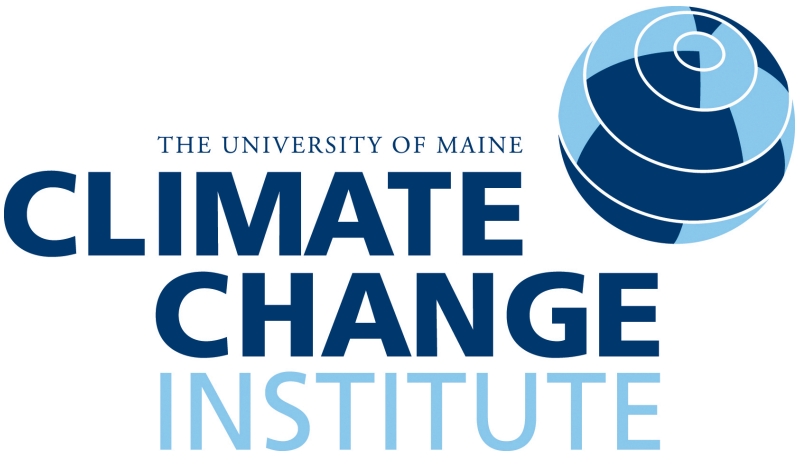

Annual Report – FY2011

Research Activity for the period of July 1, 2010 to June 30, 2011

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Table of Contents

The Climate Change Institute – University of Maine

Introduction, Summary of Accomplishments (FY2011), Goals for Next Year (FY2012), Challenges and Solutions – as depicted in our 5 Year Plan.

Institute Mission

The Climate Change Institute is an interdisciplinary research unit organized to conduct research and graduate education focused on variability of Earth's climate, ecosystems, and other environmental systems and on the interaction between humans and the natural world.

Institute investigations span the last 2 million years, a time of numerous glacial/interglacial cycles and abrupt changes in climate. These investigations inform predictions for future climate change based upon an understanding of the full dynamic range of the natural climate system and the evolving dramatic influence of human activity. Research activities include field, laboratory, and regional to global mechanistic and modeling studies. This research focuses on the timing, causes, and mechanisms of natural and human forced climate change, and on the effects of climate changes on the physical, biological, chemical, ecological, social, and economic conditions of the planet.

CCI faculty have joint appointments in several academic units including: Anthropology, Biology and Ecology, Civil and Environmental Engineering, Computer Science, Earth Sciences, Marine Sciences, Mechanical Engineering and Plant Soil and Environmental Sciences. Institute research is supported by grants from a variety of sources including the National Science Foundation, the National Oceanic and Atmospheric Administration, the National Aeronautics and Space Administration, the W.M. Keck Foundation, and endowments from the Bingham Trust, the Dan and Betty Churchill Exploration Fund, the Garrand Family and others.

Legacy

Over the past 4 decades, the Climate Change Institute, initially named the Institute for Quaternary Studies, has earned an international reputation, recognizing the unique climate perspective it provides. Institute researchers have contributed substantially to the understanding of past, present, and future physical and chemical climate change, and associated climate/society/ecosystem interactions. Both faculty and students have received numerous high profile honors for their scientific contributions.

Expectation

The direction of the Climate Change Institute is vitally linked to the widely accepted realization that an understanding of climate change and its implications are absolutely critical to the future of society, ecosystems, economy, and governance. As a consequence the Climate Change Institute is and will continue to experience ever-broadening interaction with other disciplines, University of Maine research and academic units, and local, national and international partners. It will also be faced with rapidly emerging opportunities for application of its findings and expertise to critical issues such as: climate change-induced hazards (e.g., floods, coastal erosion, drought, heat), adverse health threats (e.g., heat, moisture, disease, dust), other economic and social challenges (e.g., energy, food security, agriculture, urbanization), and climate change based decision-making by individuals, NGOs, and governmental units. To meet these challenges and opportunities the Climate Change Institute has successfully competed for federal funds, but it also requires resource flexibility not typically available through federal agency programs that will allow the Institute to continue to grow as a research catalyst within the University of Maine, and to explore and contribute to new innovations in the understanding and application of climate change research in local to global settings.

Maintaining and Advancing Institute Research

The Climate Change Institute has a long tradition of multi- and inter-disciplinary research. Following is a brief description of current Institute research themes and requirements needed to advance these themes over the next five years.

Archeology and Anthropology

Description: Humans have been an integral part of the climate system since hominids first emerged, 6.5 Million years ago. As humans spread out of Africa and throughout the rest of the world, they influenced local and global environmental change through control and use of fire, development of agriculture, domestication of animals, and development of civilization. The cultural diversity seen in modern day social systems provides the framework for influencing not only our impact on climate change but also how we react and adapt to it. Successful decisions regarding climate change need to include the human component at all levels. The institute has focused research programs concerning human societies past and the present on issues surrounding human interaction with the environment in the Northeast, North and South America, and the Pacific Islands, as well as in zooarchaeology, taphonomy, and forensic anthropology.

Future needs: (1) Arctic Anthropology tenure track position (approved and filled, June 2011); (2) Climate Change Policy Expert – research to incorporate an understanding of the importance of the human dimension in enacting successful climate change policy.

Atmospheric Climate Reconstruction and Glaciology

Description: The instrumental climate record extends back in time ~100 years in the Northern Hemisphere and is shorter and sparser in the Southern Hemisphere. Yet to understand natural climate variability and assess human impact on modern climate requires significantly longer records. Ice cores provide robust sub-annually resolved records of past temperature, precipitation, atmospheric circulation, sea ice extent, volcanism, biomass burning, chemistry of the atmosphere, and much more. The Climate Change Institute is a world leader in the recovery, analysis, modeling and interpretation of ice cores covering the last several hundred to hundreds of thousands of years. Our global array of ice cores includes records recovered from Antarctica, Greenland, Himalayas, Tibetan Plateau, Alaska/Yukon Territory, Iceland, Tierra del Fuego, and New Zealand. CCI researchers have a prominent record of leadership in several highly successful ice core programs including: Greenland Ice Sheet Project Two (GISP2, 25 US institutions), International Trans Antarctic Scientific Expedition (ITASE, 21 nations), Asian Ice Core Array (AICA), Climate of Antarctica and South America (CASA) and Polar Tropical Connections (PTC).

Future needs: (1) Upgrades to existing analytical equipment (NSF MRI submitted), (2) additional tenure track faculty to conduct the ever-expanding array of field, laboratory innovation and interpretation related to this rapidly expanding field of research.

Climate Prediction and Modeling

Description: Institute modeling activities focus on physical, chemical, biological and human phenomena influenced by climate at multiple time and space scales. Our ability to expand observations of coupled dynamic systems that collectively constitute past, present and future global climate depends on numerical modeling of the global phenomena at local scales. We have developed and acquired a computational framework for 3D time-dependent modeling of the silicate earth, cryosphere and oceans at multiple time and space scale that are coupled to the changing climate via global and mesoscale circulation models. We seek to identify and investigate the non-linear interactions among the physical, chemical, biological and human components of the climate system with the goal of prediction of climate change at centennial and decadal scales.

Future needs: Faculty position in Earth Systems modeling with concentration in one of the following: 1) Atmospheric Dynamics; 2) Coupled Human and Natural Dynamical Systems; 3) Coupled Modeling of Cryosphere, Atmosphere and Oceans. Two Post-doctoral Research Associates with concentrations in: 1) Ocean and Atmospheric Mesoscale Modeling and 2) Societal Response to Past and Future Climate Change. One Research Assistant bridging the Computation-Science-STEM aspects of Earth System modeling and visualization.

Climate Change Impacts, Policy and Sustainability

Description: Significant advances have been made in modeling future anthropogenic greenhouse gas emissions and human mitigation and adaptation

responses, but these efforts can be improved in two ways. First, the cultural scope of their analytical frameworks needs to be expanded beyond an ecological-economic focus. Human behavior consists of social, political, and ideological (worldview) action in addition to ecological-economic behavior, and these realms have major implications for climate change responses. Cosmological views of climate and weather, for instance, affect such basic issues as whether people are willing to consider that climate can change, what agents they will consider responsible for such change (e.g., humans, deities), and the suite of responses they consider appropriate for mitigating and/or adapting to it. For another example: the political as well as the technological and economic structures of human communities affect their capacity to mitigate and adapt to climate change. The nation-states of the colonial and post-colonial world have quite different political structures and dynamics to those of First World nation-states, and these differences need to be incorporated in modeling global greenhouse gas emissions and devising mitigation and adaptational policies.

In addition to expanding the cultural scope of efforts to model climate-change futures and policies, the geocultural resolution of these models also needs improvement. The current resolution of IPCC models, for example, is the nation-state, aggregated into four blocs: the OECD90, Asia, REF, and ALM. But nation-states embrace multiple sub-cultures with varying levels of agency at the national level. In the case of some post-colonial nations, it is debatable whether the state can even be considered an agent. Future models will need a finer cross-cultural resolution in addition to an expansion of the realms of human behavior they incorporate.

Future needs: 1) PhD in Anthropology and Sustainability (approved and starting up 2011), 2) Tenure-track faculty member specializing in the anthropological dimensions of climate-change to be housed in the new PhD in Anthropology and Environmental Policy (approved and starting up 2011). 3) Modeling assistance.

Cyberinfrastructure

Description: Analysis of climate data collected by satellite, airborne, undersea and sub-soil surface platforms involves identification of periodic variations, backgrounds, and trends. Unfortunately the threshold of climate variability is not always captured during the limited time that instrumental measurements have been available. How rapidly can the climate system change? What is the impact of these changes on sea level, global temperatures, and food security? The volume and variety of data available to climate scientists to help answer these and similar questions have grown dramatically in the past few decades. This growth, fueled by technological advances in instrumentation and increased exploration, holds the potential to significantly increase the rate of scientific discovery and understanding. However, this potential is frequently difficult or impossible to realize due to the challenges faced by scientists in integrating, analyzing, visualizing, and, in general, managing the vast and diverse datasets. Tools and techniques that were adequate in the recent past (often a collection spreadsheets and scripts in various formats and languages) are no longer able to cope with the increased volume and diversity of data. This difficulty in managing data leads to several related problems: (1) Scientists, who are often not experts in data management, often spend an inordinate amount of time and effort on data management tasks. (2) The rate

at which data can be analyzed and used in support of scientific discovery is limited by the difficulties in processing. (3) Potential scientific breakthroughs that are discernible only after careful integration, analysis, and interactive exploration of large, diverse datasets (and qualitatively different from those derived from simpler, smaller datasets) are currently practically unrealizable. The primary goal of the cyberinfrastructure team at CCI is to develop methods to solve the above data management and related computing problems, making it easier for climate scientists to use the growing data resources, yielding scientific breakthroughs.

Future needs: (1) Tenure-track faculty with focus scientific data management and related cyberinfrastructure; (2) Systems staff and/or tenure track faculty with expertise in software cyberinfrastructure for climate and related data to manage and teach students how to use freely available Climate models and GIS tools http://freegis.org/NCL and R in addition to p301 dx; (3) Upgrades to existing server and networking equipment and for ongoing software development and support.

Ecosystems and Environmental Change

Description: Ecosystems and the ecosystem services (e.g., food security, fiber, renewable energy, clean water, recreation, habitat, carbon sequestration) they provide are the foundation of our society and economy, and provide critical feedbacks to the climate system (e.g., GHGs, albedo). Research in the Institute has focused on the effects of both chemical and physical changes in our environment on ecosystem function. This research encompasses issues such as acid deposition, reactive nitrogen, biodiversity, eutrophication, mercury and heavy metals, as well as changing temperature and moisture regimes on both short-term (weather) and long-term (climate) timescales. A key component of this research has been long-term calibrated watershed studies that serve as ecological observatories of change, providing insights into climate change effects not possible with short-term experiments. This area of research is fundamental to effective climate change adaptation programs with direct linkages to policy and management decision-making.

Future needs: Contemporary ecosystem ecology and climate change adaptation are relative new areas of emerging emphasis in the Institute. As such, needs include: (1) growth in linkages with other University faculty doing relevant research not yet part of the Institute, (2) playing a leadership role in developing University and Institute strengths in ecosystem sciences and climate change, and (3) prioritizing faculty hires to move this framework to an implementation phase.

Glacial Geology and Climate Reconstructions

Description: Glaciers are sensitive recorders of past climate and are useful for reconstructing past temperature and precipitation changes. The Glacial Geology research group has a field-based program that focuses on using glacial geology and geochronology to understand large-scale climate and glaciological problems, such as: 1) the origin of ice ages, 2) the cause of ice-age terminations, 3) the origin of abrupt climate change, and 4) the stability of ice sheets. Our research group has ongoing

projects in Antarctica, Greenland, New Zealand, Patagonia, Peru, Maine, and the western United States.

Future needs: 1) Tenure-track faculty member who combines field-based mapping with state-of-the-art cosmogenic exposure-age techniques.

Glaciology

Description: Ice sheets and glaciers are a significant component of Earth's climate system, and they play a major role in modulating global sea levels. Glaciological research in the Institute includes observational and modeling programs that focus on examining the dynamics and characteristics of modern ice sheets and outlet glaciers in Greenland and Antarctica as well as understanding past and future ice-sheet behavior. Recent institute work has highlighted the complex interaction between ice sheets and the ocean, and shown that ice sheets will potentially lead to a rapid rise in sea level during the 21st century.

Future needs: (1) postdoctoral research associate in quantitative satellite remote sensing and data modeling; (2) foundation support for long-term ice-sheet/ocean monitoring work not traditionally supported by federal agencies; (3) additional tenure-track faculty in glacier dynamics to position the institute to fully exploit numerous funding opportunities in cryospheric research.

Marine Geology

Description: The response of shorelines and the people who inhabit them to rising sea level and associated coastal processes is the major research focus of the Marine Geology group. Sea-level change over the past 20,000 years has been studied intensively from locations above and below the present shoreline, through mapping of the seafloor as well as lake bottoms. This research is used to influence state and national policies on coastal hazards and construction.

Future needs: 1) isotope/geochemist to interpret sediment record in cores in terms of climate change and human activities; 2) terrestrial lidar device to support existing projects and future proposals.

Paleoecology and Paleolimnology

Description: Paleoecology focuses on the use of preserved fossil and chemical signatures in lake sediments to reconstruct past terrestrial and freshwater environments. Research at the Institute includes the use of chironomid and diatom fossils to reconstruct climate, acidification, and eutrophication. The use of paleoecological records to understand the effects of climate change on terrestrial and aquatic biota is also a component of research in this theme.

Future needs: CCI has a recognized strength in paleoecological research, but with the retirement of various paleoecology faculty, this cluster has shrunk to a single faculty member. The key advancement requirement in this area is a tenure-track terrestrial paleoecologist; the CCI portion of this position has already been endorsed by CCI. Faculty in this research cluster will also work toward funding postdoctoral

associates to strengthen and expand this research cluster.

Renewable Energy and Environmental Monitoring

Description: An emerging need is the prediction of local climate change based on high-resolution data. The data must be of a quality and resolution that is suitable for input into fine grid regional climate models. At the same time that modeling of local impact of climate change is developing, plans for both mitigation and local actions can be developed. The future focus includes potential local changes to the human impact on climate though conservation and the deployment of renewable energy. Understanding energy usage and carbon production on a local scale can lead to the prioritizing of investment toward the most cost effective reduction of carbon equivalent emissions.

Future needs: 1) A network of flexible energy usage, climate monitoring and resource evaluation data nodes. 2) Expanded research capabilities in the meso-scale modeling of climate are required with a new faculty member in either the sciences or engineering.

Maintaining and Advancing Graduate Student Opportunities

Description: Graduate students working in the institute register for PhD/MSc degrees in related UMaine academic units. The Climate Change Institute also offers a MSc degree program in Quaternary and Climate Studies. An Interdisciplinary PhD degree is also available through the Graduate School. Students affiliated with the institute investigate human and global change, past, present and future.

Future needs*:* CCI has a long tradition of support for graduate students through federal, foundation and private support. Continue to expand support opportunities for graduate student stipends and logistics support through federal, foundation, state and private avenues.

Maintaining and Advancing Institute Infrastructure

Description: Description: The Institute has a broad range of research facilities and equipment http://climatechange.umaine.edu/about/facilities.

Recently CCI became a WebEx user. Cisco WebEx is a software and network solution that allows subscribed users to host small scale (up to 25 users) online videoconferences. Participants can meet online anytime, anywhere, using traditional telephone or voice, video and screen sharing (e.g., Power Point, Acrobat or Image Viewer) features of modern computer devices. Users require access to the internet and a reasonably modern device (personal computer, iPhone, iPad, Android smartphones) capable of running Java software. CCI acquired a webcam with built in microphone equipment for two rooms (in the Sawyer and Bryand Buildings). We are adding better quality microphones, projector and TV. Video conferencing solutions are emerging rapidly and standards will probably change, so minor adjustments to the equipment and software solutions are expected in the future.

Future needs*:* Better quality video cameras and computer upgrades.

Maintaining and Advancing Institute Outreach

Description: The Institute maintains a wide range of outreach activities including: The Institute's website, an interactive web exhibit and discussion guide, "A Journey to Reedy Glacier" (http://climatechange.umaine.edu/ReedyJourney), Science Day (a day of K-12 class visits to CCI labs), professional development meetings and workshops for K-12 STEM teachers, public lectures, media interviews, and climate change documents and books/pamphlets written for the public (eg., *Maine's Climate Future*, *Maine's Ice Age Trail*, *The Ice Chronicles*, *Journey Into Climate*).

Future needs: One half-time to full-time position to: (1) ensure climate-related professional development for STEM educators is aligned and synergistic with other STEM education efforts within the University and the State and Nation; (2) develop education and outreach goals and generate funding for activities to meet those goals; (3) coordinate education and outreach activities within the Institute and document the impacts.

THE UNIVERSITY OF MAINE
CLIMATE CHANGE INSTITUTE

ORGANIZATIONAL CHART

REVISED
8/3/2011

DIRECTOR
P. MAYEWSKI
ASSOCIATE DIRECTOR
J. SAROS

POLICY ADVISORY COMMITTEE
P. KOONS (CHAIR, FY11)
G. DENTON (FY11)
J. KELLEY (FY11)
D. SANDWEISS (FY11)
K. MAASCH (FY 11)

PEER REVIEW COMMITTEE
B. HALL (CHAIR, FY11)
D. BELKNAP (FY11)
G. HAMILTON (FY11)
S. CHAWATHE (FY11)

GRADUATE COMMITTEE
G. ZARO (GRADUATE COORDINATOR, FY11)
B. HALL (FY11)
K. KREUTZ (FY11)
J. SAROS (FY11)

ADMINISTRATION & OUTREACH

B. LEE R. ADDESSI G. HOYLE (AR) A. DIEFFENBACHER-KRALL (RAsP) M. SCHAUFFLER (RAsP) G. JACOBSON (*MAINE STATE CLIMATOLOGIST*)	(12.5%)

ANALYTICAL LABORATORY STAFF

S. SNEED	IC, LA-ICP-MS
D. INTRONE	STABLE ISOTOPE LABORATORY
M. HANDLEY	ICP-MS
J. HOLWEGER	IC
	ARCHAEOLOGY LABORATORY

RESEARCH THEMES

	Physical & Chemical Climate Reconstruction	Glacial Geology & Climate Reconstruction	Paleoecology & Environmental Reconstruction	Anthropology & Archaeology	Glaciology	Marine Geology	Ecosystems & Environmental Change	Renewable Energy & Environmental Monitoring	Cyberinfrastructure	Climate Prediction & Modeling	Climate Change Impacts, Policy & Sustainability
THEME PRINCIPAL	P. MAYEWSKI (P) K. KREUTZ (AP) D. MEESE (RP) N. BERTLER, (RAsP) J. SIMOES (AdP) D. DIXON (PD) S. BIRKEL (PD)	G. DENTON (P), (FD) B. HALL (AP) H. BORNS, JR. (PE), (HD) G. BROMLEY (RA) C. PORTER (RA)	J. SAROS (AP) A. DIEFFENBACHER-KRALL (RAsP) M. VANDERGOES (RAsP) A. NURSE (RS) C. STAGER (AdjP) M. LAGERKLINT (RAsP)	D. SANDWEISS (P) K. SOBOLIK (P) B. ROBINSON (AP) G. ZARO (AsP) M. SORG (RAP) A. KELLEY (RAsP) D. SANGER (PE) D. KEEFER (AdP) B. SMITH (AdP) M. ZEDER (AdP) P. ROSCOE (CP) C. OCAMPO-RAEDER (CAP)	T. HUGHES (PE) G. OSWALD (RP) G. HAMILTON (AP) R. HOOKE (CP)	D. BELKNAP (CP) J. KELLEY (CP)	I. FERNANDEZ (CP) S. NORTON (CPE) B. OLSEN (RAsP) M. SCHAUFFLER (RAsP)	M. PETERSON (CP)	S. CHAWATHE (CAP) A. KURBATOV (RAsP)	P. KOONS (P) K. MAASCH (P) F. CHAI (CP) J. FASTOOK (CP) S. JAIN (CAP)	G. JACOBSON (PE), (FD) R. KATES (PP)
THEME SECOND	G. HAMILTON (AP) A. DIEFFENBACHER-KRALL (RAsP) A. KURBATOV (RAsP) M. VANDERGOES (RAsP) D. BELKNAP (CP) J. KELLEY (CP) I. FERNANDEZ (CP) A. NURSE (RS)	R. HOOKE (CP) A. KELLEY (RAsP)	D. SANDWEISS (P) K. SOBOLIK (P) G. JACOBSON (PE), (FD) R. DAVIS (PE) J. KELLEY (CP) R. HOOKE (CP) S. NORTON (CPE) A. KELLEY (RAsP) M. SCHAUFFLER (RAsP) B. OLSEN (RAsP)	H. BORNS, JR. (PE), (HD) R. KATES (PP) D. BELKNAP (CP) J. KELLEY (CP)	P. KOONS (P) P. MAYEWSKI (P) H. BORNS, JR. (PE), (HD) B. HALL (AP) K. KREUTZ (AP) J. FASTOOK (CP)	A. KELLEY (RAsP)	K. SOBOLIK (P) J. SAROS (AP) G. ZARO (AsP) A. DIEFFENBACHER-KRALL (RAsP) M. SORG (RAP) M. VANDERGOES (RAsP) R. HOOKE (CP) J. KELLEY (CP) S. JAIN (CAP) C. OCAMPO-RAEDER (CAP)	P. KOONS (P) P. MAYEWSKI (P) I. FERNANDEZ (CP)	P. KOONS (P) P. MAYEWSKI (P) J. FASTOOK (CP)	P. MAYEWSKI (P) G. HAMILTON (AP) S. BIRKEL (PD)	G. ZARO (AsP) P. ROSCOE (CP) I. FERNANDEZ (CP) J. KELLEY (CP) S. JAIN (CAP) C. OCAMPO-RAEDER (CAP) S. CHAWATHE (CAP) M. SORG (RAP) B. OLSEN (RAsP)
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	B. Grigholm, PhD - Earth Sciences B. Koffman, PhD - Earth Sciences E. Korotkikh, PhD - Earth Sciences M. Potocki, PhD - Earth Sciences N. Spaulding, PhD - Earth Sciences	G. Bromley, PhD - Earth Sciences J. Luis Garcia, PhD - Earth Sciences A. Putnam, PhD - Earth Sciences S. Allard, MS - Earth Sciences B. Chase, MS - Quaternary T. Koffman, MS - Earth Sciences K. Ladig, MS - Earth Sciences A. Lusas, MS-Earth Sciences	H. Arnett, MS - Ecology & Env. Scs. C. Daggett, MS - Ecology & Env. Scs. K. Strock, MS - Ecology & Env. Scs. K. Slemmons, MS - Ecology & Env. Scs. C. Wigdahl, PhD - Ecology & Env. Scs.	A. Mauricio, iPhD- Quaternary S. Belknap, MS - Quaternary A. Heiler, MS - Quaternary R. Ingraham, MS - Quaternary E. Olsen, MS - Quaternary J. Ort , MS - Quaternary K. Rademaker, iPhD	D. Breton, PhD - Physics S. Campbell, PhD - Earth Sciences M. Hall, MS - Earth Sciences K. Schild, MS - Quaternary W. Sneed, PhD - Earth Sciences N. Weitz, PhD - Physics	L. Sorrell, MS - Earth Sciences M. Mansfield, MS - Earth Sciences	A. Burke, MS - Plant, Soil & Env. Scs. A. Byrd, MS - Ecology & Env. Scs. K. Ditzler, MS - Ecology F. Fatemi, PhD - Ecology & Env. Scs. J. Raymond, MS - Plant, Soil & Env. Scs. E. Redding, MS - Forestry E. Roberston, MS - Ecology & Env. Scs. A. Sacks, MS - Ecology & Env. Scs. C. Salvino, MS - Plant, Soil & Env. Scs.	A. Demeo, iPhD - Ocean Engineering S. Winchenbach, iPhD - Ocean Engineering	E. Albert, PhD - Computer Science M. Royer, PhD - Computer Science		

Legend

P - Professor	CAP - Cooperating Associate Professor
AP - Associate Professor	CAsP - Cooperating Assistant Professor
AsP - Assistant Professor	CPE - Cooperating Professor Emeritus
PE - Professor Emeritus	PD - Post Doctoral Research Associate
PP - Presidential Professor	RS - Research Scientist
RP - Research Professor	RA - Research Associate
RAP - Research Associate Professor	AdP - Adjunct Professor
RAsP - Research Assistant Professor	AR - Artist in Residence
CP - Cooperating Professor	HD - Honorary Director
	FD - Former Director

Summary of Accomplishments (FY2011)

Research Grant Submissions – submitted in FY2011 – to cover period 2011 – 2013

Research grant submissions for the Climate Change Institute totaled **$46,367,501** for fiscal year 2011. This total reflects 100 submissions (includes new, supplemental, continuation, and pre-proposal submissions); and is exclusive of EPSCOR proposals that include Institute faculty participation.

New Research Grant Submission Awards – FY2011

New research grant submissions (includes new, supplemental and continuation awards) awarded to the Climate Change Institute total **$14,854,875** (61 grants).

Pending Research Grants Submissions – FY2011

Research grant submissions pending for the Climate Change Institute total **$15,228,100** (28 grants) covering FY2011 **–** FY2013.

Declined/Withdrawn Research Grant Submissions – FY2011

Research grant awards declined for the Climate Change Institute totaled **$16,284,526** (11 grants) during FY2011.

Percent Success Rate by all CCI Grant Writers for Research Grant Submissions – FY2011

Climate Change Institute faculty and staff were **84.72% successful** in obtaining grant awards during FY2011.

Funds via E&G and MEIF – FY2011

E&G funding for salaries* (minus fringe) totals: $614,103
E&G funding for operating totals: $16,580

MEIF funding for salaries* (minus fringe) totals: $463,144
MEIF funding for operating totals: $28,350

TOTAL E&G and MEIF FUNDING: $1,122,177

*Note – The vast majority of these salaries support tenure track faculty who teach courses in academic departments.

Return on Investment (ROI) for CCI – E&G and MEIF

FY2010 Research Grants *(includes only faculty supported by E&G and MEIF)*	
FY2010 Research Grants Total	$11,247,073
FY2010 E&G and MEIF Funding:	$1,147,177
ROI = CCI return on investment is $9.80 dollars per $1 invested in MEIF and E&G	

FY2011 Research Grants *(includes only faculty supported by E&G and MEIF)*	
FY2011 Research Grants Total	$10,845,220
FY2011 E&G and MEIF Funding:	$1,122,177
ROI = CCI return on investment is $9.66 dollars per $1 invested in MEIF and E&G	

The table below includes all Climate Change Institute grant writers who receive E&G and or MEIF funds through CCI.

CCI Faculty/Staff	Grant Award Total FY2011	Number of Grants
Denton, George	961,070	5
Dieffenbacher-Krall	355,412	2
Hall, Brenda	1,034,104	4
Hamilton, Gordon	2,031,770	8
Koons, Peter	2,606,179	5
Kreutz, Karl	287,336	2
Kurbatov, Andrei	436,546	1
Mayewski, Paul	2,436,946	4
Robinson, Brian	39,052	1
Saros, Jasmine	648,977	5
Zaro, Gregory	7,828	1
# of Grant Writers = 11		
TOTAL	**$10,845,220**	**38**

The average amount raised by each CCI grant writer (11) supported by MEIF and/or E&G was **$985,929** in FY2011.

Major Awards and Recognition:

Six major awards and recognitions (see page 18 of this report for details) were given to CCI faculty this year; maintaining CCI's high national and internatonal standard of excellence.

Research Expeditions:

CCI takes great pride in its international reputation for research expeditions. All CCI graduate students are involved in at least one research expedition, many several, during their graduate career. Students provide daily logs as part of CCI's outreach. CCI

undertook 54 expeditions this past year for details: http://www.climatechange.umaine.edu/research/expeditions

Mentoring

A total of 47 graduate students are associated with the Institute, 20 are PhD students. Research grants support 41 of the graduate students.

Summary of Faculty Publications – FY2011

PUBLICATION TYPE	FY2011	FY 2010	FY 2009
Publications/Abstracts/Books/Book Chapters/Journal Articles/Posters/Proceedings/Technical Reports	**238**	**218**	**267**
Presentations: International/National/Regional/State Local	**138**	**140**	**137**

FULL ROSTER OF CLIMATE CHANGE INSTITUTE FACULTY/STAFF

Last Name	First Name	Position in Research Unit	Home (Institute/Acad Dept)
Addessi	Becky	Manager of Funded Accounts	Climate Change Institute
Belknap	Daniel	Cooperating Professor	Earth Sciences/Climate Change Institute
Bertler	Nancy	Research Assistant Professor	Climate Change Institute
Borns	Harold	Professor Emeritus of Geological Sciences and Climate Change Institute	Earth Sciences/Climate Change Institute
Bromley	Gordon	Research Associate	Climate Change Institute
Chai	Fei	Cooperating Associate Professor	School of Marine Sciences/Climate Change Institute
Chawathe	Sudarshan	Cooperating Associate Professor	Computer Science/Climate Change Institute
Davis	Ronald	Professor Emeritus of Biology and Quaternary Studies	Biological Sciences/Climate Change Institute
Denton	George	Professor of Geological Sciences	Earth Sciences/Climate Change Institute
Dieffenbacher-Krall	Ann	Assistant Research Professor	Climate Change Institute/Biological Sciences
Fastook	James	Cooperating Professor	Computer Science/Climate Change Institute
Fernandez	Ivan	Cooperating Professor	Dept. of Plant, Soil & Environmental Sciences/Climate Change Institute/
Hall	Brenda	Associate Professor of Glacial and Quaternary Geology	Climate Change Institute/Earth Sciences
Hamilton	Gordon	Associate Professor	Climate Change Institute
Handley	Michael	Laboratory Manager - Inorganic Chemistry	Climate Change Institute/Sawyer Env. Chem. Research Lab.
Holweger	Paul	Research Assistant	Climate Change Institute
Hooke	Roger	Cooperating Professor	Climate Change Institute
Hoyle	Gary	Artist in Residence	Climate Change Institute
Hughes	Terence	Professor Emeritus of Quaternary Studies	Earth Sciences/Climate Change Institute
Introne	Douglas	Stable Isotope Technician	Climate Change Institute
Jacobson	George	Professor Emeritus of Quaternary Studies	Botany/Climate Change Institute
Jain	Shaleen	Cooperating Assistant Professor	Civil & Environmental Engineering/Climate Change Institute
Kates	Robert	Presidential Professor of Sustainability Science	Climate Change Institute/Senator George J. Mitchell Center for Environmental and Watershed Research
Keefer	David	Adjunct Professor	Climate Change Institute
Kelley	Alice	Research Assistant Professor	Earth Sciences/Climate Change Institute
Kelley	Joseph	Cooperating Professor	Earth Sciences/Climate Change Institute
Kellogg	Thomas	Professor Emeritus of Quaternary Studies	Earth Sciences/Climate Change Institute
Koons	Peter	Associate Professor	Earth Sciences/Climate Change Institute
Kreutz	Karl	Associate Professor	Climate Change Institute/Earth Sciences
Kurbatov	Andrei	Assistant Research Professor	Climate Change Institute
Lagerklint	Ingrid	Research Assistant Professor	Climate Change Institute
Lee	Betty	Financial & Outreach Manager	Climate Change Institute
Maasch	Kirk	Professor of Climate Change Institute and Earth Sciences	Climate Change Institute/Earth Sciences
Mayewski	Paul	Director/Professor of Climate Studies	Climate Change Institute/Earth Sciences
Meese	Debra	Research Professor	Climate Change Institute
Norton	Stephen	Cooperating Professor Emeritus	Earth Sciences/Climate Change Institute
Nurse	Andrea	Research Scientist	Climate Change Institute

FULL ROSTER OF CLIMATE CHANGE INSTITUTE FACULTY/STAFF - continued

Last Name	First Name	Position in Research Unit	Home (Institute/Acad Dept)
Ocampo-Raeder	Constanza	Cooperating Assistant Professor	Anthropology/Climate Change Institute
Olsen	Brian	Research Assistant Professor	School of Biology & Ecology/Climate Change Institute
Oswald	Gordon	Research Professor	Climate Change Institute
Peterson	Michael	Cooperating Professor	Department of Mechanical Engineering/Climate Change Institute
Porter	Charles	Research Associate	Climate Change Institute
Robinson	Brian	Associate Professor of Quaternary and Climate Studies	Anthropology/Climate Change Institute
Roscoe	Paul	Cooperating Professor	Anthropology/Climate Change Institute
Sandweiss	Daniel	Professor	Dean & Provost for Graduate Studies - Anthropology/Climate Change Institute
Sanger	David	Professor Emeritus of Anthropology and Quaternary Studies	Anthropology/Climate Change Institute
Saros	Jasmine	Associate Professor	Climate Change Institute/Biological Scs.
Schauffler	Molly	Research Assistant Professor	Climate Change Institute
Simoes	Jefferson	Adjunct Professor	Climate Change Institute
Smith	Bruce	Adjunct Professor	Climate Change Institute
Sneed	Sharon	Laboratory Coordinator	Climate Change Institute
Sobolik	Kristin	Professor	Anthropology/Climate Change Institute
Sorg	Marcella	Research Associate Professor	Climate Change Institute/Anthropology/Margaret Chase Smith Policy Center
Stager	J.Curt	Adjunct Professor	Climate Change Institute
Stone	Jeffery	Research Assistant Professor	Climate Change Institute
Vandergoes	Marcus	Assistant Research Professor	Climate Change Institute
Zaro	Gregory	Assistant Professor of Anthropology & Climate Change	Anthropology/Climate Change Institute
Zeder	Melinda	Adjunct Professor	Climate Change Institute

CLIMATE CHANGE INSTITUTE E&G & MEIF FUNDED POSITIONS

Note: The Climate Change Institute faculty/staff roster numbers 58 people. Only those with CCI MEIF or CCI E&G support are listed here.

E&G		**Grant Home**
Faculty & Staff		
Dieffenbacher-Krall, Ann	Assistant Research Professor (25%)	CCI
Denton, George	Libra Professor, Climate Change Institute & Earth Sciences (74%)	CCI
Hall, Brenda	Associate Professor, Climate Change Institute & Earth Sciences (70%)	CCI
Kreutz, Karl	Associate Professor, Climate Change Institute & Earth Sciences (100%	CCI
Hamilton, Gordon	Associate Professor (43.49%)	CCI
Maasch, Kirk	Professor, Climate Change Institute & Earth Sciences (50%)	CCI
Robinson, Brian	Associate Professor, Climate Change Institute & Anthropology (65%)	CCI
Saros, Jasmine	Associate Professor, Climate Change Institute & Biological Sciences (49.2%)	CCI
Sobolik, Kristin	Professor, Climate Change Institute & Anthropology (50%)	ANT
Zaro, Gregory	Assistant Professor, Climate Change Institute and Anthropology (50%)	CCI
Staff (not grant writers)		
Addessi, Rebecca	Account Manager (100%)	
Lee, Betty	Financial & Outreach Manager (100%)	

MEIF		**Grant Home**
Faculty & Staff		
Dieffenbacher-Krall, Ann	Assistant Research Professor (12.5%)	CCI
Mayewski, Paul	Professor of Climate Change Institute (100%)	CCI
Koons, Peter	Professor, Climate Change Institute & Earth Sciences (24.04%)	ERS
Kurbatov, Andrei	Assistant Research Professor (50%)	CCI
Saros, Jasmine	Associate Professor, Climate Change Institute & Biological Sciences (50.8%)	CCI
Staff (not grant writers)		
Holweger, Paul	Research Assistant (100%)	
Introne, Douglas	Stable Isotope Laboratory Manager (100%)	