Executive summary of ACE implementation plan

- A 11-person steering committee is proposed to include a range of expertise sufficient to lead the programme.
- Six sub-committees are being established to implement the science programme. Membership of these committees allows ACE to widen involvement in the programme in terms of expertise, gender and nationality.
- ACE steering committee officers have a 3-year term of office (co-Chairs will stand down in 2008). The sub-committee structure of ACE allows future involvement in the steering committee from a wide-range of scientists.
- A website has been constructed to inform the public, media, schools and colleges, and scientists about the progress of the project (www.ace.scar.org).
- ACE has already established a strong record of publishing scientific findings in peer-reviewed journals (e.g. papers in *Nature* and *Geology*, plus special issues of *Global and Planetary Change*, vol. 45, 2005, and *Palaeogeography, Palaeoclimatology, Palaeoecology*, vol. 198, in press). An edited book on ACE is being planned for publication in 2007.
- A timetable of activity has been defined, and dates/locations of forthcoming meetings have been coordinated with major international symposia.
- Plans for outreach, education and data management are in line with SCAR advice.

Approach to implementation

We propose that the ACE Scientific Research Programme be led by a steering committee of 10-12 persons. The committee would meet formally at least once a year, and conduct the rest of its business either remotely or when the majority of committee members are present at international symposia. Members will serve for a 3-year term, with the possibility of extension depending on contribution and performance. We propose that Martin Siegert and Robert Dunbar be identified as co-Chairs, to be replaced in 3 years time. The steering committee (membership of which is detailed below) has a wide knowledge of thematic issues and has appropriate regional (field), technical and logistical experience.

Committee

The following persons are nominated as the initial steering committee of ACE.

Martin J. Siegert – University of Bristol, UK	co-chair
Robert B. Dunbar – Stanford University, USA	co-chair
Robert M. DeConto – University of Massachusetts, USA	media and website
Fabio Florindo – Istituto Nazionale di Geofisica e Vulcanologia, Italy	secretary
Damian Gore - Macquarie University, Australia	
Carlota Escutia – University of Granada, Spain	
Robert Larter – British Antarctic Survey, UK	
Tim Naish – Institute of Geological and Nuclear Sciences, New Zealand	
Ross D. Powell – Northern Illinois University, USA	
Sandra Passchier – National Geological Survey, The Netherlands	
Gary Wilson – University of Otago, New Zealand	

Function of the programme and subcommittees

The central function of ACE is to coordinate the integration of improved geological data and Antarctic palaeoclimate modeling for a series of time periods from the onset of glaciation around the Eocene-Oligocene boundary 34 Ma ago, to the last glacial maximum (LGM) and the establishment of the present ice sheet configuration. Six subcommittees have been set up to coordinate scientific work within these timeframes. The sub-committee names, and their current chairs, are as follows:

LGM-Holocene	Chair: Tony Payne (UK)
Pleistocene	Chair: Tim Naish (NZ)
Middle Miocene-Pliocene	Chair: Alan Haywood (UK)
Oligocene-Miocene	Chair: Rob DeConto (USA)
Eocene/Oligocene	Chair: Jane Francis (UK)
Radio-Echo Sounding:	Chair: Detlef Damaske (Germany)

Terms of reference for sub committees

The sub-committees provide the overall leadership, direction and management for their respective topics. The main functions of the committees are to:

- Develop and implement an action plan.
- Encourage and facilitate communication and collaboration among research scientists working on any aspects of Antarctic climate evolution pertinent to the respective topic.
- Ensure that activities of the committee are communicated and wherever possible, integrated with those of other time-based themes, modelling themes and process-based themes of the ACE programme.
- Investigate, develop and exploit avenues for future funding in support of ACE objectives.
- Advise the research community on the types of geoscience data required for palaeoclimate modelling and effective model-data intercomparison, and the critical locations for which such data are needed for the time periods listed.
- Provide advice/assistance as needed on technical issues related to geoscience field and laboratory programmes and to palaeoclimate modelling studies pertinent to the time periods listed.
- Promote data access and data sharing (and data-contributions to the SDLS, Antarctic data centres, and World Data Centres [WDC]) to facilitate and expedite data syntheses needed for developing new field programmes and enhancing palaeoclimate models.
- Summarize and report the results of these efforts to the scientific and wider community on an ongoing basis at workshops and symposia.
- Contribute to formal reporting that will be presented to SCAR every two years.

LGM-Holocene ACE sub-committee

Rationale: The ice sheets of Antarctica were so much larger at the last glacial maximum (LGM, ~21,000 years) than today that global sea level dropped by around 20 m. The ice sheets at the LGM left a wealth of geological data, which can be used to constrain, validate and test numerical ice-sheet/climate models. Such work is critical to evaluating the evolution and stability of the present ice sheet. There are many questions to be answered with respect to the ice sheet configuration and flow at and after the LGM. The keys to answering the questions are (1) to enhance the

sophistication of the models, and (2) to integrate geological data on past ice sheet and climate conditions with model output. The LGM-Holocene sub-committee will facilitate the co-ordination of research agendas in the following areas:

- Numerical modelling of the Antarctic ice sheet with special application to the causes of grounding-line evolution during deglaciation.
- The use of Earth-System models (in particular, coupled ocean-atmosphere GCMs) to understand climate change in the circum-Antarctic region from the LGM onwards, and the implications of these changes for the ice sheet.
- The integration of the on-shore and off-shore geomorphological records of ice thinning and grounding-line retreat.
- The integration of long-term sea-level records with inverse geophysical modelling to constrain mass loss from Antarctica.
- The development of high-resolution palaeo-climate records from ice cores and deep-sea cores from the Southern Ocean, and the development of a consistent chronology to link individual records.

The sub-committee will focus attention on the following open research questions: Has grounding-line retreat stopped? Can present-day changes be attributed to on-going retreat? How synchronous was deglaciation in the various sectors of the ice sheet? To what extent does the geomorphology reflect local rather than regional effects? What caused deglaciation? Can high-resolution chronologies be used to distinguish between the effects of sea-level rise and accumulation-rate change? What is the role of ice streams in controlling the rate of grounding-line retreat and volume loss? To what extent are ice streams transients features within the ice sheet and what are the controls on their long-term dynamics? What was the contribution of the ice sheet to eustatic sea-level rise and how was this contribution distributed spatially and temporally?

The sub-committee will convene dedicated sessions at relevant international scientific conferences such as the AGU, EGU, INQUA and IGS; making research grant proposals to the relevant national funding agencies with particular reference to the forthcoming IPY; and jointly co-writing a chapter reviewing modelling and observational literature for the LGM-Holocene as part of a dedicated ACE edited volume. The sub-committee will meet occasionally, primarily during larger international conferences and will seek funds from ACE itself to facilitate this.

The sub-committee as expertise in: the numerical modelling of ice sheets and palaeo-climate; ice and deep-sea sediment core records; on-shore and off-shore geomorphology; and sea-level records and modelling.

Committee Membership: Tony Payne (Chair, UK); Philippe Huybrechts (Belgium); Catherine Ritz (France); David Pollard (US); Colm O'Cofaigh (UK); Mike Bentley (UK); Howard Conway (US); Eric Wolff (UK); Glenn Milne (UK); Rob Dunbar (US)

Pleistocene ACE sub-committee

Rationale: Studies of Antarctic ice cores show that Pleistocene climate variability between hemispheres has occurred out of phase. This variability raises questions about the response of the southern high latitudes to external climate drivers, such as orbital insolation, solar variability, and internal amplifiers such as thermohaline circulation and carbon-cycle changes that operate at both Milankovitch and millennial-decadal time scales. Answers to these questions will improve our understanding of the vulnerability of the ice sheet during Pleistocene climatic optima and its potential impact on (1) global thermohaline circulation as a southern source of melt water discharge, and (2) sea level rise well beyond the present sea level stand. The Pleistocene sub-committee will facilitate Antarctic and global environmental research investigating:

- The interval of Late-Pliocene global cooling co-incident with development of a bi-polar cryosphere (*working jointly with the Mid-Miocene Pliocene sub-committee*).
- The period of Mid-Pleistocene reorganisation of the climate system (1.0-0.4 Ma) – Mid-Pleistocene Climate Transition (MPCT).
- Major glacial terminations and super-interglacial periods (e.g. marine isotope stages 31, 11, 9 and 5) of extreme climatic warmth.

The primary focus of this sub-committee is to provide new knowledge of the role the Antarctic in the bi-polar cryosphere. It will take an integrated approach which combines atmospheric (ice core), proximal marine (SHALDRILL, ANDRILL, ODP), distal deep marine (ODP), and far-field seal-level (Wanganui Basin, Huon Peninsula etc.) records to provide boundary conditions and constraints for Earth system and climate modelling studies. In particular the committee is interested in the influence of Pleistocene Antarctic ice cover on global sea-level and ocean circulation. To achieve these scientific ambitions the committee will:

- Integrate existing datasets with new proximal datasets from EPICA, SHALDRILL, ANDRILL and ODP/IODP to determine ice sheet/shelf responses to climate forcing, including variability at a range of temporal scales (10^2-10^4 years), and possible collapses.
- Relate Antarctic ice variability to thermohaline circulation as expressed by variations in abyssal Pacific inflow along eastern New Zealand to the Pacific Ocean (ODP Leg 181 datasets)
- Synthesise global proxy data for key climatic transitions (Late Pliocene, Mid-Pleistocene, Late Pleistocene termination-interglacial)
- Undertake numerical modelling studies of ice sheet dynamics and global climate for these transitions

Committee Membership:
Tim Naish (NZ Chair); Lionel Carter (NZ); Eric Wolff (UK); Andrew Mackintosh (NZ); Ross Powell (US); Rainer Gersonde (Germany); Gary Clarke (Canada); John Chappell (AUS); Stuart Henrys (NZ); Reed Scherer (US); David Pollard (US); Ian Hall (UK).

Middle Miocene-Pliocene ACE sub-committee

Rationale: The middle-to-late Miocene period represents a time of significant ice sheet expansion in Antarctica. The sea stable isotope record shows a mid-Miocene "climatic optimum" centred at about 15 Ma, followed by strong enrichment of oceanic $\delta^{18}O$ over the next 6 Ma. It is during this interval that East Antarctic glacial ice is thought to have evolved into a major and permanent ice sheet. The Pliocene Epoch is a critical time for understanding the nature of the Antarctic ice sheet as IPCC projections of global temperature rise suggest that we will exceed Pliocene levels within the next hundred years. Of key importance in this time interval is the timing of the transition of the EAIS from a polythermal, dynamic condition to a predominantly cold stable state. Two opposing and vigorously defended views prevail. The long-standing view is that the EAIS became stable in mid-Miocene time, evidence of which is primarily from the longevity of the landscape and well-dated surfaces and ash deposits in the Dry Valleys region along the western border of the Ross Sea. Another controversial view is that terrestrial glacial deposits, known as the Sirius Group, scattered through the Transantarctic Mountains, indicate dynamic ice sheet conditions as recently as Pliocene time. The Mid Miocene and Pliocene ACE sub-committee will facilitate Antarctic and global environmental research investigating:

- The period of middle Miocene cooling
- The period of late Miocene cooling
- Pliocene warm periods
- The Pliocene - Pleistocene transition (*working jointly with the Pleistocene sub-committee*).

In particular the committee will co-ordinate and input relevant research activities for the Neogene from the British Antarctic Survey core programme GEACEP (Greenhouse to Ice-house Evolution of the Antarctic Cryosphere & Palaeoenvironment). These efforts will include:

- New data acquisition from the Ross Sea region as well as the Antarctic Peninsula in general.
- Data synthesis of global proxy climate and environmental data for the Mid Miocene, Late Miocene, Pliocene and the Plio-Pleistocene transition.
- Earth System Modelling studies for the Mid and Late Miocene cooling, Pliocene warming and the Plio-Pleistocene transition.

Provisional Committee:
Alan Haywood (UK); John Smellie (UK); Allan Ashworth (USA); Paul Valdes (UK); Sandra Passchier (the Netherlands); Carrie Lear (UK); David Cantrill (Sweden).

Oligocene-Miocene ACE sub-committee

The Oligocene-Miocene boundary marks a significant transition in the development of the Antarctic cryosphere, where small dynamic ice sheets of the late Oligocene rapidly expanded to continental scale in the early Miocene. Sediment cores recovered in Western Ross Sea indicate orbital modulation of the ice sheet during the transition. It is argued that the transition occurred as a consequence of a unique set-up of orbital parameters during an interval of declining CO_2 that led to a prolonged period of cold summer orbits, during which time a large ice sheet established. The main functions of the committee are to develop and implement environmental research investigating:

- The Eocene-Oligocene climate transition and earliest Oligocene glaciation.
- The nature and timing of Oligocene ice sheet variability.
- The response/role of Antarctica in possible Late Oligocene global warming.
- Transient cooling events including the Mi1 glaciation.
- The nature of early Miocene ice sheet variability.
- The Mid-Miocene Climate Optimum (MCO) and it's signature in Antarctica.
- Mid-Late Miocene cooling and stepped ice volume increase (*working jointly with the Miocene-Pliocene sub-committee chaired by Dr Alan Haywood*).

Emphasis will be placed on understanding Antarctica's role in (and response to) fundamental climate transitions and ephemeral events through the late Paleogene and early Neogene. This will be accomplished through the synthesis of newly acquired data from Antarctic field investigations with data from ongoing deep sea drilling expeditions and sequence stratigraphic reconstructions of eustasy. These synthesized data will be integrated into numerical modelling studies to 1) test data-driven hypotheses, 2) explore the envelope of climate-cryosphere behavior in response to specific forcings, and 3) to explore possible mechanisms and feedbacks responsible for the dramatic Antarctic and global environmental changes recognized in Paleogene and Neogene proxy climate records.

Committee Membership: Robert DeConto (chair) USA; David Pollard (proposed) Penn State University, USA; Matthew Huber (proposed), USA; Steve Pekar, USA; David Harwood (proposed), USA; Catherine Stickley (proposed), UK; Katarina Billups, USA. Members from other nations are TBA.

Eocene-Oligocene ACE sub-committee

Rationale: The Eocene-Oligocene interval was a critical time in Antarctica's geological history because it involved a fundamental climate change that saw the end of the Mesozoic greenhouse

(ice-free) climate and the birth of our present icehouse world. The Eocene climate record in Antarctica is represented by sediments and fossils, including rich assemblages of fossil plants, that signal warm temperate climates to latitudes as high as ~65-70°S 50 million years ago. By the latest Eocene climates had cooled and ice formed at sea level in Antarctica, as shown by glacial sediments. The ice sheets expanded as the Oligocene climate cooled further. The programme of activity will include the following:

- Compilation of data on existing Eocene and Oligocene geological proxies for climate from Antarctica. Time intervals of interest include: (1) Early Eocene peak greenhouse warmth; (2) Latest Eocene-Oligocene onset of glaciation; (3) Oligocene climate cooling.
- Interpretation of palaeoclimate for this interval from proxy data
- Analysis of global linkages, particularly from the marine isotope record.
- Publication on Eocene-Oligocene climates of Antarctica and global links
- Comparison with climate-vegetation model outputs

Provisional Committee:
Jane Francis (UK); Sergio Marenssi (Argentina); Vanessa Thorn (NZ); Mike Hambrey (UK); Jim Zachos (USA); Henk Brinkhuis (the Netherlands), Barbara Mohr (Germany).

Radio-echo sounding ACE sub-committee

Rationale: Radio-echo sounding is critical to the ACE programme in that it provides data on subglacial topography and conditions, which are essential to models of the ice sheet. RES data also provide information on internal ice sheet layering which can also be used to validate ice sheet models and investigate flow and accumulation conditions during the Pleistocene. RES can also offer information about ancient landscapes, which is relevant to ice sheet history over much longer timescales. Several significant regions of Antarctica have yet to be surveyed using RES. Such data gaps lead to fundamental problems in ice sheet model boundary conditions. These gaps lie predominantly in the Antarctic interior, where field logistics are difficult to coordinate.
The IPY may be used to stimulate data acquisition in these areas. Existing proposals such as GigaGAP and ICECAP are in an advanced stage of development. The ACE-RES subcommittee will act to encourage the use of RES in Antarctica and bring together new RES projects to coordinate activities. The outcome of this sub-group will be to complete the RES coverage of the ice sheet, and supply information to the Antarctic ice sheet modelling community. The action plan, to be developed over the summer 2006, includes the following:

- Establish an up-to-date overview of RES surveys.
- Develop a simple questionnaire to be sent to all possible scientists holding RES data acquired after the last SCAR-BEDMAP update.
- Update BEDMAP if possible (renew the BEDMAP initiative within SCAR).
- Check all IPY proposals with regard to RES. Establish contact to these groups - keep track on these activities.
- Distribute information on RES surveys to the community to establish contacts between scientist acquiring RES data, and to make the data available to ice-sheet modellers.

Provisional Committee:
Detlef Damaske, Germany; Ian Allison (Australia); Don Blankenship (USA); Robert Bindschadler (USA) (for IPY Mass Balance); Sun Bo (China); Heinz Miller (Germany)(for IPY Traverses); Shuji Fujita (Japan); Ignazio Tabacco (Italy); David Vaughan (UK)

Data management

Successful development, testing and refinement of palaeoclimate models depend on the accessibility of relevant observational data. Therefore ACE will encourage responsible archiving of data and samples to established data centres and repositories. Furthermore, through its website, ACE will establish a directory of such data centres and repositories to help researchers locate the data they need. ACE will also foster continued development of the Antarctic Data Library System for Cooperative Research (SDLS), which was set up under the former SCAR-ANTOSTRAT project. The SDLS now contains most of the processed data from marine multichannel seismic surveys that have been carried out around Antarctica.

ACE and the International Polar Year (IPY)

The IPY provides a unique opportunity to plan, fund and undertake international collaborative research in the polar regions. By the time of IPY (2007-8), the ACE programme will be fully functioning. It is therefore highly appropriate that ACE, as an existing major international Antarctic research programme, seeks to become involved in IPY research in order to fulfil the ambition of this intense period of investigation. ACE has been acknowledged as a potential IPY core programme, following assessment of our 'expression of intent'. ACE is in the process of forming a full IPY proposal to be submitted on 30th June 2005.

Links to other SCAR programmes

ACE has formal links with three other SCAR SRP proposals. The first is Subglacial Antarctic Lake Environments (SALE), the second is Antarctica and the Global Climate System (AGCS) and the third is Evolution and Biodiversity in Antarctica (EBA).

ACE and SALE will interact in three ways. First, the palaeoclimatic record contained in subglacial lake sediments will provide important new information from the interior of the continent. ACE and SALE will collaborate on the acquisition of such records. Second, the ice sheet history quantified through numerical modelling as part of the ACE programme will offer important constraints on the formation and development of subglacial lake environments. ACE will provide SALE with model results in order for the history of subglacial lakes to be established in the context of ice sheet and climate evolution. Third, the radio-echo sounding exploration of Antarctica planned by ACE will uncover the locations of subglacial lakes and the basal ice sheet conditions that govern their existence. We will provide SALE with such information to assist the planning of subglacial lake exploration.

Investigating Antarctic history over glacial-interglacial periods is appropriate to the study of both modern and ancient environments. ACE and AGCS aim to investigate this history as a component of much broader and distinct science plans. Further, each SPPG has compatible yet discrete specialisms that are well suited to studying the glacial-interglacial history of Antarctica. ACE contains expertise in ice-sheet/climate modelling, marine and terrestrial geology, marine geophysics and radio-echo sounding. AGCS includes expertise in atmospheric modelling and ice coring. This combined expertise covers the full suite of knowledge required to build a sub-committee on the Pleistocene history of Antarctica.

ACE and EBA have mutual interests in understanding past environments. For ACE such work is central to its programme of work. For EBA it is critical to evaluate how and why the present distribution and form of biota exists in Antarctica. Palaeoclimate information, collected and modelled through ACE will be made available to EBA. Members of EBA have been contacted; we are still waiting to hear from this SCAR programme. Members of EBA will be encouraged to attend

ACE meetings to discuss results and inform the ACE community about the various inputs the EBA programme requires.

Links to other international programmes

ACE has relevance to several major international programmes. In particular several members of the ACE programme are also involved in the Antarctic Drilling Programme, ANDRILL. ANDRILL aims to acquire sedimentary records of past climate change from a variety of locations around the Antarctic Continent. ACE is able to support ANDRILL by offering small funds to assist with meetings, and helping the integration of numerical modelling and geological data. In addition, ACE has good connections with the science programme of the European Project for Ice Coring in Antarctica (EPICA). ACE can assist EPICA by facilitating comparison, integration and modelling of EPICA (and other ice coring) results with palaeoclimatic data from other sources (e.g. marine and lake sediment cores and terrestrial geological records). In particular, ACE can serve as a means by which the ANDRILL, EPICA and ice sheet modelling communities may integrate.

Outreach and education

ACE will endeavour to support and encourage the next generation of Antarctic scientists in three ways. First, an online lecture series paralleling the findings and outcomes of the ACE programme will be made available to schools, colleges, universities, and natural history museums via the ACE website (www.ace.scar.org). These lecture materials will comprise downloadable power-point presentations, and will match ACE's scientific programme. Second, we will encourage young scientists to take part in ACE workshops by offering bursaries for travel and subsistence. Although the level and number of the bursaries will be dictated by funds available, it is hoped that at least two bursaries will be available for each workshop/meeting. The condition of each bursary will be a report by the holder about their research and workshop experiences, which will be posted on the ACE website. Third, we will facilitate an exchange scheme between our respective institutions to allow young scientists to take part in fieldwork and to sample the research culture of other nations. Similar schemes operate within, for example, the Worldwide University Network, and it is anticipated that external funds (from such schemes) will be used to support the exchanges arranged through ACE.

ACE will liaise with the SCAR office to ensure effective communication and outreach, as set out in the 'SCAR Communications Plan' and 'A Strategy for Capacity Building and Education'.

Symposia and workshops

Workshops and sessions to be organised by ACE include:

- Workshop on the use of ice sheet and climate modeling, Boston 2005-6.
- A session of Pliocene global warming will be convened at the Earth Systems Processes 2 meeting in Calgary, August 2005.
- Sessions on all the ACE sub-committee programmes will be convened at the International Symposium on Antarctic Earth Sciences (USA Santa Barbara, Sept. 2007).
- Paleogene-Neogene climate-ice sheet modelling workshop at the ANDRILL data integration meeting in New Zealand in 2007.

- An international research meeting on the Neogene and Antarctica at Cambridge, UK during the summer of 2008.
- Greenhouse-icehouse transition session at Fall AGU in 2008, focusing on the latest results from numerical climate, cryosphere, and ocean modelling studies

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Funding

Future applications for external funding of ACE activities will include:

- Work on the LGM will be funded initially through a UK-NERC application, organized by Tony Payne.
- Pleistocene work will be funded through applications to ANDRILL (both the McMurdo Ice Shelf Project in 2006-2007 and the Southern McMurdo Sound Project in late 2007), SHALDRILL, IODP, the NZ Marsden Fund and, possibly, IMAGES.
- Both Mid Miocene and Pliocene, and the Eocene-Oligocene work, will be the foci of a future proposal for ANDRILL drilling, aided by a proposed UK-NERC consortium grant.
- RES will be funded by a series of applications to national funding agencies, including the USA, UK and Germany. Much activity will be planned for the IPY period, 2007-9.

Timetable of activities

The tasks, deliverables and time-lines we envisage are outlined in Table 1. This should be viewed as a guide, as it is difficult to be prescriptive in charting future progress in research.

<table>
<tr><th>Themes</th><th>2005-6</th><th>2006-7</th><th>2007-8</th><th>2008-9</th><th>2009-10</th></tr>
<tr><td>Holocene/last glacial maximum/ and Pleistocene</td><td>Internal layers, ice flow and accumulation reconstruction.</td><td>Complete review of Antarctic ice sheet – ice shelf – Southern Ocean record</td><td>Review of data collected by IMAGES and ANDRILL projects.</td><td rowspan="2">Assess reviews of Quaternary and Pliocene in light of new data from S Ocean and sub-Ross IS core.

International meeting on the Neogene and Antarctica, Cambridge, summer 2008.</td><td rowspan="2">Publish state-of-the art report on data and modelling AIS history and behaviour from a perspective of both long term (10^3-10^6 years and short-term (1 to 10^2 years) climate change over the last 5 million years.</td></tr>
<tr><td>Pliocene</td><td>Continue review of sedimentary cores from Legs 178 and 188 (plus sediment cores from national programs).

Continue fostering IODP proposals for Wilkes Land and Ross Sea.

Earth Systems Processes 2 meeting in Calgary, August</td><td>Continue review of sedimentary cores from Legs 178 and 188.</td><td>Complete review of on-land and offshore record.

Revise IODP proposals for Wilkes Land and Ross Sea.

Develop proposals using SHALDRIL and ANDRILL technologies.

Convene session at ISAES, Santa Barbara USA</td></tr>
<tr><td>Middle Miocene</td><td>Continue review of sedimentary cores from Leg 188.

Continue fostering IODP proposals for Wilkes Land and Ross Sea</td><td rowspan="2">Complete review of offshore record – revise IODP proposals for Wilkes Land and Ross Sea.

Develop proposals using SHALDRIL and Cape Roberts (ANDRILL) technologies.</td><td>Revise IODP proposals for Wilkes Land and Ross Sea.

Convene session at ISAES, Santa Barbara USA</td><td rowspan="2">International meeting on the Neogene and Antarctica, Cambridge, summer 2008.

Assess reviews in light of new ANDRILL,</td><td rowspan="2">Publish state-of-the art report that includes new data from ANDRILL, SHALDRIL, IMAGES and IODP integrated with modelling AIS history and behaviour for the period from 50 to 10</td></tr>
<tr><td>Oligocene-Miocene boundary</td><td></td><td>Convene session at ISAES, Santa Barbara USA</td></tr>
</table>

Eocene-Oligocene	Continue review of sedimentary cores from Leg 188. Continue fostering IODP proposals for Wilkes Land and Ross Sea.	Paleogene-Neogene climate-ice sheet modelling workshop at the ANDRILL data integration meeting in New Zealand in 2007	Convene session at ISAES, Santa Barbara USA	SHALDRIL and IODP data. Greenhouse-Icehouse trans. Session at AGU-Fall meeting, Dec 2008	Ma ago.
Radio Echo Sounding	Analyse existing data to reveal internal layer structure of both ice sheets	Plan future exploratory research	Begin new surveys of East and West Antarctica, to fill data gaps. Convene session at ISAES, Santa Barbara USA	Continue surveys, and provide data to numerical ice sheet modeling community.	Continue surveys, and provide data to numerical ice sheet modeling community.

Table 1. Outline of tasks, deliverables and timelines for work to be carried out under the aegis of the ACE programme from 2005 to 2010.

Timetable of steering committee meetings

ACE plans to undertake steering committee meetings at the following dates/locations (many of which will take place around existing conferences).

2005

- August 2005, Aberystwyth, UK. International conference on glacial sedimentary processes and products. Co-sponsored by ACE.
- December 2005. San Francisco, USA. Fall Meeting of the American Geophysical Union.

2006

- July 2006, SCAR Open Science Meeting, Hobart, Australia
- December 2006. San Francisco, USA. Fall Meeting of the American Geophysical Union.

2007

- March 2007, steering committee meeting to coincide with the start of the IPY in order to coordinate activities during the IPY period. Location TBA.
- August 2007, 10th International Symposium on Antarctic Earth Sciences (ISAES X) University of California, Santa Barbara, USA.

2008

- July 2008, SCAR Open Science Meeting, St Petersburg, Russia.
- December 2008. San Francisco, USA. Fall Meeting of the American Geophysical Union.

Outputs to date

(a) Publications

Special issues of scientific journals:

Florindo, F., Cooper, A.K. and O'Brien, P.E. (Editors), 2003. Antarctic Cenozoic palaeoenvironments: geologic record and models. Palaeogeography, Palaeoclimatology, Palaeoecology, vol. 198, Issues 1-2, 1-278.

Florindo, F., Harwood, D.M., Wilson, G.S. (Editors), 2005. Long-term changes in Southern high-latitude ice sheets and climate: the Cenozoic history. Global and Planetary Change, vol. 45, 1-264.

Individual papers in scientific journals:

Barrett, P.J. 2003. Cooling a continent. Nature, 421, 221-223.

DeConto, R.M., Pollard, D. 2003a. Rapid Cenozoic glaciation of Antarctica triggered by declining atmospheric CO_2. *Nature*, 421, 245-249.

Taylor, J., Siegert, M.J., Payne, A.J., Hambrey, M.J., O'Brien, P.E., Leitchenkov, G., Cooper, A.K. Late Miocene/early Pliocene changes in sedimentation paths, Prydz Bay, Antarctica: changes in ice-sheet dynamics? *Geology*, 32, 3, 197-200. doi: 10.1130/G20275.1; 2 figures. (2004).

(b) Other Publications

Florindo, F., Dunbar, R., Siegert, M., DeConto, R., Barrett, P., Cooper, A., Escutia, C., Janecek, T., Larter, R., Naish, T., Powell, R. Antarctic Climate Evolution (ACE) Research Initiative. Terra Antarctica, 9, 127-132. (2003).

Siegert, M.J. Antarctic Climate Evolution: a new research initiative. The EGGS. Newsletter of the European Geophysical Society, issue #6, p17-23. 10 December 2003. (2003).

Sessions of international symposia

Antarctic Climate Evolution, AGU Fall meeting, 2002.

Antarctic Climate, Neogene Proxies, and Climate Modeling. AGU Fall meeting, 2004.

Long-term changes in Southern high-latitude ice sheets and climate, EGU, 2003.

Antarctic cryosphere and Southern Ocean climate evolution (Cenozoic-Holocene), EGU, 2005.

Forthcoming

International Conference on Glacial Sedimentary Processes and Products. University of Wales, Aberystwyth, 22 - 27 August, 2005.

(c) Brochures, posters, press/media articles and similar PR material

Posters and brochures for ACE have been designed, as has a logo, and these have been disseminated at numerous international conferences over the past four years.

(d) Creation of a web site

The ACE website is available at www.ace.scar.org