

Annual Report for Research Centers and Institutes
Reporting Period 2003 and 2004
(April to April)

Centre for Earth Observation Science (CEOS)

Level 1 Centre
Faculty of Environment, University of Manitoba

Prepared by:

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Executive Summary

This document is the Annual report for the period April 2003 to April 2004, which represents the previous fiscal year of operation.

The Centre for Earth Observation Science (CEOS) was established in 1994 with a mandate to research, preserve and communicate knowledge of earth system processes using the technologies of Earth Observation Science.

The basis of CEOS is research partnerships, leveraging resources and providing a research umbrella under which members conduct multi-disciplinary collaborative research projects. Future research activities will continue to build on the research strengths of CEOS members and partners. Areas of application include climate change, particularly in the Arctic, agriculture, forestry, freshwater and geomatics. CEOS is an integral part of the new Faculty of the Environment, Earth, and Resources.

CEOS is currently involved in 3 major collaborative international and many national research partnerships. These partnerships have provided funded research opportunities for Masters students and PhD students. Researchers operating under the CEOS umbrella currently hold ~\$3.7 million in research funds. NSERC is a major funding source.

CEOS has also been active in the community and surrounds. The Centre is a founding member and strong participant in the Lake Winnipeg Research Consortium (LWRC).

CEOS was instrumental in establishing MEGIC (Manitoba Educational GIS Consortium) representing six post-secondary educational institutions in Manitoba. This Consortium has facilitated teaching and research using the latest GIS software at a Provincial wide level for a reduced price.

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Personnel

Faculty

Internal

Barber, D.G., Professor of Environment and Geography (50 percent)
Baydack, R., Associate Professor Environment and Geography (10 percent)
Campbell, M., Assistant Professor Recreation Studies (5 percent)
Gardner, J. Professor of Environment and Geography (5 percent)
Hanesiak, J. Assistant Professor of Environment and Geography (25 percent)
Iacozza, J. Lecturer in Environment and Geography (20 percent)
Papakyriakou, T, Assistant Professor of Environment and Geography (25 percent)
Wang, F. Associate Professor of Environment and Geography (10 percent)

Collaborators/External

Yackel, J. Professor of Geography University of Calgary (25 percent)
Fortier, L. Professor biology Laval University (10 percent)
Richard, P. Research Scientist, Fisheries and Oceans (project bases)
Stern, G. Research Scientist Fisheries and Oceans (project bases)
Fergusson, S. Research Scientist Fisheries and Oceans (project bases)

Post Doctorial Fellows

Walker, David (100 percent) (Supervisor: Drs. Barber and Baydack)
Lukovich, Jennifer (100 percent) (Supervisor: Dr. Barber)

Research Associates

None for reporting period

Support Staff

Fast, Doug, Cartographic support (10 percent)
Mossdrop, David R., Operations Manager of CEOS. (50 percent)
Roberecki, Aggie, Administrative support for CEOS, (50 percent)

Scientific Programmer

Chan, Wayne, Programmer (100 percent)

Students (Ph.D. Masters, Honours and Summer)

The following students were supported (financially and/or logistically) over the reporting period, April 2003 to April 2004.

Name	Years Supervised	Degree (date)	Research Topic	Advisor
Blouw, C	2003-2005	MSc. (2005)	Snow catchment, sea ice roughness and higher trophic habitats	Barber
Breneman, C.	2003-2004	Msc (2005)	Polarimetric microwave remote sensing of sea ice deformation in the Canadian Arctic	Yackel
Butler, J	2002 - 2003	MA	Modeling Severe weather in the Prairies.	Hanesiak
Carriere, E	Summer 2003		Arctic Adverse Weather Climatology	Hanesiak
Chen, Z.	2003 - 2004	MA	Climatology of the Canadian Prairies	Papakyriak
Cooley, P.	1996-2001 (continuing)	Ph.D. (2004)	Development of a GIS based biodiversity atlas for Lake Malawi, Africa.	Barber
Ehn, J	2003-2007	PhD (2007)	Bio-optical modeling in marginal ice zones	Barber
Galley, R.	2002 - 2004	MA	Climate Change in the Arctic	Barber
Geldsetzer, T.	2002-2006	PhD	Polarimetric Microwave Remote Sensing of Snow Covered Sea Ice	Yackel
Hochheim, K.	1995-2000	Ph.D. (2004)	Microwave and optical remote sensing of agricultural surfaces.	Barber
Hwang, P	2002-2006	PhD	Sea-ice microwave scattering	Barber
Iacoza, J	2003-2007	PhD (2007)	Sea ice and Polar Bear Habitat	Barber
Jin, X	2003-2007	PhD (2007)	Atmospheric Radiative Transfer Modelling	Barber
Kirk, R	2001-2003	MA (2004)	Melt ponds on sea ice	Barber
McCullough, G.	1998-2004 (continuing)	Ph.D. (2002)	River Sediment loading studies in Lake Malawi.	Barber
Mundy, C.J.	2001-2005	Ph.D. (2004)	Biological implications of snow thickness distributions on sea ice.	Barber
Owens, O.	2003	MA	Polar Marine Environments	Papakyriak
Saczuk, E.	1999-2002	PhD (2002)	Mass Wasting in the Himalaya	Gardner
Scharien, R.	2001-2004	MSc	Geophysical and microwave remote	Yackel

Name	Years Supervised	Degree (date)	Research Topic	Advisor
			sensing investigations of melt ponded first-year Arctic sea ice	
Smid, B	2000-2004	PhD (2004)	Using Recreational Habitat Suitability Indices (rHSI) to better manage the recreational potential of boreal ecosites .	Campbell
Vasudevan, A.	2001-2003	MNRN	Using Expert Opinion and Perceptual Mapping to Develop Biodiversity Indicators for Ecosite Classification and Decision Support	Baydack
Wiseman, G.	2001-2003	MA (2004)	Mapping boreal ecosites and enhancing forest GIS inventories with remotely sensed data and evidential reasoning.	Barber.

Thesis completed

Cooley, P.
Hochheim, K.
Kirk, R.
Vasudevan, A

Activities and Research Projects

Selected activities are highlighted below:

On-going Projects:

The Canadian Arctic Shelf Exchange Study (CASES)

2001 - 2006

CASES is a NSERC national network award. The CASES network intends to examine the relationship between the observed reduction in sea ice extent and volume with aspects of the marine ecosystem. This climate change study focuses on the mechanisms which couple physical and biological processes and will entail a year long field experiment in the Beaufort Sea and Amundsen Gulf in Arctic Canada. The team is led by L. Fortier (University of Laval). Dr. Barber's subgroup examined thermophysical controls on subice primary production and developed remote sensing and modelling tools to allow for the estimation the sensitivity of primary production to climate variability and change. His subgroup consists of 7 PI's from Canada, USA, UK, Japan, and Poland. The final CASES proposal has a budget in excess of \$9.9M. The major field campaign for the CASES network was the year period from November 2003 until August 2004. The majority of CEOS related research by faculty and students occurred during the fall, winter(2003) and spring (2004).

Also involved as co-investigators: Dr.s Hanesiak and Papakyriakou.

Northern Scientific Training program (NSTP) fundees for CASES from CEOS were:

Name	Program	Amount
Philip Hwang	2 nd year PhD student	
Alex Langlois	1st year PhD student	
Christina Blouw	1st year Masters student	
Teresa Fisico	2 nd year Masters student	
Ryan Galley	2 nd year Masters student	
Owen Owens	2 nd year Masters Student (2 trips)	
An Tat	1st year Masters	

Schools on Board Field Program CASES (2004, February)

Lucette Barber, Program Coordinator



Schools on Board was created as an outreach program to CASES and ArcticNet. The program promotes Arctic sciences to high school students and their extended communities across Canada. Schools on Board takes high school students on-board the CCGS Amundsen where they are integrated into the activities of the various science

teams doing research in the Arctic. It is anticipated that the experiences of those chosen to participate will be shared with their fellow classmates, families and communities, and that schools, particularly teachers, who participate in the program, will be more inclined to integrate Arctic sciences in their science programs.

The Schools on Board Field Program had participation from:

South Peace Secondary School, Dawson Creek, British Columbia (1 student)
Chetwynd Secondary School, Chetwynd, British Columbia (1 student; 1 teacher/principal)
Tumbler Ridge Secondary School, Tumbler Ridge, British Columbia (1 student)
Grant Park High School, Winnipeg, Manitoba (2 students)
Springfield Collegiate, Oakbank, Manitoba (1 student)
Samuel Hearne Secondary School, Inuvik, Northwest Territories (2 students; 1 teacher)
Mangilaluk School, Tuktoyaktuk, Northwest Territories (1 student).

ArcticNet – a Networks of Centres of Excellence proposal.
(2002 – 2009)

Dr. Barber is one of four principals in the NCE application to create a network of Centres of Excellence in the theme of polar marine science. The ArcticNET NCE was funded in July, 2003 at a level of \$45M. He leads one of four themes entitled “Land-Ocean Interactions in Sub-Arctic Hudson Bay: Managing the Largest Canadian Watershed in a New Climate”. This theme will see a major field experiment in Hudson Bay (2005) using the new Canadian Research Icebreaker as a platform for social, medical, physical and marine ecosystem studies of the Hudson Bay and associated inputs of freshwater. He participates in each of the other three themes and contributes to the overall management of the NCE through my membership on the Scientific Steering Committee. Also involved as co-investigators: Dr.s Hanesiak and Papakyriakou.

A Canadian Research Icebreaker – A program funded by the Canada Foundation for Innovation ‘International Fund’.
(2002 – 2017)

Dr. Barber is a principal investigator in the CFI application to purchase and retrofit a Canadian Coast Guard Ship as a research platform for polar science. This application was funded at a level of 27.7M\$. These funds have been used to retrofit the structure of the ship and to purchase in excess of 8M\$ in scientific equipment which is integrated into the ship infrastructure. The ship will form the basis for a new polar science platform in which Canadians will lead International investigators in multidisciplinary polar science. CEOS leads the sea ice components of this program and is responsible for sea ice and meteorological infrastructure of the ship. Also involved as co-investigators: Dr.s Hanesiak and Papakyriakou.

Canada Research Chair 'Arctic System Science'
(2002-2009)

Dr. Barber was selected as a Tier 2 CRC chair to work on aspects of polar marine science. His scientific program examines aspects of atmospheric and oceanic forcing of sea ice dynamic and thermodynamic processes under the auspices of global climate change. The program also examines aspects of physical and biological coupling in the marine ecosystem through such programs as NOW, CASES and ArcticNet.

CONVECTION: Greenland Sea Convection mechanisms and Their Climatic Implications
2000-2005

CONVECTION is a collaborative research program to be performed in the Greenland Sea by a consortium of 11 institutes from 8 countries within the European Union and the CEOS lab in Canada. CONVECTION aims to assess open-ocean deep water production in the Greenland Sea by a combination of operational remote sensing, modelling and field measurements. This project has been funded to a level of \$2M+ Euro-dollars.

Development of an Ecosite-based Decision Support System for Sustainable Forest Management (continuing, application for funding into 2004)

This is a three year project fund as a CFS/NSERC/SSHRC FOREST RESEARCH PARTNERSHIPS PROGRAM.

In 2003 an application to develop a First Nations component within the Ecosite Classification was accepted by NSERC and the research partnership was expanded to include Hollow-water First Nations and Black River Communities. This project component links our Ecosite system with Indigenous Knowledge (IK) about forest habitat. A Masters of Environment student, Monique Wall, is researching this project component.

Lake Winnipeg Research Consortium (LWRC)

CEOS is a founding member of the Lake Winnipeg Research Consortium. This organization facilitates multi-disciplinary science, coordinates public and private research, and promotes information-sharing. This past summer was the third field season for this group and CEOS actively collected field data for ~30 days on the Lake and obtained remote sensing data for the entire field season of the group. CEOS also provided a portable GPS data collection system for use in vessel tracking on Lake Winnipeg and the use two of CEOSs' spectral radiometers to collect reflectance data during the lake cruise.

The Canadian Cryospheric Systems Experiment (CRYSYS)
1989 - Present

CRYSYS is a Canadian led international project lead by the Meteorological Survey of Canada (B. Goodison, PI). The CRYSYS project examines aspects of the cryosphere (portions of the planet system containing frozen water) relative to climate variability and change. The objective is to develop the capabilities to monitor pertinent geophysical variables of the cryosphere using remote sensing and to utilize these data in modeling cryospheric processes. CRYSYS is a foreign interdisciplinary project within the NASA Earth Science Enterprise program and is funded by MSC, NASA, and NSERC.

Completed Projects:

CEOS is currently engaged in a number of multi-year studies.

Academic Contributions

Primary Publications (C.1)

- Cooley, P. and D.G. Barber. Remote Sensing of the Coastal Zone of Tropical Lakes using Synthetic Aperture Radar and Optical Data. *International Association of Great Lakes Research*. 29(2):62-75.
- Barber, D.G. and J. Iacozza. Historical analysis of sea ice conditions in M'Clintock Channel and Gulf of Boothia, Nunavut; Implications for Ringed Seal and Polar Bear Habitat. *Arctic*. 57(1):1-14
- DeAbreu, R.A., J. Yackel, D. Barber and M. Arkett. Operational Satellite Sensing of Arctic First Year Sea Ice Melt. *Canadian Journal of Remote Sensing* 24:487-501
- Barber, D., J. Iacozza, and A. Walker. On the Estimation of Snow Water Equivalent (SWE) using microwave Radiometry over First-Year Sea Ice. *Hydrological Processes*. 17(17):3503-3517.
- Cooley, P. and D.G. Barber. Remote Sensing of the Coastal Zone of Tropical Lakes using Synthetic Aperture Radar and Optical Data. *International Association of Great Lakes Research*. In Press (June'02).
- Ingram, G., J. Bacle, D. Barber, Y. Gratton, H. Melling. An Overview of Physical Processes in the North Water. *Deep Sea Research II*. 49(22-23): 4893-4906
- Hanesiak, J.M., S. Lobban and R.L. Raddatz, 2003: Local initiation of deep convection on the Canadian Prairie Provinces. *Boundary Layer Met.* (in press)
- Barber, D.G. and J.M. Hanesiak, 2003: Meteorological forcing of sea ice concentrations in the Southern Beaufort Sea over the period 1978-2001. *J. Geophys. Res.* 109, C06014, doi:10.1029/2003JC002027.
- Hunter, F., Donald, D., F. Hunter, B. Johnson, W Hyde, J. Hanesiak, M. Kellerhals, R. Hopkinson and B. Oegema, 2002: The Vanguard torrential storm (Meteorology and Hydrology). *Can. Water Resour. J.*, 27, No. 2, 213-227.
- Quiring, S.M. and Papakryiakou, T.N., 2003. An evaluation of agricultural drought indices for the Canadian prairies. *Agricultural and Forest Meteorology*, 118: 49-62.

Yackel, J.J , 2003. On the utility of diurnal measurements of snow covered first-year sea ice microwave scattering for estimating surface and climate state variables. Oral Presentation. 37th Annual Canadian Meteorological and Oceanographic Society (CMOS) meeting. Ottawa, Ontario, June 25-27, 2003.

R. Scharien and Yackel, J.J , 2003. An approach for quantifying melt ponded first-year sea ice surface roughness: implications for microwave scattering. Poster presentation. 8th Annual Environment Canada – CRYospheric SYStem (CRYSYS) Meeting, Montreal, QC. March 23-25, 2003.

Papers in review

Baggaley, D.G. and J.M. Hanesiak, 2004: An empirical blowing snow forecast technique for the Canadian Arctic and Prairie Provinces, Weather & Forecasting. In press

Technical/Conference Papers

Hanesiak, J., Co-author, Modeling surface exchange and heat transfer for the shallow snow cover at SHEBA, Seventh Conference on Polar Meteorology and Oceanography and Joint Symposium on High Latitude Climate Variations (AMS), 12-16 May 2003, Hyannis, Massachusetts, USA

Hanesiak, J., Co-author, Meteorological forcing of sea ice variability in the Southern Beaufort Sea, Seventh Conference on Polar Meteorology and Oceanography and Joint Symposium on High Latitude Climate Variations (AMS), 12-16 May 2003, Hyannis, Massachusetts, USA

Hanesiak, J., Co-author, Spectral radiative transfer through high Arctic clouds and their theoretical effects on under-ice primary production, Gordon Research Conference on Polar and Marine Science, Ventura, CA, March 16-23, 2003

Scott, J.L., R.K. Baydack, D.J. Walker, and N.C. Kenkel. 2003. Determining habitat availability for northern prairie skinks in Spruce Woods Provincial Park, Manitoba. Proceedings of the 10th Annual Conference of The Wildlife Society, Burlington, Vermont, September 6-11.

Vasudevan, A., D.J. Walker, R.K. Baydack, and J.M. Campbell. 2003. Biodiversity indicators for the ecosite decision support system in Manitoba. Proceedings of the 10th Annual Conference of The Wildlife Society, Burlington, Vermont, September 6-11.

Walker, D.A., G.P. Wiseman, A. Vasudevan, R.K. Baydack, and J.M. Campbell. 2003. Developing a 'richness-free' statistic for measuring ecosystem diversity in landscape management decision support. Proceedings of the Science and Management of Protected Areas Conference, Victoria, BC, March 18-23.

Vasudevan, A. R. Baydack, D. Walker and M. Campbell. 2003. Biodiversity indicators: seeking common ground between sustainable forestry and parks and protected areas. 2nd Annual PPARFM Conference, Winnipeg, MB.

Wiseman, G., D.Barber, D. Walker and M. Campbell. 2003. Determining scale properties of boreal Ecosite attributes utilizing remotely sensed imagery and GIS resource inventory. TWS 10th Annual Conference, Burlington VA.

Workshops/Meetings/Presentations

Invited speaker, Barber, D.G, Arctic Climate Change and Hudson Bay. Ocean's Day, Churchill, MB. July, 2003.

Invited speaker, Barber, D.G.,Arctic Polynyas and climate change. McGill University, May, 2003.

Invited speaker, Barber, D.G , Sea Ice and Climate change in CASES and ArcticNet. Institute Maurice Lamontagne. Mont Jolis, Quebec.

Invited speaker, Sea Ice and Climate change. American Meteorological Society Meeting. Hyannis, MA. May, 2003.

Oral Presentation, Hanesiak J.M., Local Initiation of Deep Convection on the Canadian Prairie Provinces, 37th annual CMOS Conference, Ottawa, Ontario, June 2-5, 2003

Oral Presentation, Hanesiak J.M., Utility of a Blowing Snow Model for Operational Forecasts on the Canadian Prairies and Arctic, 37th annual CMOS Conference, Ottawa, Ontario, June 2-5, 2003

Co-author Hanesiak J.M., Arctic Polynyas and Climate Change Experiences from the NOW and CASES research networks, 37th annual CMOS Conference, Ottawa, Ontario, June 2-5, 2003

Co-author Hanesiak J.M., Modeling surface exchange and heat transfer for the shallow snow cover at SHEBA, Seventh Conference on Polar Meteorology and Oceanography and Joint Symposium on High Latitude Climate Variations (AMS), 12-16 May 2003, Hyannis, Massachusetts, USA

Co-author Hanesiak J.M., Meteorological forcing of sea ice variability in the Southern Beaufort Sea, Seventh Conference on Polar Meteorology and Oceanography and Joint Symposium on High Latitude Climate Variations (AMS), 12-16 May 2003, Hyannis, Massachusetts, USA

Co-author Hanesiak J.M., Spectral radiative transfer through high Arctic clouds and their theoretical effects on under-ice primary production, Gordon Research Conference on Polar and Marine Science, Ventura, CA, March 16-23, 2003

Papakyriakou, T.N., and L. A. Miller, 2003: Atmospheric CO₂ Fluxes over First Year Sea Ice. Seminar presented at the Institute of Ocean Science, DFO, Sidney, B.C. May 23, 2003.

CEOS Seminar Series

Was not active during this reporting period.

Funding Sources

CEOS receives an annual operating grant from the Faculty of Environment. The Department of Geography and CEOS also collaborate on providing teaching and research facilities within the Department. Currently we have one undergraduate lab, and two graduate research labs.

Funding held by CEOS Principle investigators

The following research grants (dollars and/or value-in-kind) were obtained or held within the reporting period.

Principal Investigator	Grant Description	Amount
Barber, D.G.	ArcticNet – a Network of Centres of Excellence to study the changing Arctic. I am theme leader for the Hudson Bay project in ArcticNet and participate in each of the other 3 themes. I control operating funds for theme 3 of about 0.7M\$ per year from the total NCE budget of 45M\$ over 7 years.	
Barber, D.G.	ArcticNet – a Network of Centres of Excellence to study the changing Arctic. Shiptime allocation for the subgroups for which I play a leadership role; estimated at 25 berths, 42 days in duration at \$600 per day representing an average annual value.	
Barber, D.G.	Northern Studies Training Program to support my C-ICE and CASES 2003 experiments	
Barber, D.G.	Snow Water Equivalent (SWE) estimation and biological linkages. CRYSYS support for ongoing arctic system science program	
Barber, D.G.	Polar Continental Shelf Project (PCSP) logistics support for my Resolute Bay and CASES field experiments in 2003 for twin otter, helicopter and field logistics.	
Barber, D.G.	European Space Agency (ESA) access to ENVISAT data in support of CASES. 275 ASAR scenes Sept 03 to Sept 04.	
Barber, D.G.	Canadian Space Agency. SubIce primary production estimates from Radarsat (with C. Michel, DFO, FWI).	
Barber, D.G.	Canadian Space Agency. Optical Properties of Lake Winnipeg. (with G. McCullough)	
Barber, D.G.	CRYSYS support for Sea Ice/climate interactions in Hudson Bay	
Barber, D.G.	Canadian Space Agency – purchase of ENVISAT data	
Barber, D.G.	NSERC Discovery Grant (5 years)	
Barber, D.G.	NSERC Equipment Grant (Air/Ice boat)	
Barber, D.G.	European Space Agency (ESA) data from ENVISAT and MERIS (2003-2004)	
Barber, D.G.	Polar Continental Shelf Project (PCSP) logistics support for the	

Principal Investigator	Grant Description	Amount
	CASES04 project	
Barber, D.G.	Manitoba Networks of Centres of Excellence Fund to support Theme 3 of ArcticNet	
Baydack, R and Walker, D.	"An Ecosite-based Decision Support System for Sustainable Forest Management". Extended project funding	
Hanesiak, J.M.	2002-2006 Atmosphere-Sea Ice Coupling Funding Source: NSERC Program: Discovery Grant (individual)	
Hanesiak, J.M.	2002-2006: Co-Investigator (L. Fortier et al, Lead) Project: Canadian Arctic Shelf Exchange Study (CASES) Funding Source: NSERC Program: National Networks	
Hanesiak, J.M.	2003-2006: Co-Investigator Project: Drifting and Blowing Snow: Measurements and Modelling Funding Source: Canadian Foundation for Climate and Atmospheric Sciences (CFCAS) Program: Project Grant	
Hanesiak, J.M.	2003-2010: Co-Investigator Project: ArcticNet Funding Source: NSERC/SSHRC/CIHR Program: Network Centres of Excellence (NCE)	
Papakyriakou (CI) Fortier (Laval, PI)	CFI International Project 2002-2003. Canadian Research Ice Breaker. Funds for ship-based eddy correlation system.	
Papakyriakou (CI) Pennock (U. Sask. PI)	NSERC/BIOCAP 2003-2005- Landscape-Scale Measurement of Process-Level Nitrous Oxide Measurements.	
Papakyriakou (CI) Taylor (York, University)	CFCAS 2003-2005– Blowing Snow: Measurement and Modeling	
Papakyriakou	2003 NSTP funds for 1 Master's Student for Arctic Research	
Papakyriakou (CI) Fortier (Laval, PI)	NSERC 2003-2006– National Networks. Canadian Arctic Shelf Exchange Study	
Papakyriakou (CI) Lobb (UofM, PI)	Research Grant (Ducks Unlimited). 2002-2004 Landscape-Scale greenhouse gas monitoring – Prairie Wetlands and Agrosystems	
Papakyriakou, T	2002-2006 Relationship between complex snow surfaces and the atmosphere-surface-subsurface exchange of energy and mass Funding Source: NSERC Program: Discovery Grants(individual)	
Papakyriakou (CI) Fortier (Laval, PI)	NCE -- NSERC/SSHRC/CHIR 2003-2010- Project Leader for "The Hudson Bay Coastal Zone" within "ArcticNet" – a Network of Centres of Excellence to study the Arctic system in a changing climate.	
Yackel, J.C.	2002-2006 Use of microwave remote sensing for estimating the thermodynamic and ablation state of Arctic sea ice Funding Source: NSERC Program: Discovery Grant (individual)	
Yackel, J.C.	CASES Co-Investigator on the CFI and NSERC funded Canadian Arctic Shelf Exchange Study (CASES)	

Funding applied for by CEOS Principle investigators

The following research grants were applied for within the reporting period.
Nothing for this reporting period.

The Centre has a reasonably good financial status. Most of the CEOS research support money is used to provide student stipends and purchase equipment. The operating grant from the Faculty of Environment will need to be increased in the near future if we are to maintain the current level of research and related activities.

With the experienced increase in activity the position of Operations Manager and Administrative Assistant need to be 100% time and several new technical positions (field and computer) need to be funded from baseline.

Summarized Annual Budget

CEOS budget 2003-2004 (the figures presented include taxes.)

	Expense	% of total yearly budget
1	Capital Equipment Hardware	55
2	Repairs/Parts	7
3	Software/Computer Supplies	9
4	Miscellaneous Supplies	4
5	Publications/Printing	2
6	Telephone, and Internet	3
7	Courier/Fax/Post/Customs	1
8	Seminars, Meetings, Travel and Entertainment	9
9	Professional, Development Training and Travel	0
10	Salary	10
	TOTAL	100

Infrastructure

Space Allotment for CEOS within Isbister building

Space classification	Room #	Room Type	Area (Sq ft)	Totals
A20 Instructional Lab	203	471 Lab - Dry - Teaching Computer	592	592
A31 Graduate Research	114a	629 Office Grad Student (2)	84	
	114c	629 Office Grad Student	88	
	114i	629 Office Grad Student	79	
	115	629 Office Grad Student (3)	190	
	105	629 Office Grad Student (3)	389	
	230	629 Office Grad Student (6)	300	1130
A32 Academic Research	104	241 Field Equipment Room	592	
	203A	139 Computer Server/Equip Room	150	
	229	Research Computer Lab	291	
	205	Research Computer Lab	120	
	129	827 Storage Room	198	1351
A42 Academic Office	114G	626 Office Professor: Barber	222	
	114K	626 Office Professor: Hanesiak	144	
	116	629 Office: Post Doc: Walker	118	
	114e	626 Office Professor: Papakyriakou	129	
	114b	629 Office: Research Associate: Lukovich	87	
	114f	629 Office Sessional: Iacozza	129	829
A43 Support Office	209	632 Office Support Staff: Cartography: Fast	132	
	210	632 Office Support Staff: Admin CEOS: Roberecki	132	
	117	629 Office: CEOS Programmer: Chan	126	
	203B	631 Office: System Analyst: CEOS Ops Manager: Mosscrop	191	581
A49 Office Service	207	141 Conference room (10% usage)	470	470
			TOTAL	4953

Research Facilities

CEOS considers remote sensing, geographic information systems, image analysis systems, global positioning systems, computer modeling and analytical methods as an integrated set of 'Geomatics' tools.

- Computer Hardware/software resources:
 1. Through the University of Manitoba CEOS is part of a GIS consortium, which has entered into a province-wide licensing agreement with ERSI to provide industry standard GIS software to students regardless of which institute they are attending.
 2. 8 IBM ThinkPad laptops with 17" LCD monitors, keyboards and mouse has resulted in better field computing and graduate student productivity.

- Field equipment:
 1. 5.5 Ghz MicroWave Scatterometer (custom manufactured by ProSensing) and 3 axis positioner
 2. 37 and 85 Gz MicroWave radiometers (custom manufactured by Radiometrics) and 3 axis positioner
 3. 4 VIS/NIR spectrometers,
 4. 2 magnetic linear snow depth probes with loggers
 5. Trimble differential GPS base station and rover units, and
 6. surface energy balance and cloud physics instrumentation (radiometers, psychrometers, ceilometers, and an all sky cameras)
 7. various loggers and climate measuring equipment
 8. digital still and video cameras
 9. two 7 section parcors
 10. two Paragliders
 11. Air/ice boat
 12. Two snow machines
 13. ATV

Data:

- MOUs between CEOS and the Province of Manitoba (Land Information Branch), NASA, CSA, NASDA, and ESA for access rights to data - with the qualification that these data must be used for research.
 - The University of Manitoba Libraries has entered into a licensing agreement with Linnet Geomatics to make the Land Information Navigator data available on campus. CEOS is the repository of one of four University held sets of these data.

Web Address

To be kept up-to-date with the variety of CEOS activities and to be informed of upcoming events, check our World Wide Web page regularly.

www.umanitoba.ca/ceos

www.umanitoba.ca/environment/envirogeog

www.umanitoba.ca/environment

email addresses:

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