yes In prog	
Milestone 5.1.2	Revised estimates of ocean thermal expansion from observations and models (both the CMAR and AWI models)	Jun 2005 Dec 2009	Yes In prog	
Milestone 5.1.3	Revised estimate of the 20th century Antarctic ice sheet contribution to sea-level change derived from a comparison of measured ice discharge (field observations and remote sensing) with results from a balance flux model forced with improved estimates of accumulation, distribution and temporal variability (from field observations meteorological models and ice cores)	Dec 2005 Dec 2009	Yes In prog	
Output 5.2	**Revised projections for future sea-level change during the 21st century and on longer timescales**	**Jun 2006** **June 2010**	**Yes** **On track**	
Milestone 5.2.1	Revised estimates of future ocean thermal expansion	Dec 2005 Dec 2009	Yes In prog	
Milestone 5.2.2	Estimate of the future contribution of the Antarctic and Greenland ice sheets to sea-level change using an improved high-resolution ice-sheet system model (including ice stream–ice shelf interaction), full thermodynamics and flow anisotropy) and changes in meteorological forcing	Jun 2010	In prog	
Milestone 5.2.3	Estimates of the response of ice shelves to global warming from improved models of ice shelf–ocean interaction (validated against field observations and remote sensing data from the Amery Ice Shelf); prediction from improved models of ice stream–ice shelf boundaries of the consequence of ice-shelf collapse on the discharge of grounded ice	Jun 2006 Dec 2009	Yes In prog	
Output 6.1	**Estimates of the historical impacts of sea-level change at key locations**	**Dec 2005**	**Yes**	
Milestone 6.1.1	Estimates of the historical frequency of extreme events from observational (and proxy) records	Dec 2004	Yes	
Output 6.2	**Estimates of the expected impacts of sea-level change at key locations**			
Milestone 6.2.1	Selection of key locations for more detailed studies	Jun 2004	Yes	
Milestone 6.2.2	Estimates of the changes in frequency of extreme events from numerical modelling studies	Dec 2009	In prog	
Outcome 7: Delivery of science outputs to research users				
Output 7.1	**Annual forum for research users**	**Ongoing**		
Milestone 7.1.1	Organisation of Research Users' Forum	Annual (Jul–Aug)	Yes	Refocused scope towards a round table format on specific issues.
Milestone 7.1.2	Hosting of Research Users' Forum	Annual (Nov)	Yes	

Output / Milestone	Description		Reasons why not and strategies to achieve unmet milestones
Outcome 8: Improving responses to emergent issues			
Output 8.1	**Identify and with science programs provide policy users with details on emergent issues and likely impacts on Southern Ocean management regimes**	**Annual**	**Yes**
Milestone 8.1.1	Identify emergent issues, eg, bioprospecting, iron fertilisation	Ongoing	Ongoing
Milestone 8.1.2	Complete an inventory of Southern Ocean management regimes	Jun 2004	Yes
Milestone 8.1.3	Critical review and assessment of regimes	Jun 2006	Yes
Milestone 8.1.4	Identification of gaps in regimes	Jun 2008	Yes
Milestone 8.1.5	Completion of project; recommendations to government	Jun 2010	In prog
Outcome 9: Improved Australian influence in and effectiveness of Southern Ocean management regimes			
Output 9.1	**Establish criteria for assessment of Australian influence in and the effectiveness of Southern Ocean management regimes**		
Milestone 9.1.1	Complete an inventory of Southern Ocean management regimes	Jun 2004	Yes
Milestone 9.1.2	Establishment of assessment criteria to measure influence and effectiveness	Jun 2006	Yes
Milestone 9.1.3	Assessment of Southern Ocean management regimes against criteria	Jun 2008	Yes
Milestone 9.1.4	Completion of project; recommendations to government	Jun 2010	In prog

Grants

Project title	ACE researcher(s)	Granting body	Grant period	Total (AU$)	2007–2008 (AU$)
Ice sheet–atmosphere interaction and surface climatology of interior Antarctica	Allison I	AARP	2004–2013	Logistic support	Logistic support
Ice shelf–ocean interaction in the cavity beneath the Amery Ice Shelf	Allison I Bindoff N Craven M	AARP	2004–2009	Logistic support	Logistic support
Climate Futures for Tasmania	Bindoff N	CERF	2008–2010	1,114,961	341,098
		DPIW, TAS	2008–2010	900,000	300,000
		HydroTasmania	2008–2010	150,000	50,000
		SES, TAS	2008	330,000	310,000
Atmospheric deposition of trace elements to the upper ocean and their impact on Earth's climate	Bowie A	AAS travel grant	2007–2008	6,000	6,000
Impact of atmospheric deposition on the distribution and speciation of trace elements in the upper ocean – focus on iron in the Sargasso Sea	Bowie A	NSF (USA)	2006–2009	568,205	10,000
Southern Ocean Micronutrients (Australian sector) GEOTRACES section and associated aerosol study	Butler E Bowie A	AARP	2007–2008	Logistic support (ship time)	Logistic support (ship time)
Selenium as a key micronutrient in primary productivity in the Southern Ocean	Butler E Wake B Bowie A	AARP	2004–2007	In kind	
Sea-ice motion deformation thickness and lead dynamics in the Antarctic	Haas C Heil P Massom R Worby A	ESA (FRA)	2007–2010	Satellite data	Satellite data
Complete mapping of Antarctic sea–ice dynamics and thickness	Heil P Massom R	ESA (FRA)	2007–2010	Satellite data	Satellite data
SSI team grant	Heil P	ISSI	2008–2009	16,000	4,000

Project title	ACE researcher(s)	Granting body	Grant period	Total (AU$)	2007–2008 (AU$)
Studying high-frequency Arctic and Antarctic sea–ice dynamics using drifting buoy data	Heil P Geiger C Allison I	AARP	2008–2013	In kind	In kind
An observatory of coastal sea-ice and environment	Heil P Massom R	AARP	2008–2013	In kind	In kind
Variability of the coastal Antarctic climate derived from fast ice observations	Heil P Allison I	AARP	2003–2009	In kind	In kind
Complete mapping of Antarctic sea-ice dynamics and thickness	Heil P Massom R	ESA (FRA)	2007–2010	Satellite data	Satellite data
Potential effects of increasing anthropogenic CO_2 on marine plankton in the Southern Ocean	Howard W Roberts D Moy A Trull T Bray S	DCC	2007–2008	156,340	18,440
Workshop: Ocean acidification: Australian impacts in the global context	Howard W	DCC	2008	50,000	50,000
Integrated Ocean Drilling Program	Howard W	ARC	2007–2012	6,000,000	1,250,000
^{10}Be in Antarctic Ice Cores (scholarship for J Pedro)	Howard W Pedro J	AINSE	2007–2008	In kind	In kind
Holocene chronologies of the South Tasman Rise	Howard W	AINSE	2007	9,508	9,508
The Southern Ocean and sea-ice response to climate variability and change	Marsland S Roberts J Heil P Bindoff N	APAC	2007–2008	Computer time	Computer time
A study of fast ice distribution and polynyas in East Antarctica using *ALOS* data	Massom R Worby A Lieser J	JAXA (JPN)	2003–2007	Satellite data	Satellite data
The validation of *CryoSat 2* sea-ice thickness measurements in Antarctica	Massom R Allison I Worby A Michael K Young N	ESA (FRA)	2007–2010	Satellite data	Satellite data
Study of Mertz Glacier tongue, East Antarctica	Massom R Giles B	NASA (USA)	2007–2009	Satellite data	Satellite data
Mapping and monitoring of circum-Antarctic fast ice	Massom R Heil P Young N	ESA (FRA)	2007–2010	Satellite data	Satellite data
Understanding changing ice flow and rift propagation in the Mertz Glacier tongue, East Antarctica	Massom R Warner R Young N	ESA (FRA)	2007–2010	Satellite data	Satellite data
Remote sensing of near-coastal Antarctic sea-ice and its impacts on ice shelves and ecosystems	Massom R Adams N Heil P Lieser J Worby A	AARP	2007–2010	In kind	In kind
Sea-ice primary production off eastern Antarctica	McMinn A Meiners K	AASGS	2006–2010	40,000	8,000
An integrated study of processes linking sea-ice and biological ecosystem elements off East Antarctica during winter	Meiners K Allison I Davidson A Hosie G Nicol S Wright S Constable A Worby A McMinn A Trull T Williams G Kawaguchi S	AARP	2007–2008	Logistic support (ship time)	Logistic support (ship time)
Climate of Antarctica and the Southern Ocean	Rintoul S	AARP	Jan–Apr 2008	Logistic support (ship time)	Logistic support (ship time)
Southern Ocean Observing System	Rintoul S	NOAA	Oct 2007	5,000	5,000

Project title	ACE researcher(s)	Granting body	Grant period	Total (AU$)	2007–2008 (AU$)
The carbon cycle in the Australian sector of the Southern Ocean	Tilbrook B	AARP	2007–2008	Logistic support	Logistic support
Southern Ocean Time Series Facility 3 of IMOS: support for observations of carbon cycle	Trull T Schulz E	NCRIS	2006–2011	3,900,000	1,315,000
PULSE: role of rapid and seasonal mixed-layer dynamics in Southern Ocean plankton production and carbon transports including air–sea exchange of carbon dioxide and particulate carbon fluxes to the ocean interior	Trull T	Marine National Facility	2007–2008	Logistic support (ship time)	Logistic support (ship time)
Sub-Antarctic zone mooring study of interannual variability in particulate carbon export	Trull T Bray S	AARP	2007–2008	Logistic support (ship time)	Logistic support (ship time)
Abrupt climate change: synchronizing ice core records using rapid changes in methane concentrations in trapped air	van Ommen T Morgan V	DCC (formerly AGO)	Until Jun 2008	40,500	
Investigation of sea-ice physical processes in East Antarctica during early Spring	Worby A Massom M Heil P Lieser J Meiners K	AARP	2007–2010	Logistic support (ship time)	Logistic support (ship time)
Investigation of sea-ice physical processes in East Antarctica during early spring	Worby A	AARP	2006–2009	In kind	In kind
Sea-ice thickness from space: validating estimates from laser and radar altimeters with ship-based measurements	Worby A	NASA (USA)	2008–2012	US500,000	
Land-ice monitoring in East Antarctica and Heard Island using data from the Advanced Spaceborne Thermal Emission and Reflection Radiometer	Young N	USGS (USA)	2003–2009	Satellite data	Satellite data
Iceberg tracking and environment monitoring using QuikScat scatterometer	Young N	NASA (USA)	1999–2009	Satellite data	Satellite data
Antarctic iceberg freeboard height and volume distribution	Young N Bindoff N Massom R	ESA (FRA)	2005–2010	Satellite data	Satellite data
Antarctic ice stream–ice shelf–ice sheet–ocean interaction	Young N Coleman R Fricker H Damm V	ESA (FRA)	2005–2010	Satellite data	Satellite data
Dynamics and characteristics of ice shelves and glaciers in East Antarctica	Young N Coleman R	JAXA (JPN)	2006–2010	Satellite data	Satellite data
Recent changes and dynamics of Heard Island glaciers	Young N Coleman R	JAXA (JPN)	2006–2010	Satellite data	Satellite data
Antarctic iceberg drift dispersion and dissolution rates in the Southern Ocean	Young N Massom R	ESA (FRA)	2007–010	Satellite data	Satellite data

Consultancies/contracts

Staff name	Consultancy or contract	Period	Total value (A$) ex GST	2007–2008 (A$) ex GST	Funds administered by ACE CRC
Hunter J	Aquenal: tide prediction	Sept 2007–May 2008	3,450	3,450	Y
Hunter J	Gold Coast City Council	April 2008	3,500	3,500	Y
Hunter J, Sandford R	AusAID	Mar 2007–Sept 2007	95,511	24,216	Y
McInnes K	Launceston City Council	Aug 07–Apr 08	60,000	30,000	Y
		TOTAL	**162,461**	**61,166**	

commercialisation & utilisation

The ACE CRC's Commercialisation & Utilisation Plan (C&UP) received formal approval from the Department of Education, Science and Technology at the end of August 2005. The Plan has been reviewed during 2007–2008 and no updates were required.

Program leader: Christie le Goy, ACE CRC

Technology commercialisation

Technology disclosure, assessment and formal decision-making processes for the ACE CRC have been established.

Education

During 2007–2008 the ACE CRC continued to provide formal induction on ACE CRC's commercialisation practices and policies to all new staff members with the aim of increasing commercial awareness amongst our scientists.

Disclosure and assessment

The introduction of a Technology Disclosure Report in 2005–2006 bore fruit in 2006–2007, with the reporting process identifying a novel software product, *SealceViewTool*. This tool is a flexible, intelligent, aid to viewing satellite imagery of sea-ice, enabling more efficient navigation, voyage management and science planning with potential application in both the Antarctic and Arctic regions. In November 2007 we executed a collaboration agreement with a European consortium to field-test the product in the 2007–2008 Arctic summer season. Feedback from the field has proved successful and the agreement has been extended a further year.

Spin-offs and patents

To date the ACE CRC has not applied for any patents or created any spin-off companies.

Research utilisation

As a direct result of recommendations from the Third Year Review, in August 2007 the ACE CRC recruited a Deputy CEO (Business Development) to develop a strategy to promote our research to end-users. During 2007–2008 a business development plan was created to identify key target markets for our research with a focus on potential industry and government end-users. Through discussions with industry a key opportunity was identified to promote our sea-level rise expertise to coastal infrastructure owners and planners of new infrastructure. A sea-level rise consultancy unit has been developed, supported by the recruitment of two sea-level rise consultants. The unit supports industry and government entities in providing coastal infrastructure risk assessments, taking into account the potential impacts of a rising sea level. These consulting services are being used to either determine risks to existing infrastructure or to support the establishment of prudent planning guidelines for new infrastructure. The business development unit has developed industry specific capability statements highlighting the relevance of sea-level rise assessments for each sector. A number of consultancy projects are under negotiation with airports, ports, coastal councils and the Department of Defence.

Research utilisation projects completed or under way in the year under review include:

- **Investigating Sea-Level Extremes in an Uncertain Future:** This new project, funded by DCC until June 2010, will extend the work previously piloted with the Tasmanian State Government on extreme sea levels, delivering projections for extreme sea levels around Australia in an accessible form. This project utilises the ACE CRC's unique method of statistically combining recorded variations in today's sea level (from tides, storms and other meteorological events) with internationally accepted projections of future sea level, to provide a basis for coastal infrastructure planning decisions in the 21st century. The ACE CRC will roll out a national program of seminars and training workshops. We will train industry and government stakeholders in our method of assessing future risk of sea-level rise to coastal infrastructure. We will build government and industry capability to plan appropriate, targeted and efficient strategies for adaptation to sea-level rise and its impacts.
- **Climate Futures for Tasmania: Prospects, Impacts and Information for Adaptation Options:** This is a significant new three-year project for the ACE CRC funded by both Commonwealth and Tasmanian State Government agencies and Hydro Tasmania. We have broadened our research base beyond the partners of the ACE CRC to include GA, Hydro Tasmania, the DPIW and TIAR. We have been working with stakeholders across a range of Tasmanian enterprises – for instance agriculture, water management, infrastructure management, planning, and policy. We will produce detailed assessments of possible future Tasmanian climates under a range of credible scenarios in a form that these stakeholders can take and apply to their strategic decision-making. Because of the significant funding from CERF, the results from this project must be made freely available. This project is likely to prove a useful model for broader application in other Australian states.
- **Climate Futures – Infrastructure:** Following a Tasmanian infrastructure owners workshop, jointly sponsored by engineering consulting firm Pitt & Sherry and the ACE CRC, the ACE CRC agreed to collaborate with Pitt & Sherry in an extension to the Climate Futures for Tasmania project to create a complementary infrastructure impacts projects. Pitt & Sherry is the project leader and has secured additional funding through the Tasmanian State Government. The aim of this project is to develop an expert system that will undertake a detailed engineering assessment of the effect on infrastructure of the climate change projections derived from the Climate Futures for Tasmania project. The expert system may subsequently have application at a national level.
- **South Pacific Sea Level and Climate Monitoring Project Review:** Undertaken jointly by the ACE CRC's Policy and Sea-level Rise Programs for AusAID. This project commenced in 2006–2007 and has now completed its assessment of the efficacy of this important AusAID project and delivered recommendations for more effective delivery.

- **Sea-ice Analysis and Forecasting System:** An initiative of the CVC Program to deliver to the BoM the systems to enable both 'now-casting' and short-term forecasting of sea-ice conditions in the Southern Ocean.
- **Launceston City Council:** The extreme sea levels project is investigating extreme sea levels in the Tamar River valley and the potential impacts of climate change.
- **Abrupt Climate Change and North–South Climate Connections:** Funded by DCC, this work is investigating the possibility of a link between Antarctic climate and abrupt climate shifts in the northern hemisphere.
- **Ocean Acidification: Potential effects of increasing anthropogenic CO_2 on marine plankton in the Southern Ocean:** we are building on our previous work estimating the potential impacts of recent, primarily anthropogenic, increases in atmospheric CO_2 and related changes in the carbonate chemistry of the Southern Ocean on shell formation by planktonic organisms in the Australian sector of the Southern Ocean. The project is a continued collaboration between the ACE CRC and the DCC's Australian Climate Change Science Program and incorporates collaborative work with ANU's Research School of Earth Sciences.
- **Ocean Acidification: Australian Impacts in the Global Context:** Funded by the Department of Climate Change and ACE CRC, the workshop was convened to synthesise current knowledge on the effects of ocean acidification, with particular emphasis on its implications for the Australian marine environment including the Southern Ocean, and to design research strategies for projecting and monitoring ocean acidification, particularly in poorly-understood environments such as bryozoan reefs and temperate marine ecosystems.
- **Memorandum of Understanding with Engineering Consulting Firm:** During 2007–2008 ACE CRC formed a strategic alliance with an engineering consulting firm to undertake research and consultancy services related to climate change effects on infrastructure.

Intellectual property management

During the period under review, the ACE CRC has not sold, transferred or licensed its IP for commercialisation. The ACE CRC implemented all core policies and procedures for IP management before the end of the 2005–2006 year. The Third Year Review confirmed that our approach is appropriate for our organisation and the activities we undertake. We continue to work closely with our partners to ensure a common understanding and approach in the application of these policies and procedures. The *SealceViewTool* collaboration with the consortium referred to under 'Disclosure and Assessment (see page 28) was developed with careful consideration of the optimal national benefits to Australia and be extended into 2007–2008. Although there is a very limited specialist market for the product, it was determined that Australia's Antarctic Program would most benefit from using the tool as a device to obtain a future benefit.

Communication strategy

Program leaders: Sandra Zicus and Jess Tyler, ACE CRC

The SIPEX voyage was one of the highlights of the communication program. Centre-stage in the SIPEX communications program was the inclusion – for the first time – of two science teachers who engaged in the science program to create education materials for schools. The primary delivery mechanism for the outcomes of their adventures was a dedicated web site, through which the world followed the voyage and its daily progress, and through which teachers could access classroom activities created from real-world science experiments. Every day, the public talked with scientists, shared in the results and were part of the unique experience of 'doing Antarctic science'. Supporting this core web site delivery was a communications, media and publicity program designed to raise awareness of the voyage and to take the science and its relevance to an international audience. The accompanying Teachers Experiencing the Antarctic (TEA) program was initiated by a collaboration between the ACE CRC, AAD and the Tasmanian Department of Education. Their goal was to boost primary and secondary students' knowledge about science in Antarctica, taking advantage of Australia's major role in events during the IPY. As part of the IPY program, a series of celebratory, themed days were developed, and a nationwide special-issue stamp release was initiated with Australia Post. Sandra Zicus also co-chaired the IPY International Education and Outreach Committee, a link which contributed to the profile achieved for the science of the SIPEX voyage. The CRC framework was a key catalyst that brought together the scientific, logistical and publicity expertise of the individual organisations into a potent program of activity that met the strategic communication objectives of all the partners.

Mid-term saw a change in the ACE CRC Communications Manager, with Sandy Zicus resigning in December 2007 and Jess Tyler taking over the role in January 2008. A new communications plan was developed to create a framework for establishing the Centre's communication goals, messages and outcomes. A key objective of this plan has been to highlight not only the Centre's track record of achievements, but also the importance of securing tomorrow's Antarctic and Southern Ocean climate science for Australia, by directing communication effort in areas of greatest strategic benefit for the Centre's reputation, position, profile and future security.

The framework consolidates the existing Communication Plan 2007–2008 and the previous Communications Strategy 2004, as well as considering the Commercialisation and Utilisation Plan (2005). In particular, it recognises the Centre's identified strengths and how these can be aligned with communications messages. The revised Communications Plan is structured around five communication streams, or projects, targeting different audiences and a sixth covering special communications initiatives.

Projects

Corporate communications toolkit

The new corporate identity for ACE CRC has been completed with an accompanying style guide and handbook (in preparation), significantly raising production standards across all ACE CRC publications. We now also have a complete and indexed catalogue of copyright-cleared audio/visual materials across the ACE CRC's research portfolio as the backbone of the communications toolkit. *ACE News*, a general circulation e-newsletter about the ACE CRC, has been introduced and streamlined, with three editions produced to date. The website publishing method has been reviewed and streamlined. Web content is being revised progressively, with major changes to 'Antarctica and Climate Change' and a new section, 'Voyages and Expeditions'. The media and contacts database for communications has been comprehensively reviewed and updated.

Partners

A key development has been making contact with the media/publicity officers at all core and supporting partners, who now receive *ACE Notes* and *ACE News* on a regular basis, with an open invitation to send *ACE News* on to interested parties and for reproduction in partner media. ACE CRC regularly develops items for partner media and a priority for most media stories is to highlight the collaborative nature of the ACE CRC's work. Importantly, the Communications Coordinating Committee has been re-invigorated, with its first meeting in May 2008. There is now a proactive forum for the core ACE CRC agencies to share information, ideas and progress particular communications projects. These informal meetings are set to continue and are providing a basis for improved communications with our partners.

Research users

As well as providing communications for various workshops, round tables and scientific meetings, a notable development has been a procedure and policy for developing the new position analysis series, in consultation with the Policy Program. There is now a detailed procedure and understanding about how the papers are developed, targeted and distributed for maximum impact. *CO_2 emissions and climate change: ocean impacts and adaptation issues* has been published. Position analyses on ocean fertilisation and sea-level rise are in press. Dr John Church and the ACE CRC were commissioned by DCC to prepare a ministerial briefing on developments in the science of sea-level rise post-IPCC Fourth Assessment Report, for the Hon Penny Wong, Federal Minister for Climate Change. This was delivered in June 2008 and will be publically released in 2008–2009. A series of support materials has been developed for the sea-level rise consultancy work, including capability statements and presentations to support meetings by the ACE CRC team with potential clients and at key industry meetings. Support for the CFT project has been provided for corporate identity materials and the ACE CRC website has been updated in consultation with the CFT Liaison & Extension Officer to include the latest information and developments.

Media

After an initial review of the media program and resources, there is now a tighter focus on working with specific journalists on individual stories and areas of the ACE CRC's core expertise, with excellent results. We have been featured in several television, radio, print and online stories directly related to our core business nationally and internationally. We have also placed articles in government publications to expand our profile within government circles.

Highlights of the media program during 2007–2008 included:

- Dedicated live and interactive website for the SIPEX voyage with contributions to international media campaigns for IPY
- Segments on the Southern Cross Television's *Hook, Line and Sinker* on ocean acidification and under-ice krill; a segment on ABC telecision science show *Catalyst*
- Feature in the *Sydney Morning Herald* on ocean acidification
- Several extended stories on the SIPEX and CASO voyages
- Outside broadcast by ABC radio from the ACE CRC site
- Extended national and international coverage of the ocean acidification workshop and release of the ocean acidification position analysis

Staff

ACE Notes continues to be the mainstay of regular communications with staff, and this has been expanded to include a broad clippings service. More than 100 staff, students and visitors attended part or all of the Fourth Annual ACE CRC Symposium in November 2007. The symposium provided an opportunity to review our progress so far and discuss the shape of a possible successor to the ACE CRC. Keynote presentations were provided by staff from our international partners NIWA and AWI in addition to the presentations by Australian participants.

Special projects

- **Antarctic Midwinter Festival 2007:** In 2007 ACE CRC staff participated in a number of talks, and a total of 10 staff and students ran the ACE CRC/IASOS booth over the two-day festival.
- **World Science & Technology Education Conference 2007:** More than 1,100 educators representing 50 countries attended the World Science and Technology Education Conference in Perth in early July. The ACE CRC/International Polar Year booth was one of the most popular spots in the exhibit hall. Anthony Worby gave an overview of the upcoming sea-ice voyage as one of the highlighted speakers and Sandy Zicus co-presented three workshops or seminars focused on climate change and polar science education in collaboration with staff from IASOS, the IPY Project Office and Questacon.
- **International Polar Year:** Sandy Zicus attended a series of IPY meetings in Cambridge with media officers, educators, representatives of community groups and early career researchers from 12 countries to develop strategies to promote public understanding of the importance of the polar regions and polar research through international networks. The group developed a series of four global 'IPY days' per year during the 2007-2009 period and to date these have provided excellent avenues for extended international publicity, mainly online. The first IPY signature day was focused on the ACE CRC SIPEX voyage and a companion Arctic voyage by ACE CRC partner AWI.

End-user engagement: major workshops & forums

Name	Relationship	Nature of benefit	Actual benefit
May 2007 Research Users' Forum (ocean fertiisation); Canberra, ACT			
Attorney General's Department	Research user	Increased awareness of projected risks associated with climate change	Contribution towards the objectives of the ACCSP
AusAid	Research user		
Australia Strategic Policy Institute	Research user		
Department of Agriculture, Forestry & Fisheries	Research user		
Department of Climate Change (formerly AGO)	Supporting partner		
Department of Environment, Water, Heritage & the Arts	Research user		
Department of Foreign Affairs & Trade	Research user		
Department of Prime Minister & Cabinet	Research user		
Office of National Assessments	Research user		
Aug 2007; April 2008 Climate Futures for Tasmania End-User Meeting; Hobart, Tas			
BoM	Core partner	Increased understanding of Climate Futures for Tasmania Project	Contribution towards the objectives of the ACCSP
CMAR	Core partner		
Geoscience Australia	Research user		
HydroTasmania	Research user		
State Emergency Services Tasmania	Research user		
Tasmanian Department of Primary Industries & Water	Research user		
Tasmanian Institute of Agricultural Research	Research user		
UTAS	Core partner		
Tasmanian Partnership for Advanced Computing	Research user		
Oct 2007 Climate Futures for Tasmania – Launch; Hobart, Tas			
AAD	Core partner		
Aurora Energy	Research user		
BoM	Core partner		
CMAR	Core partner		
CRC Forestry	Research user		
Fruit Growers Tasmania	Research user		
Hobart Water	Research user		
Hydro Tasmania	Research user		
National Oceans Office	Research user		
Pitt & Sherry	Research user		
Sinclair Knight Mertz	Research user		
SouthWind	Research user		
Tasmanian Department of Economic Development	Supporting partner		
Tasmanian Department of Primary Industries & Water	Research user		
Tasmanian Environment Industry Council	Research user		
Tasmanian Institute of Agricultural Research	Research user		
Tasmanian Liberals	Research user		
Tasmanian Polar Network	Research user		
Tasmanian Science & Technology Council	Research user		
Tasmanian State Fire Commission	Research user		
UTAS	Core partner		
Wine Industry Tasmania	Research user		
Nov 2007 SAZ-SENSE workshop; Hobart, Tas			
AAD	Core partner	Understanding microbial ecosystem structure and biogeochemical processes in SAZ waters west and east of Tasmania, and also in the Polar Frontal Zone south of the SAZ.	
CMAR	Core partner		
FlindersU	Research user		
IASOS	Research user		
MonashU	Research user		
Plymouth Marine Labs, GBR	Research user		
Princeton University, USA	Research user		
Royal Museum for Central Africa, BEL	Research user		
Université Libre de Bruxelles, BEL	Research user		
University of Marseilles, FRA	Research user		
UTAS	Core partner		
UTechnology Sydney	Research user		
Vrije Universiteit Brussels, BEL	Research user		

Name	Relationship	Nature of benefit	Actual benefit
Nov 2007 Research Users' Forum (ocean acidification; sea-level rise); Canberra, ACT			
AusAID	Research user	Increased awareness of projected risks associated with climate change	Contribution towards the objectives of the ACCSP
AAD	Core partner		
Department of Agriculture, Fisheries & Forestry	Research user		
Department of Climate Change (formerly AGO)	Supporting partner		
Department of Foreign Affairs & Trade	Research user		
Department of Prime Minister & Cabinet	Research user		
Nov 2007 ACE CRC Symposium; Hobart, Tas			
AAD	Core partner	Sharing of current knowledge between all ACE CRC partners and students	Contribution towards the objectives of the ACCSP
ARC Centre of Excellence in Coral Reef Studies	Research user		
Attorney-General's Department	Research user		
BoM	Core partner		
CRC Association	Non-participant		
CSIRO and CMAR	Core partner		
Department of Climate Change (formerly AGO)	Supporting partner		
Department of Education, Science & Technolgoy	Research user		
Department of the Environment, Water, Heritage & the Arts	Research user		
Geoscience Australia	Research user		
Hydro Tasmania	Research user		
AVCAL	Board Member		
SGI	Supporting partner		
State Emergency Services Tasmania	Research user		
Tasmanian Government	Research user		
Tasmanian Institute of Agricultural Research	Research user		
Tasmanian Partnership for Advanced Computing	Research user		
UQueensland	Research user		
UTechnology Sydney	Research user		
UTAS	Core partner		
Dec 2007 Climate Futures for Tasmania – Infrastructure Forum; Hobart, Tas			
Aurora Energy	Research user	Increased awareness of projected risks associated with climate change	Contribution towards the objectives of the ACCSP
Department of Tourism, Arts & the Environment	Research user		
Forests & Forest Industry Council	Research user		
Geoscience Australia	Research user		
Hobart Water	Research user		
Hydro Tasmania	Research user		
Local Government Association of Tasmania	Research user		
Pitt & Sherry	Research user		
Property Council of Australia	Research user		
Royal Australian Institute of Architects	Research user		
Tasmanian Department of Infrastructure, Energy & Resources	Research user		
Tasmanian Treasury	Research user		
Telstra	Research user		
Transend Networks	Research user		
UTAS	Core partner		
April 2008 Climate Futures for Tasmania – LiDAR End-user Workshop, Hobart, Tas			
DPIW	Research user	Increased understanding of new LiDAR data set on surface elevations adjoining the Tasmanian coastline	
UTAS	Core partner		
SGS Economics & Planning	Research user		
DIER	Research user		
Clarence City Council	Research user		
AAD	Core partner		
Digital Mapping Australia	Research user		
SES	Research user		
Department of Justice	Research user		

Name	Relationship	Nature of benefit	Actual benefit
Jun 2008 Ocean Acidification Workshop; Hobart, Tas			
AAD	Core partner	Address the effects of global processes on ocean acidification, with particular emphasis on its effects in the Australian marine environment including the Southern Ocean Assess the current state of knowledge on past, current, and anticipated geochemical changes in Australian waters, and known effects on the marine biota	Research strategies for projecting and monitoring ocean acidification, particularly in poorly-understood calcifying communities such as bryozoan reefs and temperate marine ecosystems
Australian Institute of Marine Science	Research user		
Australian NationalU	Supporting partner		
CSIRO	Core partner		
Geoscience Australia	Research user		
MonashU	Research user		
USGS, USA	Research user		
University of New South Wales	Research user		
UOtago, NZL	Research user		
UQueensland	Research user		
USydney	Research user		

End-user engagement: individual consultations

Name	Relationship	Type; Location	Nature of benefit	Actual benefit
Aurora Energy	Research user	CFT project briefings; Hobart Tas	Increased awareness of CFT	
Aurora Energy	Research user	Consultation on sea-level rise; Hobart Tas	Increased awareness of CFT and Sea-Level Rise Program	
Brisbane Airport Corporation	Research user	Consultation on sea-level rise; Brisbane QLD	Commissioned sea-level rise consultancy business	
Brisbane Ports	Research user	Consultation on sea-level rise; Brisbane QLD	Commissioned sea-level rise consultancy business	
CFT Advisory Committee	Research user	CFT project briefings; Hobart Tas	Increased awareness of CFT	
Clarence City Council	Research user	Consultation on sea-level rise; Hobart Tas	Implications of sea-level rise and increased frequency of extreme events	
DED	Research user	CFT project briefings; Hobart Tas	Increased awareness of CFT	
Department of Defence	Research user	Consultation on sea-level rise; Canberra ACT	Method to assess risk of sea-level rise and extreme events on coastal infrastructure	
DPAC	Research user	CFT project briefings; Hobart Tas	Increased awareness of CFT	
Emergency Management Australia	Research user	CFT project briefings; Adelaide SA	Increased awareness of CFT	
Fremantle Ports	Research user	Consultation on sea-level rise; Freemantle WA	Sea-level rise consultancy proposal	
Hobart Water	Research user	CFT project briefings, Hobart, Tas	Increased awareness of the CFT project	
HydroTasmana	Research user	CFT project briefings; Hobart Tas	Increased awareness of CFT	
Insurance Australia Group	Research user	Consultation on sea-level rise; Sydney NSW	Method to assess risk of sea-level rise and extreme events on coastal infrastructure	
Insurance Council of Australia	Research user	Consultation on sea-level rise; Sydney NSW	Method to assess sea-level rise and extreme events on coastal infrastructure	
Local Government Association of Tasmania	Research user	CFT project briefings; Hobart Tas	Increased awareness of CFT	
Local Government Association of Tasmania	Research user	Consultation on sea-level rise; Hobart Tas	Implications of sea-level rise and increased frequency of extreme events on planning guidelines	
Munich Re	Research user	Consultation on sea-level rise; Sydney NSW	Method to assess sea-level rise and extreme events on coastal infrastructure	

Name	Relationship	Type; Location	Nature of benefit	Actual benefit
Natural Resource Management North	Research user	CFT project briefings; Hobart Tas	Increased awareness of CFT	
Ports Australia Conference	Research user	Consultation on sea-level rise; Hobart Tas	Method to assess sea-level rise and extreme events on coastal infrastructure	
Rabobank	Research user	CFT project briefings; Launceston Tas	Increased awareness of CFT	
Roaring 40s	Research user	CFT project briefings; Hobart Tas	Increased awareness of CFT	
Tasmanian Department of Premier & Cabinet	Research user	Consultation on sea-level rise; Hobart Tas	Implications of sea-level rise and increased frequency of extreme events	
Tasmanian Department of Primary Industries & Water	Research user	Consultation on sea-level rise; Hobart Tas	Implications of sea-level rise and increased frequency of extreme events	
Tasmanian Department of Primary Industries & Water	Research user	Consultation on sea-level rise; Hobart Tas	Implications of sea-level rise and increased frequency of extreme events	
Tasmanian Environment Industry Council	Research user	CFT project briefings; Hobart Tas	Increased awareness of CFT	
Tasmanian Joint Standing Committee on Environment, Resources & Development	Research user	CFT project briefings; Hobart Tas	Increased awareness of CFT	
Tasmanian Sustainable Yields project meeting	Research user	CFT project briefings; Hobart Tas	Increased awareness of CFT	
Westpac	Research user	Consultation on sea-level rise; Sydney NSW	Method to assess risk of sea-level rise and extreme events	

education & training

Developing highly-trained scientists is a priority of the ACE CRC. This training program builds on the significant contribution made by the previous Antarctic CRC to national training in strategic scientific areas. Our Education Program, Looking South Together, works with the Science and Policy Programs and all ACE CRC participants to identify high priority research for students. It uses a mix of broadly advertised, fully-funded and 'top-up' scholarships to attract first-rate students to these areas.

It is also important for the ACE CRC to communicate its research outputs and outcomes to the wider community. We are working with our core partners, museums and education organisations to raise awareness of Antarctic science. We contribute to displays and exhibitions, provide speakers and generally seek to enhance awareness of the importance of Antarctic and Southern Ocean science. We also participate in national science and education promotions to ensure that our research results are communicated to the widest possible audience. Most staff members also contribute undergraduate and postgraduate lectures.

Program leader: Prof Andrew McMinn, UTAS

Objectives

- **To develop higher education programs that meet the needs of ACE CRC stakeholders.** The program is focused on postgraduate training through the PhD program. The program is large by both national and international standards and produces a steady flow-through of finishing graduate students. These students are substantial contributors to each of the ACE CRC subprograms.
- **To address the long-term, unmet national demand for highly trained personnel** with quantitative skills in oceanography and marine ecology.
- **To facilitate the communication of our research outcomes to the community** through interaction with the media, museums, schools and other community associations.

Key achievements 2008–2009

- Recruited 4 new graduate students into the Education Program. We currently have 67 students enrolled.
- Supported 10 students to attend international conferences, and 2 to participate in the exchange program with our international partner AWI in Germany.
- Held graduate student extension courses in commercialisation and scientific poster-making.
- Six ACE CRC staff members ran or contributed to UTAS Quantitative Marine Science courses. A further 3 ACE CRC funded staff and 5 other ACE CRC staff lectured in other UTAS undergraduate courses.
- Three students were awarded either a MSc or PhD and a further 6 are under examination.
- Provided resources to both the Australian and international education communities through work on the international IPY Education, Outreach and Communications Subcommittee.
- By working with the Quantitative Marine Science program at the University of Tasmania, we are providing, advanced, high level training courses to help meet the shortage of quantitative scientists. This program, which is now in its third year of operation, has ten of our PhD students enrolled. All other ACE CRC students are enrolled in projects identified as research required by the ACE CRC.

Plans for 2008–2009

In the coming year, we will conduct a final recruitment drive to attract as large a cohort of new students as possible to maximise the use of scholarships prior to the completion of ACE CRC in 2010. Other programs will continue.

We will also continue to provide support for student conference travel and maintain the AWI exchange program, with two students scheduled to travel to Germany.

Education & training outputs and milestones

Output/Milestones				
Outcome 10: Increase awareness of the climate system and our role/influence in it.				
Output 10.1	**Train the climate specialists of tomorrow**	**2003–2010**	**Yes**	**Ongoing**
Milestone 10.1.1	The EDU Program will attract an increasing number of top-quality students and deliver on-time completion of research theses	2003–2010	Yes	Ongoing
Outcome 11: Raise public awareness of Antarctica and Southern Ocean science.				
Output 11.1	**Communication liaison with the general public**	**2003–2010**	**Yes**	**Ongoing**
Milestone 11.1.1	Establish communications/liaison with community groups via ACE CRC contributions to Antarctic Adventure museums and educational facilities	2003–2010	Yes	Ongoing

performance measures

Performance measure	2006–2007 progress	2007–2008 progress
CRC Program Objective 1: To enhance the contribution of long-term scientific and technological research and innovation to Australia's sustainable economic and social development		
Centre Objective 1.1: Advance Australia's aspirations for its Antarctic territory and Southern Ocean exclusive economic zones		
International commitment to Australia's claims is augmented by wise stewardship. ACE CRC will provide scientific leadership necessary to this stewardship. Performance measures include: 1. Use of ACE CRC research by EA, AGO, and other Australian agencies in their international discussions, regulatory activities and management decisions. 2. Broad recognition by the international community that Australian Antarctic climate and ecosystem science is of the highest quality, and is targeting essential issues.	ACE CRC staff served on 21 national and 46 international committees, editorial boards or advisory boards related to Antarctic and Southern Ocean research/management and climate change prediction and analysis. 7 staff members served in international leadership roles such as chair, co-chair, or workshop co-convenor. ACE CRC researchers authored or co-authored 81 refereed papers, 20 book chapters, 53 conference abstracts, eight special reports and 10 other papers. 4 ACE CRC researchers served as consultants to various industries or government agencies.	ACE CRC staff served on 20 national and 47 international committees, editorial boards or advisory boards related to Antarctic and Southern Ocean research/management and climate change prediction and analysis. 8 staff members served in international leadership roles such as chair, co-chair, or workshop co-convenor. ACE CRC researchers authored or co-authored 95 refereed papers, 1 book, 15 book chapters, 39 conference papers/abstracts, 12 reports and 23 other articles. 3 ACE CRC researchers served as consultants to various industries or government agencies.
Centre Objective 1.2: Increase international engagement in Southern Ocean and Antarctic research relevant to Australia's interests.		
Commitment by other nations to undertake scientific research in collaboration with the ACE CRC, in the Australian Antarctic territory and in the Southern Ocean south of Australia.	ACE CRC researchers took part in 69 international collaborations involving 17 countries. ACE CRC hosted 21 international visitors from 7 different countries.	ACE CRC researchers took part in 60 international collaborations involving 15 countries. ACE CRC hosted 23 international visitors from 7 different countries.
CRC Program Objective 2: To enhance the transfer of research outputs into commercial or other outcomes of economic, environmental or social benefit to Australia		
Centre Objective 2.1: To develop new approaches to the forecasting of ocean and ice conditions, which can be implemented for operational use by partner and other agencies		
Uptake of these approaches by operational agencies.	Conducted initial trials of coupled ocean–sea–ice model through the OASIS coupler, and driven by the TPAC boundary layer atmosphere model. This was a concerted effort by the ACE CRC and our partner staff to establish the Australian coupled ocean–sea–ice model, which is planned to become ocean–sea–ice component of the ACCESS. Used satellite observations of sea surface height to show for the first time that the Antarctic Circumpolar Current is made up of multiple narrow jets, with the study providing a bridge between two previously unreconciled views. Led an international investigation into the controls on phytoplankton production and carbon cycling in the sub-Antarctic region south of Tasmania (SAZ-SENSE). The focus was on understanding why phytoplankton biomass, as seen in satellite ocean colour images, is larger east than west of Tasmania. This is a step to evaluating whether the warmer, higher biomass waters east of Tasmania may expand with global warming.	Provided atmospheric forcing fields for June 2008 to test a limited area version of a numerical model of sea ice covering the Southern Hemisphere sea-ice zone. Developed insights into interactions between ocean circulation and sea ice anomalies. Obtained the first detailed maps of land fast ice extent around East Antarctic coast from 75°E–170°E, satellite synthetic aperture radar data.
Centre Objective 2.2: To provide science for the assessment of sustainable ecosystem management.		
Use of these outputs by management agencies.	Hosted an Experts' Workshop on Bioregionalisation of the Southern Ocean. Information gathered from the workshop will be used to improve large-scale ecosystem modelling, ecosystem management and the development of an ecologically sound system of marine protected areas. Led an international investigation into the controls on phytoplankton production and carbon cycling in the subantarctic region south of Tasmania to understand why phytoplankton biomass is larger east than west of Tasmania. This is a step to evaluating whether the warmer higher biomass waters east of Tasmania may expand in concert with global warming. Conducted experiments to evaluate the effects of elevated CO_2 and ocean acidification on microbial communities and measured pH-induced changes in community composition and microbial processes. Developed a model of algal production in sea-ice.	Undertook a dedicated sea ice research voyage that focused on understanding the links between sea ice physics, sea ice biology and the pelagic food web. Used a remote underwater vehicle instrumented with optical sensors to measure the amount of algae within the sea ice from below. Sampled krill directly under the sea ice with a specially-designed trawl net to study their size and abundance in that environment. Compiled the results from a large-scale survey of krill, along with oceanography and all levels of biota, in the region from 30°E to 80°E. Clarified the links between ocean circulation and biological productivity by showing how interaction between the fronts of the Antarctic Circumpolar Current and the sea floor drives upwelling and enhances marine plant life, even over deep topography.

Performance measure	2006–2007 progress	2007–2008 progress
Centre Objective 2.3: To ensure recognition of oceanic carbon sinks and their impacts		
Consideration of ocean carbon sinks in carbon management plans and agreements.	Modelled the interaction between climate warming and ocean acidification, which suggests that warming will moderate the pH decrease driven by anthropogenic CO_2 uptake, but not reduce the impact of acidification on the saturation state of aragonite. The precipitation of this calcium carbonate mineral will become more difficult in a warmer, more acid ocean. Explored a global carbon cycle model of the seasonal cycles of ocean-atmosphere CO_2 exchange as a tool to estimate the fixation of CO_2 into organic carbon and its transfer to the ocean interior. Results suggest that physical ventilation has a larger influence than previously realised, which models can help to address at large scale. In concert with ACE CRC partner organisation NIWA, developed a novel, autonomous, trace-metal rosette sampling system and deployed it in the Southern Ocean for the first time, enabling a 10-fold improvement in sampling resolution compared with traditional hydrocast technology.	Documented increased phytoplankton, zooplankton and bacterial populations, and greater export of carbon to deep waters, in response to natural iron inputs from the Heard and Kerguelen islands and surrounding plateau sediments. Measured the first full, open-depth section of iron and other trace element distributions between Australia and Antarctica, using a trace-metal rosette developed by our partner NIWA. Completed a repeat inventory of total and anthropogenic dissolved CO_2, and a first survey along a section from Australia to Antarctica of the abundance of marine-calcifying organisms. Designed effective monitoring strategies for ocean uptake of CO_2-based on the relationship between ocean circulation and the uptake. Hosted international workshops on 'Ocean Acidification' and on 'Biogeochemistry of the Sub-Antarctic Zone'. The latter focussed on the causes of variations in phytoplankton levels east and west of Tasmania, to evaluate sensitivities to climate change.
Centre Objective 2.4: To provide observations essential to the consideration of climate change and variability in economic and environmental planning.		
1. Improved estimates of climate variability and change 2. Increased reference to this information by economic and environmental research users	Completed a new reconstruction of Antarctic snow accumulation variability that showed no significant changes since 1957. The study showed large spatial and decadal-scale variability in accumulation, with little overall trend, especially in East Antarctica. Produced plots of regional sea-level rise in the Australian region from 17 IPCC models for 2030, 2070, 2100. Showed that since 1990 sea level has been rising at the upper limit of the projections in the Third Assessment Report. Played a major role in the IPCC Fourth Assessment Report, which sets the world standard for climate change assessment.	Showed enhanced freshening of the surface waters in the Southern Ocean that suggests significant ice shelf melt. This is also supported by observed changes in Antarctic bottom water. Measured the complex circulation over the Antarctic continental shelf and showed that it facilitates export of dense water from the shelf, even in summer. Recovered a large array of moorings that had monitored ocean circulation over the Macquarie Ridge as part of a joint experiment with NIWA. Deployed novel moorings that will provide the first accurate measurements of dense water export from the shelf. Recovered a short ice core from Law Dome to extend the record of past changes in atmospheric conditions up to January 2007. Showed that since 1961, the trend in ocean thermal expansion is 50% larger than previous estimates.
CRC Program Objective 3: To enhance the value to Australia of graduate researchers		
Centre Objective 3.1: To become a major training centre for climate, marine, and ecosystem science.		
Increased recognition of Hobart as a top educational centre in these areas.	73 PhD and 7 MSc students associated with the ACE CRC. 15 PhD and 2 MSc students began their studies in the past fiscal year. 10 students under examination; 9 students awarded PhDs; 2 received MSc.	67 PhD and three MSc students associated with the ACE CRC. 4 PhD students began their studies in the past fiscal year. 3 students awarded PhDs, 6 under examination.
Centre Objective 3.2: To deliver students with interdisciplinary skills useful to the climate, marine, and ecosystem research and research user communities		
Successful placement of students within these communities.	7 students who completed their PhDs and 2 who completed Masters degrees took up employment with industry/research user groups.	3 students who completed their PhDs and 1 who completed Masters degrees took up employment with user groups.
CRC Program Objective 4: To enhance collaboration among researchers, between researchers and industry or other users, and to improve efficiency in the use of intellectual and other research resources		
Number of projects involving multiple participants. Degree to which participants view the research as larger than the sum of its parts.	ACE CRC researchers were involved in 36 national and 69 international collaborative projects involving 17 countries.	ACE CRC researchers were involved in 31 national and 60 international collaborative projects involving 15 countries.
Centre Objective 4.2: To undertake research of direct value to research users		
Number and success of projects involving research users in their design and completion.	3rd Research Users' Forum for government agencies included presentations by research users. 3rd ACE CRC Annual Symposium included research user presentations. Produced a report for the Tasmanian government that provides statistical assessments of future sea-level extremes at Hobart and Burnie, using projections from the IPCC Third Assessment Report. Conducted a strategic review of the AusAID/BoMS South Pacific Sea Level and Climate Monitoring Project: Phase IV. The project is to assemble an archive of sea level and climate related data to provide partner countries with information about sea-level variability and change that they need to manage their near-shore and coastal resources sustainably and to develop policies and strategies for responding to long-term trends in sea level.	4th Research Users' Forum for government agencies, under a new roundtable format on specific issues; 4th ACE CRC Annual Symposium. Developed new publication format, ACE CRC Position Analysis papers, and produced the first issue on ocean acidification collaboratively with Commonwealth regulatory agencies. Provided material to DFAT on ocean fertilisation for UN discussions on the Law of the Sea, and to DEWHA and Attorney-General's Department for the Convention on the Prevention of Marine Pollution by Dumping of Waste and Other Materials, and its related Protocol. Provided input on biological prospecting to AAD prior to the Antarctic Treaty Consultative Meeting. Initiated the Climate Futures for Tasmania Program, in consultation with stakeholders, to deliver climate projections for the state at a fine scale and across a wide range of impact areas. Developed a sea-level rise consultancy unit to support industry and government entities in providing coastal infrastructure risk assessments taking into account the potential impacts of a rising sea level.

glossary

All entries are Australian unless otherwise identified by country in brackets

A

AAD	Australian Antarctic Division
AARI	Arctic & Antarctic Research Institute (RUS)
AARP	Australian Antarctic Research Programme
AAS	Australian Academy of Science
AASGS	Australian Antarctic Science Grants Scheme
ACC	Antarctic Circumpolar Current
ACCESS	Australian Computational Earth Systems Simulator
ACCSP	Australian Climate Change Science Program
ACE CRC	Antarctic Climate & Ecosystems Cooperative Research Centre
ACROSS	Australian Centre for Research on Separation Science
AGO	Australian Greenhouse Office (now DCC)
AIMS	Australian Institute of Marine Science
AINSE	Australian Institute of Nuclear Science and Engineering
ANMS	Argentine Navy Meteorological Service (ARG)
AME	Antarctic Marine Ecosystems Program, ACE CRC
AMISOR	Amery Ice Shelf Ocean Research
ANDRILL	Antarctic Drilling Project
ANSTO	Australian Nuclear Science and Technology Organisation
APAC	Australian Partnership for Advanced Computing
ARA	Airborne Research Australia (FlindersU)
ARC	Australian Research Council
ARCNESS	Australian Research Council Network for Earth System Science
ASAC	Australian Science Advisory Committee
ASPI	Australian Strategic Policy Institute
AUV	Autonomous Underwater Vehicle
AVCAL	Australian Private Equity & Venture Capital Association Ltd
AWI	Alfred Wegener Institute for Polar Research (DEU)

B

BAS	British Antarctic Survey (GBR)
BoM	Bureau of Meteorology
BROKE-West	Baseline Research on Oceanography, Krill and the Environment (western sector)

C

CAML	Census of Antarctic Marine Life
CASO	Climate of Antarctica and the Southern Ocean
CCA	Colorado Center for Astrodynamics (USA)
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CEAMARC	Collaborative East Antarctic Marine Census
CERF	Commonwealth Environmental Research Facilities Program
CFT	Climate Futures for Tasmania
CliC	Climate and Cryosphere Program (WCRP)
CLIVAR	Climate Variability and Predictability Program (WCRP)
CMA	Chinese Meteorological Association (CHN)
CMAR	CSIRO Marine & Atmospheric Research
CNRS	Centre National de la Recherche Scientifique (FRA)
CO2	Ocean Control of Carbon Dioxide Program, ACE CRC
CPOM	Centre for Polar Oceanography and Modelling (GBR)
CRC	Cooperative Research Centre
CRREL	Cold Regions Research and Engineering Laboratories (USA)
CRESIS	Centre for Remote Sensing of Ice Sheets (USA)
CSL	Central Science Laboratory, UTAS
CVC	Climate Variability and Change Program, ACE CRC

D

DCC	Department of Climate Change (formerly AGO)
DED	Tasmanian Department of Economic Development
DEEWR	Department of Education, Employment & Workplace Relations
DEWHA	Department of the Environment, Water, Heritage & the Arts
DFAT	Department of Foreign Affairs and Trade
DIER	Tasmanian Department of Infrastructure, Energy & Resources
DIISR	Department of Innovation, Industry, Science & Research
DPAC	Tasmanian Department of Premier & Cabinet
DPIW	Tasmanian Department of Primary Industries & Water
DRI	Desert Research Institute (USA)

E

EA	Environment Australia (now DEWHA)
EPICA	European Project for Ice Coring in Antarctica
ESF	European Science Foundation
ESA	European Space Agency
EUROCEANS	European Network of Excellence for Ocean Ecosystems Analysis

G

GA	Geoscience Australia
GEOTRACES	An international study of the biogeochemical cycles of Trace Elements and Isotopes in the Arctic and Southern Oceans
GNS	Institute of Geological & Nuclear Science (NZL)

I

IASOS	Institute of Antarctic & Southern Ocean Studies (UTAS)
ICED	Integrated Analyses of Circumpolar Climate Interactions and Ecosystem Dynamics in the Southern Ocean
ICSU	International Council for Science
IFREMER	Institut Français de Recherche pour L'Exploitation de la Mer (FRA)
IGOS	Integrated Global Observing Strategy
IMOS	Integrated Marine Observing System
IPCC	Intergovernmental Panel on Climate Change
IPY	International Polar Year 2007–2008
ISSI	International Space Science Institute
ITASE	International Trans Antarctic Scientific Expedition
IWC	International Whaling Commission

J

JAMSTEC	Japan Marine Science and Technology Center (JPN)
JAXA	Japanese Aerospace Exploration Agency (JPN)

K

KEOPS	Kerguelen compared study of Ocean and Plateau in Surface waters
KIT	Kitami Institute of Technology (JPN)

L

LDEO	Lamont Doherty Earth Observatory (USA)
LEGOS	Laboratoire d'Etudes en Geophysique et Oceanographie (FRA)
LGGE	Laboratoire de Glaciologie et Géophysique de l'Environnement (FRA)
LiDAR	Light Detecting and Ranging equipment
LOBB	Laboratoire d'Océanographie Biologique de Banyuls (FRA)
LOCEAN	Laboratoire d'Océanographie et du Climat: Expérimentations et Approches Numériques (FRA)
LOHAFEX	Ocean iron fertilisation experiment (IND)
LOV	Laboratoire d'Océanographie Villefranche (FRA)
LSCE	Laboratoire des Sciences du Climat et de l'Environnement (FRA)

M

MEXT	Ministry of Education, Culture, Sports, Science & Technology (JPN)
MIT	Massachusetts Institute of Technology (USA)

N

NASA	National Aeronautics and Space Administration (USA)
NCRIS	National Collaborative Research Infrastructure Strategy
NERC	Natural Environment Research Council (GBR)
NIPR	National Institute of Polar Research (JPN)
NIWA	National Institute for Water and Atmospheric Research (NZL)
NMIT	New Mexico Institute Technology (USA)
NSF	National Science Foundation (USA)
NSIDC	National Snow and Ice Data Centre (USA)

O

OOV	Oceanographic Observatory of Villefranche-sur-mer (FRA)

P

POL	Policy Program, ACE CRC
POL	Proudman Oceanographic Laboratory (GBR)
PRIC	Polar Research Institute of China (CHN)

R

RSES	Research School of Earth Sciences (Australian NationalU)
ROV	Remotely Operated Vehicle

S

SAZ	Sub-Antarctic Zone
SAZ-SENSE	Sensitivity of Sub-Antarctic Zone waters project
SCAR	Scientific Committee on Antarctic Research
SES	State Emergency Service
SGI	Silicon Graphics International
SIMBA	Sea-ice Mass Balance in Antarctica
SIO	Scripps Institute of Oceanography (USA)
SIPEX	Sea-ice Physics & Ecosystem Experiment
SLR	Sea-level Rise Program, ACE CRC
SSI	Space Science Institute (USA)
SURVOSTRAL	Surveillance de l'Océan Austral project (FRA)

T

TERSS	Tasmanian Earth Resources Satellite Station
TIAR	Tasmanian Institute of Agricultural Research
TPAC	Tasmanian Partnership for Advanced Computing

U

U3A	University of the Third Age
UN	United Nations
USGS	United States Geological Survey (USA)
UTAS	University of Tasmania

W

WCRP	World Climate Research Programme
WHOI	Woods Hole Oceanographic Institute (USA)
WMO	World Meteorological Organisation
WOCE	World Ocean Climate Experiment (WCRP)

Photo: Sandra Zicus

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van Ommen T Loulergue L Chappellaz J Morgan V Spahni R Schilt A Curran M Roberts J MacFarling Meure C Etheridge D Stocker T (2007) 'The 8200 BP climate event in the Southern Hemisphere' ***Antarctic Climate and Ecosystems CRC Symposium*** Hobart 2007

van Ommen T Morgan V Curran M 'A new sub-annually resolved accumulation series from Law Dome' in Ubertini L Manciola P Casedai S Grimaldi S (Ed) ***Earth: Our Changing Planet: proceedings of IUGG XXIV General Assembly Perugia Italy 2007***

van Ommen T Morgan V Curran M 'Probing past climate variability in the Australian region using Antarctic ice cores' ***Greenhouse 2007*** October 2–5 2007 CSIRO Sydney Abstracts volume 91

Worby A (2007) 'Snow cover on Antarctic sea-ice from in-situ measurements aircraft and satellite data' ***American Geophysical Union Fall Meeting 2007*** San Francisco 10–14 December 2007

Worby A Lieser L and Yi D (2008) 'Recent results comparing in-situ laser altimeter data with ICESat data over Antarctic sea-ice' ***European Geosciences Union General Assembly*** Vienna Germany April 2008

Worby A Massom R Lytle V and Markus (2007) 'Validation of AMSR-E derived snow thickness over East Antarctic sea-ice' ***International Glaciological Society Symposium on Cryospheric Indicators of Global Climate Change***

Worby A Treverrow A Jordan M and Raymond B (2007) 'Antarctic sea-ice data: archival and recovery at the Australian Antarctic Data Centre' ***American Geophysical Union fall meeting 2007*** San Francisco 10–14 December 2007

Other

Allison I Cunde, X Yuansheng L (2007) 'An automatic weather station on the roof of Antarctica' ***Argos Forum*** 65 10–13

Bowie A (2007) 'Iron and the marine ecosystem' ***Australian Antarctic Magazine*** 12 26 Australian Antarctic Division

Butler E Bowie A (2008) 'Tracing elements in the ocean' ***Australian Antarctic Magazine*** 14 20 Australian Antarctic Division

Craven M I Allison I Riddle M (2007) 'Fauna flourish under honeycomb ice' ***Australian Antarctic Magazine*** 12 32 Australian Antarctic Division

Griffiths B (2007) 'Shedding light on carbon sinks' ***Australian Antarctic Magazine*** 12 27 Australian Antarctic Division

Haward M (2007) 'Climate change: from science to policy' ***LGAT News*** September 2007 42–44

Howard W Moy (2007) 'Looking into the past for changes in the present' ***Australian Antarctic Magazine*** 12 24 Australian Antarctic Division

Mapstone B (2007) 'ACE CRC Report' ***IceBreaker*** 39

Mapstone B (2007) 'IceWatch' ***IceBreaker*** 41

Mapstone B (2008) 'IceWatch' ***IceBreaker*** 42

Mapstone B (2008) 'IceWatch' ***IceBreaker*** 44

Massom R Allison I Scambos T (2008) 'Rapid disintegration of another ice chelf on the Antarctic Peninsula' ***Australian Antarctic Magazine*** 14 22 Australian Antarctic Division

Meiners K Kawaguchi S (2008) 'Sea algae put spring in krill growth' ***Australian Antarctic Magazine*** 14 p18 Australian Antarctic Division

Leiser J (2008) 'Determining sea ice thickness with an airborne scanning laser' ***Australian Antarctic Magazine*** 14 16 Australian Antarctic Division

Rintoul S (2007) 'Understanding the role of the Southern Ocean in climate' ***Australian Antarctic Magazine*** 12 8–9 Australian Antarctic Division

Tyler J (2008) 'Tiny snails send big message on climate change' ***R&D Newsletter*** University of Tasmania

Tyler J (2008) 'Sea ice physics and ecosystem experiment' ***CRC Newsletter Summer 08*** Department of Innovation, Industry, Science & Research

Tyler J (2008) 'World's largest investigation of the Southern Ocean' ***CRC Newsletter Autumn 08*** Department of Innovation, Industry, Science & Research

Tyler J (2007) 'Climate futures for Tasmania' ***LGAT News December*** Local Government Association of Tasmania

van Ommen T (2007) 'Connecting climate science and policy' ***Australian Antarctic Magazine*** 13 6 Australian Antarctic Division

Worby A (2007) 'Getting the measure of sea-ice' ***Australian Antarctic Magazine*** 12 p10 Australian Antarctic Division

Worby A (2008) 'Sea ice physics and ecosystem experiment' ***Australian Antarctic Magazine*** 14 14 Australian Antarctic Division

Wright S Davidson A (2007) 'Minicosms help build a bigger picture of ocean acidification' ***Australian Antarctic Magazine*** 12 5 Australian Antarctic Division

research collaborations

National projects

Project title	ACE researcher(s)	Collaborator(s)	Organisation
Climate Futures for Tasmania	Bindoff N, White C, Holz G, Grose M, McInnes, K	Cechet B McNeil D, Barnes-Keoghan I Ling F Hirst T Graham B	GA TIAR BoM Hydro Tasmania CMAR DPIW
Quantifying the impact of dust deposition to the Southern Ocean using dissolved aluminium concentrations	Bowie A, Butler E, Haddad P	Nesterenko P, Tria J	ACROSS (UTAS)
Selenium as a key micronutrient in primary productivity in the Southern Ocean	Bowie A, Butler E	Wake B	UTAS
The role of iron as a micronutrient to sea-ice zone algae: Fe-EPS interactions and bioavailability	Bowie A Meiners K van der Merwe P Lannuzel D	Mancuso-Nichols C	CMAR
Trace elements content of Southern Ocean phytoplankton material: implications for carbon transfer to the deep sea	Bowie A	Townsend A	CSL (UTAS)
Biogeochemical cycling of trace elements and their influence on ocean primary production and Earth's climate: an Australian GEOTRACES initiative	Bowie A	Ellwood M Butler E	RSES (ANU) CMAR
Continental aerosols as vectors of micronutrients to the oceans Cape Grim Baseline Air Pollution Station Science program	Bowie A, Butler E	Keywood M	CMAR
Germanium and silicon isotopes, pH proxy ground-truthing and trace metal studies (as part of GEOTRACES)	Butler E, Bowie A, Tilbrook B	Ellwood M, Eggins S	RSES (ANU)
Amery sediment core analysis	Craven M	Post A Hemer M	GA CMAR
Amery seafloor benthos	Craven M	Riddle M	AAD
High-resolution ice core records of cosmogenic ^{10}Be from Antarctica and Greenland for examination of past solar variability and climate	Curran M, Pedro J, van Ommen T, Morgan V	Smith A, Fink D	ANSTO
Polar oceans governance	Haward M	Kaye S Rothwell D Rayfuse R	UMelb ANU UNSW
Australia's Antarctic interests	Haward M	Bergin A	ASPI
ACCESS	Heil P	Marsland S	CMAR
The Southern Ocean and sea-ice response to climate variability and change	Heil P	Marsland S	CMAR
ARC Network for Earth System Science	Howard W, Bindoff N, Allison I, Heil P	Pitman A, England M and others	UNSW
Australian Integrated Ocean Drilling Program	Howard W	Arculus R, Exon N and others	ANU and 13 other Australian universities; CMAR, AIMS, ANSTO
Stable isotopic variability in planktonic and benthic foraminifera and pteropods	Howard W Roberts D, Moy A	Gagan M	ANU
Deglacial changes in circulation and sea-ice in the southwest Pacific	Howard W, Armand L	Quilty P Fink D	UTAS ANSTO
SIPEX	Lieser J, Worby A, Meiners K	Jansen P, Wadley V	AAD
Large-scale sea-ice monitoring from aircraft	Lieser J, Worby A	Hacker J, Lieff W	ARA (FlindersU)
Long baseline GPS data processing in the Antarctic sea-ice zone	Lieser J, Worby A, Steer A	Watson C	UTAS
Impact of anomalous atmospheric circulation on sea-ice and biota	Massom R	Pook M	CMAR
Impact of patterns of anomalous atmospheric circulation on the break-up of the Larsen B Ice Shelf	Massom R	Simmonds I	UMelb

Project title	ACE researcher(s)	Collaborator(s)	Organisation
Impact of East Antarctic fast-ice variability on Emperor penguins	Massom R	Emmerson L Pook M	AAD CMAR
Isotopic and elemental tracers in ice and snow	Morgan V, Moy A, Curran M, van Ommen T	Rosman K	CurtinU
Wealth from Oceans National Research Flagship	Rintoul S, Church J, Tilbrook B		CMAR
Australian Climate Change Science Program	Rintoul S, Church J, van Ommen T, Tilbrook B	DCC (formerly AGO)	CMAR
Deep corals as climate records: 15N as a tracer of the edge of the oligotrophic ocean south of Tasmania	Trull T, Davies D	Thresher R, Sherwood O	CMAR
East Antarctic and circum-Antarctic climate history from ITASE coring in Eastern Wilkes Land	van Ommen T, Curran M, Morgan V, Smith B	Goodwin I	UNewcastle
Air sampling from Antarctic firn and ice	van Ommen T, Morgan V	Etheridge D	CMAR

International projects

Project title	ACE researcher(s)	Collaborator(s)	Organisation	
Surface meteorological measurements in East Antarctic using automatic weather stations	Allison I	Xiao C-D, Bian L-G, Qin D-H	Chinese Met Administration	CHN
Amery Ice Shelf–ocean interaction and marine ice properties	Allison I, Craven M	Fricker H Sun B	SIO PRIC	USA CHN
Species-specific silicification rates in the sub-Antarctic Zone	Armand L	Leblanc K, Cornet-Barthaux V, Quéguiner B Fripiat F, Cardinal D	UMarseille Royal Mus Central Africa	FRA BEL
Impact of atmospheric deposition on the distribution and speciation of trace elements in the upper ocean: focus on iron in the Sargasso Sea	Bowie A	Sedwick P Church T Sholkowitz E	Berm Inst of Oc Sci UDelaware WHOI	USA USA USA
Dissolved trace elements in the Australian sector of the Southern Ocean (SR3 line)	Bowie A	Sohrin Y	KyotoU	JPN
Particulate and total dissolvable iron during the natural fertilisation experiment KEOPS: maintenance of the bloom	Bowie A	Chever F Bucciarelli E, Blain S, Sarthou G	UBrest LOBB	FRA FRA
Iron-(III) complexing ligands in the Southern Ocean	Bowie A	Ibisanmi E Hunter K, Sander S, Boyd P	UOtago NIWA	NZL NZL
Trace metal mobility in the Southern Ocean (diffusive gradient in thin films)	Bowie A	Baeyens W	UBrussels	BEL
Shipboard collection of aerosols in the Southern Ocean	Butler E	Boyd P	NIWA	NZL
Mercury speciation in the Southern Ocean as part of GEOTRACES	Butler E	Cossa D	IFREMER	FRA
Neodymium isotopes in Antarctic coastal and Southern Ocean waters as part of GEOTRACES	Butler E	Van de Flierdt T	LDEO Imperial College	USA GBR
CRAC-ICE: collaborative research into Antarctic Calving and Iceberg Evolution	Coleman R, Warner R, Young N	Fricker H MacAyeal D Rignot E Sammonds P Scambos T Bigg G Dierking W, Fahrbach E, Rack W Garcia C, Mata M Joughin I Legresy B	SIO UChicago NASA UCollege London NSIDC, UColorado USheffield AWI URio Grande UWashington CNRS LEGOS	USA USA USA GBR USA GBR DEU BRA USA FRA
Deglacial ice core chemistry	Curran M, Moy A, van Ommen T, Smith B	Steffensen J-P, Dahl-Jensen D	UCopenhagen	DNK
Holocene chemistry of the Law Dome DSS ice core	Curran M, Moy A, van Ommen T, Smith B	Mayewski P	UMaine	USA
Trace ion and metal analysis techniques and applications	Curran M, van Ommen T	McConnell J, Edwards R	DRI	USA
High-resolution ice core records of cosmogenic ^{10}Be from Antarctica and Greenland for examination of past solar variability and climate	Curran M, Pedro J, Van Ommen T, Morgan V	McConnell J	DRI	USA

Project title	ACE researcher(s)	Collaborator(s)	Organisation	
Polar oceans governance	Haward M	VanderZwaag D, Chircop A, McConnell A	DalhousieU	CAN
Antarctic fast-ice network	Heil P, Massom R	Haskell T Langhorne P Trodahl J Haas C Melnikov I Ushio S	Industrial Research Ltd UOtago VictoriaU AWI AARI NSIDC, UColorado	NZL NZL NZL DEU RUS USA
Complete mapping of Antarctic sea-ice dynamics and thickness	Heil P, Massom R	Haas C Geiger CA Clemente-Colon P	AWI CRREL NSIDC, UColorado	DEU USA USA
Sea-ice motion deformation thickness and lead dynamics in the Antarctic	Heil P, Massom R, Worby, A	Haas C Geiger CA Maksym E Clemente-Colon P	AWI CRREL BAS NSIDC, UColorado	DEU USA UK USA
Studying high-frequency ice dynamics	Heil P	Geiger C	UDelaware	USA
Integrated Ocean Drilling Program	Howard W		NSF GNS MEXT ESF	USA NZL JPN EUR
Trace-metal and boron isotopic composition of Southern Ocean planktonic foraminifera	Howard W, Moy A	Dunbar G, Carter L	VictoriaU	NZL
Boron isotopic tracers of ocean acidification	Howard W, Moy A	Bijma J	AWI	DEU
Global extremes sea-level analysis	Hunter J	Woodworth P	POL	GBR
Impact of patterns of anomalous atmospheric circulation and sea-ice on the break-up of the Larsen B Ice Shelf	Massom R	Scambos T Stammerjohn S Turner J Squire V, Williams T Fahnestock M MacAyeal D Sponsler M Aster R	NSIDC, UColorado UCalifornia BAS UOtago UNew Hampshire UChicago Stormsurf Ltd NMIT	USA USA GBR NZL USA USA USA USA
Review of bipolar polynya processes	Massom R	Barber D	UManitoba	CAN
ARISE remote sensing validation experiment: data analysis	Massom R	Markus T, Comiso J, Scambos T, Haran T Key E Enomoto H, Tateyama K, Tamura T Pfaffling A	NASA NSIDC, UColorado UMiami KIT HokkaidoU AWI	USA USA USA JPN JPN DEU
Impact of patterns of anomalous atmospheric circulation on sea-ice in the West Antarctic Peninsula region in 2005	Massom R	Stammerjohn S Lefebvre W Harangozo S Scambos T Fowler C	LDEO, ColumbiaU UCatholique de Louvain BAS NSIDC, UColorado CCA	USA BEL GBR USA USA
State of the Climate 2007: Antarctic sea-ice	Massom R	Stammerjohn S Barreira S	LDEO, ColumbiaU ANMS	USA ARG
Impact of East Antarctic fast ice variability on Emperor penguins	Massom R	Barbraud C Ancel A	CEBC CNRS Institut Pluridisciplinaire Hubert Curien	FRA FRA
Radarsat mapping of East Antarctic fast-ice	Massom R	Lytle V	UKansas	USA
Mapping and monitoring of circum-Antarctic fast-ice	Massom R, Heil P, Young N	Haskell T Ohshima K Ushio S Aoki S	Industrial Research Ltd HokkaidoU NIPR HokkaidoU	NZL JPN JPN JPN
An integrated study of processes linking sea-ice and biological ecosystem elements off East Antarctica during winter	Meiners K	Granskog M Krell A Werner I Thomas D He J	ULapland AWI UKiel UWales PIRC	FIN DEU DEU GBR CHN
Scratching the surface: the role of the threatened sea-ice habitat in supporting marine living resources and biodiversity of Antarctica	Meiners K, Nicol S	van Franeker J	Wageningen IMARES/WUR	NLD
Influence of sea-ice microalgae on sea-ice thermodynamics	Pasquer B	Maksym T	BAS	GBR
Adelie Land Bottom Water formation	Rintoul S	Houssais M, Sultan E	LOCEAN	FRA

Project title	ACE researcher(s)	Collaborator(s)	Organisation	
WOCE SR3 repeat	Rintoul S	Warner M	UWashington	USA
SURVOSTRAL	Rintoul S	Morrow R	LEGOS	FRA
Transport of the Kerguelen deep western boundary current	Rintoul S, Church J, Sokolov S	Watkatsuchi M, Fukamachi Y	HokkaidoU	JPN
Climate science–policy coordination and conflict resolution	Sandford R	Karl H	MIT	USA
Microparticle measurements in ice cores	Smith B, van Ommen T, Curran M	Petit J-R	LGGE	FRA
Net community production in the Southern Ocean	Tilbrook B	Bender M, Cassar N	PincetonU	USA
CO_2 uptake in the Southern Ocean: observations from *l'Astrolabe*	Tilbrook B	Poisson A Goyet C	UPierre et Marie Curie UPerpignan	FRA FRA
Belgian studies of Carbon in the Antarctic Ocean (BELCANTO) – comparative measures of carbon export fluxes from sediment traps and suspended particle observations including paleoproxy development	Trull T	Dehairs F	Brussels FreeU	BEL
Kerguelen: Compared Study of the Ocean and the Plateau in Surface Water (KEOPS) – the influence of natural iron fertilisation on Southern Ocean production carbon sequestration and biodiversity	Trull T, Armand L, Bowie A, Griffiths B	Blain S, Queguiner B	UMarseille	FRA
Vertical flux in The Global Ocean (VERTIGO) –penetration of sinking organic carbon through the mesopelagic ocean	Trull T, Bray S, Davies D, Moy C	Buesseler K, Lamborg C, Casciotti K	WHOI	USA
Atmospheric methane records from the Law Dome DSS ice core	van Ommen T	Chappellaz J	LGGE	FRA
Understanding Changing Ice Flow and Rift Propagation in the Mertz Glacier Tongue, East Antarctica	Warner R, Massom R, Young N	Legresy B Fricker H	CNRS LEGOS SIO	FRA USA
Wideband radar for measuring snow thickness on Antarctic sea-ice	Worby A	Gogineni P, Leuschen C	CRESIS	USA
Satellite and in-situ radar altimetry for determining snow cover thickness on Antarctic sea-ice	Worby A	Laxon S, Giles K	CPOM	GBR
Sea-ice thickness from space: validating estimates from laser and radar altimeters with ship-based and in-situ measurements	Worby A	Ackley S, Xie H	UTexas	USA
Developing a parametric curve fit to seasonal and regional thickness distribution of Antarctic sea-ice	Worby A	Geiger C Ackley S Van Woert M, DeLiberty T	UDelaware UTexas NSF	USA USA USA
Satellite laser altimetry for determining the freeboard and thickness of Antarctic sea-ice	Worby A, Lieser J	Markus T, Yi D	NASA	USA
SIMBA	Worby A	Ackley S	UTexas	USA
Australian–Italian collaborative project on the mass budget of the East Antarctic ice sheet	Young N	Frezzotti M, Tabacco I, Forieri A	ENEA & Udegli Studi di Milano	ITA
Radio echo sounding measurements of ice thickness in the Lambert Glacier tributaries and its hinterland	Young N	Damm V	BGR	DEU
Global Land Ice Monitoring from Space (GLIMS)	Young N	Kargel J	UArizona, and USGS	USA
Antarctic Surface Accumulation and Ice Discharge (ASAID)	Young N	Bindschadler R	NASA	USA
Investigating the Cryospheric Evolution of the Central Antarctic Plate (ICECAP)	Young N, van Ommen T, Warner R, Roberts J	Blankenship D, Holt J, Young D, Lawver L, Dalziel L Siegert M Payne T, Bamber J Dowdeswell J	UTexas UEdinburgh UBristol UCambridge	USA GBR GBR GBR

International visitors

Visitor's name	Institution/affiliation	Country	Purpose of visit
Abraham E	Dragonfly Inc	NZL	Collaborate on altimetry-based simulation of advective transport of iron
Allesandra T	LSCE	FRA	Collaborative research of the role of atmospheric dust for iron supply to Southern Ocean ecosystems
Cassar N	PrincetonU	USA	Mass spectrometry research
Cossa D	IFREMER	FRA	Voyage preparations, joint PhD student supervision and collaborative research planning
Dehairs F	Brussels FreeU	BEL	Collaborate on export measurements from SAZ-SENSE program investigating sensitivity of the Sub-Antarctic Zone to climate change
Ding M-H	CMA	CHN	Training in deployment of Antarctic automatic weather stations
Granskog M	Arctic Centre, ULapland	FIN	SIPEX planning
Heimbuerger L	LOV	FRA	Voyage preparations
Houssais M	l'Ocean, UPierre et Marie Curie	FRA	Collaborative work on Adelie shelf
Jeandel C	CNRS–UPaul Sabatier	FRA	Collaborate on GEOTRACES and KEOPS
Koubbi P	OOV	FRA	Collaborative work on Adelie shelf
Krell A	AWI	DEU	SIPEX planning
Leblanc K	COM-LOB CNRS/UMarseille	FRA	SAZ-SENSE Workshop
Legresy B	LEGOS	FRA	Research into dynamics of Mertz Glacier Tongue
Morrow R	LEGOS	FRA	SURVOSTRAL
Poisson A	l'Ocean, UPierre et Marie Curie	FRA	Southern ocean carbon cylcing
Roberts A	ARSC UAF	USA	Discussions on assimilation model
Sinoir M	UAix-Marseille II	FRA	MSc internship
Smith A	UOtago	NZL	Ocean Acidification Workshop and meet team
Sultan E	l'Ocean, UPierre et Marie Curie	FRA	Collaborative work on Adelie shelf
Sundquist E	USGS	USA	Ocean Acidification Workshop and meet team
Thompson D	Colorado StateU	USA	Southern Hemisphere atmosphere–ocean dynamics
Valencia M	Nautilus Institute	USA	Collaboration on ocean regimes

Staff exchanges

Staff name	Institution visited	Country	Purpose of exchange
Bowie A	Bermuda Institute of Ocean Sciences	BMU	Iron air–sea transport research cruise
	UHawaii	USA	GEOTRACES Pacific Basin workshop
Haward M	DalhousieU	CAN	Research
	UCalifornia	USA	Research
Howard W	GNS & Antarctic Research Centre Wellington	NZL	ANDRILL Project review panel
Meiners K	AWI	DEU	Planning of joint cruises
	WageningenU Research	NLD	Test run of Surface and Under Ice Trawl (SUIT)
Pasquer B	BAS	GBR	Model development
Sandford R	MIT	USA	Visiting fellow; teaching and research
Trull T	AWI	DEU	Co-supervision of PhD candidate Friederike Ebersbach; discussion of collaboration on the measurement of export during the LOHAFEX iron fertilisation experiment
	NIWA	NZL	Review NIWA Time Series program to discuss synergies
Young N	LEGOS	FRA	Collaboration on ice dynamics and change detection on Mertz Glacier and Amery Ice Shelf

National committees 2007–2008

Staff name	Committee	Role
Allison I	Antarctic Research Assessment C'tee Physical Sciences	Member
Bindoff N	ARCS Austraian Partnership for Advanced Computing Program Coordination C'tee Antarctic Research Assessment C'tee Physical Sciences BlueNET Steering C'tee ARCNESS Board	Chair Member Oceanography Coordinator Member Member
Butler E	Environmental Chemistry Division Standing C'tee, Royal Australian Chemical Institute	Tasmanian Representative
Haward M	Mawson's Huts –Gift to the Nation Steering C'tee CCAMLR Consultative Forum	Member Member
Howard W	Integrated Ocean Drilling Program Australia-New Zealand Science Steering C'tee	Chair
Hunter J	Permanent C'tee For Tides and Mean Sea Level	Permanent member
Lambeck K	Australian Academy of Science L'Oréal Australia For Women In Science Fellowships Prime Minister's Science, Engineering and Innovation Council 2008 Prime Minister's Prizes for Science Higher Education Endowment Fund Expert Panel National Elevation Data Framework Public Workshop	President Chair of Selection Panel Ex-officio Member Chair of Committee Expert Panel Member Chair
Trull T	Interdepartmental C'tee on Ocean Fertilisation	Member
van Ommen T	National C'tee for Earth Systems Science Antarctic Research Assessment C'tee Physical Sciences	Member Member
Young N	Board of Management for TERSS	Member

International committees 2007–2008

Staff name	Committee	Role
Allison I	ICSU–WMO Joint C'tee for IPY International Association of Cryospheric Science International Glaciological Society Editorial Advisory Board – *Antarctic Science* Editorial Advisory Board – *Terra Antartica* Editorial Advisory Board – *Polar Science* SCAR IPY C'tee International Scientific Organising C'tee, SCAR Open Science Conference 2008 International Science C'tee, IAMAS/IAPSO/IACS* Joint Assembly 2009	Co-chair President-elect Vice President Member Member Member Member Member Member
Armand L	Neogene Polar Diatom 2009 Workshop Organising Committee	Member
Bindoff N	IPY Data Management C'tee	Member
Bowie A	GEOTRACES C'tee	Member
Butler E	GEOTRACES C'tee	Member
Church J	Joint Scientific C'tee of the WCRP	Chair
Constable A	Scientific C'tee of CCAMLR, Wkg Grp Statistics, Assessments and Modelling CCAMLR–IWC Workshop On Antarctic Ecosystem Model Inputs Scientific C'tee–IWC Interim international Steering C'tee ICED Scientific C'tee of CCAMLR Scientific C'tee of CCAMLR Fish Stock Assessment Wkg Grp Scientific C'tee of CCAMLR Ecosystem Monitoring Wkg Grp UN Food & Agriculture Organisation Expert consultation on Modelling Ecosystem Interactions for Informing an Ecosystem Approach to Fisheries	Convenor Co-convenor Member Invited expert Member Australian National Representative Member Member
Heil P	International Programme for Antarctic Buoys	Co-deputy Chair
Howard W	Integrated Ocean Drilling Program Science Planning C'tee International Quaternary Association Palaeoclimate Commission Editorial Board – *Palaeoceanography*	Member Corresponding Member Associate Editor
Jabour J	Australian–Canadian Oceans Research Network (Phase III)	Australian Co-cordinator
Lambeck K	Federation of Asian Scientific Academies and Societies Review of l'Institut de Physique du Globe de Paris InterAcademy Panel	President Elect Chair of Review Committee Executive Committee Member
Massom R	International Programme for Antarctic Buoys NASA *AquaAMSR-E* Science & Software Team	Member Member
Rintoul S	SCAR/Scientific C'tee on Oceanic Research Expert Group on Oceanography CLIVAR/CliC/SCAR Southern Ocean Implementation Panel American Meteorological Society C'tee on Southern Hemisphere Meteorology and Oceanography	Member Member Member
Tilbrook B	International Ocean Carbon Coordination Project	Member
Trull T	Integrated Marine Biogeochemistry and Ecosystem Research The Oceans in a High CO_2 World Conference Organising C'tee Editorial Board – *Deep Sea Research*	Australian National Representative Member Associate Editor
Van Ommen T	SCAR Standing Scientific Group on Physical Sciences	Secretary
Worby A	WCRP Cryosphere and Climate Scientific Steering Group CliC Marine Cryosphere Program SCAR Antarctic Sea-ice Processes and Climate C'tee SCAR Antarctica and the Global Climate System Scientific Steering Group SCAR/SCOR Expert Group on Oceanography	Vice-chair Leader Co-chair Member Member
Young N	European Space Agency Category 1 Advisory Group	Member
Zicus S	IPY Education & Outreach sub-C'tee	Co-chair

* IAMAS/IAPSO/IACS: International Association of Meteorology and Atmospheric Science/International Association of Physical Sciences of the Ocean/International Association of Cryospheric Sciences

National presentations

Staff name	Title or topic	Type of presentation	Event	Location
Allison I	Science Plans for the IPY	Oral presentation	Australian Institute of Physics, Tasmanian Branch	Hobart, Tas
Allison I	An historical overview of the Antarctic CRCs.	Oral presentation	ACE CRC Symposium 2007	Hobart, Tas
Allison I	An overview of the IPCC fourth assessment report: the synthesis report.	Oral presentation	Australian Antarctic Division Seminar Series	Hobart, Tas
Armand L	Microscopic algae: taste-testers and commentators of Southern Ocean environmental states	Oral presentation	Australian Frontiers of Science	Canberra, ACT
Bindoff N	Evidence of climate change and CFT	Oral presentation	ACE CRC Symposium 2007	Hobart, Tas
Bowie A	The importance of iron for sub-Antarctic zone ecosystems: an atmospheric source from Australia?	Oral presentation	Cape Grim Annual Science Meeting	Melbourne, Vic
Bowie A	Dissolved iron in the Australian sector of the Southern Ocean: basin-scale distributions, seasonality, relationships with hydrography and biology	Oral presentation	SAZ-SENSE workshop	Hobart, Tas
Bowie A	Iron during SAZ-SENSE: distributions, fluxes, sources and budgets	Oral presentation	SAZ-SENSE workshop	Hobart, Tas
Butler E	SAZ-SENSE: dissolved trace metals by ICP-MS (preliminary data)	Oral presentation	SAZ-SENSE workshop	Hobart, Tas
Haward M	Australia's Antarctic and Southern Ocean interests	Oral presentation	Sea Power 08	Sydney, NSW
Heil P	Drifting buoys in sea ice research: investigation of Antarctic sea ice motion, deformation and more	Oral presentation	ACE CRC Symposium 2007	Hobart, Tas
Howard W	Response of Southern Ocean plankton to past and current changes in carbon chemistry	Oral presentation	Greenhouse 2007	Sydney, NSW
Howard W	Ocean acidification: impacts on marine ecosystem	Oral presentation	ACE CRC Research Users' Forum	Canberra, ACT
Howard W	Ocean acidification: an emerging impact	Oral presentation	ACE CRC Symposium 2007	Hobart, Tas
Howard W	Effects of climate change on ocean ecosystems: a geological perspective	Oral presentation	Tasmanian Aquaculture & Fisheries Institute	Taroona, Tas
Howard W	History and future of the carbon cycle and climate	Oral presentation	UTechnology, Sydney	Sydney, NSW
Hunter J	Sea-level rise: what are we in for?	Oral presentation	Engineering Mathematics and Applications Conference	Hobart, Tas
Hunter J	Estimating sea-level extremes in a world of uncertain sea-level rise	Oral presentation	Victorian CMA Floodplain Managers' Forum	Melbourne, Vic
Hunter J	The global and Tasmanian climate: looking back and looking forward	Oral presentation	Tasmanian Minerals Council Sustainable Development Conference	Hobart, Tas
Hunter J	Estimating sea-level extremes in an uncertain future	Oral presentation	Greenhouse 2007	Sydney, NSW
Hunter J	Estimating sea-level extremes in a world of uncertain sea-level rise	Oral presentation	5th Victorian Flood Management Conference	Warrnambool, Vic
Hunter J	Climate change and sea level Rise	Oral presentation	National Tidal Centre Tides Workshop	Adelaide, SA
Hunter J	Sea-level rise: the science	Oral presentation	ACE CRC Research Users' Forum	Canberra, ACT
Hunter J	Climate, sea-level rise and the vulnerability of coastlines	Oral presentation	Hydro 2007 Conference	Cairns, Qld
Hunter J	Sea-Level rise and ports	Oral presentation	Ports Australia Environmental Working Group	Hobart, Tas
Hunter J	Sea-level rise: implications for planning	Oral presentation	Planning Inst Aust Climate Change Forum	Sydney, NSW
Lambeck K	Sea level change through the ages: learning from the past to understand the future	Oral presentation	2007 Gentilli Memorial Lecture, UWestern Australia	Perth, WA
Lambeck K	Sea-level through the ages: learning from the past to understand the future	Oral presentation	Australian-French Association for Science and Technology Lecture	Canberra, ACT
Lambeck K	Patterns of sea level change	Oral presentation	Archaeological Science Conference	Canberra, ACT
Lieser J	SIPEX	Oral presentation	ACE CRC Symposium 2007	Hobart, Tas
Lieser J	SIPEX	Oral presentation	AAD seminar	Kingston, Tas

Staff name	Title or topic	Type of presentation	Event	Location
Massom R	Fast ice distribution in Adélie Land, East Antarctica: interannual variability and implications for emperor penguins (*Aptenodytes forsteri*)	Oral presentation	ACE CRC Symposium 2007	Hobart, Tas
Massom R	Antarctic air–sea–ice interactions: physical and ecological implications	Oral presentation	Australian Marine Sciences Association Annual Conference	Melbourne, Vic
Meiners K	SIPEX – the ecosystem work	Oral presentation	AAD seminar	Kingston, TAS
Meiners K	Sea Ice Physics and Ecosystems experiment (SIPEX)	Oral presentation	ACE CRC Symposium 2007	Hobart, TAS
Rintoul S	Oceans and climate	Panel discussion	Directions for Australian Climate Change Science	Canberra, ACT
Roberts D	Appendicularia, foraminifera and pteropod distribution during SAZ-SENSE	Oral presentation	SAZ-SENSE Workshop	Hobart, Tasmania
Sandford R	Climate change and sea-level rise: policy issues and options	Oral presentation	ACE CRC Research Users' Forum	Canberra, ACT
Sandford R	Climate change and ocean acidification: policy issues and options	Oral presentation	ACE CRC Research Users' Forum	Canberra, ACT
Sandford R	Report on the Strategic Review for AusAid	Oral presentation	ACE CRC Research Users' Forum	Canberra, ACT
Sandford R	The South Pacific Sea Level and Climate Monitoring Project (AusAid)	Oral presentation	ACE CRC Symposium 2007	Hobart, Tas
Sandford R	Mainstreaming climate science in government policy and decision making	Oral presentation	UTAS presentation	Hobart, Tas
Tilbrook B	Ocean carbon uptake and storage	Oral presentation	Greenhouse 2007	Sydney, NSW
Tilbrook B	Surface CO_2 variability	Workshops	SAZ-SENSE workshop	Hobart, Tas
Trull T	Iron-induced ocean carbon sequestration	Poster	Greenhouse 2007	Sydney, NSW
Trull T	ACE CO2 achievements	Oral presentation	ACE CRC Symposium	Hobart, Tas
Trull T	POC from bio-optical sensors	Oral presentation	Biogeochemistry of the Sub-Antarctic Zone	Hobart, Tas
Trull T	Ecosystem control of carbon export	Oral presentation	Biogeochemistry of the Sub-Antarctic Zone	Hobart, Tas
Trull T	Quantification of carbon sequestration in response to natural iron fertilisation over the Kerguelen Plateau in the Southern Ocean: an overview of KEOPS	Oral presentation	Australian Marine Sciences Association Annual Conference	Melbourne, Vic
Trull T	Nitrogen and carbon isotopic insights into nutrient cycling and export in naturally iron-fertilised waters of the Southern Ocean	Oral presentation	Australian Marine Sciences Association Annual Conference	Melbourne, Vic
Trull T	Ocean fertilisation for carbon Sequestration	Oral presentation	ACE CRC Research Users Roundtable	Canberra, ACT
van Ommen T	The 8200 BP climate event in the Southern Hemisphere	Oral presentation	ACE CRC Symposium 2007	Hobart, Tas
van Ommen T	Probing past climate variability in the Australian region using Antarctic ice cores	Oral presentation	Greenhouse 2007	Sydney, NSW
Worby A	Teachers experiencing the Antarctic in IPY	Oral presentation	Australian Marine Science Association Annual Conference	Melbourne, Vic
Worby A	Five models in the Antarctic region and its links to recent observations of ice thickness variability in the Antarctic Peninsula region	Oral presentation	14th National Australian Meteorological and Oceanographic Society (AMOS) Conference in conjunction with Southern Annular Mode Workshop	Adelaide, AUS

International presentations

Staff name	Title or topic	Type	Event	Location
Adams N	The role of the polar jet in modulating the surface weather around coastal Antarctica: a case study	Oral presentation	Third Antarctic Meteorological Observation, Modelling and Forecasting Workshop	Madison, USA
Adams N	An overview of recent developments related to Antarctic forecasting	Oral presentation	Third Antarctic Meteorological Observation, Modelling and Forecasting Workshop	Madison, USA
Allison I	The scope of science during IPY 2007-2008	Oral presentation	International Union of Geodesy and Geophysics, General Assembly	Perugia, ITA
Allison I	The role of ice–ocean interaction in the mass budget of the Amery Ice Shelf system.	Oral presentation	International Union of Geodesy and Geophysics, General Assembly	Perugia, ITA
Allison I	The scientific program of IPY 2007-2008	Oral presentation	Italian Doctoral School in Polar Science, Seminar Series, USiena.	Siena, ITA
Allison I	The Australian Antarctic Programme	Oral presentation	Italian Doctoral School in Polar Science, Seminar Series, USiena.	Siena, ITA
Armand L	Diatom occurrences in the natural fertilisation bloom zone of Kerguelen Plateau (KEOPS program)	Oral presentation	Vrije Universiteit Brussel	Brussels, BEL
Armand L	Diatom occurrences in the natural fertilisation bloom zone of Kerguelen Plateau (KEOPS program)	Oral presentation	COM-LOB, CNRS/Université de Marseille	Marseille, FRA
Bindoff N	Global changes of the hydrological cycle and ocean renewal inferred from ocean salinity, temperature and oxygen data	Oral presentation	International Conference on Environmental Systems	Gijon, ESP
Constable A	Ecosystem modelling in support of CCAMLR and the IWC	Oral presentation	ICED Southern Ocean Food Web Modelling Workshop	Virginia, USA
Curran M	Southern Ocean atmospheric chemistry signals since the LGM as recorded in the coastal Law Dome ice core: comparisons with the inland Dome C ice core record	Oral presentation	XVII International Quaternary Association Congress Cairns, Qld	Cairns, AUS
Haward M	Antarctica: past, present, future	Oral presentation	Marine and Environmental Law Institute, DalhousieU	Halifax, CAN
Haward M	Current Developments in the Antarctic Regime	Oral presentation	Boalt Hall law school, UCalifornia, Berkeley	Berkeley, USA
Heil P	Observations of Antarctic fast-ice thickness	Poster	American Geophysical Union conference (Fall 2007)	San Francisco, USA
Heil P	Monitoring Antarctic sea-ice during IPY 2007–2009	Oral presentation	International Space Science Institute workshop	Bern, CHE
Heil P	Complete mapping of Antarctic sea-ice dynamics	Oral presentation	International Space Science Institute workshop	Bern, CHE
Heil P	Roadmap for Antarctic sea- ice monitoring	Oral presentation	International Space Science Institute workshop	Bern, CHE
Howard, W	Marine-terrestrial-ice-core correlations from a million-year record of pollen in the Southwest Pacific	Oral presentation	International Union for Quaternary Research	Cairns, AUS
Howard, W	Deglacial chronology of sea-surface conditions and ice-rafted debris in the Australasian Southern Ocean	Oral presentation	International Union for Quaternary Research	Cairns, AUS
Jabour J	Southern Ocean Search and Rescue	Oral presentation	Coastal Zone Canada 2008	Vancouver, CAN
Lambeck K	The Climate–Energy Nexus: the transition from vicious circle to virtuous circle	Oral presentation	Nobel Laureates Beijing Forum 2007: Energy and Environment	Beijing, CHN
Lambeck K	The utilisation and promotion of new energy sources in Australia	Oral presentation	Nobel Laureates Beijing Forum 2007: Energy and Environment	Beijing, CHN
Lieser J	Laser scanning during SIPEX	Oral presentation	European Geosciences Union General Assembly	Vienna, AUT
Meiners K	SIPEX	Oral presentation	Polar Ecology Seminar, UKiel	Kiel, DEU
Pasquer B	Sea ice ecosystem model	Oral presentation	Ocean Sciences Meeting	Orlando, USA
Pender L	A brief history of PULSE: failures and successes of a Southern Ocean mooring	Oral presentation	Office of Naval Research and Marine Technological Society Buoy Workshop	St Louis, USA

Staff name	Title or topic	Type	Event	Location
Rintoul S	Density changes in the Southern Ocean	Poster	International Union of Geodesy and Geophysics XXIV General Assembly	Perugia, ITA
Rintoul S	Southern Ocean Observing System	Oral presentation	Southern Ocean Observing System workshop	Bremen, DEU
Rintoul S	Antarctic Circumpolar Current Fronts	Oral presentation	International Union of Geodesy and Geophysics XXIV General Assembly	Perugia, ITA
Sandford R	Integrating ACE CRC climate science in northern hemisphere/USA research, policy and decision making	Oral presentations	Address to USA federal government agencies	Cambridge, Boston, Woods Hole, USA
Sokolov S	ACC fronts and chlorophyll distributions	Oral presentation	International Union of Geodesy and Geophysics XXIV General Assembly	Perugia, ITA
Sokolov S	Relationship between fronts of the Antarctic Circumpolar Current and surface chlorophyll concentrations in the Southern Ocean	Oral presentation	International Union of Geodesy and Geophysics XXIV General Assembly	Perugia, ITA
Tilbrook B	Ocean carbon uptake and storage	Oral presentation	JAMSTEC ocean CO_2 meeting	Mutsu, JPN
Tilbrook B	Ocean CO_2 observation program in Australia	Oral presentation	Asia-Pacific workshop on Carbon Cycle Observations	Tsukuba, JPN
Tilbrook B	CO_2 observations south of Australia	Oral presentation	Asia-Pacific workshop on Carbon Cycle Observations	Tsukuba, JPN
Trull T	The SAZ Project Time Series Program	Oral presentation	NIWA Time Series Workshop	Wellington, NZL
Trull T	Phase lags, sinking rates and the transport of organic carbon to the ocean interior	Oral presentation	EUROCEANS Workshop on Carbon Export and Transport Through the Mesopelagic Zone	Brussels, BEL
Trull T	In-situ determination of particle sinking rates and the transport of carbon to the ocean interior	Oral presentation	AWI invited talk	Bremerhaven, DEU
Trull T	The Australian SAZ-SENSE study of the sensitivity of the Sub-Antarctic Zone to climate change: an introduction	Poster	International Symposium on the Effects of Climate Change on the World's Oceans	Gijon, ESP
van Ommen T	A new sub-annually resolved accumulation series from Law Dome	Oral presentation	International Union of Geodesy and Geophysics XXIV General Assembly	Perugia, ITA
Worby A	Snow cover on Antarctic sea-ice from in-situ measurements aircraft and satellite data	Oral presentation	American Geophysical Union fall meeting 2007	San Francisco, USA
Worby A	Recent results comparing in-situ laser altimeter data with *ICESat* data over Antarctic sea-ice	Oral presentation	American Geophysical Union fall meeting 2007	San Francisco, USA
Worby A	Validation of AMSR-E derived snow thickness over East Antarctic sea-ice	Oral presentation	International Glaciological Society Symposium on Cryospheric Indicators of Global Climate Change	Cambridge, GBR
Worby A	Antarctic sea-ice data: archival and recovery at the Australian Antarctic Data Centre	Oral presentation	American Geophysical Union fall meeting 2007	San Francisco, USA

Non-scientific audiences

Staff name	Title or topic	Type	Event	Location	Date
Allison I	If climate is not warming, then why are all the glaciers disappearing?	Oral presentation	National Convention of the Australian Skeptics	Hobart, Tas	Nov 2008
Barnes-Keoghan I	Long-term climate trends in Tasmania and CFT	Oral presentation	Australian Institute of Energy	Hobart, Tas	May 2008
Barnes-Keoghan I	Long-term climate trends in Tasmania	Oral presentation	Department of Primary Industries & Water	Hobart, Tas	May 2008
Bindoff N	Evidence of climate change, IPCC	Oral presentation	Hobart Water	Hobart, Tas	Jun 08
Bindoff N	The myths and facts about climate change in Tasmania	Keynote address	Tasmanian Chamber of Commerce and Industry Facing the Sustainability Challenge 2008	Hobart, Tas	Jun 2008
			Tasmanian Institute of Agricultural Research internal workshop		May 08
			Tasmanian Institute of Agricultural Research Staff Briefing		Apr 08
Bindoff N	Evidence of climate change and CFT	Invited speaker	Dept of Infrastructure, Energy and Resources	Hobart, Tas	Apr 2008
			Australian Rural Leadership Program		
			Tasmanian Aquaculture and Fisheries Institute		
			Forests and Forest Industry Council		
Craven M	Glaciology	Oral presentation	National Science Week	Hobart, Tas	Aug 2007
Craven M	AMISOR project	Webcast		Tas	Mar 2008
Howard W	Ocean research	School group	Marine Discovery Centre	W'bridge, Tas	Jul 2007
Howard W	Global climate: past and future	Oral presentation	Royal Society of Tasmania	Hobart, Tas	Aug 2007
Howard W	Global climate change: historical and geological evidence	Oral presentation	National Science Week:	Hobart, Tas	Aug 2007
Howard W	Geological perspectives on climate change	Oral presentation	Tasmanian Minerals Council	Hobart, Tas	Sept 2007
Howard W	Climate change and ocean acidification	Oral presentation	Science Meets Parliament	Canberra, ACT	Mar 2008
Howard W	Ocean acidification	Oral presentation	Midwinter Festival	Hobart, Tas	Jun 2008
Hunter J	Sea-Level rise and ports	Oral presentation	Port Botany Tenant Sustainability Forum	Sydney, NSW	Jun 2008
Hunter J	Climate, sea-level rise and the vulnerability of coastlines	Oral presentation	Mountain Festival Science Festival	Hobart, Tas	Mar 2008
Hunter J	The anti-greenhouse lobby: skeptics or contrarians?	Oral presentation	Australian Skeptics National Convention	Hobart, Tas	Nov 2007
Hunter J	Climate change and sea-level rise: a global and Tasmanian perspective	Oral presentation	U3A	Kingston, Tas	Aug 2007
Hunter J	Greenhouse gas emissions: where are we and where are we going?	Oral presentation	U3A	Kingston, Tas	Nov 2007
Hunter J	Climate change, sea-level rise and our coasts	Oral presentation	Seaweek 2008	E'hawk Nck, Tas	Mar 2008
Hunter J	Climate change, sea-level rise and our coasts	Oral presentation	National Youth Science Forum	Hobart, Tas	Mar 2008
Hunter J	Climate change, sea-level rise and your house on the dunes	Oral presentation	Midwinter Festival	Hobart, Tas	Jun 2008
Jabour J	Can whales be both a metaphor for civilised society, and dinner?	Oral presentation	Phillip Law Lecture, MidWinter Festival	Hobart, Tas	Jun 2008
Jabour J	The cold hard facts of Antarctica	Oral presentation	Probus Club	New Norfolk, Tas	May 2008
Jabour J	Antarctic science, politics and IPY legacies	Oral presentation	International Studies Association	San Francisco, USA	Mar 2008
Mapstone B	Climate Futures for Tasmania Project	Oral presentation	Partners, stakeholders & media	Hobart, Tas	Oct 2007

Staff name	Title or topic	Type	Event	Location	Date
Massom R	Ice work in Antarctica	Oral presentation	National Science Week	Hobart, Tas	Aug 2007
Massom R	SIPEX: Sea Ice Physics and Ecosystem eXperiment 2007	Oral presentation	Midwinter Festival	Hobart, Tas	Jun 2008
Meiners K	Why and how to study sea ice	Oral presentation	Marine Science Centre	W'bridge, Tas	Jul 2007
Rintoul S	Oceans and climate change	Oral presentation	Friends School Year 4	Hobart, Tas	Oct 2007
Rintoul S	Global warming	Oral presentation	Friends School Year 6	Hobart, Tas	Nov 2007
Rintoul S	Coral reefs	Oral presentation	Friends School Year 6	Hobart, Tas	Nov 2007
Trull T	Ocean fertilisation	Oral presentation	Australian Commonwealth Interdepartmental Committee on Ocean Fertilisation	Canberra, ACT	Apr 2008
van Ommen T	Messages from the past: what ice cores can tell us about climate change	Oral presentation	ANU College of Science National Science Week Lecture	Canberra, ACT	Aug 2007
Wilson S	Climate change and the Climate Futures for Tasmania Project	Oral presentation	Local Government Association of Tasmania Climate Change Workshop	Launceston, Tas	May 2008
Wilson S	Climate change and the possible impacts on the dairy industry	Oral presentation	Dairy TAS Meeting	Spreyton, Tas	Mar 2008
Wilson S	Climate change and the possible impacts on the wine change	Oral presentation	Wine Industry Tasmania	Hobart, Tas	Feb 2007
Wilson S	Climate change and the possible impacts on agriculture	Oral presentation	Tasmanian Agricultural Productivity Group	Devonport, Tas	Nov 2008
Worby A	Antarctic climate science in the International Polar Year: education and outreach during SIPEX	Oral presentation	World Congress of Science and Technology Education	Perth, WA	Jul 2007
Worby A	Teachers experiencing the Antarctic	Oral presentation	CMAR Cutting Edge Lecture	Hobart, Tas	Aug 2007
Worby, A	Is Antarctica melting?	Oral presentation	Community Lecture	Hobart, Tas	Mar 2008

Media

Staff name	Agency	Story	Date
ACE CRC	Greenhouse News	Carbon dioxide bad news for ocean critters	01/04/07
ACE CRC	Aust Financial Review; CMAR insert Science Alert online	Researchers analysing coral are throwing light on climate change	01/08/07
ACE CRC	Adelaide Advertiser	An unwelcome seachange	09/08/07
ACE CRC	Radio 3CR (Melbourne)	Ocean acidification: research	19/08/07
ACE CRC	Hobart Mercury	Class goes with the floe: two Tasmanian state school teachers to join scientific expedition to Antarctica	24/08/07
ACE CRC	Hobart Mercury	Two Tasmanian teachers will participate in a sea-ice research voyage to the Antarctic	28/08/07
ACE CRC	Courier Mail	Cyber ed / site to bookmark teachers experiencing the Antarctic	04/09/07
ACE CRC	Australian Financial Review	A truly chilling tale	22/09/07
ACE CRC	Hobart Mercury	Deep south:Tas teachers report having the learning experience of a lifetime on their Antarctic expedition	25/09/07
ACE CRC	Hobart Mercury	One month at sea: Tasmanian teachers report in again from their Antarctic journey	09/10/07
ACE CRC	ABC Radio (Hobart) Breakfast	PhD student aboard the aurora australis discusses his journey	11/10/07
ACE CRC	Hobart Mercury	Tas teachers homeward bound: SIPEX voyage nearly over	16/10/07
ACE CRC	Hobart Mercury	Tas scientists crucial to climate watching	23/10/07
ACE CRC	ABC News online	Robots deployed to measure climate change	16/11/07
ACE CRC	ABC News online	One small step for climate change: monitoring climate change from the ocean	16/11/07
ACE CRC	WWF-Aust online	Bioregionalisation of the Southern Ocean	16/11/07
ACE CRC	Science Centric News online	Ocean robots network achieves universal coverage	19/11/07

Staff name	Agency	Story	Date
ACE CRC	ABC Radio 936 (Hobart) Statewide Mornings	Visiting German professor discusses joint polar research in northern and southern hemispheres	23/11/07
ACE CRC	ScienceAlert online	When 'sea change' meets climate change	23/11/07
ACE CRC	Hobart Mercury	Icy memories: two Tasmanian science teachers develop learning resources for school students post-the SIPEX voyage	27/11/07
ACE CRC	The Australian	Opinion: don't let us be frozen out of our own patch	22/01/08
ACE CRC	Waves (MCCN Newsletter)	Ocean robot network achieves universal coverage	31/01/08
ACE CRC	Lloyds List (GBR)	15 years of going with the flow in Southern Ocean	20/03/08
ACE CRC	Hobart Mercury	Warm waters threaten fish	06/05/08
ACE CRC	Hobart Mercury	Science and politics make uneasy bedfellows	13/05/08
ACE CRC	Forbes (GBR)	Announcement of workshop	31/05/08
ACE CRC	Southern Cross Tas Nightly News, ABC- TV W'end News	New Tasmanian premier tours the ACE CRC at UTAS	01/06/08
ACE CRC	Reuters (GBR)	Rising ocean acidity threatens low-lying islands	02/06/08
ACE CRC	Yahoo News	Rising ocean acidity threatens islands	02/06/08
ACE CRC	GulfNews	Rising sea acidity puts islands at risk	02/06/08
ACE CRC	People's Daily (CAN)	Rising ocean acidity poses threat	03/06/08
ACE CRC	SouthAsiaMedia	Rising ocean acidity threatens low-lying islands	03/06/08
ACE CRC	IslandBusiness (South Pacific)	Rising ocean acidity threatens low-lying islands	03/06/08
ACE CRC	Canberra Times & Canberra Local News online	Rising sea levels threaten cities	10/06/08
ACE CRC	ScienceDaily.com	Ocean temps and sea level increases 50 percent higher than prev'ly estimated	19/06/08
ACE CRC	Hobart Mercury	White light of Antarctica dazzles on big screen	19/06/08
ACE CRC	Hobart Mercury	Cold, hard facts on climate change	23/06/08
Adams N	ABC Radio-Tasmanian Country Hour	Priorities for Tasmanian researchers in CAWCR	05/12/07
Allison I	Channel Ten	Antarctic ice sheet is shrinking at a record rate	14/01/08
Allison I	The Australian	Antarctica's ice melting faster than we thought	15/01/08
Allison I	The Age	Cold reality: ice shelf loses vast chunk	27/03/08
Armand L	ABC Radio Canberra	AAS Australian frontiers of science meeting	21/02/08
Bindoff N	Hobart Mercury	Scientists honoured: Hobart nine in share of Nobel prize	16/10/07
Bindoff N	ABC Radio (Hobart) Statewide	Public awareness of climate change- Bali declaration	17/12/07
Bindoff N	ABC 936 (Hobart)	Fourth report of IPCC: the contribution of Tas-based scientists	29/05/08
Bindoff N	Launceston Examiner	TCCI-organised seminar will look at state climate change	06/06/08
Bindoff N	Image & Data Manager	An Antarctic odyssey in weather forecasting	20/02/08
Church J	Sydney Morning Herald	From lab to the limelight	06/08/07
Church J	The Age, Sydney Morning Herald, Illawarra Mercury	Sea level rise risk exceeds forecasts	06/08/07
Church J	Canberra Times	CMAR oceanographer dr john church wins Eureka Prize for scientific research	22/08/07
Church J	Hobart Mercury	Hobart scientist rides rising tide of recognition	23/08/07
Church J	ABC Radio Nth Tas	Discusses effect of climate change and sea levels	27/08/07
Church J	The Age	Climate change: the earth is out of time	29/09/07
Church J	Sydney Morning Herald	Effects of sea-level rise only just beginning	03/10/07
Church J	Cairns Post	Climate change to raise surges	04/10/07
Church J	Townsville Bulletin	Coast at risk	10/11/07
Church J	Launceston Examiner	Sea threat to Victorian coast areas	10/11/07
Church J	Border Mail	Cmar says Aus coastal towns are under threat	10/11/07
Church J	Nature Journal Club	Difficulty of accurately estimating abyssal ocean warming	13/03/08
Church J	Focus (ATSE Newsletter)	Oceans of change	Apr 2008

Staff name	Agency	Story	Date
Church J	ABC1-TV(Syd)Lateline, ABC2(Bris) Aust Wide, SBS-TV (Syd) World News Aust, 2UE (Syd)-Radio Nights	Aus scientists have discovered impact of global warming on world's oceans is worse than prev'ly thought	19/06/08
Church J	Canberra Times	Sea warming underestimated	19/06/08
Church J	The Age	Oceans get hotter and even faster	19/06/08
Church J	Sydney Morning Herald	Sea warmth rise worse than was thought	19/06/08
Constable A	ABC Radio (Hobart) Statewide Mornings	Impact of climate change and ocean current changes on krill and pew fellowship	06/02/08
Constable A	Hobart Mercury	Focus on krill	06/02/08
Constable A	ABC-TV Stateline Tas	Krill scholarship: award of PEW Fellowship to support marine conservation	08/02/08
Constable A	Sydney Morning Herald	Moving in for the krill	13/02/08
Constable A	ABC 774 Melb-News Radio	Researching krill to discover impact of climate change in Southern Ocean	10/05/08
Constable A	Reuters (Singapore)	Race for Antarctic krill a test for green management	25/05/08
Constable A Nicol S	ABC-TV News Channel 2 –L'ton	Researching krill to discover impact of climate change in Southern Ocean	09/05/08
Constable A Nicol S	ABC1-TV W'end News (Canberra/Brisbane/ Sydney/Adelaide/ Melbourne)	Can krill provide clues about climate change and its impact in the Southern Ocean?	10/05/08
Constable A Nicol S	ABC2 (Brisbane) Australia Wide	Researching krill to discover impact of climate change on Antarctic marine life	12/05/08
Curran M	ABC Radio (Nth Coast NSW)	Ice coring in Antarctic ice sheets	12/06/08
Elcheikh A	Hobart Mercury	Telescope IceCube	21/07/07
Haward M	ABC News online	Ship accident highlights Antarctic tourism dangers	26/11/07
Haward M	Sydney Morning Herald	Dawning of a new ice age: opening of first Antarctic runway	15/12/07
Haward M	Melbourne Age	Breaking the ice: first runway operating in Aus Antarctic Territory	15/12/07
Howard W	Southern Cross TasTV Nightly News	Experts from around the world in Hobart to discuss ocean acidification	02/06/08
Howard W	ABC Radio 936 (Hobart) Statewide Mornings	CO_2 in Southern Ocean: effect on marine life	13/09/07
Howard W	ABC TV (National) Science Program Catalyst	Ocean acidification: research in Southern Ocean: impact on plankton	13/09/07
Howard W	Hobart Mercury	Planet's alarms ringing: increasing acidity in Southern Ocean – effect on marine ecosystems	14/09/07
Howard W	GRIST environmental news	Ocean acidification to weaken coral reefs, make island more vulnerable to storms	02/06/08
Howard W	ABC News online	Ocean acidity on the rise	02/06/08
Howard W and Tilbrook B	Hobart Mercury	The acid question on our oceans	03/06/08
Howard W Tilbrook B	Sydney Morning Herald & wordpress.com	Putting sea life to the acid test	07/06/08
Hunter J	Canberra Times	'Refugees' worried about a sinking feeling	19/09/07
Hunter J	ABC- Radio Drive (Nth Tas)	Climate change and coastal living	08/04/08
Hunter J	ABC South East (Bega) Radio Mornings	Climate change, sea level rise and the need for preparedness	22/04/08
Hunter J	ABC radio	Sea-level rise	29/05/08
Hunter J	farnorthcoaster online magazine	Rising sea levels could cause 50m loss of shoreline	03/06/08
Hunter J	ABC TV, Southern X	Coastal erosion enquiry	04/06/08
Hunter J	ABC morning (NSW)	Seminar presentation on sea-level rise	04/06/08
Hunter J	CBS News 60 Minutes (USA)	Tuvalu	04/06/08
Hunter J	Coffs Coast Advocate	A warning from the experts	04/06/08
Hunter J	Hobart Mercury	Erosion hotspots alert	05/06/08
Jabour J	ABC News in Science	Australia's Antarctic bonanza queried	25/04/08
Jabour J	The Age	Antarctic shelf claim may stir up rough seas	30/04/08
Jabour J	Sth Cross-TV (Hobart) Nightly News	Reduced whale numbers	22/06/08

Staff name	Agency	Story	Date
Mapstone B	ABC 936 (Hobart) Drive program	Research programs at ACE CRC of national and international significance	29/05/08
Mapstone B	WeatherNews (BoM Newsletter)	Day to praise excellence and ponder Antarctic mysteries	01/08/07
Mapstone B	ABC Radio (Hobart & Northern Tas) ABC TV – Channel 2 Evening News	Research project climate futures for Tasmania to provide climate change data specific to the region.	10/10/07
Mapstone B	Launceston Examiner	Launch of new four-year, co-funded project Climate Futures for Tasmania	11/10/07
Mapstone B	Hobart Mercury	Predicting climate future: project to detail Tas forecast for 100 years	11/10/07
Mapstone B	Canberra Times	Storms, king tides forecast for Aus as warming ice melts	15/12/07
Mapstone B	ABC Radio (Hobart & Nth Tas) Statewide Mornings	Climate futures for Tasmania research project: small-scale modelling for Tas	17/01/08
Marsland S	Herald Sun	Mertz glacier polynya	06/07/07
Marsland S	ScienceAlert online	Mertz glacier polynya	06/07/07
Marsland S	Townsville Bulletin	Mertz glacier polynya	06/07/07
Marsland S	AAP Newswire	Mertz glacier polynya	06/07/07
MarslandS	Aust Maritime Digest	Mertz glacier polynya	01/08/07
Massom R	ABC-Radio Afternoon (Darwin) Drive (Hobart)	Large chunk of Wilkins ice shelf starting to collapse	26/03/08
Massom R	ABC-Radio Drive (Melbourne)	Wilkins ice shelf breakaway	27/03/08
McInnes K	Geelong Advertiser	Planning to protect against wild climate	30/07/07
McMinn A	ABC Radio-Statewide Mornings	Trials of the aircraft route to Antarctica to commence	16/10/07
McMinn A	The Australian	World first Antarctic lessons	28/11/07
McMinn A	ABC Radio (NthTas)	New masters of Antarctic science course to commence at UTAS	11/06/08
Nicol S	The Age	Researching earth's frozen end (in 'all about science' produced by the age	13/08/07
Nicol S	Canberra Times	Antarctica: frozen in time photographic exhibition at parliament house, Canberra	20/08/07
Nicol S	Sydney Morning Herald	Ecologists fear huge rise in krill catch	05/11/07
Rintoul S	Radio National (syndicated to RN in all capital cities) The Science Show	Scientific research undertaken on v3 aurora australis in Southern Ocean and east Antarctica	14/06/08
Rintoul S	Southern Cross TV Tas Nightly News	Using southern elephant seals to gauge Antarctic climate	07/08/07
Rintoul S	Launceston Examiner	Tasmanian scientists part of international team unearthing the habits of southern elephant seals	08/08/07
Rintoul S	Canberra Times	Ocean current discovered	18/08/07
Rintoul S	ABC Channel 2 –News (C' berra) & (L'ton)	French scientists gathering info on how Southern Ocean is affecting climate change	22/11/07
Rintoul S	ABC2 (Brisbane) Australia Wide , ABC (Adelaide) News	15-year study off french Antarctic ship reveals less CO_2 absorption in Southern Ocean	23/11/07
Rintoul S	Southern Cross TV (Hobart) Nightly News	Joint Aus-French-US research program in Southern Ocean	18/02/08
Rintoul S	Barrier Daily Truth NSW Broken Hill	New ocean-climate links	19/02/08
Rintoul S	Hobart Mercury	Polar winds may be to blame	19/02/08
Rintoul S	Sunday Tasmanian	Aurora's light on the ocean	23/03/08
Rintoul S	ABC2 (Brisbane) Australia Wide	Late season Antarctic voyage heads for the Southern Ocean	24/03/08
Rintoul S	ABC-TV News (Hobart & Launceston, WIN TV, Southern Cross News	Scientific expedition to Southern Ocean finds further evidence of ocean changes	17/04/08
Rintoul S	ABC The World Today	Warm ocean waters melt Antarctic ice	18/04/08
Rintoul S	Reuters online	Freshening of deep Antarctic waters worries experts	18/04/08
Rintoul S	The Australian	Deep Antarctic waters freshening	18/04/08
Rintoul S	ABC News	Antarctic ocean less salty, less dense: scientist	18/04/08
Rintoul S	Herald Sun	Deep Antarctic waters freshening	18/04/08
Rintoul S	ABC2 (Brisbane) Australia Wide, ABC Radio (Hobart) Statewide Mornings	Southern Ocean plays an influential role in the climate of the Earth.	18/04/08

Staff name	Agency	Story	Date
Rintoul S	The Age	Antarctic waters worry climate experts	19/04/08
Rintoul S	7:30 Report (Tas)	Satellite tagged seals shed light on climate change	28/04/08
Rintoul S	DIISR Newsletter	World's largest investigation of the Southern Ocean	01/05/08
Rintoul S	Newscientist.com	Antarctic sticks out huge annual ice 'tongue'	24/06/08
Rintoul S	New Scientist (print)	Giant icy tongue	28/06/08
Rintoul S	ABC1(Melb)-TV7:30 Report	Changes in the deep ocean around Antarctica	28/04/08
Tilbrook B	CMAR Marine Research: online	Ocean sampling resumes to pinpoint CO_2 sponge	22/11/07
Tilbrook B	Seven Local News-TV Seven Bundaberg	Escalating acid levels in oceans around the world	13/03/08
Trull T	Sydney Morning Herald	Time to pipe up on climate: earth, heal thyself	27/09/07
Trull T	The Age	Pipe dream to help planet	08/10/07
van Ommen T, Curran M	West Australian	Measuring the planet from the Antarctic	02/02/08
van Ommen T	ABC Radio (Canberra) Drive	Ice core drilling and research in Antarctica	20/08/07
van Ommen T	Canberra Times	Aus science festival messages from the past: what ice cores can tell us about climate change	20/08/07
van Ommen T	Radio National (Sydney) The Science Show	Understanding climate through ice core analysis	15/12/07
van Ommen T	Sydney Morning Herald	Icy work may hold key to a brighter future	19/01/08
van Ommen T	Sunday Age	Life at the end of the earth	20/01/08
van Ommen T	The Age	Antarctic melt may outstrip prediction	21/01/08
van Ommen T	ABC Radio (Hobart) Drive	First scientists use new Antarctic airlink for summer scientific research	21/01/08
Van Ommen T, Curran M, Frankel B	Good Weekend Magazine Sydney Morning Herald/Age	Ice diaries	08/03/08
van Ommen T	Sydney Morning Herald	Antarctic research sheds light on rainfall in southwest Aus	05/10/07
van Ommen T	The Age online	A place from which to take the measure of the planet	19/01/08
van Ommen T	The Age	Scientists drill into the ice to extract the weather from the past	19/01/08
Worby A, Nicol S	Canberra Times	Antarctic study shows climate change going in for the krill	20/06/08
Worby A, Nicol S	Hobart Mercury, Launceston Examiner	Experts fear for whales' future	20/06/08
Worby A	ABC Radio (Hobart), ABC2 (Brisbane) Aust-wide, ABC-TV Hobart &, Launceston-Nightly News, Southern Cross Tas Nightly News, WIN Hobart -News	Aurora australis heads for the Antarctic with scientists from around the world on board	30/08/07
Worby A	Canberra Times	Bid to unlock mystery frozen in time.	30/08/07
Worby A	ABC Radio (Sydney) Evenings	Current conditions on SIPEX in the Southern Ocean heading to Antarctica. Eighty six scientists on board investigating how changes to the physical environment impact on the biological environment.	04/09/07
Worby A	Radio National PM (Canberra)	Progress on international expedition underway in Southern Ocean	19/09/07
Worby A	Planet Ark online	Australia uses lasers to check Antarctic sea-ice	21/09/07
Worby A	ABC Radio (Sydney) Evenings	On board aurora australis – in very heavy ice but not marooned	28/09/07
Worby A	Canberra Times	Halfway there and exploration's just at the tip of the Antarctic iceberg	10/10/07
Worby A	ABC News online	Scientists collect Antarctic climate change data: scientists keeping eye in sky on ice	17/10/07
Worby A	Antarctic Treaty Secretariat (ATS) site Online News	Sea-ice from every possible angle	19/11/07
Worby A	Australian	New satellite images bring Antarctic closer	04/12/07
Worby A, Nicol S	AAP Newswire	Study: climate change threat to whales	19/06/08
Worby A	ABC-Radio C'berra Mornings	Discusses research findings: less sea-ice effect on krill	19/06/08
Zicus S	WIN (Hobart) News	Two Tasmanian teachers join more than 80 scientists on voyage to explore ice zone in Antarctica	20/08/07

Staff resources

Staff Name	Total time	AME	CO2	CVC	POL	SLR	Rsch Total	Educ'n	Comml'n	Admin
Australian Antarctic Division - In kind										
I Allison	65%	5%		25%		30%	60%		5%	
J Anderson	85%					80%	80%		5%	
I Ball	20%	20%					20%			
R Brand	45%			22%		23%	45%			
A Constable	75%	70%					70%		5%	
M Craven	85%			45%		40%	85%			
M Curran	85%			85%			85%			
A Davidson	50%	25%	25%				50%			
A Elcheikh	60%			30%		30%	60%			
L Emmerson	20%	20%					20%			
J Gedamke	20%	20%					20%			
P Heil	80%	20%		60%			80%			
G Hosie	10%	10%					10%			
G Hyland	60%			30%		30%	60%			
A Jackson	20%				20%		20%			
T Jarvis	60%	60%					60%			
S Kawaguchi	55%	55%					55%			
R Leaper	30%	30%					30%			
R Massom	90%	15%		70%			85%		5%	
V Morgan	30%			23%		7%	30%			
A Moy	55%			55%			55%			
S Nicol	50%	50%					50%			
J Pedro	10%			10%			10%			
B Raymond	50%	50%					50%			
M Richardson	80%			40%		40%	80%			
J Roberts	85%			15%		70%	85%			
T Robertson	5%	5%					5%			
B Smith	45%			45%			45%			
C Southwell	15%	15%					15%			
A Steer	80%	25%		55%			80%			
D Thost	40%			20%		20%	40%			
T Van Ommen	80%			50%		25%	75%		5%	
R Warner	85%			25%		60%	85%			
A Worby	85%	25%		55%			80%		5%	
S Wright	45%	45%					45%			
N Young	85%			10%		70%	80%		5%	
	1940%	**565%**	**25%**	**770%**	**20%**	**525%**	**1905%**	**0%**	**35%**	**0%**
Australian Bureau of Meteorology - In kind										
N Adams	50%			45%			45%		5%	
O Alves	5%			5%			5%			
G Brassington	20%			20%			20%			
D Greenslade	5%			5%			5%			
P Reid	100%			95%			95%		5%	
E Schulz	20%			20%			20%			
X Zhou	70%			70%			70%			
F Tseitkin	70%			70%			70%			
Total	**340%**	**0%**	**0%**	**330%**	**0%**	**0%**	**330%**	**0%**	**10%**	**0%**

Staff Name	Total time	AME	CO2	CVC	POL	SLR	Rsch Total	Educ'n	Comml'n	Admin
CSIRO Division of Atmospheric Research - In kind										
T Hirst	6%			6%			6%			
I Macadam	5%					5%	5%			
M Bi	9%					9%	9%			
K McInnes	6%					6%	6%			
S Farrell	24%			12%		12%	24%			
I Smith	6%			6%			6%			
M Collier	15%			15%			15%			
Total	**71%**	**0%**	**0%**	**39%**	**0%**	**32%**	**71%**	**0%**	**0%**	**0%**
CSIRO Division of Marine Research - In kind										
N Bindoff	50%			50%			50%			
K Berry	4%		4%				4%			
E Butler	49%		49%				49%			
J Church	70%			15%		55%	70%			
R Coleman	20%					20%	20%			
L Clementson	2%		2%				2%			
B Griffiths	54%		54%				54%			
V Latham	15%		15%				15%			
S Rintoul	56%			51%			51%		5%	
B Tilbrook	45%		45%				45%			
T Trull	50%		50%				50%			
N White	56%					56%	56%			
Total	**471%**	**0%**	**219%**	**116%**	**0%**	**131%**	**466%**	**0%**	**5%**	**0%**
University of Tasmania - In kind										
N Bindoff	25%			20%		5%	25%			
R Coleman	10%			5%			5%	5%		
L Forbes	5%		5%				5%			
R Hall	10%				10%		10%			
M Haward	38%				23%		23%	15%		
M Hazelwood	15%						0%	5%		10%
M Hindell	5%						0%	5%		
J Jabour	50%				25%		25%	20%	5%	
A Kellow	10%				10%		10%			
L Kriwoken	10%				10%		10%			
P Lawrence	5%				5%		5%			
G Lugten	15%				15%		15%			
A McMinn	45%	20%					20%	20%	5%	
K Michael	50%			25%			25%	25%		
P Virtue	15%							15%		
K Miller	5%							5%		
P Haddad	5%							5%		
T Trull	30%		20%				20%	10%		
Total	**348%**	**20%**	**25%**	**50%**	**98%**	**5%**	**198%**	**130%**	**10%**	**10%**
Australian National University - In kind										
K Lambeck	15%					15%	15%			
J Zhao	3%					3%	3%			
T Purcell	12%					12%	12%			
P Tregoning	5%					5%	5%			
Total	**35%**	**0%**	**0%**	**0%**	**0%**	**35%**	**35%**	**0%**	**0%**	**0%**

Staff Name	Total time	AME	CO2	CVC	POL	SLR	Rsch Total	Educ'n	Comml'n	Admin
NIWA - In kind										
P Boyd	10%	10%					10%			
H Bostok	10%			10%			10%			
S Nodder	10%		10%				10%			
M Williams	25%			20%		5%	25%			
Total	**55%**	**10%**	**10%**	**30%**	**0%**	**5%**	**55%**	**0%**	**0%**	**0%**
TOTAL In kind	**3260%**	**595%**	**279%**	**1335%**	**118%**	**733%**	**3060%**	**130%**	**60%**	**10%**
Cash Funded Staff University of Tasmania										
L Armand	75%		75%				75%			
K Bidwell	85%						0%			85%
A Bowie	100%		100%				100%			
S Bray	100%		100%				100%			
D Davies	80%		80%				80%			
W Howard	100%	10%	35%	50%			95%		5%	
J Hunter	100%					95%	95%		5%	
T Jakszewicz	75%						0%		75%	
C le Goy	100%						0%		25%	75%
J Lieser	100%			100%			100%			
B Joseph	75%						0%			75%
B Mapstone	100%	5%	5%	5%	10%	5%	30%	5%	30%	35%
K Meiners	100%	85%				15%	100%			
M Mongin	100%		100%				100%			
C Moy	40%		15%	25%			40%			
T O'Kane	12%			12%			12%			
B Pasquer	100%	90%	10%				100%			
K Maloney	100%						0%		10%	90%
T Remenyi	100%		100%				100%			
L Robertson	18%		18%				18%			
M Rosenberg	95%		25%	70%			95%			
R Sandford	100%				95%		95%		5%	
J Tyler	46%						0%			46%
E van Wijk	80%				80%		80%			
G Williams	40%	40%					40%			
S Zicus	50%						0%	5%		45%
Total	**2071%**	**230%**	**663%**	**262%**	**185%**	**115%**	**1455%**	**10%**	**155%**	**451%**
Cash Funded Staff CSIRO Division of Atmospheric Research										
I Macadam	5%					5%	5%			
K McInnes	6%					6%	6%			
T Elliott	3%		3%				3%			
M Dix	2%			2%			2%			
S O'Farrell	44%			32%		12%	44%			
Total	**60%**	**0%**	**3%**	**34%**	**0%**	**23%**	**60%**	**0%**	**0%**	**0%**
Cash Funded Staff CSIRO Division of Marine Research										
K Paterson	32%		32%				32%			
C Rathbone	9%		9%				9%			
S Sokolov	61%			61%			61%			
Total	**102%**	**0%**	**41%**	**61%**	**0%**	**0%**	**102%**	**0%**	**0%**	**0%**

Staff Name	Total time	AME	CO2	CVC	POL	SLR	Rsch Total	Educ'n	Comml'n	Admin
Cash Funded Staff Australian National University										
D Fouracre	20%					20%	20%			
A Krayshek	8%					8%	8%			
G Estermann	50%					50%	50%			
Total	**78%**	**0%**	**0%**	**0%**	**0%**	**78%**	**78%**	**0%**	**0%**	**0%**
TOTAL CASH	**2311%**	**230%**	**707%**	**357%**	**185%**	**216%**	**1695%**	**10%**	**155%**	**451%**
TOTAL IN KIND & CASH	**5571%**	**825%**	**986%**	**1692%**	**303%**	**949%**	**4755%**	**140%**	**215%**	**461%**