

Annual Report for Research Centers and Institutes
Reporting Period 1999 and 2000

Centre for Earth Observation Science (CEOS)

Level 1 Centre of the Faculty of Arts
Department of Geography, University of Manitoba

Prepared by:
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Personnel

Faculty

Barber, D.G., Professor of Geography (50 percent)
Benbow, M. Assistant Professor of Geography (10 percent)
Bullock, P. Assistant Professor of Soils Science (10 percent)
Burke, A. Associate Professor of Archeology (5 percent)
Gardner, J. Professor of Geography (5 percent)
Kenkel, N, Professor of Botany (10 percent)
Papakyriakou, T, Assistant Professor of Geography (15 percent)
Stene.L, Associate Professor of Geography (10 percent)
Smith, G. Professor of Geography (10 percent)

Research Associates and Post Docs

Iacoza, J. full time appointment to CEOS
Mundy, CJ. full time appointment to CEOS

Visiting Scholars/Researchers

Barbosa, M – Brazil (GlobeSAR)
Campbell, M – University of Manitoba Department of Recreation Studies
Dewi, S. – Indonesia
Navone, S. - Argentina

Support Staff

Mosscrop, David R., Operations Manager of CEOS. Support for hardware, software, field equipment management, planning and organization of research projects (50 percent)
Roberecki, Aggie, Administrative support for CEOS, particularly budget control and reporting (50 percent)

Students (Ph.D. and Masters)

The following students are being supported (financially and/or logistically) over the reporting period.

Name	Years Supervised	Degree (date)	Research Topic
Brook, R	1996-1998	MA (2000)	Digital Elevation Modelling from RadarSAT Interferometry and stereo projection.
Cooley, P.	1996-2001	Ph.D. (2001)	Development of a GIS based biodiversity atlas for Lake Malawi, Africa.
Hanesiak, J	1996-2001	Ph.D. (2001)	Integration of remote sensing data within numerical models of ocean-sea ice-atmosphere processes.
Harouche, I.	1999-2001	MA (2001)	Sea Ice Remote Sensing
Hempel, R.	1998-2000	MA (2000)	Forrest Management in Indonesia
Hochheim, K.	1995-2000	Ph.D. (2000)	Microwave and optical remote sensing of agricultural surfaces.
McCullough, G.	1998-2002	Ph.D. (2002)	River Sediment loading studies in Lake Malawi.
Mkanda, F.	1997-2002	Ph.D. (2002)	Soil erosion modeling within a geographical information system.
Mundy, C.J.	1997-1999	MA (1999)	Ecological implications of snow thickness distributions on sea ice.
Pegado, A	1997-2000	MA (2000)	Effects of sedimentation of Fish Diversity in Lake Malawi, Africa.
Quiring, S.	1999-2001	MA (2001)	Prairie climate change study
Saczuk, E.	1999-2002	PhD (2002)	Mass Wasting in the Himalaya
Scharien, R	2000	Honours	Intercomparison of SSM/I and Radarsat derived ice types and concentrations.
Silvestrie, G.	1996-2001	PhD (2001)	Decision making of the Elderly
Thorgillson, W.	1998-2000	MA (2000)	Precision Agriculture
Vander Kruijs, J.	1999-2001	MA (2001)	Cryosphere-climate interactions
Walker, D.	1995-2000	PhD (2000)	Riding Mountain National Park study
Yackel, J.	1995-2000	Ph.D. (2000)	Estimation of ice breaker navigability based on the time series microwave scattering coefficient (σ^0).

Thesis completed

Nichols. T., Ringed Seal Habitat Suitability from SAR. MA. 1999.

McCullough.G. AVHRR assessment for total suspended solids in Lake Erie. MA. 1999.

Pegado, A, Effects of sedimentation of Fish Diversity in Lake Malawi, Africa. MA 2000.

Activities and Research Projects

Selected activities are highlighted below:

Proposal Development:

The CRYSYS national NSERC network 2000 - 2006

CRYSYS is being proposed as an NSERC National Network. Scientifically we propose to examine the role of the cryosphere in global climate variability and change. The study will focus on the interrelationships between various aspects of the cryosphere, remote sensing of these elements and the integration of cryospheric elements in climate models. The team is lead by Dr. E. LeDrew. I was selected as the steering committee representative for sea ice-atmosphere interactions. Deadline for the application at NSERC is October, 2000.

The Canadian Arctic Shelf Exchange Study (CASES) 2000 - 2006

CASES is being proposed as an NSERC National Network. Scientifically we propose 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 processes which drive these relationships and will entail a year long field experiment in the Beaufort Sea and Amundsen Gulf in Northern Canada. We are now at the stage of submitting a proposal to NSERC to fund this international research project. The team is lead by L. Fortier from the University of Laval. I was selected as the steering committee representative for sea ice-atmosphere interactions. Deadline for the application at NSERC is October, 2000.

On-going Projects:

C-ICE Executive Summary.

The Collaborative Interdisciplinary Cryospheric Experiment (*C-ICE*) is a multi-year field experiment that incorporates many individual projects, each with autonomous goals and objectives. The science conducted has directly evolved from research relating to one of four general themes: i. sea ice energy balance; ii. numerical modeling of atmospheric processes; iii. remote sensing of snow covered sea ice; and iv. ecosystem studies.

i. *Sea Ice Microclimate*: The energy balance over sea ice is understood only in a very rudimentary fashion. Due to the high contrast between the ocean and atmosphere, the intervening spatial pattern of the sea ice leads to dramatic fluctuations in energy transfer. The seasonal nature of radiative contributions further enhance the complexity of the system. Specific research issues being addressed within the *C-ICE* program include:

Our knowledge of energy and radiative balances between the seasonally varying snow covered sea ice surface and its interfaces with the ocean and atmosphere are not fully understood.

Climatological shortwave radiation is a major contributor to the energy balance over a snow covered sea ice surface. The seasonal portioning of this energy into reflection, transmission and absorption over various types of sea ice is poorly understood.

The role of clouds in the radiative and energy balance of sea ice is poorly understood.

The role of sea ice surface roughness in determination of turbulent exchanges between the ice surface and atmosphere is unknown.

Interannual variability in the timing of the spring melt and the direction and magnitude of the causal factors are not fully understood.

ii. *Numerical Modelling of Atmospheric Processes*: Scale is the primary focus of these studies, linking surface observations to numerical models of the atmosphere operating at regional to hemispheric scales. The objective is to provide estimates of the geophysical and/or energy parameters required by numerical models. The input variables would be inverted from remote sensing data of the surface and would be used for both initialization and verification. Specific research issues being addressed within the *C-ICE* program include:

Numerical models typically use averages of the input parameters. New models must be constructed which can accept observed parameters and which can make use of stochastic estimates of the observed spatial and temporal variability of these parameters.

The relationship between microscale energy balance components and physical and biogeochemical processes operating at the mesoscale and macroscale observations can be effectively handled in process models operating at smaller scales.

Little is known about the spatial and temporal variability of snow and sea ice geophysical or energy properties. These baseline prerequisites are essential to monitoring marine cryospheric change. This issue forms a link with themes i., iii. and iv.