Climate Change

Session #3-1

DATE: WEDNESDAY, MARCH 25, 2009

Breakout Session 3-1:

Time: 1:30pm - 3:15pm

Chair: George T. Stone, Department of Physical Science,
Milwaukee Area Technical College

Presenters:

Crisis in the Cryosphere: Implications of Planetary Meltdown
George T. Stone, Department of Physical Science,
Milwaukee Area Technical College

Anthropogenic warming is rapidly destabilizing the global climate system. Earth's cryosphere is the planet's thermometer; accelerating ice loss manifests rising surface temperatures and alerts us to the overarching challenge of greenhouse warming. All components of the cryosphere are in decline: ice sheets and outlet glaciers, ice caps and mountain glaciers, ice shelves and sea ice, and permanently frozen ground (permafrost). This worldwide meltdown not only documents changing climate, it forewarns humanity of potentially catastrophic impacts on water supplies and coastlines. Shrinking glaciers in the planet's great mountain belts threaten diminished discharge to major river systems and reduced recharge to aquifers upon which extensive agriculture and vast populations depend. Rising sea levels resulting from thermal expansion and melting glaciers put many of the world's coastal areas at ever-increasing risk of flooding and reconfiguration. Low-lying lands on deltas and atolls are especially vulnerable.

Earth's ice is stored in the cold climatic zones of high altitude and high latitude. But now geologically "instantaneous" anthropogenic warming is abruptly perturbing cryosphere equilibrium so that the rate of ice loss (negative mass balance) and consequent impacts are accelerating. Albedo and other positive feedbacks are driving the most rapid melting in the polar regions: the Arctic, including Greenland, and the Antarctic, particularly the Antarctic Peninsula. Because of the global implications of accelerating ice loss, it is vitally important to monitor closely all components of this planetary thermometer. Ongoing research is essential to increase the accuracy and confidence of impact projections in order to inform policy decisions and planning for mitigation and adaptation. This proposed Pardee Keynote Symposium for the 2009 Annual Meeting of GSA is designed to bring the latest cryosphere research and impact projections before the geoscience community.

Evidence of Past West Antarctic Ice Sheet Collapses Under Similar Conditions to Future Warming Scenarios
Ross Powell, Northern Illinois University

The West Antarctic Ice Sheet (WAIS) is potentially vulnerable to global warming because it is aground on the sea floor rather than on land: however, its future behavior has poor predictability at present. By targeting records from the 'warmer

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Presenters:

than-present' early-Pliocene epoch (~5–3Myr ago), the ANDRILL Program (the AND-1B core) has demonstrated a 40kyr cyclic variation in WAIS extent linked to cycles in insolation influenced by changes in the Earth's axial tilt (obliquity). Our data provide direct evidence for periodic WAIS collapse, resulting in open waters in the Ross Sea. These collapses occurred when planetary temperatures were up to ~3oC warmer than today and atmospheric CO2 partial pressure was as high as 400ppm; both values are within the range predicted for Earth's near future.

The evidence is consistent with a new ice-sheet/ice-shelf model that simulates fluctuations in Antarctic ice volume of up to +7m in equivalent sea level associated with the loss of the WAIS and up to +3m in equivalent sea level from the East Antarctic Ice Sheet. The collapse appears to have been induced by oceanic melting during warming events leaving only small, isolated ice caps on West Antarctic islands, and taking only one to several thousand years to occur. During these times, diatomaceous sediments in the AND-1B core indicate high surface-water productivity, minimal summer sea ice and air temperatures above freezing, suggesting an additional influence of surface melt under conditions of elevated CO2.

Wisconsin Initiative on Climate Change Impacts (WICCI)
John Magnuson, UW Madison

The Wisconsin Initiative on Climate Change Impacts (WICCI) assesses and anticipates climate change impacts on specific Wisconsin natural resources, ecosystems and regions; evaluates potential effects on industry, agriculture, tourism and other human activities; and develops and recommends adaptation strategies that can be implemented by businesses, farmers, public health officials, municipalities, resource managers and other stakeholders. WICCI represents a partnership between: The University of Wisconsin, The Wisconsin Department of Natural Resources (DNR), and Other state agencies and institutions. It combines cutting-edge climate modeling capabilities with field expertise to assess impacts at focused and relevant measures of time and space. It fosters collaboration among units across the UW System; and with agencies and institutions across the state. It develops practical information that can be used at all levels of decision making, both public and private. It is driven by stakeholder input to ensure that WICCI assessments meet the informational needs of Wisconsin citizens, businesses and institutions. Unlike the Governor's Global Warming Task Force, which targets mitigation of greenhouse gases - how we affect the climate - WICCI focuses solely on the impacts of climate change - how the climate affects us.

Acting on Inevitable Climate Change: Mitigation and Adaptation
Mark Chandler, NASA Goddard Institute for Space Studies

See presenter biographies next page

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Speaker Biographies:

Ross Powell

Ross Powell is a Distinguished Research Professor in the Department of Geology and Environmental Geosciences at Northern Illinois University where he has been teaching and researching for 28 years. His main research interests focus on processes where glaciers and ice sheets enter the sea and in interpreting the sedimentary records indicating how and why glaciers move into and out of the sea at present and during past climatic warming and cooling cycles. He has 35 years of research experience in high latitude regions including Alaska, Svalbard (Norway), the Canadian Arctic, Antarctica and Chile. Ross has helped lead a new international geological drilling initiative in Antarctica supported in part by the National Science Foundation (NSF), where scientists study geological climate records buried beneath the frozen sea to help predict possible future behavior of the Antarctic ice sheet in response to current global warming. As part of another project supported by the National Oceanic and Atmospheric Administration (NOAA) and operated through NIU's Analytical Center for Climate and Environmental Change (ACCEC), he is building a robotic submarine for exploring the unknown environments under floating ice shelves in Antarctica, to study the effects of climate change and warming ocean waters beneath them. As a participating scientist in the only NSF supported Research Experience for Undergraduates (REU) program in the Arctic (on Svalbard), Ross is also fostering development of young scientists and teaching them about polar global warming.

John J. Magnuson

John J. Magnuson is an Emeritus Professor of Zoology and past Director of the Center for Limnology at the University of Wisconsin- Madison. He earned his BS and MS from the University of Minnesota-St. Paul in fish and wildlife management and his Ph.D. from University of British Columbia, Canada, in zoology with a minor in oceanography. He joined the faculty in 1968 and taught Limnology and Ecology of Fishes. He was one of the co-chairs of the Waters of Wisconsin Project for the Wisconsin Academy of Sciences, Arts & Letters (2001-03) and is a member of the Dane Co. Lakes and Watershed Commission. He played a lead role in the lakes and streams portions of the 1995 and 2001 Assessments by Intergovernmental Panel on Climate Change (IPCC) and the Union of Concerned Scientist's "Confronting Climate Change in the Great Lakes Region." He is presently co-chair of the "Wisconsin Initiative on Climate Change Impacts". His most recent books is: Magnuson, Kratz, and Benson 2006. Long-Term Dynamics of Lakes in the Landscape. Oxford University Press.