THE UNIVERSITY OF MAINE

CLIMATE CHANGE INSTITUTE

20TH Annual Harold W. Borns, Jr.

Symposium

Schedule

April 5-6, 2012

CLIMATE CHANGE INSTITUTE
UNIVERSITY OF MAINE

Conference Schedule
2012-04-05

12:30 PM

- **Coffee**

01:00 PM

- **Director's Welcome:** Introduction and opening remarks by the Climate Change Institute's Director, Paul Mayewski.

01:15 PM

- Krista EH Slemmons, Glaciers As Drivers Of Alpine And Arctic Ecosystem Structure And Function: Effects On Lake Phytoplankton Over The Last Millennium
  Recent research has shown that glaciers are drivers of modern lake ecosystem structure and function. We investigated whether glaciers have been a chronic driver of biotic change in aquatic communities over the last 1000 years in alpine lakes of the Rocky Mountains and arctic lakes in Renland, Greenland.

01:27 PM

- Elizabeth Joy Olson, Critical Transitions: Climate Change, Coastal Geomorphology And Human Cultures On The North Coast Of Peru (7000-2800 Cal BP)
  The use of multiple proxies including sediment analysis, ground-penetrating radar data, radiocarbon dating, and archaeological site records allowed us to examine the paleoenvironment of the Salinas de Chao paleoembayment. A gradual change in climatic, geomorphic and local resources forced cultures to adapt and change the landscape themselves through architectural construction and resource use between 7000-2800 cal BP.

01:39 PM

- Erik Albert, Sudarshan S. Chawathe, Deploying A Highly Scalable Web Application In The Cloud
  The 10Green Web application (10Green.org) integrates air quality data from diverse sources and provides an intuitive interface that summarizes this information in a manner accessible to scientists and non-scientists alike. From a Computer Science perspective, this application presents interesting challenges in both the back end (e.g., data integration and analysis, maintainability) and the front end (e.g., Web-based visualization, interactive response times, and portability across very diverse client architectures). Here, we focus on scalability and outline the implementation aspects that allow the application to scale from a few hundred users to hundreds of thousands of concurrent users at low cost.

01:51 PM

- Mariusz Potocki, Paul A. Mayewski, Andrei V. Kurbatov, Jefferson C. Simões, Michael Handley, Elena Korotkikh, Ricardo Jaña, A 27 Year Long Arsenic And Cesium Deposition Record From Detroit Plateau, Antarctic Peninsula
  Arsenic and cesium were measured in a series of annually dated ice core samples, covering the period 1980 to 2007, collected from a remote, high snow-accumulation site in Detroit Plateau, Antarctic Peninsula.

02:03 PM

- Margaret Jackson, Glacial History Of Salmon Valley, Royal Society Range, Victoria Land, Antarctica
  I am reconstructing the glacial history of Salmon Valley, Royal Society Range, in order to understand better the history of the Antarctic Ice Sheet. These data will help us determine

the Antarctic's sensitivity to changing climate, as well as the continent's past contribution to sea-level change.

02:15 PM

- Allison J Byrd, Understanding Common Loon (Gavia Immer) Biogeography And Viability In An Era Of Climate Change
  Common loons (*Gavia immer*) maintain territories during the breeding season and high quality habitat is often defended by the highest quality individuals within a population. We aim to quantify the expected shift in lake territory quality with respect to loon distribution and breeding success.

02:30 PM

- **Short Break**

02:40 PM

- Nicole Spaulding, Paired Blue Ice Surface And Ice Core Environmental Records From The Allan Hills Blue Ice Area, Antarctica
  A paired blue ice surface and ice core stable water isotope record from the Allan Hills, Antarctica is presented. First attempts to establish an absolute chronology are discussed.

02:52 PM

- Erin Redding, Ivan J. Fernandez, Michael Day, G Bruce Wiersma, Chemical And Morphological Phenology In Forests Subject To Whole-Watershed Chemical Manipulation
  Tree morphological and chemical phenology was studied at a long-term watershed manipulation site subject to acidification and nitrogen enrichment. There was no effect of watershed treatments on morphological phenology, but there was on chemical phenology expressed as seasonal patterns of foliar nitrogen concentration.

03:04 PM

- Jennifer McCabe, Evaluating The Effects Of Wind Conditions On Songbird Migration Stopover Distribution: Using Current Data To Forecast Future Changes Under Predicted Climate Change Scenarios
  Migration is a critical stage in many songbirds' life-cycle, and the environmental factors that influence migration will directly affect individual success and population viability across the annual cycle. One such factor is wind and its effects on flight speed, flight times, and energy expenditures, thereby affecting survival. Despite considerable research focused on wind patterns as a controlling factor in birds' migratory flight costs, the influence of local and regional wind patterns en route are still poorly understood.

03:17 PM

- Gordon Oswald, More On Subglacial Water In Greenland
  Analysis of ice-penetrating radar data continues to reveal subglacial melt.

03:31 PM

- Molly Schauffler, But What Was Your Hypothesis? A Science Data Literacy Assessment For High School Students Highlights Difficulties In Connecting Data To Inquiry-Based Research Questions
  Two types of data analysis, comparing groups and investigating correlation, provide the foundation for high school students to analyze scientific data (Konold and Khalil, 2003). In the Acadia Learning project, which brings scientific inquiry-based research into classrooms through scientist-teacher-student partnerships, we noted students lacked the background and skills to use these two types of analyses. We designed an assessment and administered it

to 220 students across four high schools in Maine. The instrument used a sample data set and research question for each of the two skill areas. Goals were to (1) characterize student difficulties in representing data, and (2) determine whether teacher professional development (PD) about data literacy improves student work. Results suggest that comparing groups is more difficult for students; >60% of respondents created a graph that did not sort data into groups, and <10% of students created a version of the 'correct' graph. For the correlation item, 36% of students created an unrelated graph, but 39% created the ideal graph, suggesting more practice or better understanding of correlation- type questions. When teachers who had participated in data literacy professional development presented lessons targeting these two topics, student scores improved significantly (Chi square analysis, p<0.05). This study has highlighted student misconceptions and aided science teacher understanding of the types of data literacy skills students need to practice. We also demonstrated that a focus on data literacy can lead to better student understanding of graphs as evidence in scientific inquiry.

03:34 PM

- Brian McGill, Developing State-Of-The Art Climate Layers That Are Useful For Biological Predictions
  Hundreds of papers are published every year using the relationship between climate and biological distribution data to: a) improve interpolation of spatially sparse data and b) develop transfer models for predicting distributions under climate change. Biologists usually use standard climatological products that are coarse resolution and use long term means of temperature and annual precipitation. In fact organisms usually care much more about extreme events, biologically tuned measures like degree days and many applications need much higher spatial resolution. A group of scientists is working with NASA, NCEAS and iPlant to develop such data using novel analysis methods and synthesizing ground station and satellite data.

03:37 PM

- Andrei V. Kurbatov, Combined Distribution Of Climate Data And Processing Algorithms Using R Package System
  A new initiative for the distribution of self contained, comprehensive, climate data sets combined with data processing algorithms is in development. I use data and packaging functions that are embedded into the design of R software. R scripting language was selected because it was developed for statistical data manipulation and analysis. R is very similar to S-Plus but is freely distributed (http://www.r-project.org) as Free Software under the terms of the Free Software Foundation's GNU General Public License. Available for all major computer systems, R has outstanding user support, an easy to comprehend help system, and excellent graphing capabilities. R also has numerous built-in or user contributed statistical functions (packages).

03:40 PM

- Gordon Hamilton, Leigh Stearns, Pedro Elosegui, Jessica Scheick, Nora Weitz, Variable Flow Speeds On The World's Second Largest Glacier: Byrd Glacier, East Antarctica
  Outlet glacier dynamics exert an important control on ice sheet mass balance and sea level. As part of an effort to understand the physical controls on flow speed variability, we deployed a GPS network on Byrd Glacier. Initial results show that the glacier flow responds to a variety of forcings, including sub glacial lake outburst floods (response duration on the order of months) and ocean tides (response duration on the order of hours). These observations provide insights into the processes controlling outlet glacier flow.

03:43 PM

- Sean D. Birkel, Kirk A. Maasch, Paul A. Mayewski, Climreview: A Web-Based Utility For Visualizing And Interrogating Climate Reanalysis Products

We are developing web-based visualization software that will allow rapid access to the NCEP CFSR and ERA-Interim climate reanalysis products. Integrated tools will enable the user to generate surface plots, animations, vertical cross sections, anomaly fields, and time series correlations.

03:46 PM

- Seth Campbell, Strain Rate Estimates On Mount Hunter, Alaska: What Causes Crevassing At An Ice Divide?
  We investigate crevasse formation at the ice divide of the Mt. Hunter plateau, Central Alaska Range, using GPS, GPR, ice core, and numerical model data. Prior research suggests that ice divides represent low strain rate environments, which are generally crevasse free. However, our study site, which shows evidence of buried crevasses near the divide, contradicts this assumption making for a unique dynamical situation and interesting case study.

03:49 PM

- Daniel Dixon, Expanding Possibilities: ERA-Interim, WRF, And Ndown
  ERA-interim data from the European Centre for Medium-Range Weather Forecasts (ECMWF) are providing new avenues of investigation into the last three decades of Earth's climate history. We are using these data to conduct regional climate simulations with the Weather Research and Forecast Model (WRF). Normally, an extremely powerful computer such as the Cray XT5 supercomputer at Oak Ridge National Laboratory would be required to achieve very high resolution (e.g. convective-scale) model output via multiple nested grids. However, by using the "ndown" program we can achieve high-resolution model output with relatively modest computing power. The ndown program allows WRF to run one-way nested grids as often as is needed to achieve the required model resolution. We are using these powerful tools to calibrate our ice-core based proxies of climate in Antarctica and elsewhere around the globe.

03:52 PM

- Brian Olsen, David Evers, Allison Byrd, Toxin Load Decreases The Capacity Of Common Loons To Adapt To Climate Change
  A central question concerning climate change for biologists is how organisms adapt to climate changes and what factors might influence their capacity to adapt. We tested for differences in the adaptive capacity of common loons, *Gavia immer*, to maintain reproductive output under varying mercury body burdens and a variety of weather conditions. Individuals with high mercury loads were more influenced by changes in weather than those individuals with lower burdens, suggesting that anthropogenic toxins have the ability to limit adaptive capacity to climate in wild vertebrate populations.

03:55 PM

- Shaleen Jain, Modulation Of North Atlantic Hurricane Frequency By Sahelian Dust: A Modicum Of Predictability?
  In this study, we take an empirical approach answer the following question: What is the impact of Sahelian dust on North Atlantic hurricane frequency? Based on historical data and carefully selected predictors, we provide an assessment of the "predictive signal", attendant uncertainty, and the importance of model structure specification in studies of this variety.

04:00 PM

- **Break with refreshments**

04:30 PM

- Bess Giese Koffman, Steven Goldstein, Michael Kaplan, Gisela Winckler, Natalie Mahowald, Karl Kreutz, Evaluating New Zealand As A Source Of Dust To West Antarctica During The Last Glacial Maximum
  The primary objective of the planned work described here is to evaluate the hypothesis that New Zealand was a significant source of dust to West Antarctica during the Last Glacial Maximum.

04:42 PM

- Kristin Sobolik, Jeffrey Sommer, Richard Redding, Samuel Belknap III, Vaughn M. Bryant, Neandertals: New Lines Of Evidence
  Neandertals were originally found in 1856 in the Neander Valley of Germany, and analyses of the remains of these human ancestors have produced scientific theories suggesting they developed the concept of religion, buried their dead with flowers, conceptualized advanced artistic creativity, became extinct at the hands of modern humans, and perhaps interbred with humans leaving their genes in modern Eurasian populations. We summarize recent research on Neandertals and focus, specifically, on excavation, pollen, and faunal evidence from the Shanidar IV burials, excavated by Ralph Solecki in the 1950s, which then became the "type" specimens of Classic Neanderthals. We provide a reanalysis and reinterpretation of these famous remains.

04:54 PM

- Gregory Zaro, Brett A. Houk, The Growth And Decline Of An Ancient Maya City
  We utilize an array of archaeological data to interpret the growth and decline of the ancient Maya city of La Milpa, Belize. Relative construction histories and artifact depositional patterns combine with absolute and relative dating mechanisms to reconstruct the historical trajectory of this ancient Maya built environment. These data help archaeologists to better identify variability in urban growth, fluorescence, and collapse in Classic Maya civilization.

05:06 PM

- Walter Isles Beckwith, Maya Obsidian Of The Three Rivers Region, Belize: A Proposal
  A sample of obsidian artifacts housed at the R.E.W Adams Research Facility situated in the Rio Bravo Conservation and Management Area (RBCMA), Belize, will be geochemically analyzed using portable x-ray fluorescence spectrometry (PXRF) to determine source material movement and distribution in the Maya Three Rivers region.

05:18 PM

- Kirk Allen Maasch, Yi Yang, Sean Birkel, Sensitivity Of A Regional Weather Model To The Choice Of Domain Size, Location, And Spatial Resolution
  Three experiments will be performed with the Weather Research and Forecasting model (WRF) to investigate how the choice of domain size and resolution impacts model performance. WRF will be run in each experiment for two months (January and July 2010) with lateral boundary conditions provided by a global weather reanalysis. The model's performance will be assessed by a comparison with meteorological station data.

05:30 PM

- Aaron Kirk Medford, Brenda L. Hall, Late Holocene Glacial History Of Renland, East Greenland, Reconstructed From Lake Sediments
  The Arctic's climate is responding already to increases in greenhouse gases. In order to predict accurately future climate change in the region, we first must understand natural climate variability and place the present warming in context. To address this question, I will reconstruct past fluctuations of the Renland Ice Cap during the Holocene by studying multiple proxies in lake cores to constrain better the timing of climate events in Greenland.

05:42 PM

- Mark Royer, Sudarshan S. Chawathe, Andrei V. Kurbatov, Paul A. Mayewski, Managing Diverse Data Sets Using P301
  The integration and analysis of data sets from diverse sources provides scientists with an opportunity to gain insights that are not apparent from the individual data sets or sources. For many sources, improving technology and other factors have resulted in a very rapid growth in both the volume and the diversity of data. This wealth of data has the potential for significant scientific breakthroughs. However, this potential is difficult to realize unless there is a systematic and effective method for managing this data. The methods used by researchers in the past typically do not scale up to current and anticipated levels of data volume and diversity. The P301 project addresses this problem with the goal of accelerating the data flow from data sources to research results. Below, we outline one aspect of this work: Managing the syntactic and semantic consistency of data using an interactive framework that eases the task of importing, cleaning, analyzing, and visualizing data, and of recording such data transformations and results using histories and certificates.

2012-04-06

07:30 AM

- **Coffee and light breakfast**

08:00 AM

- **Summary of the Day**

08:10 AM

- Kristin E Strock, Jasmine E Saros, Exploring Climate-Induced Changes In West Greenland Lakes
  Across the Arctic, lake sediment records provide some of the few key archives documenting rates of ecosystem change in this region since the last ice age. In particular, striking changes in communities of diatoms have occurred over the last 150 years. We used experiments to provide key ecological information that will enhance interpretation of climate-induced changes from several existing diatom records from southwest Greenland.

08:22 AM

- Jessica Scheick, Gordon Hamilton, Hubbard Glacier, AK: A Brief History And Preliminary Velocity Results From High Rate GPS Observations
  Hubbard Glacier is a dynamic tidewater glacier located in southeast Alaska. In contrast to current climate trends and the behavior of nearby glaciers, Hubbard Glacier is advancing. A series of GPS observations were carried out on the glacier during 2010 and 2011. Preliminary results show precipitation is one control on glacier velocity. Further investigation will explore additional influences on flow speed variability.

08:34 AM

- Maureen Correll, Brian Olsen, Thomas P Hodgman, Predicting Tidal Marsh Bird Populations Via Remote Sensing: A Potential Tool For Coastal Conservation
  Tidal marshes are vulnerable to habitat loss due to impacts of climate change, particularly sea-level rise. We explored the relationship between bird survey data and vegetation index values in hopes of developing a cost-effective tool for use by managers in monitoring marsh-bird populations in the northeastern United States.

08:46 AM

- Elizabeth Dengler, LGM Ice Extent At Shackleton Glacier
  The establishment of the Last Glacial Maximum (LGM) ice thickness and deglaciation history at Shackleton Glacier will improve the characterization of the Ross Sea ice sheet during the LGM, thereby helping to constrain possible Antarctic contributions to Holocene sea-level rise.

08:58 AM

- Catherine West, Connecting Past And Present: Zooarchaeology And Conservation Biology In The Gulf Of Alaska
  This project addresses the utility of zooarchaeological data for addressing current environmental concerns in the Alaska Maritime National Wildlife Refuge and proposes a combination of archaeological and paleoenvironmental research to contribute to contemporary landscape management.

09:10 AM

- Thomas M. Beers, Ultra High Resolution Ice Core Analysis From Roosevelt Island, Antarctica
  The Roosevelt Island deep ice core is situated ideally to capture changes in climate impacting the Ross Ice Shelf, and the West Antarctic Ice Sheet. With the <4-micrometer precision that the Laser Ablation Inductively Coupled Plasma Mass Spectrometer allows, this record could potentially be examined on a storm event scale.

09:22 AM

- Joe Kelley, Daniel Belknap, Sea-Level Change In The Irish Sea: A Seismic Reflection And Coring Expedition
  We have completed year 1 of a three year project to document complex changes in sea level in the Irish Sea (Bantry Bay, Cardigan Bay, Isle of Man, Drogheda and Belfast). We gathered 2 weeks of seismic reflection profiles coupled to extensive multibeam bathymetric data. Seismic lines show sea level falling to – 80 m in the extreme southern Republic of Ireland to – 30 m in Northern Ireland. This summer we will core target sites to obtain dates for the observed sea level changes.

09:34 AM

- Ana Cecilia Mauricio, The Huaca 20 Site In The Maranga Complex: Human-Environment Interactions, Household Activities, And Funerary Practices In The Central Coast Of Peru.
  The Huaca 20 site was the household of a fishermen population that was severely hit by a mega-El Niño event around 600 A.D. This phenomenon triggered a series of transformations in this site directed to cope with this time of environmental stress.

09:46 AM

- Alice R. Kelley, Daniel Belknap, Andrew Heller, Charlie Baeder, Mathais Collins, Pre-Dam Removal Geomorphic Monitoring On The Penobscot River, Maine, USA
  The Penobscot River Restoration Project is the largest river restoration effort underway on the North American east coast. Removal of two hydroelectric dams and state of the art fish passage at other dams will open a large portion of the Penobscot drainage to diadromous fish. Renovations to existing dams on the Stillwater River and Penobscot main stem will allow river restoration with no net loss of generating capacity.

09:49 AM

- Karl Kreutz, Developing K-5 And Public Outreach Products For The Gulf Of Maine Using The Ios Platform

The Apple iOS platform provides new and unique opportunities to develop interactive education products, and has a distribution scheme that is well suited to research efforts where frequent content updates are desireable. We describe here our recent efforts to exploit this technology with an ongoing Gulf of Maine paleoclimate project, utilizing classroom feedback and peer communication during app development.

09:52 AM

- Daniel Belknap, Joseph T Kelley, Bedrock Control Of The Central Maine Inner Shelf
  The 'rock-bound coast of Maine" is more than just a slogan, the bedrock framework is the primary control on geomorphology, and has provided major influences on glacial erosion and deposition, sea-level change controlled littoral reworking, and modern processes of embayment and shoreline sedimentology. The bedrock structure can be followed offshore through geophysical surveys to reveal similar controls at lowstand about 60-65 m below present ca. 12.4 cal ybp. Interest in evolution of the coast in relation to climate and sea-levels changes must be informed by this fundamental structure in many coastal segments. Benthic oceanography, fisheries, and offshore wind power are other applications that need this knowledge.

09:55 AM

- Jasmine Saros, Deciphering The Effects Of Extreme Hydrological Events On The Response Of Northeastern Lakes To Reduced Sulfur Deposition
  A potential confounding factor in evaluating the response of surface waters to declining sulfur deposition is variable weather, as suggested by trends during extreme hydrological events. To investigate this, we are coupling climate reanalysis models with a 30-year database of lake geochemistry data to evaluate the role of precipitation in these trends.

10:00 AM

- **Coffee with refreshments break**

10:15 AM

- Katharine Johanna Ruskin, Brian J Olsen, Testing For Stability In The Sharp-Tailed Sparrow Hybrid Zone: 130 Years Of Plumage Comparisons
  To test for changes in the sharp-tailed sparrow hybrid zone, we compared plumage characteristics of birds captured at the same site in southern Maine in 2011 and from 1882-1941. The populations were significantly different, indicating that mean phenotype at this site has changed over time and might suggest increased rates of hybridization.

10:28 AM

- Kate Warner, Jasmine Saros, Effects Of Nitrogen Enrichment From Glaciers On Food Web Interactions In Alpine Lakes
  Lakes fed by glacial meltwaters in the central Rocky Mountains have nitrate concentrations that are one to two orders of magnitude higher than lakes fed by snowmelt waters. Although nitrogen (N) is a limiting nutrient, the standing crop of algae is often similar between glacial fed (GSF) and snowmelt fed (SF) lakes. We are investigating whether food web interactions differ between GSF and SF lakes, and explain the observed algal patterns.

10:42 AM

- Elena Korotkikh, Paul Mayewski, Daniel Dixon, Michael Handley, Sharon Sneed, Changes In Atmospheric Circulation During The Last Century As Recorded In East Antarctic Ice Cores
  Chemical signals, including dust, seasalt and marine biogenic emissions, are investigated in three ice cores from East Antarctica covering the period 1550 to 2000 A.D.

10:55 AM

- George L Jacobson, Changing Climate And Sea Level Alter Hg Mobility At Lake Tulane, Florida USA
  Lake Tulane lies on the Lake Wales Ridge on the Florida, USA peninsula at an elevation of 36 masl. Analyses of a 17 m-long radiocarbon dated sediment core have previously revealed a continuous 60,000-year record of changing climate, vegetation, and hydrology. Building on that work, we here present data and interpretation from Hg analyses on the same core. The new results provide several useful and, in some cases, unexpected observations and interpretations related to deposition of Hg over the last 45,000 years.

11:10 AM

- Courtney Wigdahl, Jasmine Saros, Sherilyn Fritz, Disparities In Diatom-Inferred Drought Records Across The Great Plains (USA): The Potential Role Of Climate-Induced Changes In Lake Habitat
  Diatom-inferred salinity in prairie saline lakes is frequently used to identify past patterns of drought. However, diatom-based drought reconstructions from geographically-close sites in the Great Plains have yielded disparate results. Climate-induced physical changes in lake ecosystems may alter the accuracy of these salinity reconstructions, due to the influence of habitat changes on diatom community structure.

11:25 AM

- Bjorn Grigholm, Paul A Mayewski, Shichang Kang, Vladimir Aizen, Karl Kreutz, Cameron Wake, Elena Aizen, ~500-Years Of Regional Atmospheric Dust Variability Captured In High-Resolution Asian Ice Core Array
  High-resolution calcium records from AICA sites reveal the spatial and temporal variability of atmospheric dust concentrations over Asia for the last ~500 years and possible circulation controls.

11:40 AM

- **Final Remarks and Introduction**: Closing remarks by the Climate Change Institute's Director, Paul Mayewski, and his introduction of Professor of Anthropology and Quaternary and Climate Studies/Dean and Associate Provost for Graduate Studies, Daniel Sandweiss.

11:45 AM

- **Induction**: Professor Daniel Sandweiss will induct Dan and Betty Churchill into the Graduate School's George Davis Chase Society.

12:00 PM

- **Lunch**

07:00 PM

- **David Clayton Smith Lecture**:
  "Ice Ages and Christmas Children: An Archaeologist Looks at Ancient Climate Change"
  presented by Brian Fagan, Professor Emeritus, University of California, Santa Barbara, CA.

  Hutchins Hall, Collins Center for the Arts