Antarctica New Zealand

2012 ANNUAL ANTARCTIC CONFERENCE

Looking to the Future

UC Geodome, Hagley Park 4-5 October 2012

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GENERAL INFORMATION

Map
There is a map of the Hagley Park Ice Station on the last page of this publication.

Audio Visual Information and Presenters
All presenters should provide their presentation to the staff at the AV desk either on a memory stick or laptop no later than the session before their own session (those in the first session should provide their presentations at the time of registration. This enables the presentations to be loaded onto the AV system during the break before the session.

Catering
Morning and afternoon teas will be provided at the back of the Geo Dome.
A map of suggested lunch venues has been included on the second to last page of this publication.

Cell Phones
You are kindly requested to have your cell phone turned off while in any of the conference sessions.

Conference Dinner
Date: Thursday 04 October 2012
Time: Seated by 7pm
Place: Cook 'n' with Gas
23 Worcester Boulevard
Christchurch

For those that registered for the dinner, please be at the venue prior to 7pm.
Unfortunately there are no additional tickets available for this dinner.

Email Facilities
Free Wi-Fi is available in the UC Geo Dome.

Name Badges
Admission of delegates to all sessions, morning and afternoon teas is by conference name badge only. Delegates are requested to wear their name badge at all times.

Car Parking
There is limited parking available at the Botanic Gardens Car Park. Please refer to the Ice Station Map for location. Alternatively, Christchurch City Council and Wilson Parking offer plenty of metered parking within walking distance of the Hagley Park Ice Station.

Posters
Posters are to be displayed in the UC Geo Dome. The posters and poster boards have been numbered. Please refer to the programme and display your poster on the relevant board. Suitable adhesive materials are available at the registration desk. Posters should be displayed at the first available opportunity and remain on display for the duration of the conference.

Poster presenters will have on minute to present a Power Point slide at a pre-determined session during the conference to introduce their posters. After this presentation, presenters are asked to stand by their posters during the poster viewing session to answer any questions. Please refer to the programme to find out which session you will be presenting your poster at.

Registration Desk
The conference registration desk is located at the entrance of the Geo Dome and will be staffed from 8am – 10.45am on Thursday 04 October. If you require assistance after this time please contact Dr Ed Butler 021 283 0600.

Smoking
The conference is Smoke free and smoking is not permitted anywhere in the UC Geo Dome. Smoking outdoors is allowed provided smokers are considerate to non-smokers.

Taxis and Airport Shuttles
Green Cabs: 0508 447 336
Blue Star Taxis: 03 379 9799
First Direct Taxis: 03 377 5555
Gold Band Taxis: 03 379 5795

ANNUAL ANTARCTIC CONFERENCE 2012

Day 1 Thursday 04 October

8.30 – 9.00 Registration for workshop participants and networking over tea and coffee

9.00 Welcome – Antarctica New Zealand
Antarctica New Zealand

THEME: Paleo-Observations Models and Processes of the Physical Antarctic Environment.

CHAIR: Ed Butler Antarctica New Zealand

9.30 IPCC Science drivers for Antarctic research
Tim Naish Victoria University of Wellington

10.00 Antarctic Ice Sheet response to global climate change during the early to middle Miocene
Richard Levy GNS Science

10.15 Antarctic and Southern ocean Influences on Late Pliocene Global Cooling
Rob McKay Victoria University of Wellington

10.30 Glacial history of the Dry Valleys from cosmogenic nucleotides
Warren Dickinson Victoria University of Wellington

10.45 - 11.00 Morning tea

THEME: Recent Observations, Models and Processes of the Physical Antarctic Environment.

CHAIR: Adrian McDonald

11.00 Sea ice growth rates in McMurdo Sound
Inga Smith University of Otago

11.15 Propagation of Ice Shelf Water beneath McMurdo Sound Sea Ice
Ken Hughes University of Otago

11.30 Marine ice formation at the Southern McMurdo Ice Shelf
Inka Koch University of Otago

11.45 Sea ice thickness in Antarctica measured by helicopter and satellites
Wolfgang Rack University of Canterbury

12.00 - 1.00 Lunch

1.00 Aeolian dust distribution studies in SW Ross Sea region, Antarctica
Cliff Atkins Victoria University of Wellington

1.15 Aeolian sediment distribution in McMurdo Sound, Antarctica
Jane Chewings Victoria University of Wellington

1.30 Mass balance, ice discharge and basal melting calculated from satellite in an enclosed ice-shelf fiord system, Antarctica
Oliver Marsh University of Canterbury

1.45 The Zombie Satellite, Killer Electrons and Tomorrows Flying Barrels
Craig Rodger University of Otago

2.00 The GCOS Reference Upper Air Network (GRUAN): creating an Arctic/Antarctic mirror
Greg Bodeker Bodeker Scientific

2.15 Snow Web 2.0: Development and utilisation of a high resolution system of Antarctic weather stations
Jack Coggins University of Canterbury

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Day 1 Thursday 04 October

THEME: Observations, models and processes of Antarctic ecosystems.
CHAIR: Jenny Webster-Brown

2.30 The Latitudinal Gradient Project and the IPY-CAML voyage: What did we learn about the meroplankton?
Mary A Sewell University of Auckland

2.45 Meroplankton community in the Ross Sea: Identification and latitudinal variation
Ramon Gallego University of Auckland

3.00 Modelling broad scale ecosystem implications of ocean acidification and climate change to Antarctic coastal benthic communities
Clair Guy NIWA

3.15 Drivers of Adelie Penguin Chick mass and condition at three colonies on Ross Island
Amy Whitehead Landcare Research

THEME: Poster Introductions: 1 Minute introductions to the posters
CHAIR: Ed Butler

3.30 - 4.15 Poster session and afternoon tea

THEME: Observations, models and processes of Antarctic Ecosystems
CHAIR: Craig Cary University of Waikato

4.15 Coping with ice: paradox resolution
Clive Evans University of Auckland

4.30 An overview of phosphorus geochemistry in coastal melt-water systems in McMurdo Sound, Antarctica
Hana Christenson University of Canterbury

4.45 SCAR Update
Bryan Storey SCAR Vice President

5.05 - 6.00 APECS *"Speed meet a geek"*

Day 1 Thursday 04 October ABSTRACTS

10.00 Antarctic Ice Sheet response to global climate change during the early to middle Miocene

Richard Levy GNS Science

Abstract: A 1138-meter sediment core (AND-2A) recovered from southern

McMurdo Sound contains a near-continuous record of Antarctic climate and ice sheet variability through the early to middle Miocene (20.2 to 14.5 million years ago), including an interval of inferred sustained global warmth known as the Miocene Climatic Optimum.

The record preserves 55 glacial-interglacial cycles that reflect two broad modes of Antarctic Ice Sheet character and behaviour. Modern "polar-style" glaciation and relative ice sheet persistence dominate the early Miocene and a period of relative ice sheet stability is characterized by cold sea surface temperatures and the presence of a semi-permanent sea-ice/ice shelf fringe. In contrast, several distinct intervals in the core indicate that this high latitude site was influenced by a relatively small, local ice sheet. These intervals of ice minima are characterized by significantly higher precipitation and sea surface temperature than during recent interglacial episodes. This dynamic response of Antarctic climate to relatively modest greenhouse gas forcing presents a serious challenge for numerical climate and ice sheet models, which generally fail to produce the this range of variability at levels of atmospheric CO2 presumed to have existed in the Miocene.

10.15 Antarctic and Southern ocean Influences on Late Pliocene Global Cooling

Rob McKay Victoria University of Wellington

Abstract: The termination of Pliocene warmth that ultimately led to the origin of genus Homo and bipolar glacial world is one of the most fundamental questions in paleoclimatology. Much research in the Pliocene community has focussed on under standing equatorial ocean re-organisation and influence on global heat transport, yet we know very little of the role of the southern high latitudes, which control some of the largest feed backs on the climate system. In this talk, estimates of sea surface temperatures and sea ice from coastal Antarctica throughout the Pliocene are discussed, looking at records from the ANDRILL project and from existing cores in the Southern Ocean.

While low latitude and northern hemisphere deep ocean records suggest northern continental glaciations occurred 2.7millon years ago, high southern latitudes began to cool at 3.3million years with the Antarctic Ice Sheet expanding into the outer continental shelf coincident with surface ocean cooling and summer sea-ice development, and northward movement of southern ocean fronts, leading to changes in westerly wind fields, ocean circulation and global heat transport. Such reconstructions are highly relevant as geological pCO2 proxies indicate a drawdown of 100ppm atmospheric carbon dioxide between 3.2 and 2.8 Ma to pre-industrial levels, which may have been driven by these changes in Antarctica and Southern Ocean.

10.30 Glacial history of the Dry Valleys from cosmogenic nucleotides

Warren Dickinson Victoria University of Wellington

Abstract: Conflicting evidence exists for the paleoclimate over the past 15 million years in the McMurdo Dry Valleys (MDV). A large body of stratigraphic and geomorphic evidence indicates that cold, dry polar conditions have existed at high (>1000m) elevations in the MDV for the past 12.5 Ma and that warmer and wetter conditions existed in the MDV prior to this time. Recently, cores from ANDRILL have shown that the Ross Sea was probably open, under warm conditions 4-8 Ma. How these two distinct paleoenvironments co-existed is not clear, but in the MDV, ancient soils with several proxy indicators of climate may help to resolve this problem.

Similar to 14C, meteoric 10Be is a radioactive cosmogenic isotope, which is produced in Earth's upper atmosphere and when it falls to ground it becomes incorporated in soils. Paleoclimate constraints are possible from understanding how and where 10Be accumulates in the soil profile. Time constraints are also possible from the 10Be radioactive clock. Our studies have made several advances in understanding paleoclimate and landforms in the Antarctic Dry Valleys using meteoric 10Be. Critically, these 10Be data provide an independent test to the glacial-stratigraphic evidence, which commonly has been used to determine Antarctic paleoclimate.

11.00 Sea Ice Growth rates in McMurdo Sound

Inga Smith University of Otago

Inga J. Smith 1, Patricia J. Langhorne1, Gregory H. Leonard2, H. Joe Trodahl3, Alex J. Gough1, Russell D. Frew4, Robert Van Hale4, Andrew R. Mahoney1,5, Timothy G. Haskell6
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3 School of Chemical and Physical Sciences, Victoria University of Wellington, Wellington, New Zealand 4 Department of Chemistry, University of Otago, Dunedin, New Zealand
5 Geophysical Institute, University of Alaska Fairbanks, Fairbanks, USA 6 Industrial Research Limited, Lower Hutt, New Zealand

Abstract: The McMurdo Ice Shelf and Ross Ice Shelf lie at the southern end of McMurdo Sound and the Ross Sea. Melt water from beneath these ice shelves affects sea ice structure and growth rates. Faster sea ice growth rates and thicker sea ice are a consequence of the input of this melt water. Formation of platelet ice crystals in supercooled water is a significant factor in this process.

Changes in sea ice thickness over time are not well known because determining sea ice thickness using satellite sensors is difficult. Direct measurements through drilling, extracting cores, or the use of temperature (thermistor) probes are resource intensive to collect, and are therefore limited to a few sites. An ideal methodology would allow retrospective reconstruction of sea ice growth rates. This presentation compares 2010 winter measurements of bulk sea ice growth rates in McMurdo Sound with an isotope-based growth rate model. To accurately predict sea ice growth rates in McMurdo Sound, modifications to existing growth rate models are necessary. The role that platelet ice plays in the growth process will be discussed in relation to this.

11.15 Propagation of Ice Shelf Water beneath McMurdo Sound Sea Ice

Ken Hughes University of Otago

Patricia J. Langhorne1, Gregory H. Leonard2
1 Department of Physics, University of Otago, Dunedin, New Zealand
2 School of Surveying, University of Otago, Dunedin, New Zealand

Abstract: A cold water mass, termed Ice Shelf Water, appears to persist for much of the year beneath the sea ice cover in western McMurdo Sound, yet it is present for only a small part of the year in the east. It alters the sea ice structure through the introduction of small ice crystals (called platelet ice) that form in supercooled water. The platelet structure dominates the appearance of vertical thin sections prepared from sea ice cores from an east-west transect of the Sound conducted within 3 km of the McMurdo Ice Shelf. For the first time in over a decade McMurdo Sound was ice free in February 2011. Consequently these first-year sea ice cores, collected in November 2011, provide a history of the oceanographic conditions during the 2011 winter in the Sound. We describe what we may deduce about the ocean from these sea ice samples and, through comparison with similar previous studies of the sea ice cover, examine some of the implications of our observations.
We use a one-dimensional numerical model to predict the evolution of Ice Shelf Water beneath the Ross and McMurdo Ice shelves and identify the physical controls on its spatial variation throughout the year. Our adaption of the model to McMurdo Sound will eventually be used to help understand the influence of the ice shelf on the observations of spatial and seasonal variations in the sea ice cover. Preliminary results will be presented here.

11.30 Marine ice formation at the Southern McMurdo Ice Shelf

Inka Koch University of Otago

Sean Fitzsimons, University of Otago

Abstract: Marine ice forms from the freezing of a mixture of sea and glacial water at the base of ice shelves and is thought to enhance ice shelf stability by adding layers of dense ice mass or filling bottom crevasses, rifts or inverted depressions at the ice-water interface. Although widespread in Antarctic ice shelves, the conditions for marine ice formation remain poorly understood. This study aims to improve our understanding of marine ice formation and its impact on ice shelf behaviour.

Our study site is the Southern McMurdo Ice Shelf (SMIS), which is a small ice shelf (~5,000 km2) adjacent to the western margin of the Ross Ice Shelf. The ice shelf velocity of ~5 m a-1 slows down to 1-2 m a-1 as SMIS flows toward its southern shore, where the ice shelf also has a negative surface mass balance of -0.16 m a-1. This ablation zone is characterized by a ~3km wide band of dark bare ice containing marine debris and macrofossils. Five marine ice cores between 2.5 and 10 m in length were extracted from the ice shelf surface in this zone. The extracted ice was identified as marine ice on the basis of its chemical signature; the ice is more depleted in heavy isotopes than seawater but more enriched than glacier ice (-4 to +3 0/00 18O and -35 to +25 0/00 D), with a total salinity between 0.03 and 0.9 ppt. Typically, marine ice at SMIS is either made up of granular or elongated (banded) ice crystals as visible in vertical thin sections of the ice. Data on marine ice chemistry and crystallography provide new insights into marine ice formation processes and rates.

11.45 Sea ice thickness in Antarctica measured by helicopter and satellites

Wolfgang Rack University of Canterbury

Abstract: Quantification of sea ice related energy and mass fluxes in the Southern Ocean require knowledge about ice thickness and growth rates both of which are difficult to determine on a larger scale. Areas with higher sea ice production rates are located near ice shelves, where the occurrence of coastal polynyas and the outflow of cold ice shelf water favours the sea ice formation process. Satellite remote sensing methods based on freeboard measurements from ICESat and CryoSat-2 are the most promising means to indirectly assess the sea ice thickness over these large areas.

In November 2009 and 2011 we conducted ground measurements on the landfast ice in McMurdo Sound in conjunction with helicopter EM-bird measurements in order to extend the local information on ice thickness properties to a larger area. Field data include information on sea ice thickness by drilling, snow depth on ice by ground penetrating radar, and platelet ice thickness underneath the sea ice from direct measurements.

The EM-bird is the only remote sensing tool to date which can measure total sea ice thickness from the air. Modified and fitted with an optical camera, it also allowed basic classification of the snow and ice surface simultaneously with the ice thickness measurements.

Here we present results from the field work and compare it to information on sea ice freeboard from ICESat measurements from previous seasons. We exemplify our methodology for employing remote sensing technology for deriving sea ice thickness. The analysis illustrates the diverse properties of landfast sea ice in the McMurdo Sound area.

1.00 Aeolian dust distribution studies in SW Ross Sea region, Antarctica

Cliff Atkins Victoria University of Wellington

Abstract: Aeolian dust derived from ice-free areas around the coast is an important but poorly-constrained source of sediment and micro-nutrients such as Iron into the Ross Sea. The K001D research programme aims to quantify the sediment flux, determine it composition, provenance and distribution in the region, thereby improving our understanding of its impact on biogeochemical processes. The programme has so far collected surface snow samples on sea ice in Western McMurdo Sound, firn cores from ANDRILL sites at Windless Bight and Coulman High and most recently (2011/12 season), surface snow samples, firn cores and sediment trap samples from the Nansen Ice Shelf in Terra Nova Bay. Collectively these provide a spatial and temporal record of aeolian dust flux in the region.

At Terra Nova Bay, a strong katabatic airflow crosses the Transantarctic Mountains and Nansen Iceshelf adjacent to a well-studied polynya where intense phytoplankton blooms occur each summer. Preliminary results from custom-built sediment traps deployed along the margin of the ice shelf and surface snow samples show that the dust flux varies considerably over the ice shelf.

The distribution and composition of the dust combined with reanalysis of wind-field data indicate a 'dusty corridor' exists from the Priestley Glacier and Browning Pass area, through 'Hells Gate' between the Northern Foothills and Inexpressible Island. This suggests a concentrated 'point-source' of aeolian sediment entering the Terra Nova Bay polynya. Future work will focus on linking the dust to source areas, creating a numerical model of dust flux and investigating the impact on phytoplankton blooms and sedimentation in Terra Nova Bay.

1.30 Mass balance, ice discharge and basal melting calculated from satellite in an enclosed ice-shelf fiord system, Antarctica

Oliver Marsh University of Canterbury

Abstract: This work highlights a multi-satellite technique for calculating spatial variation in ice shelf basal melt rates by measuring cross-sectional ice discharge at closely spaced flux gates on the floating part of outlet glaciers. This combines accurate satellite speckle tracking using high resolution TerraSAR-X X-band radar from 2012 for velocity estimation, and a combination of ICESat altimetry, ASTER and TanDEM-X digital elevation models to infer ice thickness change. The method is implemented along the 60km laterally enclosed section of ice-shelf downstream of the grounding line of the Skelton Glacier, Antarctica. This outlet glacier occupies an over-deepened channel with its grounding line set back from the ice shelf edge in contrast to the majority of other Transantarctic Mountain outlet glaciers. The area studied is also formed from the combination of two tributaries with different characteristics producing an interesting pattern of lateral as well as longitudinal thickness variation.

1.15 Aeolian sediment distribution in McMurdo Sound, Antarctica

Jane Chewings Victoria University of Wellington

Abstract: Significant volumes of aeolian sand and dust are winnowed from exposed bedrock, till and supraglacial debris surrounding McMurdo Sound, Antarctica.

Transported offshore with windblown snow onto extensive, winter-formed sea ice in the southwest Ross Sea, this material is subsequently released into the water-column during summer sea ice breakup. Aeolian contribution to McMurdo Sound seafloor sediments was first noted by Barrett et al. (1983)[1], but since then only limited investigations to quantify aeolian input for the region have occurred. This study aims to accurately determine aeolian sediment mass flux, particle size characteristics and spatial extent for the McMurdo Sound region; thereby, improving our understanding of the relative importance of geological processes supplying sediment to the Ross Sea.

A "snapshot" of aeolian dust and snow accumulation on sea ice was obtained in 2010 for a 3,000km2 area fringing southwest McMurdo Sound. This was achieved by collecting 150 samples, taken every 5km, in a grid pattern. These samples provide the empirical foundation for development and validation of a regional-scale, numerical dust distribution model[2]. The model uses local windfield reanalysis data and particle transport physics to predict regional aeolian sediment dispersion to the McMurdo Sound-southwest Ross Sea area. Modelling suggests that aeolian material is mainly transported during katabatic storm events where wind velocities can considerably exceed 40 m s-1.

A minimum aeolian sediment load of 1.2 ±0.65 g-1m-2yr was measured for the southwest McMurdo coastal zone, however local variability is evident. Additional variability in dust accumulation would be expected year-on-year due to annual fluctuations in the local wind regime, storm frequency, and in sea ice breakout patterns.

Notably, the volume of dust is much higher than that found in ice core records distal from the coast (e.g. Taylor Dome 0.009 g-1m-2yr[3] and Byrd Station 0.001 g-1m-2yr[4]).

The dust's origin can largely be attributed to the McMurdo Ice Shelf (MIS) debris band, located to the south of the study area, based on its volcanic glass content, grain size distribution and dominant wind patterns. Poorly sorted debris blankets 1,500km2 of the MIS surface and offers the largest source of unconsolidated material in the region.

Sediment derived from the McMurdo Dry Valleys (MDV) is also indicated by localised plumes of relatively coarse aeolian sediment on near-shore sea ice along the coast. The relative contribution from the MDV remains uncertain however, as there are common compositional characteristics between both sources.

Preliminary results from this study and from other smaller-scale studies[5,6] suggest the McMurdo Sound area is a significant local and regional source of aeolian sediment to the Ross

References
1] Barrett, P.J., Pyne, A.R., Ward, B.L., 1983, Modern sedimentation in McMurdo Sound, Antarctica. In Oliver, R.L., James, P.R. and Jago, J.B. (Eds.), Antarctic Earth Science, Australian Academy of Science, Canberra: 550-554[2] Golledge, N. 2012. Numerical Model for Aeolian Sediment Transport and Evolution (NaMASTE). Antarctic Research Centre, Victoria University of Wellington3] Hinkley, T.K., Matsumoto, A. 2001. Atmospheric regime of dust and salt through 7,500 years of Taylor Dome ice core: Refinement by measurement of major, minor, and trace metal suites. Journal of Geophysical Research, 106(D16): 18487-18493.[4] Windom, H. 1969. Atmospheric dust records in permanent snowfields: Implications to marine sedimentation. Geological Society of America Bulletin, 80: 761-782.[5] Atkins, C.B., Dunbar, G.B. 2009. Aeolian sediment flux from sea ice into Southern McMurdo Sound, Antarctica. Global and Planetary Change, 69: 133-141[6] Dunbar, G.B., Bertler, N.A.N., and McKay, R.M. 2009. Sediment flux through the McMurdo Ice Shelf in Windless Bight, Antarctica. Global and Planetary Change 69(3): 87-93

1.45 The Zombie Satellite, Killer Electrons and Tomorrows Flying Barrels

Craig Rodger **University of Otago**

Abstract: On 5 April 2010 a space weather event caused the Galaxy-15 geostationary satellite to malfunction, turning it into an out of control "zombie spacecraft" which drifted around the world causing interference worries for the operators of other communications and navigation satellites. Our team has combined multiple ground-based observations (from the Antarctic and Arctic) with space-based measurements to work out the atmospheric effect of this space weather event - we have particularly focused on the most energetic electrons, nicknamed "killer electrons" due to their potential effect on satellites. Our measurements have included those from our AARDDVARK radio receivers in the Arctic and Antarctic, and especially our Scott Base, Casey and Finland AARDDVARKS.

I will also talk about the upcoming US satellite launches which aim to understand the production and loss of killer electrons found in the space around this Earth - and the Antarctic BARREL balloon flights to be launched from Halley and SANAE in conjugation with the satellites, all of with which we will support with AARDDVARK observations.

2.00 The GCOS Reference Upper Air Network (GRUAN): creating an Arctic/Antarctic mirror

Greg Bodeker **Bodeker Scientific**

Abstract: Over the past decade, a weakness in the global climate observing system has been identified. This deficiency has compromised efforts to reliably and accurately attribute observed changes in global climate to human activities. To fill this gap, the World Meteorological Organization (WMO) and the Global Climate Observing System (GCOS) called for the establishment of a new state-of-the-art global network of high quality measurements of essential climate variables in the upper atmosphere. GRUAN (the GCOS Reference Upper Air Network), now in its implementation phase, comprises 15 sites but will soon be expanding to 35-40 sites, including sites in Antarctica. The goals of GRUAN are to provide long-term high quality climate records, constrain and calibrate data from more spatially-comprehensive global observing systems (including satellites and current radiosonde networks), and fully characterize the properties of the atmospheric column. In addition to summarizing the current state of GRUAN, this presentation will outline a plan that proposes how the Antarctic atmospheric research community in New Zealand might contribute to GRUAN. If implemented, this would result in transfer of skills and expertise in climate monitoring into New Zealand and would foster mutually beneficial links between a number of institutions in New Zealand with counterparts in Europe.

2.15 Snow Web 2.0: Development and utilisation of a high resolution system of Antarctic weather stations

Jack Coggins **University of Canterbury**

Abstract: SNOWWEB is a system of weather stations designed and built by the University of Canterbury specifically for use in Antarctica. Through its use of a distributed network of nodes, the system has the potential to overcome the lack of redundancy and paucity of high-resolution meteorological data inherent in the conventional weather station approach.

Nodes have the added functionality of built-in wireless communication, which allows for real-time data ferrying and remote-control of the network.

Over the summer season of 2011-12, SNOW-WEB was deployed in the region around Scott Base in a proof-of-concept and data-collection study. The system operated independently for two months and collected a significant volume of data. This talk will report on the outcomes of the successful development and field testing of the system and comment on future directions for the project. Results from data validation using established sources, namely automatic weather stations and forecast output from the Antarctic Mesoscale Prediction System, and preliminary results from meteorological studies using the acquired data will also be presented.

2.30 The Latitudinal Gradient Project and the IPY-CAML voyage: What did we learn about the meroplankton?

Mary A Sewell University of Auckland

Abstract: The Latitudinal Gradient Project and the IPY-CAML voyage: what did we learn about the meroplankton?

Meroplankton, the planktonic larvae of benthic marine invertebrates and fish, are for many species the only dispersing life-history stage for the colonization of new habitats and determine the level of population connectivity and gene-flow among locations. In general, the Antarctic meroplankton community has been poorly studied; in part due to the remote location and its associated logistic challenges, as well as the general acceptance of Thorson's rule (Mileikovsky, 1971) that pelagic larval stages were less common in polar environments. Through the work of the Latitudinal Gradient Project (LGP) we have revealed a high degree of meroplankton diversity in the coastal Ross Sea and, with the use of molecular approaches, have been able to identify many common forms to the species-level. With the additional samples collected during the International Polar Year-Census of Antarctic Marine Life (IPY-CAML) voyage we can now begin to interpret patterns of distribution and abundance in the oceanic Ross Sea (shelf, slope, waters of the Antarctic Circumpolar Current). In this talk I will give an overview of what we have learnt about the Ross Sea meroplankton, and where we might focus our research efforts in the future.

2.45 Meroplankton community in the Ross Sea: Identification and latitudinal variation

Ramon Gallego University of Auckland

Abstract: Very scarce information is available regarding the larval component of the plankton in the Antarctic, and none is available for the open waters of the Ross Sea. Traditional studies on the topic have been constrained by the impossibility of identifying the larvae found to a species level, limiting the scope of the analysis to the relative abundances of different morphotypes (Operational Taxonomical Units). We sampled the meroplankton community during the International Polar Year -Census of Antarctic Marine Life voyage to the Ross Sea, and identified the larvae to a lower taxonomic level thanks to the use of three molecular markers. For the first time it is possible to link species composition changes with differences on environmental variables.

3.00 Modelling broad scale ecosystem implications of ocean acidification and climate change to Antarctic coastal benthic communities

Clair Guy NIWA

Abstract: Anthropogenically driven environmental change is becoming ever more apparent worldwide, particularly in polar regions. Ocean acidification (OA), where ocean pH is reduced due to absorption of atmospheric CO2, reduces carbonate abundance (required to build and maintain skeletal structures) and disrupts acid/base balance, affecting basic physiological functions. The effect is exacerbated in cold waters where calcite and aragonite levels are naturally depleted. Environmental change in polar regions is expected to be stronger and occur sooner than more temperate areas. Species in these areas are adapted to narrow, stable ecological conditions and as such are more likely to negatively impacted by OA and temperature change. As such predictive models produced using polar data may give insight into potential future effects in more temperate regions.

Here we describe multifactorial, dynamic models of the Antarctic coastal benthic ecosystem incorporating parameters most likely to be sensitive to future OA and warming.

These models, based on real data, combine field results with those of laboratory experiments investigating physiological responses of key Antarctic bivalves, Laternula elliptica and Adamussium colbecki to near-future pH levels. This talk will describe the models and, particularly, the implications of our findings to coastal ecosystems of which these bivalves are key functional component.

3.15 Drivers of Adelie Penguin Chick mass and condition at three colonies on Ross Island

Amy Whitehead Landcare Research

Abstract: Body mass (how heavy an individual is) and body condition (how heavy an individual is for its size) can be important determinants of an individual's ability to survive. Individuals in good condition (a high mass for their size) may have higher energy reserves, allowing them to successfully survive periods when conditions are harsh. This may include periods of unfavourable environmental conditions that require high energy reserves to ensure body maintenance and survival. Unfavourable environmental conditions may also change patterns of prey availability and quality, leading to reduced foraging efficiency, reducing calorific inputs and subsequently body mass and condition. The effects of inter- and intra-specific competition may also affect foraging efficiency, and ultimately individual mass and condition, particularly when populations approach carrying capacity and food resources may be limiting.

We compare body mass and condition of Adélie penguin chicks using 10 years of data from three Adélie penguin colonies on Ross Island and investigate whether it is influenced by the foraging efficiency of adult Adélie penguins with respect to intra-specific competition and changing environmental conditions. We predict that chick mass will greater and condition better when adult foraging efficiency is high and the diet is dominated by silverfish, a high energy dietary component. We also predict that chick mass will be greater and condition better when resource competition is low (i.e. at smaller colonies and low numbers of chicks) and will be negatively influenced by the presence of the giant icebergs (B-15 and C-16) adjacent to Ross Island from 2001-2005. We discuss the implications of our findings.

4.15 Coping with ice: paradox resolution

Clive Evans University of Auckland

Abstract: The success of Antarctic fishes in their freezing environment is largely attributable to the evolutionary acquisition of antifreeze glycoproteins (AFGPs), which are widely distributed in their blood and interstitial fluid. Despite this assertion, certain larval fish survive early months of their developmental programme with functionally inadequate levels of antifreeze. How can this be?

As the larvae continue to develop, the concentrations of antifreeze in their body fluids reach physiologically relevant adult levels even though the pathway of synthesis of antifreeze is from the exocrine pancreas to the gut, from where discharge is likely with the faeces. How can antifreeze levels be so high in the blood and interstitial fluid if they are discharged directly into the intestinal tract? Likely answers to these apparent paradoxes will be provided along with a summary of our current understanding of how antifreeze functions in vivo.

4.30 An overview of phosphorus geochemistry in coastal meltwater systems in McMurdo Sound, Antarctica

Hana Christenson University of Canterbury

Abstract: Phosphorous plays an essential role in the biochemistry of all living organisms, and understanding factors controlling its availability in an ecosystem can provide insight into how the ecosystem will respond to change. Freshwater ecosystems in Antarctica contain vibrant microbial communities, dominated by cyanobacteria in structured benthic mats. Productivity in melt water ponds is generally considered to be limited by nitrogen availability in coastal areas, and by phosphorous availability inland, but the sources of phosphorous and factors controlling its bioavailability in Antarctic melt waters are not well understood.

In January 2011 and January 2012 the concentration and distribution of phosphorous in coastal and inland melt water ponds in the McMurdo Sound region were investigated. Ponds at six sites were studied: Cape Royds, Cape Evans and Hut Point on Ross Island, Bratina Island on the McMurdo Ice Shelf, and in the Upper and Lower Wright Valley.

Phosphorous distribution between in pond water, sediment, soil, soil salts, snow and bacterial mat was determined for up to 5 ponds at each site. These results have been compiled together with major ion and nutrient data to construct a model of the phosphorous cycle in each pond, showing the key role recently flooded sediments play as an immediate phosphorous source to a new pond.

4.45 SCAR Update

Bryan Storey SCAR Vice President

Abstract: The following five new Antarctic Research programmes were approved at the recent SCAR delegates meeting held in Portland in July 2012.

Past Antarctic Ice Sheet Dynamics (PAIS)
Solid Earth Response and influence on Cryosphere Evolution (SERCE)
Antarctic Climate (AntClim)
Antarctic Thresholds – Ecosystem Resilience and Adaptation (Ant- ERA)
State of the Antarctic Ecosystem (AntEco)
These programmes, together with the previously approved "Astronomy and Astrophysics from Antarctica" provide excellent opportunities for the New Zealand Antarctic research community to get involved in international collaborations.

This presentation will provide an update on recent developments within SCAR including the 2014 SCAR/COMNAP meetings to be held in Auckland in August 2014.

NOTES

ANNUAL ANTARCTIC CONFERENCE 2012

Day 2 Friday 05 October

KEY NOTE PRESENTATION:

8.30 Korean Antarctic Programme
Yeadong Kim Korean Polar Research Institute

THEME: Observations, models and processes of Antarctic ecosystems (continued)
CHAIR:

9.00 Targeted enrichment of tramway ridge microbial community members: A novel approach to deciphering physiological and metabolic drivers of cultivation resistant microbial systems
Chelsea Vickers University of Waikato

9.15 Microbial community variation in the Dry Valleys of Antarctica
Eric Bottos University of Waikato

9.30 Resolving Spatial and Temporal Heterogeneity in Terrestrial Antarctic Microbial Communities: an emerging biosecurity dilemma
Craig Cary University of Waikato

9.45 Responses of Dry Valley Microbial Communities to Physico chemical Drivers
Charles Lee University of Waikato

THEME: Historical Perspectives, Policy and Governance
CHAIR: Michelle Rogan-Finnemore

10.00 Successes and failures; The magnetic science of the Discovery expedition (1901-1904)
Andrew Atkin University of Canterbury

10.15 "Scott of the Antarctic" on the German Stage: Reinhard Goering's Die Sudpoleexpedition des Kapitans Scott
Hanne Nielsen University of Canterbury

10.45 Shackleton's Whisky – an historical perspective
Neville Peat University of Canterbury

10.45 - 11.00 Morning tea and poster session

THEME: Governance in Antarctica
CHAIR: Anne-Marie Brady

11.00 Is more always better? An assessment of Antarctic tourism regulation within the Antarctic Treaty System and beyond
Daniela Liggett University of Canterbury

11.15 The Science-Policy Relationship and the Locus of New Zealand Polar Science
Alan Hemmings University of Canterbury

11.30 China's Expanding Interests in Antarctica
Anne-Marie Brady University of Canterbury

11.45 - 12.45 Lunch

THEME: Environmental Monitoring and Management
CHAIR:

12.45 TITLE TBA
Steven Chown Monash University

1.15 Antarctic Environments Portal
Jana Newman Antarctica New Zealand

Day 2 Friday 05 October

1.30 Blizzard City; Science and Built Environment in Antarctica, 1911-1961
Alex Moffat-Wood Victoria University of Wellington

1.45 Developing a terrestrial environmental classification for the Ross Sea Region
Fraser Morgan Landcare Research

2.00 Emerging contaminants in Erebus Bay: Sources, distribution and implications
Phil Emnet University of Canterbury

2.15 Non-native species in Antarctica - a risk-based approach
Melanie Newfield Ministry of Primary Industries

2.30 Student prizes
Antarctica New Zealand

2.45 Wrap up and comments
Antarctica New Zealand

ANNUAL ANTARCTIC CONFERENCE 2012

Day 2 Friday 05 October ABSTRACTS

9.00 Targeted enrichment of tramway ridge microbial community members: A novel approach to deciphering physiological and metabolic drivers of cultivation resistant microbial systems

Chelsea Vickers University of Waikato

Abstract: Mount Erebus is the most active volcano on the Antarctic continent, and has the most geographically and physically isolated geothermal soil on Earth. Preliminary genetic analysis of the microbial community present in the 65°C subsurface soil of Tramway Ridge, Mt Erebus, revealed a unique high temperature ecosystem, with the dominant members possessing little genetic similarity to known bacteria. The aim of this study was to investigate the metabolism and physiology of this poorly understood ecosystem, using physical-chemical soil surveying, community based phenotypic arrays, nutritional enrichment experiments and pyrosequencing.

Overall, the results of this study have led to the development of two main hypotheses 1) the Tramway ridge microbial community is driven by 3 'keystone' members and 2) the community is reliant on constant and abundant availability of carbonate in order to maintain its overall structure and diversity. Based on experimental observations it is further hypothesised that carbonate is required to act as an environmental buffer and secondly, to act as an energy source for carbon fixation. This study has also emphasised the endemic and highly unique nature of this microbial system which validates and strengthens previous work. Considering the detailed investigation of this apparently archaic and isolated microbial system, there is potential for this study to become an excellent model for future studies addressing the fundamental functioning and evolutionary processes associated with other thermophilic communities.

9.15 **Microbial community variation in the Dry Valleys of Antarctica**

Eric Bottos **University of Waikato**

Abstract: The Dry Valleys of Antarctica possess a unique ecosystem where abiotic factors that influence microbial communities can be readily identified. As part of The New Zealand Terrestrial Antarctic Biocomplexity Survey, it is our goal to describe the composition of the microbial communities in the Dry Valleys and to elucidate the environmental factors that drive their structure. Over 600 soil samples were collected over two field seasons, from a 250 square km area encompassing the Miers, Marshall and Garwood Valleys. Using DNA fingerprinting techniques and high-throughput DNA sequencing, we characterized the bacterial communities in more than 450 samples from throughout the study site. Bacterial community structures were found to vary significantly ($p<0.001$) with respect to many of the landscape and physicochemical variables measured, but most strongly with variation in elevation and soil moisture. Results from this work are being integrated with those from the Dry Valley biocomplexity survey to develop a predictive ecological model that can be applied to the management of Antarctica's ice-free areas.

9.30 **Resolving Spatial and Temporal Heterogeneity in Terrestrial Antarctic Microbial Communities: an emerging biosecurity dilemma**

Craig Cary **University of Waikato**

Abstract: Although recent reports on the microbial ecology of McMurdo Dry Valley soils have rejected the notion that Antarctic Dry Valley soils contain limited microbiota, little is known regarding how these microbial communities are influenced by the harsh environmental conditions that preclude the existence of vascular plants and macrofauna.

The Dry Valley soil ecosystem is exceptionally simple and provides a highly manageable framework for elucidating interactions between abiotic factors and soil microbial communities. Reported dominance of aeolian transport in biota distribution and extremely low estimated turnover rates contribute to an assumption that, despite clear physicochemical heterogeneity within the region, Dry Valley soil microbial communities are homogeneous and respond to change very slowly.

Our ongoing research challenges these beliefs by revealing incredibly localized phylogenetic diversity and rapid turnover rates in Dry Valley soil microbiota. The New Zealand Terrestrial Antarctic Biocomplexity Survey (nzTABS), is examining the effects of local physicochemical factors on Dry Valley biodiversity. Soil samples collected from 4 Dry Valleys were subjected to biogeochemical analyses and high throughput DNA sequencing to characterize the microbial communities.

The results show that the communities are structurally and phylogenetically distinct, and possess vastly different levels of microbial diversity. Geochemical analyses reveal correlation between physicochemical parameters and compositions of bacterial and cyanobacterial communities. In a second experiment using similar methodologies, we monitored the effects on the microbial communities after placing a mummified seal on a patch of pristine Dry Valley soil. We found that Dry Valley soil microbiota respond quickly to changes in macroclimatic conditions with a dramatic change in community structure and significant loss of diversity.

Our results indicate that physical and geochemistry play major roles in shaping and maintaining microbiology of ice-free areas of Antarctica, and the surprisingly localized diversities of Dry Valley soil microbial communities indicate extraordinary spatial heterogeneity. These observations underscore the need to re-evaluate current ideas of microbial biogeography, raises issues regarding microbial biosecurity within the Dry Valley system and signals the potential loss of biodiversity induced by changes in macroclimatic under current climate change predictions.

9.45 **Responses of Dry Valley Microbial Communities to Physicochemical Drivers**

Charles Lee **University of Waikato**

In recent years, multiple studies have reported apparent correlations between physicochemical heterogeneities and diversities in microbial communities in McMurdo Dry Valley soils. Such physicochemical heterogeneities within the Dry Valleys reflect historical and ongoing geological processes, but their ability to directly influence microbial ecology is yet to be tested.

Therefore, direct experimental evidence is required before the unusual microbial ecology of the Antarctic Dry Valleys can be interpreted as being *driven* by local abiotic factors in a causal manner. Here we present preliminary findings from our ongoing effort to examine a plethora of potential physicochemical drivers using multiple experimental approaches and molecular genetic techniques. The results from this research will potentially frame our understanding of Dry Valley ecosystem functions and its response to environmental change.

10.00 Successes and failures; The magnetic science of the Discovery expedition (1901-1904)
Andrew Atkin University of Canterbury

Abstract: Research into terrestrial magnetism was the prime scientific activity during the Royal Geographical Society's Discovery expedition. Conditions were ripe for a successful voyage of scientific exploration following the intellectual traditions established by the Royal Navy voyages of Halley, Cook, James Clark Ross and others. Preparations included construction of the ship with a magnetic observatory and the acquisition of the latest and bes magnetic instruments.

On its return to England, the expedition was hailed a great success on account of the abundance of specimens and data collected. Most current literature on the history of Antarctic exploration and science perpetuates that positive view.

In spite of the preparations and the diligent work of the physicist, the magnetic science program was flawed in significant and unexpected ways and the outputs fell short of expectations. The nature of the failures , and the causes are the subject of this paper. Shortcomings in the research processes of others scientific disciplines of the expedition have also been revealed during the research and reconsideration of the overall success of Discovery's scientific program is now warranted. The paper closes with speculation on how and why these failures remained buried until now.

10.15 "Scott of the Antarctic" on the German Stage: Reinhard Goering's Die Sudpoleexpedition des Kapitans Scott
Hanne Nielsen University of Canterbury

Abstract: As the first public staging of Scott's story, Reinhard Goering's play Die Südpolexpedition des Kapitäns Scott (1930) created considerable controversy in Britain.

A late Expressionist drama written and performed within the specific cultural context of the Weimar republic, it offered a perspective on the expedition quite different to those coming out of Scott's homeland. While the play was received as a piece of theatre in Germany, in England the staging of events from recent history were seen as a recreation and the play caused much uproar. Examining both German and English responses to the work and to Goering's later libretto and unpublished satyr play provides greater historical depth to the history of dramatic responses to Scott, while Goering's treatment of the story shows that Scott's aura of heroism was recognized by outsiders but not celebrated in the same way.

Die Südpolexpedition des Kapitäns Scott offers new insights into how Scott's final expedition was viewed by foreign contemporaries precisely because it does what the English dared not do in the 1930s and puts Scott on stage.

10.45 Shackleton's Whisky – an historical perspective
Neville Peat University of Canterbury

Abstract: In 2006-07, the Antarctic Heritage Trust hut conservation team working at Ernest Shackleton's Cape Royds base found and began extracting from the ice under the hut three cases of the Scotch whisky he had taken south 100 years earlier.

One case was subsequently thawed at Canterbury Museum and three bottles from it were flown to Scotland for chemical and specialist analysis – and replication. Neville Peat, of Dunedin, author of the brand-new book, Shackleton's Whisky, will describe the scientific scrutiny applied to the 100-year-old Rare Old Highland Malt Whisky, and how the three bottles managed to navigate Antarctic Treaty hoops. This is Neville's fifth book on Antarctic themes.

11.15 Is more always better? An assessment of Antarctic tourism regulation within the Antarctic Treaty System and beyond

Daniela Liggett University of Canterbury

Abstract: The rapid increase and diversification of Antarctic tourism operations since the 1990s has been cause for concern among Antarctic political decision-makers and representatives of environmental NGOs. Antarctic tourism was soon elevated as a "policy problem" by Antarctic Treaty Consultative Parties, and its regulation and management have been subject to intense discussion at Antarctic Treaty Consultative Meetings over the last decade.

A number of incidents involving cruise ships and yachts in recent years continue to serve as humble reminders of the risk associated with operating in the Antarctic as well as the need to manage this risk from a regulatory perspective. In this paper, I will discuss the responses to Antarctic tourism development by Antarctic Treaty Consultative Parties and the tourism operators themselves. I will show that despite laudable efforts by Antarctic tourism operators to self-regulate, the unstructured patchwork approach to Antarctic tourism regulation by Antarctic Treaty Consultative Parties means that the current regulatory situation represents a fragile equilibrium.

Finally, I will outline pathways to strengthen existing regulatory mechanisms for Antarctic tourism within the context of a strategic approach to Antarctic governance in general.

11.30 The Science-Policy Relationship and the Locus of New Zealand Polar Science

Alan Hemmings University of Canterbury

Abstract: The paper considers the degree to which the pursuit of New Zealand polar science is stimulated or constrained by broader national policy interests and consequential logistic and infrastructure choices.

Whilst all Antarctic-active states set limits on their science support, they do so within differing frameworks. The New Zealand Antarctic programme has, in domestic terms, been relatively well supported under all New Zealand administrations.

Historically this support has been predicated on geographical proximity and arguments of objective regional significance, claim to territorial sovereignty over the Ross Dependency, and active support of the instrumentally critical Antarctic Treaty System within which the conduct of science is the sine qua non.

The constraints appear to have included the confinement of New Zealand Antarctic science to the Ross Dependency, the effective restriction therein to the immediate environs of a small number of coastal fixed point locations for most activity, the apparent imperative of maintaining the single year-round station of Scott Base, and a lack of platform capacity to support remote sensing, and extended maritime or polar plateau access within the Ross Dependency.

New Zealand as also an original signatory to the 1920 Spitsbergen Treaty has, further, not sought to enable New Zealand polar science to develop in the Arctic. The paper asks whether current arrangements, understandable in historic terms, necessarily continue to provide New Zealand with the best options in relation to the conduct of its Antarctic (and wider polar) science. Are there options that would enable New Zealand polar science to operate over a wider or different field? Is there any interest within the New Zealand Antarctic science community in such liberation? If there is, by what mechanism might the case for change to the framework within which New Zealand policy situates Antarctic science be advanced by the New Zealand science community?

11.45 China's Expanding Interests in Antarctica

Anne-Marie Brady University of Canterbury

Abstract: This panel presents the work of UC researchers working on various aspects of the theme of governance in Antarctica. Karen Scott, Law will speak on "Southern Oceans Governance: Establishing Marine Protected Areas on the High Seas"; Daniela Liggett, Gateway Antarctica will speak on "Is more always better? An assessment of Antarctic tourism regulation within the Antarctic Treaty System and beyond"; Alan Hemmings, Gateway Antarctica, will speak on "The Science-Policy Relationship and the Locus of New Zealand Polar Science"

1.00 Antarctic Environments Portal

Jana Newman Antarctica New Zealand

Abstract: The Protocol on Environmental Protection to the Antarctic Treaty affords comprehensive protection to Antarctic environments and designates Antarctica as a natural reserve devoted to peace and science. The Committee for Environmental Protection (CEP) is charged with providing advice to Antarctic Treaty Consultative meetings (ATCMs) on minimising or mitigating environmental impacts of activities in the Antarctic Treaty area, on the state of the Antarctic environment and on the need for scientific research. The CEP works with SCAR whose mission includes the provision of independent, sound, scientific advice to the Antarctic Treaty system (ATS). Antarctica's status as a natural reserve requires wise management of the region, which in turn, requires readily available, defensible and up-to date information to inform that management.

Antarctic environments are changing due to global and local pressures. Rapid changes in ocean and air temperature, sea ice extent and species distribution and abundance have been observed in parts of the Antarctic in recent decades. Climate induced pressures in the Antarctic may be compounded by pressures from increasing human activity there.

There is currently no centralised means of bringing information together on Antarctic environments to inform the ATS. If policy debate and management decisions are to keep pace with the change in Antarctic environments, a robust means of collating summary information is needed. New Zealand and SCAR are developing an on-line portal for information on Antarctic environments to meet this need.

1.15 Blizzard City; Science and Built Environment in Antarctica, 1911-1961

Alex Moffat-Wood Victoria University of Wellington

Abstract: This research investigates four Antarctic built environments, and their relationships with science, between 1911 and 1961: Robert Falcon Scott's 1910-1912 Terra Nova expedition base at Cape Evans, Ross Island; Sir Douglas Mawson's 1911-1914 Australasian Antarctic Expedition base at Commonwealth Bay in Adelie Land; Australia's Mawson Station in Mac-Robertson Land, founded in 1954; and New Zealand's Scott Base, also on Ross Island, founded in 1957.

Examining unpublished and published diaries of expeditioners, government files and newspaper reports, this research demonstrates that, to the expeditioners who built and occupied them, these places created protective bastions of a highly scientific civilization in an extreme environment. It investigates what residents and architects (figurative and literal) thought and felt about these blizzard cities, their meaning and significance. It argues that these Antarctic built environments allowed expeditioners to create civilization in what seemed the world's greatest wilderness, and that science was a key factor in this process. Civilization was created through the bases' structures, technologies, social relationships, and the scientific and political agendas that drove their construction and occupation.

1.30 Developing a terrestrial environmental classification for the Ross Sea Region

Fraser Morgan Landcare Research

Abstract: Building on the success of the Environmental Domains for Antarctica continental classification, Landcare Research is currently developing a new environmental classification focusing on the Ross Sea Region that incorporates new knowledge on soil, climate, and biological diversity and abundance.

The two-stage classification process used in the original classification has been revised to take advantage of increases in computing power and new approaches. We have begun to develop new geospatial data layers that capture the biogeographic variation within the region focusing on three broad areas, Climate, Landform, and Geologic/Soil. We have accessed biodiversity information from the Evolution and Biodiversity in the Antarctic database and individual researchers and are using this information to validate and improve the level of biogeographic variation captured in the new classification.

Finally we are developing a geospatial data portal to enable to interaction, querying and dissemination of the classification within an open and sharable format. The paper will outline the progress in developing this classification while also stimulating feedback on the approaches being undertaken and provide an opportunity to contribute to the development of the classification for the Ross Sea Region.

1.45 Emerging contaminants in Erebus Bay: Sources, distribution and implications

Phil Emnet University of Canterbury

Abstract: Emerging contaminants (ECs) are of increasing concern with respect to the environment and human health. A wide range of effects have been reported in aquatic organisms, including endocrine disruption. Their main source into the environment is sewage effluent discharged into waterways, and many chemicals used in everyday personal care products are today amongst the most commonly detected compounds in surface water worldwide.

There is no data on many ECs in the Antarctic environment. The vast majority of Antarctic research stations release industrial and household sewage into the coastal environment. Given the unique environmental conditions found in Antarctica it is likely that many removal processes, including sorption to sludge and sediments, photo-degradation, and microbial degradation are likely to be inhibited compared with temperate regions.

Wastewater samples from McMurdo Station and Scott Base and seawater samples from the surrounding coastline were analysed for a range of ECs. Target analyses were detected in both wastewater and seawater at concentrations similar to those reported in other parts of the world. The environmental fate of these compounds will be discussed in terms of the Antarctic environmental conditions. Our planned future work will also be outlined.

2.00 Non-native species in Antarctica - a risk-based approach

Melanie Newfield Ministry of Primary Industries

Abstract: Non-native species in Antarctica are causing increasing concern. There is a wide range of associated species which could reach Antarctica from the diverse cargo transported. A risk-based approach can direct management action to the species and pathways of highest risk.

We have completed a non-native species risk analysis for Antarctica New Zealand's operations by adapting the risk analysis process used in the Ministry for Primary Industries. We identified hazards and classified them into broad groups, allowing qualitative pathway risk assessments to be done. These assessments considered the likelihood of each group arriving in Antarctica, reaching a suitable environment and establishing, and the consequences.

The risk assessment identified six groups, which were:

- soil- and other contaminant-associated organisms
- pathogens and other micro-organisms associated with biological materials
- marine organisms
- freshwater organisms
- visible terrestrial organisms (mainly invertebrates)
- viable seeds

The risk analysis identified a range of management options, and some important challenges for non-native species management in Antarctica. One challenge is that most current risk management effort is focused on the visible organisms and seeds, which are the lowest risk groups. Another challenge is that intra-continental movement of organisms is a higher risk than the arrival of organisms from outside Antarctica.

ANNUAL ANTARCTIC CONFERENCE 2012

POSTERS

APECS Oceania: A network for polar early career scientists, students and educators in Australia and New Zealand
Sira Engelbertz

Evidence of past East Antarctic ice sheet dynamics from the Dubris Valley. Transantarctic Mountains
Kurt Joy

Ocean acidification in Antarctica: potential effects on functioning of two key coastal benthic bivalve species
Vonda Cummings

Ozone hole related measurements from Arrival Heights
Sylvia Nicol

Preliminary Observation of cyanobacteria communities along environmental gradients in the McMurdo Sound region of Antarctic
Claudineia Lizieri

The When and Where of data collection: Improvements to sampling and placement of SNOW-WEB Antarctic sensors
Simon Fullick

Exploring stratospheric polar dynamics using the "function M"
Madeleine Smith

Analysis of polar stratospheric cloud occurrence
Fraser Dennison

Distribution of osmolytes in Antarctic marine species and their application as dietary biomarkers
Crystal Lenky

SNOWWEB 3 - A new generation of Antarctic Meteorological monitoring systems
Ben Jolly
Adrian McDonald, Matt Pannell, Graeme Plank and Jack Coggins, University of Canterybury

Measurements of bromine and iodine oxide in the Antarctic marine boundary layer
Karin Kreher[1]
Timothy Hay[1,] Udo Friess[2], Denis Poehler[2], Johannes Zielke[3], Paul Johnston[1], Alan Thomas[1].
1. NIWA
2. University of Heidleburg
3. Berlin, Germany

Three soil chronosequences in recessional glacial deposits in the Central trans-Antarctic Mountains, Antarctica
Joshua Scarrow

Celebrating 25 years of the Montreal Protocol and the Dobson spectrophotometer at Arrival Heights
Sylvia Nichol[1]
Dan Smale[2], Stephen Wood[2] and Tom Clarkson[2]
1. NIWA Wellington
2. Lauder NZ

The genetic studies on thermal adaptation and membrane saturation in Antarctic fish
Vanita C. Malekar
Victoria Metcalf
Wine, food and Molecular Biosciences Department Lincoln University.

What's up with the tooth fish?
Clive W Evans[1]
Barbara Evans[1], Paul Cziko[2], C-H Christina Cheng[3], David G Ainley[4] and Arthur L DeVries[3].
1. University of Auckland
2. University of Oregon
3. University of Illinois
4. H.T. Harvey and Associates

ANNUAL ANTARCTIC CONFERENCE 2012

POSTERS

Genomic and physiological responses to ocean acidification in a key Antarctic mollusc species, the Antarctic scallop (Adamussium colbecki)

Gaurav Samuel
Victoria Metcalf
Wine, food and Molecular Biosciences Department Lincoln University.

Extracting gas samples from ice cores

Katja Riedel[1]
H. Schaefer[1], G. Brailsford[1], D Ferretti[1], D Etheridge[2], P. Franz[1], R Martin[-1]
1. NIWA
2. Division of Atmospheric Research, CSIRO

We leave it as we found it: Value motivations and pro-environmental behaviour in the Ross Sea region

Erin Neufeld[1]
Gary D Steel[2]
1. Gateway Antarctica University of Canterbury
2. Lincoln University

Bacterioplankton dynamics during winter freezing in a Bratina Island pond, Antarctica

Stephen Archer

Sub-glacial volcanism in western Ross Sea

Fred Davey[1],
J Lee[2], Y Kim[2], L Lawver[3]
1. GNS Science
2. Korean Polar Research Institute
3. Institute for Geophysics University of Texas

A dense fog hung over the waters

Wolfgang Rack and Ursula Rack
Gateway Antarctica, University of Canterbury

Photosynthetic microbes in the Wright Valley

Phil Novis[1]
Jackie Aislabie[1], Malcolm McLeod[1], Susan Turner[2]
1. Landcare Research
2. Bio Discovery New Zealand

Long-term Changes in the Properties of Antarctic Ponds.

Clive Howard-Williams[1]
Ian Hawes[2]
1. NIWA
2. Gateway Antarctica, University of Canterbury

Declining trends of CO, C2H6, and HCN in the SH and the sensitivity of CO columns to global isoprene emissions

S. Nichol[1]
G. Zeng, S Wood, O Morgenstern, J.Robinson, D. Smale, R. Buchholz, C. Paton-Walsh, N.Jones, D. Griffith [2]
1. NIWA
2. University of Wollongong

ANNUAL ANTARCTIC CONFERENCE 2012

DELEGATES

Name	Organisation
Adrian McDonald	University of Canterbury
Alan Hemmings	Consultant
Alex Moffat-Wood	Victoria University
Amy Whitehead	Landcare Research
Andre Eger	Lincoln University
Andrew Atkin	Gateway Antarctica
Andrew Leachman	Royal New Zealand Navy
Anne Hunter	GCAS Alumni
Anne-Marie Brady	University of Canterbury
Barbara Evans	University of Auckland
Ben Jolly	University of Canterbury
Brett Fotheringham	New Zealand Defence Force
Bob Noonan	University of Canterbury
Bryan Storey	Gateway Antarctica
Chanel Furborough	
Charles Lee	University of Waikato
Chelsea Vickers	University of Waikato
Chrissie Williams	
Clair Guy	NIWA
Claudineia Lizieri	Gateway Antarctica
Cliff Atkins	Victoria University
Clive Evans	Auckland University
Clive Howard-Williams	
Colin Johnson Hillman	Gateway Antarctica
Craig Cary	University of Waikato
Craig Marshall	
Craig Rodger	University of Otago
Crystal Lenky	University of Canterbury
Daniela Liggett	Gateway Antarctica
Dr Carol Smith	Lincoln University
Emma McFadyen	The Sir Peter Blake Trust
Eric Bottos	University of Waikato
Erin Neufeld	Gateway Antarctica
Euan C Young	University of Auckland
Fiona Shanhun	Lincoln University
Fraser Dennison	University of Canterbury
Fraser Morgan	Landcare Research
Fred Davey	GNS Science
Gary Steel	Lincoln University
Gavin Lear	Lincoln University
Giselle Walker	University of Otago
Greg Bodeker	Bodeker Scientific
Hana Christenson	University of Canterbury
Hanne Nielsen	Gateway Antarctica
Heidi Roop	GNS Science
Ian Hawes	University of Canterbury
Inga Smith	University of Otago
Inka Koch	University of Otago
Iman Soltanzadeh	University of Canterbury
Jack Coggins	University of Canterbury
Jana Newman	Antarctica New Zealand
Jane Chewings	Victoria University
Jane Ellis	Middleton Grange School
Jenny Webster-Brown	University of Canterbury
Joshua Scarrow	University of Waikato
Karin Kreher	NIWA
Katja Riedel	NIWA
Katrina Hall	Gateway Antarctica
Ken Hughes	University of Otago
Kurt Joy	Gateway Antarctica
Lacey Briars	
Lorna Little	University of Otago
Linda Kestle	Antarctic Society
Madeleine Smith	University of Canterbury
Mark Chin	GCAS Alumni

ANNUAL ANTARCTIC CONFERENCE 2012

DELEGATES

Name	Organisation
Mary A Sewell	University of Auckland
Melanie Newfield	Ministry for Primary Industries
Melissa Idiens	Gateway Antarctica Alumni University of Canterbury
Michelle Rogan-Finnermore	COMNAP
Mr Gaurav Samuel	Lincoln University
Neil Gilbert	Antarctica New Zealand
Neville Peat	Neville Peat
Nigel Watson	AHT
Nita Smith	
Olaf Morgenstern	NIWA
Oliver Marsh	Gateway Antarctica
Peter Almond	Lincoln University
Peter Barrett	Victoria University
Phil Emnet	University of Christchurch
Phil Novis	Landcare Research
Ramon Gallego	University of Auckland
Richard Levy	GNS Science
Sarah Bouckoms	COMNAP
Simon Fullick	University of Canterbury
Sira Engelbertz	Gateway Antarctica
Stephanie Lawlor	GCAS Alumni
Stephen Archer	University of Waikato
Sylvia Nichol	Niwa
Theresa Slaten	GCAS Alumni
Tim Naish	Victoria University
Ursula Rack	University of Canterbury
Vanita C. Malekar	Lincoln University
Victoria Metcalf	Lincoln University
Vonda Cummings	Niwa
Wolfgang Rack	Gateway Antarctica

ICE FEST EVENTS

THURSDAY 04 - SUNDAY 07 OCTOBER 2012

THURSDAY 04 OCTOBER

TV3 Film Night: No Horizon Anymore. 8pm.

Online pre-sales $11, door sales $15

FRIDAY 05 OCTOBER

Headliners: This Awful Place Te Radar. 8pm.

Online pre-sales $22, door sales $25

SATURDAY 06 OCTOBER

UC Science Café: Life in an Icy Inferno. Prof Craig Cary. 10-30am-12 noon. Igloo Bar.

Artists in Antarctica: Musicians. Dave Dobyn, Patrick Shepherd, Chis Cree Brown, 1-2pm,

Antarctic Yarns: Women in Antarctica. Dr Margaret Bradshaw, Chelsea Vickers, Dr Victoria Metcalf, Jan Heine. 2.30-3.30pm.

UC Celebrate: Why Antarctic Science Matters. Dr Gary Steel, Prof Craig Cary, Associate Prof Wendy Lawson, Dr Craig Marshall. 4-5pm.

Headliners: This Awful Place Te Radar. 8pm. Online presages $22, door sales $25

SUNDAY 07 OCTOBER

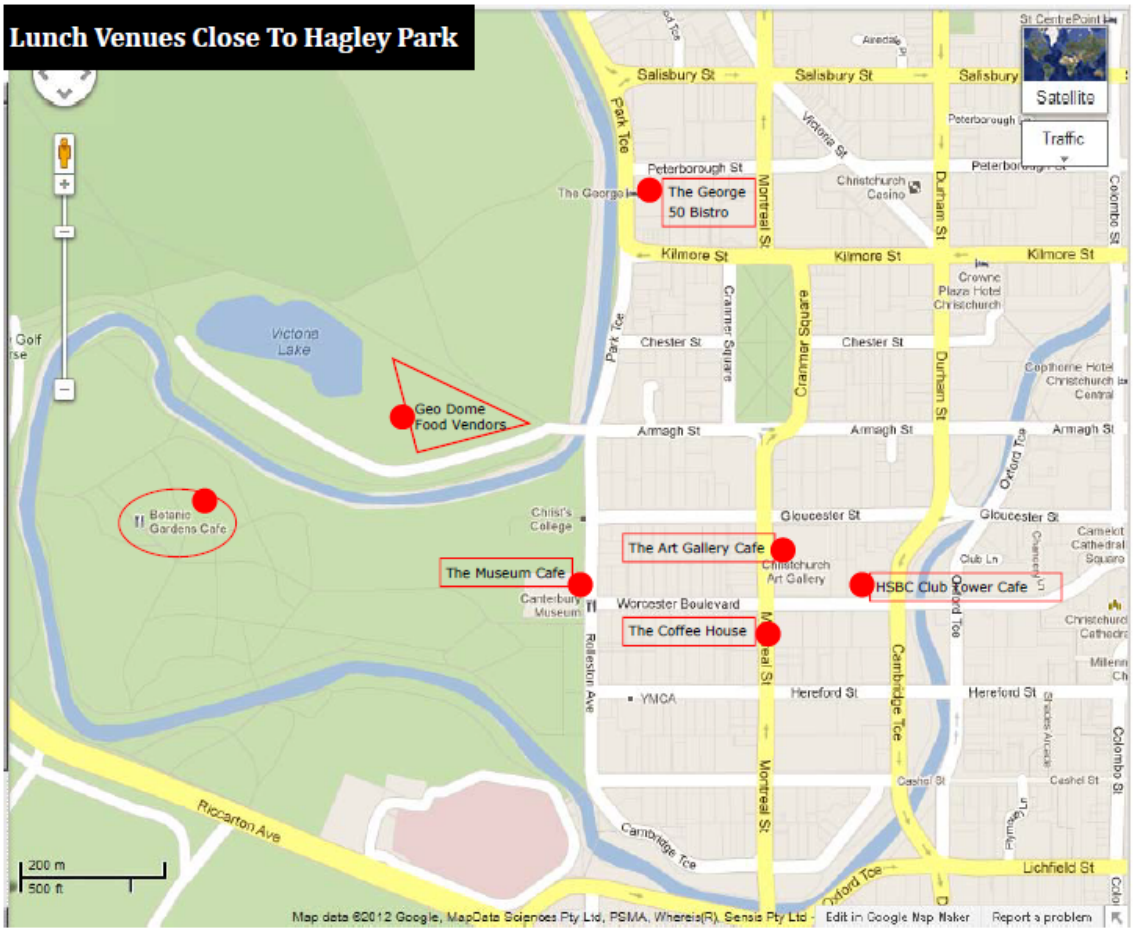
UC Science Café: Secrets from the Past. Dr Richard Levy, Prof Bryan Storey 10.30am-12 noon. Igloo Bar.

Artists in Antarctica: Photographer Megan Jenkinson. 1-2pm.

Antarctic Yarns: Old School Antarctica. Tony Bromley, Trevor Chinn, Jan Heine, Shaun Norman. 2.30-3.30pm.

UC Celebrate: Life in Unexpected Places. Prof Jenny Webster-Brown, Dr Ian Hawes. 4-5pm.

Lunch Venues Close To Hagley Park



Food Vendors located by the Geo Dome:

- Base Pizza
- Mr Chips
- Chiang Mai Thai Food
- Duggies USA Food
- Baked Potatoes
- Jonny Schwass Gorilla CRU
- Tip Top Ice Cream
- Fruzo Fruit Slushies