Christopher A. Shuman[2] (301 614 5706; christopher.shuman@gsfc.nasa.gov)

[1]Raytheon ITSS,, Building 33, Code 971, NASA/Goddard Space Flight Center,, Greenbelt, MD 20771, United States

[2]Oceans and Ice Branch,, Building 33, Code 971, NASA/Goddard Space Flight Center,, Greenbelt, MD 20771, United States

The Law Dome ice cap adjoining the main East Antarctic ice sheet in Wilkes Land between longitudes 110 aE and 116 aE is about 200 km in diameter with a maximum surface elevation of 1389 m. Satellite radar altimetry results (ERS1-2) and ice flow modeling by using annual layer data derived from the deep ice cores show that the ice cap is currently close to steady state. Law Dome is characterized by a complete range of ice formation zones with extraordinarily large accumulation gradient from west to east from negative values in the ablation zone to about 4 m a-1 net accumulation in the dry snow zone. As an analogue of the main Antarctic ice sheet, Law Dome is an ideal location to examine ICESat capabilities and data quality and to perform detailed studies of seasonal and interannual changes in surface elevations. So far, data from the three 8-day repeat cycles crossing over the ice cap in February-March, 2003 are analyzed. The average separation between the repeat tracks and a reference track varies from 354 to 930 m. To inter-compare the elevations from the three profiles, the elevations are corrected for the cross-track slope estimated from the three profiles to obtain the respective elevations along the reference track. Comparisons of the derived elevations for different cycles show the high accuracy of the ICESat data with standard deviation of 30 cm for the entire crossing range and 6 cm for the lower slope region near the summit. The preliminary data also reveal systematic changes in surface roughness, with higher values at low elevations due to melting and wind erosion features, and minimum values near the summit that well agree with ground observations.

C32A-0444 1330h POSTER

ICESat Calibration-Validation and Mass Balance Studies in Antarctica

Bea Csatho[1] (614-292-6641; csatho.1@osu.edu); Tony Schenk[2] (schenk.2@osu.edu); Kyung In Huh[3] (huh.26@osu.edu); Cornelis van der Veen[3] (vanderveen.1@osu.edu); Impyeong Lee[4] (iplee@uos.ac.kr); Vandy Blue Spikes[5] (vandy.spikes@maine.edu); William Krabill[6] (krabill@osb.wff.nasa.gov)

[1]Byrd Polar Research Center, The Ohio State University, 1090 Carmack Rd., Columbus, OH 43210, United States

[2]CEEGS, The Ohio State University, 2070 Hitchcock Hall, Columbus, OH 43210, United States

[3]Department of Geologic Sciences, The Ohio State University, 125 South Oval Mall, Columbus, OH 43210, United States

[4]Dept. of Geoinformatics, University of Seoul, 90 Jeonnong-dong, Dongdaemun-gu, Seoul 130-743, Korea, Republic of

[5]University of Maine, Climate Change Institute, 5790 Bryand Global Sciences Center, Room 303, Orono, ME 04469, United States

[6]NASA, Laboratory for Hydrospheric Processes, Wallops Flight Facility, Wallops, VA 23337, United States

To map mass balance changes of major drainage basins over a relatively short period, ICESat is designed to measure surface elevation changes with an accuracy of 1.5 cm/year for spatial averages of measurements over areas of 100 km^2. To achieve this accuracy different post-launch calibration-validation (CV) approaches are used to identify and to remove the non-geophysical artifacts from the data products. As part of the CV effort detailed surface topography was mapped by NASA's Airborne Topographic Mapper (ATM) scanning laser over sites in Greenland, western US and the Dry Valleys in Antarctica. Ice sheet surface elevations mapped by airborne laser altimetry surveys also serve as baselines for the ICESat mission. Here we present results from two different projects in the Antarctica. Detailed surface topography, derived from ATM data, is used to verify the ICESat products over the Dry Valleys. Surface elevations, mapped by the University of Texas airborne system (former Support Office of Airborne Geophysics), serves as baselines to map changes over the West Antarctic Ice Sheet ice streams. ATM surveys were conducted over the Dry Valleys in December 2001 in collaboration with NSF and USGS. In addition to survey candidate calibration/validation sites for the ICESat mission, the campaign was going to support NSF projects and to provide data to evaluate the potential of the use of laser altimetry in the Antarctica. The survey resulted blanket coverage over several sites. We have developed a procedure using robust estimation techniques to remove the outlier observations and to interpolate the data into regular grids (DEMs). The ICESat elevation and waveform products were verified by comparing them with the DEMs and with simulated waveforms. Surface reflectivity, necessary for the waveform simulation, was derived from satellite imagery. The stable terrain of the site makes it ideal for serving as benchmark surface throughout the ICESat mission. Precise repeat laser altimetry surveys were conducted with the SOAR system in 1997/98 and 1999/2000 over portions of the Whillans ice stream and ice streams C and E, West Antarctica. It is well known that these ice streams are undergoing substantial changes in length, width, thickness and speed at decadal and shorter changes. We determined elevation changes during the last 5 years by comparing elevations measured by ICESat over the 8-day repeat orbits with the results of the SOAR surveys. We plan to use the 91-day repeat ICESat data to investigate the details of the surface change pattern.

C32B MCC: 3010 Wednesday 1340h

International Polar Year 2007-2008 I

(joint with A, B, G, H, OS, PP, S, ED, GC)

Presiding: **C Elfring,** Polar Research Board, The National Academies**; S Drobot,** Polar Research Board, The National Academies

C32B-01 1340h

A New Phase of Exploration and Understanding: Planning for The International Polar Year - 2007/2008

Robin E. Bell[1] (robinb@ldeo.columbia.edu); Chris Rapley[2] (c.rapley@bas.ac.uk); Chris Elfring[3] (celfring@nas.edu); Ian Allison[4]; Robert Bindschadler[5] (Robert.A.Bindschadler@nasa.gov); Steve Chown[6] (slchown@sun.ac.za); Gerard Duhaime[7] (gerard.duhaime@fss.ulaval.ca); Vladimir Kotlyakov[8] (igras@igras.geonet.ru); Olav Orheim[9] (orheim@npolar.no); Zhanhai Zhang[10] (zhangzhanhai@263.net.cn); Michael Kuhn[11] (Michael.Kuhn@uibk.ac.at); Henk Schalke[12] (henkscha@worldonline.nl); Prem Pandey[13] (pcpandey@ncaor.org); Hanne K. Petersen[14] (hkp@dpc.dk); Gino Casassa[15] (gcasassa@cecs.cl)

[1]ICSU IPY 4 Planning Group, Lamont-Doherty Earth Observatory, Palisades, NY 10964, United States

[2]ICSU IPY 4 Planning Group, British Antarctic Survey, Cambridge CB3 0ET, United Kingdom

[3]Polar Research Board, National Academies of Science, Washington, DC 20001, United States

[4]Australian Anartic Division & Antarctic CRC, PO Box 252-80 Hobart, Tasmania 7001, Australia

[5]NASA Goddard Space Flight Center, Code 971, Bldg. 33, Rm. A218, Greenbelt, MD 20771, United States

[6]Department of Zoology, University of Stellenbosch, Matieland 7602, South Africa

[7]GETIC, Universite Laval, Quebec G1K 7P4, Canada

[8]Russian Academy of Sciences, Staromonetny Street 29, Moscow 109017, Russian Federation

[9]Norsk Polarinstitutt, Polarmiljosenteret, Tromso N-9296, Norway

[10]Polar Research Institute of China, 451 Jinqiao Rd., Shanghai Pudong 200129, China

[11]Institute of Meteorology & Geophysics, Innrain 52, Innsbruck A-6020, Australia

[12]IUGS-UNESCO Division of Earth Sciences Joint Program Project, Starkenborglaan 10, BM Oegstgeest 2341, Netherlands

[13]National Centre for Antarctic and Ocean Research, Department of Ocean Development Govt. of India, Vasco de Gama, Goa 403804, India

[14]Danish Polar Center, Strandgade 100H, Copenhagen K DK-1401, Denmark

[15]Centro de Estudios Cientificos, Avenida Arturo Prat 514 Casilla, Vildivia 1469, Chile

Planning is underway to hold an International Polar Year in 2007-2008. IPY 2007-2008 stands to be a significant research opportunity to further our understanding of polar regions and polar processes. The International Polar Year has the potential to capture the public's imagination and convey the crucial role that the polar regions play in global systems. IPY 2007-2008 is envisioned to be an intense, international campaign of coordinated polar observations and analysis, which will be bipolar in focus, multidisciplinary in scope, and truly international in participation. The vision is for many nations to work together to gain holistic insights into planetary processes, targeted at exploring and increasing our understanding of the poles and their roles in the global system. The concept of an International Polar Year 2007 - 2008 has been endorsed and advanced by a broad range of global and polar research groups. Earlier this year, the International Council for Science (ICSU) formed an International Polar Year Planning Group (IPY-PG) which met for the first time at the end of July. The Planning Group discussed ways to create an open process that encourages broad input from the international community. The Planning Group began to describe the desired goals of IPY 2007-2008, which should address compelling science issues through multi-national programs, enable scientific programs which would not otherwise occur, attract and develop the next generation of polar scientists, and engage the public. The Planning Group has identified three overarching themes that we hope can serve as the foundation for IPY 2007-2008: Exploring the Earth's Icy Domains, Decoding the Role of the Poles in Global Change Understanding Polar Processes. The Planning Group envisions focused research activities under each of these major themes. For example, a program to explore the sub-ice environment of East Antarctica would fit under the theme Exploring the Earth's Icy Domains, a program of Integrated Polar Observing Networks including environmental instrumentation would fit under Decoding the Role of the Poles in Global Change, and a collaborative effort to study the stability of the cryosphere would fit under Understanding Polar Processes.

C

C32B-02 1355h

A Rising Tide for Polar Science: Efforts of the U.S. National Committee for the International Polar Year

Mary R Albert (603-646-4422; malbert@crrel.usace.army.mil)

Cold Regions Research & Engineering Lab, Geophysical Sciences Division 72 Lyme Road, Hanover, NH 03755, United States

The polar regions, fascinating yet distant and cold places, hold the keys to our changing world. While the upcoming IPY is the 50th anniversary of the International Geophysical Year and the 125th anniversary of the first International Polar Year, it also falls at a crucial time in rapid changes in environmental and social systems that may affect all peoples of the Earth. Further warming of the Arctic, changing ecosystems and opening pathways for ocean travel, impact not only the people there but also the shipping, economics, and strategic considerations of distant nations. Yet potential further warming of the Arctic may be understood by clues in the Antarctic ice. How are the polar regions changing, and how swiftly may those changes affect the entire Earth? This is but one question emerging from community discussions of the science of the upcoming IPY. Our emerging ability to investigate previously unexplored areas is increasing our understanding of the wide world we live in, through interdisciplinary studies and tools for connections. Autonomous vehicles, genomics, and remote sensing technologies are just a few of the emerging areas that may provide new tools for investigating previously inaccessible realms. At the same time, tools such as the internet are making the world smaller, enabling instant communications between the peoples of the world. Joint international investigations enhance our ability to understand one another as well as our ability to understand our world and our universe. Rapid communications and international involvement can revolutionize the way we educate young scientists and our future leaders in a complex and changing world. Involving and educating people - young scientists, college students, school children, and the public - will be included as hallmarks of the IPY. The people are here. New tools are emerging. The ideas, or scientific goals, of the IPY are being crafted jointly through broad involvement of the scientific community, through meetings, conversations, and web-based discussions. This presentation will describe the process that the U.S. National committee has employed to nurture the evolution of the IPY, and will describe the new report that is being prepared based on this process.

C32B-03 1410h INVITED

NSF and IPY 2007-2008

Karl A Erb (kerb@nsf.gov)

Office of Polar Programs, National Science Foundation, 4201 Wilson Blvd., Arlington, VA 22230, United States

International research organizations including the International Arctic Science Council, the Arctic Ocean Sciences Board, the Scientific Committee on Antarctic Research, the World Meteorological Organization and the International Council for Science have announced

planning efforts toward coordinated international polar research during 2007-2008, the 50th anniversary of the International Geophysical Year and the Third International Polar Year. This activity is fueled in considerable measure by the conviction that coordinated efforts building on advances in support infrastructure and in instrumentation technology could lead to breakthrough discoveries in subjects ranging from global climate change to astrophysics, oceanography, and micro-biology, to list just a few of those we have heard discussed. The National Science Foundation's Office of Polar Programs–steward of the U.S. Antarctic Program, the U. S. Interagency Arctic Research Policy Committee, and a major source of funding for the education and training of polar scientists, their research and their field support – has engaged in continuing discussions about the upcoming Polar Year with officials responsible for polar research in other U. S. Agencies, in other nations, with a number of international organizations, and with the U. S. planning committee leadership. We have also sought to catalyze thinking in the research community through workshops and discussions and have been monitoring the development of related scientific and educational thrusts. Our goal is to be poised to support U. S. efforts brought forward in timely fashion by researchers and educators and to be ready to facilitate their integration with related international efforts. The time is now rapidly approaching when we will need to begin planning for the support of specific research and education projects. This talk will summarize NSF activity related to planning for the 2007-2008 International Polar Year and will address ways that NSF's focus on People, Ideas, and Tools might support its implementation.

URL: http://www.nsf.gov/home/polar/

C32B-04 1440h INVITED

The Cryosphere in Earth System Science – NASA's Contribution to Polar Research as We Approach IPY.

Ghassem R. Asrar (202/358-2165; ghassem.asrar@nasa.gov)

National Aeronautics and Space Administration, 300 E Street, SW, Washington, DC 20546

The designation of 2007/08 as the next International Polar Year is well timed. The polar regions are undergoing rapid changes, with uncertain - but potentially large - impacts well beyond those frigid climes. Scientists have begun to see the polar regions as bellwethers of global change, beginning with stratospheric ozone depletion (and potential recovery) and extending to the most recent measurements of ice sheet change. The connections between the polar regions and the rest of the Earth system are new and active areas of research. At the same time, our capability to study the polar regions has never been greater. NASA is nearing completion of the deployment of the first phase of the Earth Observing System of remote sensing satellites, and over 20 instruments with active and passive remote sensing capabilities in NASA's current suite of satellites examine the atmosphere, cryosphere and hydrosphere of the polar regions. Stable monitoring of polar sea ice cover have revealed startling trends in recent decades. Two satellite radar mapping campaigns have produce detailed topographic maps of Antarctica and are providing new insights to ice sheet flow characteristics. Laser mapping of Greenland from aircraft has both documented change there and prepared the way for a new space-based capability to map the entire cryosphere. Many nations of the world have recently enhanced and articulated their commitment to Earth observation and the integration of in situ and remote sensing data for use in prediction of future changes. The world scientific community is now well positioned to pose and answer profound questions about polar region change and the implications for the rest of the Earth system. NASA and its domestic and international partners will be essential and active participants in this international scientific effort in the coming decades.

URL: http://www.earth.nasa.gov/

C32B-05 1510h INVITED

Possibilities for NOAA Activities During the IPY

John A. Calder (301-713-2518; John.Calder@noaa.gov)

Arctic Research Office National Oceanic and Atmospheric Administration , 1315 East West Highway R/ARC Rm 11362, Silver Spring, MD 20910, United States

The International Polar Year and the Declaration from the Earth Observation Summit combine to offer a challenge and an opportunity to improve our knowledge of the polar environment. Within the constraints of available resources, NOAA will strive to emphasize polar observations during the IPY period. Among activities currently foreseen are publication of newly available and recalibrated historical data sets, accelerated deployment of in situ oceanographic sensors, full-scale operation of a network of Arctic atmospheric observatories, increased observation of the polar portion of the carbon cycle, improved access to polar satellite data, and an effort to ensure that all of this information is available to the broad science community. Many of NOAA's planned activities would benefit from close coordination with activities of other U.S. agencies and with agencies of other nations. The IPY offers an opportunity to improve collaboration and sharing of expensive observation platforms and other support facilities. Should the will and resources be available, the IPY could be the catalyst for a 3-5 year deployment of a robust pan-Arctic network of oceanographic moorings to obtain a synoptic view of Arctic Ocean circulation and ice thickness. This could allow more confident specification of a decadal-scale observing system for the Arctic Ocean. For the Arctic region, NOAA will look to the U.S. Climate Change Science Program and the Study of Environmental Arctic Change and its sub-programs for scientific guidance and priority.

C32C MCC: 3010 Wednesday 1600h

International Polar Year 2007-2008 II

(joint with A, B, G, H, OS, PP, S, ED, GC)

Presiding: **R E Bell,** Lamont-Doherty Earth Observatory**; M Albert,** Cold Regions Research and Engineering Laboratory

C32C-01 1600h INVITED

A half century perspective on the International Geophysical Year (IGY) - A Template for the International Polar Year 2007 (IPY 2007)?

John C Behrendt (303 492 3733; behrendj@colorado.edu)

INSTAAR, University of Colorado, Boulder, CO 80309-0450, United States

In 1956 I sailed for Antarctica to spend 18 months as a graduate student participating in geophysical-glaciological investigations , as part of the 18-month IGY. This led to a career in geophysics, which has taken me to all of the continents and oceans. As we approach the IPY 2007, the changes in technology and our understanding of the earth over the past half century are breathtaking to contemplate. Although 70 countries participated in IGY, the disciplines were restricted to geophysics. Originally the Third Polar Year, the name was changed to IGY in 1952, at the suggestion of Sydney Chapman. The geographical area comprised the entire earth. The highest priority was given to "problems requiring concurrent synoptic observations at many points involving cooperative observations by many stations." One category was reserved for research on topics such as ocean levels, weather patterns, and the distribution of glacier ice "to establish basic information for subsequent comparison at later epochs." IPY 2007 seems such an epoch. A major international efforts was concentrated in Antarctica, although only 12 counties participated. Glaciology, seismology, auroral studies, ionospheric soundings, magnetic field measurements, and other solar-terrestrial, and meteorological observations comprised the scientific station activities. The only major field activities away from the stations were the oversnow geophysical-glaciological traverses, which made seismic measurements of ice thickness and other ice properties; gravity and magnetic anomaly profiles; and determination of snow accumulation and mean annual temperature. The most intensive of the oversnow traverse programs were those of the U.S. and USSR. Geology and topographic mapping were excluded from the Antarctica because of potential complications due to territorial claims and the possibility of mineral resource discoveries. Despite this, significant geologic findings, such as the discovery of the Dufek intrusion, were made by glaciologists and geophysicists with geologic training. Biology was not an IGY discipline, but even in this case, noted ornithologist, Carl Ekland (at Wilkes Station), carried out significant investigations of skuas. Physical oceanographic investigations resulted in geologic and biological sampling of the sea floor as well. A very few of the significant accomplishments of the IGY include the discovery of the Van Allen belts (the symbol of the IGY was a satellite circling the earth); the observation (at Mauna Loa) and recognition of the rapid global increase in carbon dioxide; the first major models of Arctic sea ice formation, decay, and drift; and the mapping of the midocean ridge system. In Antarctica, a first approximation of the mass of the ice sheet including the order of magnitude thicker ice than previously known (4 km) was a highlight. A baseline of mean annual temperatures measured (to about 0.1 degree accuracy) at about 40 km intervals along thousands of km of oversnow traverses was defined. Three World Data Centers were established; scientific results and data were deposited and made freely available to all. The peaceful international cooperation in Antarctica led directly to the signing of the Antarctic Treaty in 1959, with the first disarmament and freedom of inspection and scientific investigations clauses in history, covering a large area of the earth. I anticipate even greater international scientific cooperation from the IPY 2007. A new generation of polar scientists was developed as a result of IGY; a few of us are still active in Antarctic research. A similar result will provide continuity for the next 50 years.

C32C-02 1630h

From Darkness Toward Light: The International Geophysical Year's Education and Information Projects

Fae L. Korsmo (703-292-7431; fkorsmo@nsf.gov)

National Science Foundation, 4201 Wilson Boulevard, Suite 875,, Arlington, VA -2223, United States

As geoscientists attempt to integrate education and research across different institutions, cultures, and age groups, it is instructive to examine earlier attempts to interest students and the public in science. The U.S. National Committee for the International Geophysical Year (IGY, 1957-58) developed a poster series, associated classroom activities, publications and newsletters, and a set of thirteen half-hour films to explain the disciplinary and interdisciplinary findings of IGY. This presentation describes the lessons learned by the IGY scientists who participated in the education and information projects.

C32C-03 1645h

Understanding the Causes of Climate Change: Ice Cores, the International Polar Year, and Beyond

Kendrick Taylor[1] (Kendrick@dri.edu)

Eric Wolff[3] (e.wolff@bas.ac.uk)

Jean Jouzel[4] (JOUZEL@lsce.saclay.cea.fr)

Jeff Severinghaus[5] (jseveringhaus@ucsd.edu)

Paul Mayewski[2] (paul.mayewski@maine.edu)

[1]Desert Research Institute, 2215 Raggio, Reno, NV 89511, United States

[2]Climate Change Institute, University of Maine, Orono, ME 04469, United States

[3]British Antarctic Survey, High Cross Madingley Road, Cambridge CB3 0ET, United Kingdom

[4]Université de Versailles Saint-Quentin, 5 Boulevard d'Alembert, Guyancourt 78280, France

[5]Scripps Institution of Oceanography, 8675 Discovery Way, La Jolla, CA 92037, United States

The polar regions have a large influence on the earth's climate, and they contain records of how and why climate has changed in the past. In order to understand how climate might change in the future, and to determine the extent to which climate is changing now, we need to understand how polar regions influence climate. The international ice core community has been discussing interrelated Arctic and Antarctic projects for the investigation of climate on time scales of one to a million years. Some of the key questions are: How will the current interglacial period end?; What is the role of Greenhouse gases in climate change?; What are the triggers for abrupt climate change?; How do the Arctic, tropics and Antarctic interact during climate transitions?. Projects being discussed include: 1) development of a spatial array of Arctic and Antarctic climate records spanning the last deglacial, 2) recovery of climate records with decadal time resolution from the end of the last warm period that was similar to current

C32C-04 1700h

IPY and the Southern Ocean

Miles McPhee[1] (mmcphee@starband.net); Josephino Comiso[2] (comiso@gsfc.nasa.gov); David Holland[3] (holland@cims.nyu.edu); Doug Martinson[4] (dgm@ldeo.columbia.edu); Laurie Padman[5] (padman@esr.org); David Thompson[6] (davet@colostate.edu)

[1]Miles McPhee, 450 Clover Springs Road, Naches, WA 98937, United States

[2]Josefino Comiso, Goddard Laboratory for Atmospheric Sciences Goddard Space Flight Center, Greenbelt, MD 20771, United States

[3]David Holland, CIMS, New York Univerity 251 Mercer St., New York, NY 10012, United States