MEMBER COUNTRY: **CANADA**

National Report to SCAR for year: 2012–2013

Activity	Contact Name	Address	Telephone	Fax	Email	web site
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Standing Scientific Groups						
Life Sciences						
1) Member	Dr Kathleen Conlan	Canadian Museum of Nature, Life Sciences, P.O. Box 3443, Station D, Ottawa, Ontario, K1P 6P4, Canada	[1](613)364-4063	[1](613)364-4027	kconlan@mus-nature.ca	www.nature.ca
2) Member	Prof. Émilien Pelletier	Institut des sciences de la mer de Rimouski, Université du Québec à Rimouski, C.P. 3300, 310, allée des Ursulines, Rimouski, Québec G5L 3A1, Canada	[1](418)723-1986x1391	[1](418)724-1842	emilien_pelletier@uqar.qc.ca	www.ismer.ca/Pelletier-Emilien
3) Member	Dr Irene R. Schloss	Institut des sciences de la mer de Rimouski, Université du Québec à Rimouski, C.P. 3300, 310, allée des Ursulines, Rimouski, Québec G5L 3A1, Canada	[1](418)723-1986x1391	[1](418)724-1842	irene_schloss@uqar.qc.ca	www.ismer.ca/schloss-irene
4) Member	Prof. Peter Suedfeld	Department of Psychology, University of British Columbia, 3533 - 2136 West Mall, Vancouver, British Columbia V6T 1Z4, Canada	[1](604)822-5713	[1](604)822-6923	psuedfeld@psych.ubc.ca	http://www2.psych.ubc.ca/~psuedfeld/

5) Member	Dr Diana E. Varela	Department of Biology, University of Victoria, PO Box 3020, Stn CSC, 3800 Finnerty Road (Ring Road), Victoria, British Columbia V8W 3N5, Canada	[1](250) 472-5425	[1](250) 721-7120	dvarela@uvic.ca	www.uvic.ca/science/biology/people/home/faculty/facpages/varela.php
Geosciences						
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2) Member	Dr Dermot Antoniades	Département de biologie, Université Laval, Pavillon Abitibi-Price, Québec, Québec G1K 7P4, Canada	[1](418)656-2131x8298	[1](418)656-2978	dermot.antoniades@cen.ulaval.ca	
3) Member	Prof. P. Thayyil Jayachandran	Physics Department, University of New Brunswick, 8 Bailey Drive, UNB Campus, PO Box 4400, Fredericton, New Brunswick E3B 5A3, Canada	[1](506)447-3330	[1](506)453-4581	jaya@unb.ca	http://radio.physics.unb.ca/jayachandran/
4) Member	Dr Charles T. Tarnocai	Research Branch (ECORC), Agriculture and Agri-Food Canada, 960 Carling Avenue, Ottawa, Ontario K1A 0C6, Canada	[1](613)759-1857	[1](613)759-1926	tarnocaict@agr.gc.ca	http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1181923002120&lang=eng
Physical Sciences						
1) Member	Dr Thomas S. James	Geological Survey of Canada, Natural Resources Canada, 9860 West Saanich Road, P.O. Box 6000, Sidney, British Columbia, V8L 4B2, Canada	[1](250)363-6403	[1](250)363-6565	tjames@nrcan.gc.ca	www.pgc.nrcan.gc.ca/geodyn/people/tj_home.htm
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3) Member	Dr Nathan P. Gillett	Canadian Centre for Climate Modelling and Analysis, Environment Canada, University of Victoria, P.O. Box 1700, 3964 Gordon Head Road, Victoria, British Columbia V8W 2Y2, Canada	[1](250)363-8264	[1](250)363-8247	nathan.gillett@ec.gc.ca	http://tinyurl.com/lle92c5
4) Member	Dr Philippe D. Tortell	Department of Earth and Ocean Sciences, University of British Columbia, 6386 University Boulevard, Vancouver British Columbia V6T 1Z4, Canada	[1](604)822-4728	[1](604)822-6088	ptortell@eos.ubc.ca	www.eos.ubc.ca/about/faculty/p.tortell.html

Activity	Contact Name	Address	Telephone	Fax	Email	web site
Scientific Research Program **EBA** **1)** **2)** **3)** **4)**						
AAA **1) Working Group B, Vice-chair** **2)** **3)** **4)**	Dr Eric Steinbring	Canadian Gemini Office, Dominion Astrophysical Observatory, National Research Council Canada, 5071 West Saanich Road, Victoria, British Columbia V9E 2E7, Canada	[1](250)363-3452	[1](250)363-0045	eric.steinbring@nrc-cnrc.gc.ca	
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ACTION GROUPS **1) IASC/SCAR Bipolar A. G.**	Prof. Gail A. Fondahl	Geography Program, University of Northern British Columbia, 3333 University Way, Prince George, British Columbia V2N 4Z9, Canada	[1](250)960-5856	[1](250)960-5538	gail.fondahl@unbc.ca	www.unbc.ca/geography/faculty/fondahl/
2) WCRP/SCAR IPAB Co-ordinator	Prof. Christian Haas	Department of Earth and Space Science and Engineering, York University, 140 Campus Walk, Toronto, Ontario M3J 1P3, Canada	1 (416) 736-2100 x 77705	1 (416) 736-5817	haasc@yorku.ca	http://lassonde.yorku.ca/users/christianhaas
3) AntETR	Dr Irene R. Schloss	Institut des sciences de la mer de Rimouski, Université du Québec à Rimouski, C.P. 3300, 310, allée des Ursulines, Rimouski, Québec G5L 3A1, Canada	[1](418)723-1986x1391	[1](418)724-1842	irene_schloss@uqar.qc.ca	http://ismer.uqar.ca/cvismer/?153/Schloss-Irene-R
4) AntETR	Dr Kathleen Conlan	Canadian Museum of Nature, Life Sciences, P.O. Box 3443, Station D, Ottawa, Ontario, K1P 6P4, Canada	[1](613)364-4063	[1](613)364-4027	kconlan@mus-nature.ca	
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2) ANTPAS Steering Committee	Dr Charles T. Tarnocai	Research Branch (ECORC), Agriculture and Agri-Food Canada, 960 Carling Avenue, Ottawa, Ontario K1A 0C6, Canada	[1](613)759-1857	[1](613)759-1926	tarnocaict@agr.gc.ca	http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1181923002120&lang=eng
3) GRAPE	Dr Paul Prikryl	Space Weather Hazards, Geomagnetic Laboratory, Natural Resources Canada, 7 Observatory Crescent, Ottawa, Ontario K1A 0Y3, Canada	[1](613)837-5134	[1](613)824-9803	paul.prikryl@nrcan.gc.ca	
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5) Human Biology and Medicine	Prof. Peter Suedfeld	Department of Psychology, University of British Columbia, 3533 - 2136 West Mall, Vancouver, British Columbia V6T 1Z4, Canada	[1](604)822-5713	[1](604)822-6923	psuedfeld@psych.ubc.ca	
6) ICESTAR - TAG D	Prof. Eric Donovan	Department of Physics and Astronomy, University of Calgary, Calgary, Alberta T2N 1N4, Canada	[1](403)220-5385	[1](403)282-5016	edonovan@ucalgary.ca	http://phas.ucalgary.ca/profiles/eric-donovan
SCADM						
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SC-AGI						
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2) Member	C. Simon L. Ommanney	CCAR Secretary, 56 Spinney Road, P.O. Box 730, R.R. #1, Glenwood, Yarmouth County, Nova Scotia B0W 1W0, Canada	[1](902)643-2527		simon.ommanney@ns.sympatico.ca	

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Antarctic Names	Heather Ross	Antarctic Working Group, Geographical Names Board of Canada, 634 – 615 Booth Street, Ottawa, Ontario K1A 0E9, Canada	[1](613)992-4136	[1](613)943-8282	heather.ross@nrcan-rncan.gc.ca	http://geonames.nrcan.gc.ca/pdf/antarcticguidelines_e.pdf
Antarctic Map Depository	Virginia Pow	William C. Wonders Map Collection, 1-55 Cameron Library, University of Alberta, Edmonton, Alberta T6G 2J8, Canada	[1](780)492-7919	[1](780)492-2721	virginia.pow@ualberta.ca	http://guides.library.ualberta.ca/content.php?pid=45635&sid=817949
ASPeCt	Prof. Christian Haas	Department of Earth and Space Science and Engineering, York University, 140 Campus Walk, Toronto, Ontario M3J 1P3, Canada	[1](416)736-2100 x 77705	[1](416)736-5817	haasc@yorku.ca	http://lassonde.yorku.ca/users/christianhaas
ACAP	Dr Ken Morgan	Population Conservation, Pacific Wildlife Research Centre, Environment Canada, 5421 Robertson Road, Delta, British Columbia V4K 3N2, Canada	[1](250)363-6537	[1](604)946-7022	ken.morgan@ec.gc.ca	
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SCOR	Dr Robie W. Macdonald	Institute of Ocean Sciences, Fisheries and Oceans Canada, 9860 West Saanich Road, PO Box 6000, Sidney, British Columbia V8L 4B2, Canada	[1](250)363-6409	[1](250)363-6807	macdonaldrob@pac.dfo-mpo.gc.ca	
SCOR	Prof. Bjørn Sundby	Department of Earth and Planetary Sciences, McGill University, Frank Dawson Adams Building, 3450 University Street, Montréal, Quebec H3A 2A7, Canada	[1](514)398-4883	[1](514)398-4680	bjorn.sundby@mcgill.ca	www.mcgill.ca/eps/people/faculty/sundby
SCOR	Dr Paul G. Myers	Department of Earth and Atmospheric Sciences, University of Alberta, 2-98 HM Tory Building, Edmonton, Alberta T6G 2H4, Canada	[1](780)492-6706	[1](780)492-2030	pmyers@ualberta.ca	http://wessex.eas.ualberta.ca/~myers
SCOSTEP	Prof. William E. Ward	Physics Department, University of New Brunswick, 8 Bailey Drive, UNB Campus, PO Box 4400, Fredericton, New Brunswick E3B 5A3, Canada	[1](506)447-3257	[1](506)453-4581	wward@unb.ca	www.yorku.ca/scostep
SCOSTEP	Prof Jean-Pierre St.-Maurice	Department of Physics and Engineering Physics, University of Saskatchewan, 116 Science Place, Saskatoon, Saskatchewan S7N 5E2, Canada	[1](306)966-2906	[1](306)966-6400	jp.stmaurice@usask.ca	http://physics.usask.ca/~jean

Ocean Acidification	Dr Philippe D. Tortell	Department of Earth and Ocean Sciences, University of British Columbia, 6386 University Boulevard, Vancouver British Columbia V6T 1Z4, Canada	[1](604)822-4728	[1](604)822-6088	ptortell@eos.ubc.ca	www.eos.ubc.ca/about/faculty/p.tortell.html

NATIONAL ANTARCTIC DATA CENTRE

No centre yet established

SCAR DATABASE

Canada not responsible for an Antarctic database

This report is dedicated to the three Canadians who died in a DHC-6-300 Twin Otter belonging to Calgary-based Kenn Borek Air, while working in support of Antarctic science programs. The pilot, Bob Heath of Inuvik, Northwest Territories, with Mike Denton, a newlywed from Calgary, Alberta, and Perry Andersen, of Collingwood, Ontario, crashed at a height of 3900 m near the summit of Mount Elizabeth, at the northern end of the Queen Alexandra Range, while on a supply run from the South Pole to Italy's Mario Zucchelli Station on Terra Nova Bay. Kenn Borek Air has been operating aircraft in Antarctica for the past 28 years and Bob Heath was a 10-year veteran of that program.

A BRIEF SUMMARY OF SCIENTIFIC HIGHLIGHTS:

Canadian research in the Antarctic is strongly influenced by the ability of individual scientists to develop partnerships within the scientific programs of other Antarctic nations. The assistance of these national programs is greatly appreciated. Canadian work fits within the broad categories of the three Standing Scientific Committees, but is not necessarily specific to any group or project. As reflected in the attached bibliography, many Canada-based scientists have been active in the collection and analysis of Antarctic data, and publication of results, but have not necessarily reported on their current work in this annual report.

A recent example of Canadian technology being adopted for Antarctic science is that of undersea surveillance equipment developed by Ultra Electronics Maritime Systems Inc. of Dartmouth, Nova Scotia. A sonobuoy contract with the Alfred Wegener Institute will provide underwater sound equipment for tracking whales and helping identify a well-known sound of yet-unknown origin that is pervasive in the Southern Ocean, but only present during the Antarctic wintertime and thought to be produced by minke whales.

LIFE SCIENCES

Piotr Angiel (pangiel@uwo.ca), Department of Earth Sciences, University of Western Ontario, is involved with a number of projects following on from his previous work with the Department of Antarctic Biology, Polish Academy of Sciences. Studies on King George Island from October 2005 – March 2007 and October 2008 – April 2009 involved documenting variations in penguin and other seabird colonies and sea mammal populations, plant community colonization in response to climate change, and glacier fluctuations. Glacier changes since the Little Ice Age on King George Island, and Antarctic climate change from the earliest Cenozoic glaciation record, have been documented.

Andrew Irwin (airwin@mta.ca), Department of Mathematics and Computer Science, Mount Allison University, took part in the January–February 2012 NSF LTER cruise along the West Antarctic Peninsula to document the foraging habits of Adélie penguins.

Kristen Gorman (kgorman@sfu.ca) and Tony Williams, Department of Biological Sciences, Simon Fraser University, in a collaboration on William Fraser's Palmer LTER program (Polar Oceans Research Group), are continuing their investigation of *Pygoscelis* penguins that was reported on last year.

Jim Gower (gowerj@pac.dfo-mpo.gc.ca), Institute of Ocean Sciences, Fisheries and Oceans Canada, has used the European Space Agency's MERIS satellite to monitor signal intensity every year in February and March at 709 nm, near the wavelength of the chlorophyll "red edge", in mixed ice and water along Antarctic coast. Previously, he reported on high concentrations of phytoplankton in the ice, which were interpreted as "super-blooms". The Maximum Chlorophyll Index (MCI) time series shows an increase throughout the MERIS mission (2003–13). Lack of surface observations prevents a definite interpretation of the events causing this signal, but it is expected that the required surface observations will eventually become available.

Peter Davies (peter.davies@queensu.ca) and Laurie Graham, Department of Biomedical and Molecular Sciences, Queen's University, have been studying antifreeze protein (AFP) activity in an Antarctic bacterium from an ice-covered brackish lake, Ace Lake, to see how microorganism AFPs differ from those in fish, insects and plants. Although only a small part (~2%) of a giant 1.5 mDa protein, after bioinformatics analyses on the rest of this huge molecule, it was found to be an adhesin which serves to bind the bacterium, *Marinomonas primoryensis*, to ice, and not a protein that controls the growth of ice – like most AFPs. This will keep the obligate aerobe in the zone of oxygen and nutrient production by algae that receive some light through the ice cover. They are currently studying the role of calcium ions in extending the adhesion outwards toward the ice, and the mechanism by which bacteria co-operate to bind to ice.

Brian Hunt (bhunt@eos.ubc.ca) and Evgeny Pakhomov, Department of Earth and Ocean Sciences, University of British Columbia, in a collaboration with the Alfred Wegener Institute for Polar and Marine Research, participated in the joint Eddy Pump/SYSTCO II voyage in the Polar Frontal Zone of the Atlantic sector of the Southern Ocean (January–February 2012), aboard the RV *Polarstern*. Their research included: 1) investigating the spatial structure of meso- and macrozooplankton on a longitudinal transect between 10°E and 40° W; 2) Time-series analysis of zooplankton community development in an eddy-contained phytoplankton bloom; 3) Estimates of vertical flux of zooplankton faecal pellets; 4) Biology of the tunicate *Salpa thompsoni* and amphipod *Themisto gaudichaudii*; and 5) Food-web dynamics through stable-isotope collections. In May 2013, they attended a wrap-up meeting and data overview of this voyage in Bremerhaven. In August–October 2013 they will participate in a winter voyage to the Weddell Sea.

Jack Terhune (terhune@unbsj.ca), Department of Biology, University of New Brunswick, is continuing studies of Weddell seal (*Leptonychotes weddellii*) underwater vocal behaviour using recordings from Davis and Mawson obtained between 1990 and 2002. The focus is on background noises and masking avoidance.

Kerry Rowe (kerry@civil.queensu.ca) and Dan Jones, Department of Civil Engineering, Queen's University, in collaboration with the Australian Antarctic Division and Monash University, continued monitoring six biopile (fuel remediation and containment) sites at Casey Station, in 2012/2013. A seventh biopile was constructed, using a new geomembrane (liner material) constructed of coextruded high density polyethylene and ethylvinyl alcohol; the first time such geosynthetics have been used on the continent. Research continues into how hydrocarbons migrate through engineered liner systems (geomembranes and geosynthetics clay liners) in the Antarctic environment.

John Smol (smolj@queensu.ca), Department of Biology, Queen's University, and Warwick Vincent (warwick.vincent@bio.ulaval.ca), Département de biologie, Université Laval, co-organized a polar aquatic ecosystems symposium at the Association for the Sciences of Limnology and Oceanography Aquatic Sciences meeting at Otsu, Japan, in July 2012. The latter also co-organized two symposia on Antarctic subglacial lakes at the SCAR Open Science Meeting in Portland, Oregon, July 2012.

PHYSICAL SCIENCES

Graham Cogley (gcogley@trentu.ca), Department of Geography, Trent University, with colleagues from the University of Alaska Fairbanks, has compiled a complete inventory of the glaciers of the Antarctic periphery, excluding the mainland, that includes the Subantarctic islands north to Kerguelen and South Georgia; a primary source was the Antarctic Digital Database. It documents a total glacierized area of >133,000 km² and has been merged into the Randolph Glacier Inventory (RGI: www.glims.org/RGI/get_randolph.php), which consists of vector outlines with limited accompanying attributes and is the first globally complete inventory of glaciers excluding the two ice sheets. Field and remote-sensing measurements by the ICESat and GRACE satellites, combined with the RGI, provided an estimate of global average glacier mass balance for 2003–2009. These included the first explicit measurement, by laser altimetry, of the mass balance of the offshore Antarctic glaciers, which was both small specifically (-50 ± 70 kg $m^{-2}a^{-1}$) and as a contribution (-6 ± 10 Gt a^{-1}) to the global balance of -259 ± 28 Gt a^{-1} (0.71 mm a^{-1} of sea-level equivalent).

Martin Sharp (martin.sharp@ualberta.ca), Department of Earth and Atmospheric Sciences, University of Alberta, spent January 2013 working on the Blue Glacier and McMurdo Ice Shelf, Ross Sea region, under the auspices of the New Zealand Antarctic Program in collaboration with Sean Fitzsimons and Jamie Howarth (University of Otago). This was a continuation of research begun in January 2007 and focused on chemical analysis of meltwater ponds formed on the saline ice of the present day McMurdo Ice Shelf and on relict saline ice buried within the Ross Sea Drift in front of Blue Glacier. On the McMurdo Ice Shelf (at Minna Bluff), water sampling identified a suite of ponds with wide-ranging solute concentrations, from which might be elucidated the evolutionary pathways of water chemistry over time. At Blue Glacier, there are thick deposits of the salt mirabilite within and on top of the drift sequence. The precipitation of these salts probably results from salt concentration by summer evaporation and winter freezing within the ponds, and they may provide a geological signature for the former existence of saline ice shelves. Their development seems to be associated with thermokarst processes taking place within the glacial sediments overlying buried saline ice. Thaw slides expose saline ice, allowing the development (by melting) of ponds in which salts become concentrated and precipitated, eventually filling in the basins and becoming buried by later generations of thaw slides.

John McFee (john.mcfee@drdc-rddc.gc.ca), Defence R&D Canada, Suffield Research Centre, together with Stephen Achal and Alejandra Umana Diaz, ITRES Research Ltd, Calgary, in collaboration with the British Antarctic Survey, successfully carried out the first known airborne hyperspectral imaging survey over Antarctica, in February 2011. Three ITRES pushbroom hyperspectral imagers (CASI, SASI, TASI), mounted in a BAS Twin Otter, were flown from Rothera during some 25 flight hrs over 4000 km that included georegistered imagery in the VNIR, SWIR, LWIR bands. The objective was to collect data on vegetation (lichens and moss), geological formations, snow and ice features and mammals for comparison with concurrent satellite imagery and ground-truthed data. Analysis of the >2 TB of hyperspectral imagery collected is ongoing.

Denis Lacelle (dlacelle@uottawa.ca), Department of Geography, University of Ottawa, and David Fisher (dafisher2@sympatico.ca), Department of Earth Sciences, University of Ottawa, have been sampling and modelling ground ices in University Valley, McMurdo Dry Valleys. Ground-ice cores, obtained from 2011–13, have been analyzed for ice content, chemistry and stable isotopes. These very cold, dry, sites' ground ices are similar to those found on Mars (by the Phoenix Mission), being produced largely by vapor diffusion down temperature gradients. An environmental cryo-chamber will be used to measure the growth rates and isotopes of ground ices. The work is a collaboration with the ASTEP project of Chris McKay (NASA Ames). The team also includes Wayne Pollard, Department of Geography, McGill University. Jacqueline Goordial (jacqueline.goordial@mail.mcgill.ca), Department of Natural Resource Sciences, McGill University, another member of the team, participated in the 2013 IceBite field trip, visiting several of the Dry Valley sites. She is currently studying the microbial ecology, activity, and biodiversity of permafrost and cryptoendolithic samples taken from University Valley.

Christian Haas (haasc@yorku.ca), Department of Earth and Space Science and Engineering, York University, continues as coordinator of the WCRP/SCAR International Program for Antarctic Buoys (IPAB), with a meeting planned for 2014 at the IGS Sea Ice Symposium in Hobart. Collaborations continue with Wolfgang Rack (University of Canterbury) and Pat Langhorne (University of Otago) on studies of the thickness and morphology of sea ice and the ice shelf in McMurdo Sound. Airborne and ground-based surveys are planned for November and December 2013 and data acquisition will be coordinated with NASA's Operation IceBridge.

Ron Lewis (ron@mun.ca), Faculty of Engineering and Applied Science, Memorial University of Newfoundland, has been working with Neil Bose, University of Tasmania, on a multi-agency effort to: 1) asses the capability and level of risk associated with operating an autonomous underwater vehicle (AUV) in a polar environment for sea-ice mapping, mass estimation, and habitat classification; and 2) specifically assess the suitability of operating Memorial University's large Explorer AUV with the available resources including logistical support, ship support, operational specifications, environmental considerations and mission requirements. The work was based from the RV Aurora Australis in October (2009, 2010). Experiments were conducted from sea-ice floes and shore-fast ice in the vicinity of Davis Station.

Geoff Stanley (gstanley@uvic.ca), School of Earth and Ocean Sciences, University of Victoria and Oleg Saenko, Canadian Centre for Climate Modelling and Analysis, Environment Canada, tested two independent parameterizations for the diapycnal diffusivity in a coarse-resolution idealized-basin ocean–climate model (the UVic ESCM). The abyssal meridional overturning circulation (MOC) was found to intensify under stronger Southern Ocean winds, in contrast to previous theoretical and numerical results. The system was found to be driven by the wind: wind steepens isopycnals and creates eddies, which generate small-scale mixing, driving the MOC. Alternatively, when the diapycnal diffusivity, as well as the eddy-transfer coefficient and surface climate, were decoupled from the winds, then the abyssal MOC was found to decrease under stronger Southern Ocean winds. A scaling theory of the abyssal MOC was extended to incorporate this energy pathway, which corroborated the numerical results.

Paul Kushner (paul.kushner@utoronto.ca), Department of Physics, University of Toronto, has been involved in three collaborative research activities: 1) A re-examination of observed Antarctic stratospheric temperature trends in the presence of photochemical ozone loss in comparison with recent climate simulations. This work revised previous estimates of cooling trends associated with the Antarctic ozone hole, showing that they were 50% larger than previously estimated. The revised estimate brings the observations in line with temperature trends simulated by chemistry–climate models and ozone-temperature relationships were found to be realistically represented; 2) It has been shown that the Antarctic ozone hole has induced an increase in the Southern Hemisphere stratospheric stationary wave field that is captured in chemistry–climate model simulations and is projected to reverse under ozone recovery. Furthermore, greenhouse-gas increases have brought about an eastward shift in the stationary wave field, manifested as an eastward shift of the centre of the Southern Hemisphere polar vortex. The mechanism of this shift is tied to tropospheric subtropical jet stream changes caused by global warming, and the eastward shift is projected to increase as greenhouse-gas forcing increases in the future; 3) The so-called "linear interference" effect that quantifies important contributions to stratospheric variability from stationary waves has been studied, covering both Northern and Southern Hemisphere circulation with the findings in the Southern Hemisphere being particularly novel. Despite the fact that the Antarctic stratospheric polar vortex is strongly zonal, it turns out that the stationary waves in the Southern Hemisphere drive a surprising amount of interannual variability there, with implications for tropospheric variability via stratosphere–troposphere interactions.

Michael Sigmond (michael.sigmond@ec.gc.ca) and John Fyfe, Canadian Centre for Climate Modelling and Analysis, Environment Canada, in a comparison of the mean sea-ice trends in CMIP3 models, with and without time-varying stratospheric ozone, suggest that ozone depletion is associated with decreased sea-ice extent, and that ozone recovery acts to mitigate the future sea-ice decrease associated with increasing greenhouse gases. Historical simulations of six CMIP5 models show decreased sea-ice extent peaking in September–November in response to historical ozone trends. It is suggested that processes not linked to stratospheric ozone depletion must be invoked to explain the observed increase in Antarctic sea-ice extent.

Kaley Walker (kwalker@atmosp.physics.utoronto.ca), Department of Physics, University of Toronto, reports that the Canadian-led Atmospheric Chemistry Experiment (ACE) satellite mission continues to make measurements over Antarctica throughout each season. Solar occultation observations have been made since early 2004 and nearly a 10-year time series of trace-gas profiles of importance in ozone-depletion chemistry has been amassed.

GEOSCIENCES

Thomas James (tjames@Nrcan.gc.ca), Geological Survey of Canada, Natural Resources Canada, with Andrea Darlington, School of Earth and Ocean Sciences, University of Victoria (SEOS), have reported on Antarctic crustal and upper mantle structure and rheology and its influence on glacial isostatic adjustment (GIA), especially the crustal motion observed by Global Positioning System instruments. With Karen Simon (SEOS), and in collaboration with Erik Ivins (Cal Tech), GIA modelling results have been contributed and satellite gravity observations from the Gravity Recovery and Climate Experiment (GRACE) satellite mission examined to determine the influence of GIA. The results indicate that the present-day contribution to sea-level rise of the Antarctic ice sheet is smaller than previously thought.

David Greenwood (greenwoodd@brandonu.ca), Department of Biology, Brandon University, is collaborating with international partners in analyzing the record of past vegetation present as terrestrial plant spores and pollen in a marine sediment core from the Integrated Ocean Drilling Program (IODP Expedition 318, Site U1356). He is reconstructing the climate of Wilkes Land from the spore-pollen fossils for the early and middle Eocene Epoch (55–38 M yr ago). This period is of particular interest to climate modellers and earth scientists as it represents the cooling that followed a substantial global warming event during the early Eocene when naturally high atmospheric CO_2 levels created an enhanced greenhouse effect that produced global temperatures warm enough to support forests at both the North and South Poles. It has been shown that the coast of East Antarctica was warm enough in the early Eocene to support palms and other subtropical plants, with this vegetation replaced by a cool temperate rainforest as Antarctica cooled into the middle Eocene.

Paul Prikryl (paul.prikryl@nrcan.gc.ca), Geomagnetic Laboratory, Natural Resources Canada, continues to work actively on ionospheric research in conjunction with the GRAPE Working Group 1 (Solar-Terrestrial interactions and ionospheric effects in the current solar cycle). Studies have been concluded on an interhemispheric comparison of GPS phase scintillation and probabilistic forecasting of scintillation at high latitudes.

ASTRONOMY

Tijmen de Haan (tijmen@physics.mcgill.ca), Department of Physics, McGill University, together with colleagues Amy Bender and Graeme Smecher (Three-Speed Logic Inc.), spent 10 weeks calibrating the polarization angles of the bolometric detectors of the South Pole Telescope using a polarized source installed 3 km from it. Following this, a Digital Active Nulling readout mechanism, a novel and exciting digital feedback system developed at McGill, was installed.

Mark Halpern (halpern@physics.ubc.ca), Department of Physics & Astronomy, University of British Columbia, is working with international partners on Keck/SPUD* ground-based measurements of the polarization of the Cosmic Microwave Background at the South Pole. He is also a collaborator with SPIDER, a stratospheric balloon-borne observatory to measure large angular-scale polarization that is scheduled for a circumpolar flight in 2013/2014. *(SPUD = Small Polarimeter Upgrade for DASI; DASI = Degree Angular Scale Interferometer)

Darren Grant (drg@ualberta.ca), Department of Physics, University of Alberta, and leader of the IceCube institute there, now has four students who have reached full IceCube collaboration status and become authors on IceCube publications. Roles in the IceCube collaboration include convener for the Low-Energy working, lead scientist for Future Detector Upgrades, leaders of analyses in indirect Dark Matter detection and atmospheric neutrino oscillations, and investigators of the potential use of in-ice detectors for measurement of the neutrino mass hierarchy and proton decay.

Kevin MacDermid (kevin.macdermid@mail.mcgill.ca), Francois Aubin and Matt Dobbs, Department of Physics, McGill University, were at McMurdo in 2012/13 to launch EBEX, a balloon-borne telescope designed to study the beginning of the universe, for a 3-week flight. It measures the polarization of the cosmic microwave background, trying to detect the imprint of gravity waves caused by inflation. This is a collaboration with the University of Minnesota, Columbia University and the Columbia Scientific Balloon Facility, the subset of NASA which deals with high-altitude balloons; data analysis is ongoing.